Operation & Maintenance Manuals and

As-built information

OPERATION & MAINTENANCE MANUAL

Project Name:	Essentia – Surfers Paradise
Project Address:	18 Remembrance Drive Surfers Paradise QLD 4217
Project Number	2854

Main Contractor	Morris Property Group
Address	Suite 101, 2400 Gold Coast Highway Mermaid Beach QLD 4218
Fire Protection Sub-Contractor	Auscoast Fire Services
Address:	1/105 Spencer Road, Nerang Qld 4225
Contractor Telephone No:	07 5596 1270
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Contractor Contact:	service@auscoastfire.com.au
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SECTION 1

GENERAL ARRANGEMENT

1.1 PROJECT CONTACT DIRECTORY

Trade	Company	Contact Name	Position	Email	Contact	Postal Address
Fire Services	Auscoast Fire Services	Haydn Mackie	Director	haydn@auscoastfire.com.au	0419 756 151	1/105 Spencer Road, Nerang Qld 4211

1.2 FIRE PROTECTION INTRODUCTION

Combined Sprinkler/Dry Hydrant/Hose Reel System

Sprinkler Protection System is installed to:

- Basement 2 to Level 9

  ** The installations include the sprinkler installations, installation control valves and sprinkler distribution networks.*

Hydrant System is installed to:

- Basement 2 to Roof Level

Hose Reel System is installed to:

- Basement 2 to Ground Floor

Addressable Fire Detection System and Building Occupant Warning System

Fire Detection is installed to:

- Basement 2 to Roof Level

Fire Extinguishers

Fire Extinguishers are installed to:

- Basement 2 to Roof Level

SECTION 2

SPRINKLER/DRY HYDRANT/HOSE REEL SYSTEM

2.1 GENERAL

The Automatic wet pipe sprinkler system provided are designed to detect fire in its incipient stage, to apply water onto the fire area and simultaneously sound local alarm and provide automatic generated signal to the Queensland Fire Service.

2.2 WATER SUPPLIES FOR SPRINKLER/DRY HYDRANT/HOSE REEL SYSTEM

The Water Supply comprises of x2 Sprinkler pumps (x1 Diesel & x1 Electric) & x1 Pressure Maintenance Pump suitably rated to provide the necessary flow and pressure requirements for the Sprinkler Installation fed from 1 x 70kl Sprinkler tank fed from town's main. The Pump is located in the Fire Pump Room on Ground Floor.

2.3 SPRINKLER VALVES

The Sprinkler Control Valve Assemblies are located in the Fire Pump Room on Ground Floor. The Sprinkler Control Valve Assembly consist of a Stop valve, Check Valve, Flow Switch, Gauges, Waste and Test Facility.

2.4 FIRE HOSE REELS

The Hose Reels are located on the Basement 2, Basement 1 & Ground Floor. The Hose Reels consist of a Hose Reel, Stop valve, and Nozzle.

The system pressures are maintained by the combined automatic jacking pump.

2.5 DESIGN CRITERIA

This building is protected by a Sprinkler/Dry Hydrant/Hose Reel system which is designed in accordance with requirements of the following Australian Standard

- AS 2118.1 - 1999, AS 2419.1 – 2005, AS 2441 – 2005, AS 2941 - 2013

Design Area:	**Hazard Classification:**
Basement 2	Ordinary Hazard 2
Basement 1	Ordinary Hazard 2
Ground Floor – Carpark	Ordinary Hazard 2
Ground Floor to Level 9	Light Hazard (Residential)

2.6 SYSTEM OPERATION

In the event of a fire, a heat sensitive element in the sprinkler head fuses or bursts when the temperature reaches the intended temperature, automatically releasing a flow of water. The sprinkler system is designed to control the fire until the fire brigade arrives (and possibly extinguish it).

As the system starts to operate the following sequence of events will occur, the flow of water through the sprinkler head will reduce the pressure within the system which will cause the sprinkler diesel pump to start once the pre- determined set pressure of the pump pressure switch is achieved, simultaneously a signal is sent to the FDCIE via a flow switch which is activated by the flow of water through the system, the activation of the evacuation flow switch activate the OWS (Occupant Warning System). The flow switch will generate a signal to the fire brigade via the ASE (Alarm Signalling Equipment).
The below ceiling sprinklers will fuse at 68$_{o}$ C and concealed space sprinklers will fuse @ 79$_{o}$ C.

2.7 TESTING FACILITIES

A test valve is provided at each valve set, open test valve which will activate the flow switch which will drop the system pressure, start the diesel pump and activate the flow switch and send a signal to the FDCIE which will activate the OWS.

Monthly Testing is a requirement of AS 1851 - 2012 and should be completed by qualified person holding the correct licenses.
Note: Ensure the ASE is isolated prior to testing system.

2.8 EMERGENCY PROCEDURES

After the event of a fire, a careful examination of the fire area must be carried out to ensure that the fire has been extinguished. Once it has been confirmed that there is no further danger of fire re-ignition, and then only must the installation butterfly main stop valve be shut off.

Remove and replace the fast response sprinklers that have operated with sprinklers of the same size and temperature rating from the sprinkler spares cabinet which is located Adjacent to the sprinkler control valve situated within the pump room. Refill the installation that has operated and reset the FDCIE ensuring all faults have been cleared.

It is imperative that the staff responsible for the security of the premises, as regards to fire protection, fully understand the system that has been installed.

Regular inspection and testing of the equipment will result in a reliable fire protection system in the event of a fire.

2.9 BOOSTER CONNECTION

The Sprinkler system has twin booster connections installed externally. In the event of pressure failure, a fire brigade tender will be able to pressurise the installation.

2.10 DRY HYDRANT SYSTEM

The Dry Hydrant system is where the hydrant system is primarily dry, In this case via brigades acceptance, we have installed a 25mm bypass line to keep water in the system for ease of bleeding out the air when the brigade attends to connect to the system. It has twin booster connections installed externally. In the event of a fire, a fire brigade tender will be able to pressurise the installation which will activate the hydrant system in doing so.

2.11 EXTERNAL/BALCONY SPRINKLER MAINTENANCE

Where external or balcony sprinklers are installed the owner shall clean those sprinkler heads monthly with Lukewarm soapy water in the prevention of corrosion occurring and to ensure the sprinklers are clear of any debris.

SECTION 3

SPRINKLER PUMPSETS

3.1 GENERAL

The Combined Sprinkler/Hydrants Pumpsets are activated upon a drop-in pressure within the Combined Sprinkler/Hydrant system. The pump cut in pressures are pre-set using pressure switches located on the pump discharge pipework located in the pump room.

An Electric Automatic Pressure Maintenance pump (Jockey Pump) is also installed to maintain system pressures. This pump is installed in conjunction with a Differential Type Pressure Switch which enables the pump to cut in and out automatically to cater to any fluctuations in system pressure. In the event of a fire the Jockey Pump will not be able to meet the demand of a sprinkler/hydrant in operation allowing the main Diesel Pump to cut in.

3.2 MANUAL MODE

Press the test push button to start the diesel pump, the diesel will start and the pilot lights for fire alarm and pump run will be illuminated.

To stop the diesel pump the engine must be manually stopped by pushing in the reset button on the pump control panel.

Press the emergency start push buttons 1 or 2 to start the diesel engine, the pilot light for pump run will be illuminated.

The diesel engine must be manually stopped by pushing in the reset button on the pump control panel.

3.3 AUTOMATIC MODE

Should the pressure drop in the sprinkler system and reach the predetermined set point pressure on the test arrangement for the diesel sprinkler pump, then the controller will latch onto this signal and start the diesel fire pump automatically.

The fire alarm and pump run light will be illuminated. To stop the pump, pull the stop lever back and hold until the pump stops and press the reset button. If the pressure in the sprinkler system is not up to the normal level, the diesel pump will restart as soon as the engine stop lever is released.

Alarms will be initiated as described under annunciator.

If the diesel engine does not start immediately on receiving a test or automatic signal, the diesel engine will proceed through a crank cycle.

The diesel engine will crank on battery # 1 for 15 seconds and dwell for 7 seconds before attempting to crank on battery # 2. A total of 6 start attempts are made, after which the start cycle will stop and a pump fail light will be illuminated on the diesel controller.

Should the diesel engine start at any time during the cranking of the diesel engine, the diesel controller will receive a signal from the diesel engine and will abort the crank cycle.

The test push button on the diesel controller will simulate an automatic start from the test arrangement and the pump will operate as listed above.

Emergency start push buttons will bypass the automatic and control circuits and will start the diesel pumpset. When the diesel pumpset is started like this the pump run light will only be illuminated.

The diesel engine must be stopped by pulling the stop lever back.

For additional information regarding the Diesel Pumpsets please refer to the Diesel Pump Operation & Maintenance manual in Section 7.

SECTION 4

Fire/Smoke Detection System

4.1 GENERAL

The fire detection system installed consists of an analogue addressable fire detection CIE (FDCIE) interfaced with an emergency warning intercommunication system (EWIS). The FDCIE and EWIS are housed in entry lobby on Ground Floor.

4.2 SYSTEM OPERATION

When smoke is detected via a smoke detector a signal is sent to the FDCIE (Fire Detection CIE) which provides the location of the detector that has activated, this is indicated on the LED screen of the FDCIE, simultaneously the ASE (Alarm Signalling equipment) is activated alerting the Fire Brigade, the alert and evacuation tones are then activated with in the relevant evacuation zone, the smoke exhaust fans are started and the Air conditioning systems are shut down via a signal sent from the FDCIE to the MSSB (Mechanical services switch board). The same sequence of events will occur should the automatic sprinkler system operate.

By referring to the location diagram adjacent to the FDCIE the area in alarm can be easily determined.

4.3 EVACUATION ZONES & WARDEN INTERCOM PHONES

The system comprises of evacuation zone amplifiers, which provides audible alert and evacuation tones over a monitored network of dedicated speakers. Please refer to the location diagrams at the FDCIE's

The tones are activated by the FDCIE automatically and manually via the front facia push buttons of the panel. Public address facilities are also provided via the paging microphone of the EWIS system.

The EWIS system has a built-in communication system comprising of a red phone situated at the main EWIS panel connected to remote red warden phones installed on each level. These are typically utilized in a fire situation by the dedicated fire wardens and fire brigade to ensure each level has been completely evacuated.

4.4 MONTHLY TESTING

It is a requirement of AS 1851 - 2012 that the building occupant system is tested on a monthly basis. The testing of the EWIS is to be done in conjunction with the testing of the automatic sprinkler installation.

4.5 USER OPERATING INSTRUCTIONS AND LOGBOOK FOR RECORDING TEST RESULTS

A logbook has been provided on the premises to record the monthly test results for the sprinkler system, fire pumps and fire detection and alarm system.

SECTION 5

Fire Extinguishers

5.1 GENERAL

The Fire Extinguishers have been installed in accordance with Australian Standard AS2444 - 2001. Locations can be found on Evacuation Diagrams.

5.2 MAINTENANCE

The Fire Extinguishers maintenance shall be in accordance with Australian Standard AS1851 -2012.

SECTION 6

Routine Testing Procedures

6.1 GENERAL

This section sets out the requirements for maintenance of fire protection systems covered by AS 1851-2012

6.2 PROCEDURES AND PRECAUTIONS

6.2.1 Design and installation survey

Fire systems shall be surveyed on an annual basis in accordance with AS 1851-2012

6.2.2 Systems interface

Where fire protection systems interface with other systems, all interface functions shall be tested in conjunction with the other systems to ensure that the interconnection to other systems functions as intended.

6.2.3 Maintenance records

Details of records shall be kept in accordance with the requirements of AS1851-2012 Maintenance records for the fire sprinkler/hydrant systems, hard copy records, in the form of log books should be kept on site and be available at all times.

6.2.4 Logbooks

Logbooks shall have sequentially numbered pages in triplicate. Provision shall be made for the signatures of the building owner, occupier or agent, and the service person. The required distribution of copies shall be printed on each page as follows:

(a) Original……. owner / occupier / agent.
(b) Duplicate……. service person.
(c) Triplicate……. retain in books.

6.2.5 Reports

Defect and condition reports shall be prepared and distributed in accordance with AS1851 - 2012

6.3 Frequency

For the purposes of this Section, the following frequencies of inspection, test, preventive maintenance and survey shall apply as designated in the frequency of AS 1851-2012

(a) Monthly.

(b) Six-monthly.

(c) Yearly.

(d) Five-yearly.

(d) Ten-yearly.

(d) Twenty five-yearly.

(d) Thirty-yearly.

SECTION 7

7.1 MANUAL

Fire Pumpsets

USER MANUAL

Fire Protection Pumpset

FIRE PUMP SET TO AS2419 & AS2118

Aline

PUMPING WITH INNOVATION

REVISION #3

Fire Services Pump Set

This manual explains the features and operations of the Fire Services Pump Set which is specifically designed for Boosting pressure in a fire main.
The Fire Pump System is capable of boosting water from either a tank or from a mains supply and is capable of feeding both Sprinklers and Hydrants.

Warnings

Failure to follow these precautions could result in serious injury or death. Keep these instructions with warranty after installation. This product must be installed in accordance with AS 2941, so as to prevent moisture from entering or accumulating within the controller housing or the Engine.

ELECTRICAL SHOCK HAZARD
Disconnect power before installing or servicing this product. A qualified service person must install and service this product according to applicable electrical codes and electrical schematics.

- *Do not install in area with: excessive or conductive dust, corrosive or flammable gas, moisture, rain or regular impact shocks.*
- *Do not place in water or let water leak onto the controller.*
- *Do not allow debris to fall inside the unit during installation.*
- *Double-check all the wiring before turning on the power supply.*
- *Do not touch live wires.*
- *Stay as far as possible from high-voltage cables and power equipment.*

EXPLOSION HAZARD
Do not install in hazardous locations as defined by AS 3000.

Aline
PUMPING WITH INNOVATION

ALL REPLACED PARTS ETC. WILL BE DISPOSED OF AFTER REPAIR UNLESS REQUESTED OTHERWISE. UNCLAIMED PUMPS/PARTS DISPOSED OF AFTER THREE WEEKS. A SERVICE CHARGE MAY BE PAYABLE AFTER ASSEMBLY IF REPAIR IS NOT CARRIED OUT. ALL CARE BUT NO RESPONSIBILITY TAKEN FOR CUSTOMER'S FITTINGS SUPPLIED WITH PUMP.

USER MANUAL

Aline
PUMPING WITH INNOVATION

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Before installation, operation or maintenance of Pump System, please read these Safety Precautions carefully.

System operation may cause injury. Take all necessary precautions. Wear the necessary protective equipment. Refer to Engineers department. Any maintenance of Pump Systems must be carried out by authorised, qualified personnel only.

WARNING Pump may start at any time

In normal automatic mode, pumps may start automatically at any time. Before maintenance or any other work carried out on pumps or motors, ensure proper isolation of motors at the relevant controller.

WARNING System is pressurised

Under normal operating conditions, the pipes, pumps and components of water supply and pressure systems are pressurised. Before unbolting or dismantling any pipework or equipment, ensure water supply to the areas of maintenance is isolated and water pressure relieved.

DANGEROUS Voltage

Control boxes containing live wiring and terminals. Entry of control boxes is not permitted except by authorised service personnel only. Ensure Controller is isolated before entering.

CAUTION Exposed moving parts

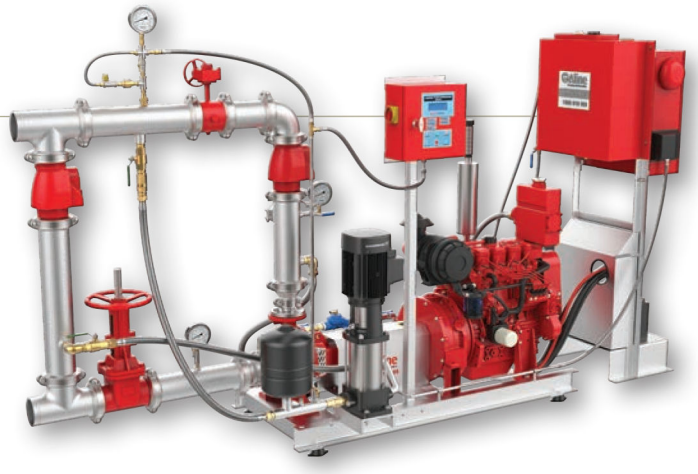
Keep clear of all moving parts on pumps, motors and couplings and keep area around pump system clear at all times.

CAUTION High Temperature

Parts of the Diesel Engine, exhaust pipe and cooling pipework are hot when the engine is running and for some time after the engine stops. *Keep clear of these areas during these times.*

CAUTION Take Care

Please take care and use common sense when working on or near the Fire Pumpset and report all faults to the maintenance manager.



Specific Warnings and Precautions

MAINTENANCE
Fire protection Pumpset must be TESTED and MAINTAINED on a regular basis in accordance with the relevant Australian Standards including AS1851-14.
Regular testing to be carried out by a fire systems maintenance contractor.

MANUAL SHUT DOWN
The Australian Standards prohibits automatic shutdown of fire pumps. The fire pumps will not automatically shut down after they have started and must be MANUALLY STOPPED.

EXTERNAL WARNING DEVICE
The fire pump system generates alarm and warning outputs which must be connected to an adequate external system and maintained to the relevant Australian Standards. Procedures must be instigated to ensure warning signals are responded to in a competent manner, on a 24 hour per day basis.

INTENDED USE OF EQUIPMENT
The fire pumps must not be used other than for their intended purpose, ie: fire protection, training and system pressure maintenance. Failure to comply with this may void warranty.

VENTILATION AND DRAINAGE
The pump room must be adequately vented and drained. Failure to do this may result in severe damage to property and personnel.

EXHAUST
Diesel exhaust must be piped to a suitable external location in a manner that will preclude the entry of water. Exhaust pipework should include a condensate trap and must be sized to engine manufacturer's recommendations. Exhaust pipework and accessories must be lagged in a suitable method to industry standards.

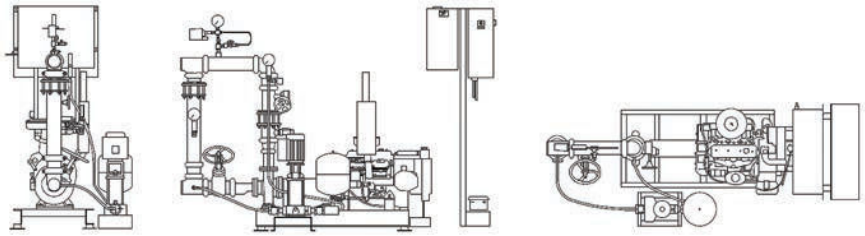
EQUIPMENT
Equipment to be mounted on a suitable vibration isolation mounts and fixed to floor.

LOCATION
The Fire Protection Pumpset is to be located out of direct weather and sunlight.

MAINS POWER
The Pumpset shall be permanently connected to the supply side of the mains switch and must comply with AS/NZS 3000 and AS/NZS 3013.

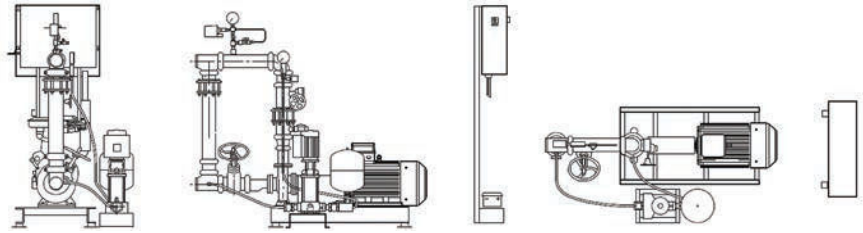
General System Layouts

Single Diesel



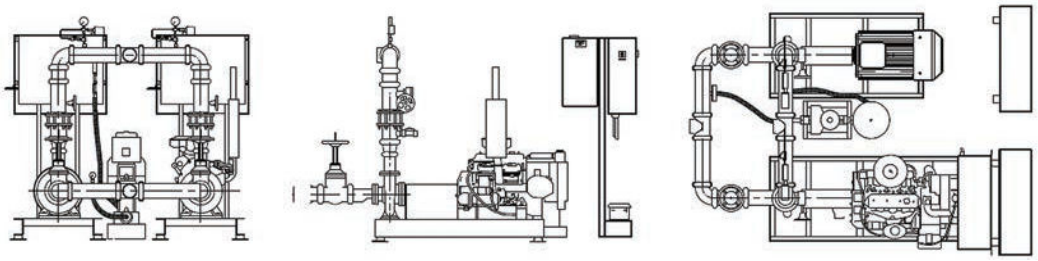
One pump coupled to a Diesel Engine with control panel and fuel tank with the option of jacking pump and pipe work.

Single Electric



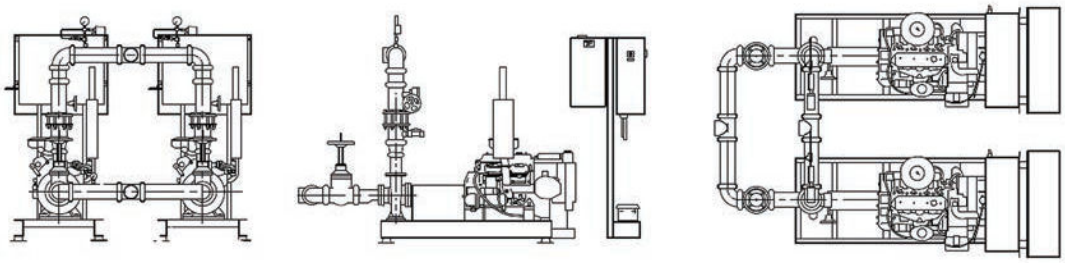
One pump coupled to an Electric Motor with control panel with the option of jacking pump and pipe work.

Dual Diesel / Electric



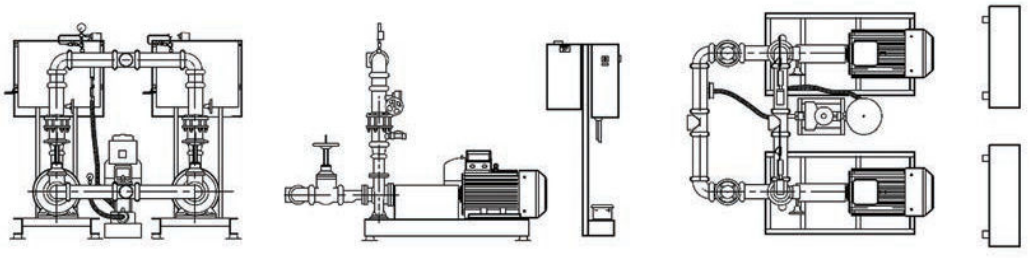
Two Pumps, one coupled to a Diesel Engine with control panel and fuel tank and the other coupled to an electric motor with control panel with the option of jacking pump and pipe work.

Dual Diesel



Two pumps, both coupled to their own Diesel Engine, control panel and fuel tank with the option of jacking pipe and pipe.

Dual Electric



Two pumps, both coupled to their own Electric Engine, control panel and fuel tank with the option of jacking pipe and pipe.

WARNING

PUMP SYSTEM IS AUTOMATICALLY CONTROLLED AND MAY START AT ANY TIME

ELECTRIC PUMP

TO **START** PUSH THE EMERGENCY START BUTTON

TO **STOP** TURN OFF THE MAIN ISOLATOR

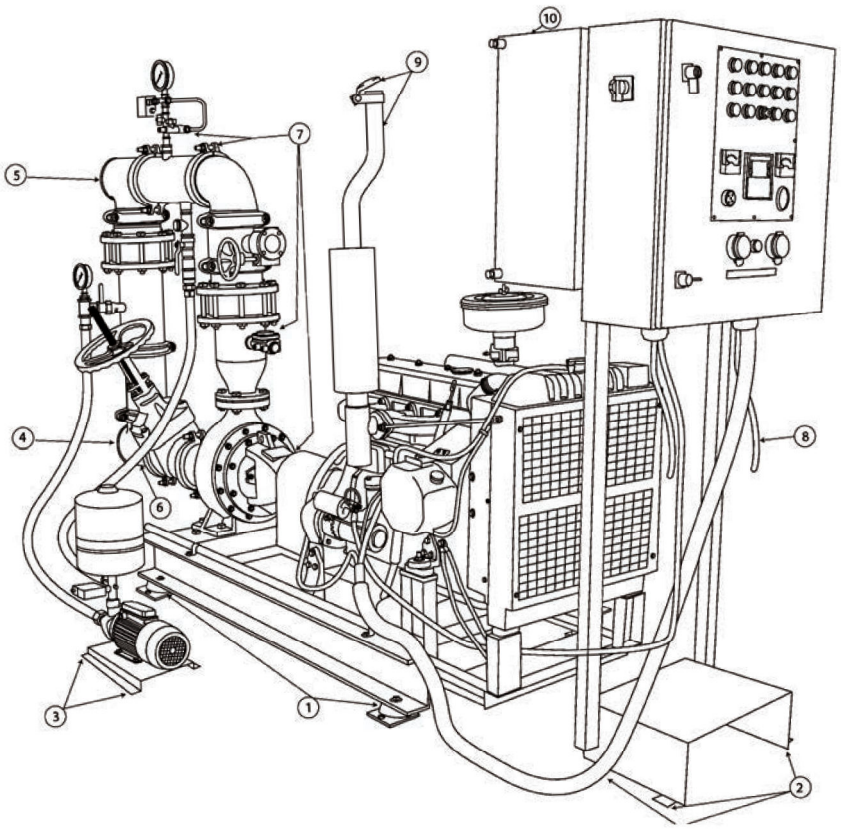
DIESEL PUMP

ENSURE THE CRANK ISOLATE KEY IS IN THE NORMAL POSITION

TO **START** PUSH AND HOLD EITHER (*OR BOTH*) EMERGENCY START BUTTON UNTIL ENGINE STARTS

TO **STOP** PUSH AND HOLD THE PUMP STOP BUTTON

IF THE DIESEL MOTOR **WON'T STOP** OR CONTINUES TO CRANK, OVERTURN THE KEY SWITCH TO ISOLATE, THEN PRESS STOP *OR* PULL THE YELLOW LEVER ON THE SIDE OF THE MOTOR



INSTALLATION

Pump unit must be installed in a full weather protected enclosure/room.

A minimum length of 1,000mm is required at the control panel end of the system to allow access for servicing.

Control panel stand may be turned 90° and installed in front of the engine if sufficient length is unavailable.

The installation steps 1-10 must be completed before system commissioning can be carried out.

Contact our Service Department to arrange for commissioning upon completion.

Note: *An additional service call will be charged in the event of incomplete installation.*

FIRE HYDRANT PUMP INSTALLATION

1. Remove transport timbers and fit pumpset with underbase mounts (grey). (Supplied inside the control panel)

2. Bolt panel/fuel stand directly to plinth.

3. Mount jacking pump on plinth (mounts not required), in suitable position for connection suction/discharge hoses.

4. Connect suction pipework.

5. Connect discharge pipework.

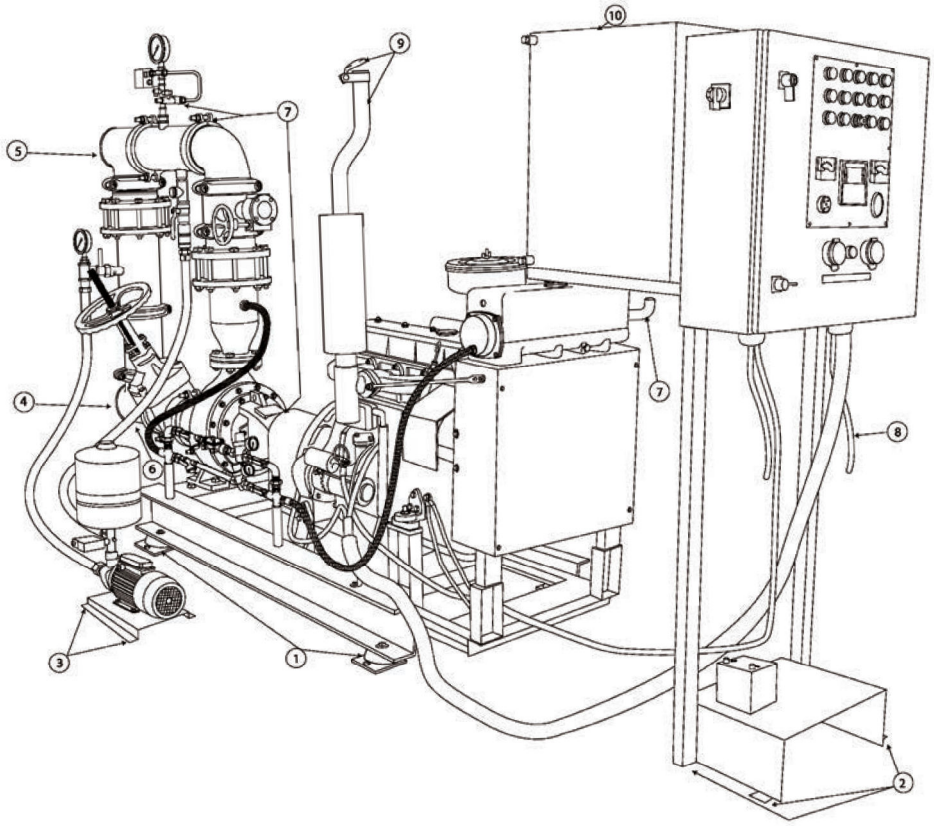
6. Install approved pipe brackets and/or suitable plinth, to provide suction and discharge pipe support.

7. Pipe test valve pressure relief valve, pump gland and Circulation Relief Valve discharge to drain in suitable metallic pipe.

8. Employ electrical contractor to connect mains power supply to control panel.

9. Fit exhaust pipe to diesel, finished with suitable moisture ingress protection (Rain Cap).

10. Fill tank with diesel. (Approx. 70 litres required).



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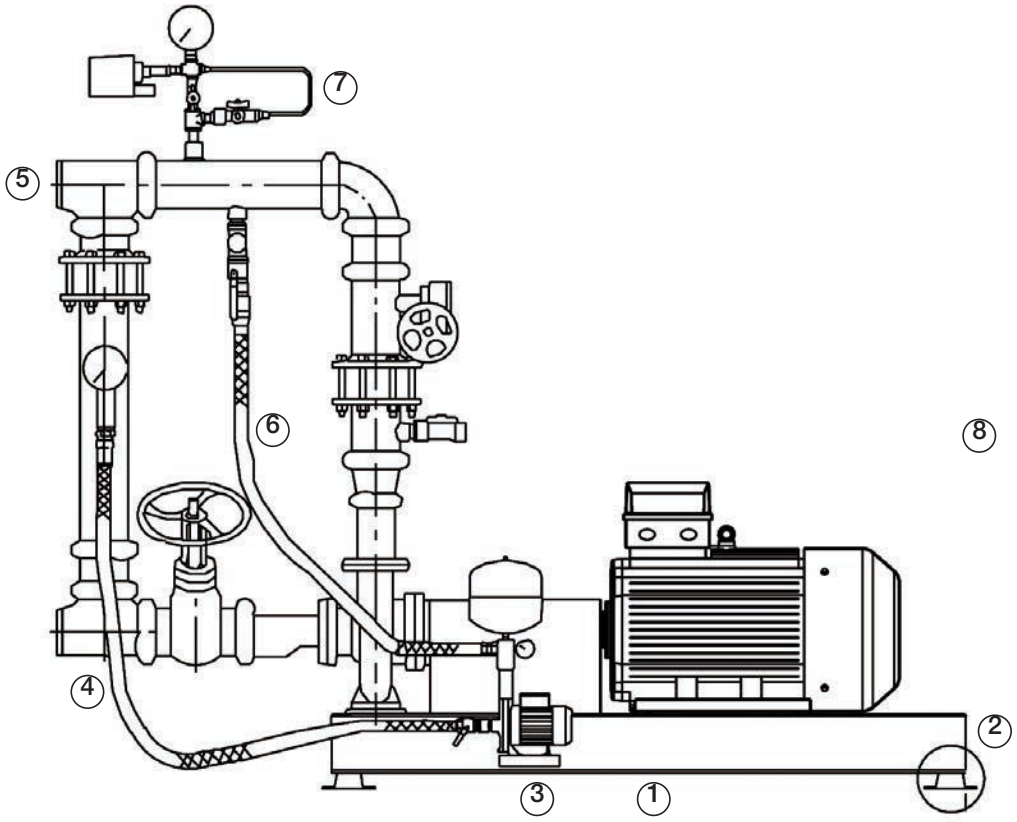

INSTALLATION

Pump unit must be installed in a full weather protected enclosure/room.

A minimum length of 1,000mm is required at the control panel end of the system to allow access for servicing.

Control panel stand may be turned 90° and installed in front of the motor if sufficient length is unavailable.

The installation steps 1-8 must be completed before system commissioning can be carried out.

Contact our Service Department to arrange for commissioning upon completion.

Note: *An additional service call will be charged in the event of incomplete installation.*

FIRE HYDRANT PUMP INSTALLATION

1. Remove transport timbers and fit pumpset with underbase mounts (grey). (Supplied inside the control panel)
2. Bolt panel stand directly to plinth.
3. Mount jacking pump on plinth (mounts not required), in suitable position for connection suction/discharge hoses.
4. Connect suction pipework.
5. Connect discharge pipework.
6. Install approved pipe brackets and/or suitable plinth, to provide suction and discharge pipe support.
7. Pipe test cock pressure relief valve, pump gland and heat exchanger discharge to drain in suitable metallic pipe.
8. Employ electrical contractor to connect 415 volt power supply to control panel.

IMPORTANT

Install in accordance with relevant Australian Standards and local regulations. Standards include AS2941

1. PUMPSET

must be installed in a well ventilated area. Mechanical ventilation may be required in limited ventilation areas.

2. PUMPSET

Must be mounted on a level concrete plinth, 150mm tall and on rubber resilient pads provided. Pumpset to be anchored down securely. Great care should be taken not to twist base when tightening down - ie: do not force base down with anchor bolts.

3. PIPEWORK connections include:

a) Main suction from tank or mains, all care must be taken to ensure there are no leaks, no potential air locks (ie: air will automatically bleed from suction line) and no prohibited devices in the suction line (refer AS2941).
b) Main discharge to Hydrants / Sprinklers.
c) Relief valve connection back to storage tank or drain.
d) Diesel heat exchanger outlet to drain (discharge must be visible) if applicable.
e) Test valve drain to waste.
f) Circulation relief valve connection back to storage tank or drain.

4. PLEASE ENSURE

that heat exchange waste pipework is of adequate size.
Pipework size to be at least the same size as the outlet of the heat exchanger and must be plumbed independently to the relief valve waste.

5. ELECTRICAL CONNECTIONS INCLUDE:

a) **Diesel Pump** Single phase (or three phase if the jacking pump requires) supply to operate control system and hose reel/jacking pump. Supply to be classed ‘essential supply’ and in fire rated cabling.
b) **Electric Pump** Three phase and Neatural supply to operate the control system, Hose Reel/ jacking pump and also the main pump. Specific note should be taken of the current rating of the main pump motor. Supply to be classed essential supply and in fire related cabling.

6. COUPLING ALIGNMENT

Must be checked after installation. Transit and/or installation may have disturbed coupling alignment. Alignment should be within 1mm parallel alignment and 2 degrees angle alignment. Alignment should be rechecked after the first month and 6 monthly thereafter. If Pumpset uses a driveshaft type Coupling, misalignment should be greater than 5º and less than 14º. Ensure all bolts and grub screws on the drive train are checked before commissioning and periodically thereafter.

7. PUMP ROOM

Must be adequalely drained. Drainage should be sufficient to cope with a catastrophic failure of any component without flooding the pump room.

8. CARE SHOULD BE TAKEN

installing the exhaust system. Exhaust systems run at a high temperature. Where applicable, exhaust should be shielded to prevent burns. All materials used in exhaust systems and in contact with adjacent to exhaust system, should be suitable for high temperatures. Exhaust systems should not be supported by engine connections. Suitable bracketing should support system for entire length. Connection to the engine must be via flexible connection. Exhaust systems must be configured so as the entry of water is precluded. Exhaust turn down is recommended. Final discharge of exhaust should not be in a sheltered environment and care should be taken to ensure no person is at risk from discharge of hot exhaust or fumes. At the bottom of any rise in the exhaust system, a condensate/water trap should be installed. Exhaust pipe sizing should be one larger than exhaust engine connections for discharge lengths up to 3m. Exhaust that runs over this length, will require further upsizing to ensure there is no excessive back pressure on engine.

Refer to manufacturer.

9. CRITICAL

The system outputs (including power on, pump(s) run and faults) should be monitored on a continuous basis with a management plan in place to respond to signals. Unattended running can cause damage to pump equipment and associated building/grounds and may void warranty.

10. ALL

wiring and electrical work to be in accordance with AS3000 and other applicable standards.

11. BATTERIES

must be left disconnected and stored correctly as per manufacturers recommendations or when mains power is disconnected or off line.

Failure to follow procedure, may cause battery failure which is not covered by warranty.

Fire Pumps have been pre-commissioned and tested to AS2941-2008 prior to dispatch from workshop, however, a site commission is still necessary.
It is suggested initial startup is done with the site electrician present.

1. Visual inspection of the complete system to ensure pipework connections are in place and nothing is out of order.

2. Open necessary valves to allow water from tank to pumpset.

3. Open suction and discharge isolation valves on main pump/s and jacking pump.

4. Open bleed ball valve on top manifold (incorporated in fail safe loop) to allow air to escape.

5. If jacking pump is a vertical multistage pump, a separate bleed valve will be fitted at the top of pump. Open to allow air to escape. Close valve once water starts flowing.

6. Ensure ball valves to pressure switches and gauges are open.

7. Bleed any residual air out of suction manifold.

8. Check with the site electrician to ensure mains power is present in the control panel.

9. Isolate diesel engine starts via ‘Crank isolate” key switch on control panel.

10. Connect battery terminal lugs. (Removed for shipping purposes).

11. Mute audible alarm if necessary.

12. Turn ‘mains isolator’ switch on.

13. Jacking pump can be switched to automatic to take up system pressure. (Rotation must be checked on jacking pump if it is 3 phase).

14. Ensure jacking pump shuts down automatically via pressure switch once system is at full pressure.

15. Check current draw of jacking pump to be correct.

16. Switch ’Crank isolate’ switch to normal if system pressure is high, main pump should not start.

17. Press ‘emergency start’ button. **WARNING: ENGINE WILL START IMMEDIATELY.** Engine can be stopped by pressing pump stop button.

1. AUTOMATIC START TEST

1) **Ensure crank isolate key (if mains pump is a diesel) is in normal position.**
Turn Hose Reel on. Hose Reel Pump should start and maintain pressure.
Turn Hose Reel off. Pump should stop within 1-2 minutes.
(Only applicable if Hose Reel system is installed).

2) **Open Hydrant** main pump should start. Shut Hydrant down. Pump should continue to run. Press 'Stop reset' button on diesel panel and hold down until diesel engine has completely stopped.

2. MANUAL START TEST

1) **Jacking Pump** Press Jacking Pump Selector to 'Manual', pump should run and pressure will increase. Return to auto.

2) **Main Pump**
Test 1 - Press one of the 'Manual start' buttons on the control panel and hold down until pump starts. Pump will run. Press 'Stop reset' on control panel and the pump stops completely.

Test 2 (if a diesel pump) - Press other manual start on diesel panel and hold down until engine starts. Press 'stop reset' and the pump stops completely.

Note: Engine can be prevented from starting by turning key switch on diesel panel to isolate. This will cause an alarm condition and should not be left in this position unnecessarily.

Fire protection pumpset should be tested and maintained in accordance with relevant Australian Standards AS1851.14. After operating fire pump set, the system should be visually inspected. Check engine levels, exhaust systems (including exhaust flap if fitted) to ensure all is back to normal condition.

Pumps should start automatically on loss of pressure.
If pumps fail to start, the following procedure should be followed.

1. MANUALLY START ELECTRIC PUMP

By pressing the pump start button on electric pump controller on the remote panel.
Should the motor fail to start, ensure the mains isolation is **ON**.
If the motor still will not start, proceed to the diesel pump if installed.

1. MANUALLY START DIESEL PUMP

by pressing one of the 'Manual Start' buttons
on **DIESEL FIRE PUMP CONTROLLER or on REMOTE PANEL.**

Should engine fail to start, press the second **'MANUAL START'** button
located on **DIESEL FIRE PUMP CONTROLLER.**

If engine cranks but refuses to start, check diesel fuel level in tank.

In case all systems fail, 12 volt DIESEL ENGINE can be started using a standard car battery, by either using jumper leads immediately on the start solenoid or in the place of the crank battery. A 24 voly DIESEL ENGINE requires two 12 volt batteries connected in series.

Should pumps be running and there is lack of water at the hydrants, check valve positions. Ensure bypass valves are off. Also check water level in main tank.

TO BE PERFORMED ONLY BY SUITABLY QUALIFIED AND AUTHORISED PERSONNEL

1. DIESEL FIRE PUMP SET

1.1 To shut down a pump that is running

A shut down is performed with the controls mounted on front of 'Diesel Fire Pump Controller'.

1) Select 'Isolate' position in 'Crank Isolator Switch' selector switch.
2) Press red pump 'Stop' push button.
3) Return 'Crank Isolator' selector to 'Normal'. (engine may attempt to restart if controller is still receiving a start signal).

CAUTION: Never leave 'Start Isolator' selector in 'Isolate' position.

1.2 Isolate Diesel Fire Pump
(If engine is running, use above procedure to stop engine).
1) Notify relevant management personnel.
2) Select 'Isolate' position on 'Crank Isolator' selector switch. (mounted on face of the Diesel Fire Pump Controller).
3) Isolate mains power supply to 'Diesel Control Panel'.
4) Remove battery leads off both crank and control batteries.

1.3 Electric Fire Pump Set (If installed)
Shut down is performed with the controls mounted on the front of 'Electric Fire Pump Controller'
1) Notify relevant management personnel.
2) Turn off mains isolator.

2. ELECTRIC JACKING PUMP

2.1 Isolate Electric Jacking Pump

(Isolation is performed from the 'Diesel Fire Pump Controller' in the case of a single fire pump configuration).

1) Notify relevant management personnel.
2) Select the 'Off' position of jacking pump selector switch.
3) Isolate jacking pump motor starter circuit breaker and lock off.

CAUTION: The jacking pump is designed to maintain system pressure. Isolating jacking pump is likely to result in a main pump start up.

AS2941-2008 - DIESEL FIRE PUMP CONTROLLERS

FUNCTION

The AFP series of fire pump controllers are designed to automatically operate a diesel fire pump when a remote sensor detects a pressure sensor commands.

POWER SUPPLY

240V AC single phase supply or 415V DC 415 V AC Three Phase Supply.

INDICATORS

Power available (green)
Mains power available to the supply side of the mains isolator.

Pump on standby (green)
There are no faults and the pump will start when required.

Pump running (red).
Pump is running.

Crank isolated (red)
Crank isolator key switch is in the isolate position, therefore the pump will not start.

Alarm muted (red)
The audible alarm buzzer is muted or silenced.

Charger supply fail (red).
The power supply to the battery chargers has failed.

Crank charger fail (red).
The crank battery charger is failing to produce a charge.

Control charger fail (red).
The control battery charger is failing to produce a charge.

Crank battery fault (red)
Crank battery voltage is or was below the acceptable level.

Control battery fault (red)
Control battery voltage is or was below the acceptable level.

Fail to start (red)
Diesel engine has failed to start when required.

Low fuel (red)
Fuel tank is low on fuel.

Engine overspeed (red)
Engine has exceeded the preset RPM maximum limit.

Low oil pressure (red)
Oil pressure is/was below preset minimum.

Engine temp fault (red)
Engine coolant temperature has exceeded high or low temperature limit.

BUTTONS

Alarm test
Tests all the audible and visual alarms and indicators.

Pressure switch test
Simulates the situation of the pressure switch closing contacts.

Overspeed test
Simulates the situation of the engine exceeding maximum RPM setting.

Stop reset
Will stop the engine if running and reset alarms.

Alarm mute
Silences the audible alarm.

Emergency start #1
Push to start the engine manually (will not start if crank is isolated).

Emergency start #2
Push to start the engine manually (will not start if crank is isolated).

JACKING PUMP
A red LED beside each button will indicate the condition of the jacking pump controls

AUTO - The jacking pump will operate automatically

OFF - Isolates the jacking pump

MANUAL - The jacking pump will run while button is pushed, then return to previous condition

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SWITCHES

Mains isolator
Isolates the mains AC supply to the panel. (Power will remain at the power fail relay inside and the power available light will remain on, but the charger supply fail light will come on)

Crank isolator
In the normal position, the engine will start when requested. When the key is in the isolate position the engine will not start when called for manually or automatically.

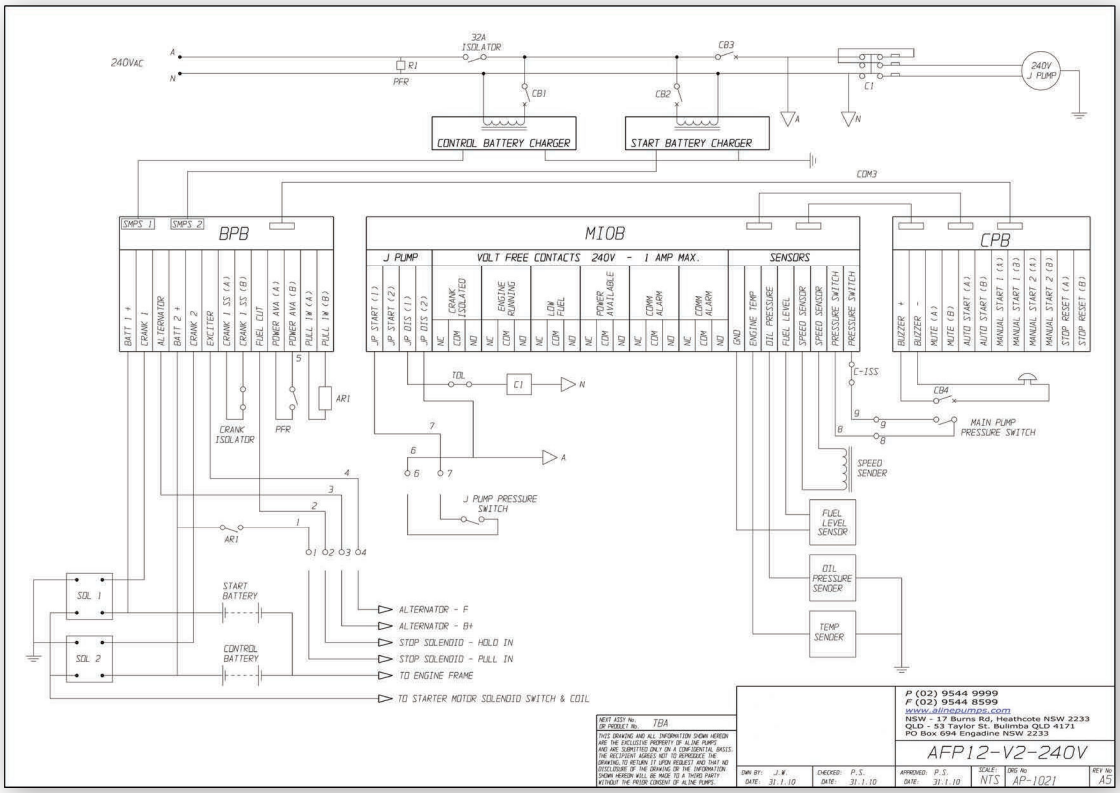
Operation
Starting - The AFP will start the diesel automatically if the contacts are closed on the remote pressure switch. This can be simulated by pressing the pressure switch test button. There are two emergency start buttons (one for each battery bank) to start the engine in an emergency. *No starting function will start the engine when the crank isolate switch is in the isolate position.

Stopping - To stop the engine press the stop reset button

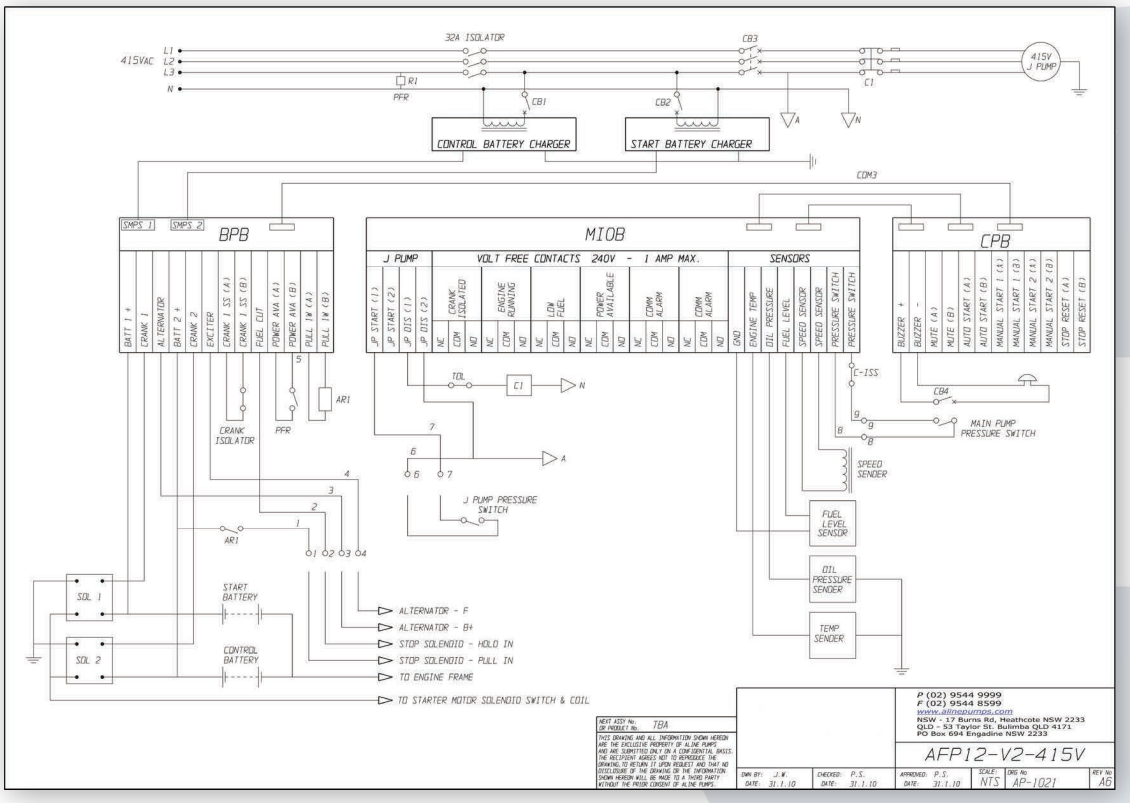
Emergency starting
There are two emergency start buttons (one for each battery bank) to start the engine in an emergency. These are both green in colour. Pushing either of these will start the engine unless in the **CRANK ISOLATE** mode.

***NO STARTING FUNCTION WILL START THE ENGINE WHEN THE CRANK ISOLATE SWITCH IS IN THE ISOLATE POSITION**

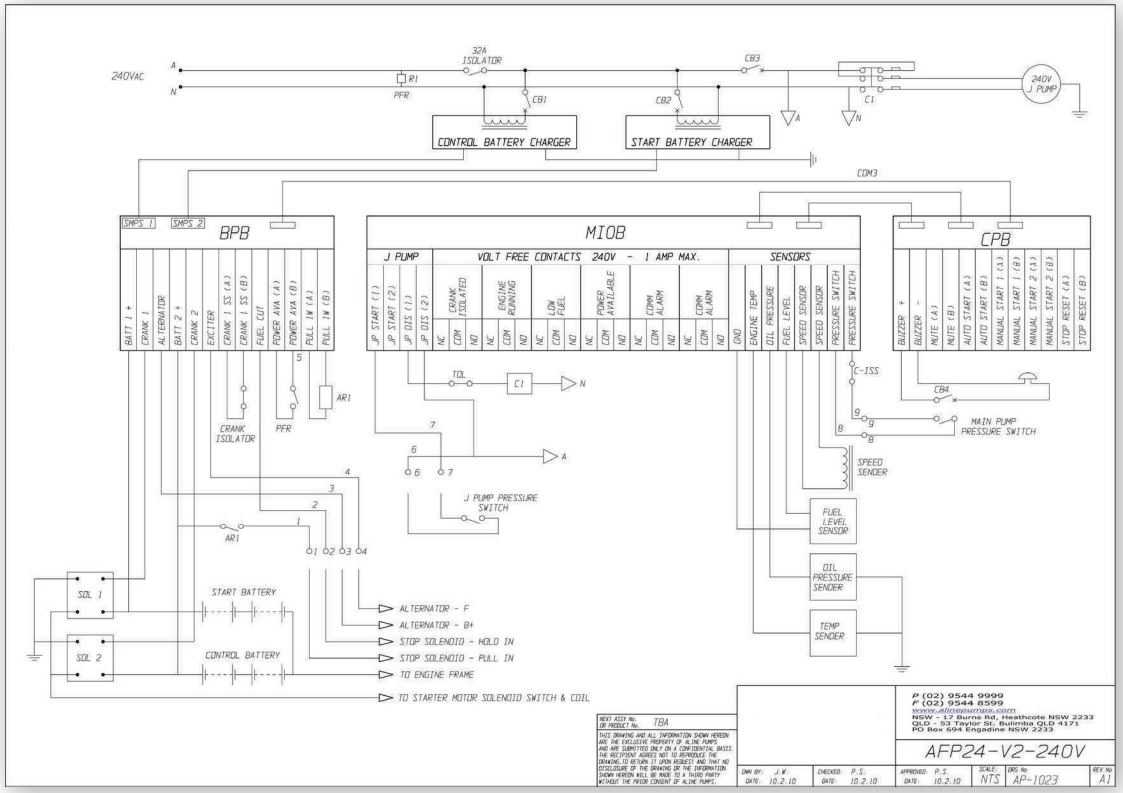
12 VOLT 240VOLT JACKING PUMP



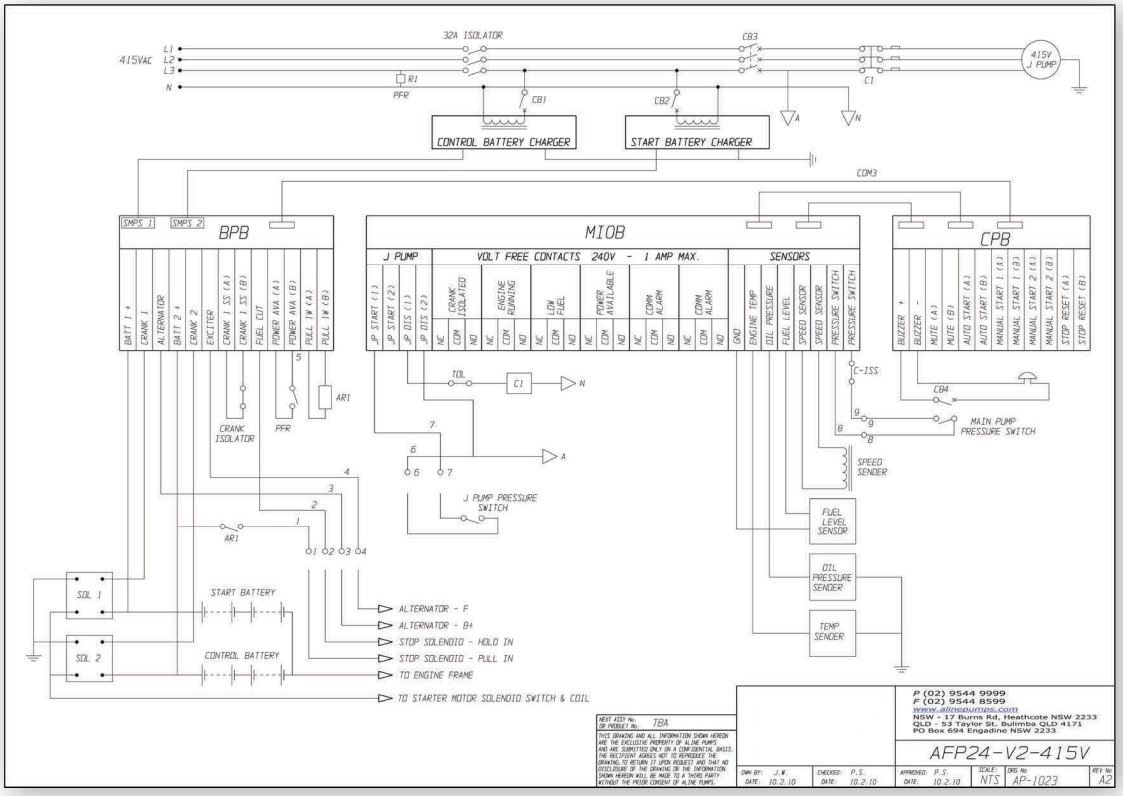
12 VOLT 415VOLT JACKING PUMP



24 VOLT 240VOLT JACKING PUMP



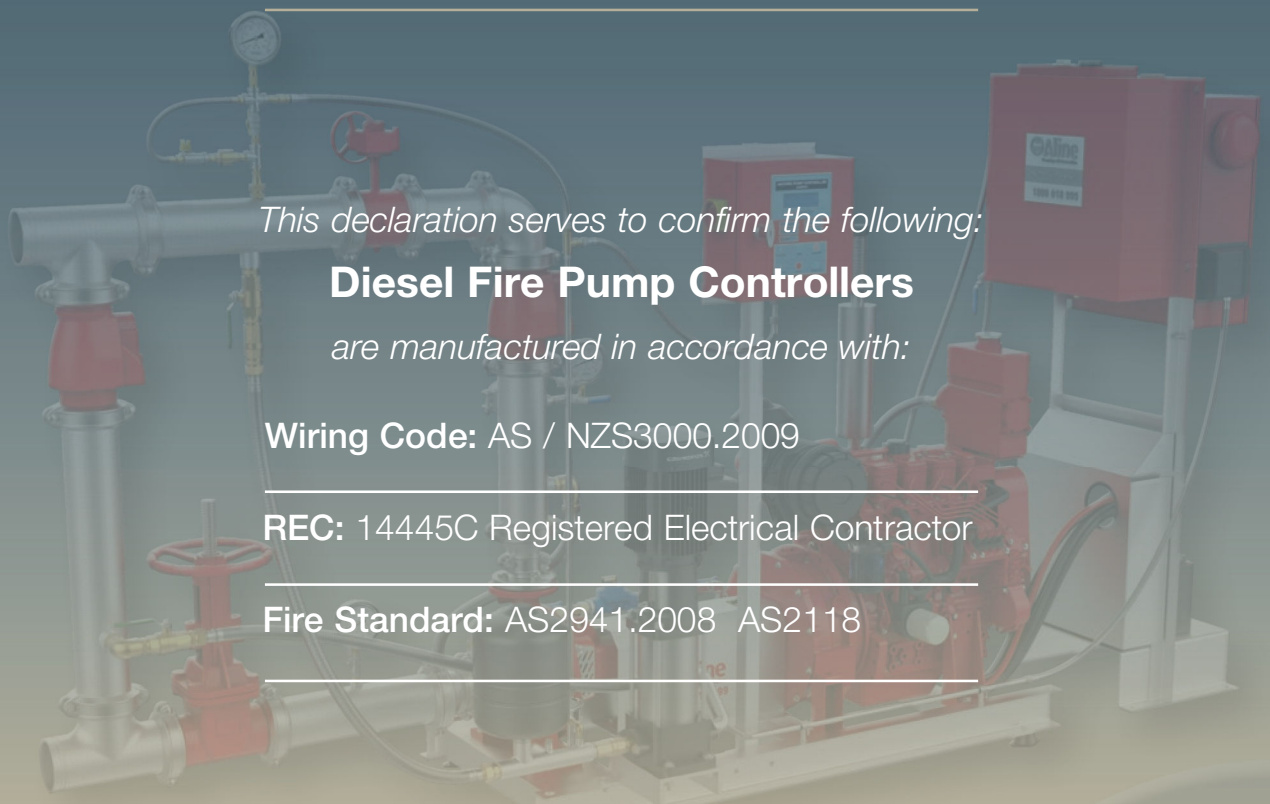
24 VOLT 415VOLT JACKING PUMP



Aline

PUMPING WITH INNOVATION

Manfacturers Declaration



This declaration serves to confirm the following:

Diesel Fire Pump Controllers

are manufactured in accordance with:

Wiring Code: AS / NZS3000.2009

REC: 14445C Registered Electrical Contractor

Fire Standard: AS2941.2008 AS2118

Peter Sharpe Operations Co-Ordinator for Aline Pumps and Service
1st January 2012

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WARNING NOTICE

1. It is strictly forbidden to use inferior and dirty diesel fuel or lube oil, please choose to use lube oil with stipulated number according to the instructions.
2. It is strictly forbidden to leak out from an intake system (air filters, pipelines and connecting components).
3. It is strictly forbidden to have hard water (well water or spring water) as cooling water, if necessary to apply hard water, soften it first.
4. It is strictly forbidden to start under the circumstance of lack of lube oil or water.
5. It is strictly forbidden to operate at overload or under other conditions against the rules.
6. It is strictly forbidden to regulate the fuel injecting pump as well.
7. It is strictly forbidden to change the diameter of the pulley.
8. To control the starting time (less than 15 seconds) and the starting interval (more than 2 minutes) strictly.
9. Unskilled workers are not allowed to dismantle and assemble the engine and spare parts.

1. Please pay the utmost attention to safe operation proceedures, so as to protect your life and property. Failure to not abide by the operating regulations, may cause a fatal accident or machine or property damage.
2. It is common that many accidents incurring great damage to engines, are caused by the operator not understanding operation essentials, adjustment and maintenance, so the operator shall have the technical training so as to master the abilities for operation, maintenance etc.
3. Although the diesel engine has advanced technology and is of high quality, correct operation and careful maintenance are essential to achieve ultimate functionality.
4. For lubrication, use a light, diesel oil equivalent to Mobil Delvac MX 15W-40.
5. Long term anti-freeze and anti-rust liquid for automotive use shall be used in the cooling water to prevent the cooling system water loop becoming blocked.
6. It is very important for the function and life of the diesel engine to have “clean air, oil and water”. Please pay special attention to keep the air filter, oil filter and diesel filter clean according to technical requirements during work.
7. Please keep safe when carrying out maintenance of disassembly work and try to avoid accidents or injuries due to impact on the body during machine operation, parts assembly or improper use of tools.
8. Make sure the diesel engine is always clean and in complete status. Before disassembly and assembly of the parts, clean or wipe the parts clean to guarantee the assembly quality. Complicated adjustment or maintenance shall be carried out indoors to avoid contamination inside the diesel engine by the environment.
9. The manufacturer takes no responsibility for any consequences caused by presumed change of diesel engine structure.
10. The manufacturer takes no responsibility for any consequences that violate discharge as regulated by provisions, such as disassembly of the high pressure oil supply and timing system, which will influence the function and discharge of the diesel engine.
11. The manufacturer takes no responsibility for any consequences that violate discharge as regulated by provisions, such as disassembly of the high pressure oil supply and timing system, which will influence the function and discharge of the diesel engine.
12. The use of non-genuine spare parts could void warranty.
13. When transporting, loading or disassembly the diesel engine assy, proper hoisting tools shall be used to guarantee safety.

14. Preparation before starting:

a. Check if the points that fix the diesel engines are reliable and if the operating handle is flexible.

b. Rotate the crank several times to check if the moving parts are flexible and if there are any obstacles.

c. Check if the oil services inside the oil sump and injection pump are within regulated scale range and if the oil tank is full and if the fuel loop is smooth..

d. Turn on the fuel tank valve to check if there is air inside the oil loop; if yes, loosen the discharge bolts of the diesel filter and injection pump. Press handle pump on the transmission oil pump until the air inside the oil loop is discharged completely. Screw up the disharge before loosening the high pressure oil pipe joint nut at the end of the oil injector. Rotate the crank to discharge the air inside the high pressure oil pipe. After air is totally discharged, screw up the pipe joint nut and meanwhile check if there is any oil leakage at each oil pipe joint.

e. Check if the water tank is filled with coolant and if there is any water leakage at the water pipe joints.

f. Check if the joints of the parts of diesel engines are reliable or not. Check if the storage battery is charged sufficiently and if the joints of the lines of electrical appliance system are correct and reliable.

15. Start the diesel engine:

a. Position the timing handle and medium speed position.

b. Rotate the ignition switch to open position and press the start button to make the diesel engine start. If the diesel engine cannot be started, loosen the button immediately and wait 2-3 minutes to restart. If the diesel engine fails in starting for three times successively, check the fault cause and eliminate the faults before restart.

c. After the diesel engine is started, loosen the button and rotate the ignition switch to another position. Connect the generator charging circuit to charge the generator. At the same time, adjust the gun to observe the rotation velocity meter. Make the diesel engine run on low speed and check if the diesel engine is normal or if there are any abnormal sounds. Pay special attention to check if the pressure of oil is correct. Pull the timing handle gradually to make the rotation speed of diesel engine reach rated speed and warm the machine without load.

16. Operation of diesel engine:

a. When the coolant temperature reaches 50^{o} C and the oil temperature over 40^{o} C working with load is permitted. When using marked power, the water temperature shall reach about 80^{o} C.

b. Increase or decrease of the diesel engine load and rotation speed shall be carried out evenly and gradually. Under normal conditions, it is not allowed to add or remove the load suddenly.

c. During the operation time of diesel engine, pay attention to the exhausted gas colour and the operation sound. Stop the machine for inspection if there is anything abnormal.

17. Safety requirements on the diesel engine:

a. Prevention facilities warning marks must be installed on all exposed rotating parts and transmission structure that might hurt the operators when the diesel engine is used for machine set. Preventative guards and separating shield shall be rigid which can only be dismantled when using tools.

b. The workig site for diesel engines must be well ventilated. Ventilation facilities shall be installed in the places where combustible, toxic or asphyxia gases could gather.

c. Anti-slip cover must be available in the diesel engine operation places. Guardrails must be installed in operation areas such as working paths, operation platforms and stairs, to avoid sliding of operators or objects.

d. When using the diesel engine, necessary instruments such as water temperature meter, oil meter and indication system that guarantee the normal operation shall be provided.

e. If such errors as abnormal sound, machine lifting or lubrication stops during the test run of the diesel engine, or the humidity at the exhaust exit in combustible and explosive environment excess the regulated limit, fuel shall be cut off fast (pull the stop handle and cut off the fuel pipe, etc.) and air(block) inlet or other effective measures can be carried out to stop the motor quickly.

f. Oil inlet and fuel tank ventilation hole shall be placed far from high temperature surface and electronic components. The caps shall guarantee no leakage of fuel will occur whwn the fuel tank is bumped.

g. Warning marks shall be placed in prominent positions when configuring the radiator so as to inform the operator not to open the water inlet cover of the radiator under hot status of the motor to avoid injury by high temperature vapour.

h. The surface of the exhaust pipe and the muffler of the diesel engines are extremely hot, so the operator needs to pay special attention. Most Importantly, to avoid possible fire, extreme caution must be taken to protect high temperature surfaces.

i. The diesel engine shall have the high temperature surfaces, such as surface of exhaust pipe and that of the muffler shall be cooled or set with effective preventative measures and warning marks. Heat preservation materials shall not be burned and attention should be given not to let any fuel leak to the heat preservation materials so as avoid fire.

In order to make the diesel engine work regulary and reliably, reduce the wear of components and prolong the life, the following maintenance system, must be carried out on the diesel engine.

DAILY MAINTENANCE

1. Check if the oil surface inside the oil sump is between the two scales of the oil gauge and closer to the upper one. After oil is filled to the upper scale of the new machine or the diesel engine that has not been used for a long time, run the engine for 5-10 minutes on low speed and then stop. Re-measure the height of the oil with oil gauge
2. Check the water quantity inside the radiator
3. Check the oil surface of the internal machine of oil injection pump accelerator and supplement to regulated position when it is not sufficient
4. Check the water, oil and air leakage of the diesel engine
5. Remove the water, oil and air leakage of the diesel engine
6. Check the fixing of the stands and joints of the diesel engine and the connection of other driven equipment
7. Keep the diesel clean. Removeoil, water and dust with dry cloth or mop soaked with a little gasoline. Specially keep the electric equipment clean and dry. Remove the dust on the radiator pieces of the water tank
8. After running for 20 hours the oil inside the sump, injection pump and accelerator of the new diesel engine shall be changed. Clean the filtering core of the oil filter, oil sump and oil gathering filtering net.

MAINTENANCE AFTER 20 HOURS OPERATION

Beside the items in 'Daily Maintenance', the following procedures shall be added:

1. Change the oil inside the oil sump
2. Clean or change the filtering core of the oil filter
3. Check the fixing conditions of the cylinder cover bolt
4. Check if the clearance between the air valves complies with the regulations and adjust if necessary
5. Check the tension of the fan belt and adjust if necessary
6. Clean the dust accumulated in the air inlet pipe, dust pan of the air filter and on the surface of paper filtering core and remove the dust inside the air exhaust pipe and the muffler

7. After **100 hours** running in total, check the oil injection pressure and the injection status. Clean the needle valve parts if necessary and readjust the oil injection pressure

8. Components disassembled due to maintenance work shall be cleaned before the reassemble and the installation position shall be guaranteed correctly. Then start the diesel engine and check it's operation

MAINTENANCE AFTER 100 HOURS OPERATION

Beside the items in 'Maintenance after 20 hours', the following procedures shall be added:

1. Change the oil injection pressure of the injector and observe the pulverisation quality of oil injection. Clean the needle valve parts and readjust the oil injection pressure if necessary

2. Check the wording conditions and oil supply advanced angle of the oil injection pump, readjust if necessary. Readjust the oil supply to the oil pump on the oil pump test bench if conditions allow

3. Check the sealing conditions of the inlet, exhaust valve and the air valve stand. Retify if necessary and readjust the clearance between the air valves

4. Check the fixing status of connection rod bolt and main bearing bolt

5. Refasten the bolt of the cylinder cover and adjust the clearance between the air valves according to the regulations

6. Clean or change the filtering core of the air filter

7. Clean the cooling system. The detergent comprises 150g NaOH 1L water. Beforecleaning, discharge the water in the cooling system and fill with detergent. Start the diesel engine after reserving the detergent for 8-12 hours and stop when the water temperature reaches the wrong temperature. Discharge the detergent immediately to avoid furring deposit. Clean the cooling system with water.

8. Check the working condition of the thermostat and check water drop inside the water discharging hole in the water pump. If water drop is serious, replace the water seal

9. Check if the joints of the electric circuits of the electric equipment are firm and if lead contact is good. If there is burning marks found, clean it immediately

10. After **250 hours** of working accumulatively, add the following work:
    a. Generally inspect the parts of the diesel engine and carry out necessary repairs and adjustments
    b. Dismantle the generator and the motor to clean the old button on the bearing and replace with new button, meanwhile check the gears on the driving motor

11. After **500 hours** of working accumulatively, add the following work:

a. Dismantle the cyliner cover; check other parts between air valve, air valve stand and cylinder cover set
b. Remove the deposited carbon on such parts as cylinder lid, cylinder cover, piston and piston cover set
c. Check and measure the abrasion of piston and piston ring
d. Check and measure the abrasion of internal holes of cylinder cover
e. Check and measure the abrasion of crank necks
f. Check and measure the abrasion of main shafting and connection to rod shaft
g. Clean oil tunnels inside the engine and change oil

SEALING AND PRESERVATION OF DIESEL ENGINE

When the diesel engine is to be stopped for a long time, the following can be taken for sealing and preservation:

1. After stopping the engine, discharge oil, coolant and fuel thoroughly when they are hot, clean the oil sump and the filter

2. Clean the dust and oil in the surface. Apply antirust oil onto the parts that are not coated. No oil shall be applied onto rubber and plastic products

3. Heat the filtered oil to 110-120^{o} C until foam disappears totally. Fill the dehydrated oil to the oil sump until it reaches the upper scale of the oil gauge and turn the crank to make the whole lubrication system full of oil

4. Add some dehydrated oil to the cylinder from the oil injector installation hole on the cylinder lid and then turn the crank to make the oil adhere onto the piston, piston ring, cylinder cover and air valve sealed surface

5. The mouths of the air inlet and exhaust pipes (muffler) shall be blocked with a wooden lid or wrapped in plastic cloth to avoid immunities entering

6. Diesel engine should be placed in dry and clean locations with dood ventilation. It shall be covered to avoid dust drop. It is prohibited to pile chemical products near the diesel engine. The above oil cleaning method can be used to preserve the machine for 3 months. When exceeding such time limit, reseal with oil.

DIFFICULT OR REFUSE TO START

Cause	Remedy
1. Fuel filter and fuel pipelines blocked	Clean
2. Air trapped in fuel system	Exhaust air and tighten all fuel pipeline connectors
3. Advanced fuel injection angle correct	Readadjust according to specifications
4. Fuel spray abnormal	Readadjust fuel injection pressure according to specifications, clean or replace injector needle valve sets
5. Compression pressure low	Check and replace piston rings and cylinder liners. Cylinder head nuts should be tightened in case of leakage on cylinder head gaskets
6. Valve lash incorrect	Adjust according to specifications and align gear marks
7. Battery charge insufficient	Charge battery
8. Wire connections loosened	Check and tighten wire connections Clean contact point
9. Ambient temp too low and oil too viscous	Preheat cooling water and lube oil

INSUFFICIENT POWER

Cause	Remedy
1. Compression pressure inside cylinder too low	Refer to above table - item 5 Replace components exceeding wear limit
2. Advanced fuel injection angle correct	Adjust according to specifications
3. Valve lash incorrect	Adjust according to specifications
4. Fuel supply for each cylinder unbalanced	Adjust fuel injection pumps to proper supply
5. Air filter clogged	Clean
6. Fuel injection pump, fuel injectors set worn off or fuel injection pressure incorrect	Replace with new sets, adjust fuel injection pressure and check fuel spray
7. Rotation speed incorrect	Adjust with speed governing handle in order to reach specified speed

SMOKING EXHAUST

Cause	Remedy
1. Engine overload	Reduce the load
2. Fuel injectors not well atomised	Check the injection pressure and fuel spray. Replace in case of damage
3. Fuel unqualified	Use qualified fuel
4. Combustion incomplete	Mainly caused by unqualified fuel injectors, incorrect advanced fuel injection angle, leakage at cylinder head gaskets and low compression pressure. Rectify in accordance with specific problem.
5. Advance fuel injection angle incorrect	Readjust according to specifications
6. Air trapped in fuel systems	Exhaust air
7. Fuel supply for each cylinder unbalanced	Readjust fuel supply
8. Fuel unqualified	Use qualified fuel
9. Wear of certain components exceeds limits	Replace

LUBE OIL INSUFFICIENT OR NO PRESSURE

Cause	Remedy
1. Advance fuel injection angle incorrect	Add oil up to mark on dipsticks
2. Air trapped in fuel systems	Eliminate leakage
3. Fuel supply for each cylinder unbalanced	Clean and replace elements if necessary
4. Fuel unqualified	Clean and replace elements if necessary
5. Wear of certain components exceeds limits	Use qualified oil
6. Oil sump gears seriously worn off with excessive clearance	Adjust the clearance or replace
7. Pressure relief valves of oil filter cease to function	Check and repair or readjust them
8. Main bearing, connecting to rod bearing and camshaft brushings seriously worn off with excessive clearance	Check and repair or replace them

OVERHEATING OF ENGINE

Cause	Remedy
1. Temperature of cooling water too high a. Insufficient cooling water or vapour lock in water pipes b. Bad working state of water pumps c. Water scale in cooling system too thick	a. Fill the tank to make cooling water level higher than the centre line of water pump b. Check water pump clearance and tightness of belts. Eliminate leakage c. Remove it
2. Oil temperature too high a. Insufficient or excessive oil b. Oil pressure too low with sufficient flow	a. Check whether the oil level is betwwen the dipstick scale line b. Refer to table 10
3. Engine overload	a. Relieve load

ENGINE RUNNING AWAY

Cause	Remedy
1. Malfunction of governors	Stop engines immediately, check and repair
2. Conrtol rod fuel injection pump get stuck	Stop engines immediately, check and repair
3. Injection pump delivers too much	Stop the engines and adjust injection pump delivery
4. Excessive burnout	Stop engines immediately, check and repair

ALINE DIESEL ENGINES ARE OPTION FITTED WITH HEAT EXCHANGE TYPE COOLING SYSTEMS.

This system takes a small portion of the water being pumped to cool the closed fluid loop of the engine.

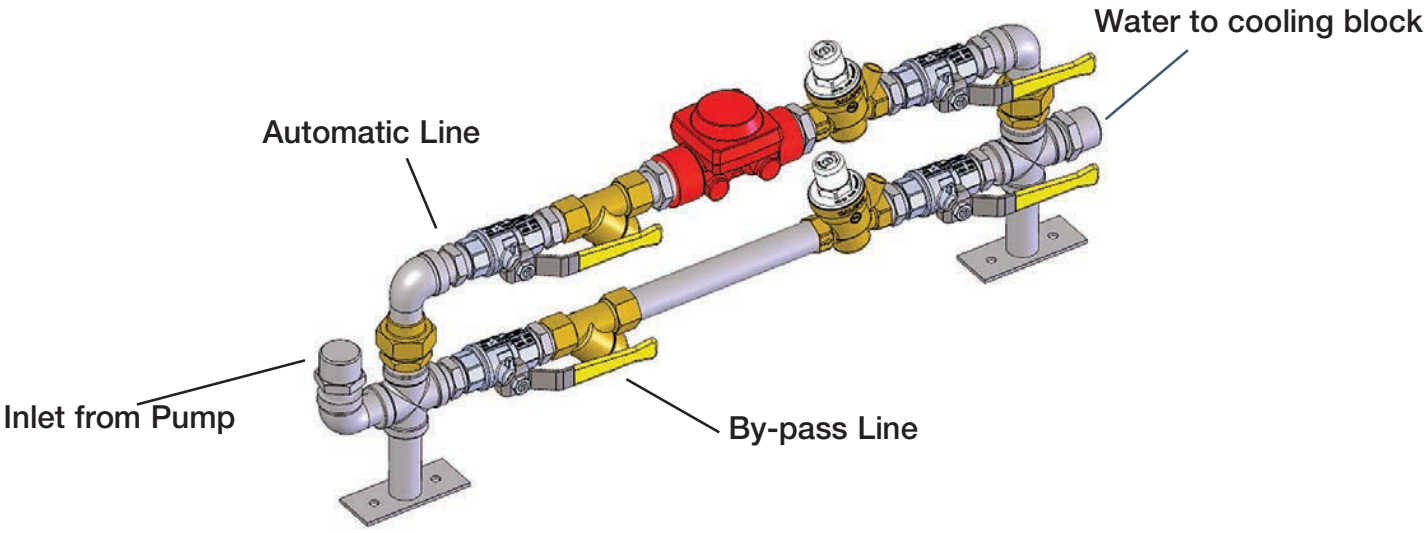
Heat Exchanged cooled engines can be installed in more confined spaces as the airflow requirements are greatly reduced.

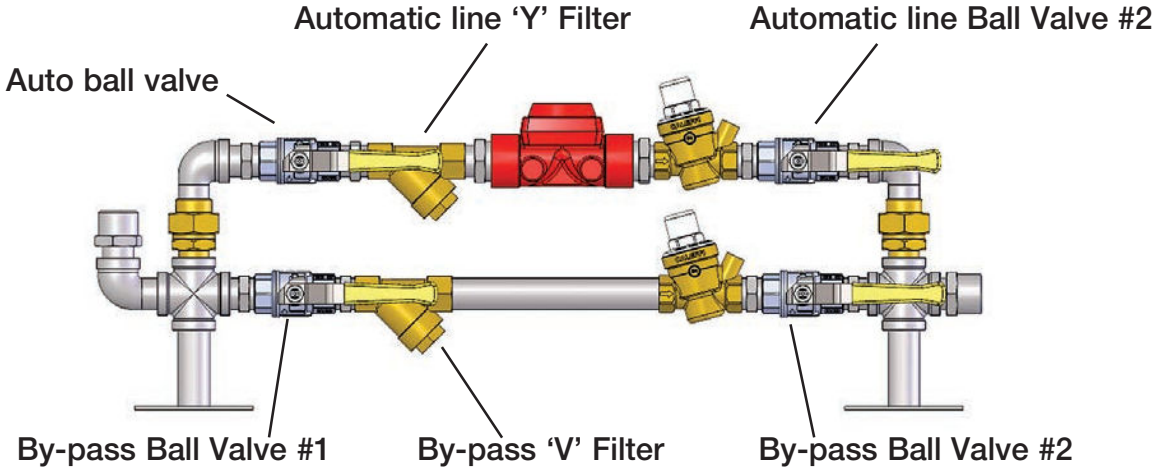
The Header Tank must have its water level maintained in the same manner as a Radiator cooled engine

On one side of the main pump skid, will have a cooling loop mounted on it. The manifold has 2 lines, an automatic line and a by pass line as per below.

In sitting in installation, the by-pass line should be turned off using the bypass ball valve #1 and #2. The two valves on the automatic line, auto line ball valve #1 and auto ball valve #2 must be padlocked open.

Each line has AY strainers in it. These strainers must be cleaned every 6 hours of operation.





AFP 3 AS2941-2008 - ELECTRIC FIRE PUMP CONTROLLERS

FUNCTION

The AFP series of fire pump controllers are designed to automatically operate a diesel fire pump when a remote sensor detects a pressure sensor commands.

POWER SUPPLY

240V AC single phase supply and 415V AC three phase supply

INDICATORS

Power available (green)
Mains power available to the supply side of the mains isolator.

Mains power fail (red)
Mains power supply is NOT energised.

Alarm muted (red)
The audible alarm buzzer is muted or silenced.

Battery fault (red)
Crank battery voltage is or was below the acceptable level.

General Warming (red)
System Fault.

Pump running (red)
Pump is running.

Crank isolated (red)
Crank isolator key switch is in the isolate position, therefore the pump will not start.

Charger supply fail (red)
The power supply to the battery chargers has failed.

Low oil pressure (red)
Oil pressure is/was below preset minimum.

High Temperature (red)
Motor temperature has exceeded recommended limit.

BUTTONS

Pump Start
Push to start the Motor pump start manually.

Pump Stop
Will stop the main pump if it is running.

Alarm mute
Silences the audible alarm.

Alarm reset
Will stop the engine if running and reset alarms.

Alarm test
Tests all the audible and visual alarms and indicators.

Pressure switch test
Simulates the situation of the pressure switch closing contacts.

A red LED beside each button will indicate the condition of the jacking pump controls

AUTO - The jacking pump will operate automatically

OFF - Isolates the jacking pump

MANUAL - The jacking pump will run while button is pushed, then return to previous condition

SWITCHES

Mains isolator

Isolates the mains AC supply to the panel.

Operation

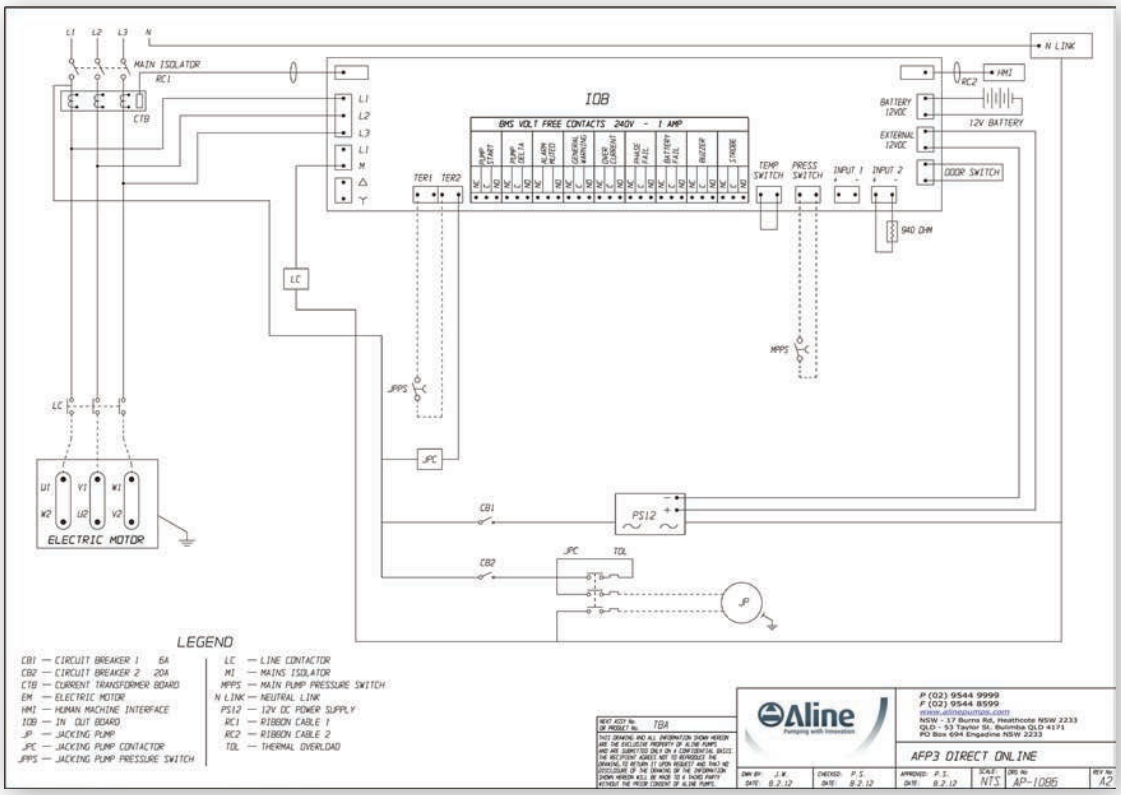
Starting - The AFP will start the motor automatically if the contacts are closed on the remote pressure switch. This can be simulated by pressing the pressure switch test button.

Stopping - To stop the engine press the stop reset button.

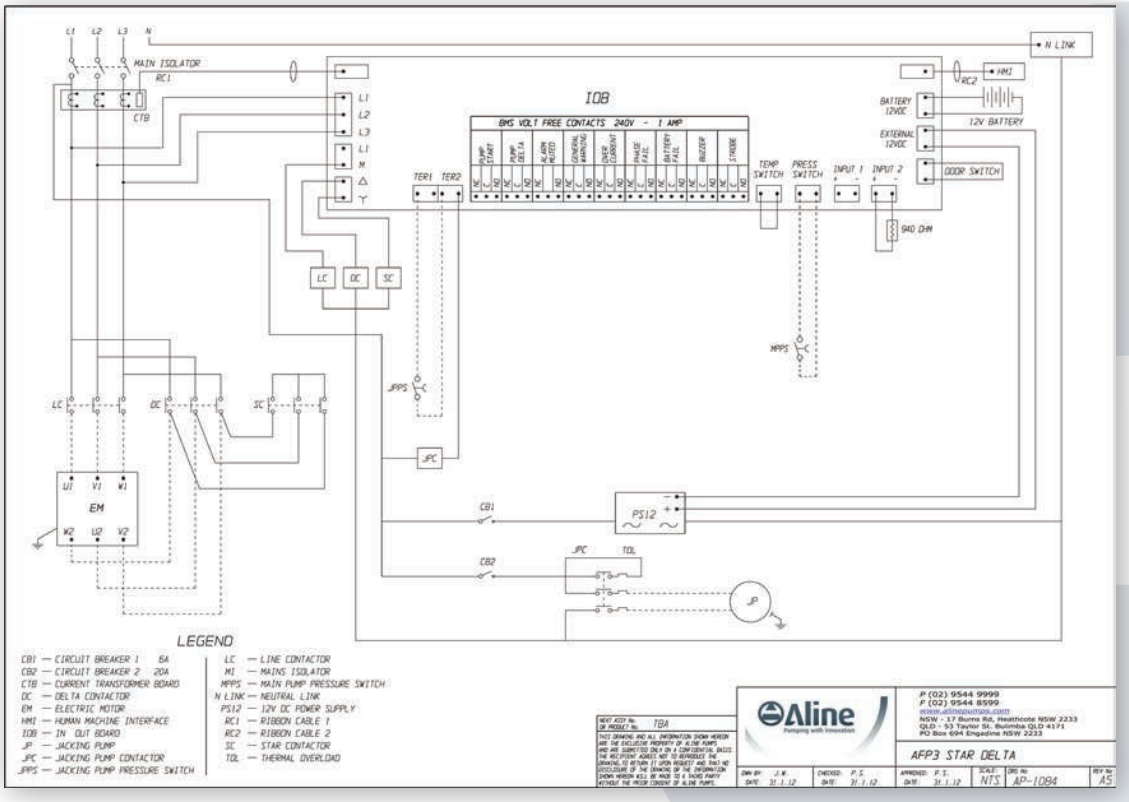
Emergency starting

Push the green pump start button.

ELECTRIC FIRE PUMP CONTROLLER DIRECT ON LINE



ELECTRIC FIRE PUMP CONTROLLER STAR / DELTA



Aline
PUMPING WITH INNOVATION

Manfacturers Declaration

This declaration serves to confirm the following:

Electric Fire Pump Control

are manufactured in accordance with:

Electrical Wiring AS 3000

Fire Standards: AS2941.2008 AS2118
AS2419

Peter Sharpe Operations Co-Ordinator for Aline Pumps and Service
1st January 2012

17 Burns Rd Heathcote NSW 2233 P.O. Box 694 Engadine NSW 2233
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53 Taylor St Bulimba QLD 4171
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MOTORS ARE DESIGNED AND MANUFACTURED TO BE ROBUST AND RELIABLE WITH MINIMAL MAINTENANCE.

The following items should be taken into consideration to ensure a trouble free installation and reliable running throughout the motor's life.

Installation

The following items should be considered on installation to ensure reliable operation of the motor:

Surroundings

- Ensure that the motor is properly protected against ingress of oil, water or dust especially if construction work is in progress around the motor.
- Ensure air intake is not obstructed. Refer to dimension BL in the Manual.
- When installing hazardous location motors, make sure that the zone and gas group or dust and temperature are complied with.

Mounting

- Bed plates or slide rails should be firmly fixed to a solid, level foundation to ensure the motor remains rigid and vibration free.
- Shims or packers (if required) must be of adequate size and placed adjacent to and inbetween base fixing screws.
- Protective transport coatings on shafts and/or flanges must be removed prior to connection to the driven load.
- A light coating of grease to shafts and/or flanges will inhibit corrosion during service and assist removal of pulleys or couplings.

Pulleys and Couplings

- Pulleys or Couplings should be independently balanced with a half key during manufacture.
- In fitting Pulleys or Couplings to the motor shaft, care must be taken to ensure the roller/ball bearings are not damaged. Both shaft and coupling bore should be cleaned and lubricated. If the fit is too tight, the pulley or coupling should be pre-heated in air or oil to enable easy assembly.
- Shock methods must not be used in fitting or removing pulleys or couplings. Proper wheel or pulley removers should be used to prevent shaft and bearing damage. Tapped holes are provided in shaft extensions to assist in the fitment of couplings and/or pulleys.

Alignment

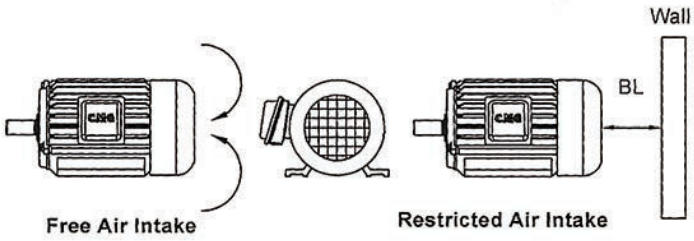
- Great care must be taken in aligning the complete machine, since misalignment can cause rapid deterioration of bearings and lead to other mechanical failures due to the stress produced.
- After final tightening of foundation bolts, machine alignment should berechecked as bed plates could move and/or distort during machine mounting.
- No end thrust should be applied without express approval.
- When slide rails are used in conjunction with pulley drives, the adjustinf screw ends should be positioned between the motor and load at drive shaft end and the other diagonally opposite. This helps speedy and accurate belt aligning, tensioning and replacement.

Cooling Formats

- There are various cooling formats for electric motors with IC411 (totally enclosed fan cooled) as the most common type that is used on our motors. This type of cooling of motor is achieved by a fan mounted at the non-drive end, inside a fan cowl, which has an air inlet grille at the rear. Air is drawn in through the grille and the fan distributes the airflow along the fins of the motor body. The fan is designed for either direction of rotation (unless otherwise indicated on the fan cowl).

- With TEFC motors it is important that the cooling fins remain clear of debris to allow the airflow to be fully effective in maintaining motor winding temperature within the design limits.

- It is equally important to ensure the installation provides good unrestricted access to normal ambient air at the fan entry point at all times and that inlet grille is clear of contaminants. Refer to dimension BL below.



Motor Frame	Dimensions BL (mm)
80-100	30
112-132	60
160-180	80
200-280	100
315	130

Only motors that carry nameplates indicating Ex e or Ex nA or Ex tD (or DIP) or combination of them can be used in hazardous locations. Check nameplate before installing motors in hazardous locations.

Cable Entries

- Cable entries are via appropriate cable glands or conduits fitted to the threaded entries in the wall of the terminal box or the gland plate attached to it. Cable entries for various frame sizes are as per the folllowing table:

Motor Frame	No. of entries	Entry size x pitch
80-132 Brake Motors	2	M20 x 1.5 or M25 x 1.5
80-132	2	M20 x 1.5 or M25 x 1.5
160-180	2	M20 x 1.5 or M32 x 1.5 or M40 x 1.5
200-280	2	M32 x 1.5 or M40 x 1.5 or M50 x 1.5
315	Blank Gland Plate	Customer to drill to suit Max size 2 x M63 x 1.5

Supply Terminals

- Supply terminals are located in the terminal box. They are suitable for receiving crimped lugs on the supply cables. In addition, the terminal box also houses an earthing terminal.

Motor Frame	Terminal size	Max supply cable size* (mm^2)
80-132	M5	16
160-180	M6	50
200-225	M8	95
250-280	M10	2 x 95
315	M12	2 x 185
*3 or 4 core +E, PVC insulated		

Electrical Connection

- Ensure all electrical connections are solid and continuous.
- Check motor starter and overloads for correct rating and trip setting.
- All circuit breakers, HRC fuses or protective devices associated with the motor must be rated to suit motor running current and starting characteristics.
- Supply cables must be appropriately selected considering the voltage drop.
- When using long supply cables with VVVF drive, check for proper recommendations to avoid high voltage transients occurring at motor terminals.
- Check the connection diagram on the motor terminal box and make sure the supply leads are properly connected considering the supply phase sequence.
- Ensure that the supply cable termination onto the motor terminal board is firm, without loss of strands while using crimped lugs and all washers are used in the corect order as provided.
- Ensure enoughclearances are provided between supply cables lugs and to earth especially so in case of hazardous motors.
- Ensure that proper earthing connection is made with all washers as provided.
- Check that the cable glands used on hazardous location motors are Ex approved by the standards organisation. Gland plugs to be of approved type.
- If using conduit for the supply leads, ensure the conduit is completely threaded in and seal the threads appropriately.
- If RTD's of hazardous location motors are connected to monitor the winding temperature, the maximum voltage to the RTD's must be kept to 90V (peak) or below.

Initial startup

Prior to initial start-up check the following-

- ***Do not measure insulation resistance when the motor is connected to the control panel.***
- Insulation resistance of motor winding to earth be over 1 MΩ for motors up to 600V and over 10 MΩ for over 600V.
- Do not megger test thermal protective devices across their terminals. Short the entire protector leads together and apply the test voltage between the shorted leads and earth and/or phases.
- Anti-condensation heaters if provided must be so connected as to switch on when the motor supply is disconnected and switch off when the motor supply gets connected.
- Ensure that the supply voltage and frequency correspond to the motor nameplate ratings.
- Ensure shaft turns freely before initial start.
- Measure winding resistance between supply terminals and record in the log book.

Operation

- Before running the motor make sure that the terminal box lid is closed and secured with appropriate clearance to live parts.
- Make sure that appropriate earthing is done.
- Make sure that the coupling and/or transmission is adequately guarded for safety.
- Check the mounting bolts and/or flanges are firmly secured.
- Make sure no loose objects are around that may be sucked in by the cooling fan on the motor.
- Make sure that the load applied is within the nameplate specification.
- Make sure that the ambient temperature is inside 40o C or nameplate specification.
- Avoid frequent starting of motor. Refer to motor catalogue for recommendation on frequency and duration of starts.
- If a VVVF drive is used on Ex nA motor, make sure that the applied load is inside the limits specified by the loadability curve shown in drawing HGA 007.
- On Ex e motors, make sure that the starting method employed keeps the starting current and duration within the nameplate figures of $1_A/1_N$ ratio and t_N time.
- Check that the running current on no load and full load are reasonably balanced within 10% of the average and record the figures in the log book for future reference. Note that the currentimbalance can be higher, typically 10 times the voltage imbalance if there is an imbalance in supply voltage.

Number of starts per hour

For greater number of starts per hour:

Frame	Starts per hour			
	2 Pole	4 Pole	6 Pole	8 Pole
80	10	20	30	
90	8	20	30	
100	8	20	30	30
112	8	20	30	30
132	5	15	20	20
160	5	15	20	20
180	5	10	15	15
200	4	10	10	10
225	3	8	8	8
250	3	6	6	6
280	2	4	4	4
315	2	3	3	3

Permitted starting time

In respect to the temperature rise of the motor, starting time (i.e:,from rest to operational speed) should not exceed the time indicated in the following table. Motor must be allowed to cool prior to each start.

Frame	Starting Method	Maximum starting time (sec)			
		2 Pole	4 Pole	6 Pole	8 Pole
80	D.O.L.	15	26	40	-
90	D.O.L.	10	15	25	-
100	D.O.L.	12	13	18	40
112	D.O.L	10	10	18	35
132	D.O.L	14	12	12	25
160-315	D.O.L	15	15	20	20
160-315	Star-delta	45	45	60	60

Maintenance

Reliable, trouble free operation of a motor needs regular maintenance. Exact maintenance needs vary, based on the site conditions. To obtain reliable service from the motor, the following maintenance schedule may be used as a guide. An authorised service agent must carry out maintenance of hazardous location motors SGAE, SGAN or SGAD.

A. Ensure air intake space is unobstructed.
B. On a weekly basis, use an air hose to ensure all air ways are clear and free of dust.
C. Once every month, check motor for condensation. Replace drain plugs before starting if they are blocked or found missing.
D. Do not wash the motor down unless it is IP66 rated.
E. On a quarterly basis-
(1) Check the motor terminals for tightness and proper contact
(2) If terminal lug/s are discoloured, re-terminate with fresh lugs.
(3) Check operation of starting equipment, ensuring all terminals are tight.
(4) Check mechanical operation of thermal overload relays, if any.
(5) Check mechanical operation of thermistor relays, if fitted.
(6) Check operation of anti-condensation heaters, if fitted.
F. On a six monthly basis, in addition to the items in 'E'-
(1) Check winding resistance between supply terminals and compare to original value and enter in log book.
(2) Check supply voltage at motor terminals and record in log book.
(3) Check bearings for abnormal noise/overheating.
G. On an annual basis, in addition to the items in 'E' an 'F'-
(1) Re-grease the bearings as recommended in the following table. Frames 71-80 use sealed bearings. Frames 200-315 use open re greasable bearings. When re-greasing bearings, ensure that the correct type of grease is used. If in doubt about the existing grease type, clean out the old grease thoroughly from bearings and bearing houses, prior to regreasing.

WARNING: NEVER MIX GREASE OF DIFFERENT TYPES.
Use Lithium based grease such as Shell Alvania R3 or equivalent unless otherwise specified. SGAH, SGASS and SGAHS motors require extra high temperature grease such as Magnalube G or equivalent.

(2) Completely disassemble stator, rotor apart and clean thoroughly.
(3) Check bearings for wear/damage-replace as necessary.
(4) Check all bolts and nuts for cracks or damage-replace as necessary
(5) Check all holding down bolts for signs of fatigue or damage-replace as necessary.
(6) After re-assembly, check and record in the log book-
Insulation resistance by megger
No load current and voltages
Full load current and voltages
Ensure that these figures compare well with the original records in the log book.
(7) Check and ensure that the cooling fan is operational.

Sealed Bearings

The required replacement interval for sealed bearings is generally determined by the grease life which is dependant on operating temperature, operating speed, the limiting speed of the bearing and the type of grease. Under normal operating conditions, the following relationship applies:

$$\log t = 6.54 - 2.6\frac{n}{N} - (0.025 - 0.012\frac{n}{N})T$$

Where:
t = **Average grease life (hours)**
n = **Speed (RPM)**
N = **Bearing limited speed with grease lubrication (RPM)**
T = **Operating Temperature (ºC)**

Aline end suction pumps are designed in accordance with international standards of ISO2858 or DIN 24255 and are interchangable with other similiar pumps, conforming to the same standards.

1. **Bronze wear rings -** fitted as standard, replaceable front and rear wear rings for a trouble free lifecycle.
2. **Bronze wear rings -** in a closed design is fitted as standard to prevent corrosion in stationary or inactive situations. Cast 304SS or 316SS are available. the use of 3-D solid model (CAD) Computer Aided Design and (CFD) Computational Fluid Dynamics ensures high efficiencies, reducing overall running costs. Impeller diameters can be trimmed to suit specified performance.
3. **Pump casing -** high efficiency Cast Iron volute casings, with flanges rated to PN1.6MPa (16bar), drilled to AS2129, Table E (on the standard pumps) and to ISO 2084-16 (on the DIN Standard Pumps).
4. **Casing oring -** re-usable orings in Nitrile, for ease of re-assembly (optional materials available).
5. **Back pull-out design -** allowing for easy removal of rotating element without disturbing the pipe work, lagging, motor or pump volute casing. This is proven to reduce downtime whilst performing routine maintenance.
6. **Enlarged shaft -** reduces shaft deflection. Standard in 420SS and 316SS as an option. Tapered and keyed shaft design allowing ease of removal in maintenance and positive locking whilst in operation.
7. **Shaft seal -** single, high quality John Crane or approved equivalent mechanical seal with carbon vs ceramic fitted as standard.
8. **Tappings -** convenient suction and discharge pressure gauge tappings plus volute drain, fitted as standard to all end suction pumps.
9. **Bearings -** Heavy duty SKF or approved equivalent, greased for life, reducing maintenance. Housed within removable bearing cap cover assembly, protected by a quality manufactured lip seal reducing ingress of moisture or foreign matter.
10. **Bearing housing -** Robust / heavy duty, manufactured in high strength cast iron providing free life cycle.

Operation and Maintenance

This instruction for installation, operation and maintenance of end suction, single stage. non-self priming, centrifugal pumps. End suction centrifugal pumps are designed with high efficiency and low maintenance features.

Installation Location

It is important to select a site as close to the liquid source as possible. All end suction fire pumps must have a positive suction pressure: they must never need to lift water in the suction line.

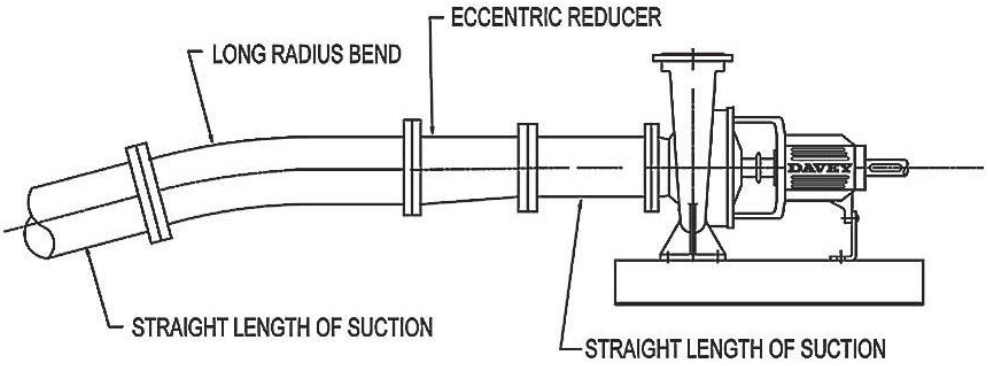
Foundations

The pump unit should be mounted on a foundation that is substantial enough to withstand the weight of the unit and large enough to accommodate all mounting feet so they can be securely fixed to avoid movement.

Suction Piping

All fittings and suction piping should be free of air leaks.

When long suction suction lengths are unavoidable, consideration should be given to over sizing the suction line to reduce suction losses. For applications that are tank fed, ensure that the suction line is well below the minimum water level and a diffuser or vortex plate is installed to reduce whirlpools and air inclusion. Air inclusion can result in cavitation, reducing the pump performance and eventually destroying the pump or its components.



PREFERRED ARRANGEMENT FOR SUCTION LIFTS

Discharge Piping

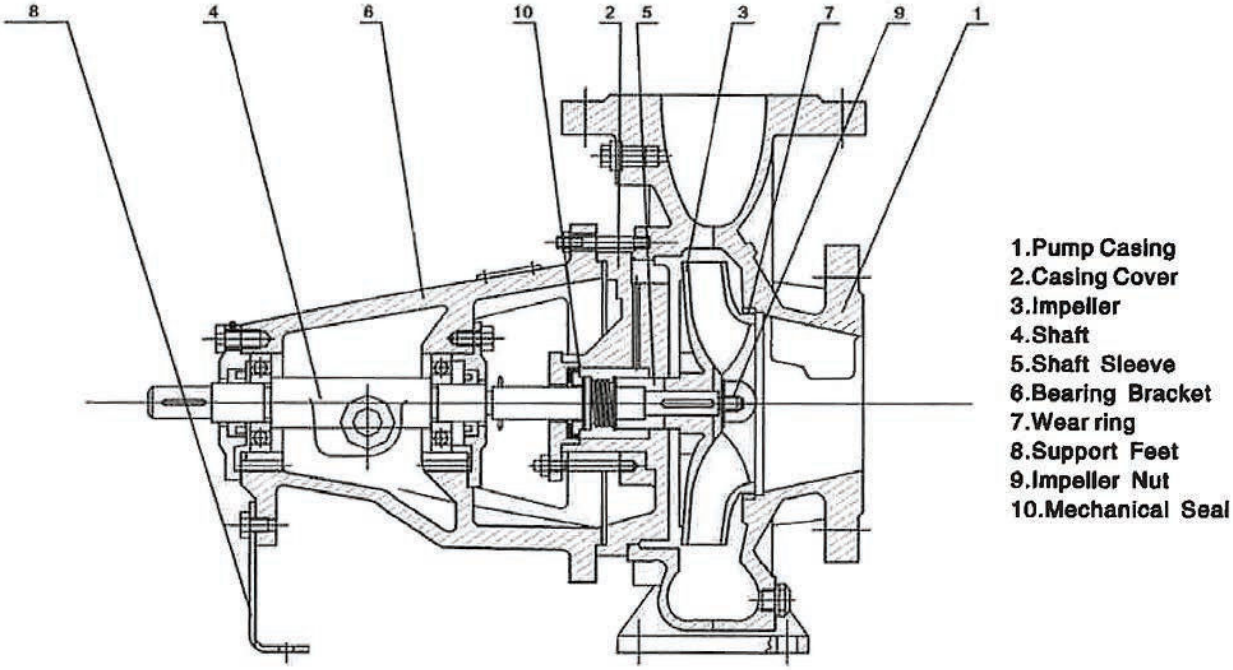
Discharge piping must be selected of a size that would equal the discharge of the pump. For long discharge lengths, consideration should be given to oversize to minimise discharge losses reducing flow.

Caution:
Do not attempt to run pump if it has not been filled with water (primed).
Severe damage will result to shaft seal.

Starting

1. Ensure the suction line and pump casing is full of water, open suction valve if fitted.
2. Check power is off and rotate the pump shaft slowly to release any trapped air within the pump casing.
3. Close the discharge valve.
4. Check the direction of rotation on the pump casing or motor cover.
5. If this is correct, you may now start the pump. When it reaches full speed, you will see the pressure in the discharge line rise. Slowly open the discharge valveuntil the pump adjusts to maintain its duty point.

Structural Representation



In accordance with AS 3350.2.41 we are obliged to inform you that this pump is not to be used by children or infirm persons and must not be used as a toy for children.

Trouble Shooting

Pump is running but failing to deliver water or desired pressure.

1. ⚠ Turn the unit off.
2. Check suction line is free of debris or blockages and check that the pump has not lost its prime. If so, remove blockages and repeat starting at step 1.
3. Check that the suction valve is open.
4. Check that the discharge valve is open.
5. Check for air leaks. These may not always be visable to the naked eye unless pressure is applied to the suction line.
6. Check that the suction line is not too long.
7. Is suction line to pump excessive?
8. Is the foot valve stuck open or undersized?
9. Is spped too slow?
10. Check motor direction rotation.
11. Check for possible clogging in impeller vanes.
12. Is the discharge piping undersized for applications?

Excessive Vibration

1. ⚠ Turn the unit off.
2. Check motor is rotating in correct direction.
3. Check both motor feet and pump feet are secured properly.
4. Check coupling rubbers are not worn.
5. Check drive couplings are secured tightly to the pump and drive shafts.
6. Check pump and motor bearings are ok.
7. If so, alignment will need to be performed.
8. Impeller could be partially blocked causing imbalance.

Noisy Operation

1. ⚠ Turn the unit off.
2. Check pump or motor bearings.
3. Check pump is primed.
4. Check suction line is not damaged causing insufficient supply and resulting in cavitation.
5. Check you are not pumping solids.

High Power Consumption

1. Check direction of rotation.
2. Check operation speed on the motor matches the intended performance curve speed.
3. Check that the estimated head is correct as pump may be running down on it's curve producing high flow but drawing more power. Throttle the pump back onto it's curve via discharge gate valve or reduce impeller diameter.
4. The specific gravity or density of the liquid is greater than 1kg/litre affecting power draw.
5. Check impeller diameter for the correct size to establish maximum power requirement at duty point.

Lubrication

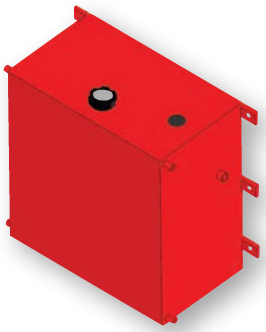
Pump bearings are greased for life.

Motor bearings refer to Motor manufacturers recommendations.

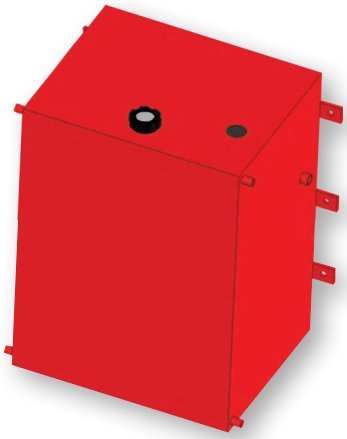
ALINE HAS A SET RANGE OF FUEL TANKS SPECIFICALLY DESIGNED FOR DIESEL FED FIRE PUMPS SETS.

These fuel tanks have the below features:

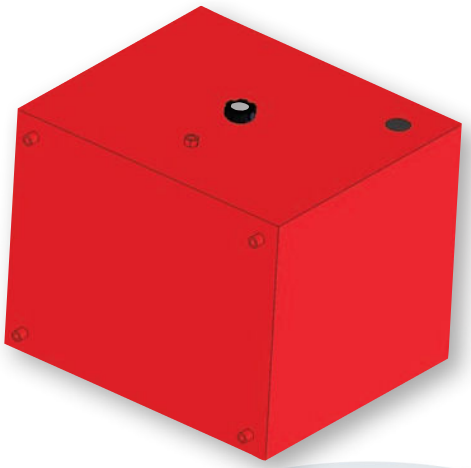
- Heavyduty Steel carcass
- Signal red, AS 4506 powder coat finish
- Multiple supply and return ports
- Local cover gauge
- Portal provision for electronic level sensor
- Designed, built and vented to AS 1692
- Base drainage port
- Capacity to feed engine for a minimum of 6 hours



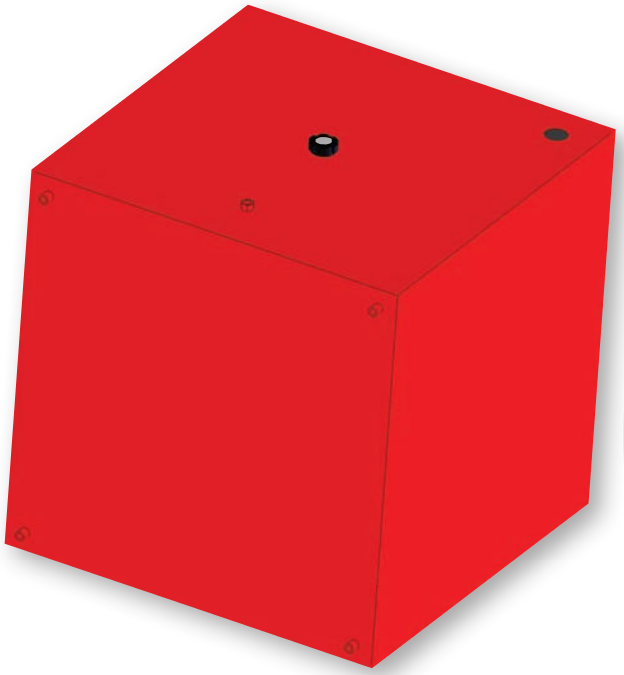
Fuel tank #4



Fuel tank #5



Fuel tank #6



Fuel tank #7

Aline
PUMPING WITH INNOVATION

Manfacturers Declaration

This declaration serves to confirm the following:

Diesel Fuel Tanks

#4 - 85L Capacity
#5 - 152L Capacity
#6 - 282L Capacity
#7 - 994L Capacity

are manufactured in accordance with:

Code for Tanks for Flammable & Combustible Liquids: AS1692

Fire Standards:
AS2941.2008 AS2118 AS2419

Peter Sharpe Operations Co-Ordinator for Aline Pumps and Service
1st January 2012

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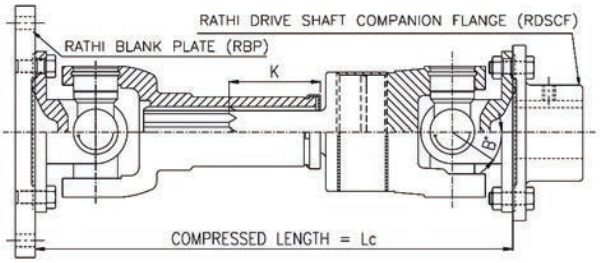
53 Taylor St Bulimba QLD 4171
www.alinepumps.com

FEATURES

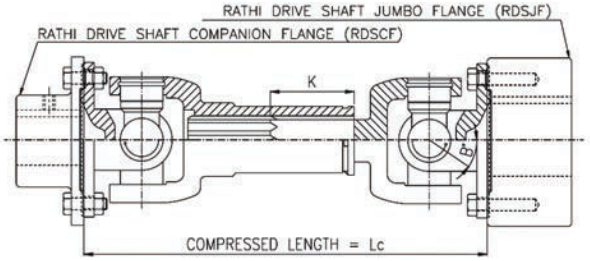
- Easy installation
- Length compensation
- Highly efficient
- Low maintenance

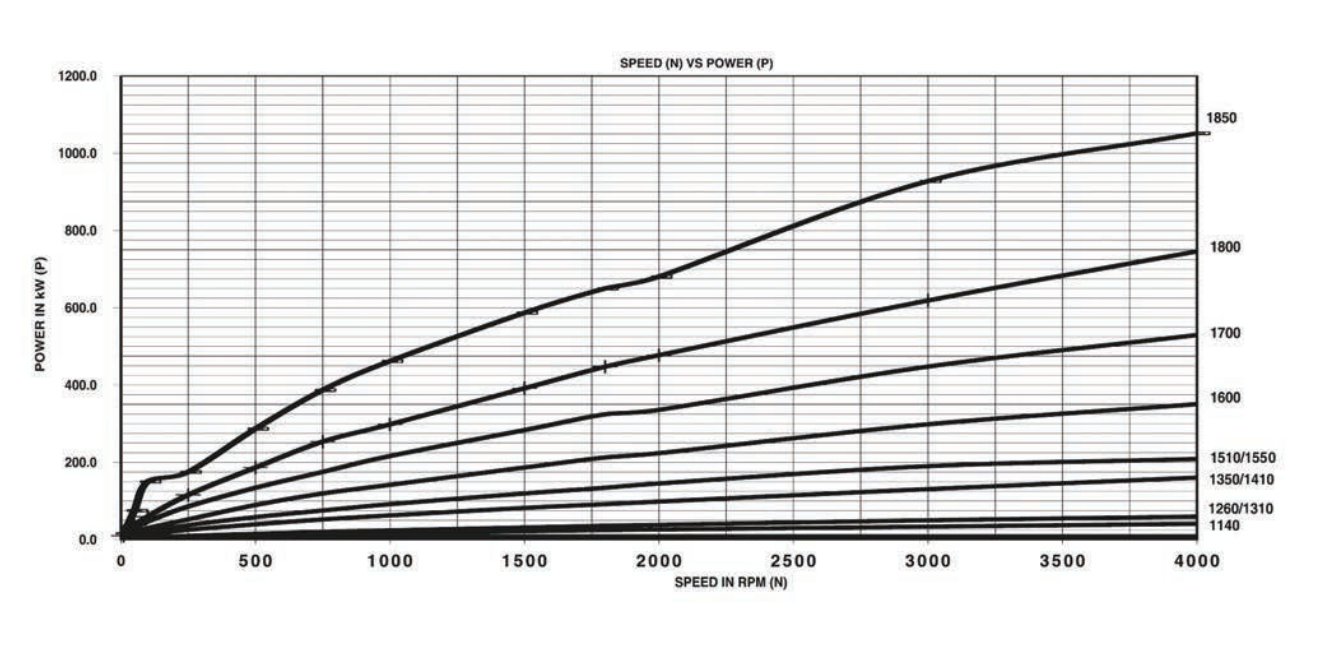
TECHNICAL DATA

TUBULAR DRIVE SHAFT



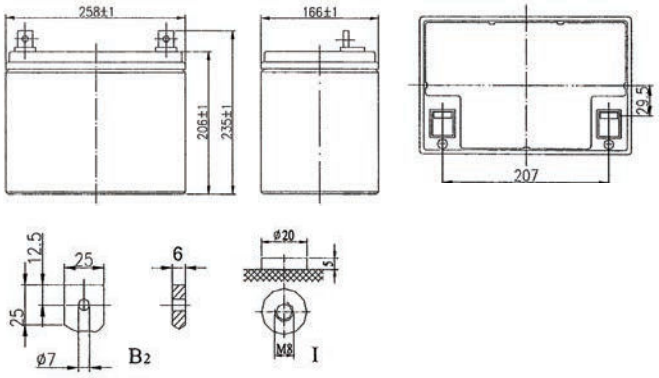
SUPER SHORT DRIVE SHAFT

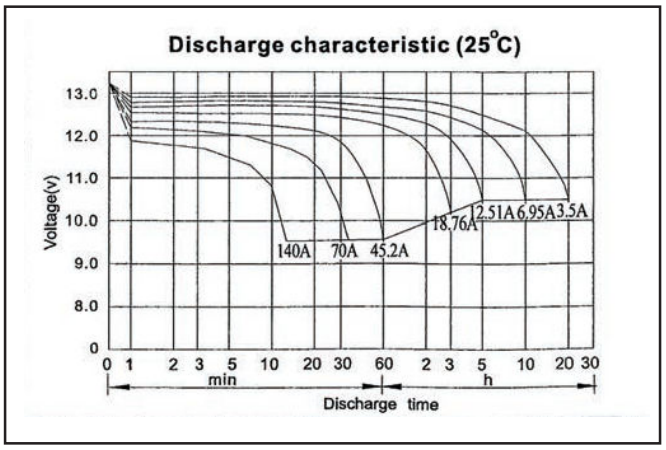


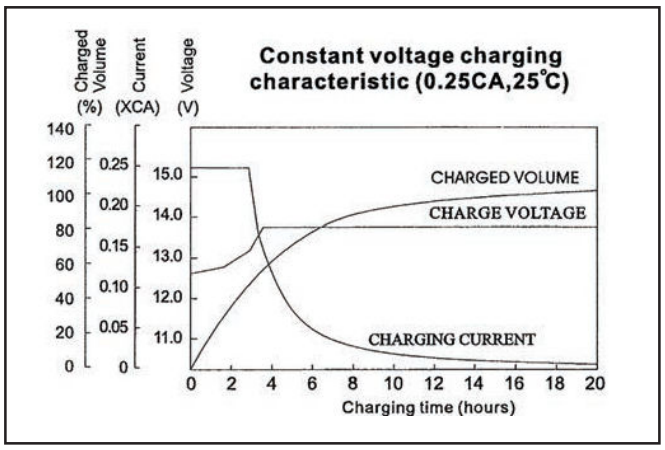


SPECIFICATIONS

Voltage	12 volt nominal
Nominal Capacity 77ºF (25ºC)	
10 hr rate (12.0A)	70Ah
5 hr rate (21.0A)	62.5Ah
1 hr rate (80.0A)	45.17Ah
Dimensions	256(L) x 168(W) x 208(H) (212-inc terminal)
Plates	Heavy duty
Terminal	Insert - (1) (Optional - Standard Post - B_2)
Container / Cover	ABS
Charge voltage	Cycle: Maximum charging Current 21A Voltage: 14.4 - 14.7V at 77º F (25ºC) Temperature compensation: -30mV/ºC Standby: Voltage 13.6V - 13.8V at 77º F (25ºC) Temperature compensation: -20mV/ºC
Internal resistance:	77º F (25ºC) - Fully charged battery - 5.7mΩ
Electrolyte	Immobilised Electrolyte - Sulphuric Acid
Vent	Self sealing - 2psi operation
Operating temperature:	-25 to+55 (However, it is recommended that the batteries be operated in the temperature range of 20 to 30º C to obtain full life and optimum performance).

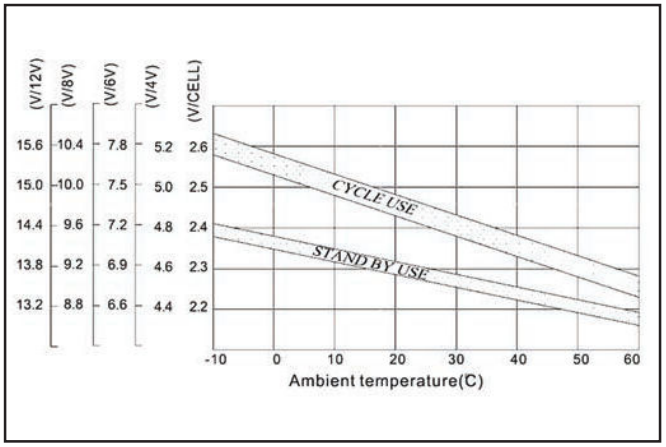




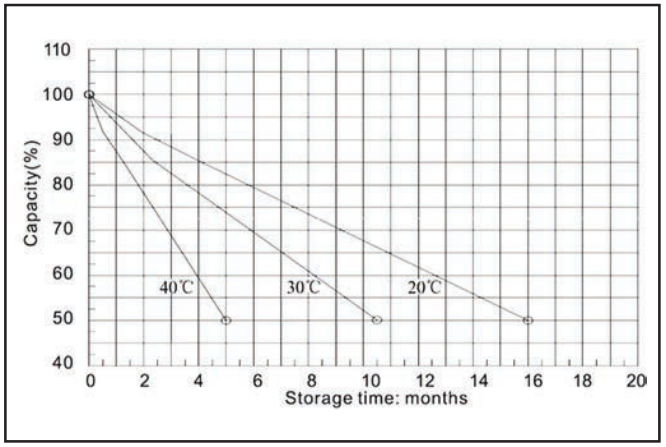


Specifications subject to change without notice

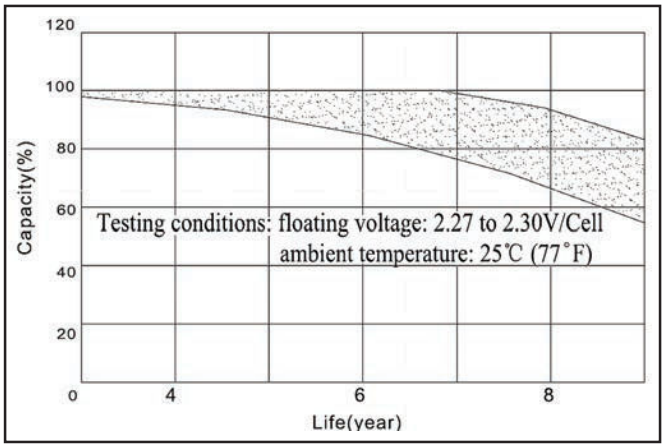
Relationship between charging Voltage and Temperature



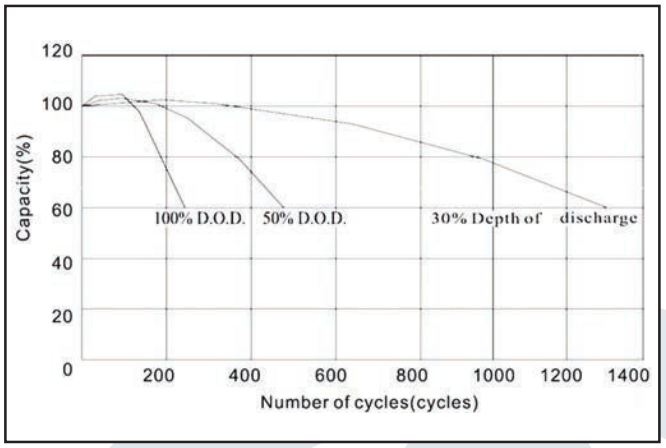
Self discharge characteristics



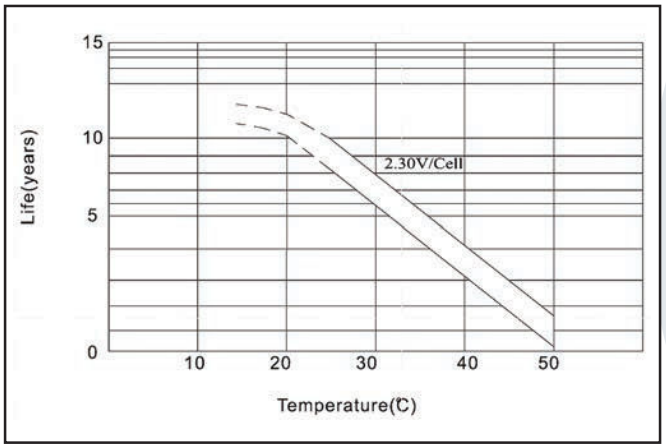
Life Characteristics of standby use



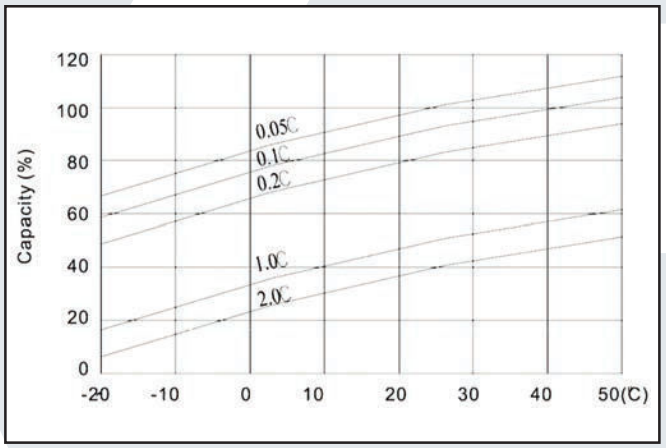
Cycle service life in relation to depth of dDischarge



Temperature effects on float life



Temperature effects on capacity



Specifications subject to change without notice

PRODUCT DESCRIPTION

Robust high pressure Hydropneumatic Water Pressure Vessel
of replaceable diaphragm design.

FEATURES AND BENEFITS

- Replace diaphragm with unique tiered design
- Long life
- Heavy duty EPDM diaphragm meets EEC requirements for portable water requirements
- Confidence the tank will not adversely affect the quality of your water
- Deep drawn Steel shell with appliance like high quality Polyurethane finish
- Protected against rusting for long life
- UV resistant for harsh environments
- Every tank is individually tested
- Guaranteed reliable operation
- Compliance with the strict requirements of ISO 9001 and CE quality standards
- Consistent product quality
- Dependability
- Twin lifting lugs on 24100RHP25
- Easier installation

MATERIALS OF CONSTRUCTION

PART	MATERIAL
Tank Shell	Steel
Tank Finish	Polyurethane
Diaphragm	EPDM
Tank inlet	Stainless Steel

OPERATING LIMITS

Maximum operating pressure	2500kPa (363 psi)
Maximum water temperature	90°C
Minimum water temperature	-20°C
Tank air pre-charge	400kPa

THIS SERIES OF KF PUMPS HAS A PERIPHERAL TYPE IMPELLER

These pumps are made in this way because on the extremitiesof the impeller there are several radial paddles which give more energy to the pumped liquid. The special shaping of the paddles gives the fluid a fast recycling motion between the paddles of the impeller and the pump body. This characteristic enables the fluid to increase progressively the pressure during its way from the inlet to the outlet, obtaining a regular and not pulsating flow and high pressures with quite sloping curves.

APPLICATIONS

General water supply for clean liquids only.

PUMP CONSTRUCTION

Pump body and motor support in cast iron, pressed brass impeller. Mechanical seal in carbon'ceramic, rotor shaft in Stainless Steel with seal for life bearings. Totally enclosed fan cooled motor (TEFC). Single phase motors with a built in thermal overload protection on request, the capacitor is permanently in circuit. Motor protection to IP44. Winding insulation to class B (for motors of size 63), F (for other sizes).
Standard Voltage: 230V - 50Hz single phase.

PUMP PERFORMANCE DATA

- Capacities up to 4.2m^3 / hr.
- Heads up to 88 metres.
- Liquid quality requirement is clean and free from solids or abrasive substances and non aggressive.
- Maximum temperature of pumped liquid - 15^oC to +70^oC.
- Maximum ambient temperature 40^oC.

For higher temperatures please contact the sales office. Maximum working pressure 9 bar.
The tolerances of the hydraulic features are according to UNI / ISO 2548 - Class C Appendix B electric features according to C.E.I.

INSTALLATION

Pump must be installed with the motor shaft in the horizontal position.

HORIZONTAL JACKING PUMPS

This series of KF pumps has a peripheral type impeller. These pumps are made this way because on the extremities of the impeller there are several radial paddles which give more energy to the pumped liquid.
The special shaping of the paddles gives the fluid a fast, radical recycling motion between the paddles of the impeller and the pump body.
This characteristic enables the fluid to increase progressively the pressure during its way from the inlet to the outlet, obtaining a regular and not pulsating flow and high pressures with quite sloping curves.

APPLICATIONS

General water supply for clean liquids only.

PUMP CONSTRUCTION

Pump body and motor support in cast iron, pressed brass impeller.
Mechanical seal in carbon/ceramic, rotor shaft in Stainless Steel with seal for life bearings.
Totally enclosed fan cooled motor (TEFC).
Single phase motors with a built in thermal overload protection on request, the capacitor is permanently in circuit.
Motor protection to IP44.
Winding insulation to class B (for motors of size 63), F (for other sizes).
Standard voltage: 230V - 50Hz single phase.

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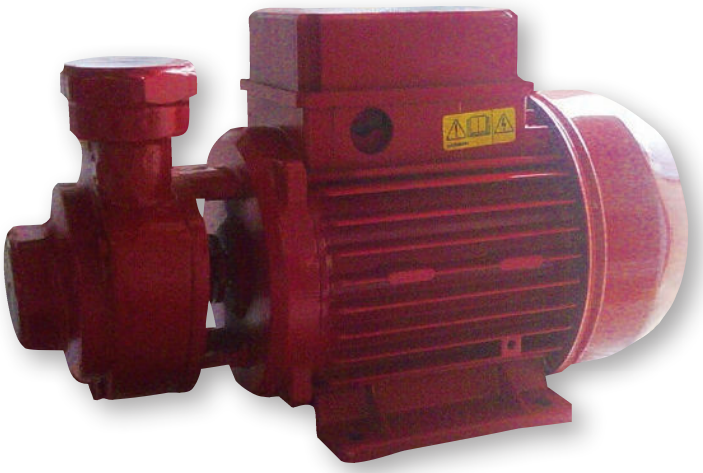


INSTALLATION

Pump must be installed with the motor shaft in the horizontal position.

GENERAL INFORMATION

Before performing any operation on the machine, it is indispensable that you be completely familiar with the entire use and maintenance manual. The manufacturer declines all responsibility for improper use of the product, for damage caused following operations not contemplated in this manual or unreasonable interventions.

SAFETY INFORMATION

Cautionary warning to be followed to guarantee the safety of the operator and those persons present in the work area.

Failure to comply with instructions may result in electric shock

Failure to comply with instructions may result in damage to the motor pump or the system.

Each transport installation, connection, setting at work, control and eventual maintenance or stop operation shall be executed by trained and qualified staff. Furthermore, possible local regulations or directions not mentioned in this manual must be taken into consideration as well. Tampering with the product is prohibited. The user is responsible for dangers or accidents in relation to other persons and their property. Use the pump only for the purposes described below. Any other use can cause accidents.

Before executing any operation, the feeder cables shall be disconnected from the terminals of the motor. Never touch the electric pump while it is working.

TRANSPORT, HANDLING AND INTERMEDIATE STORAGE

The electric pumps have to be fitted observing the following recommendations, according to their weight (indicated on their packing):
Up to 20kg: manually by one person
20-60kg: manually by two persons
More than 60kg: by means of a suitable lifting device.

TECHNICAL SPECIFICATIONS AND USE

Description of the product: electric pumps with peripheral impeller. The identification data and technical characteristics of the pump are shown on the plate attesting to its conformity to CE standards. Technical features: see fig 1.
Application and Service: Clean water and liquids for fire fighting.

Never use the electric pump in explosive atmospheres or to pump flammable or dangerous liquids. The pumps must **NOT** be used for swimming pools.

Use the pump only with clear water, without sand, oil or other impurities.
Never use the pump in absence of liquid.
Always use the pump with a delivery indicated in the working diagram.

INSTALLATION

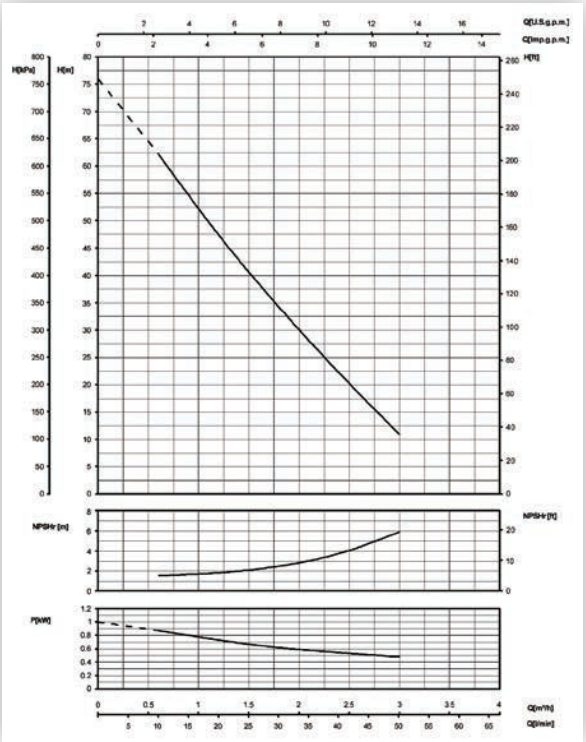
Verify that the data shown on the plate and in particular, power, frequency, voltage, absorbed current, are compatable with the characteristics ofthe electricline or current generator available. In particular, the voltage of the line can have a variance of ±5% from the nominal value on the plate.

Verify that the electrical system corresponds to the CEI EN 60204-1 standard. The disconnection devices must be foreseen in the supply network. Pumps with three phase motors: a protection device must be put in the system according to EN 60947.

Verify that the pump's flow rate and head correspond to the required characteristics. Before connecting the pipes to the relative openings, make sure that the rotating part of the pump turns freely and is not hindered.
The pipes must be supported by anchorages to prevent their weight damaging the bodies of the electric pump (fig: 2-A). The suction piping diam. must not be less than the pump outlet diam. and it must have a positive inclination towards the pump. The pump must be installed as nearest as possible to the liquid to be pumped.

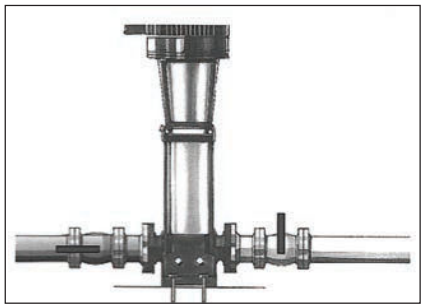
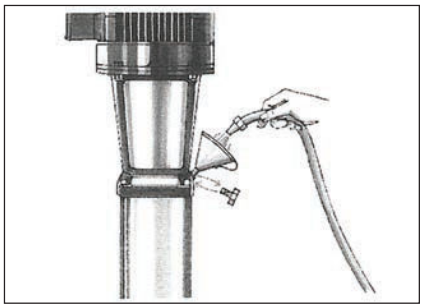
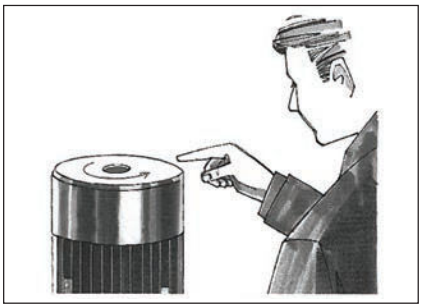
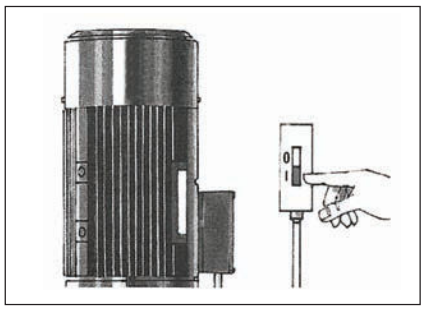
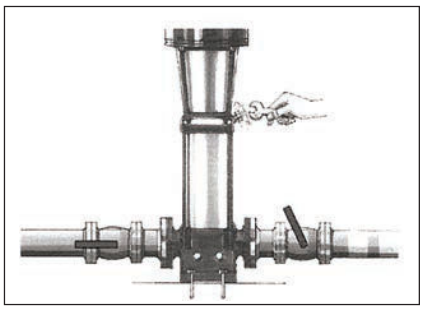
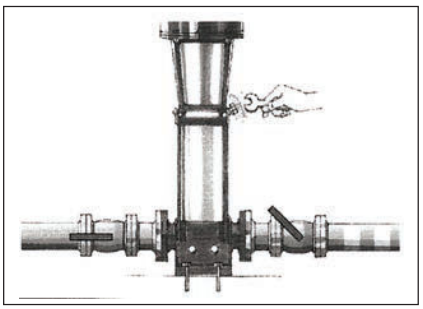
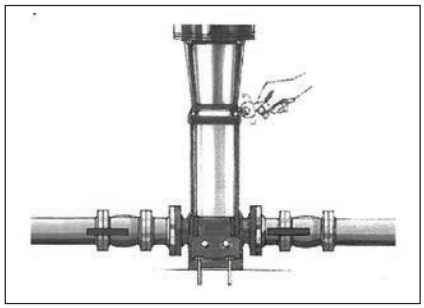
SETTING AT WORK, OPERATION AND STOP

Before executing any operation, turn off the power and prevent it from
After verifying the data indicated on the plate, connect the terminals of the motor following the schematics. Connect the earthing cable.
Once the connection is done, re-assemble the fairleads and close with care the terminal board. Three phase motors: clockwise rotation seen from fan motor side; if not, invert two phases.



	COMPONENT	MATERIAL
05	Pump body	Cast iron G20
08	Plug	Brass
12	Impeller	Brass
13	Rolling seal member	Graphite
14	OR	Rubber NBR
15	Fixed seal member	Ceramic
17	Drop guard	Rubber
18	Support (only KF 0-3-4-5-6)	Cast iron G20
19	Screw	Galvanised Steel
20	Bearing	Commercial
21	Key	Stainless Steel AISI 304
22	Rotating Shaft	Stainless Steel AISI 431
24	Circlip	Steel
25	Casing with wound stator	Aluminium
27	Tie-rod	Galvanised Steel
29	Terminal block cover	Thermoplastic resin
30	Terminal block	Thermoplastic resin
31	Fairlead	Thermoplastic resin
32	Driving Cap	Aluminium
33	Fan	Thermoplastic resin
35	Fan cover	Steel
49	Snap ring	Stainless Steel, AISI 304
452	Capacitor	Commercial

TECHNICAL DATA

NOTE

For motor bearing maintenance at ambient temperatures above 40°C, see maintenance section.

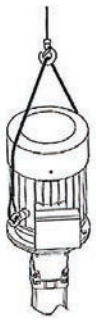
The maximum permissable operating pressure and liquid temperature ranges apply to the pump only.

HANDLING

When lifting the entire pump with motor, follow these instructions:

- Pump with motor sizes 0.37 - 7.5kW: Lift the pump in the motor flange by means of straps or the like.
- Pump with motor sizes 11 -75kW: Lift the pump by means of the motor eyebolts.

In the case of pumps without eyebolts, we recommend that you lift the pump by means of straps in the motor flange.

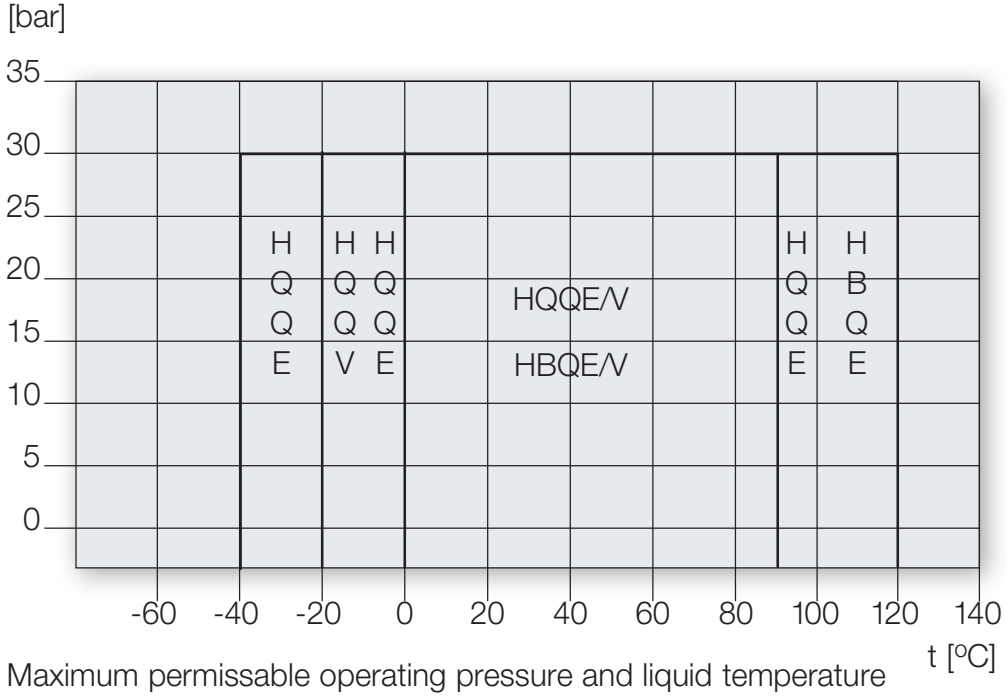


0.37 - 7.5kW 11 - 75kW

Correct lifting of a Vertical pump

MAXIMUM PERMISSABLE OPERATIONAL PRESSURE AND LIQUID TEMPERATURE FOR THE SHAFT SEAL

NOTE:
The diagram below applies to clean water and water containing anti-freeze liquids.
CR, CRI, CRN 1s to 20 and CR, CRN 32 to 150



Maximum permissable operating pressure and liquid temperature

Standard Shaft Seal	Motor [kW]	Max temp range
HQQE	0.37 - 45	-40°C to +120°C
HBQE	55 - 75	0°C to +120°C
HQQV	0.37 - 45	-20°C to +90°C
HBQV	55 - 75	0°C to +90°C

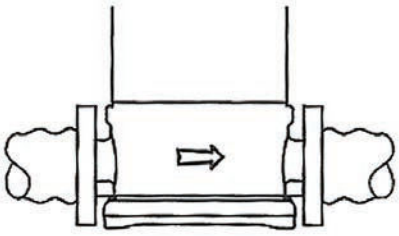
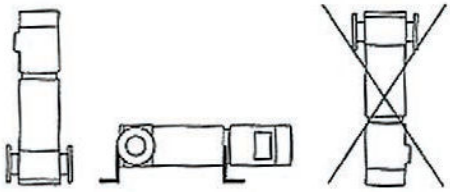
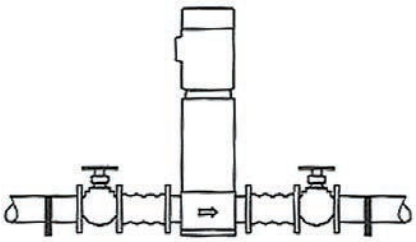
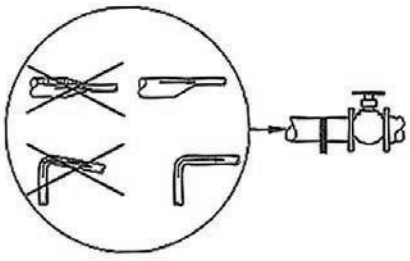
CRI and CRN pumps using a type H shaft seal with EPDM rubber parts, HxxE, can be cleaned in place (CIP) with liquids up to 150°C for maximum 15 mns.

NOTE:
The pumping of liquids above +120°C may result in periodical noise and reduced pump life.

CR, CRI, CRN pumps are not suitable for the pumping of liquids above 120°C for long periods.

INSTALLATION

The pump must be secured to a horizontal plane and soild foundation by bolts through the holes in the base plate. When installing the pump, follow the procedure below in order to avoid damaging the pump.

STEP		ACTION
1		Arrows in the pump base show the direction of flow of liquid through the pump.
2		The pump can be installed vertically. Ensure that an adequate supply of cool air reaches the motor cooling fan. Motors above 4kW must be supported.
3		To minimise possible noise from the pump, expansion joints are fitted on either side of the pump. Isolating valves are fitted on either side of the pump to avoid draining the system if the pump needs to be removed for cleaning, repair or replacement. Always protect the pump against backflow by means of a non-return valve.
4		Install the pipes so that air locks do not occur, especially on the suction side of the pump.

FOUNDATION

NOTE:

THe foundation / installation must be carried out in accordance with the following instructions. Non-compliance may result in functional faults which will damage the pump components.

Grundfos recommends to install the pump on a concrete foundationwhich is heavy enough to provide permanentand rigid support to the entire pump. The foundation must be capable od absorbing any vibration, normal strain or shock. The concrete foundation must have an absolutely level and even surface.

Place the pump on the foundation and fasten it.
The base plate must be supported on the whole area.

Note that the length and width of the foundation for pumps with motor size ≤ 30kW must be 200mm larger than the base plate.

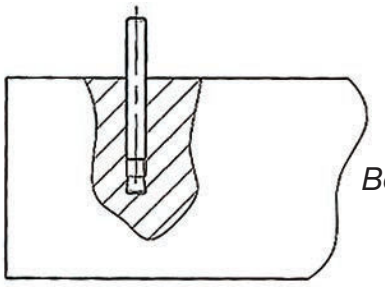
For pumps with motor size ≤ 37kW the length and width must always be 1.5 x (L_f x W_f) metres.

The mass of the foundation must be at least1.5 times the total mass of the pump. The minimum height of the foundation is 150mm.

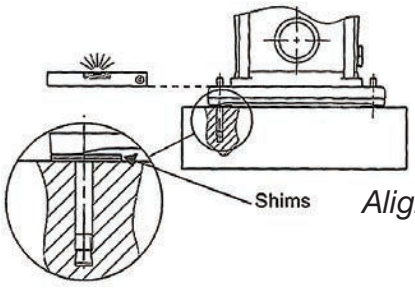
In installations where noise-less operation is particulary important, a foundation with a mass up to 5 times that of the pump is recommended.

The foundation must be provided with bolts for fixing the base plate.

When the foundation bolts are in position, the pump can be placed on the foundation. The base plate can now be aligned using shims, if necessary, so that it is completely horizontal.



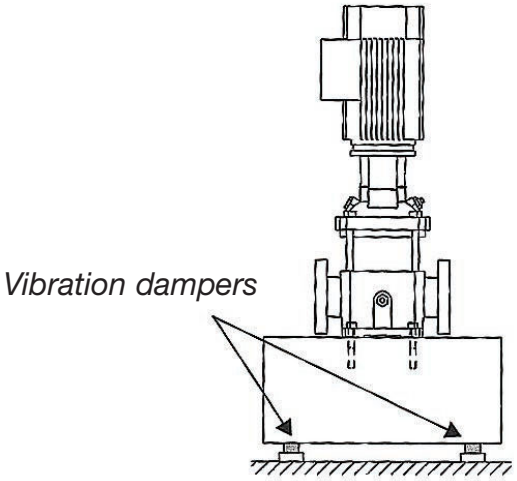
Bolt in foundation



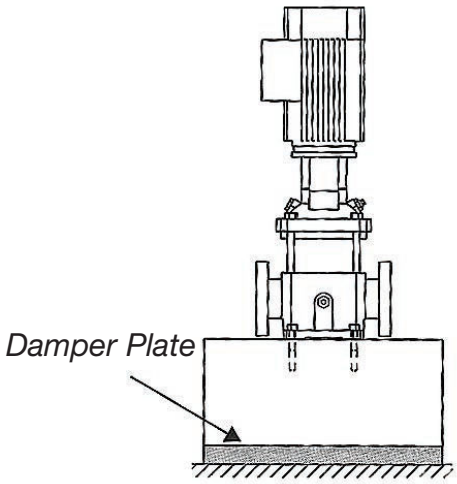
Alignment with shims

VIBRATION DAMPENING

If vibration dampers are used, they must be installed under the foundation.
Pumps with motor size ≤ 30kW can use vibration dampers.



Pump on vibration dampers



Pump on damper

OUTDOOR INSTALLATION

When installed outdoors, it is essential to provide the motor with a rain and UV cover.
It is also recommended to open one of the drain holes in the motor flange.

ELECTRICAL CONNECTION

The electrical connection should be carried out by an authorised electrician in accordance with local regulations.

WARNING:
Before removing the terminal box cover and before removing / dismantling the pump, make sure that the power supply has been switched off and that it cannot be accidently switched on.
The pump must be connected to a main switch.

The operating voltage and frequency are marked on the motor nameplate. Make sure that the motor is suitable for the power supply on which it will be used and the motor terminal connection is correct. You will find a wiring diagram in the terminal box.

TERMINAL BOX POSITION

The terminal box can be turned to four positions, in 90° steps.
Follow this procedure:
1. If necessary, remove the coupling guards. Do not remove the coupling.
2. Remove the bolts securing the motor to the pump.
3. Turn the motor to the required position.
4. Replace and tighten the bolts.
5. Replace the coupling guards.

Carry out the electrical connection as shown in the diagram inside the terminal box cover.

START - UP

CAUTION: Do not start the pump until it has been filled with liquid and vented. If the pump runs dry, the pump bearings and the shaft seal may be damaged.

WARNING: Pay attantion to the direction of the vent hole and take care to ensure that the escaping water does not cause any injury to persons or damage to the motor or other components.

MAINTENANCE

WARNING: Before starting work on the pump, make sure that all power supplies to the pump have been switched off and that they cannot be accidently switched on.

Pump bearings and shaft seal are maintenance free.

MOTOR BEARINGS

Motors not fitted with grease nipples are maintenance free.
Motors filled with grease nipples should be lubricated with a high temperature, Lithium based grease. See instructions on the fan cover.

In the case of seasonal operation (motor is idle for more than 6 months of the year), we recommend you to grease the motor when the pump is taken out of operation.

Depending on the ambient temperature, the motor bearings must be replaced or lubricated according to the table below. The table applies to 2-pole motors.
The number of operating hours stated for bearing replacement are guidelines only.

Motor size (kW)	Bearing replacement interval (operating hours)				
	40°C	45°C	50°C	55°C	60°C
0.37 - 0.75	18000	-	-	-	-
1.1 - 7.5	20000	15500	12500	10000	7500

Motor size (kW)	Lubrication interval (operating hours)				
	40°C	45°C	50°C	55°C	60°C
11 - 18.5	4500	3400	2500	1700	1100
22	4000	3100	2300	1500	1000
22	4000	3000	2000	1500	-

SERVICE

It is advisable to repair pumps with motors of 7.5kW and up at pump site. Necessary lifting equipment must be available.

NOTE: If a pump has been used for a liquid which is toxic or injurious to health, the pump will be classified as contaminated.

If Aline is requested to service the pump, Aline must be contacted with details about the pumped liquid, etc. ***before*** the pump is returned for service.

Possible costs of returning the pump are to be paid by the customer.

However, any application for service (no matter to whom it may be made) must include details about the pumped liquid if the pump has been used for liquids which are toxic or injurious to health.

FAULT FINDING CHART

FAULT	CAUSE	REMEDY
1. Motor does not run when started	a) Supply failure	Connect the power supply
	b) Fuses are blown	Replace fuses
	c) Motor protective circuit breaker has tripped out	Reactivate the motor protective circuit breaker
	d) Thermal protection has tripped out	Reactivate the thermal protection
	e) Main contacts in motor-protective circuit breaker are not making contact or the coil is faulty	Replace contacts or magnetic coil
	f) Control circuit is defective	Repair the control circuit
	g) Motor is defective	Replace the motor
2. Motor-protective circuit breaker trips out immediately when supply is switched on	a) One fuse/automatic circuit breaker is blown	Replace the fuse/cut in the circuit breaker
	b) Contacts in motor-protective circuit breaker are faulty	Replace motor protective circuit breaker contacts
	c) Cable connection is loose or faulty	Fasten or replace the cable connection
	d) Motor winding is defective	Replace the motor
	e) Pump mechanically blocked	Remove the mechanical blocking of the pump
	f) Motor-protective circuit breaker setting is too low	Set the motor-protective curcuit breaker correctly
3. Motor-protective circuit breaker trips out occasionally	a) Motor-protective circuit breaker setting is too low	Set the motor-protective circuit breaker correctly
	b) Low voltage at peak times	Check the power supply
4. Motor -protective circuit breaker has not triped out but the pump does not run	a) Check 1 a), b), d), e) and f)	
5. Pump performance not constant	a) Pump inlet pressure is too low (cavitation)	Check the suction conditions
	b) Suction pipe/pump blocked by impurities	Clean the suction pipe/pump
	c) Pump draws in air	Check the suction conditions
6. Pump runs but gives no water	a) Suction pipe/pump blocked by impurities	Clean the suction pipe/pump
	b) Foot or non return valve blocked in closed position	Repair the foot or non-return valve
	c) Leakage in suction pipe	Repair the suction pipe
	d) Air in suction pipe or pump	Check the suction conditions
	e) Motor runs in the wrong direction of rotation	Change the direction of rotation of the motor
7. Pump runs backwards when switched off	a) Leakage in suction pipe	Repair the suction pipe
	b) Foot or non-returnvalve defective	Repair the non-return valve
8. Leakage in shaft seal	a) Shaft seal is defective	Replace the shaft seal
9. Noise	a) Cavitation	Check the suction conditions
	b) Pump does not rotate freely (frictional resistance) because of incorrect pump shaft position	Adjust the pump shaft

ALINE FIRE PUMPS USE A SYNTHETIC RUBBER HOSE FOR THE FLEXIBLE CONNECTION BETWEEN THE FUEL TANK AND THE DIESEL ENGINE

Black cover meets flame resistance acceptance designation "MSHA 2G"

Recommended for:
Hydraulic Oils, Water, Glyco antifreeze solutions, engine lubricating oils and air.
Lock-on hose and couplings are NOT recommended for pressure surge applications or critical applications, such as permanent piping in residential or commercial buildings.

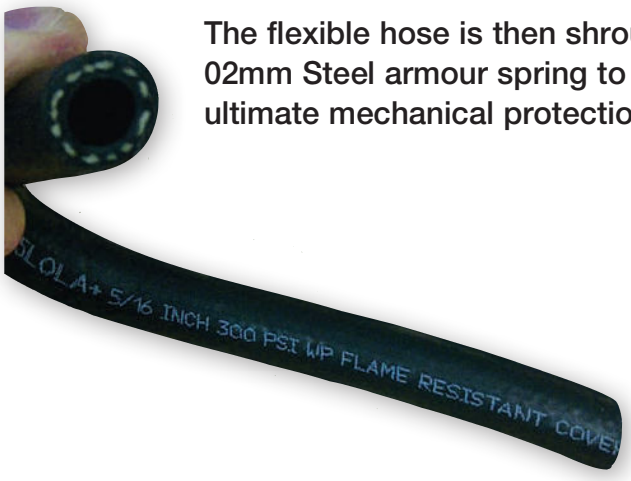
Tube:
Black, oil resistant, synthetic rubber highly resistant to oil and heat (Nitrile - Type C).

Reinforcement:
One fibre braid.

Cover:
Oil and abrasion resistant, synthetic rubber (modified Nitrile type C2).

Temperature range:
-40° F to + 212° F° (-40° C to +100°). Air to +160° F (+71° C) only.

Description	⟷	↕	WP	BP
3L Olaxreel	3/16	0.41	300	1,200
4L Olaxreel	1/4	0.47	300	1,200
5L Olaxreel	5/16	0.55	300	1,200
6L Olaxreel	3/8	0.63	300	1,200
8L Olaxreel	1/2	0.77	300	1,200
10L Olaxreel	5/8	0.94	300	1,200
12L Olaxreel	3/4	1.06	300	1,200



The flexible hose is then shrouded by a 02mm Steel armour spring to give the ultimate mechanical protection.

ALINE FIRE PUMPS USE A SELECTION OF VIBRATION MOUNTS OR DAMPNERS TO ISOLATE THE VIBRATION OF AN OPERATING PUMP FROM THE REST OF THE BUILDING

Standard Mount Selections

Q Mount

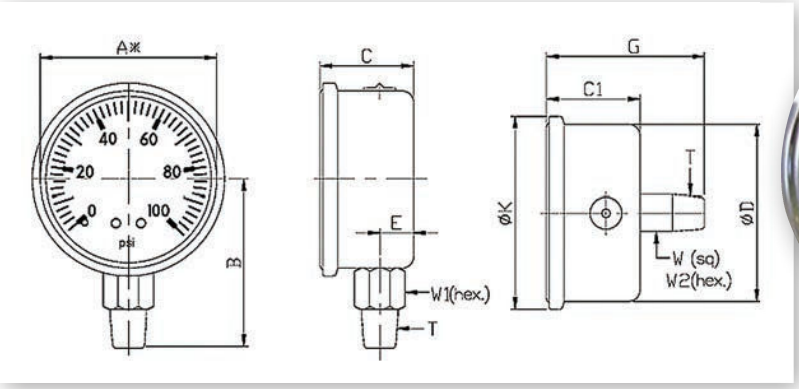
P Mount

PSM Mount

Each Fire Pump has a mount specifically prescribed that best fit the specifications and operating parameters of the pump.

ISO 9001
ISO 14001
OHSAS 18001
BUREAU VERITAS
Certification
N 214214

Case and Bezel material:	304 Stainless Steel, liquid filled with vent plug
Connection:	Copper Alloy
Bourdon tube material:	Copper Alloy
Working temperature:	Ambient = -20-60º C, Process = +70º C
Dial:	Black print (kPa) red print (PSI) on white background
Ranges:	-100-0 kPa to dual scale 0-40000kPa/PSI
Connection:	1/4” BSPT for 63mm, 3/8” BSPT for 100mm
Surge Protection:	Available on request
Window:	Polycarbonate
Movement:	Copper Alloy
Pointer:	Aluminium black finish
Accuracy:	+/- 2.5% of full scale



	A	B	C	C1	D	E	G	K	T	W1	W2
100	**96.5**	**78.5**	**32.0**	**34.3**	**98.7**	**9.8**	**73.0**	**104.0**	**3/8” BSPT**	**22.0**	**21.0**

Dimensions in mm

	100mm diameter	
Range (in kPa)	**Lower Mount P/N**	**Accessories**
-100/+1000	**1618527**	
0-1000	**1618570**	**Restrictor 0.25mm P/N: 1619916**
0-1600	**1618580**	
0-2500	**1618590**	
0-4000	**1618600**	**Restrictor 0.25mm P/N: 1619916**
0-6000		

ACCURATE CHANGEOVER SWITCH WITH ADJUSTABLE DIFFERENTIAL

Description

Full Metal bodied fire switch with a diaphragm or piston sensing element and one switched output as a changeover contact for converting pneumatic and hydraulic pressures into an electrical switching signal.

An adjusting screw allows setpoints to be easily adjusted, even in situ.

The switch is suitable for non-aggressive liquids. It is available as standard with a 1/4" thread Galvanised Steel process connection. The switch can be installed in any desired mounting position.

The A250 can be used for control and monitoring pressure media in fire systems. The integrated microswitch allows switching performance of up to 4A.

Features

- Adjustable differential
- Change over contact
- Angle plug IP 65
- Diaphragm versions supports up to 30 bar
- Piston type supports up to 350 bar
- Fine accuracy adjustment

Applications

- Fire system sensing
- Fire system control

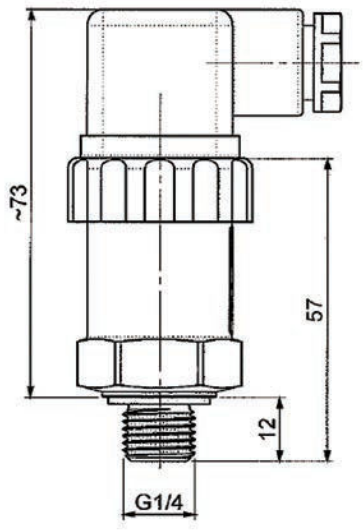
Adjustment ranges (bar)	Overload limit (bar)	Repeatability (bar)	Measuring principle	Switching function
				SPDT
1..16	60	± 0.32	Diaphragm	B076001
10..30	350	± 0.6	Piston	B133001

TECHNICAL DATA

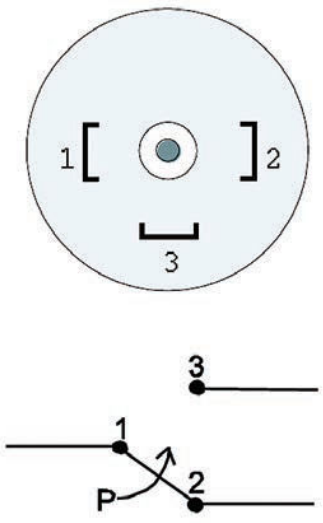
	MECHANICAL PRESSURE SWITCH	
Model	A250	
Execution	Positive Gauge Pressure	
Media	Neutral Fluid	
Process connection standard	G 1/4	
Measuring principle	Spring loaded diaphragm 0, 2-30 bar, spring loaded piston 10-350 bar	
Materials	Diaphragm type	Piston type
Measuring element standard	NBR	NBR / PTFE
Thread standard	Zinc plated Steel	
Housing standard	Zinc plated Steel, contact insert plastic	
Switching outputs		
Number	1	
Switching function	SPDT	
Switching element	Microswitch	
standard	Silver plated contacts	
Adjustment standard	In site, with adjustment screw	
Hysteresis	Adjustable	
Power rating*		
DC up to 28V	2A	
AC up to 125V	4A	
up to 250V	4A	
Load cycles	max 100/min	
Temperature ranges	-20° C + 80° C	
Electrical connection standard	L-plug acc. to DIN EN 175301-803	
Protection type	IP65	
Mounting position	Any	
Weight	-0.1kg	

*All specifications for ohmic load. For voltages >42V regulation for protective means have to be regarded.

Dimensions (in mm)



Electrical connection SPDT



SETTING YOUR PRESSURE SWITCH

Tools required

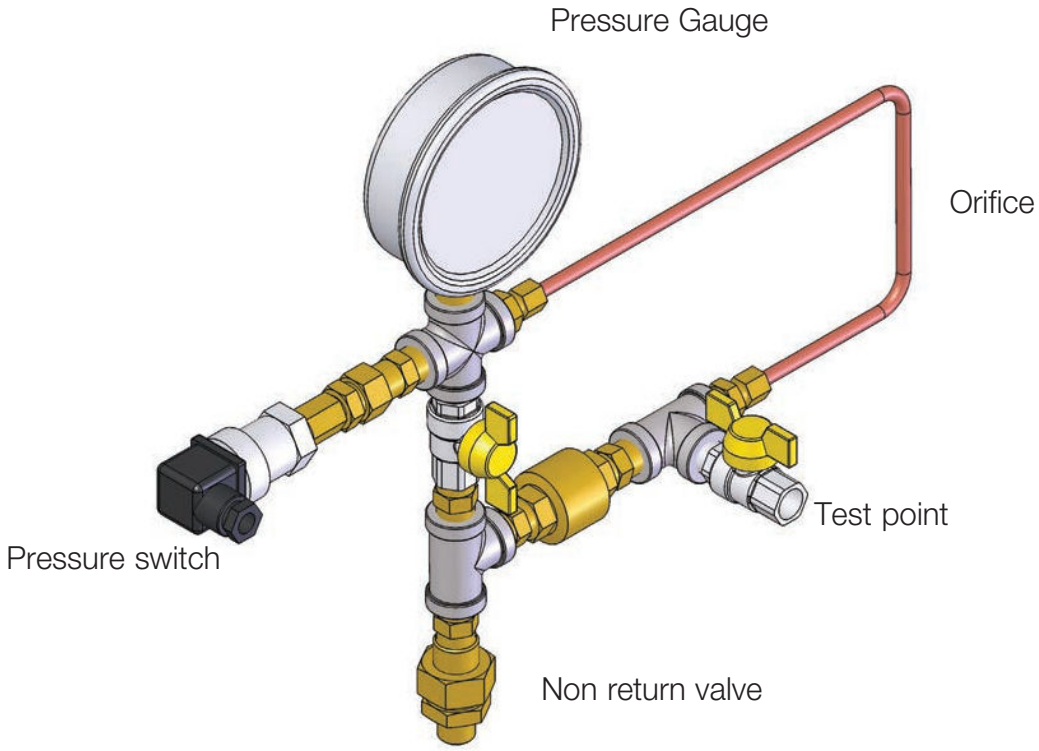
- 2.5mm screw driver
- 2.5mm allen key
- Adjustable spanner

PROCESS OF SETUP

- Remove the DIN plug (black plug with the cable coming into it)
- Remove the small brass hex in the centre of the switch
- Adjust the set pressure by rotating the centre bolt using the 2.5mm allen key
- If there is a need to adjust the differential do so by rotating the screw driver port beside the straight terminal

AS2941 HAS THE REQUIREMENT THAT ALL MAIN FIRE PUMPS ARE FITTED WITH A FAIL SAFE PRESSURE SWITCH TEST ARRANGEMENT. ALINE FIRE PUMPS COME STANDARD WITH THIS ARRANGEMENT

Typical pressure switch arrangement-connected to an installation AS2941 diagram



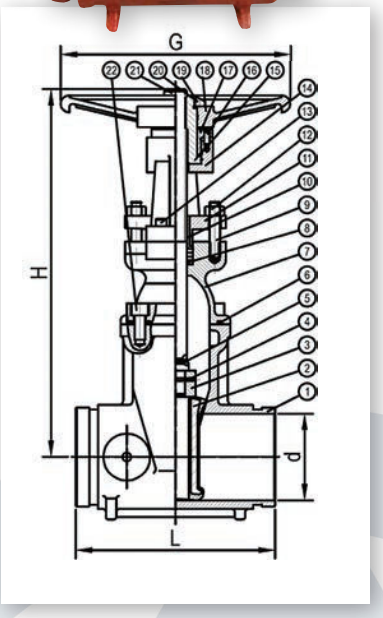
Aline fail safe test loop

As AS2941's embrace of the failsafe system has been warmly welcomed and boasts great advantages as follows:

- As its name suggests, it is failsafe
- Increased accuracy of testing switch settings
- Vastly reduced water wastage

GROOVED-END GATE VALVE

- Bolted Bonnet
- Outside screw and yolk
- Resilient wedge
- Grooved end
- 300PSI/20.7 Bar non shock cold working pressure
- Conforms to AWWA C509
- FBE coated interior and exterior
- Maximum operating temperature 185ºF / 85ºC
- FM approved and UL/ULC listed



MATERIAL SPECIFICATIONS

PART	SPECIFICATION
1. Valve Body	Ductile Iron ASTM A 536
2. Resilient Wedge	Ductile Iron ASTM A 536 with EPDM encapsulation
3. Wedge Nut	Bronze ASTM B 584 UNS C83600
4. Dowel Pin	Stainless Steel ASTM A 276 UNS S42000
5. Stem Back Seat 0-Ring	EPDM
6. Bonnet Gasket	EPDM
7. Bonnet	Ductile Iron ASTM A 536
8. Stem packing	EPDM
9. Threaded Rod	Carbon Steel Zinc Plated
10. Gland Bushing	Brass ASTM B 584
11. Gland	Cast iron ASTM A 126-B
12. Gland Nut	Stainless Steel 18-8
13. Yoke Screw	Alloy Steel ASTM A 574M Zinc Plated
14. Yoke	Cast Iron ASTM A 126-B
15. Yoke Bushing	Bronze ASTM B 584
16. Flat Point Set Screw	Alloy Steel ASTM F 912M Black Oxide
17. Yoke Bushing Retainer	Cast Iron ASTM A 126-B
18. Handwheel	Ductile Iron ASTM A 536
19. Handwheel Nut	Carbon Steel Zinc Plated
20. Flat Head Screw	Carbon Steel Zinc Plated
21. Stem	Bronze ASTM B 150 UNS C61400
22. Bonnet Screw	Alloy Steel ASTM A 574M Zinc Plated

DIMENSIONS

PART NUMBER	SIZE		L		d		G		HALF OPEN		HALF CLOSE		TURNS TO OPEN
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	
135-065	2.5	65	7.5	190	2.5	64	7.9	200	17.8	453	14.9	378	8.8
135-080	3	80	8.0	203	3.0	76	10.0	254	20.1	510	15.9	405	10.5
135-100	4	80	9.0	229	4.0	102	10.0	254	22.4	568	16.6	422	13.75
135-150	6	100	10.5	267	6.0	152	12.4	315	30.3	769	22.9	581	16
135-200	8	150	11.5	292	8.0	203	14.8	375	37.8	960	28.5	724	17.5
135-250	10	250	13.0	330	10.0	254	16.4	416	44.8	1139	34.5	877	21.5
135-300	12	300	14	356	12.0	305	17.5	445	52.9	1326	39.9	1014	25.5

Note: Freezing weather precaution-subsequent to testing a piping system, valves should be in an open position to allow complete drainage.

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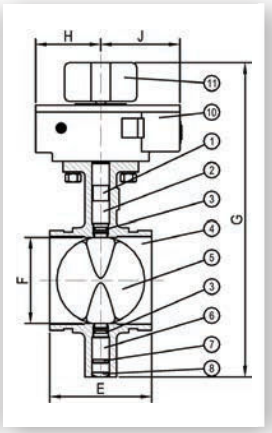
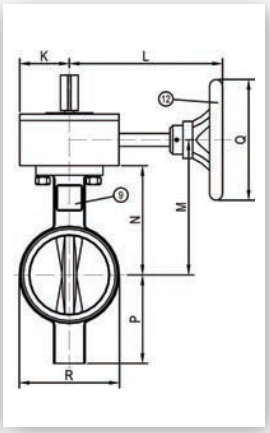
GROOVED-END BUTTERFLY VALVE

- Approved Gear Operator for both indoor or outdoor use
- NSF Certified Polymide coated ductile iron body for excellent protection
- Elasyometer encapsulated disc with outstanding flow characteristics
- Extended neck
- Low torque operation
- Options of double internal supervisory switches
- FM and UL/ULC pending

MATERIAL SPECIFICATIONS

PART	SPECIFICATION
1. Upper Stem	Stainless Steel ASTM A 276 Type 420
2. Upper Bearing	PTFE Bronze sintered on Steel
3. O-Ring	EPDM
4. Body	Ductile Iron ASTM A 536, Polymide coated
5. Disc	Ductile Iron ASTM A 536, EPDM encapsulation
6. Lower Bearing	PTFE Bronze sintered on Steel
7. Lower Stem	Stainless Steel ASTM A 276 Type 420
8. Dust Plug	PVC
9. Name Plate	Stainless Steel
10. Gear Operator	Cast Iron and Steel
11. Indicator Flag	Cast Iron
12. Handwheel	Cast Iron

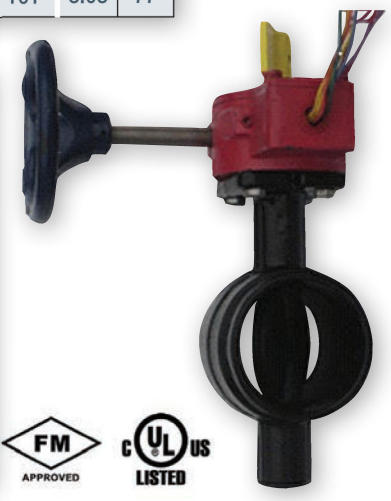




DIMENSIONS

PART NUMBER	SIZE		OD		E		F		G		H		J		K	
	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm
VBG01-073	2 1/2	65	73.0	3.85	3.85	98	2.40	61	11.22	285	2.91	74	3.54	90	2.13	54
VBG01-076	3OD	65	76.1	3.85	3.85	98	2.40	61	11.22	285	2.91	74	3.54	90	2.13	54
VBG01-089	3	80	88.9	3.85	3.85	98	2.87	73	12.20	310	2.91	74	3.54	90	2.13	54
VBG01-114	4	100	114.3	4.56	4.56	116	3.86	98	14.17	360	2.91	74	3.54	90	2.13	54
VBG01-140	5 1/2OD	125	139.7	5.86	5.86	149	4.80	122	15.35	390	2.91	74	3.54	90	2.13	54
VBG01-141	5	125	141.3	5.86	5.86	149	4.80	122	15.35	390	2.91	74	3.54	90	2.13	54
VBG01-165	6 1/2OD	150	165.1	5.86	5.86	149	5.75	146	16.73	425	2.91	74	3.54	90	2.13	54
VBG01-168	6	150	168.3	5.86	5.86	149	5.75	146	16.73	425	2.91	74	3.54	90	2.13	54
VBG01-219	8	200	219.1	5.27	5.27	134	7.72	196	19.41	493	2.91	74	3.54	90	2.13	54
VBG01-273	10	250	273.0	6.30	6.30	160	9.57	243	22.76	578	3.90	99	3.98	101	3.03	77

SIZE	L		M		N		P		Q		R		WL	
In.	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	In.	mm	Lbs.	Kg.
2 1/2	7.68	195	5.27	134	3.78	96	2.95	75	5.90	150	3.35	85	17.6	8.0
3OD	7.68	195	5.27	134	3.78	96	2.95	75	5.90	150	3.35	85	18.3	8.3
3	7.68	195	5.63	143	4.13	105	3.54	90	5.90	150	3.82	97	18.9	8.6
4	7.68	195	6.81	173	5.31	135	4.33	110	5.90	150	4.88	124	23.4	10.6
5 1/2OD	7.68	195	7.32	186	5.83	148	5.00	127	5.90	150	6.10	155	31.3	14.2
5	7.68	195	7.32	186	5.83	148	5.00	127	5.90	150	6.10	155	31.3	14.2
6 1/2OD	7.68	195	8.00	203	6.50	165	5.71	145	5.90	150	7.20	183	34.8	15.8
6	7.68	195	8.00	203	6.50	165	5.71	145	5.90	150	7.20	183	35.5	16.1
8	8.03	204	9.53	242	8.03	204	6.89	175	9.84	250	9.29	236	50.5	22.9
10	9.49	241	11.42	290	9.65	245	8.27	210	11.8	300	11.38	289	88.6	40.2



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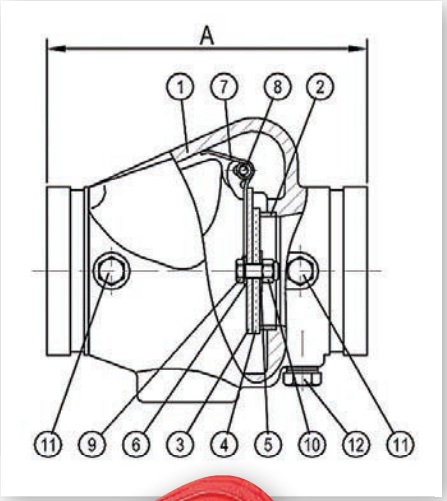
GROOVED-END SWING CHECK VALVE

- Installed in both horizontal or vertical line with upward flow
- Easier and faster to maintain and install
- Low pressure drop
- EPDM non-stop leak tight sealing
- All Stainless Steel welded parts to provide superior corrosion resistance
- FM approved and UL/ULC listed

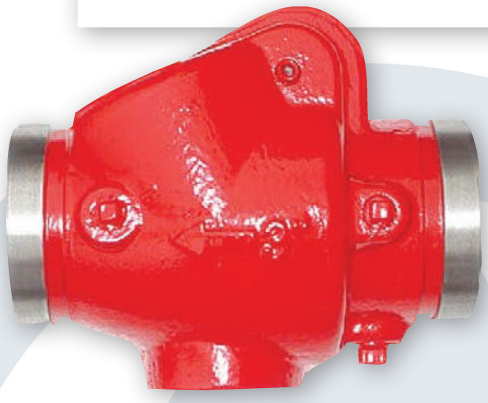
MATERIAL SPECIFICATIONS

PART	SPECIFICATION
1. Body	Ductile Iron ASTM A 536
2. Seat	Bronze
3. Clapper	Stainless Steel 304
4. Facing Seal	EPDM Rubber
5. Clamping Ring	Stainless Steel 304
6. Gasket	EPDM Rubber
7. Spring	Stainless Steel 304
8. Hinge Pin	Stainless Steel 304
9. Bolt	Stainless Steel 304
10. Locknut	Stainless Steel 304
11. Plug 1/4" NPT	Carbon Steel
12. Plug 1/2" NPT	Carbon Steel



DIMENSIONS

PART NUMBER	SIZE		OD	A		WEIGHT	
	In.	mm	mm	In.	mm	lbs	kg
VCG01-060	2	50	60.3	6.65	169	5.5	2.5
VCG01-073	2 1/2	65	73.0	7.20	183	8.8	4
VCG01-076	3OD	65	76.1	7.20	183	8.8	4
VCG01-089	3	80		7.80	198	13	6
VCG01-114	4	100	114.3	8.58	218	20	9
VCG01-140	5 1/2OD	125	139.7	9.76	248	33	15
VCG01-141	6	125	141.3	9.76	248	33	15
VCG01-165	6 1/2OD	150	165.1	10.63	270	42	19
VCG01-168	6	150	168.3	10.63	270	42	19
VCG01-219	8	200	219.1	12.80	325	77	35
VCG01-273	10	250	273.0				
VCG01-324	10	250	323.9				



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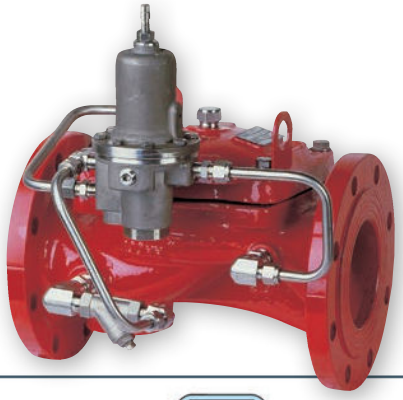
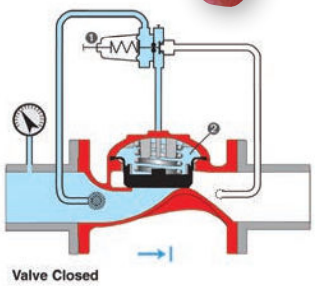
FEATURES AND BENEFITS

- Simple operation
- Quick cover removal - **easy in-line service**
- One piece diaphragm - **reliability**
- Line - pressure driven
- Unrestricted flow path



OPERATION

The pressure relief valve remains closed as long as the inlet pressure is lower than the setpoint. When it senses inlet pressure that is higher than the pilot **1** setting, it acts upon the control chamber **2** causing the main valve to open, relieving excess pressure to either the reservoir or sump.



SPECIFICATIONS

The valve is a line-pressure driven, direct-diaphragm actuated, globe pattern valve. Valve actuation is accomplished by a one piece diaphragm assembly. The valve cover is removable for in-line service. The valve has an obstructed flow path, with no stem-guide or supporting ribs.The pilot system consists of relief pilot valve and control strainer.

MATERIALS

Manufacturers Standard Materials

Main valve body and cover:

Cast Iron ASTM A 126 Class B(1)

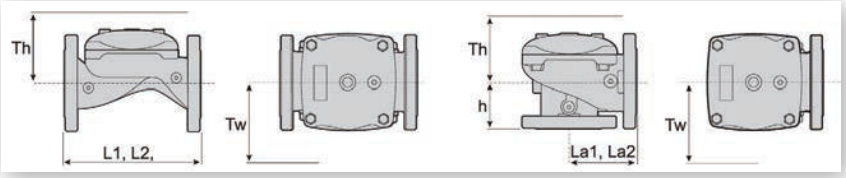
Valve wetted parts:

Stainless Steel and Natural Rubber

Control System:

Brass with Copper tubing

Pilot System Dimensions



	Valve Size	2"		2½"		3"		4"		6"	
		mm	inch	mm	inch	mm	inch	mm	inch	mm	inch
Dimensions	(1)L1	205	8 1/2	205	8 1/2	250	9 13/16	320	12 9/16	415	16 5/16
	(2)L2	180	7 1/16	210	8 1/4	255	10 1/16	N/A	N/A	N/A	N/A
	(1)La1	121	3 3/4	N/A	N/A	153	6	160	6 5/16	N/A	N/A
	(2)La2	284	11 3/16	N/A	N/A	300	11 3/16	313	12 5/16	341	13 7/16
	Tw	284	11 3/16	284	11 3/16	300	11 3/16	313	12 5/16	341	13 7/16
	Th	210	8 1/4	210	8 1/4	215	8 7/16	243	9 9/16	315	12 3/8
	h	83	3 1/4	N/A	N/A	101	4	112	4 7/16	N/A	N/A

Notes

1. L1 and La1 are for flanged ANSI #125 / #150 and ISO PN16
2. L2 and La2 are for threaded NPT or BSP
3. Tw and Th are max for pilot system
4. Data is for maximum envelope dimensions, component positioniong may vary
5. Provide adequate space around valve for maintenance

Connection Standard

Flanged: ANSI B16.42 (Ductile Iron), B16.5 (Steel and Stainless), B16.24 (Bronze), B16.1 (Cast Iron), ISO PN16

Threaded: NPT or BSP for 2, 2 1/2 and 3"

Water Temperature

0.5 - 50° C (33 - 122°F)

Available sizes

Globe: 2, 2 1/2, 3, 4, 6, 8, 10 and 12"

Angle: 2, 3, and 4"

Working Pressure

Max working pressure: 235psi (16 bar)

Sizing

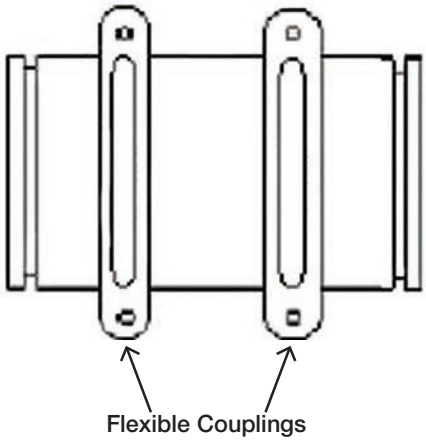
Size the value not less than according to Aline Pumps

GROOVED COUPLING VIBRATION ELIMINATION SYSTEM

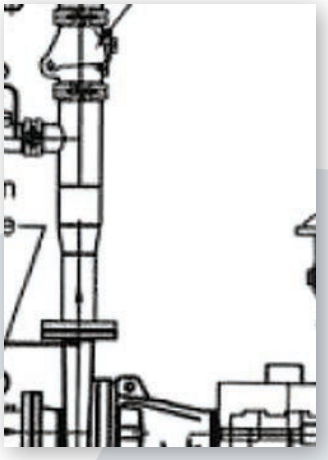
As dedicated to industry advancement, quality and product reliability, Aline Pumps has implimented a system of multiple roll grove couplings for reductionof vibration and noise and to solve issues with misalignment, flexibility and expansion / contraction in pipework systems.

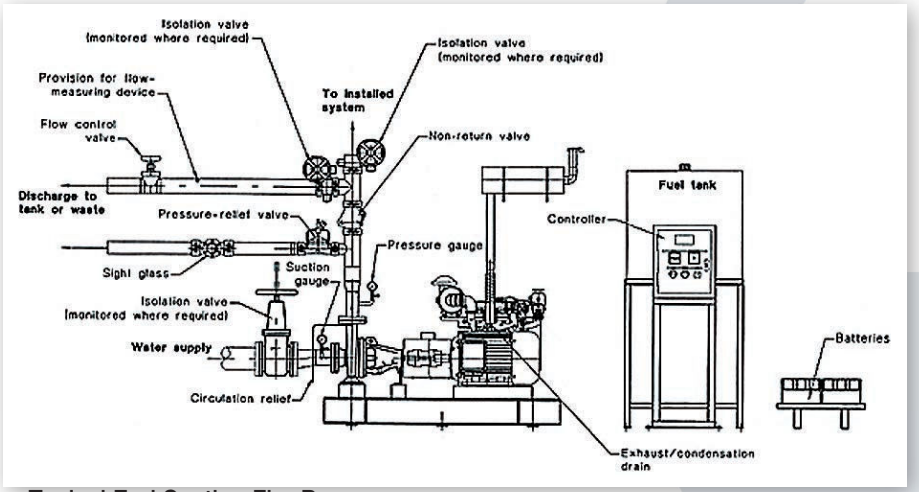
A series of a least two couplings gives greater vibration reduction reliability than the out dated wire braided connector.

- Each flexible coupling allows 2 to 5 degrees of misalignment with no adverse effect on the system.
- All components in the system now have the same specifications.
- Each coupling has flexibility to allow for expansion and contraction in the system pipework
- The coupling system does not stretch or bulge (like the braided connectors) if pipe work is incorrectly saddled or supported.
- Every joint is a union which allows for greater flexibility in connection to on site pipework.
- The system can be despatched after its bench test, then installed on site, without having to be modified. The braided connectors have to be special transport braces installed to hold them from crumbling in transport. These then have to be removed on site.



The coupling system has proved a great move forward in piping systems, especially for the fire industry. The repute of the system is high and has been accepted throughout the industry. AS2941.2008 no longer asks for the braided system as the coupling system is so successful (pictured).





Typical End Suction Fire Pump arrangement

ROLLED GROOVED FITTINGS
Flexible Galvanised

APPLICATION	Suitable for fire sprinkler and hydrant systems. Can also be used for hot water and potable water. Not for use with hydrocarbons, eg: Petroleum, Kerosene and Diesel. Suitable for fire protection.
DESIGN	Flexible couplings allow controlled angular, linear and rotational movement at each joint. This accommodates expansion / contraction, setting, vibration and other piping system movement.
MATERIAL	Housing - Ductile Iron to ATSM-A536 Standard Gasket - EPDM (Black) Other materials available on request Hot dip Galvanised finish to AS4680
TEMPERATURE	-30º to +110º C
MARKINGS	CPS Style 10
COMPATABILITY	Interchange with Victaulic Style 75
APPROVALS	UL No. EX4390

SIZE NB	SIZE (inch)	PART No.	WP		Approvals	
			psi	MPa	UL	FM
32	$1^{1/4}$	FWG-75-43	300	2	✓	✓
40	$1^{1/2}$	FWG-75-48	300	2	✓	✓
50	2	FWG-75-60	300	2	✓	✓
65	$2^{1/2}$	FWG-75-76	300	2	✓	✓
80	3	FWG-75-88	300	2	✓	✓
100	4	FWG-75-114	300	2	✓	✓
150	6	FWG-75-165	300	2	✓	✓
150USA	6USA	FWG-75-168	300	2	✓	✓
200	8	FWG-75-219	300	2	✓	✓

ROLLED GROOVED FITTINGS
Tee Equal Galvanised

MARKINGS	CPS Style 110S
COMPATABILITY	Interchange with Victaulic Style 002
MATERIAL	Ductile Iron to ATSM-A536

SIZE NB	SIZE (inch)	PART No.	WP	
			psi	MPa
100	4	FWG-20-114S	500	3.5
150	6	FWG-20-165S	500	2.8
200	8	FWG-20-219S	500	3.4

ROLLED GROOVED FITTINGS
90º Elbow Galvanised

MARKINGS	CPS Style 100S
COMPATABILITY	Interchange with Victaulic Style 001
MATERIAL	Ductile Iron to ATSM-A536

SIZE NB	SIZE (inch)	PART No.	WP	
			psi	MPa
100	4	FWG-10-114S	500	3.5
150	6	FWG-10-165S	500	3.5
200	8	FWG-10-219S	500	3.5

SECTION 1- PRODUCT AND COMPANY IDENTIFICATION

Hazardous according to criteria of
National Occupational Health and Safety Commission

PRODUCT

Product Name: **DIESEL**
Product Description: **Hydrocarbons and Additives**
Product Code: **166009-85**
Intended use: **Diesel Engine Fuel**

COMPANY IDENTIFICATION

Supplier: **MOBIL OIL AUSTRALIA PTY LTD**
12 Riverside Quay Southbank VIC 3006 Australia A.B.N. 88004 052 984

SECTION 2 - HAZARDS IDENTIFICATION

Hazard Classification: HAZARDOUS SUBSTANCE. NON-DANGEROUS GOODS
Refer to Section 15, Regulatory information, for hazard classification criteria

CLASSIFICATION

I Carc. Cat 3; R40 I Xn; R65 I R66 I

POISON SCHEDULE NUMBER S5

PHYSICAL / CHEMICAL HAZARDS

Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited. Material can accumulate static charges which may cause an incendiary electrical discharge.

HEALTH HAZARDS

Limited evidence of a carcinogenic effect. **HARMFUL: May cause lung damage if swallowed.** Repeated exposure may cause skin dryness or cracking. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. May be irritating to the eyes, nose, throat and lungs. High pressure injection under skin may cause serious damage.

ENVIRONMENTAL HAZARDS

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

SAFETY PHRASES

S2: KEEP OUT OF REACH OF CHILDREN **S24:** AVOID CONTACT WITH SKIN
S36/37: WEAR SUITABLE PROTECTIVE CLOTHING AND GLOVES
S61: AVOID RELEASE INTO THE ENVIRONMENT Refer to special instruction/safety data sheets
S62: IF SWALLOWED, DO NOT INDUCE VOMITING: SEEK MEDICAL ADVICE IMMEDIATELY AND SHOW THIS CONTAINER OR LABEL

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health Studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 - COMPOSITION INFORMATION ON INGREDIENTS

This material is regarded as a preparation

REPORTABLE HAZARDOUS SUBSTANCE(S) OR COMPLEX SUBSTANCE(S)

NAME	CAS #	CONCENTRATION*	SYMBOLS/RISK PHRASES
Fuels, Diesel	68334-30-5	>99%	Xn; Carc. Cat 3;R40 Xn; R65, R66

*All concentrations are percent by weight unless the ingredient is a gas. Gas concentrations are in percent by volume.
Note: Composition may contain up to 0.5% performance additives and/or dyes.
Other ingredients determined not to be hazardous up to 100%.

- FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself and others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea or unconsciousness occurs seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resusciation.

SKIN CONTACT

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a Physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of the injury.

EYE CONTACT

Flush thoroughly with water. If irritation occurs, get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis.
Treat appropriately.

PRE-EXISTING MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED BY EXPOSURE

Hydrocarbon Solvents/Petroleum Hydrocarbons. Skin contact may aggravate an existing dermatitis.

SECTION 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames. **Inappropriate extinguishing media:** Straight streams of water.

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.
Hazardous Combustion Products: Aldehydes, Oxides of Carbon, Sulphur Oxides, Incomplete combustion products, Smoke, Fumes.

FLAMMABLE PROPERTIES

Flash Point (Method): 64C (147F) I ASTM D-93
Flammable limits (Approx. Volume % in air): LEL: 0.6 I UEL:7.0
Autoignition Temperature: N/D

SECTION 6 - ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material. *See* **Section 5** for fire fighting information. *See* **Section 2** for significant hazards. *See* **Section 4** for First Aid Advice. *See* **Section 8** for Personal Protective Equipment.

SPILL MANAGEMENT

Land Spills: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour suppressing foam may be used to reduce vapour. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
Large Spills: Eliminate all ignition sources Water spray may reduce vapour, but may not prevent ignition in enclosed spaces.

SECTION 6 - ACCIDENTAL RELEASE MEASURES (Cont.)

SPILL MANAGEMENT (Cont.)

Water Spills: Stop leak if you can do so without risk. Warn other shipping. Seek the advice of a specialist before using dispersants. Eliminate source of ignition. If the flash point does not exceed the Ambient Temperature by 10° C or is less than the Ambient Temperature, use booms as a barrier to protect shorelines and allow the material to evaporate. If the Flash Point exceeds the Ambient Temperature bt 10° C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit.
Water spill and land spill recommendations are based on the most likely spill scenario for this material: however, geographic conditions, wind, temperature (and in the case of water spill) wave, current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted.

Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS:

Large Spills: Dyke far ahead of liquid spill for later recovery and disposal.
Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 - HANDLING AND STORAGE

HANDLING

Avoid contact with skin. Use proper bonding and/or earthing procedures.
Prevent small spills and leakage to avoid slip hazard.

Static Accumulator: This material is a static accumulator.

STORAGE

Keep container closed. Handle containers with care. Open slowly in order to to control possible pressure release. Store in a cool well ventilated area. Storage containers should be earthed and bonded. Drums must be earthed and bonded and equipped with self-closing valves, pressure vacuum bungs and flame arrestors.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALVES

EXPOSURE LIMITS/STANDARDS (Note: Exposure limits are not additive)

SUBSTANCE NAME	FORM	LIMIT/STANDARD			NOTE	SOURCE	YEAR
Fuels, Diesel (Total Hydrocarb,vapour & aerosol)	Vapour & Aerosol	TWA	100 mg/m3		SKIN	ACGIH	2006
Total Hydrocarbons	Stable Aerosol	TWA	5 mg/m3			Exxon Mobil	2006
Total Hydrocarbons	Total vapour & Aerosol	TWA	500 mg/m3	100 ppm		Exxon Mobil	2006

SECTION 8 - (Cont.)

Note: Limits/standards shown for guidance only. Follow applicable regulations.

Biological Limits: No biological limits allowed.

ENGINEERING CONTROLS:
The level of protection and types of controls necessary, will vary depending upon potential exposure conditions.
Control measures to consider: Use exposure proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION:
Personal Protective Equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.
Respiratory protection: If engineering control do not maintain airborne containment concentrations as a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include: **Organic Vapour.** No special requirements under ordinary conditions of use and with adequate ventilation. For high airborne concentrations, use an approved supplied air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.
Hand protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability: inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include: **Viton, Nitrile.** If prolonged or repeated contact is likely, chemical resistant gloves are recommended. If contact with forearms is likely, wear gauntlet style gloves.
Eye protection: If contact with material is likely, chemical goggles are recommended.
Skin and body protection: Any specific clothing information provided is based on published literature or manufacturers data. The types of clothing to be considered for this material include: If prolonged or repeated contact is likely, chemical and oil resistant clothing is recommended.
Specific Hygiene measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS:
See sections 6, 7, 12, 13

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below.
Consult the supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State:	**LIQUID**
Colour:	**Clear (may be dyed)**
Odour:	**Petroleum / solvent**
Odour Threshold:	**N/D**

IMPORTANT HEALTH, SAFETY AND ENVIRONMENTAL INFORMATION

Relative Density [at 15C]: 0.84
Flash Point (Method): 64C (147F) [ASTM D-93]
Flammable Limits (Approx. volume % in air): LEL: 0.6 UEL: 7.0
Autoignition temperature N/D
Boiling Point / Range 185C (365F)
Vapour density (Air=1): >2 at 101 kPa
Vapour pressure: 0.067 kPa (0.5mm Hg) at 20C
Evaporation rate (N-Butyl Acetate =1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coeefficient): >3.5
Solubility in water: Negligible
Viscosity: 2.7cSt (2.7mm^2/sec) at 40C
Oxidising properties: See Sections 2, 15, 16

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: <18ºC (64ºF)

SECTION 10 - STABILITY AND REACTIVITY

STABILITY

Material is stable under normal conditions

CONDITIONS TO AVOID

Open flames and high energy ignition sources

INCOMPATIBLE MATERIALS

Halogens, Alkalies, Strong Acids, Strong Oxidisers

HAZARDOUS DECOMPOSITION PRODUCTS

Material does not decompose at ambient temperatures

HAZARDOUS REACTIONS

Will not occur

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

ROUTE OF EXPOSURE	CONCLUSION / REMARKS
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m^3 **Irritation: Data available**	**Minimally toxic** **Based on test data for structurally similiar materials** **Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat or lungs. Based on test data for structurally similiar materials**
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	**Minimally toxic.** **Based on test data for structurally similiar materials**
Skin: **Toxicity (Rabbit): LC50 > 2000 mg/kg** **Irritation: Data available**	**Minimally toxic.** **Based on test data for structurally similiar materials** **May dry the skin leading to discomfort and dermatitis** **Based on test data for structurally similiar materials**
Eyes: **Irritation: Data available**	**May cause mild, short lasting discomfort to eyes** **Based on test data for structurally similiar materials**

SECTION 11 - TOXICOLOGICAL INFORMATION (Cont.)

CRONIC / OTHER EFFECTS

For the product itself:

Vapour concentration above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are an anesthetic and may have other central nervous system effects. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema.

Diesel fuel:

Carcinogenic in animal tests. Caused mutations in-vitro. Repeated dermal exposures to high concentrations in test animals resulted in reduced litter size and litter weight and increased foetal resorptions at maternal toxic doses. Dermal exposure to high concentrations resulted in severe skin irritation with weight loss and some mortality. Inhalation exposure to high concentrations resulted in respiratory tract irritation, lung changes/infiltration/accumulation and reduction in lung function.

Diesel Exhaust fumes:

Carcinogenic in animal tests. Inhalation exposures to exhaust for 2 years in test animals resulted in lung tumors and lymphoma. Extract of particulate produced skin tumors in test animals. Caused mutations in-vitro.

Additional information is available on request.

IARC Classification:

The following ingredients are cited on the lists below: None

REGULATORY LISTS SEARCHED

1 = IARC 1 2 = IARC 2A 3 = IARC 2B

SECTION 12 - ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material and similiar materials.

ECOTOXICITY

Material: expected to be toxic to aquatic organisms.

May cause long term adverse effects in the aquatic environment.

MOBILITY

More volitile component: Highly volatile, will partition rapidly to air.

Not expected to partition to sediment and wastewater solids.

High molecular wt. component: Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

- ECOLOGICAL INFORMATION (Cont.)

PERSISTANCE AND DEGRADABILITY

Biodegradation: Majority of components expected to be inherently biodegradable.
Atmospheric Oxidation: More volitile component, expected to degrade rapidly in air.

BIOACCUMULATION POTENTIAL

Base oil component, has the potential to bioaccumulate, however metabolism or physical properties may reduce the bioconcentration or limit bioavailability.

SECTION 13 - DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disosal by supervised incineration at very high temperatures to prevent formation of undesireable combustion products.

Empty container warning (where applicable):
Empty containers may retain residue and can be dangerous.

DO NOT***: PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.***
Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with government regulations.

SECTION 14 - TRANSPORT INFORMATION

LAND (ADG):
Not regulated for Land Transport

SEA (IMDG):
Not regulated for Sea Transport according to IMDG-Code

AIR (IATA):
Not regulated for Air Transport

- REGULATORY INFORMATION

Material is hazardous as defined by the Approved criteria for classifying Hazardous Substances NOHSC: 1008

CLASSIFICATION
Category 3 Carcinogen. Harmful.

Nature of special risk: R40: Limited evidence of carcinogenic effect. **R65:** Harmful, may cause lung damage if swallowed. **R66**: Repeated exposure may cause skin dryness or cracking.

SAFETY PHRASE(S):
S2: Keep out of the reach of children. **S24:** Avoid contact with skin. **S26/37**: Wear suitable protective clothing and gloves. **S51:** Use only in well ventilated areas. **S61:** Avoid release to the environment. Refer to special instructions/safety data sheets. **S62:** If swallowed do not induce vomiting: seek medical advice immediatelyand show this container or label.

Contains: Fuels, diesel.

Product is not regulated according to Australian Dangerous Goods Code.

Poison Schedule number allocated by the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) established under the Therapeutic Goods Act.

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS
Complies with the following national/regional chemical inventory requirements:
AICS, EINECS, PICCS, TSCA

SECTION 16 - OTHER INFORMATION

KEY TO ABBREVIATIONS AND ACRONYMS:

N/D - Not determined **N/A** - Not applicable **STEL** - Short term exposure limit
TWA - Time weighted average

KEY TO THE RISK CODES CONTAINED IN SECTION 2 AND 3 OF THIS DOCUMENT:

(for information only)
R40: Limited evidence of carcinogenic effect.
R65: Harmful, may cause lung damage if swallowed.
R66: Repeated exposure may cause skin dryness or cracking.

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision changes:
Section 09: Pour Point ^{O}C (^{O}F) was modified
Section 15: EU contains was modified
Section 08: Exposure limits table was modified
Section 06: Eye protection was added
Section 10: Conditions ot avoid was deleted

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SECTION 16 - OTHER INFORMATION

This product material safety data sheet provides health and safety information. The product is to be used in applications consistent with our product literature. Individuals handling this product should be informed of the recommended safety precautions and should have access to this information. For any other uses, exposures should be evaluated so that appropriate handling practices and training programmes can be established to ensure safe workplace operations. Please consult your local sales representative for any firther information.

REFERENCES

Threshold limit values for Chemical Substances and Physical Agents and Biological Exposure Indices, American Conference of Governmental Industrial Hygienists, OH., (Ariel Insight CD-ROM version), Ariel Research Corp., Bethesda, MD.

Hazardous Substance Data Bank, National Library of Medicine, Bethesda, Maryland (TOMES CPS CD-ROM version), Micromedex, Inc, Englewood, CO.

IARC Monographs on the evaluation of the Carcinogenic Risk of Chemicals to Man, Geneva: World Health Organisation, International Agency for Research on Cancer.

Integrated Risk Information System, U.S. Environmental Protection Agency, Washington, D.C. (TOMES CPS CD-ROM version), Micromedex, Inc., Englewood, CO.

Annual Report on Carcinogens, National Toxicology Programme, U.S. Department of Health and Human Services, Public Health Service.

Title 29 Code of Federal Regulations, Part 1910, Subpart Z, Toxic and Hazardous Substances, Occupational Safety and Health Administration (OSHA), (Ariel Insight CD-ROM version), Ariel Research Corp., Bethesda, MD.

Registry of Toxic Effects of Chemical Substances, National Institute for Occupational Safety and Health, Cincinnati, OH, (TOMES CPS CD-ROM version), Micromedex, Inc., Englewood, CO.

Ariel Insight (An integrated guide to Industrial Chemicals covered under major regulatory and advisory programmes). North American Module, Western European Module, Chemical Inventories Module and the Generics Module (Ariel Insight CD-ROM version), Ariel Research Corp., Bethesda, MD.

The Teratogen Information System, University of Washington, Seattle, WA (TOMES CPS CD-ROM version), Micromedex, Inc., Englewood, CO.

REVISED INFORMATION

Significant changes to regulatory or health information for this revision is indicated by a bar in the left hand margin of the SDS.

Prepared by: Nalco Asia Pacific, Safety, Health and Environment (SHE) Specialist.

SECTION 1 - PRODUCT & COMPANY IDENTIFICATION

GENERAL INFORMATION

Product Name: **MOBIL DELVAC MX 15W-40**
Product Description: **Base Oil and Additives**
Product Code: **441048-85**
Intended Use: **Engine Oil**

COMPANY IDENTIFICATION

Supplier: **MOBIL OIL AUSTRALIA PTY LTD**
12 Riverside Quay Southbank Victoria 3006 Australia

24 hour Environmental / Health Emergency	**1800 023 005**
Product Technical Information	**1800 033 863**
Supplier General Contact	**1800 631 296**

SECTION 2 - HAZARDS IDENTIFICATION

HAZARD CLASSIFICATION

Not classified as hazardous according to the criteria of National Occupational Health & Safety Commission. NON -HAZARDOUS SUBSTANCE. NON-HAZARDOUS GOODS.
Refer to Section 15, Regulatory Information, for hazard classification criteria.

POISON SCHEDULE NUMBER

N/A None allocated.

HEALTH HAZARDS

Low order of toxicity. Excessive exposure may result in eye, skin or respiratory irritation.
High-pressure injection under the skin may cause serious damage.

Note: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

REPORTABLE HAZARDOUS SUBSTANCE(S) OR COMPLEX SUBSTANCE(S)

NAME	CAS #	CONCENTRATION*	SYMBOLS/RISK PHRASES
Zinc Dithiophosphate	**68649-42-3**	**<2.5%**	**XI; R38, XI; R41**

*All concentrations are percent by weight unless the ingredient is a gas. Gas concentrations are in percent by volume.
Other ingredients determined not to be hazardous up to 100%

SECTION 4 - FIRST AID MEASURES

EYE CONTACT
Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT
Wash contact areas with soap and water. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a Physican as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury.

INGESTION
First Aid is normally not reqired. Seek medical attention if discomfort occurs.

INHALATION
Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SECTION 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA
Appropriate extinguishing media: Use water fog, foam, dry chemical or Carbon Dioxide (CO2) to extinguish flames.
Inappropriate extinguishing media: Straight streams of water.

FIRE FIGHTING
Fire fighting instructions: Evacuate area. prevent run-off from fire control or dilution from entering streams, sewers or drinking water supplies. Fire fighters should use standard protective equipment and in enclosed spaces, self contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.
Hazardous Combustion Products: Oxides of Carbon, Sulphur Oxides, Aldehydes, Smoke, Fumes, Incomplete combustion products.

FLAMMABILITY PROPERTIES
Flash Point [Method]: >215C (419F) [ASTM D-92]
Flammable Liquids (Approx. volume % in air): LEL: 0.9 UEL:7.0
Autoignition Temperature: N/D

SECTION 6 - ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

SPILL MANAGEMENT

Land Spill: Stop leak if you can do so without risk. Recover by pumping or with suitable absorbent.
Water Spill: Stop leak if you can do so without risk. Confine the spill imediately with booms. Warn other shipping. Remove from the surface by skimming or with suitable absorbants. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature (and in the case of a water spill) wave, current direction and speed may greatly influence the appropriate action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spill: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements and confined areas.

SECTION 7 - HANDLING AND STORAGE

HANDLING

Avoid contact with used product. Prevent small spills and leakage to avoid slip hazard.
Static Accumulator: This material is a static accumulator.

STORAGE

Do not store in open or unlabelled containers.

SECTION 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMITS/STANDARDS FOR MATERIALS THAT CAN BE FORMED WHEN HANDLING THIS PRODUCT

When mists/aerosols can occur, the following are recommended:
5mg/m^3 - ACGIH TLV, 10mg/m^3 - ACGIH STEL.

Note: Limits/standards shown are for guidance only. Follow applicable regulations.

BIOLOGICAL LIMITS

No biological limits allocated.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions.
Control measures to consider: No special requirements under ordinary conditions of use and with adequate ventilation.

PERSONAL PROTECTION

Personal Protective Equipment selections vary, based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the slection of protective equipment for use with this material, as provided below, is based on intended normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:
Particulate: No special requirements under ordinary conditions of use and with adequate ventilation. For high airborne concentrations, use an approved supplied air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Work conditions can greatly effect glove durability; inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:
Nitrile: No protection is ordinarily required under normal conditions of use.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include: No skin protection is ordinarily required under normal conditions of use. In accordance with good industrial hygiene practices, precautions should be taken to avoid skin contact.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections: 6, 7, 12, 13.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Typical physical and chemical properties are given below.
Consult the supplier in Section 1 for additional data.

GENERAL INFORMATION

Physical State:	**LIQUID**
Colour:	**Amber**
Odour:	**Characteristic**
Odour Threshold:	**N/D**

IMPORTANT HEALTH, SAFETY AND ENVIRONMENTAL INFORMATION

Relative Density (at 15C):	**0.881**
Flash Point [Method]:	**>215C (419F) [ASTM D-92]**
Flammable Limits (Approx. Volume % in air):	**LEL: 0.9 UEL:7.0**
Autoignition Temp:	**N/D**
Boiling Point / Range:	**>316C (600F)**
Vapour Density (Air=1):	**N/D**
Vapour Pressure:	**<0.013 kPa (0.1mm Hg) at 20C**
Evaporation Rate (N-Butyl Acetate =1):	**N/D**
pH:	**N/A**
Log Pow (n-Octanol/Water Partition Coefficient):	**>3.5**
Soluable in Water:	**Negligible**
Viscosity:	**105 cSt (105mm^2/sec) at 40C I 14.2cSt (14.2mm^2/sec) at 100C**
Oxidising Propertiesr:	**See Sections 2, 15, 16.**

OTHER INFORMATION

Freezing Point:	**N/D**
Melting point:	**N/A**
Pour Point:	**-27°C (-17°F**
DMSO Extract (Mineral Oil only), IP-346:	**<3%wt**

- STABILITY AND REACTIVITY

STABILITY
Material is stable under normal conditions.

CONDITIONS TO AVOID
Excessive heat. High energy sources of ignition.

INCOMPATABLE MATERIALS
Strong Oxidisers.

HAZARDOUS DECOMPOSITION PRODUCTS
Material does not decompose at ambient remperatures.

HAZARDOUS REACTIONS
Will not occur.

SECTION 11 - TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

ROUTE OF EXPOSURE	CONCLUSION / REMARKS
INHALATION	
Toxicity (Rat): LC50 > 5000 mg/m^3 Irritation: No end point data	Minimally toxic Based on test data for structurally similiar materials Negligable hazard at ambient/normal handling temperatures Based on assessment of the components.
INGESTION	
Toxicity (Rat): LD50 > 2000 mg/kg	Minimally toxic. Based on test data for structurally similiar materials
Skin: Toxicity (Rabbit): LD50 > 2000 mg/kg Irritation (Rabbit): Data available	Minimally toxic. Based on test data for structurally similiar materials Negligible irritation to skin at ambient temperatures Based on test data for structurally similiar materials
Eyes: Irritation (Rabbit): Data available	May cause mild, short lasting discomfort to eyes Based on test data for structurally similiar materials

SECTION 11 - TOXICOLOGICAL INFORMATION (Cont.)

CHRONIC/OTHER EFFECTS

For the product itself: Diesel Engine Oils. Not carcinogenic in animal tests. Used and unused diesel engine oils did not produce any carcinogenic effects in chronic mouse skin painting studies. Oils that are used in gasoline engines may become hazardous and display the following properties: Carcinogenic in animal tests. Caused mutations in vitro. Possible allergen and photoallergen. Contains polycyclic aromatic compounds (PAC) from combustion products of gasoline and/or thermal degradation products.
Contains: Base oil severly refined. Not carcinogenic in animal studies. Representative material passes IP-346, Modified Ames test, and/or other screening tests. Dermal and inhalation studies showed minimal effects; lung non-specific infiltration of immune cells, oil deposition and minimal granuloma formation. Not sensitising in test animals.

Additional information is available on request.

IARC Classification:
The following ingredients are cited on the lists below: None

REGULATORY LISTS SEARCHED

1 = IARC 1 2 = IARC 2A 3 = IARC 2B

SECTION 12 - ECOLOGICAL INFORMATION

The information given is based on data available for the the material, the components of the material and similiar materials.

ECOTOXICITY

Material-Not expected to be harmful to aquatic organisms.

MOBILITY

Base oil component - Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTANCE AND DEGRADABILITY

Biodegradation: Base oil component-Expected to be inherently biodegradable.

BIOACCUMULATION POTENTIAL

Base oil component - Has the potential to bioaccumulate, however, metabolism or physical properties may reduce the bioconcentration or limit bioavailability..

SECTION 13 - ECOLOGICAL INFORMATION

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

Empty Container Warning (where applicable): Empty containers may retain residue and can be dangerous. **DO NOT PRESSURE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.** Do not attempt to refill or clean container since residue is difficult to remove. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with government regulations.

SECTION 14 - TRANSPORT INFORMATION

LAND TRANSPORT (ADG)

Not regulated for Land Transport

SEA TRANSPORT (IMDG)

Not regulated for Land Transport according to IMDG-Code

AIR TRANSPORT (IATA)

Not regulated for Air Transport

SECTION 15 - REGULATORY INFORMATION

Material is not hazardous as defined by the Approved Criteria for classifying Hazardous substances NOHSC: 1008.

Product is not regulated according to Australian Dangerous Goods Code.

No Poison Schedule number allocated by the Standard for the Uniform Scheduling of Drugs and Poisons (SUSDP) established under the Therapeutic Goods Act.

REGULATORY STATUS AND APPLICABLE LAWS AND REGULATIONS

Complies with the following National/Regional Chemical Inventory requirements:
AICS, IECSC, DSL, EINECS, ENCS, KECI, PICCS, TSCA

SECTION 16 - OTHER INFORMATION

KEY TO ABBREVIATIONS AND ACRONYMS:

N/D - Not determined **N/A** - Not applicable **STEL** - Short term exposure limit
TWA - Time weighted average

KEY TO THE RISK CODES CONTAINED IN SECTION 2 AND 3 OF THIS DOCUMENT:

(for information only)
R38: Irritating to skin.
R41: Risk of serious damage to eyes.

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision changes:
Section 04: First Aid Skin - Header was modified
Section 04: First Aid Ingestion - Header was modified
Section 06: Notification Procedures - Header was modified
Section 01: Product Code was modified
Section 11: Ingestion Acute Lethality - Header was modified
Section 09: Boiling Point ^{O}C (^{O}F) was modified
Section 09: Pour Point ^{O}C (^{O}F) was modified
Section 09: Vapour pressure was modified
Section 02: Health Hazards was modified
Section 06: Accidental Release - Spill Management - Water was modified
Section 09: Relative Density - Header was modified
Section 09: Flash Point ^{O}C (^{O}F) was modified
Section 09: Viscosity was modified
Section 09: Viscosity was modified
Section 09: Oxidising Properties was modified
Section 15: EU Regulatory Status and Applicable Laws and Regulations was added
Section 15: EU Inventory Requirements - Header was added
Section 15: National Chemical Inventory Listing was added
Section 02: Australian Poison Schedule - Default was added
****Section 16:** End of (M) SDS** was added
****Section 02:** Australian Hazardous Substance/Dangerous Goods Statements** was added
****Section 02:** Australian Hazardous Substance/Dangerous Goods Statements/Header** was added
****Section 02:** Australia refer to Section 15 Statement** was added
****Section 10:** Incompatible Materials - Header** was added
****Section 10:** Hazardous Reactions - Header** was added
****Section 16:** Additional Abbreviationsr** was added
****Section 16:** Key to Abbreviations and Acronyms - Header** was added
****Section 15:** Australian Dangerous Goods Code** was added
****Section 15:** Australian Poison Schedule Allocated** was added
****Section 08:** Biological Limits - Header** was added
****Section 08:** Biological Limits - Allocation** was added
Section 10: Materials to Avoid - Header was deleted
Section 10: Hazardous Polymerisation - Header was deleted
Section 02: AU -Not Hazardous Statementwas deleted

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SECTION 1 - CHEMICAL PRODUCT & COMPANY IDENTIFICATION

GENERAL INFORMATION

Product Name: **NALCOOL® MAXIMUM**
Application: **Corrosion Inhibitor**
Company Identification: **Nalco Australia Pty Ltd**
2 Anderson Street Botany NSW 2019
Ph: (02) 9316 3000 Fax: (02) 9666 5292

SECTION 2 - HAZARDS IDENTIFICATION

HAZARD CLASSIFICATION

Not classified as hazardous according to the Australian Safety & Compensation Council (ASCC). This product is not classified as dangerous goods according to National or International regulations.

SAFETY PHRASE (S):

S24/25: Avoid contact with skin and eyes.
S37/39: Wear suitable gloves and eye protection.

SECTION 3 - COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAME	GAS NO	% (w/w)
Ingredients determined **NOT** to be dangerous.		100

SECTION 4 - FIRST AID MEASURES

EYE CONTACT

Flush affected area with water. If symptoms develop, seek medical advice.

SKIN CONTACT

Flush affected area with water. If symptoms develop, seek medical advice.

INGESTION

Do **NOT** induce vomiting without medical advice. If conscious, wash out mouth and give water to drink. If relexive vomiting occurs, rinse mouth and repeat administration of water. Get medical attention.

INHALATION

Remove to fresh air, treat symptomatically. If symptons develop, seek medical advice.

NOTE TO PHYSICIAN

Based on the individual actions of the patient, the Physician's judgement should be used to control symptoms and clinical condition.

SECTION 5 - FIRE FIGHTING MEASURES

FLASH POINT
NOT flammable.

EXTINGUISHING MEDIA
This product should not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable. Use extinguishing media appropriate for surrounding fire.

FIRE AND EXPLOSION HAZARD
NOT flammable or combustible

SPECIAL PROTECTIVE EQUIPMENT FOR FIRE FIGHTING
In case of fire, wear a full face positive pressure self contained breathing apparatus and protective suit.

SENSITIVITY TO STATIC DISCHARGE
NOT expected to be sensitive to static discharge

SECTION 6 - COMPOSITION/INFORMATION ON INGREDIENTS

PERSONAL PRECAUTIONS
Restrict access to areas as appropriate until clean-up operations are complete. Use Personal Protective Equipment recommended in Section 8 (Exposure Controls/Personal Protection). Stop or reduce any leaks if it is safe to do so.

METHODS FOR CLEANING UP
Small Spills Soak up spill with absorbent material. Place residues in a suitable, covered, properly labelled container. Wash affected area.
Large Spills Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Clean contanimated surfaces with water or aqueous cleaning agents. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).

METHODS FOR CLEANING UP
DO NOT contaminate surface water.

SECTION 7 - HANDLING AND STORAGE

HANDLING

DO NOT get in eyes, on skin or clothing. Do not take internally. Use with adequate ventilation.
Do not breathe vapours/gases/dust. Keep the containers closed when not in use.
Have emergency equipment (for fires, spills leaks etc.) readily available.
Ensure all containers are labelled.

STORAGE CONDITIONS

Store in suitable labelled containers. Store the containers tightly closed.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS

This product does not contain any substance that has an established exposure limit.
None of the components have been assigned an exposure standard by ASCC (Australia) or OSH (New Zealand).

ENGINEERING MEASURES

General ventilation is recommended.

PERSONAL PROTECTION

General advice The use and choice of Personal Protection Equipment is related to the hazard of the product, the workplace and the way the product is handled. In general, we recommend as a minimum precaution that safety glasses with side shields and workclothes protecting arms, legs and body be used. In addition, any person visiting an area where this product is handled should at least wear safety glasses with side-shields

RESPIRATORY PROTECTION

Respiratory protection is not normally needed.

HAND PROTECTION

Nitrile gloves, Neoprene gloves, PVC gloves, Rubber gloves, Butyl gloves.

SKIN PROTECTION

Wear standard protective clothing.

EYE PROTECTION

Wear chemical splash goggles.

HYGIENE RECOMMENDATIONS

Keep an eye-wash fountain available. Keep. a safety shower available

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE	**Liquid**
APPEARANCE	**Clear Green**
ODOUR	**None**
pH (100%)	**7.5-9.5**
VAPOUR PRESSURE	**No data available**
VAPOUR DENSITY	**No data available**
SPECIFIC GRAVITY	**1.07-1.12 (15ºC)**
DENSITY	**No date available**
SOLUBILITY IN WATER	**Complete**
FREEZING POINT	**No date available**
BOILING POINT	**No data available**
FLASH POINT	**Not flammable**
LOWER EXPLOSION LIMIT	**No data available**
UPPER EXPLOSION LIMIT	**No data available**
AUTOIGNITION TEMPERATURE	**No data available**

Note: These physical properties are typical values for this product and are subject to change.

SECTION 10 - STABILITY AND REACTIVITY

STABILITY
Stable under normal conditions.

CONDITIONS TO AVOID
None known.

INCOMPATABLE MATERIALS
Contact with strong oxidizers (eg: Chlorine, Peroxides, Chromates, Nitric Acid, Perchlorate, concentrated Oxygen, Permanganate) may generate heat, fires, explosions and/or toxic vapours.

HAZARDOUS DECOMPOSITION PRODUCTS
Under fire conditions. None known.

HAZARDOUS REACTIONS
Hazardous polymerization will not occur.

SECTION 11 - TOXICOLOGY INFORMATION

OVERVIEW OF HEALTH HAZARDS

ACUTE HAZARDS - EYE CONTACT
May cause mild irritation.

ACUTE HAZARDS - SKIN CONTACT
May cause irritation with prolonged contact.

ACUTE HAZARDS - INGESTION
Not a likely route of exposure. No adverse effects expected.

ACUTE HAZARDS - INHALATION
Mists may cause irritation of the upper respiratory tract.

CRONIC HAZARDS
No adverse effects expected other than those mentioned above.

SUMMARY OF TOXIC INFORMATION

ACUTE TOXICITY DATA
No toxicity studies have been conducted on this product.

ACUTE TOXICITY DATA
No toxicity studies have been conducted on this product.

SENSITISATION
This product is not expected to be a sensitiser.

CARCINOGENICITY
None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH).

For added information on the hazard of the preparation, please consult section 2 and 12.

HUMAN HAZARD CHARACTERISATION
Based on our hazard characterisation, the the potential human hazard is **LOW.**

SECTION 12 - ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL EFFECTS

No toxicity studies have been conducted on this product.

MOBILITY AND BIOACCUMULATION POTENTIAL

The environmental fate was estimated using level III fugacity methematical models developed by the US EPA. The model assumes a steady state condition where the total input and output have equilibrated. The levelIII model does not require equilibrium between the defined media. The information provided is intended to give the user a general estimate of the environmental fate of this product under the defined conditions of the models.

ENVIRONMENTAL HAZARD AND EXPOSURE CHARACTERISATION

Based on our hazard characterisation, the potential environmental hazard is LOW.

AIR	WATER	SOIL / SEDIMENT
<5%	30 - 50%	50 - 70%

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL

Dispose of wastes in an approved waste treatment / disposal site, in accordance with all applicable regulations. Do not dispose of wastes in local sewer or with normal garbage.

Empty drums should be taken for recycling, recovery, or disposal through a suitably qualified or licenced contractor.

SPECIAL PRECAUTIONS FOR LANDFILL OR INCINERATION

No additional special precautions have been identified

SECTION 14 - TRANSPORT INFORMATION

The information in tis section for reference only and should not take the place of a shipping paper (bill of lading) specific to an order. Please note that the proper Shipping Name / Hazard Class may vary by packaging, properties and mode of transportation. Typical proper Shipping Names for this product are as follows:

LAND TRANSPORT

Proper Shipping Name: Product is not regulated during Transportation

AIR TRANSPORT (ICAO/IATA)

Proper Shipping Name: Product is not regulated during Transportation

MARINE TRANSPORT (IMDG/IMO)

Proper Shipping Name: Product is not regulated during Transportation

SECTION 15 - **REGULATORY INFORMATION**

AUSTRALIA

NICNAS

All substances in this product comply with the National Industrial Chemicals Notification and Assessment Scheme (NICNAS).

SUSDP SCHEDULE

Not listed.

INTERNATIONAL CHEMICAL CONTROL LAWS

UNITED STATES

The substances in this preparation are included on or exempted from the TSCA 8 (b) Inventory (40 CFR 710).

CANADA

The substance(s) in this preparation are included on or exempted from the Domestic Substance List (DSL)

JAPAN

This product contains substance(s) which are not in compliance with the law regulating the manufacture and importation of chemical substances and are not listed on the existing and new chemical substances list (ENCS).

CHINA

This product contains substance(s) which are not in compliance with the provisions of the Environmental Administration of New Chemical Substances and may require additional review.

KOREA

This product contains substance(s) which are not in compliance with the Toxic Control Law (TCCL) and may require additional review.

PHILIPPINES

This product contains substance(s) which are not in compliance with the Republic Act (RA 6969) and may require additional review.

COUPLING
Check alignment after the first month, then an ongoing 6 monthly basis. Check for worn coupling rubbers, grease nipples etc. Alignment should be within manufacturers recommendations.

PRESSURE VESSEL
Check on a 6 monthly basis, that air pressure in vessel is in accordance with commissioning information. Air pressure should be checked when there is no water pressure in the system. Air pressure can be checked with a tyre pressure gauge. Air pressure in vessel should be charged. (without water pressure) to approximately 50kPa below 'cut in' of jacking pump.

BATTERIES
Check on a 2 monthly basis servicability of battery, voltage and charge amps and in accordance with AS 1851.

DIESEL ENGINE
Change oil, flush radiator (if applicable), check fan belts, clean heat exchanger loop filter (if applicable) and go through other maintenance procedures, as per diesel engine manual.

DIESEL ENGINE - Exhaust
Diesel Engine exhaust should be checked on a weekly basis to ensure no water (eg; rain water) is gaining entry to exhaust or diesel engine. Where engine exhaust is fitted with a condensate trap, this can be checked by removing the drain plug at the bottom of the trap.

ELECTRIC MOTOR
Ensure grease nipples are filled every month.

MOUNTS
Check mount bolt down system on a 6 monthly basis

BOLTS / FASTENING
Check bolts / nuts tensions for correct levels after the first month and then on a 6 monthly basis.

Fire protection Pumpset must be tested and maintained on a regular basis in accordance with relevant Australian standards including AS1851-14.

Aline Pumps Disclaimer: Aline Pumps accepts no responsibilty for incorrect use or misinterpretation of this User Manual. The information and recommendations given in this User Manual is accurate and reliable to the best of Aline Pump's knowledge at the time of printing. It is the users responsibility to ensure and heed proper health and safety warnings. Alteration of any kind to this document is strictly prohibited and is not to be copied in whole or in part without the consent of Aline Pumps. Any additional information / advice needed on any subject in this manual can be obtained by phoning Aline Pumps on (02) 9544 9999.

IMPORTANT SERVICE INFORMATION Should be carried out by qualified personnel
These checks are only intended as a guide and do not replace an approved management system.
After commissioning, these checks should be followed - ***Failure to do so may void warranty.***
The Fire Protection Pump Set is to be fully tested on a regular basis by suitably qualified fire service personnel to the relevant Australian Standards including AS1851.14.
Testing should include, but not be limited to the following items:

MONTHLY

1. Fault indication ☐
2. Lamp / Alarm test ☐
3. Fuel Level ☐
4. Diesel Engine oil level ☐
5. Diesel Engine coolant ☐
6. Battery voltage - crank battery ☐
7. Battery voltage - control battery ☐
8. Charge amps - crank battery ☐
9. Charge amps - control battery ☐
10. Water level in supply tank (if applicable) ☐
11. System pressure ☐
12. Test run diesel engine in auto mode ☐
13. Diesel engine cut in pressure* ☐
14. Test run diesel engine in manual mode ☐
15. Test run jacking pump in manual mode ☐
16. General system condition ☐
17. Check for damage or wear on pump system ☐
18. Check / drain exhaust condensate trap ☐
19. Exhaust system - gas and water leaks ☐
20. Drain condensate trap ☐
21. Clean heat exchange feed filter ☐

Service Personnel: _____ **Date:** _____

3 MONTHS

1. Voltage on volt meter ☐
2. Float current on charging circuit ☐
3. All switches in correct position ☐
4. No fault lights ☐
5. Diesel start & run for 10mns without overheating ☐
6. Electric start & run for 2mns without failure ☐
7. All external hydrants & hose reels are locked & pad locked shut ☐
8. Power supply OK ☐
9. All volt free contacts connected to BMS or monitored ☐
10. Volt outputs hooked into monitoring or remote indicator ☐
11. Check and clean heat exchange filter ☐
12. Retention tie down bolts ☐
13. Retention pipe work bolts ☐
14. Retention pipe monitoring bolts ☐
15. Check & retention/reseal exhaust pipe work fittings ☐

Service Personnel: _____ **Date:** _____

6 MONTHS

1. Voltage on volt meter ☐
2. Float current on charging circuit ☐
3. All switches in correct position ☐
4. No fault lights ☐
5. Diesel start & run for 10mns without overheating ☐
6. Electric start & run for 2mns without failure ☐
7. All external hydrants & hose reels are locked & pad locked shut ☐
8. Power supply OK ☐
9. All volt free contacts connected to BMS or monitored ☐
10. Check and clean heat exchange filter ☐
11. Heavy controls in electric control are in good condition and free of dust ☐
12. System starts and stops as intended on pressure drop ☐
13. System serviced to AS1851 ☐

Service Personnel: _____ **Date:** _____

12 MONTHS

1. Voltage on volt meter ☐
2. Float current on charging circuit ☐
3. All switches in correct position ☐
4. No fault lights ☐
5. Diesel start & run for 10mns without overheating ☐
6. Electric start & run for 2mns without failure ☐
7. All external hydrants & hose reels are locked & pad locked shut ☐
8. Power supply OK ☐
9. All volt free contacts connected to BMS or monitored ☐
10. Check and clean heat exchange filter ☐
11. Heavy controls in electric control are in good condition and free of dust ☐
12. System starts and stops as intended on pressure drop ☐
13. Diesel serviced ☐
14. System serviced to AS1851 ☐
15. Flow test completed and logged ☐
16. Replace rubber mounts as necessary ☐

Service Personnel: _____ **Date:** _____

*Refer to section 4 to confirm pressures are correct.

If any condition exists or functions are not correct, report immediately to maintenance manager for immediate action and rectification.

It should be noted that all fire systems are required to be maintained as per AS1851 this involves weekly/monthly checks, inspections and reporting. This should commence immediately after the fire system is commissioned.

USER MANUAL

Fire Protection Pumpset

FIRE PUMP SET TO AS2419 & AS2118

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TORNATECH

LISTEN DEVELOP LEAD

INSTALLATION AND MAINTENANCE MANUAL FOR DIESEL ENGINE FIRE PUMP CONTROLLERS MODEL AFD

ViZi TOUCH

Introduction 1

Diesel engine fire pump controllers are designed to automatically start a diesel engine driven fire pump upon detection of a pressure drop in the fire protection system. A diesel engine fire pump controller provides automatic & manual starting and stopping. An automatic start is controlled by a pressure transducer or by remote automatic devices such as a Fire Water Pressure Switch or a deluge valve. A manual start is controlled by remote manual button or by controller pushbuttons. The diesel engine fire pump controller includes two battery chargers to maintain the engine batteries continuously charged.

Types of Diesel Engine Fire Pump Controllers

FIRE PUMP CATALOG NUMBER

MODEL No. EXAMPLE : AFD-12-220
Model Prefix AFD
Battery Voltage 12:12V, 24:24V
Incoming Voltage 220: 208/240V 50/60Hz

Methods of Starting/Stopping

The controllers are available as combination automatic / non-automatic with provision for manual shutdown only.

METHODS OF STARTING

AUTOMATIC START
The controller will start automatically on low pressure detection by the pressure sensor when the pressure drops below the cut-in threshold.
FIRE WATER PRESSURE SWITCH
The engine can be started from a remote location by momentarily opening a contact of a pressure switch.
MANUAL START
The engine can be started by pressing the MANUAL START BATTERY and/or MANUAL CONTROL BATTERY push button, regardless of the system pressure, when the Main Selector switch is in the NORMAL position. The Stop Solenoid Valve will be deactivated as soon as a start request is generated and will remain in this state.
REMOTE MANUAL START
The engine can be started from a remote location by momentarily closing a contact of a manual push button.
SEQUENTIAL START
In case of a multiple pump application, it may be necessary to delay the starting of each motor when there is a water pressure drop to prevent simultaneous starting of all motors.
EMERGENCY START
The engine can be started by pressing the mechanical EMERGENCY START-CONTROL BATTERY and/or EMERGENCY START-START BATTERY push button, regardless of the system pressure and the Main Selector switch position.

METHODS OF STOPPING

MANUAL STOP
Manual stop is done by pressing the STOP push button. If a starting condition is still present when released, engine will restart.
EMERGENCY STOP
The emergency stop is always possible in any running condition and is done by positioning the main selector - switch to the CRANK ISOLATE position.

Installation 2

The controller is built in accordance with the latest edition of the Australian Standard for the Installation of Centrifugal Fire Pumps, AS 2941 – 2013.

This controller can be used with non-approved engine, using the optional control by analog senders (Magnetic pickup, oil pressure and engine temperature senders) all shown using on-screen gauges on the ViZiTouch. Find more information on the home section of this manual.

Location

The controller shall be located as close as practical to the engine/motor it controls and shall be within sight of the engine/motor. The controller shall be located or protected such that it will not be damaged by water escaping from pump or pump connections. Current carrying parts of the controller shall be not less than 12 in. (305 mm) above the floor level.

The controller is suitable for use in locations subject to a moderate degree of moisture, such as a damp basement. The pump room ambient temperature shall be between 39°F (4°C) and 104°F (40°C) (If a temperature option is included, see the rating label for maximum temperature).

The standard controller enclosure is rated IP 55. It is the installer's responsibility to insure that either the standard enclosure meets the ambient conditions or that an enclosure with an appropriate rating has been provided. Controllers must be installed inside a building and they are not designed for outside environment. The paint color may change if the controller is exposed to ultraviolet rays for a long period of time.

Mounting

The fire pump controller shall be mounted in a substantial manner on a single incombustible supporting structure. Wall mounted controllers shall be attached to the structure or wall using all four (4) mounting ears provided on the controller with hardware designed to support the weight of the controller at a height not less than 12 in. (305 mm) above floor level. Floor mounted controllers shall be attached to the floor using all holes provided on the mounting feet with hardware designed to support the weight of the controller. The mounting feet provide the necessary 12 in. (305 mm) clearance for current carrying parts.

Storage

If the controller is not installed and energized immediately, Tornatech recommend following the instructions from the chapter 3 of the NEMA ICS 15 standard.

Wiring and Connections

Water Connections

The controller must be connected to the pipe system according to AS 2941 – 2013. The water connections are on the left side of the controller. The connection to the system pressure is a Male 3/8” BPT.

Electrical Connections

A licensed electrician must supervise the electrical connections. The dimension drawings show the area suitable for incoming power and motor connections. No other location shall be used. Only watertight hub fittings shall be used when entering the cabinet to preserve the IP rating of the cabinet. The installer is responsible for adequate protection of the fire pump controller components against metallic debris or drilling chips. Failure to do so may cause injuries to personnel, damage the controller and subsequently void warranty.

Energy Consumption

Diesel Controller with charger per battery		
Model / State	Current	VDC Output Float / Boost
12VDC Low charge (Float)	1A	13.7V / 14.4V
12VDC Full charge (Boost)	5A	
24VDC Low charge (Float)	1A	27.4V / 28.8V
24VDC Full charge (Boost)	5A	

Sizing

Wiring between controller and engine (terminals 11,13,14 on controller engine terminal) must be stranded #10 AWG or 6mm2 as minimum.

Wiring between controller and engine (terminals 5,6,12 on controller engine terminal) must be stranded #8 AWG or 10mm2 as minimum.

Power supply wiring must be stranded #14 AWG or 2.5mm2 as minimum.
Incoming power supply terminals are sized for #16 AWG (1mm2) to #6 AWG (16mm2) wire.

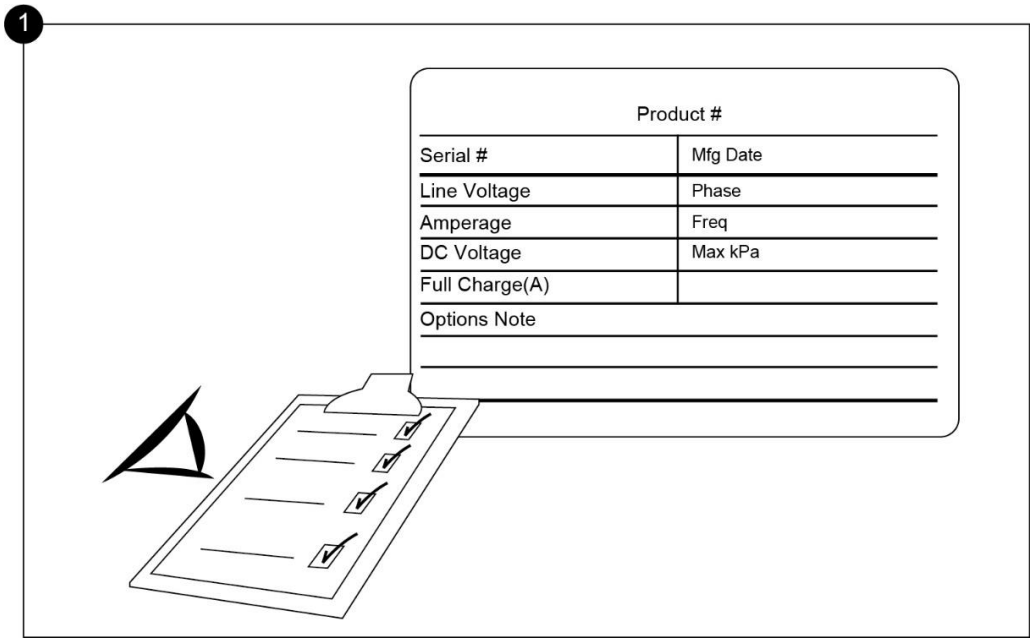
Incoming Power Connections

Diesel engine driven fire pump controllers shall be powered by a dedicated source protected by a fuse or circuit breaker. Verify the label on the cabinet to select the correct protection. Always follow this procedure when connecting or disconnecting the controller: Connect both batteries before connecting the AC power. Disconnect the AC power before disconnecting the batteries. Disconnecting the batteries while the AC is connected may result in severe damage to the controller electronic boards.

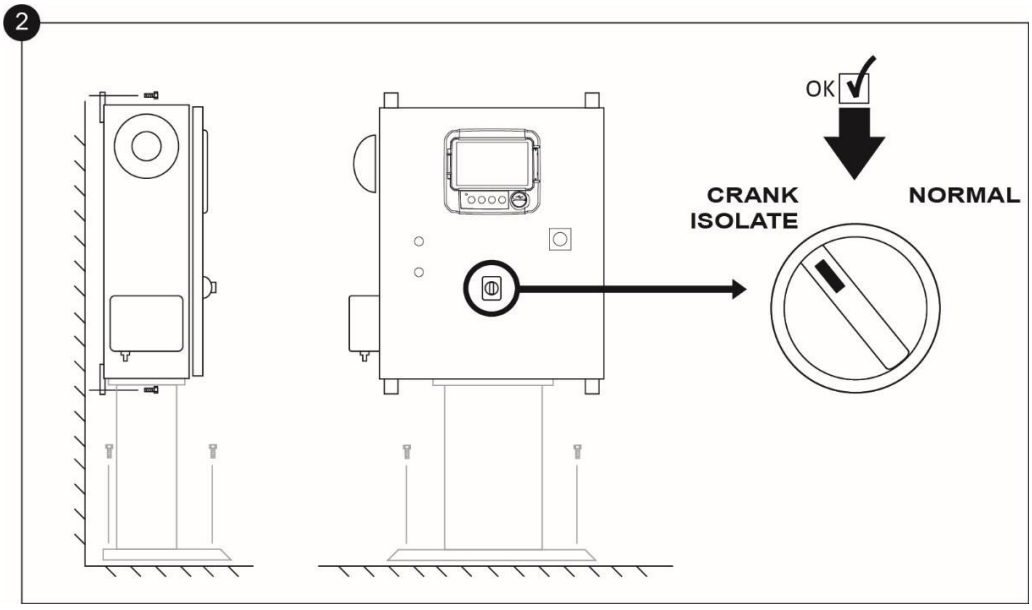
Circuit protection

CB1 protects both start battery and control battery chargers. CB2 protects the control circuit from start battery and CB3 protects the control circuit from control battery. CB4 protect the Jacket Heater circuit.
Always follow this procedure when connecting or disconnecting the controller: Connect both batteries before connecting the AC power. Disconnect the AC power before disconnecting the batteries.

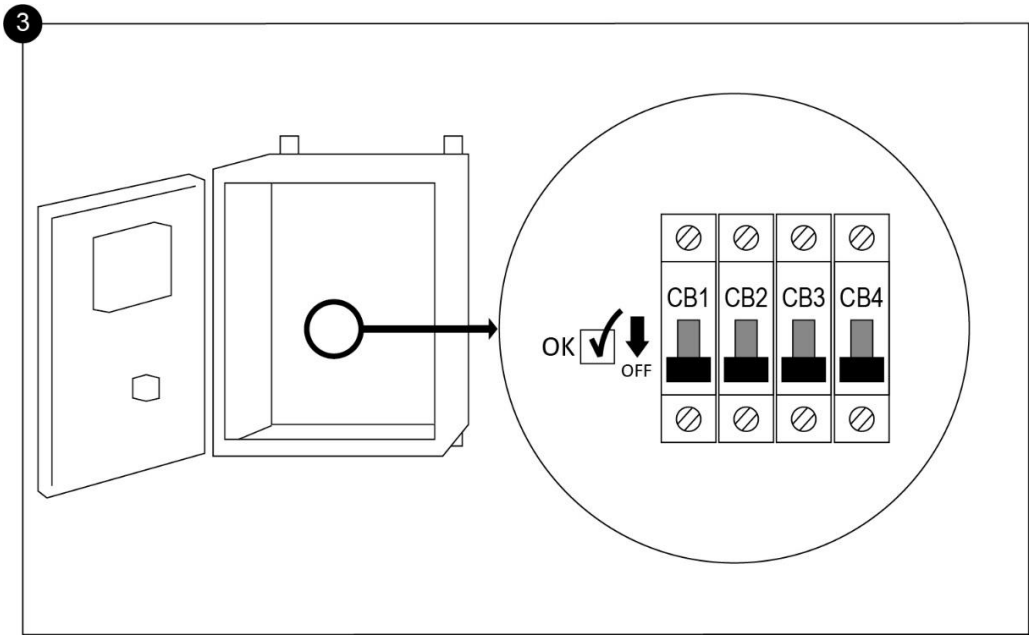
Quick Start-Up Guide



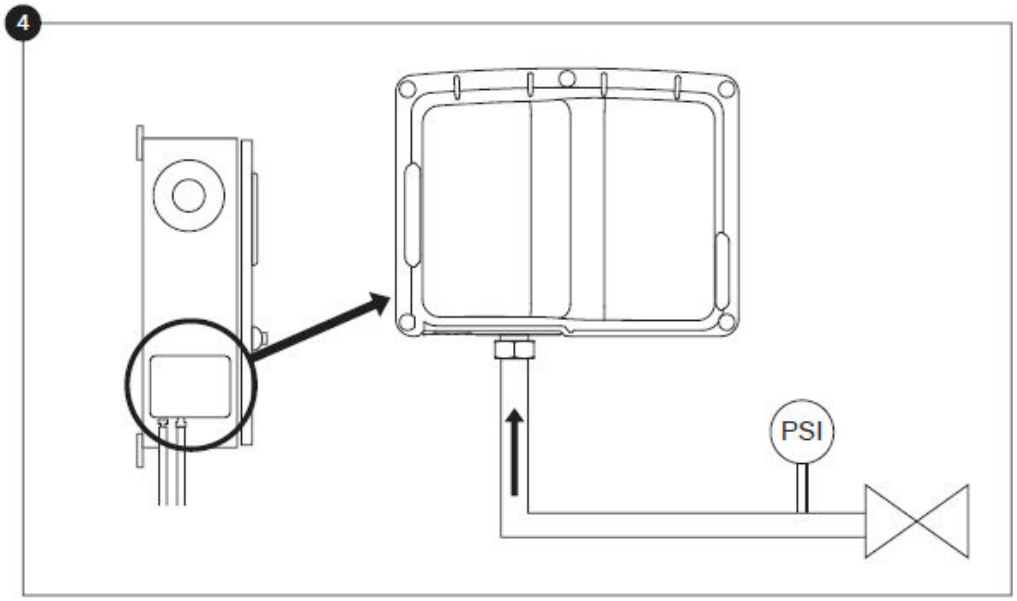
The rating label is the most important label. It must be read carefully to ensure the compatibility between the controller and the installation.



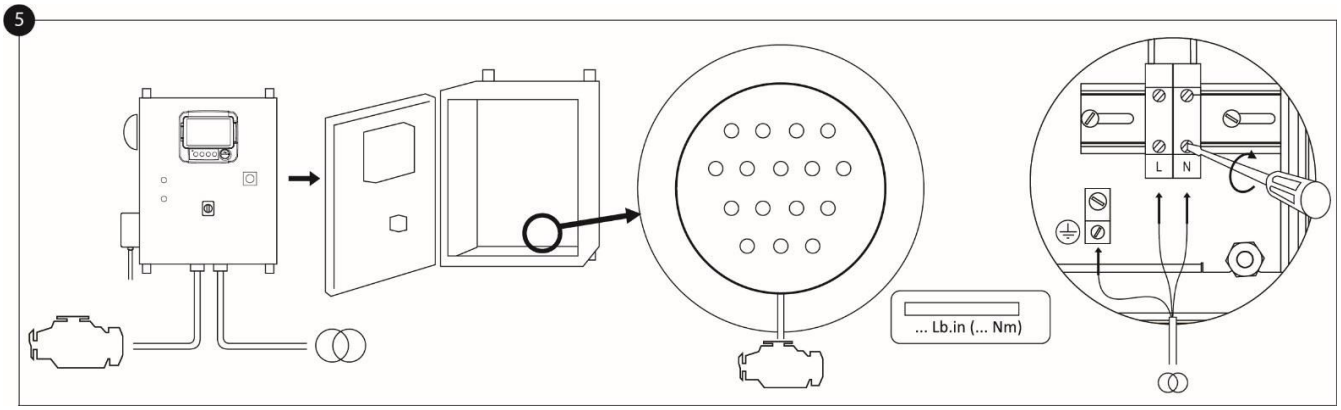
Verify that the controller is installed securely on the wall, or optionally on the mounting stand. Verify the Main Selector Switch is in the Left position labelled “CRANK ISOLATE.



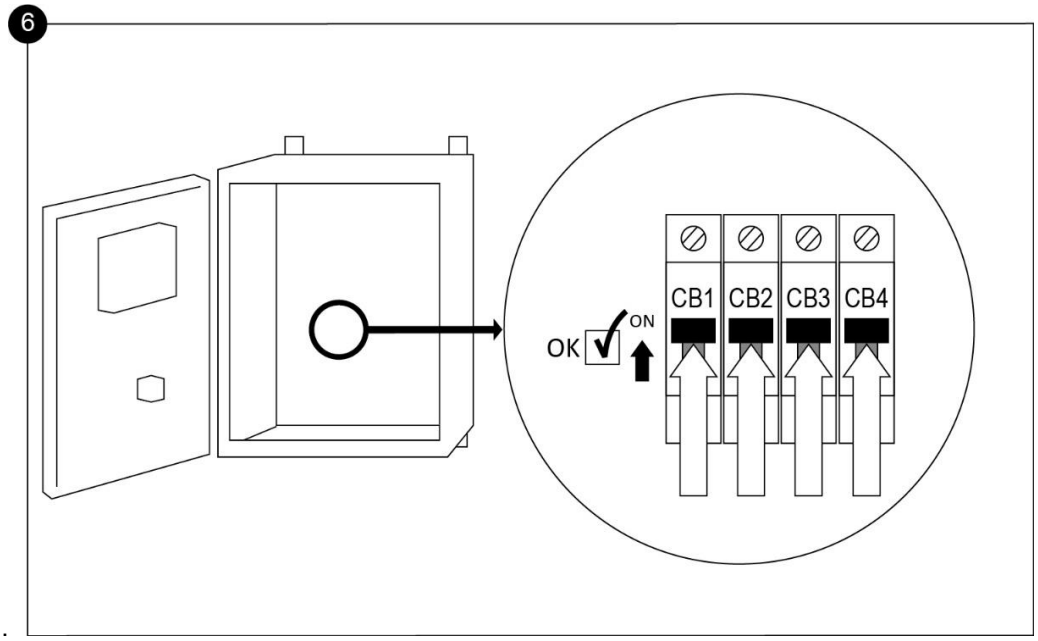
Open the controller's door and verify that the disconnect switch and all circuit breakers are in the “OFF” position.



Verify and/or install the proper water connections for the water input and the drain. They must be securely installed and tightened. Refer to the silkscreen markings on the plastic cover.

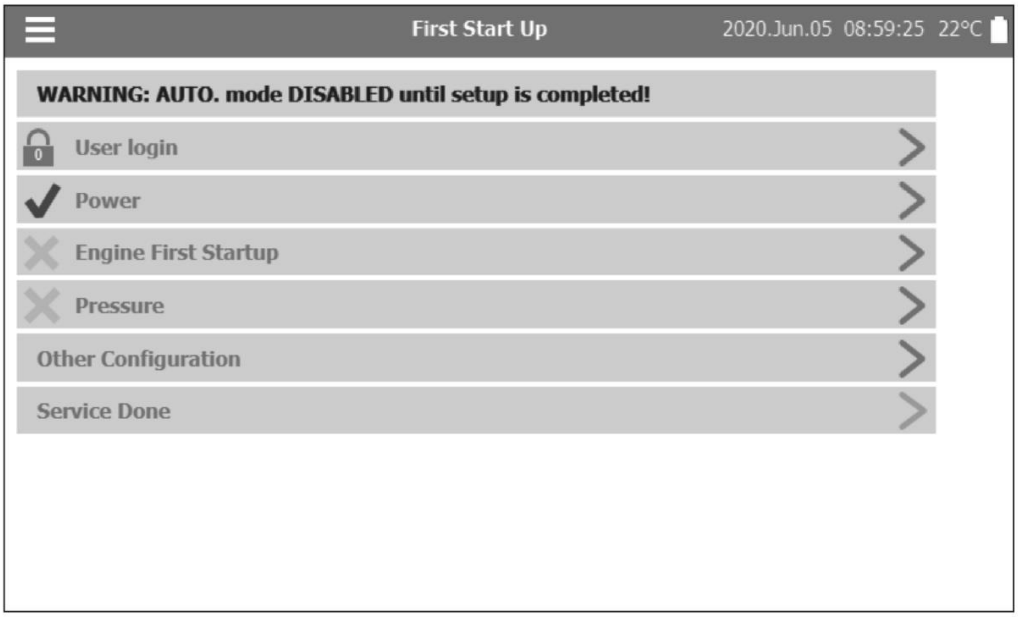


Connect all cables between the engine control panel and the controller engine terminals with the 16 pins quick connect connector. Connect the AC main line and ground to the AC terminal in the controller.

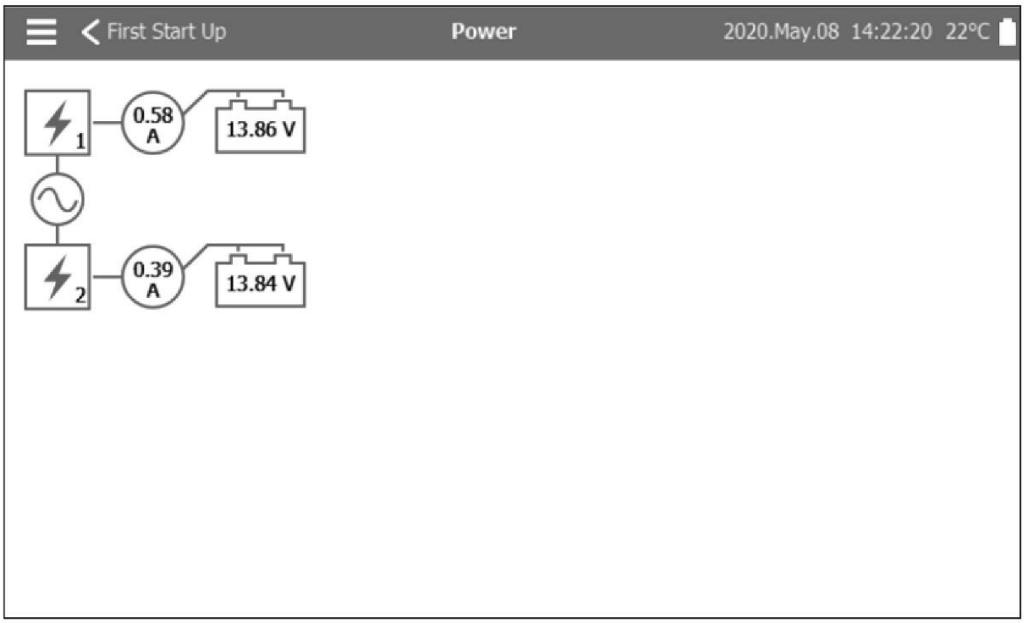


.

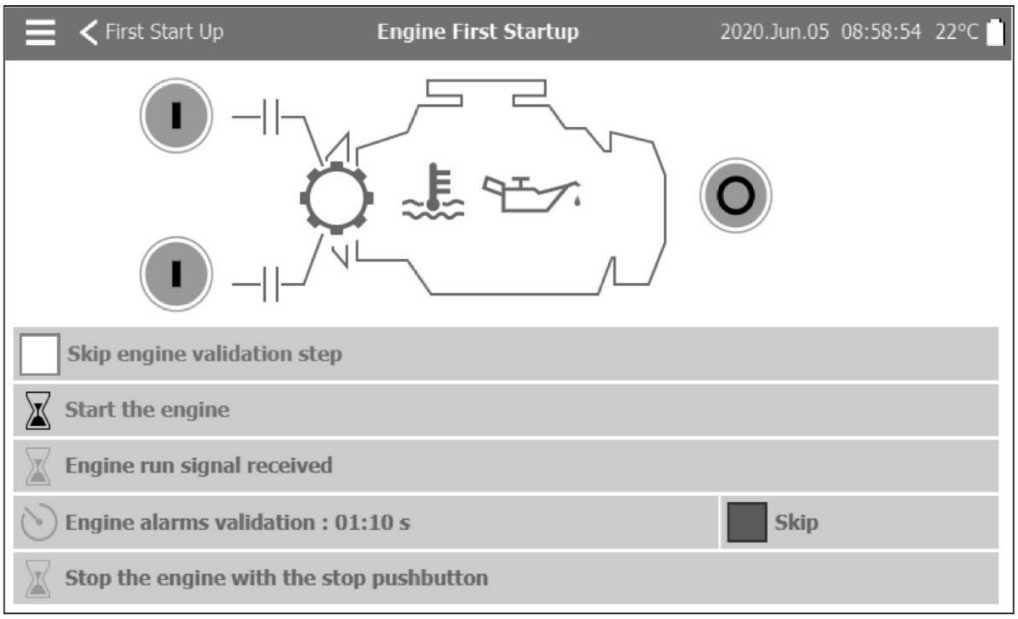
Activate the disconnect switch (if present) and all breakers by setting them to the "on" position. The controller will boot up for the first time.



Once the controller has booted up, the “First Start Up” page appears. Press “User Login” and enter a valid authorization code. Once logged in, press “Power”.



The “Power” page will automatically validate the power if no alarm is detected and if the power meets the requirements. Note: The power validation timer might not appear if all is adequate immediately.
To continue to next step, press “First Start Up “.



Press “Engine First Startup” and turn the Main Selector Switch to the “NORMAL” position.

Note: Before starting the engine, verify that the engine has been officially commissioned (by an authorized engine representative or service dealer) and that the exhaust pipe is connected properly.

You can choose to skip this step completely by selecting “Skip engine validation step”. This selection will be recorded in the logs.

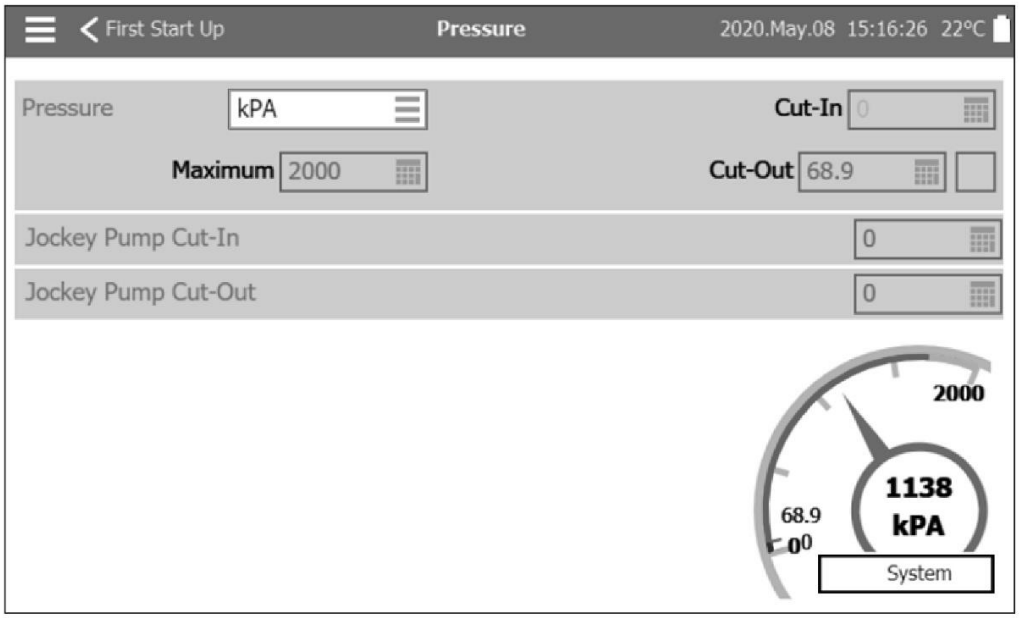
Start the engine manually by using the “START BATTERY” membrane button. Verify that the engine has started and is running properly. Stop the engine by turning the “Main Selector Switch” in the “CRANK ISOLATE” position.

- With the engine started and running, a timer will start counting.

Note: You can choose to bypass the timer by pressing the “Skip” button. This selection will be recordred in the logs.

- During this time, the controller will verify that no alarms are detected. If an alarm appears, stop the engine by pressing the “STOP” button. Take appropriate action to resolve the alarm that has appeared. If no alarms are detected by the expiration of the timer, stop the engine by pressing the “STOP” button.

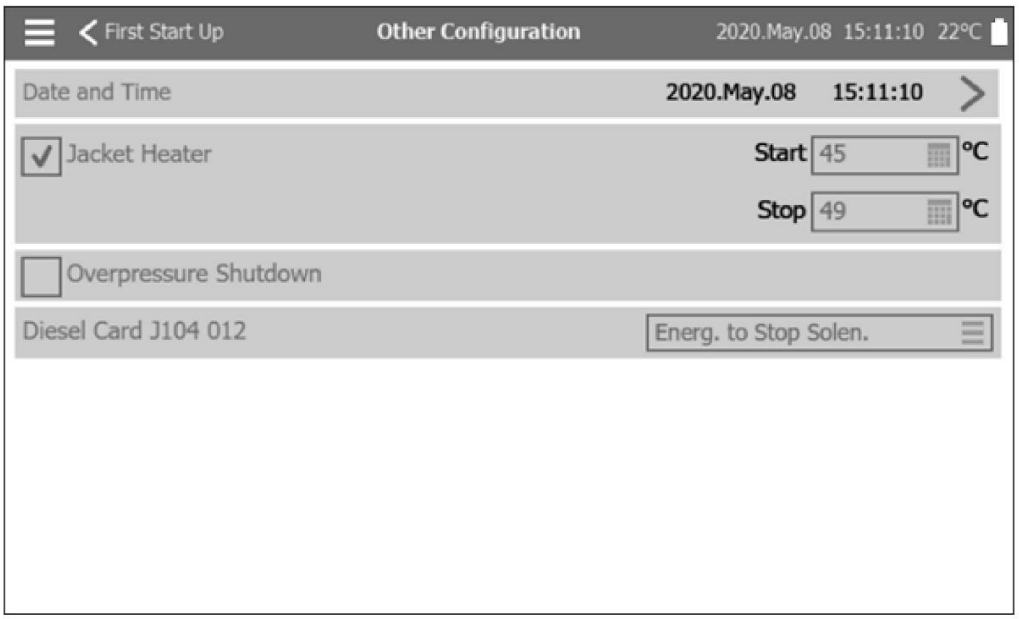
To continue to next step, press “ < First Start Up “.



Press “Pressure”.
- Verify that the pressure reading on the screen matches with the calibrated pressure gauge installed on the sensing line.
- Choose the desired units of measurement for pressure reading.
- Adjust, if required, the range of the digital pressure gauge at Max. Pres.
- Insert the Cut-Out and Cut-In pressure values of the fire pump.
- Insert, if so desired, the Cut-Out and Cut-In pressure values of the jockey pump.

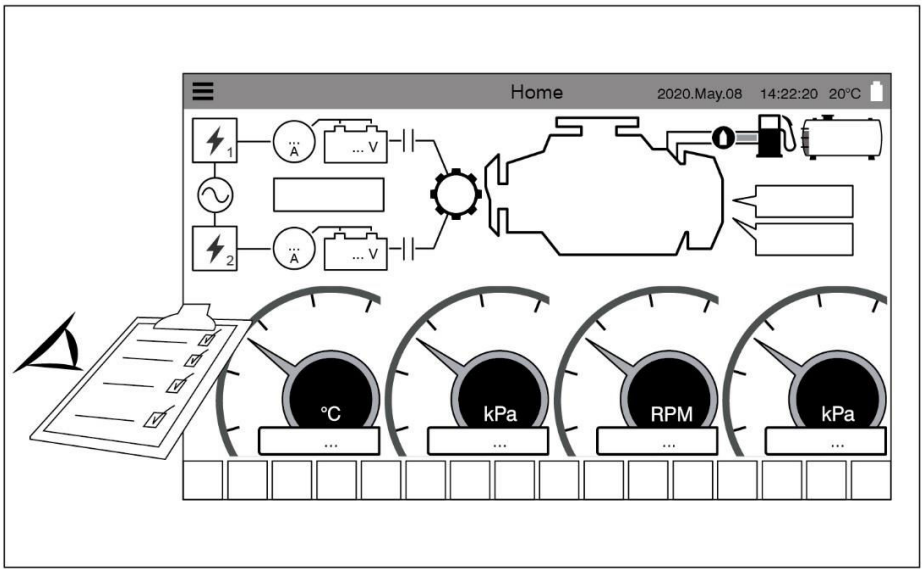
Note: The jockey pump Cut-Out and Cut-In values must be set at the jockey pump controller itself. Inserting these values at the Fire Pump Controller is only for pressure recording data purposes.

To continue to next step, press “ < First Start Up “.

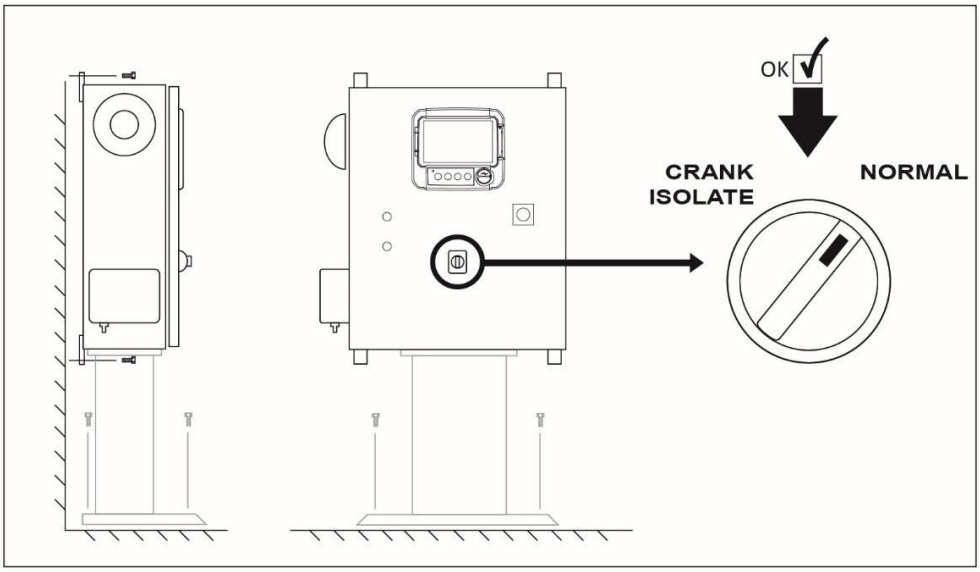


Go back to the controller start-up page and press the “Other Configuration” button. Enter the time and date. Jacket Heater can be enable/disable on this page with the set and reset temperature. The overpressure shutdown feature

should be enabled with AHJ's approval only. On this page we can also configure the Diesel Card connector J104 pin 012 for a ''Engergize to Stop solenoid'' or a ''Energize to Start solenoid''. Others parameter related to Energize to stop could be found in Control Timers menu.



From the "Home" page, verify that the displayed values are correct.

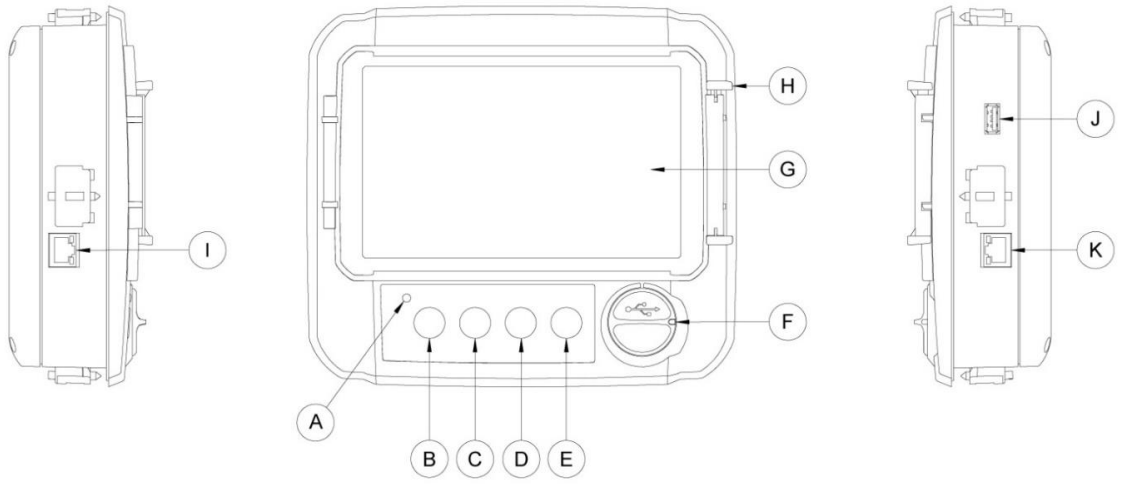


Press the home page button to verify that the displayed values are correct. Turn the "Main Selector Switch" to the "NORMAL" position. This is the preferred position and from now on, the "Main Selector Switch" should always remain in that position.

The “First Start up” is now completed. The controller is fully installed and configured.

Main Features 3

The ViZiTouch



A: Power LED 3 colors: Green for power available and red for AC power fail..
B: Crank 1- START BATTERY button: Used to manually crank the starter from the Start battery while in "NORMAL" mode.
C: Crank 2 -CONTROL BATTERY button: Used to manually crank the starter from the Control battery while in "NORMAL" mode.
D: Stop button: Used to stop the engine if all starting conditions are gone.
E: Short press: Silence alarm
Long press : Reset. Used to reset the alarm. Some alarm need a physical reset button as per AS 2941 – 2013
F: Front USB Connector: USB Device connector used for file download, software updates, service reports.
G: Touch Screen: 7 inch color touch screen LCD with protective cover.
H: Locking mechanism for the protective cover of the screen. Push to open.
I: CANBUS connector for communication with IO board.
J: Side USB connector.
K: Ethernet connector.
Warning
After 2 years of service, the Vizitouch battery may become less efficient and could lose the time after a shutdown.

Alarm Bell

The alarm bell is activated under default faulty conditions stated by the AS 2941 – 2013 standard.

Any of these conditions will energize the alarm bell but may be silenced, except in some cases, by pressing on the the “Silence bell” button on the Alarms page. When silenced, the alarm bell restarts ringing if a new fault occurs or if the alarm conditions remain unchanged after 24 hours. The alarm bell automatically stops ringing if alarm conditions are not present anymore.

Note: Other optional or user defined conditions can also activate the bell and can be configured by the user. See section 5 and verify drawings affixed inside the cabinet for more details.

First Setup

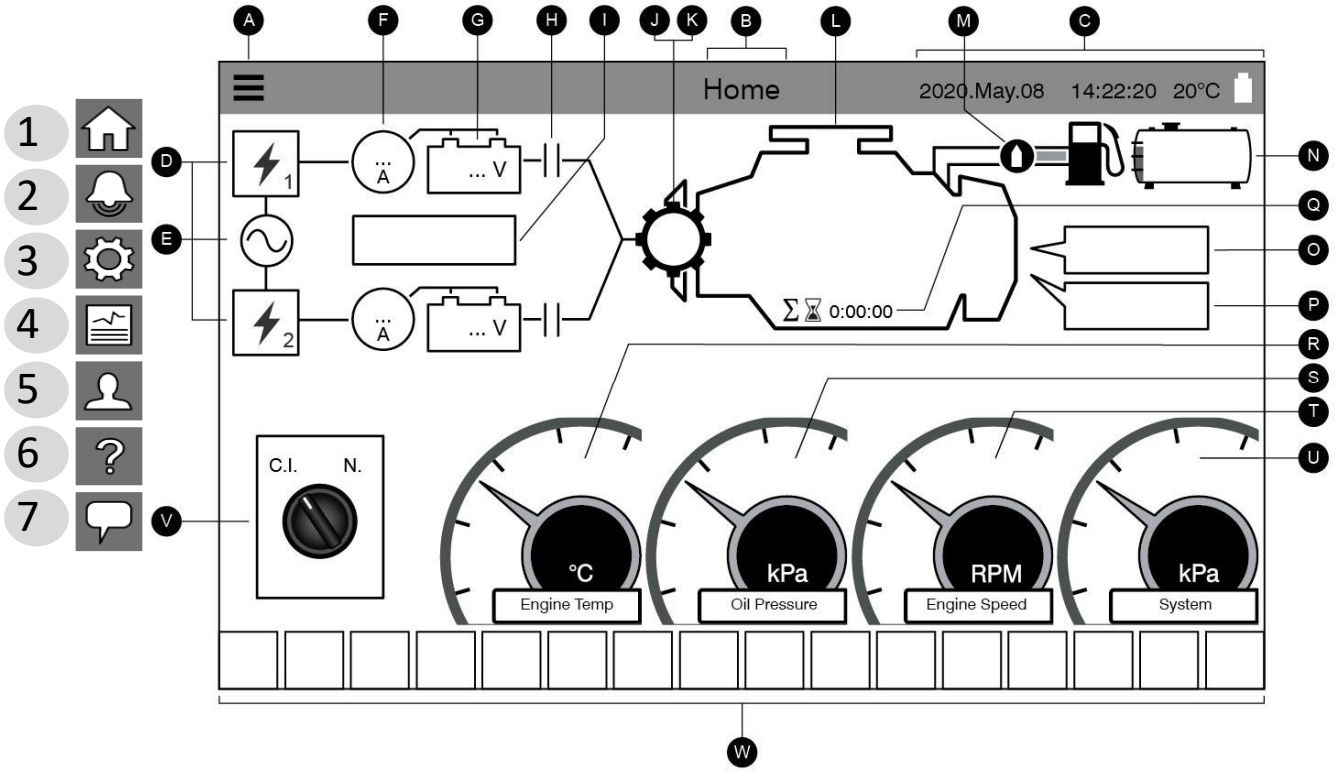
The First Setup must be done prior to using the controller. Completing the First Setup is the only way to access the homepage and enable the automatic mode of the controller.

ViZiTouch: Manual Rebooting Method

If required, here is the procedure to manually reboot the ViZiTouch:
1- Turn OFF all disconnecting means to de-energize the ViZiTouch. The ViZiTouch's screen should turn black.
2- Press the stop button or wait until the ViZiTouch's LED extinguishes.
3- Wait 10 seconds.
4- Turn ON all disconnecting means.

Home 4

Home (Menu)	Home



The home page displays all controller statuses and important values of the controller. This includes all voltages, currents, pressure, engine state and status, as well as all timers and cranking sequences.

A- Navigation bar: 1- Go to Home page 2- Go to Alarms page3- Go to Configuration page 4- Go to History page 5- Go to Service page 6- Go to Download Manuals page 7- Select Controller Language	**B**- Name of the page. **C**- Displays the date, time and ambiant temperature. Press on the temperature display to chose the temperature unit.	**D**- Battery chargers 1 (START) and 2 (CONTROL): The state of each charger is displayed by changing the color of the charger icon:

#	Color of the box	Lightning color	Status
1	Green	Green	Charging (below 2 amps)
2	Green	Yellow	Charging (above 2 amps)
3	Red	Red	Failure
4	Grey	Grey	No AC voltage / Low AC Voltage

E- Alternative current status: Red when there is a failure and green otherwise.

F- Ammeter: Displays the actual current between the charger and the battery in amps.

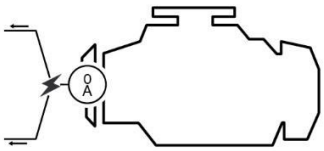
G- The battery: The battery will be red if it is in failure and green otherwise. The data shows the actual voltage of the battery and the charger in volts.

H- Starter contactor: Grey when non active (open) and green when they are activated (closed) during a crank.

I- Starter state window: This window only appears during a cranking cycle. The counter inside indicates the step timer, with the 10 seconds cranking delay and the 20 seconds waiting delay. As there are two cranking modes, "waiting/rest for crank" and "cranking", two symbols will alternate: a gear during cranking mode and an hourglass during the waiting mode.

J- The starter gear (when motor not running): Grey when non active and green when activated during cranking.

K- Charging alternator current (when motor running); The “Alternator Current” analog input gives the possibility to support engine with no alternator management. This value is only visible when motor is running.



L- The diesel engine: It will be grey if the engine is stopped, green if an "Engine Run" signal is detected and red if a "Fail to start" occurred, after 6 unsuccessful cranking attempts. Inside the engine two major alarms are represented; the "low oil pressure" alarm and the "engine high temperature" alarm. These alarms will stop the engine only if it is running in test mode. When active, the appropriate alarm symbol will turn red.

M- Fuel solenoid valve: This valve controls the flow of fuel to the engine. When the fuel solenoid is activated, the valve will be horizontal, green and the yellow representation of the fuel will flow through the entire pipe. When the "Stop Solenoid valve" is activated, the valve will rotate vertically, become red and the yellow representation of the fuel will stop at the valve, indicating that the fuel does not flow through anymore.

O- Fuel level: This sensor is monitoring the “Fuel Level” as a percentage. This analog input gives the possibility to support engine with no electronic “Low-High Level;” switch.

N- Motor starting or stopping cause: A message box will indicate the reason why the motor is running.

O- Operations timers: This includes the sequential start timer, the run period shutdown timer, the manual test timer, the weekly test timer and the alternating current failure timer.

P- Hour meter: An hour meter to indicate the total cumulative time of operation of the engine.

Q- Engine temp: An engine temperature gauge that represent engine temperature, the low engine temperature zone and high engine temperature zone.

R- Engine Oil Pressure: This analog input gives the possibility to support engine with no electronic “Low Oil Pressure” switch.

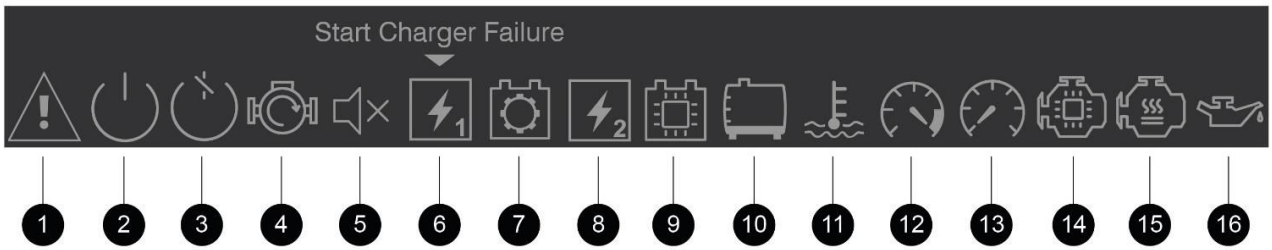
S – Tachometer: Indicate the engine speed in RPM. The gauge represent the overspeed with a red zone, the engine run zone in yellow and the nomitated pump speed value.

T- The pressure gauge: It allows for a precise reading of the actual system pressure. The cut-in and cut-out are represented by a red and green line on the gage, allowing a quick comparison between the actual pressure and the set points. At the center of the gauge, a digital indicator shows the actual pressure represented also by the needle

of the gauge. Just under of the digital pressure indicator, the actual pressure unit is shown. The maximum allowable pressure is also indicated on the gauge and will scale the gauge accordingly.

U- Crank Isolate Indicator: Displays the current mode on mode change. If the mode is crank isolate it will be shown in permanence.

V- Alarm bar (indicator light): As per AS 2941 – 2013 there is a list of standard alarms that need to be shown in the main display. All icon are gray unless the condition is valid. There is also at the left a warning symbol that indicate in yellow if there is a warning or an error in red. When we touch the icon a description will appear. If an error condition is valid the icon will be in red, the description will be highlight in red and there will be an automatic cycling to display the error description in red.



1-Warning sign (Yellow or red)
2-Power on (green)
3-Power fail – Loss of incominig power supply (Red)
4-Pump Running (Red)
5-Aural alarm silence (Red)
6-Start Charger Failure (Red)
7-Start battery failure (Red)
8-Control charger failure(Red)
9-Control battery failure (Red)
10-Low fuel level (red)
11-High engine temperature (Red)
12-Overspeed shutdown (Red)
13-Fail to start (Red)
14-ECM fault (Red)
15-Jacket heater failrue (Red)
16-Low oil pressure (Red)

Screen Saver

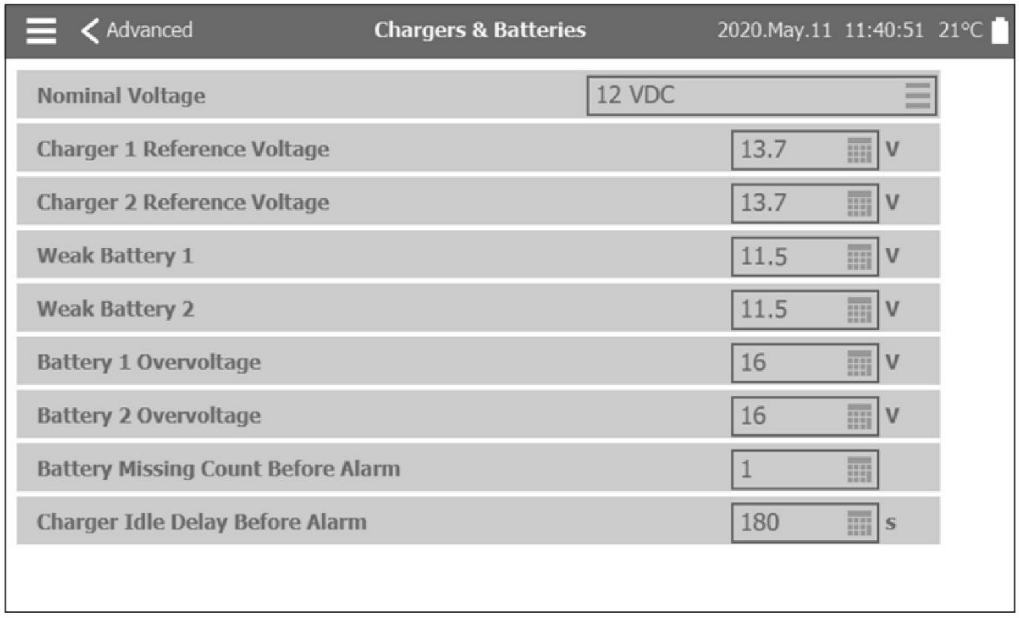
After 5 minutes of inactivity on the ViZiTouch, the “Black Screen” screen saver will activate. Its goal is to expand the lifetime of the LCD screen. The screen saver will be instantly deactivated if the engine is running or if an alarm is activated. To manually deactivate it, simply touch the screen or any membrane button. After deactivation, the screen saver will always redirect to the “Home” page. It will also log off any user by resetting the security level to 0 and save any new modifications to the settings.

Configuration 5

Config (Menu) **Config**

Two menus have specific detail for the AFD product (Charger and speed setting). Those two specials menu will be cover in detail.

Chargers and Batteries **Config > Advanced > Chargers and Batteries**



This page is used to adjust some features of the batteries and chargers.

Nominal Voltage: On the field a certified technician could physicaly change the charger to modify the nominal batteries/chargers between 12V and 24V. If and only if this physical modification is done this setting will adjust all other value (Voltage référence for alarm, timer etc).

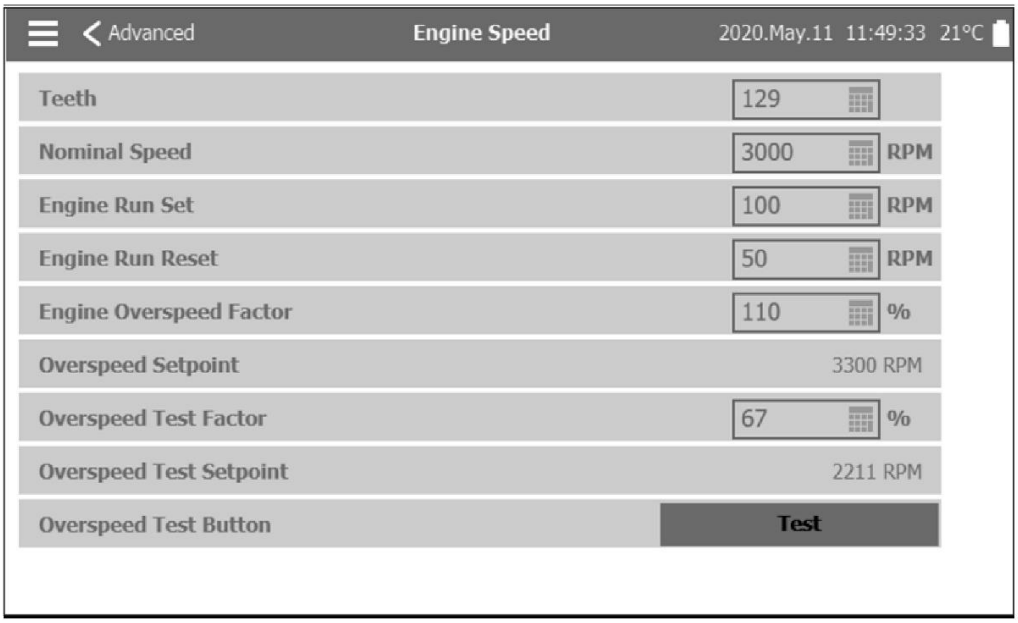
Charger 1-2 reference voltage: This is the normal voltage of the chargers in float mode and serves as a reference to trigger the “charger fail” alarm.

Weak battery 1-2: Under this voltage, the batteries are considered weak. The alarm “weak battery” is then activated.

Battery 1-2 overvoltage: Over this voltage, the batteries are considered in overvoltage. The alarm “battery overvoltage” is then activated.

Charger Idle Delay Before Alarm: The charger on this product have a wait periodic wait period after a charge were the charger listle but did not charge. This delay should not be change unless under specific need.

Engine Speed **Config > Advanced > Engine Speed**



Teeth: The “teeth” input box allows the user to match the number of teeth on the flywheel. This is an important setting to allow a precise calculation of the RPM.

Nominal speed: Nominal speed of the motor

Engine Run Set/Reset: Speed where we ‘’set’’ and engiine run and the value where we ‘’reset this engine run.

Engine overspeed factor: Percentage of the nominal speed at which then engine is considered to be in overspeed.

Overspeed setpoint: Calculated value from Nominal speed and Engine overspeed factor

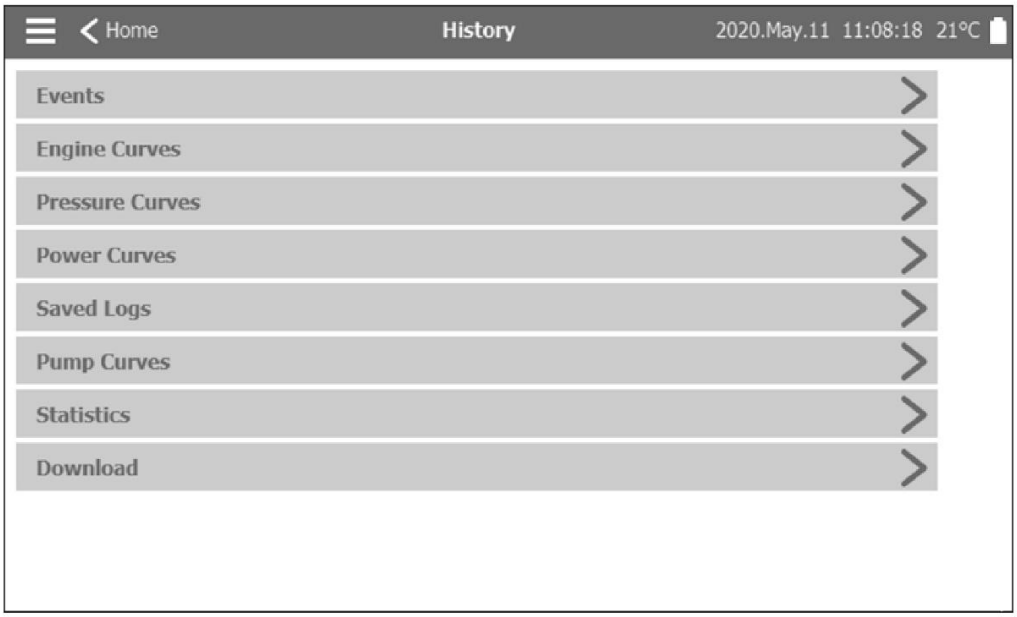
Overspeed Test Factor: Percentage of the nominal speed at which the engine is considered to be in overspeed during an overspeed test,

Overspeed Test Setpoint: Calulcated value from the Overspeed Test Factor.

Overspeed Test Button: Activates the overpseed test mode

History 6

History (Menu) **History**

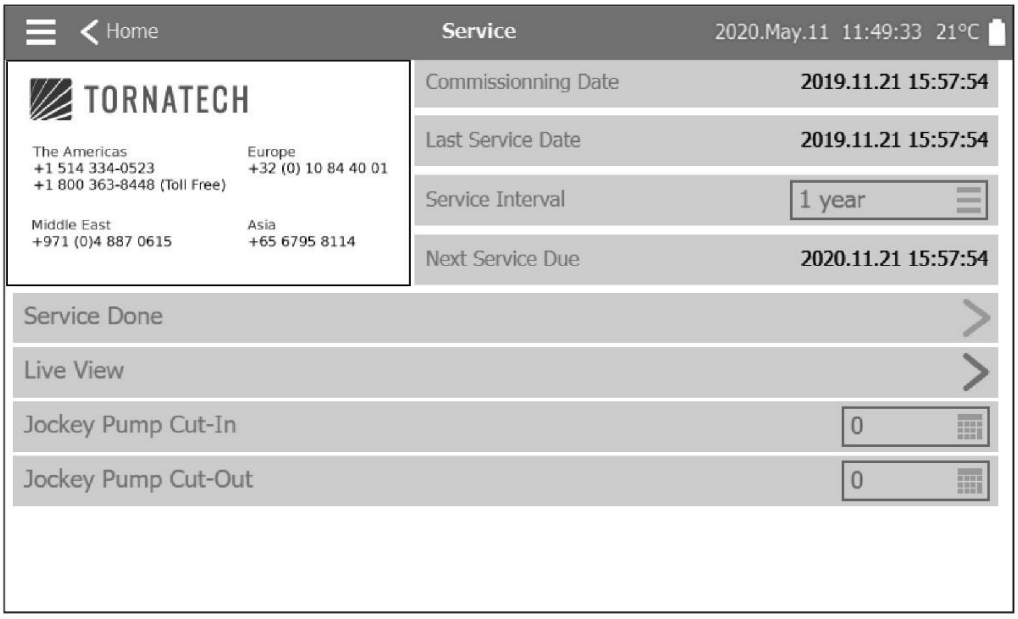


This page is used to access all data related to events, statistics, pressure history, power logs and the downloading of this information via one of the two USB ports.

-**Events**: This button leads to the “Events” page, which displays the events from the most recent 500 logs. Each event log contains the date and time of occurrence as well as a brief description of the event.
-**Engine curves**: This button leads to the “Engine Curves”, which displays all relevant engine information (speed, oil, temperature, fuel level, overspeed, engine run) from the most recent 500 logs.
-**Pressure/Power Curves**: This button leads to the “Pressure Curves” / “Power Curves” page accordingly, which displays all relevant pressure/power information from the most recent 500 logs.
-**Saved Logs**: This button leads to a page where past logs can be viewed.
-**Pump Curve**: This button leads to the “Pump Curves” page.
-**Statistics**: This button leads to the “Statistics” page, which leads to “All Time Statistics”, “First Service Statistics” and “Last Service Statistics” pages.
-**Download**: This button leads to the “Download” page, which allows the user to download information, including the user manual, drawings, logs, statistics and configuration.

Service 7

Service



Informations on how to reach technical support, concerning the commissioning date, the last service date and the next service due date is available on this page. It is the client responsibility to make sure that the proper maintenance is done on the controller. A reminder for the “Service” can be selected from these options: OFF, ½ year, 1 year, 1 ½ years, 2 years and 3 years. The next service will be determined using the last service and the chosen service interval. This service must be done by an accredited technician.

A proper password must be enter for the “Service Done” button to be available. This button should only be pressed by an authorized person after a completed service.

The “Live View” page is where the user can grant or refuse the remote access demands.

The “Nameplate Information” page contains all the information found on the nameplate.

The Jockey Pump Cut-Out and Cut-In can be set on this page.

It is possible to install a custom Service card on this page. Contact Tornatech for more information.

Diesel Engine Fire Pump Controller
24VDC Negative Ground
Wiring schematic

Model:AFD
Built to AS-2941-2013

PER QUOTE DRAWING No.		
REV.	DESCRIPTION	DD/MM/YY
0	As Built	08/04/21

DRAWING NUMBER: D 1170094-S1

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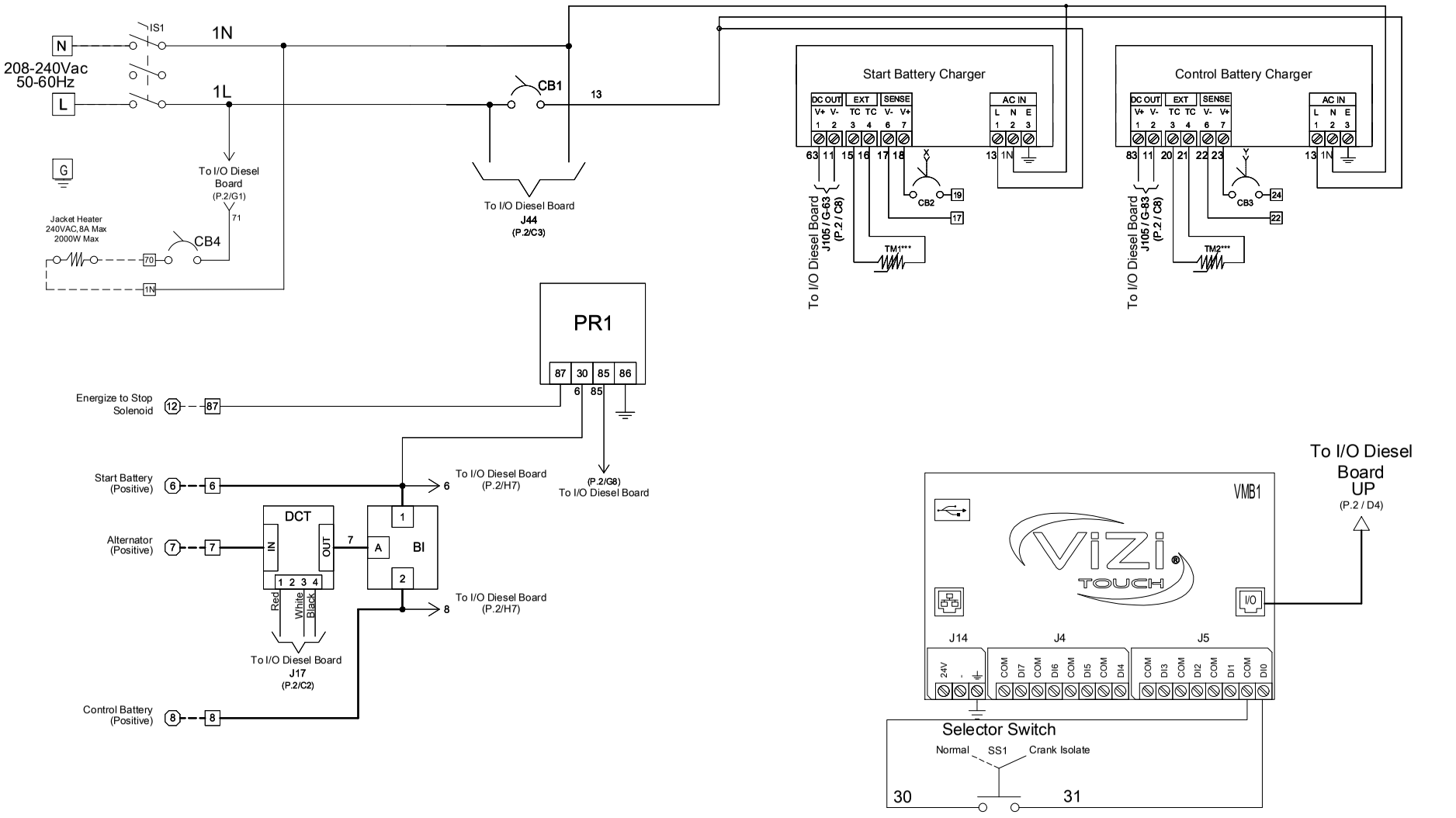

*** TM1 and TM2 should be fixed on the start battery and control battery respectively.

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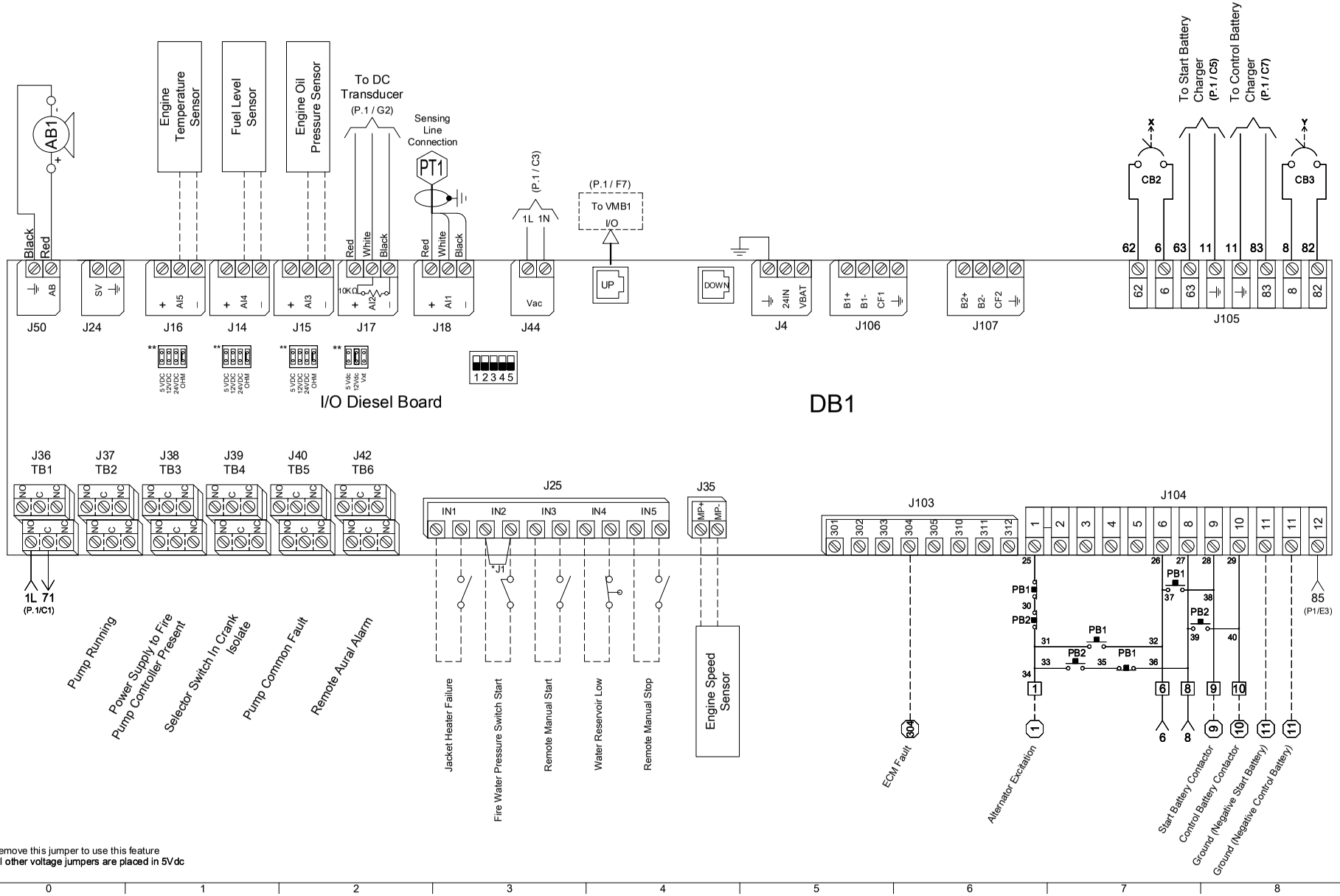
Diesel Engine Fire Pump Controller
24VDC Negative Ground
Wiring schematic

Model:AFD
Built to AS-2941-2013

PER QUOTE DRAWING No.			
REV.	DESCRIPTION	DD/MM/YY	DRAWING NUMBER
0	As Built	08/04/21	D 1170094-S1

TORNATECH



* Remove this jumper to use this feature
** All other voltage jumpers are placed in 5Vdc

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Diesel Engine Fire Pump Controller
24VDC Negative Ground
Terminals diagram

Model:AFD
Built to AS-2941-2013

PER QUOTE DRAWING No.			
REV.	DESCRIPTION	DD/MM/YY	DRAWING NUMBER
0	As Built	08/04/21	D 1170094-S1

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Power Supply

Terminals Wire Size:
1.5-16 mm2
1.9 Nm

208-240Vac
50-60Hz

L
N
G

Engine Connections

304 Electronic Control Module Fault — 304 — J103
11 Ground (Negative Start Battery) — 11 — J104
11 Ground (Negative Control Battery) — 11 — J104

Engine Temperature Sensor — + AI5 – — J16
Fuel Level Sensor — + AI4 – — J14
Engine Oil Pressure Sensor — + AI3 – — J15
Engine Speed Sensor — V MP+ — J35

Terminals Wire Size:
6 - 10 mm2
1.9 Nm

1 Alternator Excitation — 1
9 Start Battery Contactor — 9
10 Control Battery Contactor — 10
12 Energize to Stop Solenoid — 87

Terminals Wire Size:
10 - 35 mm2
3.5 Nm

6 Start Battery — 6
7 Alternator — 7
8 Control Battery — 8

Field Connections

Terminals Wire Size:
0.5 - 4 mm2
0.5 Nm

I/O Diesel Board

Jacket Heater Failure
Fire Water Pressure Switch Start
Remote Manual Start
Water Reservoir Low
Remote Manual Stop

*J1

IN 1 IN 2 IN 3 IN 4 IN 5

J25 Controller Terminal Strip

Network Connections

Terminals Wire Size:
Shielded Female Connector RJ45

Located on Main Board

Modbus TCP/IP

Engine Connections

Terminals Wire Size:
1.5-16 mm2
1.9 Nm

Jacket Heater 240VAC,8A Max — 240Vac / 8A 2000W Max — 70 — 1N

Field Connections

Terminals Wire Size:
1.5-16 mm2
1.9 Nm

Voltage Sense of Battery 1 — + — 19 — 17 —
Voltage Sense of Battery 2 — + — 24 — 22 —

* Remove this jumper to use this feature

Alarm Contacts

Terminals Wire Size:
0.5 - 2.5 mm2
0.5 Nm

I/O Diesel Board

Pump Running	Normally Opened Closes to alarm	NO C NC	TB2
	Normally Closed Opens to alarm	NO C NC	
Power Supply to Fire Pump Controller Present	Normally Opened Closes to alarm	NO C NC	TB3
	Normally Closed Opens to alarm	NO C NC	
Selector Switch In Crank Isolate	Normally Opened Closes to alarm	NO C NC	TB4
	Normally Closed Opens to alarm	NO C NC	
Pump Common Fault	Normally Opened Closes to alarm	NO C NC	TB5
	Normally Closed Opens to alarm	NO C NC	
Remote Aural Alarm	Normally Opened Closes to alarm	NO C NC	TB6
	Normally Closed Opens to alarm	NO C NC	

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Diesel Engine Fire Pump Controller
24VDC Negative Ground
Dimension

Model:AFD
Built to AS-2941-2013

PER QUOTE DRAWING No.			
REV.	DESCRIPTION	DD/MM/YY	DRAWING NUMBER
0	As Built	08/04/21	D 1170094-S1

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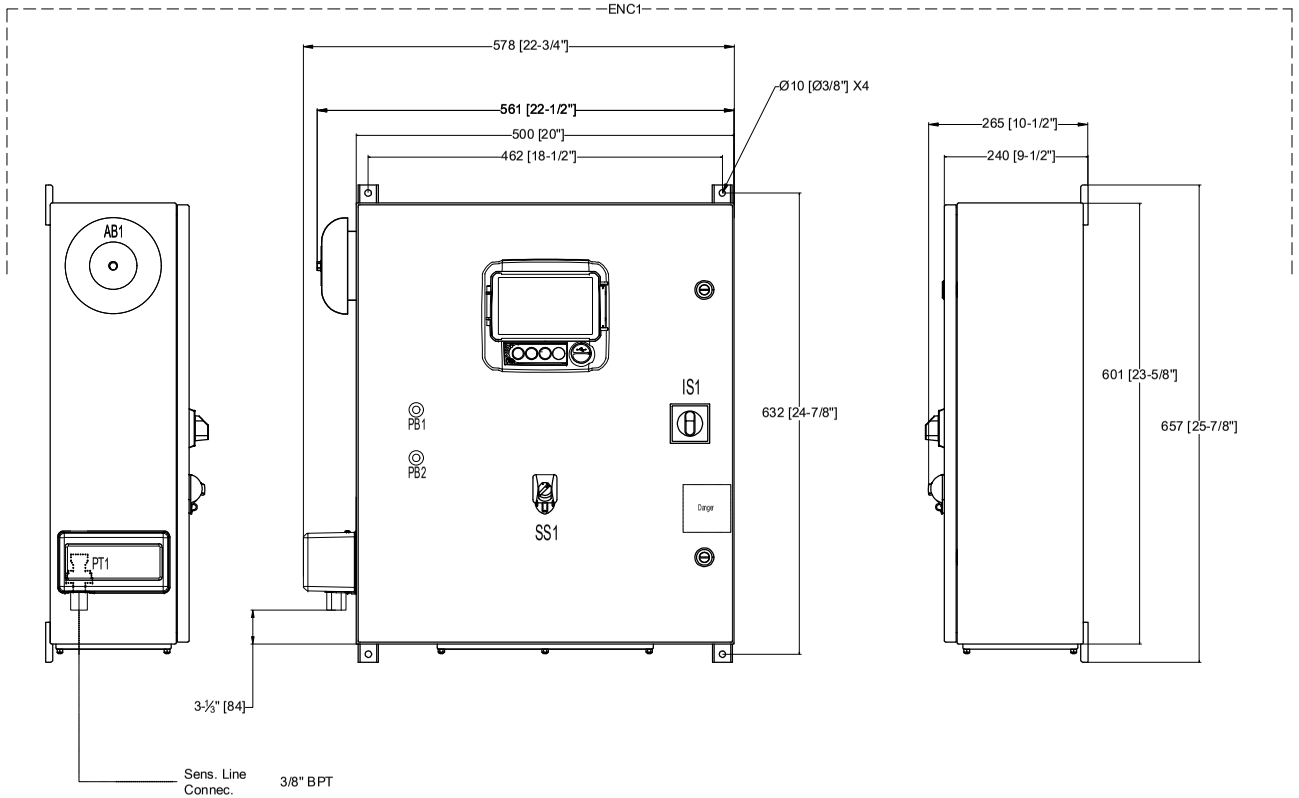
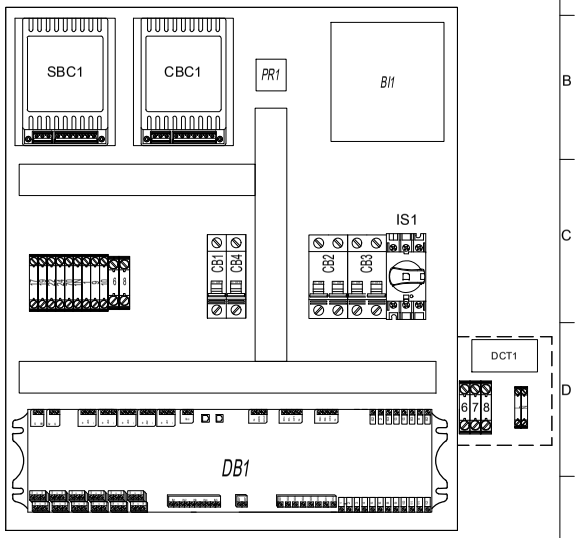
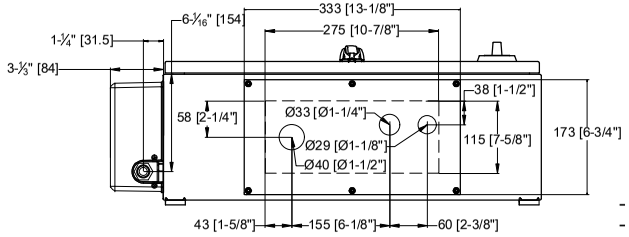




Internal Layout

Designation	Description
AB1	Aural Alarm
BI1	Battery Isolator
CB1-CB4	Circuit Breaker 16A
CB2-CB3	DC Breaker 16A
CBC-SBC	Charger 5A
DB1	I/O Diesel Board
DCT1	DC Current transducer
IS1	Isolating Switch 25A
PR1	Power Relay
PT1	Pressure Sensor
SS1	Selector Switch 2 positions
VMB1	ViZiTouch Main Board



- Enclosure TYPE IP55
- All Dimensions are in Millimeters (Inches)
- Paint: textured red RAL 3002

- Use watertight conduit and connector only.
- Protect Equipment Against Drilling Chips.
- Ambient Temperature : Between 4°C (39°F) and 40°C (104°F)
- Shipping Weight, Wall Mounted: Approximate 98 Lbs - 45 Kg

Projection

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Harness for Aline Diesel Engine Fire Pump Controller

Model:AFD

Assembly

PER QUOTE DRAWING No.		

REV.	DESCRIPTION	DD/MM/YY
0	First Issue	06/05/15
1	Update for Relay PR1	09/09/15
2	Update for Wires	14/07/17
3	Update for IO Board to 2VIZ104	22/09/20

DRAWING NUMBER: 5HAR001

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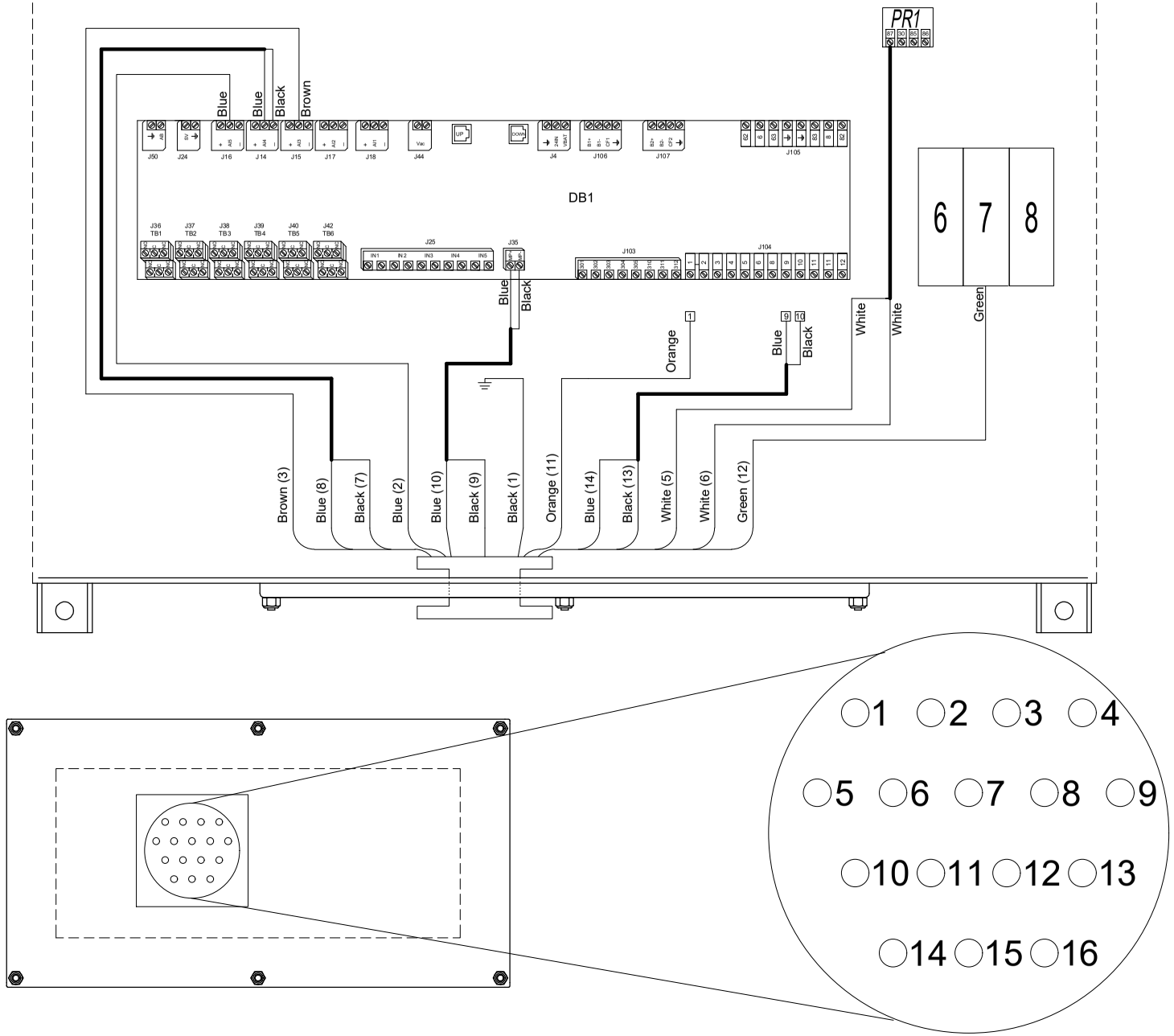

TECHNICAL DATA - MODBUS COMMUNICATION
FOR DIESEL ENGINE FIRE PUMP CONTROLLER

To modify IP and SubNet Mask: Go to Config / Advanced / Network Config. Check the "Manual" box. Enter the desired IP address and SubNet Mask. Press Apply. The Modbus node adress is 1.

Generals Characteristics	
Connection Type	Shielded female connector RJ45
Possible IP adress	10.0.1.0 – 10.255.255.255 (Class A private) 172.16.0.0 – 172.31.255.255 (Class B private) 192.168.0.0 – 192.168.255.255 (Class C private)
Frame Format	TCP/IP

BINARY	16 boolean (1 = TRUE, 0 = FALSE)
DIGITAL VALUES	16 bits representing a number. The result refers to a list of values
ANALOG VALUES	16 bits representing a number. Analog signals values are multiply by 10 for communication purpose, unless otherwise specified.

Controller Info

WORDS 40001-40040 String	Serial Number	WORDS 40041-40080 String	Model
WORDS 40081-40120 String	Package Name	WORDS 40121-40160 String	Software Version
WORD 40161 ANALOG VALUES	Nominal AC Voltage (V)	WORD 40162 ANALOG VALUES	Nominal Battery Voltage (V)
WORD 40163	NA	WORD 40164	NA

Alarms Activation

Alarms Activation 1 BINARY WORD 41001		Alarms Activation 2 BINARY WORD 41002	
	0 AC Failure		0 Faulty Pressure Transducer
	1 DC Failure		1 Weekly Test Required
	2 Battery 1 Failure		2 Cooling No Flow
	3 Battery 2 Failure		3 Engine Fail When Running
	4 Charger 1 Failure		4 Engine Fail to Start
	5 Charger 2 Failure		5 Engine Overspeed (3)
	6 Engine Trouble		6 I/O Diesel Board Communication Loss
	7 Pump Room Alarm		7 I/O Expansion 1 Communication Loss
	8 Controller Trouble		8 I/O Expansion 2 Communication Loss
	9 Service Required		9 I/O Expansion 3 Communication Loss
	10 Weak Battery 1		10 I/O Expansion 4 Communication Loss
	11 Weak Battery 2		11 I/O Alarm Communication Loss
	12 Loss of Continuity (Contactor 1)		12 Low Ambient Temperature (Internal Sensor)
	13 Loss of Continuity (Contactor 2)		13 Engine Run
	14 Weekly Test Cut-In not reached		14 CANBUS Communication System Failure
	15 Weekly Test Check Solenoid Valve		15 Pump On Demand

Alarms Activation 3 BINARY WORD 41003		Alarms Activation 4 BINARY WORD 41004	
	0 Invalid Cut-In		0 Low Spare Temperature
	1 Test Mode		1 Water Reservoir Low
	2 Pneumatic Fail to Start		2 Water Reservoir Empty
	3 Auto-mode Bypass		3 Water Reservoir High
	4 Hydraulic Fail to Start		4 Flow Meter On
	5 Bell Silenced		5 Fuel Tank Leak
	6 APSAD General Default		6 Low Fuel Level
	7 Overpressure		7 High Fuel Level
	8 Underpressure		8 Electronic Control Module in Alternate Position
	9 Low Suction Pressure		9 Fuel Injection Malfunction
	10 Flow Start		10 Engine High Temperature
	11 Battery 1 Overvoltage		11 Engine Low Temperature
	12 Battery 2 Overvoltage		12 Engine Electronic Control Module Warning
	13 High Ambient Temperature (Internal Sensor)		13 Engine Electronic Control Module Fault
	14 NA		14 Engine Low Oil Pressure
	15 Low Raw Water Flow		15 Low Pneumatic Pressure

Alarms Activation 5 BINARY WORD 41005		Alarms Activation 6 BINARY WORD 41006	
	0 Main Relief Valve Open		0 User Alarm 16
	1 User Alarm 1		1 User Alarm 17
	2 User Alarm 2		2 User Alarm 18
	3 User Alarm 3		3 User Alarm 19
	4 User Alarm 4		4 User Alarm 20
	5 User Alarm 5		5 NA
	6 User Alarm 6		6 NA
	7 User Alarm 7		7 NA
	8 User Alarm 8		8 NA
	9 User Alarm 9		9 High Raw Water Temperature
	10 User Alarm 10		10 PLD Low Suction Pressure
	11 User Alarm 11		11 Low Hydraulic Pressure
	12 User Alarm 12		12 I/O Expansion 5 Communication Loss
	13 User Alarm 13		13 I/O Expansion 6 Communication Loss
	14 User Alarm 14		14 I/O Expansion 7 Communication Loss
	15 User Alarm 15		15 I/O Expansion 8 Communication Loss

WORDS 40201-40300

WORDS 40201-40300 BINARY	1 MODBUS Remote Manual Start 2 MODBUS Automatic Start

NFPA Registers

WORD 42001 ANALOG VALUES (10x)	Battery 1 Voltage (V)	WORD 42002 ANALOG VALUES (10x)	Battery 2 Voltage (V)
WORD 42003 ANALOG VALUES	NA	WORD 42004 ANALOG VALUES (10x)	Battery 1 Current (A)
WORD 42005 ANALOG VALUES (10x)	Battery 2 Current (A)	WORD 42006 ANALOG VALUES	NA
WORD 42007 ANALOG VALUES (10X)	System Pressure (chosen unit)	WORD 42008 ANALOG VALUES (10X)	Suction Pressure (chosen unit)
WORD 42009	NA	WORD 42010	NA

WORD 42011	NA

NFPA Alarms 1		
BINARY	0	Minimum run delay timing high
	1	NA
	2	High zone delay timing high (option)
WORD 42012	3	Sequence delay timing high (option)
	4	Engine running high
	5	NA
	6	Low suction alarm high (option)
	7	Low suction shutdown active high (option)
	8	System over pressure alarm high (option)
	9	Overspeed alarm high
	10	Weekly test demand active high
	11	Failure to start alarm high
	12	Lockout active high (option)
	13	Crank on battery #1 high
	14	Crank on battery #2 high
	15	Resting high

NFPA Alarms 2		
BINARY	0	Pressure start demand high
	1	Remote start demand high
	2	Deluge start demand high (option)
WORD 42013	3	Weekly test start demand high
	4	Start contactor #1 fail high
	5	Start contactor #2 fail high
	6	Audible alarm high
	7	NA
	8	NA
	9	Pump demand high
	10	Control switch in auto high
	11	Control switch in manual high
	12	Pressure transducer fault high
	13	NA
	14	AC power fail start high
	15	NA

NFPA Alarms 3		
BINARY	0	Battery #1 failure alarm high
	1	Battery #2 failure alarm high
	2	Pump trouble group alarm high
WORD 42014	3	System trouble #1 alarm high
	4	AC power fail alarm high
	5	Battery #1 over voltage alarm high
	6	Battery #2 over voltage alarm high
	7	Electronic control module in alternate position high
	8	Fuel injection malfunction high
	9	Electronic control module warning high
	10	Electronic control module fault high
	11	High raw water temperature high
	12	Low raw water flow high
	13	Low engine temperature high
	14	Low oil pressure alarm high
	15	NA

NFPA Alarms 4		
BINARY	0	Pump trouble #1 input high
	1	Pump trouble #2 input high
	2	Pump trouble #3 input high
WORD 42015	3	Pump trouble #4 input high
	4	Pump trouble #5 input high (option)
	5	Pump trouble #6 input high
	6	Pump trouble #7 input high
	7	Pump trouble #8 input high
	8	Battery #1 in equalize high
	9	Battery #2 in equalize high
	10	Battery #1 OK high
	11	Battery #2 OK high
	12	Charger #1 fail alarm high
	13	Charger #2 fail alarm high
	14	System trouble #2 alarm high
	15	NA

WORD 42016	Start Count
ANALOG VALUES	

WORD 42017	Run Time
ANALOG VALUES	(Hours)

WORD 42018	Hours since last run
ANALOG VALUES	(Hours)

WORD 42019	NA

WORD 43029	Cut-In
ANALOG VALUES	(PSI)

WORD 43030	Cut-Out
ANALOG VALUES	(PSI)

TORNATECH

PARTS LIST

For Model # AFD-24-220
Serial # WD1170094
Project SERT125434-AFD24-220

Customer Aline Group Australasia Pty Ltd

P.O. 106653_SPB

Reference

Spare Parts Kits
A:
B:
C:

Components	Identification	Part Number	A	B	C
Circuit Breaker	CB2-CB3	BRKLOV0008		1	1
Battery Charger Board	BC1-BC2			1	1
ViziTouch	VMB1	ELBTOR0105			1
Pressure Transducer	PT1	GSESCH0016		1	1
I/O Board	DB1	ELBTOR0111	1	1	1

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LISTEN DEVELOP LEAD

www.tornatech.com

7.2 MANUAL

Fire Indicator & EWIS Panels

PERTRONIC
F220
AUTOMATIC FIRE ALARM
(AS7240-2&4, AS4428-3:2010)
TECHNICAL MANUAL
AUSTRALIA

Valid For F220:

F220 Mainboard hardware:	v3.98A
F220 Mainboard software:	v7.04
F220 Keyboard hardware:	v1.11
F220 Keyboard software:	v7.02
F220 Charger Controller hardware:	v1.10
F220 Charger Controller software:	v2.00
F220 Loop Driver II hardware:	v2.02
F220 Loop Driver II software:	v4.12
FireUtils Programming Utility:	v7.04
NET2CARD hardware:	v2.07
NET2CARD software:	V7.02

ISSUE 6.0

Serial Number:
Date of Manufacture: … / … / …

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Pertronic Industries Pty Limited

Abbreviations:

AA	Analogue Addressable	
AAF	Alarm Acknowledge Facility	
ACF	Ancillary Control Facility	
Activated	Not in its normal state	
ADF	Alarm Delay Facility	
ASE	Alarm Signalling Equipment	
AVF	Alarm Verification Facility	A facility designed to minimise 'false alarms' by ensuring multiple operation of devices (smoke detectors) before the alarm is raised.
BCO	Bell Cut-Off	Bell Cut-Off switch terminates the output from the panel BELL relay. Two BCO switches are provided, an External BCO switch for Brigade and Tester use and an Internal BCO for Fire Technician use.
c.i.e	Control and indicating equipment	Terminology from AS 7240.2
DBA	Direct Brigade Alarm	
DCB	Deluge Control Block	
DHR	Door Holder Relay	
EOL	End of Line	End of Line termination, nominally 10kΩ Resistor, used to monitor the presence and integrity of the detector circuit.
ISO	Disable switch	
Latched	A state that is maintained once invoked	Removal of the cause and a reset are required to remove a latched state
LCD	Liquid Crystal Display	
LED	Light Emitting Diode	
MCP	Manual Call Point	
NC	Normally closed	Relay or switch contacts
NCU	Network Control Unit	A mimic capable of remotely controlling and monitoring selected F220 panels or an entire F220 Net 2 network
NO	Normally Open	Relay or switch contacts
OC	Open Circuit	
PCB	Printed Circuit Board	
PFA	Pertronic Fire Alarm equipment	
PSU	Power Supply Unit	
SC	Short Circuit	
SOU	Sole Occupancy Units	

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1. INTRODUCTION

1.1 Functional Description

The Pertronic F220 is a modular, expandable, analogue addressable automatic fire alarm system designed for medium to large building applications.

Figure 1-1: Pertronic F220 Analogue Addressable Fire Alarm Control Panel (16U Cabinet)

- It is expandable from 2 to 20 addressable loops giving a maximum of up to 3180 addressable smoke or heat detectors plus up to 1980 manual call points, modules, or addressable relays for the system.

- The panel uses a 7 inch (180 mm) 800 x 480 pixel colour display to unmistakably identify the panel status. The alarm mode is clearly identified by the use of red status bars, and by using large easy to read text descriptors. Fault information, device disablement information, pre-alarm conditions, walk test, supervisory and system information all have their own unique coloured display screens to provide comprehensive easy-to-use information for all users including fire brigade personnel, building managers, and service technicians.

- Powerful diagnostic information is provided to all users through 9 separate event logs. These logs and other reports can be access though Pertronics FireUtils PC based application software.

- All the F220 functions, which incorporates the configuration data specific to the site, is controlled by software that is stored in non-volatile flash memory on the Mainboard. The configuration data, generated by FireUtils can be installed
  - Using a USB flash memory stick, or
  - Through an RS-232 port, or
  - Via an Ethernet port on the Mainboard, or
  - If installed, an Ethernet port on the Net2Card board.

  The configuration data can only be modified by service personnel with Level 4 Access.

- Remote access. LCD mimics with different functionality are available to provide remote access to one F220 panel (F220 FFMA, F220 EMMA, F220 AMMA) or multiple Panels on the Net2 network (Net2 NCUA, Net2 EMMA, Net2 AMMA)

- F220 fire alarm systems are available in a range of cabinets. A lockable front door provides access to the Keyboard-Display.

- The F220 conforms to Australian Standards AS 7240.2–2004, AS 7240.4–2004 and AS 4428.3–2010.

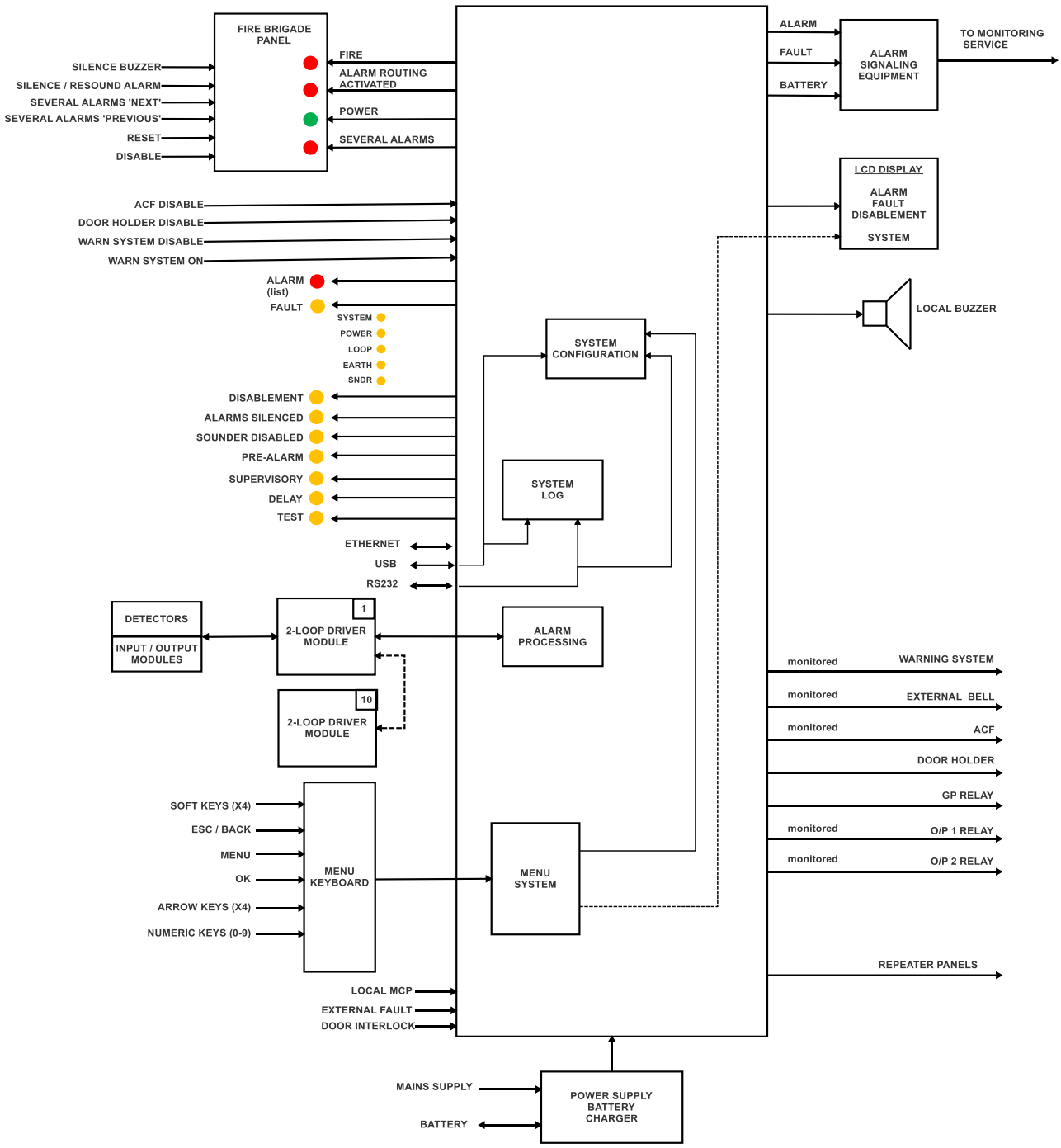


Figure 1-2: F220 AUS Block Diagram

1.2 Overview of Features

1.2.1 General Features

- Large 7-inch (180 mm) 800 x 480 pixel active matrix TFT colour LCD display
- Comprehensive front panel controls, including:
  - Fire Brigade Panel to AS 4428.3–2010
  - Alarm Queue display key
  - Fault Queue display key
  - Disablement Queue display key
  - ACF Disable control key
  - Door Holder Disable control key
  - Warning System Disable control key
  - Evacuation test control (Warn System On)
- F220 configuration data generated by the Pertronic FireUtils application can be uploaded in a few minutes using an RS-232 connection or, in a few seconds, using the Ethernet port or a USB flash drive containing the configuration file
- The F220 has a minimum of two independent analogue addressable loops, expandable to 20
  - The loops can accept addressable input devices and addressable relays.
  - The loops are short circuit and over-voltage protected.
- Input devices include Detectors, Manual Call-Points, Loop Responders and Modules.
  - Each input device can be configured for full Fire system operation or indicator only operation.
  - Each input device can be configured to disable any external bell operation or warning system operation.
  - Each input device can be mapped to activate the on-board relays, DHR, ACF, O/P1 and O/P2.
  - Each input device can be mapped to multiple loop relays and display LEDs.
  - Each input device can be mapped to any zone.
  - Each zone can be mapped to multiple loop relays and display LEDs.
  - The sensitivity of each detector can be independently adjusted.
- Addressable Loop Relays can be configured as relays, Sounder relays, ACF relays, or as Door Holder relays.
- On-board relays for external signalling – monitored external Bell relay, monitored Warning System relay, master alarm (fire) relay, Fault relay, Battery Fault relay, monitored ACF relay and a Door Holder relay.
- Disablement of zones or individual loop input devices is possible.
- Comprehensive system test functions include testing all detectors and a battery load test carried out at a programmable time and repeated from once up to seven times a week. A simple menu selection enables the display of individual detector analogue values on the LCD display.
- A 10,000-event history log, each entry is time stamped. The log may be downloaded, for viewing or storing, to a USB flash drive or to a laptop or PC through the high speed RS-232 or Ethernet connections .
- Additional logs for Alarms (2000), Pre-alarms (500), Faults (500), Supervisory (500), Disablements (500), Disablement Activity (500), Active events (500) , System events (500).
- Control inputs include a Panel-MCP and an External Fault input.
- A door interlock provides warning of door closure when panel control functions are in the off-normal state.
- Night mode, when enabled, provides all detectors with a second sensitivity level. Night mode can be controlled by an internal 24 hour timer or an external input.

- **Alarm Acknowledge Facility (AAF)** provides a delay from a local non-brigade calling alarm before calling the brigade. The delay can be extended ONCE by pressing an Acknowledge button and allows the occupant the opportunity to clear the alarm before the brigade is called.
- **Alarm Delay Facility (ADF)** provides a delay, to minimise false alarms, from a local non-brigade calling smoke detectors before calling the brigade. If the occupant has cleared the detector before the end of the delay period, the F220 will return to “Normal’ and the brigade is not called. Unlike AAF there is no Acknowledge button for the occupant to press and, once initiated, the delay period cannot be extended.
- **Alarm Verification Facility (AVF)** provides a delay from all input devices, except heat detectors, MCPs, Disable and 3-way switches, to minimise the number of false alarms. After the device has been activated the F220 will wait for 60 seconds to see if the device is still activated. If it is, the brigade is called immediately. If not, the F220 will wait an additional verification period of 120 seconds. If the device is activated again during the activation period, the brigade is called, otherwise at the end of the verification period the F220 reverts to ‘Normal’.
- **Zone Timers** provide a delay from a local non-brigade calling alarm, within a zone, before calling the brigade. Multiple non-brigade calling alarms in the same zone may cause an immediate brigade call. One zone timer is allocated per zone.
- **Logic Blocks** provide a means of conditioning output control using Boolean logic. An individual block’s logic examines inputs to decide whether the block is active, and if so, enables the output. Conditional operators such as AND, OR and ANY2 can be applied. In addition each input can also be logically inverted. Each of the 999 logic blocks can be configured to operate relays, call the brigade, and turn on sounder and evacuation amplifiers.
- **Timers** allow configurable delays to outputs to be applied. Programmed outputs such as relays can be delayed based on inputs such as date, time of day, or detector state (alarm, defect etc). For example, a timer can be set to call the brigade after prolonged activity, say 5 minutes, on a group of normally non-brigade calling smoke detectors. The F220 has 50 general purpose timers.
- **Fan Control Blocks (FCB)** support air handling control functions conforming to AS/NZS1668.1.1998. It combines elements of both Logic Blocks and Timers for its operation. The F220 supports up to 400 FCBs.
- **Deluge Control Blocks (DCB)** implement specialised logic and timing for the control of deluge systems. It utilises features of the Fan Control Block for its operation. The F220 supports up to 400 DCBs.
- Automatic Daylight Saving adjustment (based on time zone selection at system setup).
- Configurable Fault alert filters minimise nuisance call-outs – suitable for temporary use with intermittent faults.

1.2.2 Serial Communication Facilities

- External High Speed RS-485 Bus: For Mimics/Repeater displays.
- Internal High Speed RS-485 Bus: For Communication between the Mainboard, Keyboard-Display, Charger Controller and Net2Card.
- Low Speed RS 485 Bus: For legacy products such as RS-485 Ancillary Peripherals. See Table 5-3: Low Speed RS-485 Devices.
- RS-232 Port: For upload of configuration data and download of configuration, logs etc. to a laptop or PC.
- USB Port: For upload of configuration data and download of configuration, logs etc. to a USB flash drive.
- Ethernet Port: For upload and download of configuration data, log etc to a laptop or PC.

1.2.3 Access restrictions:

- Access Level 1: Outer door closed and locked. Visual and audible indications can be seen and heard through the transparent outer door. The Manual Call Point on the outer door (if fitted) can be operated.
- Access Level 2A: The panel's outer door has been unlocked and opened. Controls on the fire brigade panel can be operated.
- Access Level 2B: The panel's outer door has been unlocked and opened. Authorised person is able to operate all controls on the Keyboard-Display.
- Access Level 3A: Requires Access Level 2 first. A password is required to enter the 'program' section of the menu, to configure the site data.
- Access Level 3B: Requires Access Level 2 first, then the inner door needs to be opened with a large screwdriver or coin.
- Access Level 4A: Requires Access Level 3B first, then a hardware tool/screwdriver to access or remove the coin cell battery.
- Access Level 4B: Requires Access Level 3B first, then a programming tool and associated software on a laptop is required to download new firmware.

1.3 Options with Requirements

The F220 includes the following options with requirements as specified in standard AS 7240.2-2004**.**

7.8 Output to fire alarm devices

7.9.1 Output to fire alarm routing equipment

7.10.1 Output to fire protection equipment – output type A

7.11 Delays to outputs

7.12 Dependency on more than one signal

7.12.1 Type A dependency

8. Supervisory

8.1 Reception and processing of supervisory signals

8.2 Indication of supervisory signal condition

8.3 Indications of supervisory signals from zones

8.4 Audible indications

8.5 Reset of supervisory signal

8.6 Supervisory signal condition output

9.3 Fault signals from points

9.9 Output to fault warning routing equipment

10 Disabled condition

10.5 Disablement of addressable points

11 Test condition

ZB Alarm Acknowledgement Facility

ZD Ancillary Control function

The F220 includes the following option as specified in standard AS 7240.4 2004.

5.5 Battery function check

The F220 includes an automatic battery function test.

1.4 Specification

Cabinet:		
Dimensions	16U Cabinet:	550(w) x 800(h) x 185(d) mm
	28U Slim Cabinet:	575(w) x 1330(h) x 278(d) mm
	28U Deep Cabinet:	575(w) x 1330(h) x 380(d) mm
	40U Deep Cabinet:	575(w) x 1865(h) x 380(d) mm
	• Specified depth is measured to the front face, excluding the index. Some fittings protrude forward of the front face. • Most cabinets are supplied with a blank white index fitted to the front (FS) or rear (RS) of the cabinet. The index increases the cabinet depth by 3mm	
Material	1.2 mm mild steel, powder-coated	
Colour	Hybrid Cream Wrinkle (colour code HL532/8160, RAL9001)	
Power Supply, Primary:		
5 Amp PSU	**Input**	85-264V AC 50-60Hz, 176 VA
	Output	27.5V +0.5V/-1.0V, 176W
	Quiescent current	15mA
	Maximum Load	4.5 A @ 27.5 Vdc (Charge current <225 mA),124W 2.7 A @ 27.5 Vdc (Charge current 2.1 A), 75W
	Battery Charging Output	27.4 V @ 20°C, temperature compensated for lead-acid batteries 2.1 A maximum current
11 Amp PSU	**Input**	85-264V AC 50-60Hz, 350 VA
	Output	27.5V +0.5V/-1.0V , 350W
	Quiescent current	15mA
	Maximum Load	10.5 A @ 27.4 Vdc (Charge current <225 mA), 290W 8.25 A @ 27.4 Vdc (Charge current 2.1 A), 225W
	Battery Charging Output	27.4 V @ 20°C, temperature compensated for sealed lead-acid batteries 2.1 A maximum current
22 Amp PSU	**Input**	85-264V AC 50-60Hz, 680 VA
	Output	27.5V +0.5V/-1.0V, 680W
	Quiescent current	15mA
	Maximum Load	21.5 A @ 27.5 Vdc (Charge current <225 mA), 590W 15.5 A @ 27.5 Vdc (Charge current 5.2 A), 425W
	Battery Charging Output	27.4 V @ 20°C, temperature compensated for lead-acid batteries 5.2 A maximum current

Power Supply, Secondary:	
Battery	**Nominal Voltage** 24 Vdc (+/- 20%) **Type** Valve Regulated Lead Acid (VRLA) in AGM or Gel types only **Capacity** 7 Ah to 42 Ah (5A and 11A models) 16Ah to 100Ah (22A model) The choice of power supply and battery capacity depends on the system load. This depends on the number and type of optional extras, together with the number and type of external devices powered by the F220 fire alarm panel power supplies. Pertronic Industries provides a web-based calculator for calculating the system load and battery capacity. This is on-line at: http://www.pertronic.com.au/resources/online-tools/battery-size-calculator/
Quiescent Current:	154.7mA F220 panel only, normal state. 56 mA for each 2-loop module. 3.5 mA for each group of 10 detectors, Manual Call-Points or modules. 4 mA each Relay Responder. 20mA each Loop Responder. 145mA Panel in 'Fault' (backlight on). 256.5mA (max.) Panel in 'Fire' (relays and backlight on).
Zone Allocation:	Up to 999 physical zones. Where network sites require unique zone numbers for each panel an offset feature allows zone numbers in the range 0001 to 64999 to be used for the network. See section 12.12 for details
LED Display:	Up to 2048 display LEDs.
Analogue Addressable Loop Circuits	The basic F220 has two analogue addressable loops, expandable to 20 loops with 2-loop expander modules.
Detectors, Manual Call-Points, and Modules:	Each loop can have up to 159 detectors plus up to 99 manual call-points or modules. (Some types of detectors support only 99 loop addresses. See Section 21 for details.) A four-loop F220 will accept a maximum of 636 detectors and 396 Manual Call-Points or Modules. A twenty-loop F220 will accept a maximum of 3180 Detectors and 1980 Modules. Each input module (e.g.detector, call-point) can be mapped to a zone, and to multiple LEDs and addressable relays. Each input module can be configured to independently activate any of EXT STROBE, WARN SYS, DHR/DHRM or ACF/ACFM relays. Each input module can be configured for full 'Fire', Brigade only, or Indicator Only operation. The detectors are tested regularly during normal operation of the system, or on demand through the menu. Zones and individual detectors and Manual Call-Points may be disabled.

Loop Characteristics:	Maximum Loop Length: Up to 2500m end to end (2.5mm^2 cable), with appropriate configuration. Maximum Loop Current: 350 mA. Maximum Loop Resistance: 50 Ω. Conductor Size: 1.0 mm^2 to 2.5 mm^2 Cable Type: Twisted pair cable recommended. Loop configuration must be verified using the loop calculator at http://www.pertronic.com.au/resources/online-tools/loop-length-calculator/
Loop Isolators	Loop Isolators are used to separate the zones within loops.
Detector sensitivity	Detector sensitivities are individually adjustable. Refer to the individual detectors for information on the levels that are available and their default values.
Device Disablement:	Detectors and monitor inputs (e.g. MCP, PSW, FSW, VMD, etc) can be individually disabled. Zones may also be disabled.
Addressable Relays:	There are four types of addressable relay – Warning System, ACF, Door Holder and any configurable Relay. Each loop can include up to 99 addressable relays. The address space is shared with the manual call-point addresses. This means the sum of manual call-points plus addressable relays cannot exceed 99. No two addresses can be the same.
Fire Relay:	Single form C contact, 2.0 A @ 30 Vdc resistive load, normally de-energised.
Fault Relay:	Single form C contact, 2.0 A @ 30 Vdc resistive load, normally energised.
Warning System Relay:	One normally-open contact rated at 30 Vdc protected by a 3A blade fuse, with circuit monitoring.
External Bell/Strobe Relay:	One normally-open contact rated at 30 Vdc protected by a 3A blade fuse, with circuit monitoring.
ACF Relay:	Ancillary Control Function. Single contact, normally-open, monitored by a 10 kΩ End of Line resistor. Rated 2.0 A @ 30 Vdc resistive load. Mappable as ACF.
Disable Relay:	Single form C contact, 2.0 A @ 30 Vdc resistive load.
General Purpose Relay:	Single form C contact, 2.0 A @ 30 Vdc resistive load.
GP ASE Relay:	Single form C contact, 2.0 A @ 30 Vdc resistive load.
Battery Fault Relay:	Single form C contact, 2.0 A @ 30 Vdc resistive load. Operates when battery voltage falls below 23.5 Vdc.
Door Holder Relay:	Single form C contact, rated 5 A @ 30 Vdc. Not monitored. **Note**: For standards compliance the door holder output must be fitted with a monitoring device.
O/P1 Relay:	Single contact, normally-open, monitored by a 10 kΩ End of Line resistor. Rated 2.0 A @ 30 Vdc. Protected by a PTC resettable fuse.

O/P2 Relay:	Single contact, normally-open, monitored by a 10 kΩ End of Line resistor. Rated 2.0 A @ 30 Vdc. Protected by a PTC resettable fuse.
Auxiliary Outputs:	8 mappable auxiliary outputs accessible via 2 connectors; FET current sink drivers; for internal panel use only, 100 mA per output
RS-232 Port	Automatic speed adjustment, 115.2 kb/s (high speed) or 9.6 kb/s
USB port	USB 2.0 compatible, for USB flash downloads and uploads
Ethernet Port	RJ45 10/100 Mb/s
External High Speed RS-485 Bus	Baud rate: 115.2 kb/s 3.5 A maximum load
Internal High Speed RS-485 Bus	Baud rate: 115.2 kb/s 500mA maximum load
Low Speed RS-485	Baud rate: 9.6 kb/s, 500mA maximum load per connector (Internal) Baud rate: 9.6 kb/s, 1.4A maximum load per connector (External)
Earth Monitoring:	An “Earth Fault” indicator is provided on the Mainboard to indicate an earth fault. The external loops, sounders circuits, RS485 busses and other external circuits are monitored for possible ground connection. The case, chassis and other metal parts are tied to mains earth. For normal operation the system resistance to earth shall be greater than 50 kΩ. An Earth Fault will be indicated if the system resistance to earth is less than 500 Ω. ‘Earth Fault’ may be displayed for resistance to earth between 500 Ω and 50 kΩ.
Options:	Conventional Circuit interface; LED repeater panel (up to 8 addressable panels plus global panels); LCD repeater panel (up to 8 addressable panels plus global panels). **Note**: a maximum of 32 devices may be connected to the Mimic port.
Environmental:	Temperature: -10 °C to +50 °C Humidity: +40 °C or below, ≤ 95 % relative humidity +41 °C to +50 °C, ≤ 75 % relative humidity
Cabling:	All cabling for the Pertronic F220 Fire Alarm System shall comply with AS3000 (Australian Wiring Rules) and AS1670.1 (Fire Detection), together with relevant project requirements and local codes or regulations.

Table 1-1: F220 Specifications

1.5 Capacity

Analogue Addressable Loops	Up to 20 loops (max). Basic F220 panel is supplied with 2 loops.	
Intelligent Sensors	3,180 (max)	
Intelligent Modules, MCPs & Addressable Alarm Devices	1,980 (max)	
Zones	Up to 999 consecutively numbered zones per F200 panel, within the range of 1 to 64999.	
Air Handling (Fan) Controls	400 (max)	
Deluge Controls	400 (max)	
Cause-Effect Logic Blocks	999 (max)	
General Purpose Timers	50 (max)	
Alarm Acknowledge Facilities	1200 (max)	
Zone Timers	999 (max). One per zone	
Groups	999 (max)	
Individually Addressable LEDS	2048 (max)	
Network Inputs	999 (max). Inputs 1 to 640 directly configurable. Inputs 641 to 999 accessible via Logic Block facility.	
History Logs	Main Event Log (All)	10,000 events (max)
	Alarm Log	2,000 events (max)
	Pre-Alarm Log	500 events (max)
	Defect Log	500 events (max)
	Ancillary Log	500 events (max)
	Isolation Log	500 events (max)
	Isolation Activity Log	500 events (max)
	Active Event Log	500 events (max)
	System Event Log	500 events (max)
	PSU Log	5,000 events @ 10 min intervals

Table 1-2: F220 Maximum Capabilities

2. F220 FRONT PANEL CONTROLS AND DISPLAY

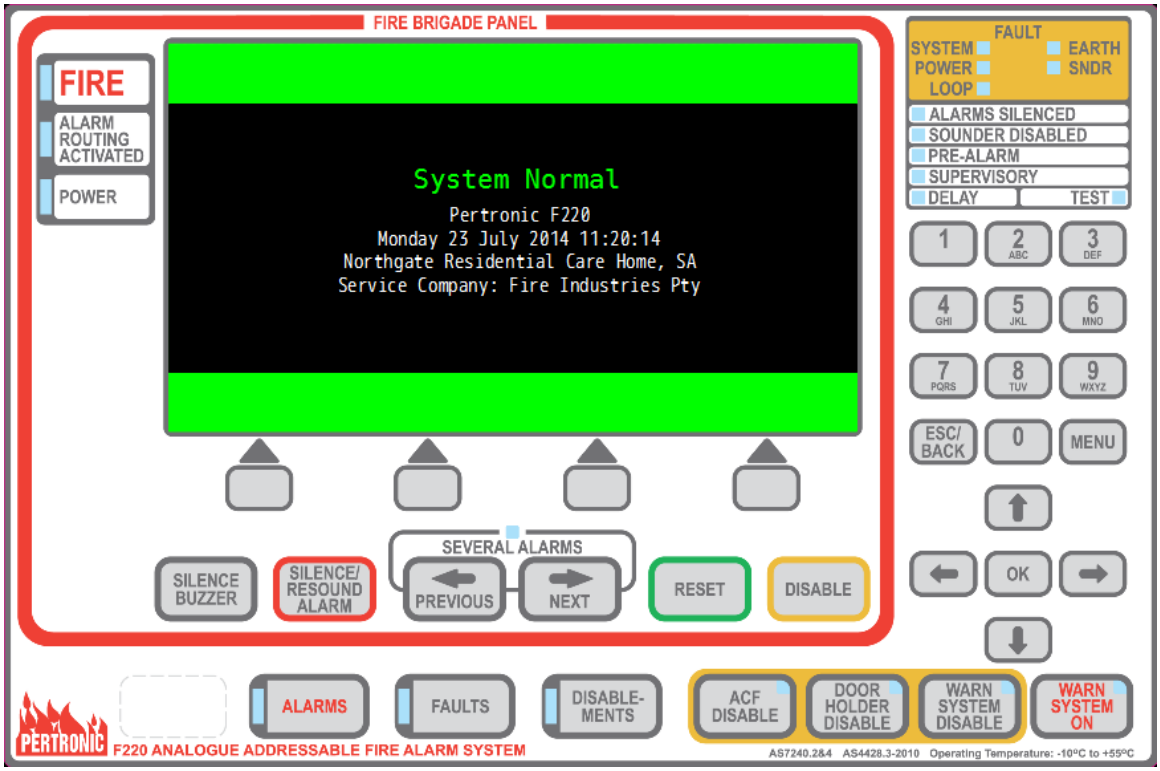


Figure 2-1: F220 Front Panel

2.1 Fire Brigade Panel (AS 4428.3-2010)

The red border as shown in Figure 2-1: F220 Front Panel encloses the Fire Brigade Panel.

See section 9 Operating The Fire-Fighter Facility, for operating instructions.

2.1.1 Fire Brigade Panel Indicators

There are four indicators shown and these are:

Indicator	Function	Colour	Description
	FIRE	Red	General Fire Alarm Indicator.
	Alarm Routing Activated	Red	Indicator for transmitted alarm routing equipment activated. Remains ON until the fire alarm condition is reset.
	Power	Green	ON when mains or battery power is available.
	Several Alarms	Red	Indicator for several alarms. ON if three or more devices are in alarm.

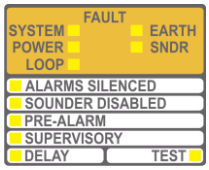
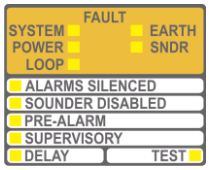
2.1.2 Fire Brigade Panel Controls

Switch	Control	Function
	Silence Buzzer	Press to Silence the CIE alarm / fault buzzer. **Note**: Buzzer resounds for new Alarms
	Silence/ Resound Alarm	Press to Silence sounder devices or Resound alarm devices if the “Alarms Silenced” indicator is ON—toggle action.
	Previous, Next (Several Alarms)	Scroll keys used to view devices in alarm. The scroll keys will only have effect if three or more devices are in alarm.
	Reset	Press to Reset the CIE to its Normal condition. Any faults remaining after the CIE has reset will be re-established within 20 seconds.
	Disable	Press to disable the devices in Alarm. Also can be used to return devices that were “disabled” to their Normal state.

2.2 Engineering Indicators and Controls

The indicators and controls outside the Fire Brigade Panel are for the use of the building owner or service and maintenance personnel. These are shown in Figure 2-1: F220 Front Panel.

2.2.1 Engineering Indicators

Indicators	Function	Colour	Description
	Alarm	Red	Indicates that devices are in alarm and can be viewed by pressing the associated key.
	Fault (Common Fault)	Yellow	Common fault indicator. ON whenever any fault is present on the system. In addition one or more fault category indicators will also be ON.
	Disablements	Yellow	Indicates that devices are disabled. Disablements can be viewed on the display pressing the associated key.
	System	Yellow	ON if a system fault is present—Program monitoring, Configuration memory fault
	Earth	Yellow	ON when an earth fault is detected by the CIE
	Power	Yellow	ON when there is a power fault with the CIE or devices connected to the loop e.g. Mains missing, battery test failure,
	Sndr (Sounder)	Yellow	ON when a sounder fault is present e.g. wiring open or short
	Loop	Yellow	ON when a loop wiring fault is detected, such as a short or open circuit.
	Alarms Silenced	Yellow	ON if alarm devices have been silence by operation of “Silence / Resound Alarm”
	Sounder Disabled	Yellow	ON if Warning System devices have been disabled
	Pre-Alarm	Yellow	ON when detectors have gone off-normal and potentially could soon go into an Alarm state
	Supervisory	Yellow	ON when a supervisory input is in the active state.
	Delay	Yellow	ON when one or more output circuits are in a delayed operating mode
	Test	Yellow	ON when one or more zones are in Walk Test mode.

2.2.2 Engineering Controls

Switch	Control	Function
	Alarms	Press to view a list of all points that are currently in Alarm state (“points” includes: devices, logic blocks, timers etc.)
	Faults	Press to view a list of all current fault events
	Disablements	Press to view a list of all devices currently disabled
	ACF Disable	Press to toggle the disable state of ACF type devices
	Door Holder Disable	Press to toggle the disable state of Door Holder type devices
	Warn System Disable	Press to toggle the disable state of Warning System
	Warn System On	Press to turn ON or OFF the building Warning System (manual evacuation)
	Function Keys	These four keys select the soft-key functions displayed at the bottom of the display
	OK key	Used to accept “edit”, “configuration” and other information for data entry functions. Can also be used to select a highlighted menu item.
	Menu key	1. Used to select User and Engineering Menus. 2. Used to return to top level menu system while in “Classic LCD mode”
	Esc/Back key	1. Used to return to the next higher (parent) level in the menu (except in “Classic LCD Mode”) 2. In “Classic LCD Mode” , Used to enter or exit the various Classic LCD User menu options.
	Navigation Keys	Used to move between “fields” while viewing lists or “editing” functions. Can also be used to move a highlight in menus.
	Numeric Keys	Can be used in some menus when a numeric value is required e.g. entering a zone number

2.3 Alphanumeric LCD Display and Menu Functions

The Colour LCD display is an integral part of the Fire Brigade Panel (AS4428.3-2010) and provides information and menu structures for use by:

- Fire Brigade
- System users
- Technicians
- Engineers

2.3.1 Event Display and Event Queues

Whenever an event occurs on the F220 system it is placed into one of the queues in the table below. The queues are colour coded on the display.

Queue		Contains / example	Priority
Alarm	**Alarm**	Devices in Alarm	Highest
Walk Test	**Walk Test**	Zones that have “Walk Test” alarms	
Pre-Alarm	**Pre-Alarm**	Detectors that are very near the alarm threshold	
Fault	**Fault**	Contains all panel faults such as “duplicate address”, missing devices, power supply faults, system faults, loop faults earth faults, sounder faults	
Disablement	**Disablement**	All devices and zones that have been disabled	
Supervisory	**Supervisory**	Outputs of systems monitoring suppression systems , air handling systems or other life, safety or property protection systems.	
System Events	**System Events**	See Table 8-3: System Event Types	
Active Events	**Active Events**	Typically inputs from monitoring devices that are “off normal”.	Lowest
System Normal	**System Normal**	Normal View (no events in any queue).	

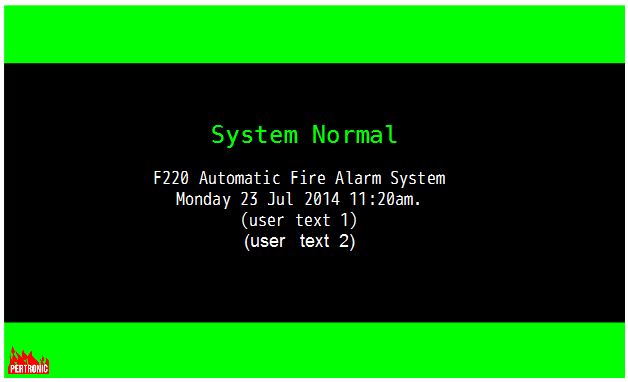
An event queue that contains current information is deemed to be active, and the event queue with the highest priority will be displayed. Other active queues, with lower priority events, will be indicated by the appropriate LED indicator. The user may switch between the events in the active queue that are displayed by pressing the OK key**.**

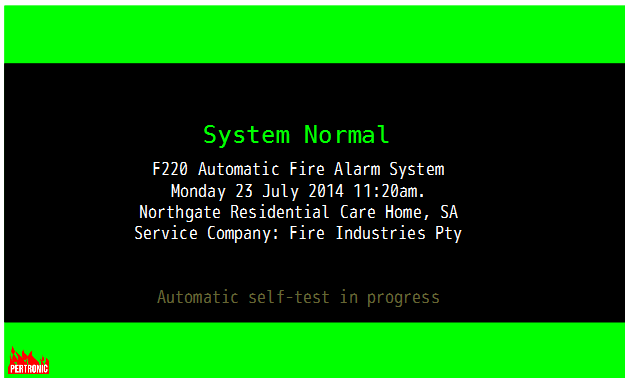
The alarm queue contains active alarms. When all alarms have been either reset or disabled the Alarm Queue becomes inactive.

2.3.2 Normal / Date-Time Display

When the F220 is Normal the following screen is displayed showing date / time and two lines of user text. A variant of the Normal screen is also shown when the system is performing background testing.

These displays may also appear after 5 to 10 minutes of no keypad activity.





2.3.3 System Off-Normal Display

An 'Off-Normal' display will occur if an activity is present but the system is not in alarm nor in a Walk Test.

The colour of the band at the top and bottom of this off-Normal summary display will show the highest priority event being reported.

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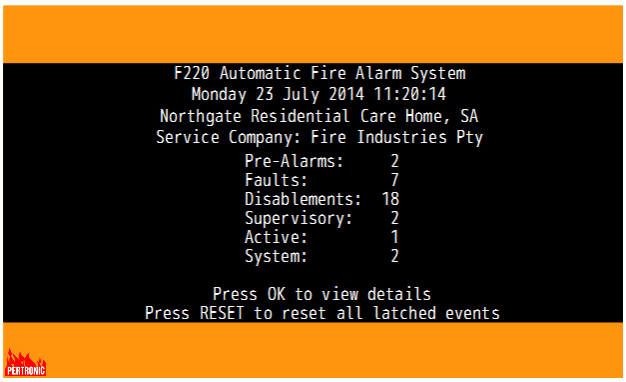
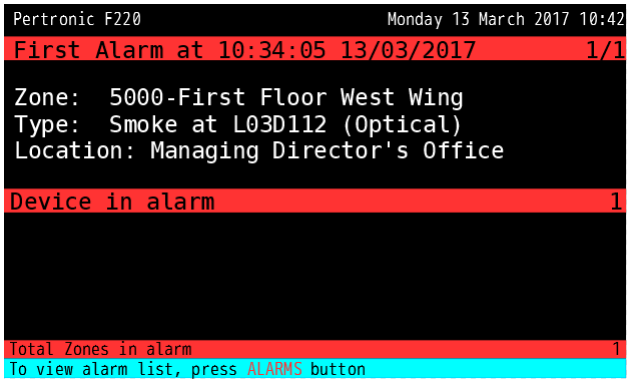


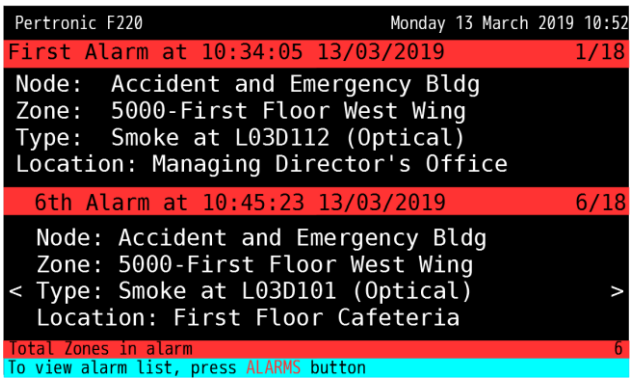
In this example the colour of the bands is "orange" indicating pre-Alarm conditions

2.3.4 Fire Alarm Display

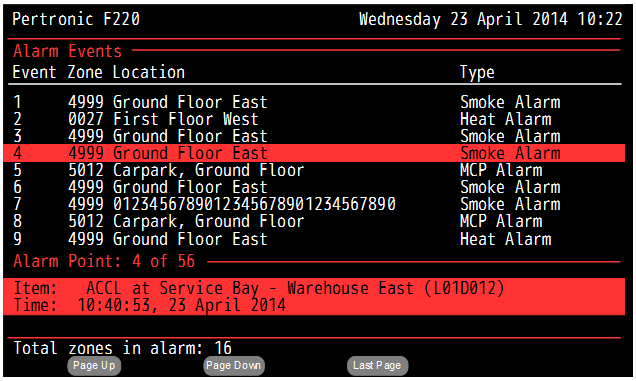
The First Alarm present on the Fire Panel is always presented at the top of the display (diagram below left) and will remain there until the system has been reset.

The next alarm that occurs will be displayed below the first (diagram right below). Subsequent alarms can be viewed, if the panel door is open, by using the Previous and Next keys of the Several Alarms function to scroll through them. Note that the sequence number of the alarm and the time that it occurred is also displayed. With the door closed, alarms will roll over automatically every 10 seconds. Opening the door inhibits the auto scrolling.





Whenever alarms are present the “Alarms” LED will be ON indicating that users can press the associated key to view details of all points that currently are in alarm (“points” includes: devices, logic blocks, timers etc.).

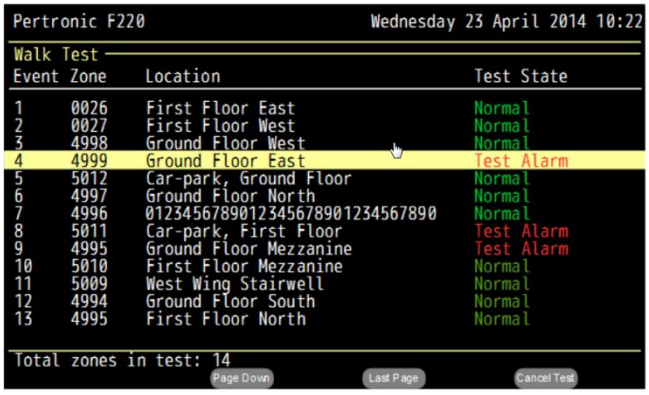


In the example shown there are a total of 56 points in alarm (“points” includes: devices, logic blocks, timers etc.) and these can be viewed by using Page Up or Page Down soft keys. Select a particular event using the keyboard ↑ or ↓ keys.

Each event can be reset or disabled using the Reset or Disable key switches but only after all sounders have been silenced

2.3.5 Walk Test Zone Alarm Display

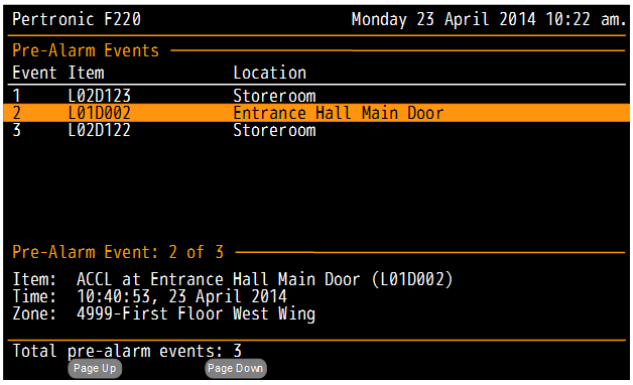
When Walk Test is activated for a zone a screen showing the zones currently in walk test and their state will be displayed.



The user is also able to cancel “Walk Test” on a per zone basis by moving the yellow high light to the desired zone and selecting the “Cancel Test” soft-key

2.3.6 Pre-Alarm List Display

The Pre-Alarm list will be displayed if it is the highest priority active queue. If alarms are present as well these will have priority and the presence of Pre-Alarms is indicated by the Pre-Alarm LED turning **ON**—press the **OK** key to view the Pre-Alarm list.



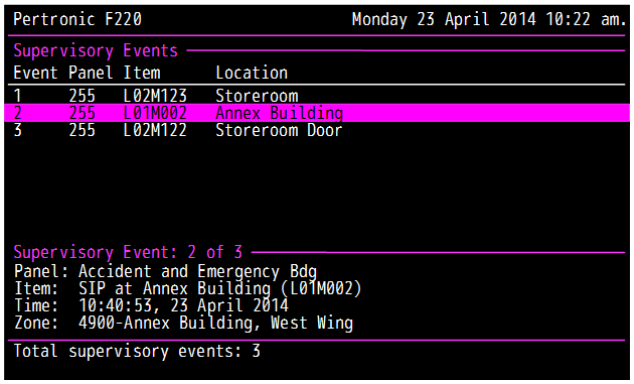
Pre-Alarm events can be selected using the keyboard ↑ or ↓ keys and once selected can be Reset or Disabled

Use Page Up or Page Down soft keys to view information not currently on-screen.

2.3.7 Supervisory Display List

Supervisory events are usually generated by equipment that is monitoring other life safety or property protection systems and indicate an abnormal status other than a fault. Some typical examples are:

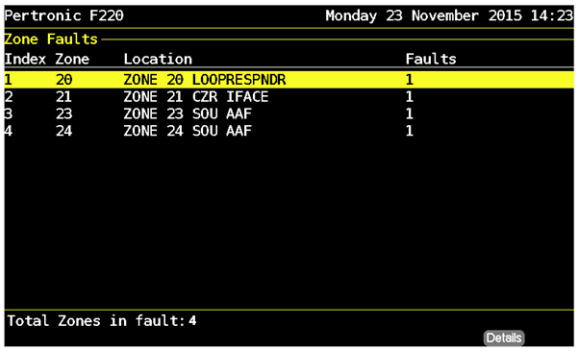
- Fire suppression systems where valve position, water temperature, water pressure and pump conditions are monitored.
- Air handling systems where damper position and fan operation are monitored.



2.3.8 Fault Display

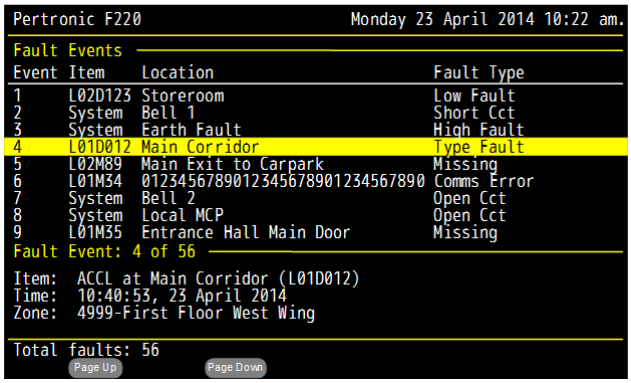
2.3.8.1 Zone Faults

Fault events will initially be displayed at a zone level as shown below. For further details select the zone required using the keyboard ↑ or ↓ keys and press “Details” or “OK”. To return to the Zone Fault display press the Fault key.



2.3.8.2 Fault Events

The General Fault LED will be ON whenever fault events are present and one or more Fault Category indicators (System, Power, Loop, Earth, Sndr). Fault messages are automatically cancelled when the fault is removed. If the display is not currently showing on the screen then it can be viewed by pressing the Fault key or repeatedly pressing OK until it appears



Fault events can be selected using the keyboard ↑ or ↓ keys and once selected can be Reset or Disabled

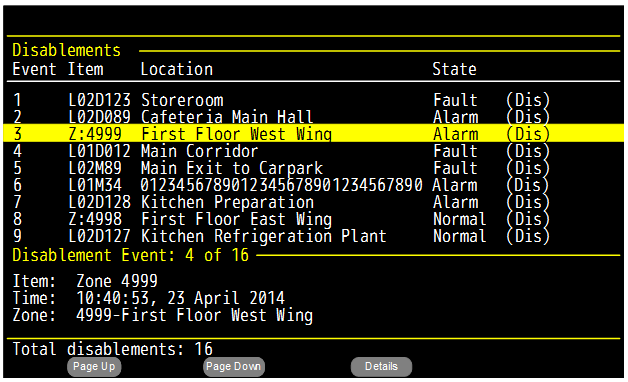
Use Page Up or Page Down soft keys to view information not currently on-screen

Note:

Buzzer on Fault can be globally enabled or disabled for networked panels in FireUtils or on individual panels by setting or resetting the FitBuzz flag. See Section 12.7.1: System Flags. The flag setting on individual panels overrides the global setting.

2.3.9 Disablement Display

The Disablement LED will be ON whenever devices have been disabled. If the display is not currently showing on the screen then it can be viewed by pressing the Disablement key or repeatedly pressing OK until it appears.

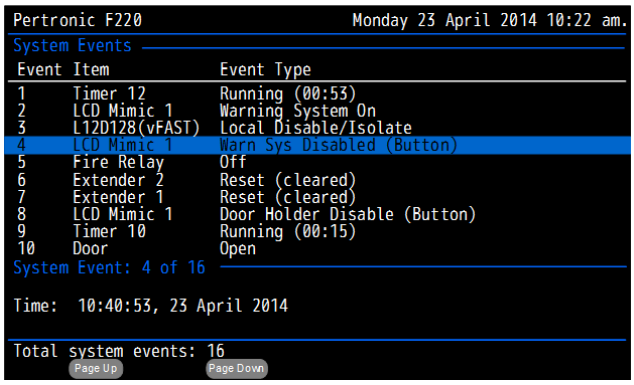


Disablement events can be selected using the keyboard ↑ or ↓ keys and once selected can be Reset or Disabled

Use Page Up or Page Down soft keys to view information not currently on-screen

2.3.10 System Events

System Events, when present and not the highest priority, can be viewed by repeatedly pressing OK until the screen is visible.

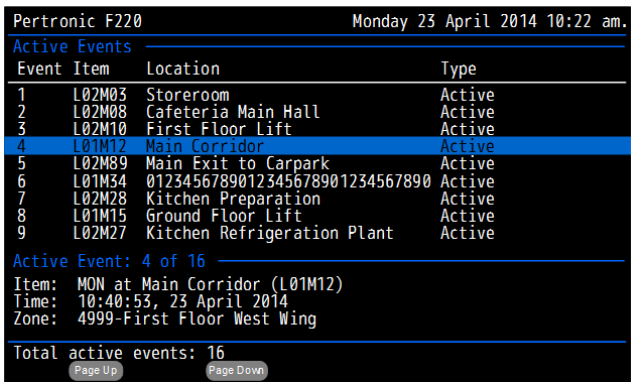


Time and date information for the currently selected event can be viewed at the bottom of the screen. The blue selection bar can be moved by using the keyboard ↑ or ↓ keys.

Use Page Up or Page Down soft keys to view information not currently on-screen

2.3.11 Active Events

Active Events when present and not the highest priority can be viewed by repeatedly pressing OK until the screen is visible.

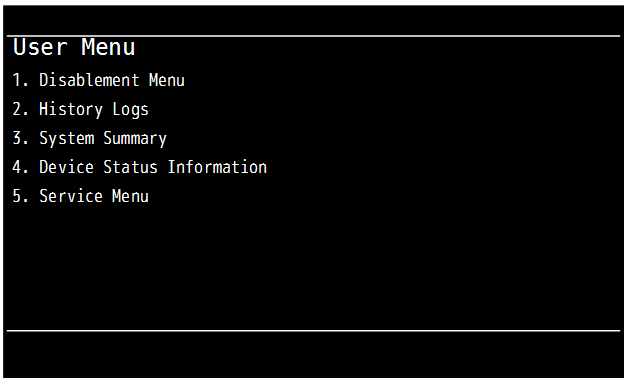


Further information for the currently selected event can be viewed at the bottom of the screen. The blue selection bar can be moved by using the keyboard ↑ or ↓ keys.

Use Page Up or Page Down soft keys to view information not currently on-screen

2.3.12 User Menu Operations

The User Menu is used for accessing functions such as Disablement functions, History Logs, System Summary, Device Status Information and Service Menu (Engineers).



The first, or top, level of the User Menu is reached by pressing the Menu Key followed by the numeric key corresponding to the sub-menu option required.

For further information on the User Menu and its functions, refer to section 10.

2.3.13 Engineer's Menu Operations

The Engineer's Menu is available from the Service Menu (option 5) and is accessed using Classic LCD Mode.

It can be used for functions such as modifying detector configurations and entering or changing zone and device descriptors.

A password is required from the operator before the Engineer's Menu is entered.

Note:

It is recommended that the F220 configuration tool FireUtils be used to make configuration changes to the panel

For further information on the Engineer's Menu and its functions, refer to Section 12: Operating the Engineer's Menu.

3. SYSTEM STARTUP AND SYSTEM SELF-TESTS

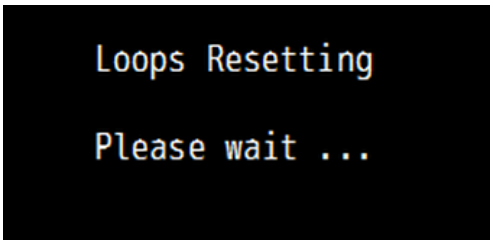
3.1 System Initialisation

When the F220 system is first powered up or Reset the following processes will occur before the system is able to process “device activations”:

- The boot-loader program loads a copy of the operating system from non-volatile memory to RAM;
- The operating system is initialised and runs;
- The F220 fire panel application starts running; and
- Independently the Keyboard-Display unit starts up and establishes communications with the Mainboard

Note:

Once communication is established with the Keyboard, the LCD will display a Normal condition. However, it will be at least another 20 seconds before the loop drivers have initialised and are polling their loops for device activity.



While the loop drivers are initialising the message (diagram left) will be displayed

3.2 Normal Operation System Tests

When the F220 is operating, various tests are continually performed. These tests fall into two categories:

a) General system tests carried out by the F220 Mainboard; and

b) Loop tests carried out by the Loop Driver Boards.

3.2.1 System Self-Checks

Frequency	Check
500 ms	Monitored Bell Relays, Monitored ACF Relay, Door Open, Earth Leakage, CRC Check.
One second	Battery Voltage, Mains Present.
Sixty Seconds	Battery Present.
Daily	F220 Fire Alarm System on runs on secondary supply for a period of 40 minutes.
Each time the panel door is closed	Check for correct number of LCD and LED mimics

3.2.2 Loop Tests

Frequency	Check
Every poll cycle	Loop Continuity; Monitored addressable relays; Missing detectors or modules.
Each time the panel door is closed; And after entering Engineer's Menu.	Check for extra (un-configured) loop devices
24 hours (and door closure as above)	Detector test

Note:

If the loop configuration is changed remotely using a connected NET2CARD network, the detector test does not occur until either the F220 panel door is opened and closed or the automatic 24-hour test starts.

3.2.3 Watchdog:

If the processor does not pass regularly through predefined firmware locations, the watchdog resets the processor, and a fault is signalled on the automatic restart.

4. ANALOGUE ADDRESSABLE LOOP

Detection circuits in the Pertronic F220 fire alarm system use analogue addressable loop architecture. A system may have up to 20 analogue addressable loops. Each loop consists of a single-pair cable connected in a loop, from the loop driver (A terminals), to each analogue addressable device in turn, and finally back to the loop driver, (B terminals). The loop is effectively driven from both ends. This means that an open circuit fault, anywhere on the loop, will not affect its operation.

Analogue addressable fire system devices include smoke detectors, heat detectors, manual call points, monitor modules, loop responders, and loop relay units. A mixture of device types may be used. Section 16: Detectors and Modules lists the addressable devices that may be connected to the F220.

Each loop provides detector addresses 1 to 159 for smoke and heat detectors, and module addresses 1 to 99 for manual call points, relays, loop responders, etc.

A maximum of 258 devices may be installed on each loop (159 detectors plus 99 modules). Each detector or module must have a unique address. No two detectors can have the same address and similarly no two modules can have the same address.

The zones within a loop are determined by the premises layout and the routing of the loop wiring. Each zone is allocated a zone number and can be allocated a 31 character zone descriptor.

The F220 detects loop faults by performing a continuity test before each poll sequence. Loop isolators are used between zones to prevent more than one zone being lost in the event of a loop short-circuit.

Figure 4-1 illustrates a system with two analogue addressable loops, showing detectors (D), modules (M), isolators (ISO) and a possible device numbering scheme.

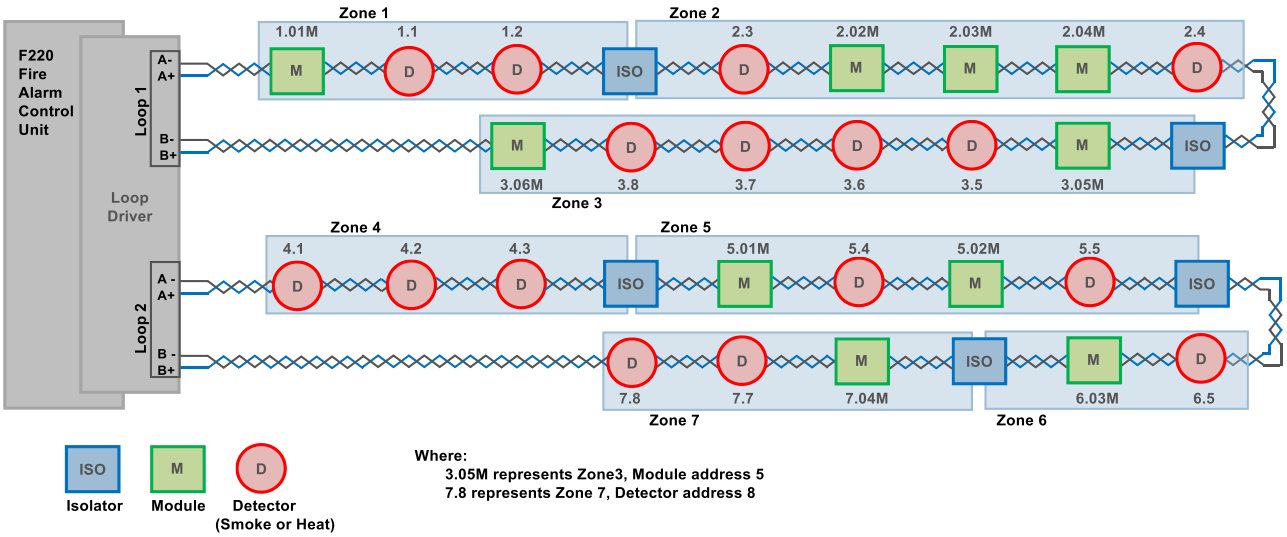


Figure 4-1: Device Labelling

Note:

The number of detectors in each zone, and the number of zones covered by a single analogue addressable loop, may be limited by regulatory or project requirements. Consult all applicable regulations and specifications to ensure that any proposed loop configuration complies with all mandatory requirements

4.1 Loop Driver

Analogue addressable loop circuits are controlled by one or more F220 Loop Driver units.

Each F220 Loop Driver is responsible for two analogue addressable loops and executes commands for devices relating to operation and disablement. It sends the current alarm and fault status to the F220 Mainboard for each connected device and reports its own current status.

The Loop Driver performs the following functions:

- Polls loop devices for current status
- Compares device readings with alarm thresholds
- Updates detector clean air values once per hour
- Communicates with the F220 master controller

Optionally, the loops may be operated from an isolated 24 Vdc power supply

4.2 Loop Design

The analogue addressable loop must satisfy applicable regulatory requirements (see section 18, as well as the F220 system specifications).

The maximum end-to-end loop length depends on the cable characteristics, as well as the number, type, and distribution of connected devices, including detectors and modules.

To develop a practical layout for an analogue addressable loop, it is necessary to consider the effect of two factors: Series cable resistance (Section 4.2.1), and the positions and current consumption of loop devices(Section 4.2.2).

Pertronic Industries provides a web-based calculator for checking loop configuration. This is available on-line at: http://pertronic.com.au/resources/online-tools/loop-length-calculator/

Twisted pair cable is recommended as it offers better crosstalk and interference performance over untwisted cable when placed near other cables. Loop cable runs alongside and close to other cables that may produce, or be susceptible to, interference should be avoided.

4.2.1 Series Cable Resistance

The maximum end to end loop cable resistance must not exceed 50 ohms: That is, each leg of the circuit shall not exceed 25 ohms (2 x 25= 50).

This leads to the following upper limits on the end-to-end loop length:

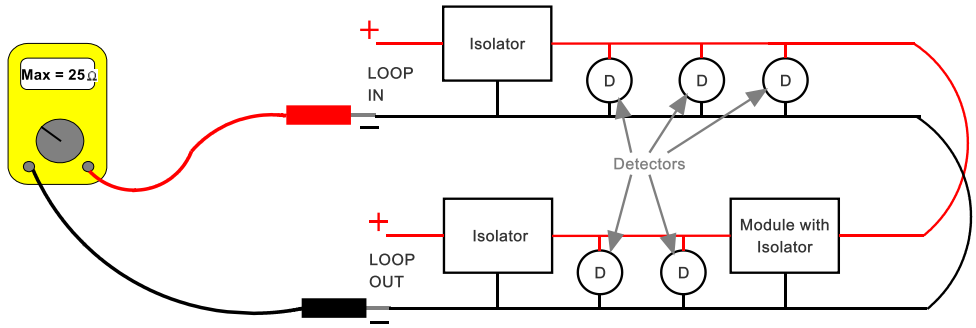
Conductor Size	Upper Limit on Loop Length
2.5 mm²	2500 metres
1.5 mm²	1500 metres
1.0 mm²	1000 metres

Table 4-1: Upper Limits on Loop Length

In practice it is not feasible to directly measure the loop cable resistance after loop devices have been installed. This is because each isolating device is an open circuit unless the loop is powered up. Powering up the loop makes it impracticable to measure the cable resistance with an ordinary multimeter.

There are two alternative technques:

1. Using a multimeter
   Unplug the loop from the Loop driver, and as shown below, measure the resistance between Loop In negative and Loop Out negative. This value should not exceed 25 ohms. Assume the positive leg has the same or similar resistance value.



2. Using the Pertronic Loop Cable Tester.

   Pertronic Industries recommend using the Pertronic Loop Cable Tester (LOOPTEST-KIT-A) to check loop cabling during installation and commissioning.

   https://pertronic.co.nz/displayproduct?product=224

4.2.2 Effect of Loop Configuration on Maximum Loop Length

The loop lengths shown in Table 4-1 are suitable for a lightly loaded loop with devices evenly distributed along its length. If the loop is heavily loaded, or if the devices are bunched close together, then it may be necessary to reduce the loop length.

Note:

The total current consumption of all devices on the loop must not exceed the maximum current capacity of the F220 Loop Driver: 350 mA

Pertronic Industries provides a web-based calculator for calculating the loop configuration. This is available on-line at:

http://pertronic.com.au/resources/online-tools/loop-length-calculator/

4.3 Fault Isolation Between Zones

A loop isolator is used to electrically isolate adjacent sections of the analogue addressable loop.

An isolator must be installed at each zone boundary, if the applicable regulations or system requirements demand that a fault in one zone shall not prevent normal loop operation in any other zone. The isolator monitors adjacent loop connections for short-circuits. If a short-circuit is detected, the isolator disconnects the loop connection to the faulty zone.

Provided that both ends of the loop are terminated at the F220, and there is an isolator at each side of each zone, a short-circuit on any zone will not affect the operation of the rest of the loop.

Suitable isolators include

- System Sensor M500X Isolator Module,
- System Sensor ISO524-1 Isolator Module
- System Sensor B524IEFT-1 Detector Base with Isolator,
- Pertronic Loop Responder,
- Pertronic Loop Relay.

Isolators are not required adjacent to the F220 as isolation is provided by the F220 Loop Driver board.

The following diagram illustrates a typical loop configuration with isolators at appropriate locations:

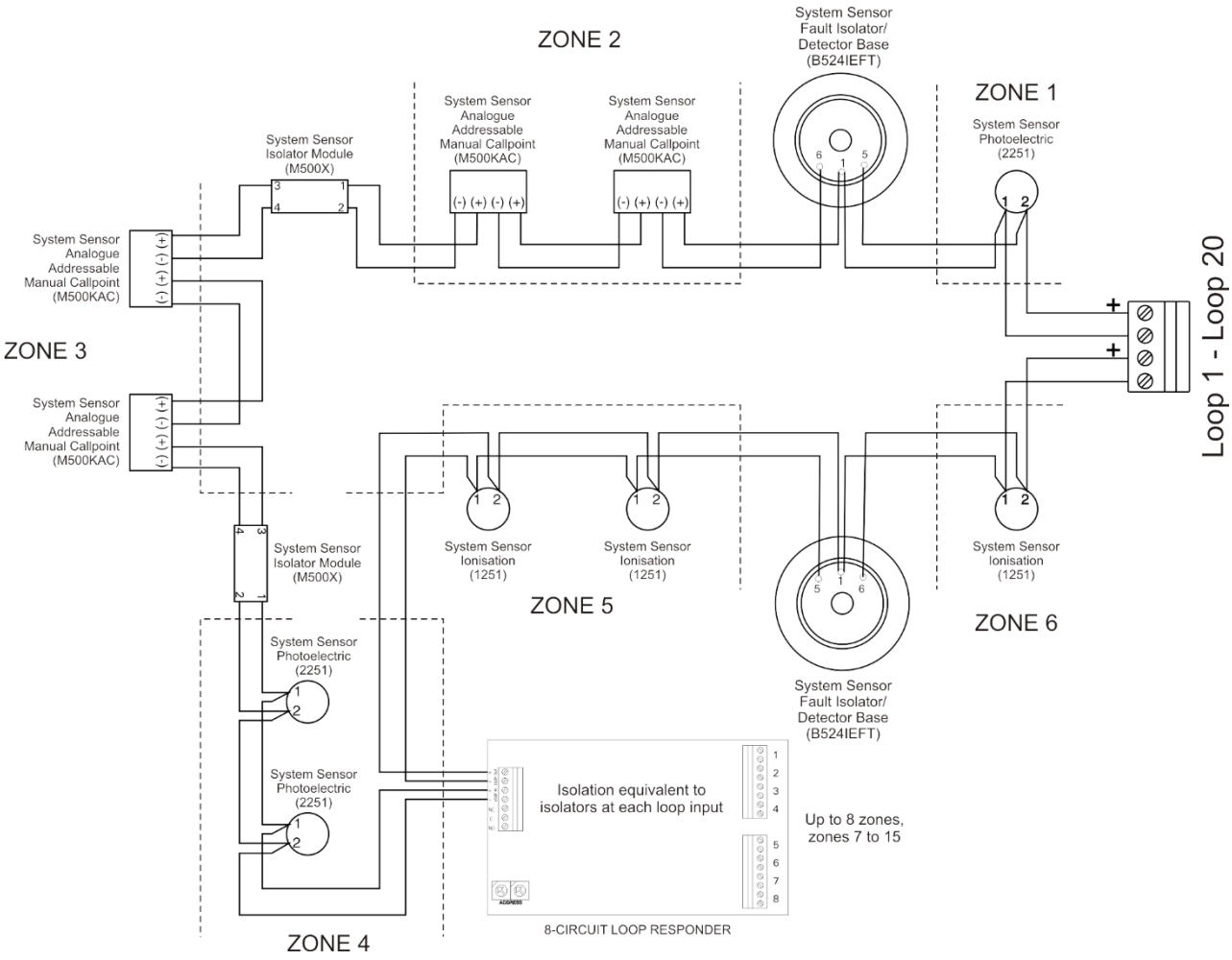


Figure 4-2: Isolation Between Zones

4.4 Detectors

The analogue addressable detectors used by the F220 and their corresponding Type designators are:

Type Designator	Description
ION	System Sensor 1251BPI Ionisation smoke detector
OPT	System Sensor 2251BPI Photoelectric smoke detector
HEAT	System Sensor 5251BPI and 5251B-WP Fixed temperature heat detector
HEAT	System Sensor 5251RBPI and 5251RB-WP Rate of Rise heat detector
ACCL	System Sensor 2251TMBPI Acclimate™ Detector
ACCL	System Sensor 2251CTLE-34-IV and 2251TLE-34-IV Detector
LASR	System Sensor 7251 Pinnacle™ Laser Detector (Deprecated)
LASR	System Sensor 7351 Pinnacle™ Laser Detector
BEAM	System Sensor 6500S-34 Reflected Beam Detector
FAST	System Sensor BPI series FAAST™ Aspirated Smoke Detector

Table 4-2: Detector Type Designators

Two levels of detection are implemented for analogue detectors, “Pre-Alarm” and “Alarm”. When the “Pre-Alarm” level is reached, a Fault is generated; and when the “Alarm” level is reached, an “Alarm” is generated.

Each detector can be configured for a range of sensitivities.

The detectors are polled every 2 to 10 seconds, depending on the number of devices on each loop.

Each of the parameters shown in Table 4-3 may be set, through menu functions, for each detector.

Parameter	Value	Description
Sensitivity	-5 to +3	The number of levels available depends on the device type. The default sensitivity value is 0. More sensitive levels are positive, less sensitive are negative.
Configuration Flags	Warning System	Setting ‘W’ active causes the monitored WARNING SYSTEM relay to activate when the detector is in the alarm condition.
	External Strobe	Setting ‘E’ active causes the monitored EXTERNAL BELL/STROBE relay to activate when the detector is in the alarm condition.
	Brigade	When Brigade is set, the ‘Fire’ relay activates in the alarm state. This affects both the Brigade transmission and the clean contacts.
	ACF	Selecting ACF causes the ‘ACF’ relay to activate when the detector is in the alarm state. If ACF disable is active (ACF Disable), the detector will have no effect on the auxiliary relays.
	Door Holder	When set, the Door Holder relay activates when the detector is in the alarm condition. If the door holder relays are disabled (Door Holder Disable), the detector has no effect on the relay.
	Alarm Queue/ Buzzer	When set, the local buzzer is sounded when an alarm condition occurs. Press “Silence Buzzer” key to silence. If the alarm is reset and subsequently a new alarm occurs, the buzzer sounds again.
	Latching	If a detector is set as ‘latched’, the alarm condition is latched by the F220, otherwise the output follows the state of the detector.
	Brigade Latch	Non-latching until the brigade is called, at which point the detector acts as though the Latch is set.
	Zone Trip (Relays only)	Setting Zone Trip ensures that the relay latches ON once activated, regardless of the state of the triggering device. The relay is unlatched with the Global Fan Reset signal (see for section 8.10.3 details).
	AVF (Also known as Type A dependency – AS7240.2 clause 7.12.1)	OFF or ON. This option sets the ‘Alarm Verification Facility’ for a device (all input devices except Heat detectors, MCPs, Disable and 3-Way switches). If AVF is set and the device goes into the ‘Alarm’ state within the verification period following the first activation, the F220 will signal the appropriate ‘Alarm’ condition for that device.

Table 4-3: Device Parameters

Detectors may also be assigned the following parameters:

Parameter	Description
Zone Number	A number 1 to 64999 (or zero (0) for no assignment) which corresponds to a physical zone area in the building. **Note**: 1. The Network Zone Offset parameter has an effect here (see section 12.12). The Zone Offset is required where a large number of panels on a network are required to use unique zone numbers for display. The offset simply increases all apparent zone numbers by the offset value. The range of zone numbers remains at 999, and zone 0 is still valid in those cases where a zone number is not required. The maximum value of the Zone Offset is 64000, resulting in a displayed zone range of 64000 to 64999 inclusive. 2. The Network Zone Offset parameter for each panel on the network is set that panels 'Panel Editor' in FireUtils
Descriptor	A 31-character descriptor can be assigned to each detector. This descriptor is used when displaying an event associated with the detector on the LCD display. Both the detector and zone descriptors are normally used on the display. If the detector has no descriptor assigned, the zone descriptor only is used, otherwise the "Loc:" field is left blank. A descriptor can be assigned to a detector using the Loop Editor in FireUtils.

Table 4-4: Detector parameters

4.5 Virtual Detectors

A Pertronic virtual sensor is one where the analogue output of one sensor (the "parent") is used to generate different states which are used typically to warn, or give a "heads-up", of a more serious condition that is about or could occur.

An F220 may have "virtual" detectors programmed. Each virtual "child" detector has a copy of the current status of the "parent" detector, but is processed as an independent detector with separate alarm level, output mapping, and descriptor. This allows for up to four (4) different levels of panel response based on detector sensitivity.

The F220 uses a lower-case 'v' to designate virtual detector types. Hence a parent "OPT" detector can have child "vOPT" detectors and a parent "ACCL" can have child "vACCL" detectors, etc. Parent detectors are programmed as usual, but any virtual devices must be programmed at the address immediately following the parent's address.

An example of virtual detector use might be to use the System Sensor® Pinnacle™ Laser detector to provide escalating response to different levels of smoke, as illustrated below:

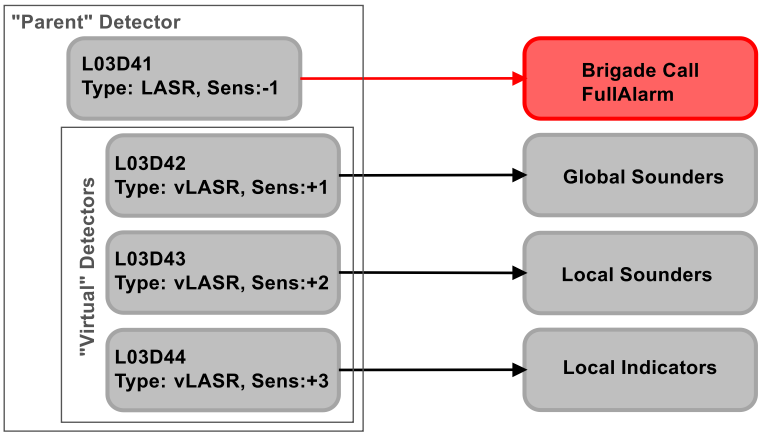


Figure 4-3: Example of Virtual Detector Use

4.5.1 Limitations

- Virtual detectors cannot be configured to be Brigade Calling. This function must be programmed into the base detector, if required. Consequently, it is expected that all virtual devices will be more sensitive than their parent detectors.
- Similarly, there are no Pre-Alarm events generated for virtual detectors.
- There can be at most 3 virtual devices attached to a real detector.
- The only Fault event generated by a virtual detector is for Type Mismatch. This will occur if there is no parent, a different parent type, a real detector at the same address, or if there are more than 3 virtual detectors configured.

4.6 Manual Call-Points

The F220 uses the System Sensor Addressable Call-Point, product codes: AAMCPT, AAMCP-TWP-MK2 (Weatherproof) and AMMCPT-E (Euro-style enclosure)

Manual Call-Points are polled (worst case) every 3.2 seconds. If activation of a call-point is detected, the call-point is polled immediately to re-confirm the ‘Alarm’ state, giving a maximum response for a call-point alarm of 4.1 seconds.

Manual Call-Points give ‘Normal’, ‘Fault’, and ‘Alarm’ states to the F220.

Each call-point can have parameters programmed through the menu system. The parameters are the same as for the detectors, except for ‘sensitivity’ and ‘AVF’ which are not applicable to Manual Call-Points.

Manual Call-Points may also be individually assigned a zone number and descriptor, as for detectors (described in Section 8.5 Boolean Logic Block Mapping

).

The selected address (1 to 99) is part of the Module address allocation.

4.7 Monitor Modules

The F220 uses the following modules for additional inputs to the system:

- System Sensor M201E-240 Mains Switching Output Module
- System Sensor M220E Dual Channel Input Module
- System Sensor M221E Dual Channel Input – Single Channel Output Module
- System Sensor M500MB Monitor Module
- System Sensor M500X Zone Isolator
- System Sensor M501M Monitor Module (Miniature)
- System Sensor M210E-CZR Conventional Interface Module

A variety of Type designators, with corresponding functions, are allowable for input modules. These are programmed and controlled in a manner similar to Manual Call-Points and are assigned parameters and descriptors in the same way. Monitor modules may be programmed for unlatched operation.

The input device Type designators and a description of their function are listed in Table 4-5.

Type Designator	Function and Operation	
MCP	Manual Call-Point	Always latches, Brigade Latch and AVF disabled.
SPR	Sprinkler	As for MCP operation, except that Unlatching, AVF and Brigade Latch are allowed.
FSW	Flow Switch	
PSW	Pressure Switch	
VMD	Valve Monitor Device	
SIP	Sub-Indicator Panel	
ISO	Disable Switch	When active, the zone assigned to the input is disabled, along with all other devices within that zone. When the input is returned to Normal, the zone is no longer disabled, and all other devices within the zone are returned to the Normal state.
M512	Conventional Zone Monitor Module	A single zone of conventional devices may be connected to a Conventional Zone Monitor module and configured like detectors with Unlatching, Brigade Latch and AVF allowed. Powered from the analogue loop or an external PSU. May be reset from panel.
ZMU	Zone Monitor Unit	Used only by M502 modules. A zone of conventional devices may be connected to the M502 module. An external PSU is required. To reset latching devices, the PSU supply to the M502 must be broken with a relay. This relay may be triggered from the “Device Reset” system event output.
BMIF	Conventional Beam Detector via interface	For a beam detector, an external reset is required to unlatch the device, so the “Device Reset” event will also be triggered for a BMIF device as for ZMU.
SW	Switch input	As for MCP operation, except that Unlatching is allowed.
PLNT	Switch input - PLNT	
MON	Switch input - MON	
VES	VESDA input	
SW_H	Hidden Switch input	The SW_H device type is for controls that do not require display or event logging, latching is not allowed.
LPRS	Loop Responder	8 zones of conventional devices may be connected and configured as for detectors with Unlatching, Brigade Latch and AVF allowed.
SW3	3-Position Switch	Used to handle commonly used switches (e.g. fan, damper controls) that use an OFF/AUTO/ON layout. Uses a standard loop input module, but treats Short as “OFF” and Open as “ON”. The normal condition (47 kΩ EOL) is the “Auto” position.
FANC	F100 Fan Controller	Deprecated. The F220 recognises this type to support upgrading older systems. New systems should use the F220 Fan Control Block logic and accessories.
FANR	F100 Fan Relay Unit	Deprecated. The F220 recognises this type to support upgrading older systems. New systems should use the F220 Fan Control Block logic and accessories.

Table 4-5: Input Device Type Designators and Description

Some modules provide a two- or four-wire monitored input circuit. A 47 kΩ EOL (end of line) resistor is required for the two-wire configuration. (Refer to the Installation and Maintenance Instructions for the M500 series modules, System Sensor document M500-05-00).

The selected address (1 to 99) is part of the Module address allocation.

For conventional device operation, the Pertronic Loop Responder (refer to Section 4.5) may be a better choice than the M502 module. The M502 requires an external supply, and resetting the detectors or modules is more difficult.

4.8 Loop Responder

An eight-circuit Loop Responder is available for use in F220 systems.

The Pertronic Analogue Addressable Loop Responder (AALR-MFA) provides an interface to conventional detector circuits. It is used primarily in conventional circuit Smoke mode to interface zones of conventional detectors into an F220 fire alarm systems. It also has a Switch mode, which is designed for monitoring control switches, sprinkler valve interface switches, reading the Fault and Alarm status from FAAST™ systems, or receiving commands from a SCADA system.

The Loop Responder has eight individually addressable 2-wire detector or switch circuits; as well as one addressable voltage-free form C (change-over) relay contact. The unit has an integral loop isolator, and may be powered from the analogue addressable loop, or from an isolated external power supply unit.

The Loop Responder Type Designator is LPRS.

As for detectors, the parameters and descriptors are assigned for each conventional circuit on the loop responder, using the menu system.

Note:

1. The Pertronic Loop Responder uses 9 address spaces. The addresses are allocated in sequence with the lowest address being set by the rotary switches on the responder.

   For example, for responder switches set to address 41, the responder occupies addresses 41 to 49 inclusive. The first 8 addresses are allocated to the circuits (1 to 8 respectively), the 9th address space is the output relay. In the example, this is address 49. The selected addresses (1 to 99) share the Module address allocation.
2. If a conventional detector is inadvertently wired to the analogue loop on a Apartment Module a defect will be generated on the panel

For further information, refer to the Pertronic Loop Responder AALRES-A Technical Manual.

4.9 Loop Input Device Parameter Default Settings

The default settings for the Loop Input devices are:

Parameter	Default State	Notes
Sensitivity	zero (0)	Applies to detectors only
Warning System	set	All loop input devices
External Bell	set	All loop input devices
Brigade	set	All loop input devices
ACF	set	All loop input devices
Door Holder	set	All loop input devices
Latched/Unlatched	Latched	All loop input devices
Brigade Latch	clear	All loop input devices
AVF	OFF	Applies to all input devices except Heat detectors, MCPs, Disable and 3-Way switches.

Table 4-6: Default Device Settings

4.10 Loop Relays

The F220 uses System Sensor M500S Supervised Control Module, System Sensor M500R Relay Control Module, Pertronic Loop Responder (AALR-MFA) and Pertronic Loop Relay (AALREL) for relay operation. All four are analogue addressable devices. The selected address (1 to 99) is part of the Module address allocation.

The M500S control module relay output has a monitored set of relay contacts that use a 47kΩ EOL (end of line) resistor for monitoring purposes. (Refer to the Installation and Maintenance Instructions for further information).

The Pertronic AALR-MFA Loop Responder relay uses the 9th address from the base input circuit address of the responder. This relay has a clean single changeover contact. For further information, refer to the Pertronic Loop Responder Technical Manual.

The Pertronic Loop Relay AALREL has 4 pairs of relay contacts available. Each relay pair has one monitored contact and one non-monitored (clean) contact. The Loop Relay (PCB version 2.00 onwards) uses 4 or 8 addresses, starting from the base address selected on the unit. Four addresses are used in 'non-pulsing mode', and 8 addresses when 'pulsing mode' is selected. When 'pulsing mode' is selected, the first two addresses correspond to Relay1, the next two addresses to Relay2, and so on. When the first of each of the two relay addresses is activated, the relay will pulse; when the second address is activated, the relay will remain ON continuously.

All relays can be allocated a zone number (1 to 64999), which corresponds to the physical zoning of the loop devices. The zone number is used by the F220 when reporting a Fault state from a relay control module, and to disable the module when the zone is disabled.

For further information, refer to the Pertronic Loop Relay Technical Manual.

Loop Relays can be configured through the menu system to be one of four types (Table 4-7).

For further information on mapping of Groups and LED number mapping to relays, refer to Section 8: Mapping.

Type	Description	Operated by	Disabled by
ACF ACFM	ACF Relay type monitored and non-monitored	Output mapping*	Disabling the zone in which the relay is assigned, or by disabling the device address. Operating the panel ACF DISABLE push button
DHR	Door Holder type not monitored	Output mapping*	Disabling the zone in which the relay is assigned, or by disabling the device address. Operating the panel DOOR HOLDER DISABLE push button.
WRN WRNM	Sounder Relay type monitored	Output mapping* Panel MCP input The panel 'Warn System On' push-button or from a Mimic or Repeater connected to the External High Speed RS-485 Bus	Isolating the zone in which the relay is assigned, or by isolating the device address. Operating the panel WARN SYS DISABLE push button.
RLY RLYM	Relay Output type monitored and non-monitored	Output mapping*	Disabling the zone in which the relay is assigned, or by disabling the device address.

Table 4-7: Output Device Types

4.11 Loop Relay Settings

Parameter	Value	Description
Flags	Zone Trip	Setting 'Zone Trip' ensures that the relay latches ON once activated, regardless of the state of the triggering device. The relay is unlatched with the Global Fan Reset signal (see Section 8.2.7: Fan Reset for details)
	Screen	Forces events to be displayed on the F220 Keyboard-Display (defaults to Active Events queue) and forces History and Export to be set.
	Export	Broadcasts relay state of network NMO's for status reporting in FireMap. Force History to be set.

Table 4-8: Additional Flags for Loop Relays

4.12 Isolating the Loop Driver Power Supply

Usually the loop driver is powered from the panel power supply. However, in situations where crosstalk results from loops on other loop drivers the option exists to fit a DC:DC Converter and operate the F220 Loop Driver from an isolated supply.

A typical situation can occur if building wiring must be re-used in a retrofit situation or screened cable has been used in a 'high noise' environment.

Since all communications interfaces between boards use optically isolated connections, all that is required to isolate the loop driver from its neighbours is a separate 24 Vdc, 0.7 A (or greater) isolated power connection (24 Vdc:24 Vdc Converter: PB12H-2424F).

To convert a Loop Driver to operate from an isolated supply:

a) Retain the connection of the panel power supply to connector K6/K11;

b) Remove links LK1 and LK2;

c) Insert a 24 Vdc:24 Vdc converter or isolated 24 Vdc power supply connected to K10.

Note:

The panel supply must remain connected when the isolated supply is connected to the loop driver.

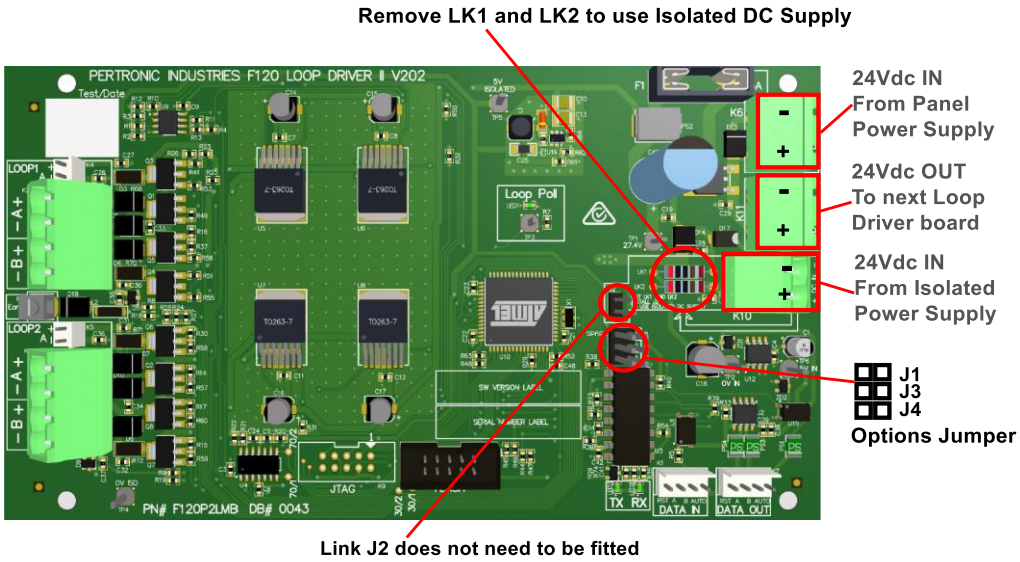


Figure 4-4: Isolated Loop Driver 2 Board

4.13 Analogue Addressable Communications Protocol

The F220 Analogue Addressable Loop and connected input and output devices communicate using the System Sensor CLIP protocol.

5. SERIAL COMMUNICATION: RS-485

The F220 has three independent RS-485 buses:

- External High Speed RS-485 Bus
- Internal High Speed RS-485 Bus
- Low Speed RS-485 Bus

These buses facilitate communication between the F220 Mainboard and other Pertronic fire alarm system components, including the Keyboard-Display, Charger Controller, Mimic & Repeater displays, and Ancillary Peripherals.

All three buses use multi-drop half duplex communication where the F220 Mainboard is the master and all connected devices are polled repeaters. A 9-bit protocol is used to communicate with the polled devices. The first data byte contains the address of the polled device.

When polled, a connected device reports its current status.

5.1 External High Speed RS-485 Bus

The F220 External High Speed RS-485 Bus runs at 115.2 kb/s. It is used to connect the remote F220 Keyboard-Display (Mimics) such as the F220-FFMA, F220-EMMA and F220-AMMA, EA60/EA120 amplifiers, and future peripheral units.

The maximum number of LCD Mimics that can be attached to the External High Speed RS-485 bus is 32, for the LED Mimics 8 and for EA60/EA120 Amplifiers 16. In combination, the total number of LCD, LED mimics and amplifiers cannot exceed 32.

Device	Mainboard Connector	Mainboard Label
Remote F220 Keyboard-Display (Full function master mimic)	K29 K26	EXT HIGH SPD RS485 HIGH SPD RS485

Table 5-1: External High Speed RS-485 Bus Connectors

Note:

1. It is essential that external devices connected to the External High Speed RS-485 Bus are wired in daisy-chain fashion using twisted pair cable and that a 120 Ohm bus terminating resistor is connected across the last device.
2. Spur wiring is not permitted (*Refer Section 20.9*)**.**

5.2 Internal High Speed RS-485 Bus

This bus carries communication between the Mainboard, Keyboard-Display, Net2Card, Charger Controller, and EA60/EA120 Amplifiers

Device	Mainboard Connector	Mainboard Label
Charger Controller	K39	CHARGER CONTROLLER
Unassigned	K41, K43, K44, K45	HIGH SPD RS485
Keyboard-Display	K42	F220 KEYBOARD*
NET2CARD	K41, K43, K44, K45	HIGH SPD RS485
NET2GATE	K41, K43, K44, K45	HIGH SPD RS485

EA60/EA120 Amplifiers	K41, K43, K44, K45	HIGH SPD RS485

Table 5-2: Internal High Speed RS-485 Devices and Connections

5.3 Low Speed RS-485 Bus

This bus is used for connecting a range of existing Pertronic products that operate at 9600 b/s. Up to 32 devices may be connected to the F220's Low Speed RS-485 Bus.
The following devices may be connected to the Low Speed RS-485 Bus

RS-485 Device	Master	Polled Repeater	Repeater
LED Mimic: 12-Way Smart LED board	Yes (1 – 8)	No	No
EVAC50W24V Amplifier (set as LED–1-8 Amplifiers)	Yes (1 – 8)	No	No
EA60 and EA120 Amplifier (set as LED–1-8 Amplifiers)	Yes (1 – 8)	No	No
EVAC50W24V Amplifier (set as LCD–9-16 Amplifiers)	Yes (1 – 8)	No	No
EA60/EA120 Amplifier (set as LCD 9-16 Amplifiers)	Yes (1 – 8)	No	No
LED AFI Controller (LEDAFIC)	Yes (1 – 8)	No	No
LED Address Controller:	Yes (1 – 8)	No	No
RS-485 Ancillary Peripherals: connect to 12-Way Smart LED board or LED Address Controller			
8-Way LED Extender board (F100PDB)			
8-Way AFI Display (AFI-8WAY)			
8-Way LED Relay board (F100ZDRLY)			
LED Zone Address Offset board (LAC12W)			
48-Way Open-Collector board (48WOC-IF)			
24-Way Open-Collector board (24WOC-IF)			

Table 5-3: Low Speed RS-485 Devices

The maximum number of LCD Mimics that can be attached to the Low Speed RS-485 bus is 32 and, for the LED Mimics, 8. In combination, the total number of LCD and LED mimics cannot exceed 32.

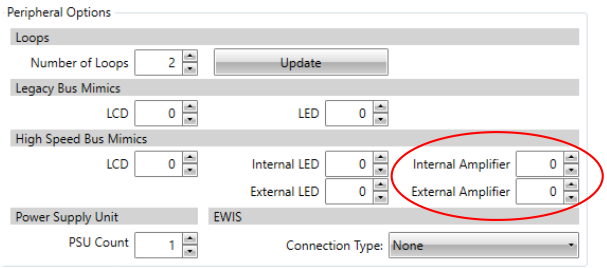
Mainboard Connector	Mainboard Label
K1, K6, K18, K22, K24, K40	INTERNAL RS485
K24	EXTERNAL RS485

Table 5-4: Low Speed RS-485 Bus Connectors

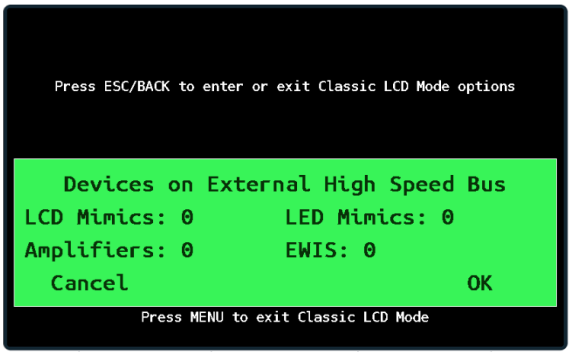
Note:

The EA60 and EA120 Amplifiers can be added to the panel's configuration by accessing,

1. In FireUtils, the Peripherals Option of the Panel Editor, or



2. In the Engineer Menu, Engineer>MimicBus>…. and selecting one of three bus options HS Int, HS Ext or Legacy, followed by Amplifiers



Engineer>MimicBus>HS Ext>Amplifiers

6. OTHER SERIAL COMMUNICATION PORTS

In addition to the RS-485 buses, the F220 has the following serial communication ports:

- RS-232 Serial port
- USB port
- Ethernet port

Details of these ports and their use are covered in the sections that follow.

6.1 RS-232 Port

An isolated RS-232 port is provided for connection to user computers that are running FireUtils ®.

The port operates at a default speed of 9.6 kb/s (1 start bit , 8 data bits, 1 stop bit).

When FireUtils ® is connected to the panel it will automatically reconfigure the serial port to operate at 115.2 kb/s.

In FireUtils ®,

- Open the Connection Manager in the Tools menu or click on the “Connect” button on the tool bar
- In the “Panel” tab, click the “Connection Type” button labelled RS-232
- Select “Auto Detect” or the appropriate “Com Port” from the drop down list.
- Enter the Panel Engineer’s Password (default 10000)
- Click the “Connect” button
- If successful, the connection status will be displayed in the “Panel Response” window.
- If unsuccessful, an error message will be displayed
- Once connected, the tool bar button will change to “Disconnect

6.2 USB Port

The USB can operate in two modes and these are switch selectable.

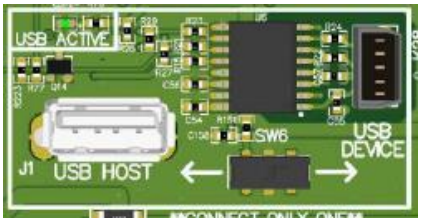


Figure 6-1: F220’s USB Port

6.2.1 Host Mode

This mode is used to Read and Write to USB memory devices that have been connected to the USB HOST connector.

These files have the following functions:

File Type	Function	Read / Write
Configuration	Save current configuration or Load a new configuration	Read / Write
History Log	Save current history log	Write
Status	Save current device status	Write

Mainboard Firmware	Load a firmware update for the Mainboard	Uses inbuilt system bootloader

Table 6-1: USB Host Mode

6.2.2 Device Mode

No functionality is available for any current user applications.

6.3 Ethernet Port

An Ethernet port is provided on the F220 Mainboard for connection to user computers that are running FireUtils ®, either directly to the panel or via a network,

In FireUtils ®, for a direct connection

- In the “Panel” tab, click the “Connection Type” button labelled “TCP/IP”
- In the “TCP/IP” section, click on “Panel Ethernet”, and “Discover”
- The Name and IP Address for the connection will appear in the selector box
- Click on the selector box to the left of the desired connection
- Enter the Engineer’s password and click the “Connect” button.
- If successful, the connection status will be displayed in the “Panel Response” window
- If unsuccessful, an error message will be displayed.
- Once connected, the “Connect” toolbar button will change to “Disconnect”

6.4 F220 Communication Ports

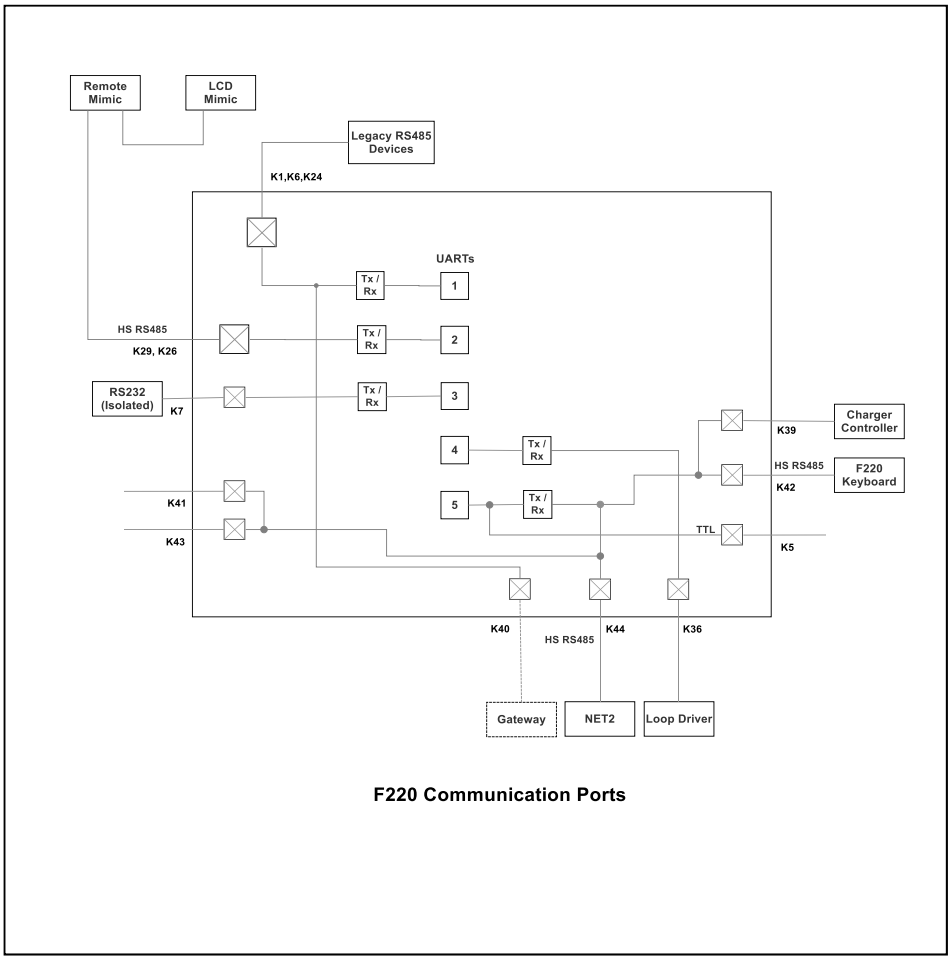


Figure 6-2: F220 Communication Ports

7. FIRMWARE UPLOADS

7.1 F220 Mainboard (Main PCB Assembly)

F220 firmware can be loaded into an F220 using a USB memory stick. The firmware update process effectively isolates the F220 from whatever network it may be connected to while the update is in progress.

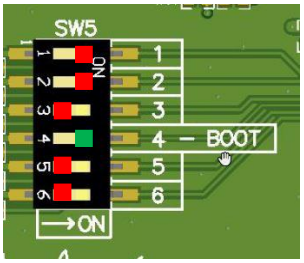
The firmware update process does not check the firmware version, the uploaded file will always replace the currently loaded firmware.

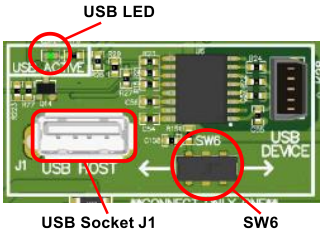
USB memory stick setup:

- The USB memory stick must be FAT32 formatted, See 7.4 USB Flash Memory File System Format.
- Open the zip file containing the firmware to be installed. The zip file name will be in the format F220_Installer_vx.x.x.zip where x is the version numbering.
- Copy the entire directory named “F220_Installer” in the zip file to the root directory of the USB memory stick.

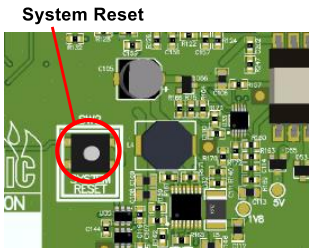
F220 main board setup:

- Set SW5_4 to “ON”.
- Set SW6 to “Host”, if required.



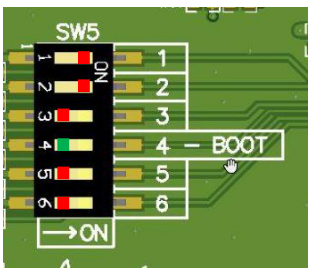


- Press the System Reset button SW2.
- Wait for the USB LED to start a slow blink to indicate the F220 main board is ready for a firmware upload. See Figure 7-1



Loading F220 main board firmware:

- Insert USB memory stick into USB socket J1.
- The USB active LED will be fast blinking while the firmware is being loaded (there may be a 10 to 20 second initial delay). The firmware will take up to a couple of minutes to load.
- The USB active LED will stay on continuously after successfully loading the firmware from the USB memory stick. A slow blink at this stage indicates a failure.
- Remove the USB memory stick. The USB LED will go to a slow blink.
- Set SW5_4 to “OFF”.
- Press the System Reset button SW2.



The F220 main board will start using the new firmware.

USB LED Activity	Notes
Slow blink, 0.5s on /0.5s off	F220 Mainboard is ready for a firmware upload and waiting for a USB memory stick to be inserted.
Constant fast blink	F220 Mainboard is uploading firmware from a USB memory stick
Steady on	Successful firmware upload.
Slow blink, 0.5s on /0.5s off	Firmware upload failure, if the USB memory stick is still inserted.

Figure 7-1 USB LED Activity For F220 Mainboard Firmware Upload

Note:

The current configuration of the F220 panel can be downloaded from the Mainboard to a USB stick. The process is as follows.

1. Insert a FAT32 formatted USB stick into the USB socket J1.
2. Use the Save Configuration in User Menu > Service Menu > USB Menu > Save Configuration. Further details are given in section 10.5.3

7.2 F220 Keyboard/Display

The F220 keyboard/display firmware can be loaded into an F220 keyboard/display using a USB memory stick.

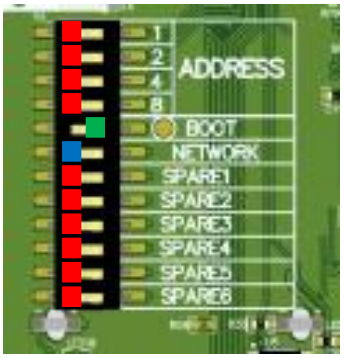
The firmware update process does not check the installed firmware version, the uploaded file will always replace the currently loaded firmware.

USB memory stick setup:

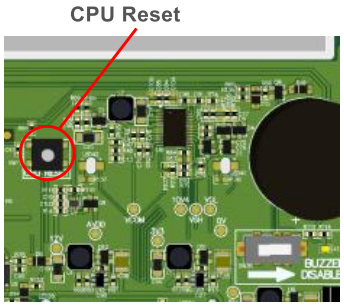
- The USB memory stick must be FAT32 formatted, See 7.4 USB Flash Memory File System Format.
- Create a folder named “F220Display_Installer” in the root directory of the USB memory stick (if it does not exist already).
- Open the zip file containing the firmware to be installed. The zip file name will be in the format F220_NCU_vx.x.x.zip where x is the version numbering.
- From the F220_Keyboard_vx.x.x.zip file, copy the entire folder named “Keyboard” into the USB memory stick folder named “F220Display_Installer”.

F220 keyboard/display setup:

- Set DIP switch S1 switch 5 to ON. This switch is labelled “BOOT” (Green square).
  This switch is only read at startup.
- Set DIP switch S1 switch 6 to OFF. This switch is labelled “NETWORK” (Blue square). This switch is only read at firmware upload time. It is recommended that this switch be left in this position to indicate that the board is intended to be an F220 keyboard/display. If this switch is set to ON then NET2-NCUA firmware may be uploaded.

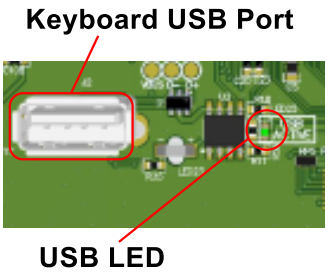


- Press the reset button SW17, “CPU Reset”.
- Wait for the USB LED to start a slow blink to indicate the F220 keyboard/display is ready for a firmware upload. See Figure 7-2 USB LED Activity for F220 keyboard/display Firmware Upload.



Loading F220 keyboard/display firmware:

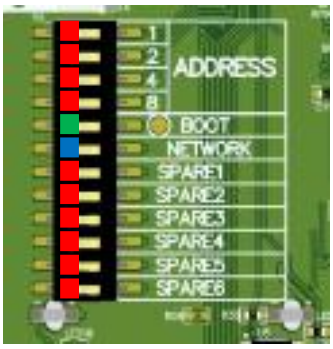
- Insert USB memory stick into socket J2.
- The USB active LED will be fast blinking while the firmware is being loaded. The firmware may take up to a couple of minutes to load and there may be brief periods of LED on time as loading progresses.
- The USB active LED will stay on continuously for at least five seconds after successfully loading the firmware from the USB memory stick. A slow blink at this stage indicates a failure.



- Remove the USB memory stick. The USB LED will go to a slow blink.
- Set DIP switch S1 switch 5 to OFF.
- Press the reset button SW17, “CPU Reset”.

The F220 keyboard/display will start using the new firmware.

At start up the display will show the firmware version.



Checking the firmware version also indicates if conversion from F220 to NCU firmware (or vice versa) was successful.

A log file will be created (if it does not exist already) on the USB memory stick and it will have brief details of the result of the last firmware upload timestamped and appended to the file.

LED25 (USB Active)	Notes
Slow blink, 0.5s on /0.5s off	F220 keyboard/display is ready for a firmware upload and waiting for a USB memory stick to be inserted.
Constant fast blink	F220 keyboard/display is uploading firmware from a USB memory stick. Brief interruptions to the blinking are normal.
Steady on	Successful firmware upload.
Slow blink, 0.5s on /0.5s off	Firmware upload failure, if the USB memory stick is still inserted.

Figure 7-2 USB LED Activity for F220 keyboard/display Firmware Upload

7.3 USB Memory File Structure

This USB memory file structure covers NET2 and F220 firmware and configuration files.

The USB memory must be formatted with a FAT32 file system, see section 7.4 USB Flash Memory File System Format.

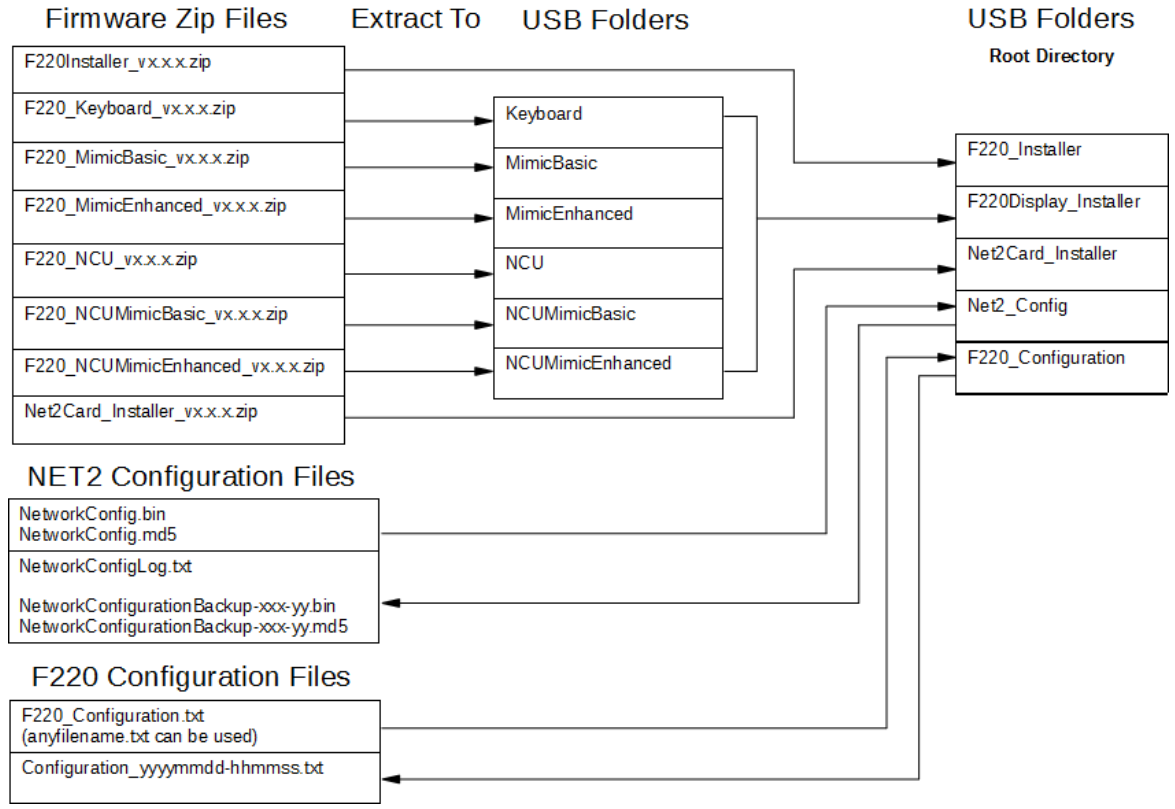


Figure 7-3 USB memory file structure

7.4 USB Flash Memory File System Format

The USB flash memory stick must have a FAT32 file system format for correct operation of the configuration process. The easiest way to check the format of USB memory is to plug the memory into a PC and when it is mounted:

- Open a file explorer window
- Right click the drive letter representing the USB memory
- Select “Properties” from the menu.

The file system should be FAT32.

If the file system is NTFS or some other format, it can be formatted to FAT32. There are several ways of formatting to FAT32, all involve total loss of any existing files. Any reformatting is best done on a smaller size (less than 32GB) USB memory stick. An internet search on “FAT32 USB format” should provide some good advice on reformatting using ordinary PC operating system utilities.

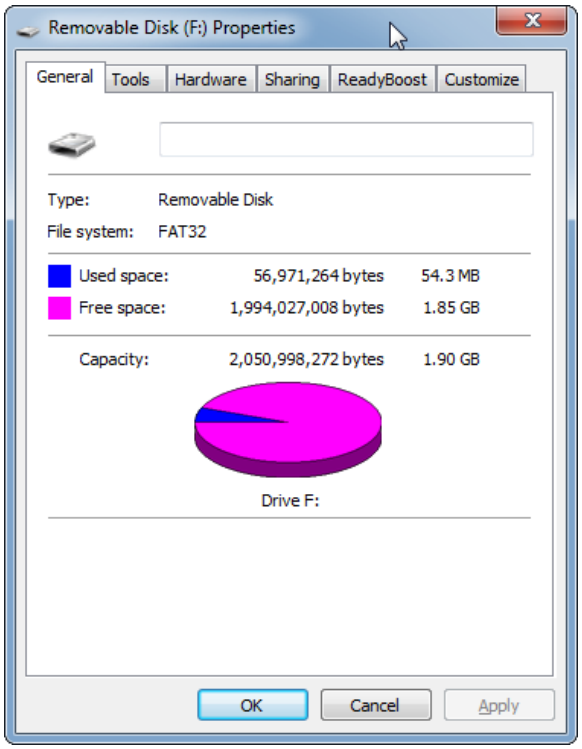


Figure 7-4 USB Flash Memory Stick File System Format

The configuration/firmware files must be loaded onto a USB flash memory stick for loading into the F220. The configuration files must have the correct names and be in the correct directory, the directory must also be in the correct location in the USB memory. See section 7.3 USB Memory File Structure.

8. MAPPING

This section details how the F220 panel is configured to meet the requirements specific to the site. It is recommended that configuration of the F220 panel is undertaken using Pertronic's FireUtils software. FireUtils is a computer application that allows users to configure and analyse Pertronic Fire Panels and Networks. It displays configuration data in a series of panes and tables for inserting and editing loop devices, zones, groups, local call points, timers, logic blocks, system events, fan and deluge control blocks, AAF/ADF and ACF processes, LED and auxiliary outputs.

For detailed description refer to the FireUtils User Manual.

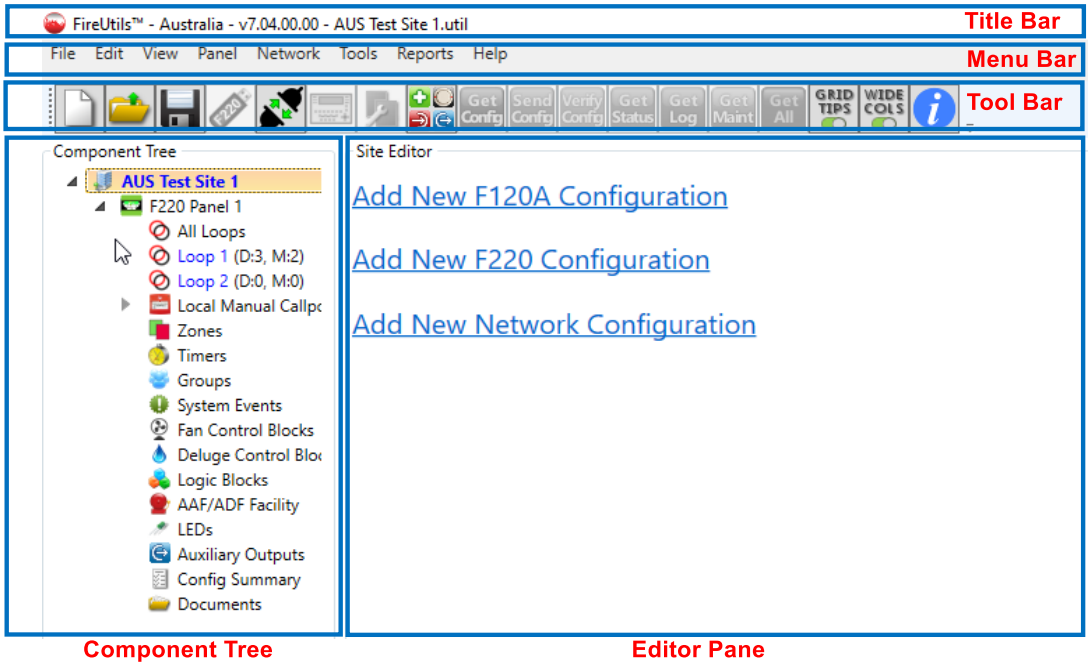


Figure 8-1: FireUtils Main Application Window

8.1 Loop Device Mapping

The F220 supports a flexible mapping system. Using the Loop Editor in FireUtils, loop detectors and modules can be mapped to activate relays (Warn Sys, Brigade, Door Holder), four Loop Outputs (see Section 8.1.1); and selected system events (see Section 8.4). It can also be used, among other tasks, to assign a device to a zone and/or group, set detector sensitivities, monitor and record events, and latch a device's alarm condition, if required.

In FireUtils, select and click on 'Loop' in the Component Tree to display the Loop Editor. For convenience, Figure 8-2 and Figure 8-3 shows the Loop Editor in two parts, with a brief description of the function of each column. More detailed description of device parameters are given in Table 4-3 through to Table 4-8.

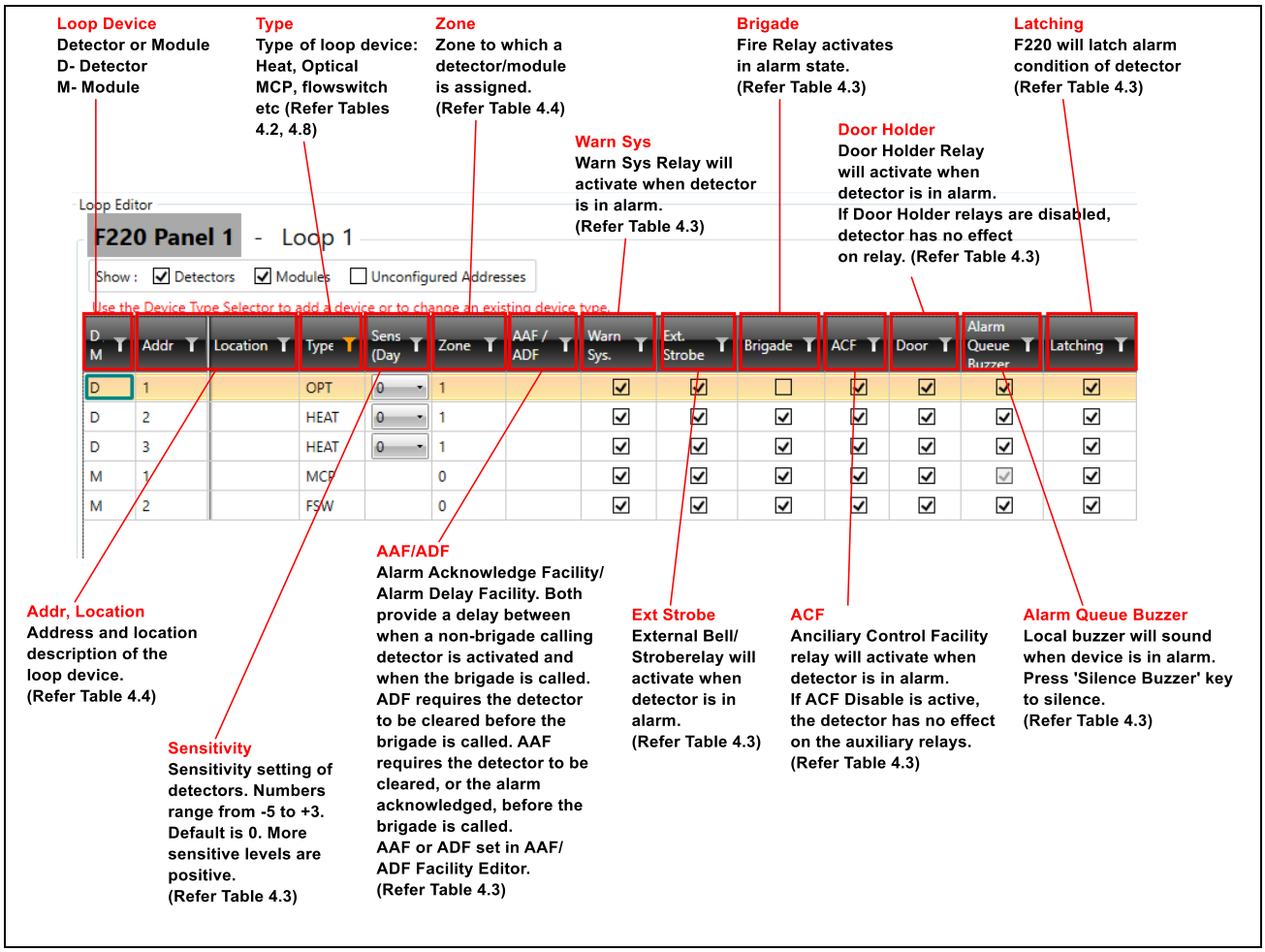


Figure 8-2: Part 1 of FireUtils' Loop Editor

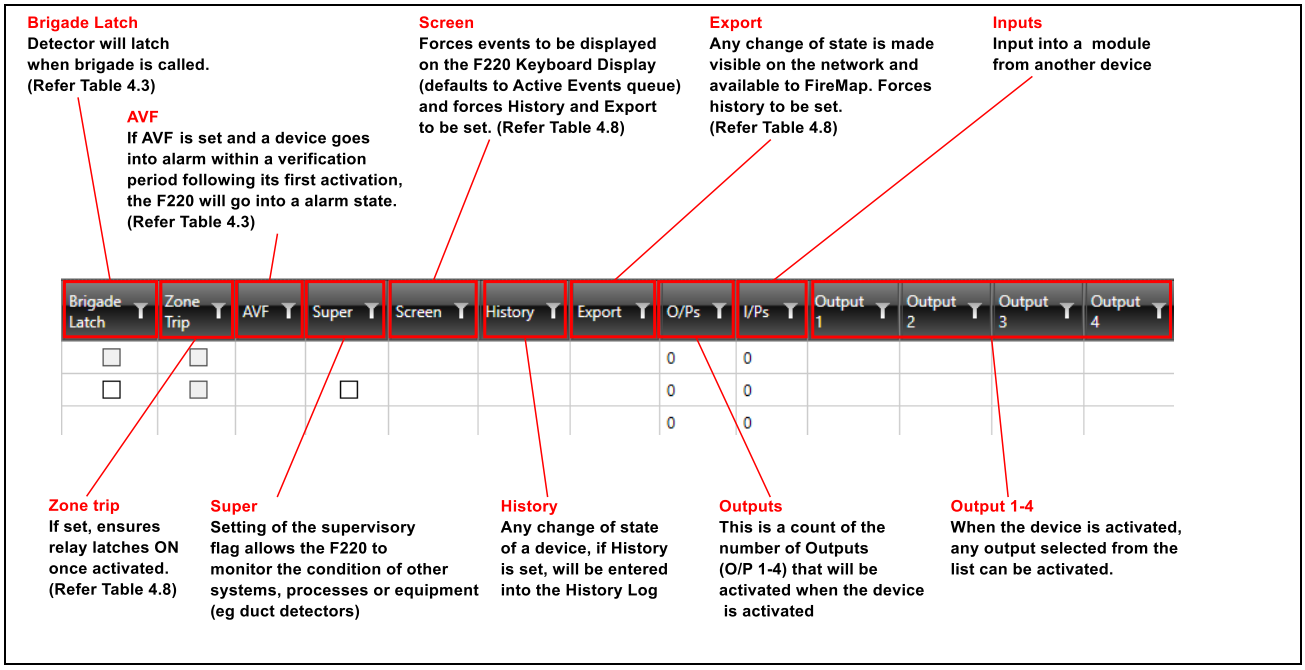


Figure 8-3: Part 2 of FireUtils' Loop Editor

8.1.1 Loop Output Registers

The four Output Register of each Loop device can be mapped to trigger one of 25 different actions (or Output Types) ranging from activating a relay, LED, or resetting a latched fan block to disabling a detector, zone, module or relay.

However when the loop device is activated, its outout must pass an extra qualification or requirement (see Figure 8-4 below), such as being in 'Alarm' or 'Fault', before it is passed on to the Loop Output Register to which it has been mapped. The activation qualification is dependent (see Section 8.1.2) the type of loop device – a detector, input or output module.

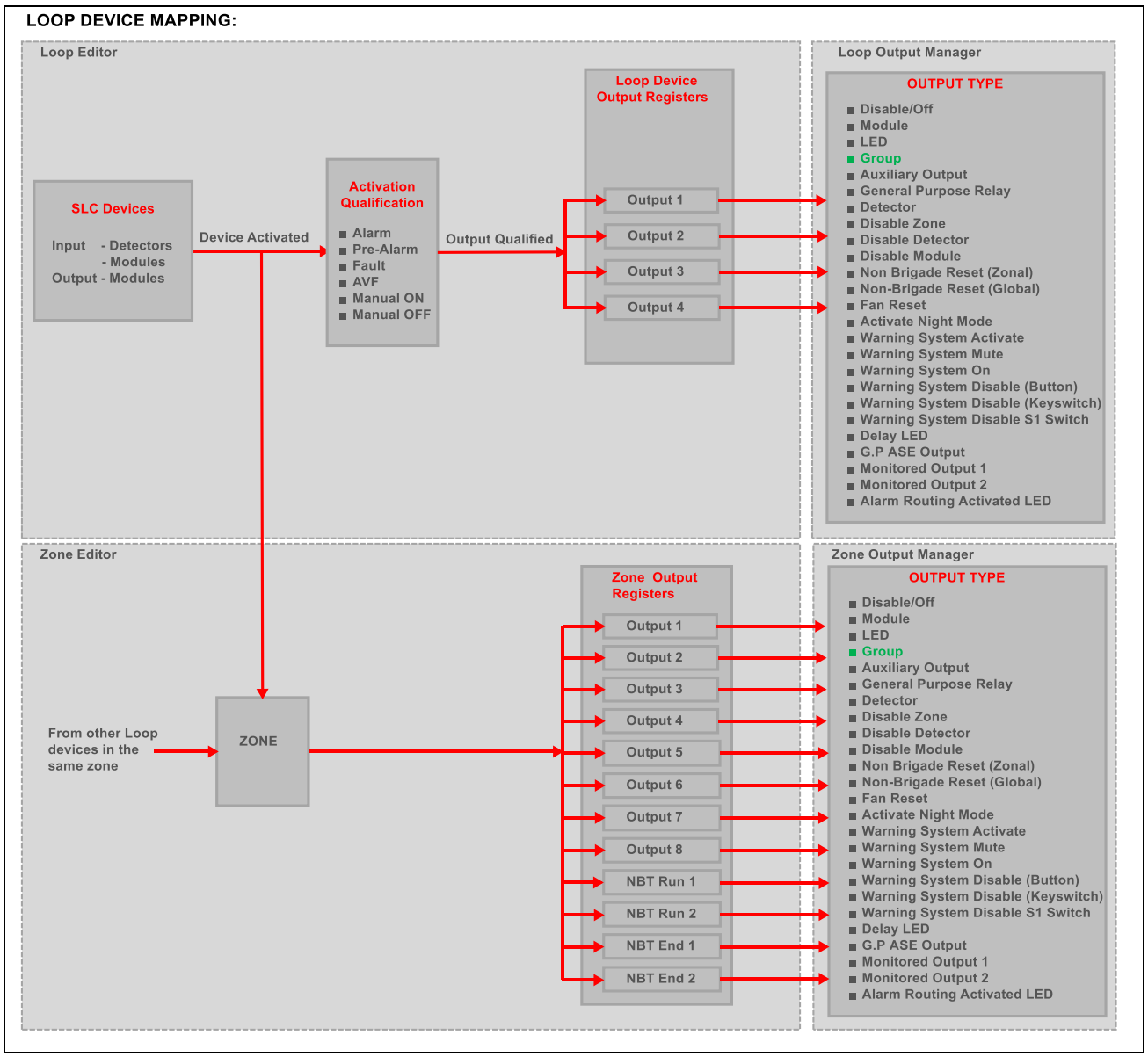


Figure 8-4: Mapping of a loop device to loop and zone outputs

Each Loop Output Register may be configured to have one of the following Output Types:

Type	Description
Disabled/Off	The output register for the loop device is disabled
Loop Device	This may be: • A detector – simply turns on the detector LED for sounder base type applications. • A module – a relay type loop device. When a Loop Device is selected, the input device, zone or group can be mapped to a loop relay or detector (in the case of a detector, just the detector`s LED will illuminate). The device is selected in the standard LxxMyyy or LxxDyyy format where xx represents the device`s loop number (1 to 20) and yy its address (1to 159)
LED	When LED is selected, the zone, loop device, or group maps to a display LED (whether physically present or not). The address tange for a display LED is 1 to 2048.
Group	When the group is selected, the zone, loop input device or group maps to one of 999 Groups. Each group can take 1 to 15 further outputs. Groups can map to another group but the group mapped to must have a higher number than the first group. This may be desirable either to simply extend the number of outputs available to a loop device or zone, or to collect similar panel functions into different groups.
Auxiliary Output	When Aux is selected, the zone, loop device or group maps to one 8 auxiliary outputs. The open-collector Aux outputs are located on the F220 Mainboard (K10). Range 1 to 8.
General-Purpose Relay	When GP Relay is selected, the output is mapped to the ‘GP Relay’ on the F220 Mainboard. The relay provides 2 sets of clean contacts rated at 2.0A at 30Vdc.
Disable Zone	Disables the selected zone. Range 1 to 999.
Disable Loop Device (Detector or module)	A single loop detector or mdoule may be disabled. Range for detectors is 1 to 159 and for modules 1 to 99.
Non-Brigade Reset (Zone or Global)	When N.B Reset is selected, a reset command is sent to all Non-Brigade devices belonging a specified zone (1 to 64999) or all zones. This function is particularly useful for resetting non-brigade-calling smoke detectors in conjunction with the Zone Timer function (refer to Section 8.2.2)
Fan Reset	When Fan Reset is selected, a reset signal is sent to each active Fan Control Block and Deluge Control Block in the system. Refer to section 8.10 for Fan Control Block operation and section 8.11 for Deluge Control Block operation. This signal also resets any latched relays with the Zone Trip attribute set.

Type	Description
Activate Night Mode	With the Day/Night mode active, all detectors can have a second Sensitivity value that can be used when the panel enters Night Mode. When Night Mode is selected, the panel's night sensitivities are utilised instead of the standard (Day) sensitivitiy levels. This feature allows the F220 to operate with enhanced smoke or heat sensitivity when the building occupation changes during a 24-hour period. Night Mode output is typically generated using a timed logic function or an input driven by an external timer or security system. The Night Mode output has no effect unless the Day/Night Mode is enabled (see Section 12.7.1 System Flags)
Warning Systems Activate	Similar to Warn Sys On, except that the External Bell/Strobe Relay and local Buzzer are not activated.
Warning System Mute	Temporarily silences all Warning System devices. The 'Mute' function is cancelled by any new 'Alarm' event or any action of 'Warn Sys On' / 'Warn Sys Disable' functions. Input(s) activating the 'Mute' output must return to Normal before 'mute' can re-activate.
Warning System On	Replicates the action of the WARN SYS ON button on the front panel, activating the WARNING SYSTEM relays, plus all loop Warning System devices, generating a standard 'Evacuate' sequence.
Warning System Disable (Button)	Disables Warning System devices in the same manner as using the 'Warning System Disable' button on the Keyboard-Display. This output over-rides the Warn Sys On command, as does the local Warn Sys Disable button. Local buttons override the mapped function - this allows local control to be taken if, for example, the panel has been silenced from a remote location. If local control is taken, the input(s) driving the WSD-B output must be returned to normal before it will take effect again.
Warning System Disable (Key-Switch)	Silences all Warning System devices on the system - this acts as if the 'BCO' input on the Mainboard has been activated.
Warning System (S1 switch)	Changes the behaviour of some loop warning system device types to choose different Stage 1 tones by [logically] (de)activating the LED output when activating the relay. The output negates the effect of the global "Warning System Stage 1" flag
Delay LED	Turns on the Delay LED on the Keyboard-Display indicating that a 'Delay to Outputs' is operating (AS7240.2 section 7.11)
G.P.ASE Output	Mappable relay. Output connections available via ASE connector.
Monitored Output O/P1	Alternative monitored output operates with Brigade Relay. Can also be mapped for independent use. See 12.7.9.1
Monitored Output O/P2	Alternative monitored output operates with Fault Relay. Can also be mapped for independent use. See 12.7.9.1
Alarm Routing Activated LED	Turns on the Alarm Routing Active LED on the Keyboard-Display.

Table 8-1: Output Types

Note:

To facilitate the fire brigade's ability to track alarms when they arrive on-site,

the non-brigade reset function is disabled when the brigade (Fire) relay has activated

8.1.2 Loop Device Output Qualification

Loop devices have an extra qualification applied to their outputs, whereby the device must be in the selected state for the output to activate. The options available are:

Qualification	Description
None/Alarm	The default: activate on alarm events. This is independent of whether the device is configured to generate an alarm queue priority event or not.
PreAlarm	Detectors: Active if the detector is currently in PreAlarm state. ISO modules: Activate when there are any active devices within the configured zone. SW_H modules: Activate if the device has been activated by another output.
Fault	The device is in a Fault state
AVF	Activated if AVF is enabled
ManualON	An SW3 device is in the ON state.
ManualOFF	An SW3 device is in the OFF state.

Table 8-2: Loop Output Qualification

8.1.3 Device Mapping in FireUtils

In FireUtils, to configure a device's Output Registers, select and click on the appropriate Loop in the Component Tree to open the Loop Editor. Double click, using the mouse's left button, on the Output (Register) cell to open the Output Manager. The Output Type and Activation Qualifiers can be selected from the drop-down menus.

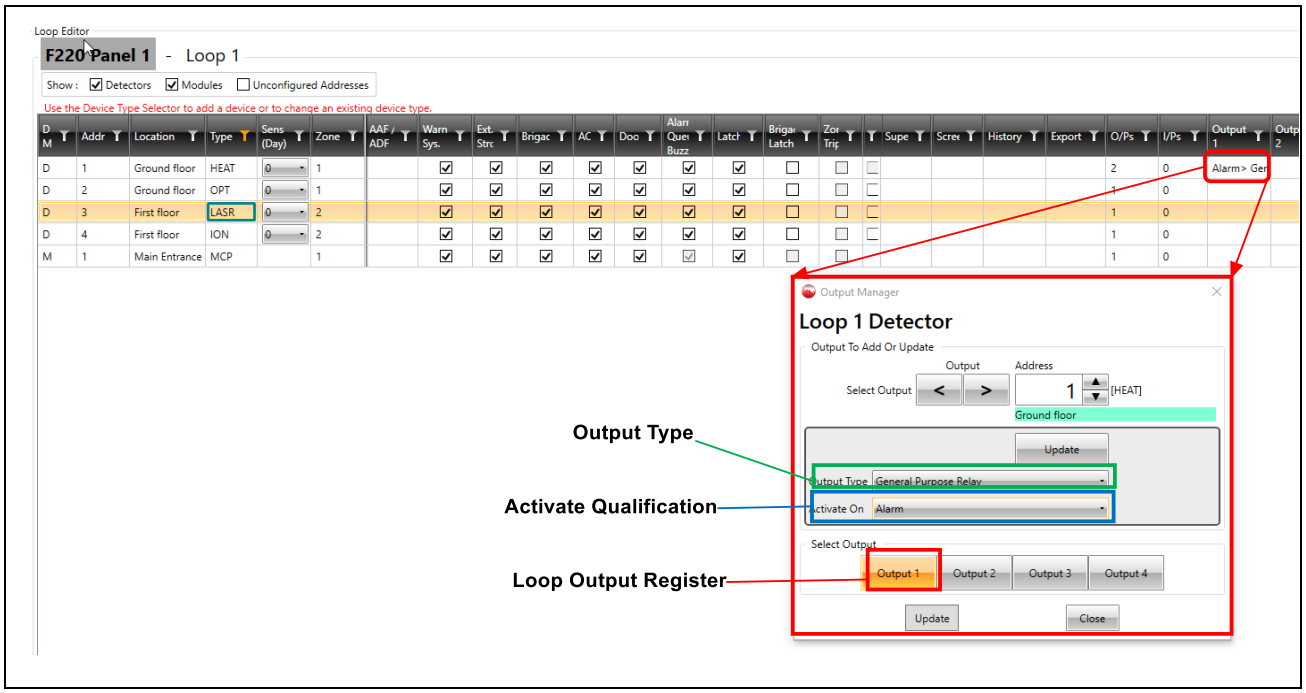


Figure 8-5: FireUtils' Loop Editor and Output Manager

Example

Take the example of a heat detector wired into zone 1 of Loop 1, with its activation qualification set to Alarm (See Figure 8-5 above). If the heat detector Output state changes from Normal to Pre-Alarm, its output will be blocked and not passed onto the Loop Output register to which it is mapped. If the detector's state later turns to Alarm, the Loop Output register will be enabled, and one of the preselected 25 Output Types, listed in Table 8-1, will become active.

8.2 Loop Mapping to Zones

A loop device, a detector or input module, can also be mapped to a zone (Refer to Figure 8-4), and the zone mapped to one of 8 Zone Output, or one of 4 Non-Brigade Output registers. Similar to the loop mapping process above, each Zone and Non-Brigade Output Register can be mapped to one of 25 Output Types listed in Table 8-1. The F220 can address up to 999 zones

In FireUtils, select and click on 'Zones' in the Component Tree to access the Zone Editor. Figure 8-6 shows the Zone Editor, with a brief description of the function of each column.

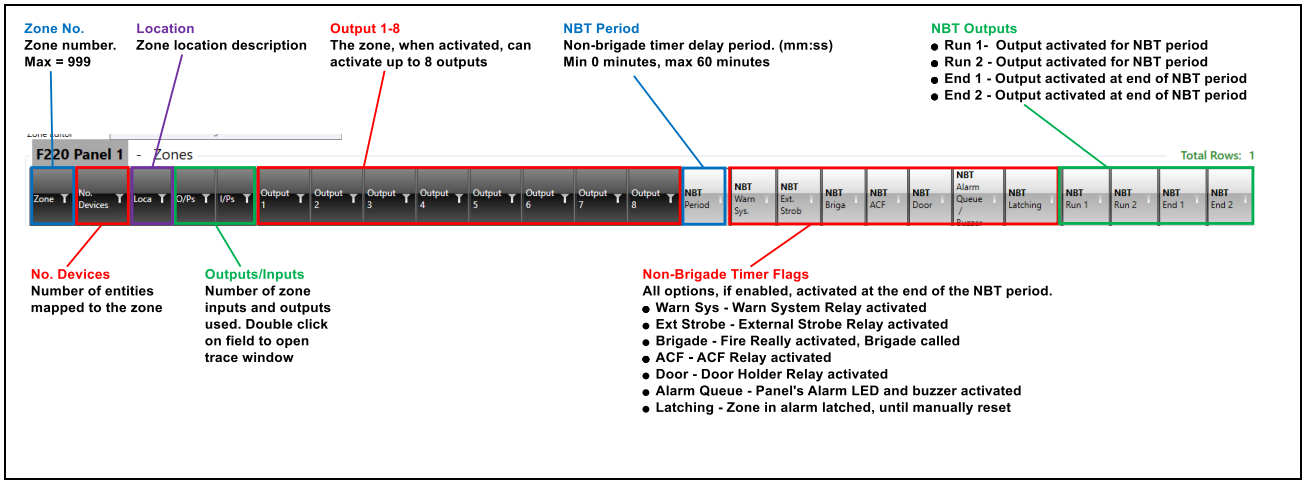


Figure 8-6: FireUtils Zone Editor

8.2.1 Zone Mapping in FireUtils

In the example (Figure 8-7) below, when any of the 40 entities, such as detectors and modules, in zone 1 becomes active, Zone Output 1 is enabled, activating output 1 of the Auxiliary Output (**Note**: Aux Output (K10) is mounted on the F220's Mainboard). The zone is not recorded in the history log as being active but the detector is. Resetting the detector will reset the panel.

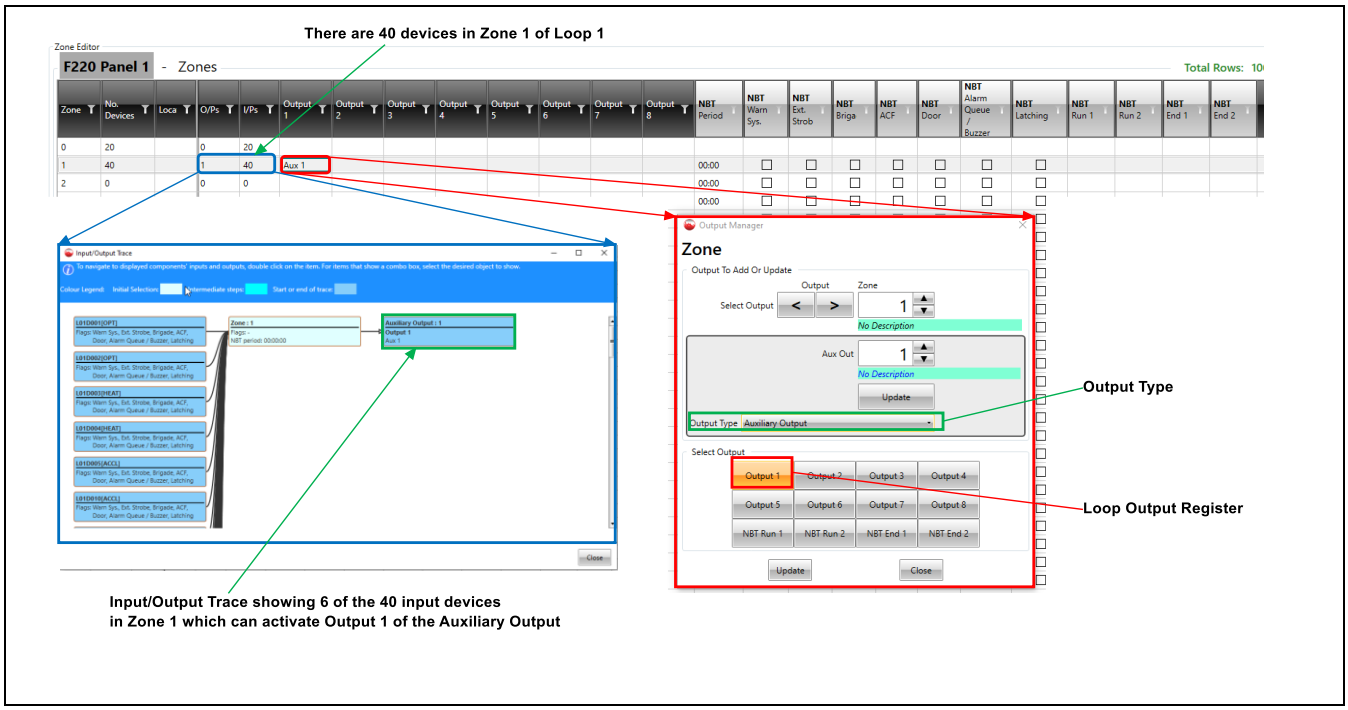


Figure 8-7: FireUtils Zone Editor, Output Manager, and I-O Trace

The Output Manager is accessed by double clicking the left mouse button on the desired Output Register grid cell. Select the Zone (eg Zone 1), the Output Type (eg. Module), and the other parameters associated with that particular Output Type inside the red highlighted box, if there are any. Click on both 'Add' or 'Update', and 'Close'.

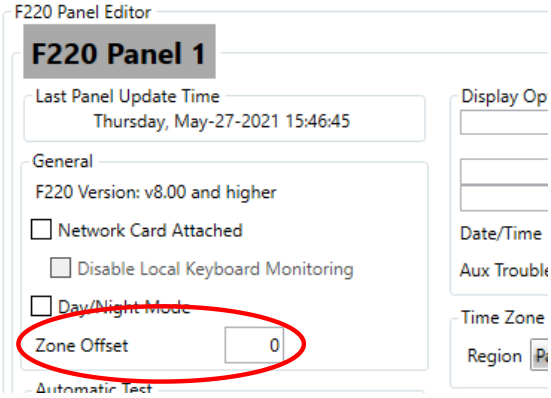
The Input/Output Trace diagram is a diagram that shows which loop inputs and Output Types are mapped to to the zone. It is accessed by double clicking the right mouse button on either the I/P or O/P cell (See Figure 8-7).

Note:

Where network sites require unique zone numbers for each F220 Panel, an offset feature allows zone numbers in the range 0001 to 64999 to be used for the network.

As there can be up to 999 physical zones per panel, the zone offset can have a maximum value of 64000.

The Zone Offset is located on FireUtils Panel Editor.



8.2.2 Zone Timers

The Zone Timer function is a feature designed to simplify operation of systems where non-brigade smoke detectors are utilised. In such systems, designated smoke detectors within a zone are configured as non-brigade-connected (ie. Loop device's 'Brigade Flag' turned Off), so that local staff can investigate the cause of activation before involving the brigade. The process is designed to reduce the number of false alarms.

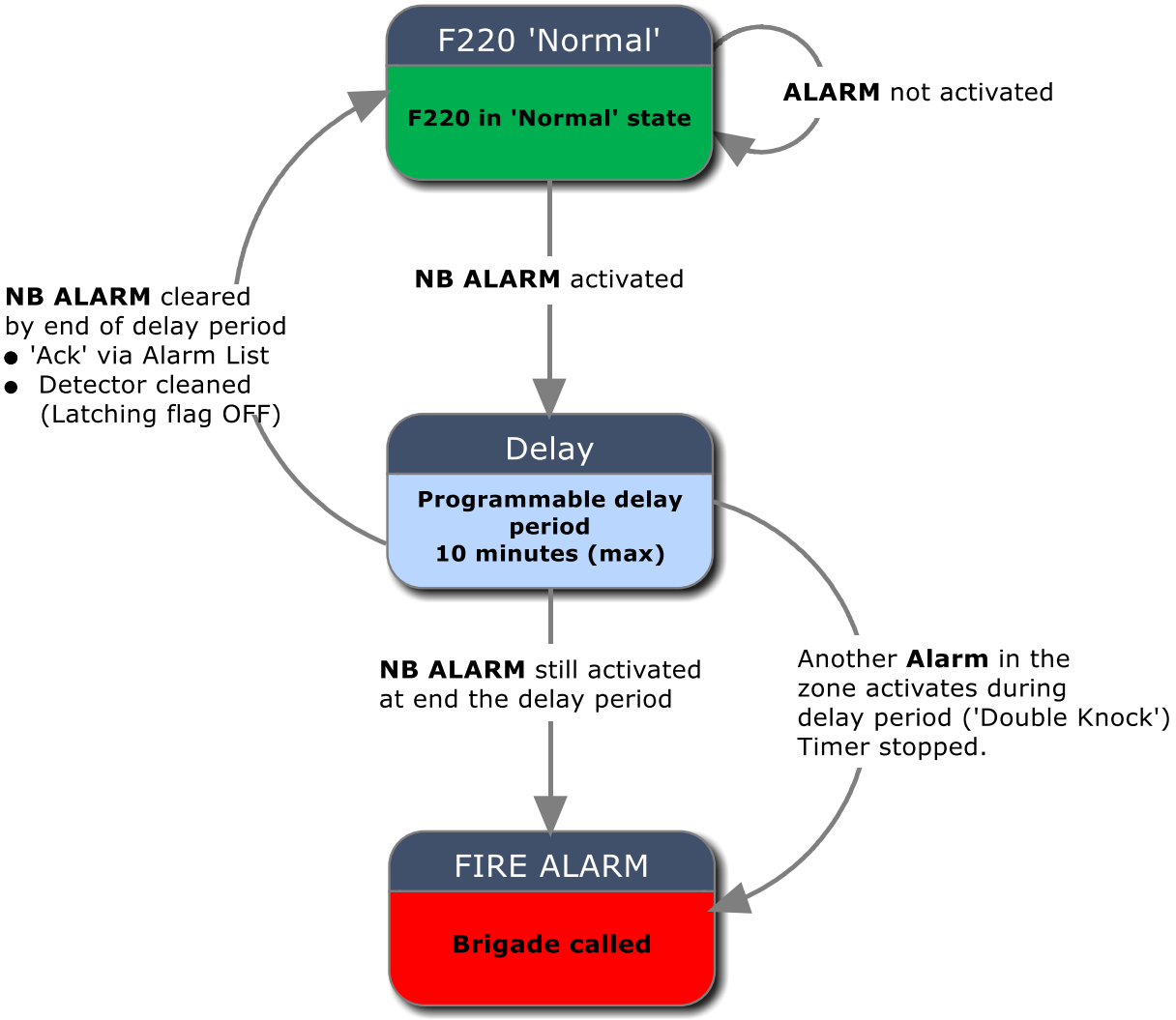
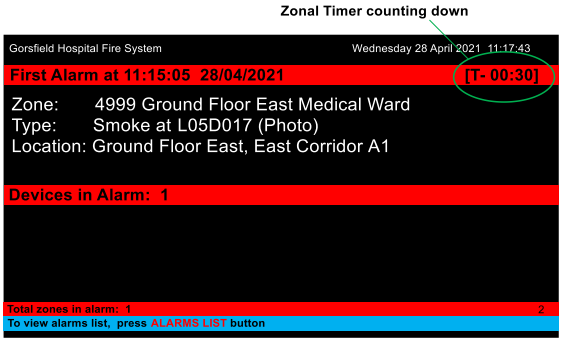


Figure 8-8: Zone Timer Event Sequence

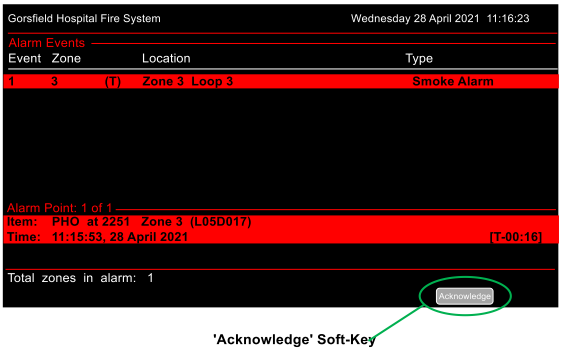
When a non-brigade Alarm occurs,

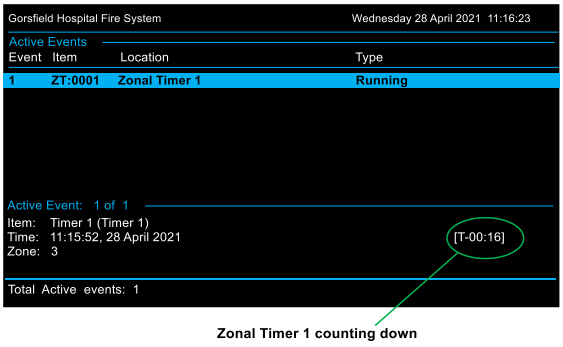
- The Zonal timer starts counting down,
- Outputs Run 1 and Run 2 will be activated, if enabled.
- Device flags activated, if enabled



While the timer is operating,

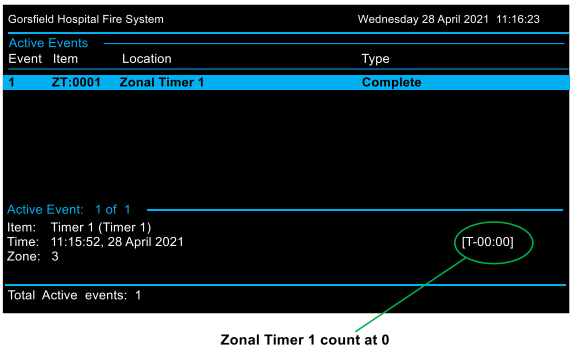
- Timer will stop and reset, if device is cleared (Loop device's 'Latching' flag OFF), or acknowledged using the 'Acknowledge' soft-key in the 'Alarm List'.
- A "Zone xxxx Timer started" event is logged to the System Event queue and the current System Event can be viewed by pressing the 'OK' key
- If a second alarm occurs in the same zone, alarm routing is enabled and the brigade is called immediately
- If any brigade-connected device within the zone activates, all timer outputs are turned OFF, even if the timer has already finished





At the end of timer period

- Timer will stop and reset
- Outputs Run 1 and Run 2 are deactivated
- Outputs End 1 and End 2 will be activated, if enabled
- Non-Brigade flags activated, if enabled.
- If the NBT Brigade flag is enabled, Alarm Routing is enabled and the brigade is called.
- All enabled device flags remain active.
- A "Zone xxxx Timer ALARM" event is generated



The timer function can be externally controlled as follows:

- **Acknowledging** the device in 'Alarm' via the Alarm List removes it from the timer processing logic; the timer is reset and a further activation is necessary to restart the timer. This facility can be used as a temporary disable if the alarm cause is non-threatening, but difficult to clear from the detector within the timer period (for example, steam contamination). After clearing the detector it will revert automatically to 'Normal' if configured as non-latching
- Resetting a device via the Fire-Fighter Facility or via a "Non-Brigade Reset" output will reset the timer. If the device is still in the 'Alarm' state after the reset, the timer will restart. This

technique can be used to extend the time period if clearing the source of the alarm proves to be too time-consuming.

8.2.3 Mapping Zone Timers in FireUtils

Zone Timers are configured in FireUtils' Zone Editor. The timer provides a programmable delay of up to 60 minutes from a non-brigade calling alarm before the brigade can be called.

In the example (Figure 8-9) below, if both the device's 'Latching' and 'Brigade' flags set to OFF in the Loop Editor, when that device goes into alarm, the zonal timer will start counting down from 30 to zero and the Delay LED on the F220's front panel will be turned ON.

If no other alarms in zone 1 go into alarm, or the Acknowledge soft-key is not pressed, the timer will run for 30 seconds. At the end of the 30 seconds, the Delay LED will turn OFF, and because the NBT Brigade Flag is set, the brigade will be called.

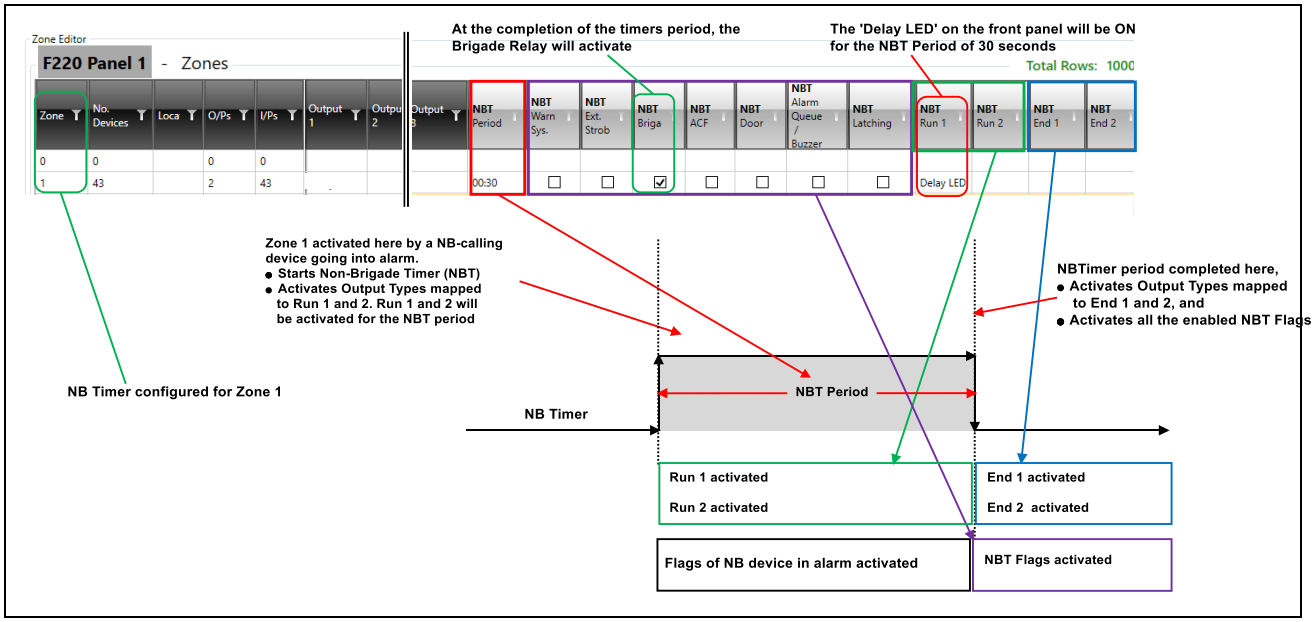


Figure 8-9: NB Timer Flags and Output functions within FireUtils' Zone Manager

8.3 Group Mapping

Outputs from Loop Devices, Zones and System Events may be combined and mapped into a Group, and the Group, in turn, using the Group Editor mapped to one of 15 Group Output Registers. In the Group Output Manager, each Output Register can be mapped to one of the Output Types listed in Table 8-1.

When any of the devices in the Group is active, the mapped Group Output will be enabled, activating the preselected Output Type.

A Group can be mapped to another Group, however the mapping will fail to operate unless the Group mapped to it has a higher group number than the first group.

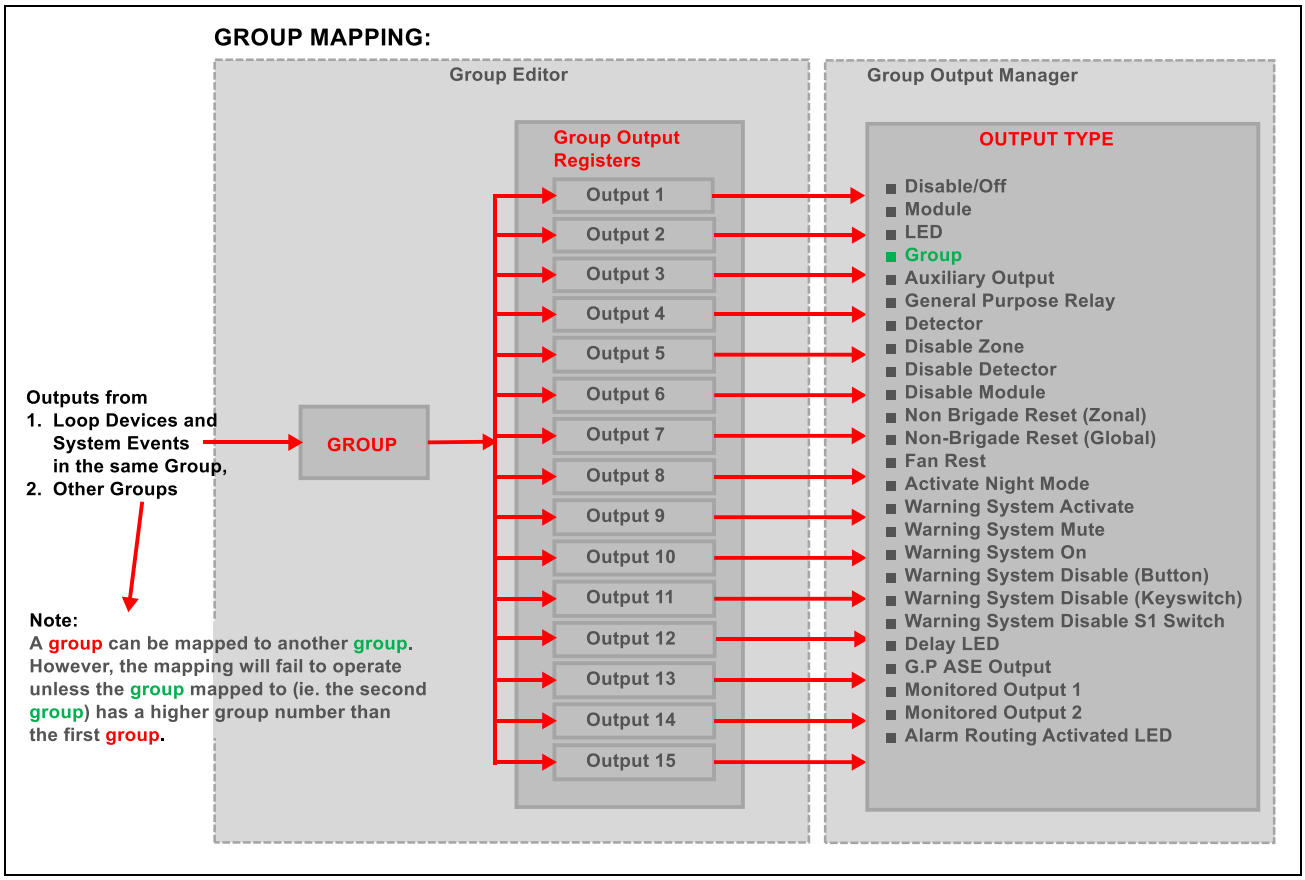


Figure 8-10: Group Mapping

In the Component Tree of FireUtils, select Group to access the Group Editor.

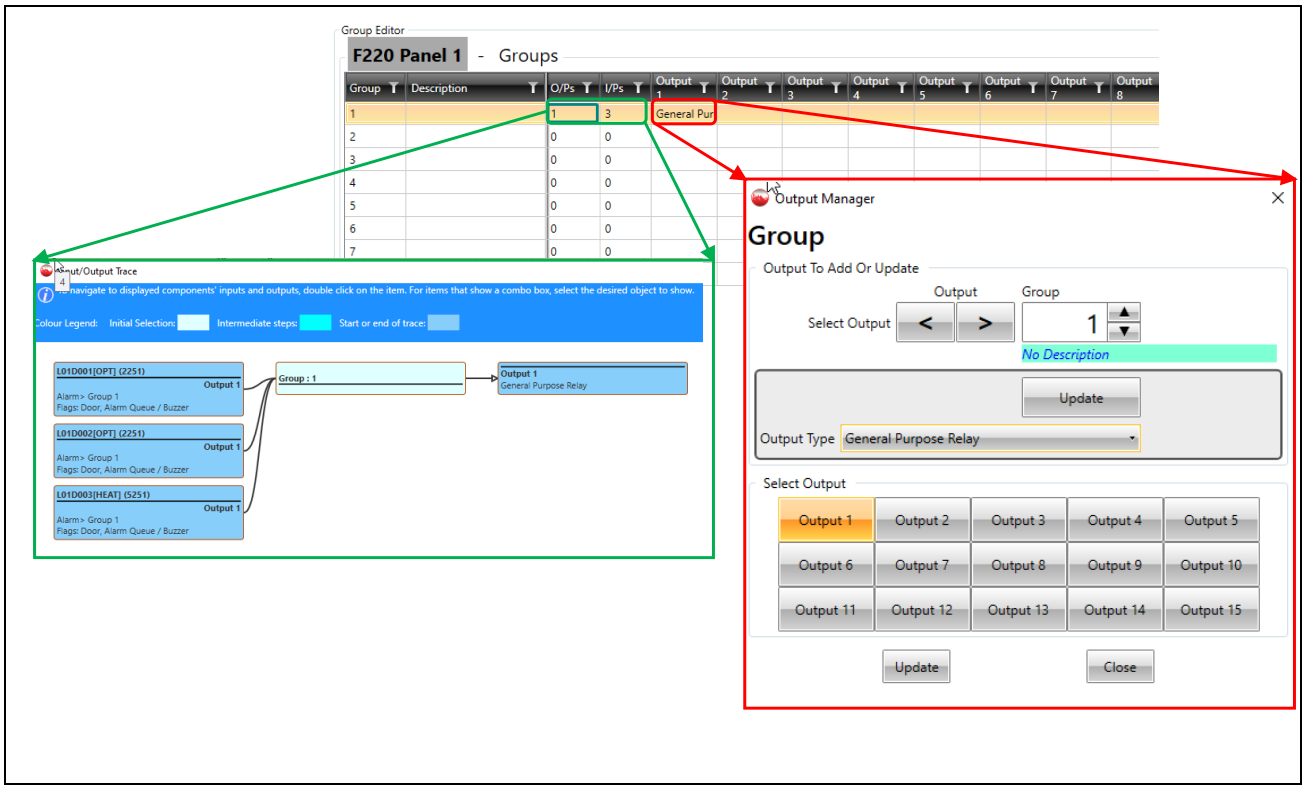


Figure 8-11: FireUtils' Group Editor, Output Manager and I-O Trace

8.4 System Events Mapping

System Events are an easy way to modify Panel behaviour based on common Panel states and/or events such as Alarm, Fault, and Disable.

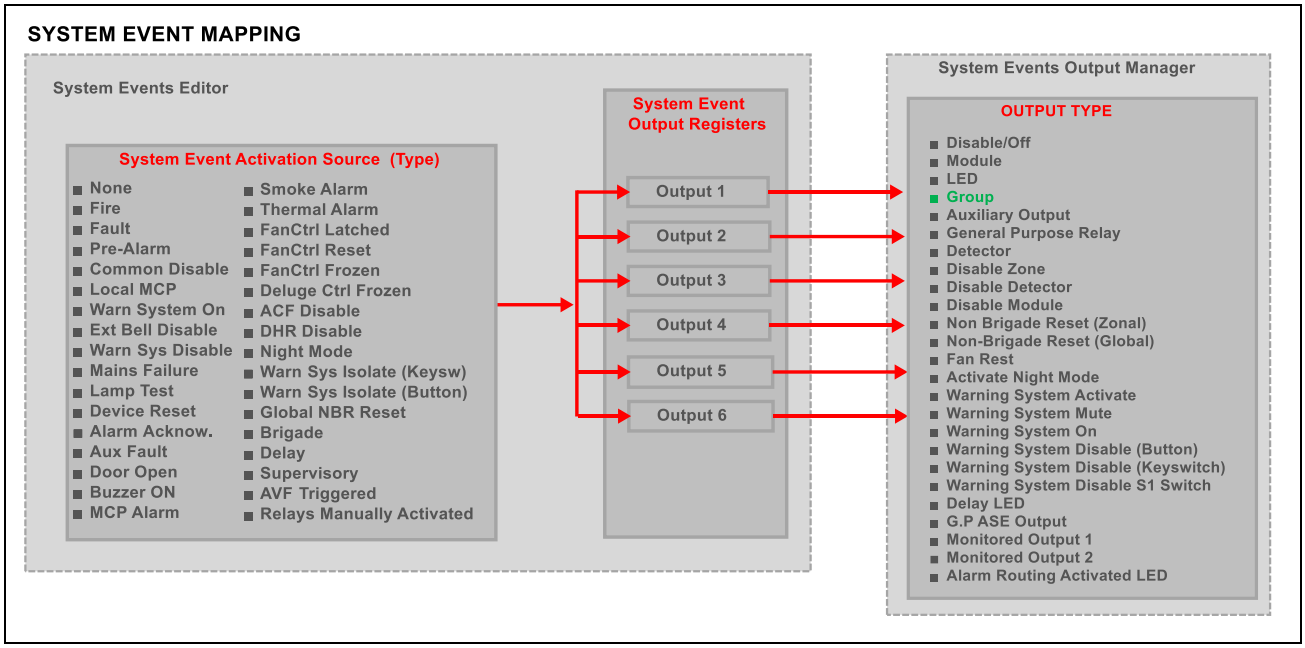


Figure 8-12: System Events Mapping

The System Events configuration block consists of 32 ‘slots’, each containing six output registers. Each slot may be programmed with a System Event code, which determines whether the outputs activate. If more than six outputs are required for a particular event, then depending on requirements, further slots may be used as an alternative to using Groups.

The System Event activation sources, or types, available are:

Type	Description
Fire	Global Fire condition set.
Fault	Global Fault condition set.
Pre-Alarm	At least one detector is in pre-alarm state.
Common Disable	At least one device or zone is disabled.
Local MCP	MCP input on F220 Mainboard.
Warn System On	WARN SYSTEM ON active.
Ext Bell Disable	(Not used)
Warn Sys Disable	WARN SYS DISABLE active.
Mains Fail	Mains supply absent. Note that this is the actual state of the mains supply -it does not cause a Fault condition immediately.
Lamp Test	Activated when the F220 is in Global Lamp Test mode. Provided for lamp test of external equipment. Local lamp test will not trigger this event. **Note**: LED outputs are overridden by Lamp Test and will therefore not operate, although they will be treated normally if used as a logical input.
Device Reset	Active for 40 seconds after system reset or power-up, or 5 seconds after a device (ZMU or BMIF types only) is reset via the Fire-Fighter Facility (see Section 12: Operating the Engineer’s Menu). Intended for use with devices, which require a power-down to unlatch an ‘Alarm’ condition.
Alarm Acknowledge	(Not used)
Aux Fault	Active when the AUX FAULT input on the Mainboard is open-circuit.

Door Open	Active when any LCD Mimic or the main panel door is open.
Buzzer On	Active when the F220 buzzer is activated.
MCP Alarm	Active when any MCP device is in ‘Alarm’.
Smoke Alarm	Active when any smoke detector is in ‘Alarm’.
Thermal Alarm	Active when any heat detector is in ‘Alarm’.
FanCtrl Latched	Active when any latched Fan Control Block, or Relay with the ZoneTrip flag set, is active and therefore must be reset via the global FanReset output.
FanCtrl Reset	Active for at least 5 seconds (or when all FCB’s have been processed) after the global FanReset output is activated.
FanCtrl Frozen	Active once the FCB Freeze Time period has expired (see Section 8.10.9).
Deluge Ctrl Frozen	Active once the DCB Freeze Time period has expired (see section 8.11.8).
ACF Disable	ACF DISABLE control is active.
DHR Disable	DOOR HOLDER DISABLE control is active.
Night Mode	Active when panel is in Night mode
Warning System Isolate – Key-Switch	Generates a ‘Warning System Disable’.
Warning System Isolate - Button	Generates a ‘Warning System Disable’ similar to operating the button on the keyboard.
Global NBR Reset	Set for 5 seconds after the global Non Brigade Reset function has been activated.
Brigade	Active whenever the main Brigade Fire relay is active.
Delay	Active when a “Delay to Outputs” is operating (AS7240.2 section 7.11)
Supervisory	Active when a supervisory signal is active.
AVF Triggered	AVF is active
Relays Manually Activated	One or more relay outputs have been manually activated.

Table 8-3: System Event Types

The Output Types in the drop-down menu are the same as listed in both ‘Loop Device’ and ‘Group Mapping’ (Refer to Table 8-1).

8.4.1 Mapping System Events in FireUtils

To access the System Events Editor in FireUtils, select System Events in the Component Tree

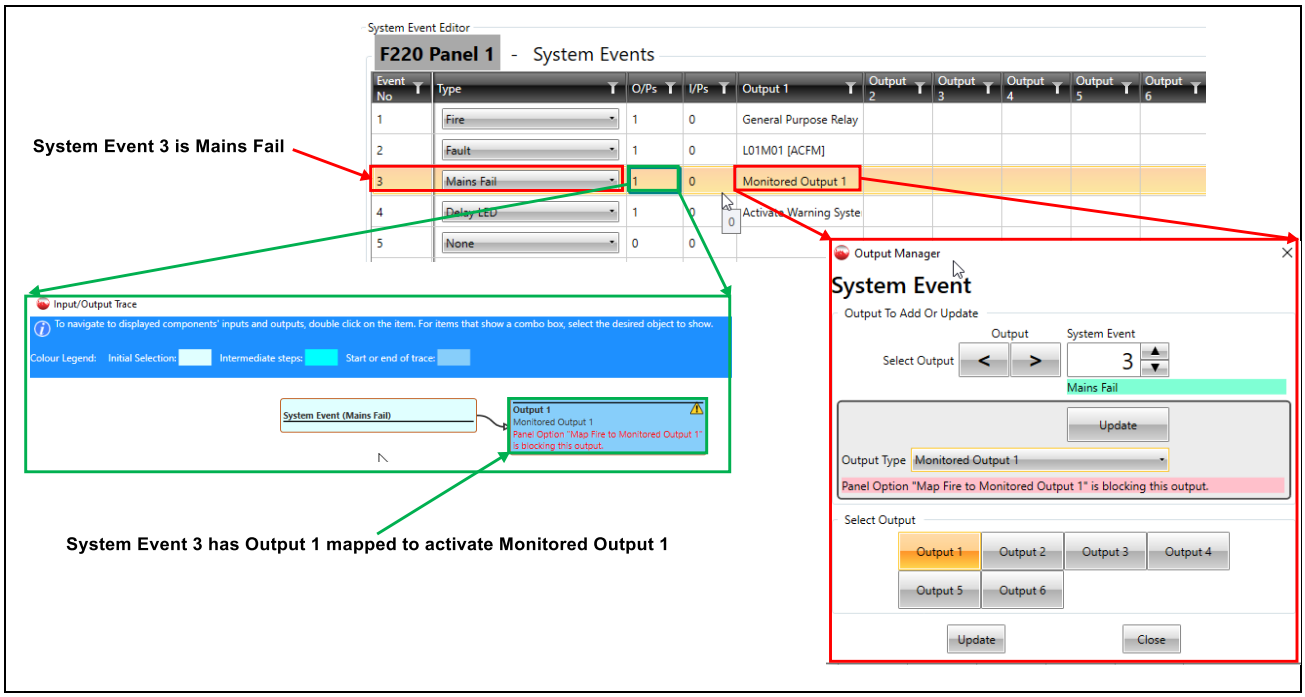


Figure 8-13: FireUtils System Editor, Output Manager, and I-O Trace

IMPORTANT NOTE:

Outputs are activated when the specified event is active or, for loop devices only, the device is in the selected state (see Section 8.1.20). The ultimate state of an output depends on the collective state of all the activating inputs. For the F220, the inputs are logically OR'ed together, hence any active input, zone or group mapping to a particular output will ensure the output remains active. Similarly, all inputs that directly or indirectly map to a given output must be inactive (Normal) for the output to be switched OFF. The exception to this occurs when a relay output is disabled (depending on the type) using one of the isolating functions at the panel (Silence Alarms, Door Holder Disable or ACF Disable).

SLC Device Mapping:

Loop 6 Detector
Type: ION
Zone: 0000

→ Output 1: Relay, Loop 6 Module 13
Output 2: LED 16
Output 3: Group 5
Output 4: (nil)

Zone 5

-from other
Input Devices

→ Output 1: Group 105
Output 2: LED 2
Output 3: Relay, Loop 1 Module 54
Output 4: (nil)
Output 5: Group 106
Output 6: (nil)
Output 7: (nil)
Output 8: (nil)

System Event Mapping:

System Event 01

→ Output 1: Relay, Loop 3 Module 77
Output 2: Aux01
Output 3: Group 25
Output 4: (nil)
Output 5: (nil)
Output 6: (nil)

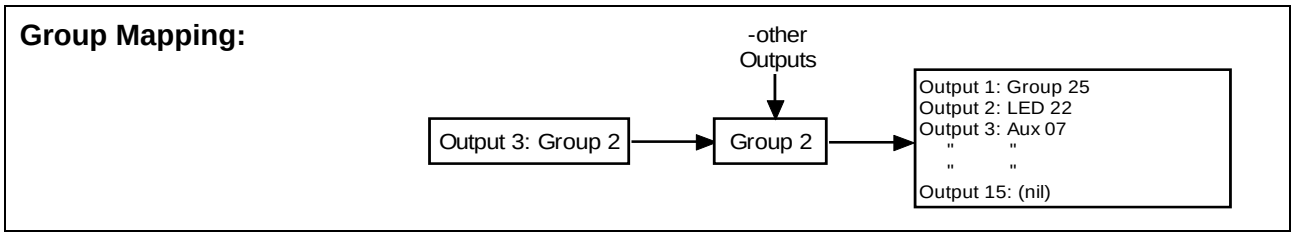


Figure 8-14: Mapping Structure Examples

8.5 Boolean Logic Block Mapping

Logic blocks are used to create more complex cause-and-effect programming via AND, OR, and ANY2 logic conditions. They allow many more control options to be handled by the panel software rather than external hardware. The F220 supports logical operations in up to 999 Logic Blocks.

A Logic Block can be considered to be a 'black box' with 8 logical inputs and 4 outputs (plus the 9 global system outputs – Warn Sys, Ext Strobe, Brigade, ACF, Door, Alarm Queue Buzzer, Latching, Screen and History) as shown in Figure 8-15 below.

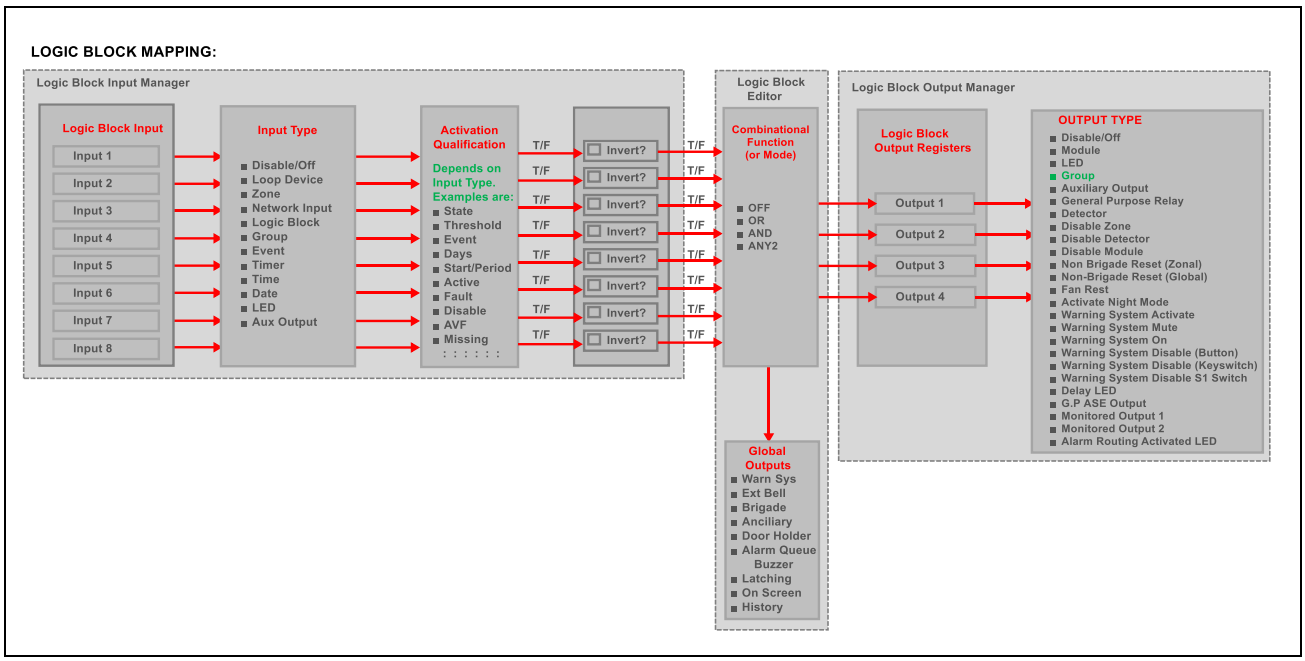


Figure 8-15: Logic Block Mapping

The block's logic examines the inputs to which it has been mapped to decide whether the block is in a designated state ('Activation Qualification', Figure 8-15) and if so, enables the Output Register to which the input is mapped. The Output Registers are in turn mapped to one of different Output Type listed in Table 8-1.

8.5.1 Logic Block Input

Each Logic Block can have up to 8 different inputs, with each input being any one of the different Input Types described in Section 8.5.2 below. Each input can also be logically inverted. For example, the block may test for a group NOT being active.

8.5.2 Logic Block Input Types

The Inputs used the Logic Blocks (as well as Timers (Section 8.6) & Fan Control Blocks (Section 8.10) provide a logical True or False value to act upon. The various types of input, associated parameters and state descriptions are listed in Table 8-4 below:

Input Type	Parameters	State Description
Device	FromLoop, FromAddress, ToAddress State, Threshold	Looks at the state of one or more devices on the same loop. Event can be any of: • Input Active: Specified input device has activated • Output Active: Specified output device has activated • Call-Point, Smoke, Heat: Call-Points/Smoke/Heat Only in 'Alarm' • Pre-Alarm: Detectors in 'Pre-Alarm' state • Disable: disabled devices • Fault: Device currently in 'Fault' • Missing: Device not responding • Dirty: Detector reached Maintenance Alarm threshold • Test: Device is being tested via the Test menu (not from 24Hr Test) • ManOFF: A SW3 device is in the OFF position • ManON: A SW3 device is in the ON position Threshold determines the number of devices that must be active for the input to be considered True. Threshold can be set from 1 (OR function) up to 5. A value of zero is treated as all devices within the range (AND function).
Zone	ZoneNumber, State	True if the specified zone activity matches Event (Alarm, Fault or Disable).
Network Input	NetInputNumber	True if the selected Network Input has been activated.
Logic Block	FromBlockNumber, Span, ToLogicBlock, Threshold	True if the specified logic block is true. Span determines the range of block numbers to examine, so that the range is BlockNumber..(BlockNumber+Span). Threshold determines the number of blocks that must be active for the input to be considered True. Threshold can be set from 1 (OR function) up to 5. A value of zero is treated as all blocks within the range (AND function).
Group	GroupNumber	True if the specified group has been activated
Event	EventType	True if any of the Events listed in Table 8-3 is active
Timer	TimerNumber, State	True if the selected timer TmrNumber is in the selected state. The State values can be one of OFF, Running, Complete or Disabled.
Time	Days, StartTime, Period	True if the weekday is in WeekdayMask (MTWTFSS) and if the current time falls in the range of StartTime to (StartTime+Period). Period can be up to 12 hours (12:00:00) and StartTime can be up to 23:59:59. Times wrap to the next day if the sum exceeds 24 hours, so a StartTime of 21:00:00 & Period of 10:00:00 is valid from 9pm to 7am.
Date	Days, FromtDate, ToDate	True if the current date falls within the range FromDate to ToDate and the weekday is in Weekday. FromDate can be higher than ToDate if the input should be true over the 31-Dec to 01-Jan period.

Input Type	Parameters	State Description
LED	FromLEDNumber, Span, ToLEDNumber, Threshold	True if the specified LED has been activated. Span determines the range of LED numbers to examine, so that the range is LEDNumber..(LEDNumber+Span). Threshold determines the number of LEDs that must be active for the input to be considered True. Threshold can be set from 1 (OR function) up to 5. A value of zero is treated as all LEDs within the range (AND function).
Auxiliary Output	AuxOutputNumber	True if the specified user auxiliary output has been activated.

Table 8-4: Input Type Descriptions

8.5.3 Block Input Mode

When a Logic Block has more than one input, the overall logic function associated with the Logic Block can be as shown in Table 8-5 below. The Mode is set in FireUtils' Logic Block Editor

Function	Description
OR	Any active input causes the block to become active.
AND	All defined inputs must be active to cause the block to become active.
ANY2	Any 2 or more active inputs cause the block to become active.

Table 8-5: Block Input Mode

8.5.4 Logic Block Descriptors

The block has a descriptor for assigning meaningful text to a logical operation. The block descriptor is shown with on-screen or logged events

8.5.5 Logic Block Input Configuration using FireUtils

In FireUtils, mapping an input to a Logic Block is undertaken using the Input Manager in the Logic Block Editor as shown in Figure 8-16 below.

In the Figure 8-16 example, Logic Block 1 has 2 inputs. Input 1 is from a 2251 Smoke Detector (OPT) at address 1 on Loop 1(L01D001) and Input 2 is a System Event, active when there is a Fire. These inputs are configured in the Logic Block Input Manager (Inputs 1 and 2 respectively). For each input, the Input Type, Address, Activation Qualification (State, Threshold, …), Invert and so on are configured as per the parameters listed in Table 8-4.

Note, however, both of the Detector and the Fire Event have to be active (ie. Input Mode is set to AND) for the Logic Block to activate an Output Register.

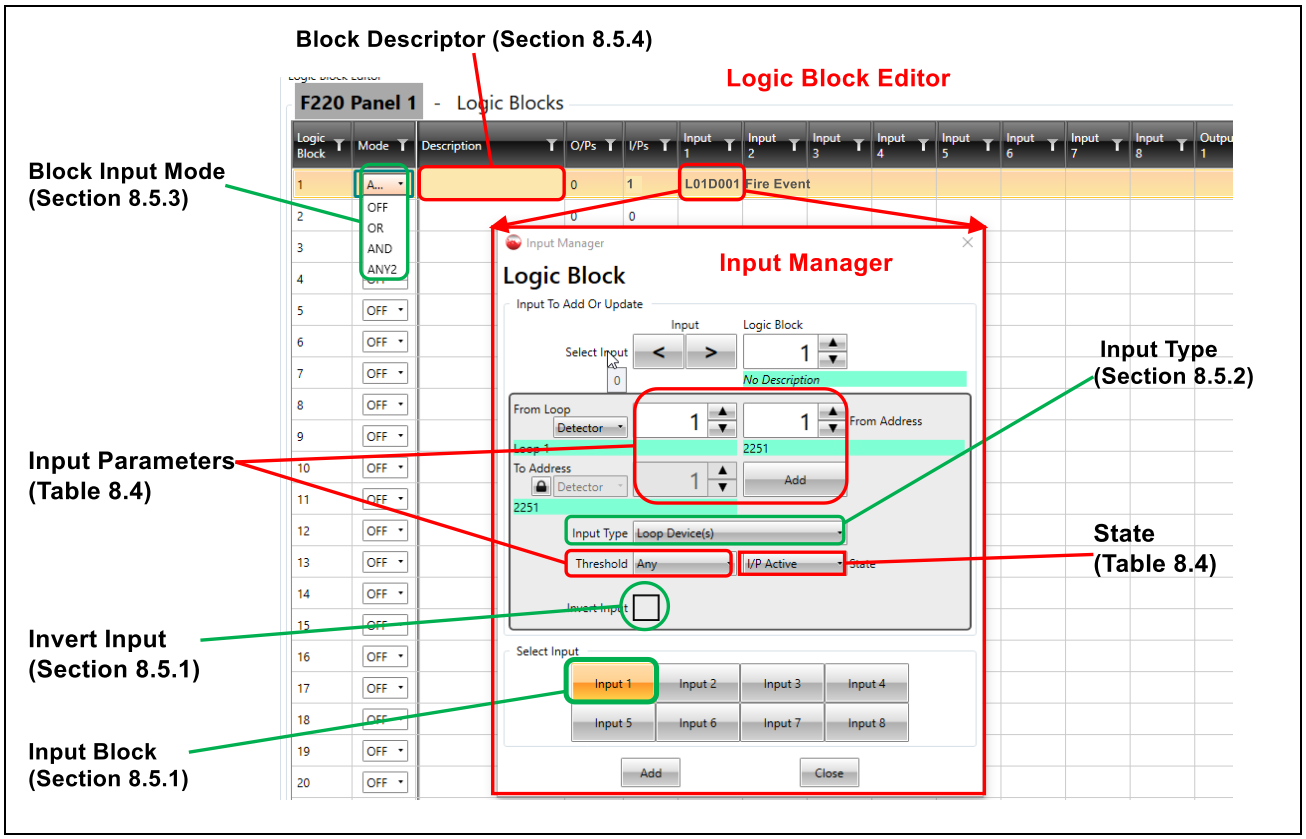


Figure 8-16: FireUtils' Logic Block Input Manager

8.5.6 Logic Block Outputs

Each Logic Block can be mapped in the Logic Block Editor to 4 Output Registers, which, in turn, can be mapped to activate one of the Output Types from a drop-down list. These Output Types are listed in Table 8-1 and are identical to those used in Loop, Zone, Group and System Events mapping functions.

In addition to the 4 Output Registers, the logic blocks can be mapped to activate the 9 global system outputs; the Warn Sys, Ext Bell, the Brigade, Anciliary and Door Holder Relays, the Alarm Queue Buzzer, and the Latching, Screen and History flags.

The full list is:

Flag	Symbol	Description
Warn Sys, Ext Bell	W, E	Activates selected bell relay.
Brigade	B	Calls Brigade.
Anciliary	A	Activates ACF & ACFM relays on the Mainboard
Door Holder	D	Activates Door Holder relay on the Mainboard
Alarm Queue/ Buzzer	Z	Activates warning buzzer. Forces OnScreen set and event into 'Alarm' queue.
Latching	L	Latches logic event until manual reset. Forces OnScreen to be set.
OnScreen	S	Forces event to be displayed on LCD (defaults to System Events queue) and forces History to be set.
History	H	Log event in historical event buffer.

Table 8-6: Logic Block Flags

8.5.7 Logic Block Output Configuration using FireUtils

Figure 8-17 below demonstrates how the Logic Block Output Manager in FireUtils can be used to map Output Registers 1 and 2 to activate the General Purpose Relay on the mainboard and Group 1. This can only happen when both smoke detector OPT L01D001 (logical) AND system event Fire, configured using the Input Manager, are both active.

The detector is also mapped (highlighted in green) in the Logic Block Editor, to activate the Global System outputs; Warn Sys, Ext Strobe, Brigade, and Door Holder relay, the Alarm Queue Buzzer and the Latching, Screen and History flags.

All the flags settings are highlighted in the LB1 block of the Input/Output Trace.

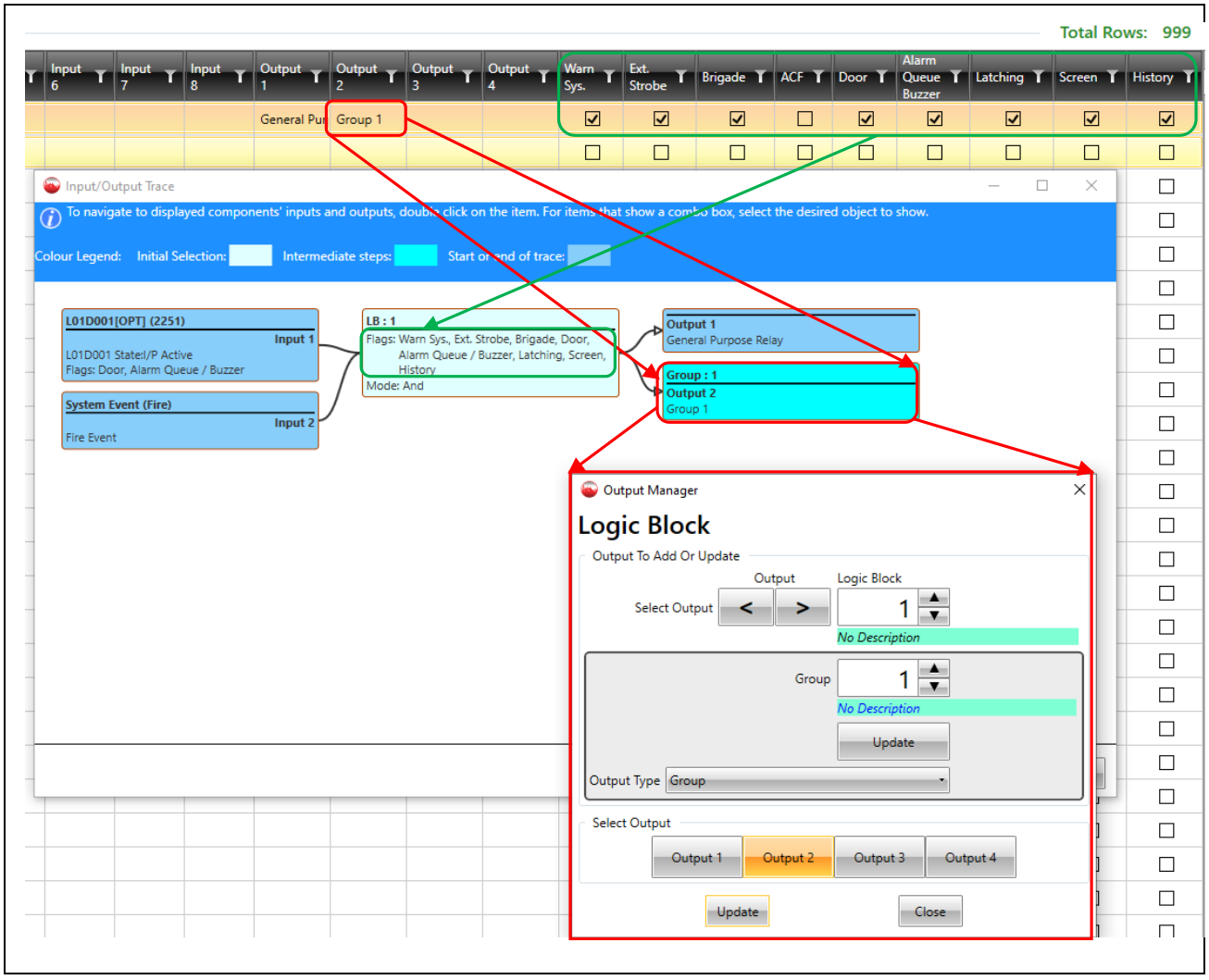


Figure 8-17: Logic Block's Output Manager, Logic Block Editor, and I-O Trace

8.6 Timers

This feature allows time control options to be handled by the panel software instead of external timer hardware. Timers are used to impose delays on output activations, delay alarm conditions, and used to trigger output at set times during the day or week.

The F220 Timers consist of two preload registers (T1 and T2), four control inputs (Start, Reset, Disable, Override), four outputs (both T1 and T2 have 2 outputs) and 12 global system flags for configuration. A number of different behaviours can be selected using the options provided (refer to Table 8-10: Timer Example).

The F220 supports up to 50 Timers.

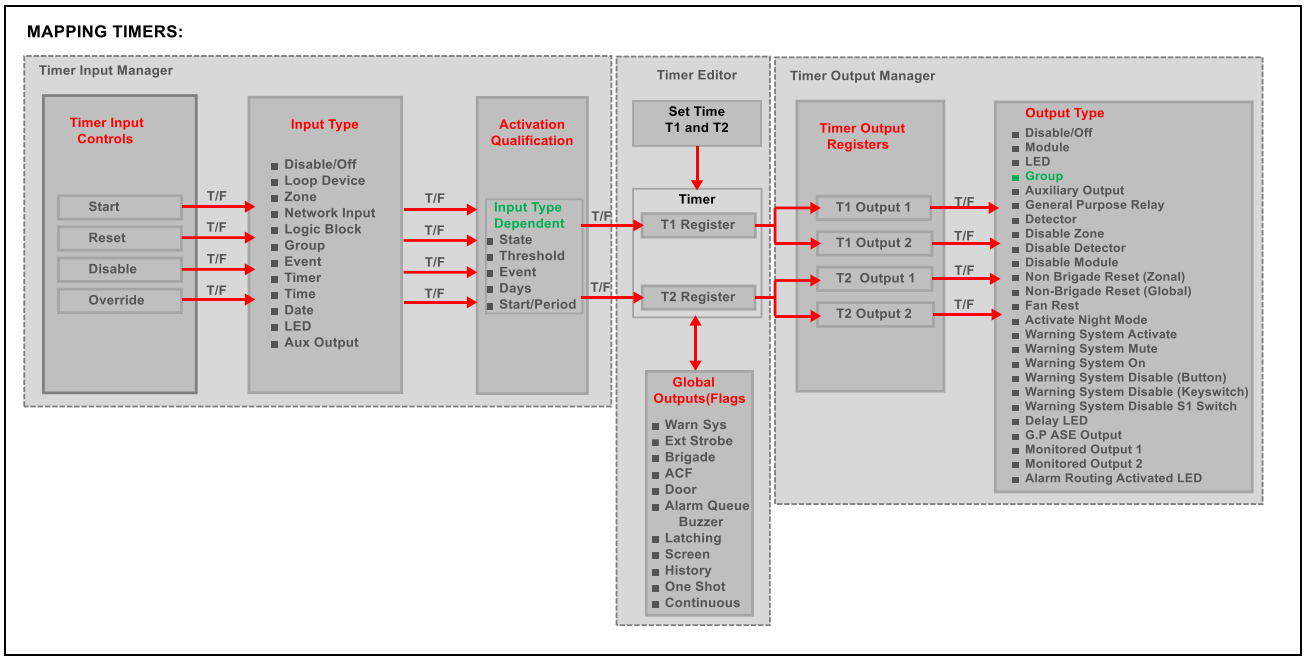


Figure 8-18: Timer Mapping

8.6.1 Timer Control Inputs

The Timer has 4 control inputs. Each input is activated by the selected logical input, which is the same as the inputs into the F220 Logic Blocks.

Input Name	Description
Start	Starts the Timer. In 'Normal' mode, the Timer will return to Normal when the start input is inactive. In 'One-Shot' mode, the start input must return to Normal (false) before the Timer can be re-triggered.
Reset	If the Timer is running and the Start input is still active, the Timer resets to the start of the T1 period, as though it has just been started. If the Start input is inactive, the Timer resets to Normal. **Note:** Timers can always be manually reset (if configured to be on-screen) using the front-panel RESET key, as for loop devices.
Isolate/Disable	Disables the Timer. This overrides all other inputs and forces the Timer OFF.
Override	Forces the Timer into its 'complete' state. All outputs specified by the Timer output flags as well as the T2 outputs are activated.

Table 8-7: Timer Control Inputs

8.6.2 Timer Registers

The Timer preload registers provide the values for the main timing of the Timer.

- T1 register loads the initial Timer Delay (up to 12 hours), which begins when the Timer is started.
- T2 register sets the second period of the Timer (also up to 12 hours), which begins when the T1 period is complete.
- T1 must be set to a non-zero value for the Timer to operate.

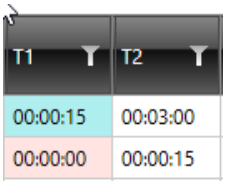
8.6.3 Timer Input Configuration using FireUtils

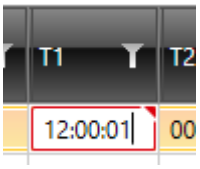
Figure 8-19 shows how FireUtils' Timer's Editor and Input Manager are used to configure Timer 1's T1 and T2 registers, as well as mapping the photoelectric smoke detector L01D001 to start T1 when it becomes active. Using the Timer Editor, T1 has been set to run for 15 seconds and T2 for 3 minutes.

At the completion of the 15 seconds, T2 will be run for 3 minutes.

Note:

1. If T1 and T2 have been set correctly, within the allowable minimum and maximum time periods, the background color of T1 will change to blue.
2. If T2 has been set but not T1, the background color of T1 will change to red.
3. If times greater than 12 hours are entered into either T1 or T2, the cell outline will become red





The Input Manager is accessed by double clicking the Timer 1 'Start' cell.

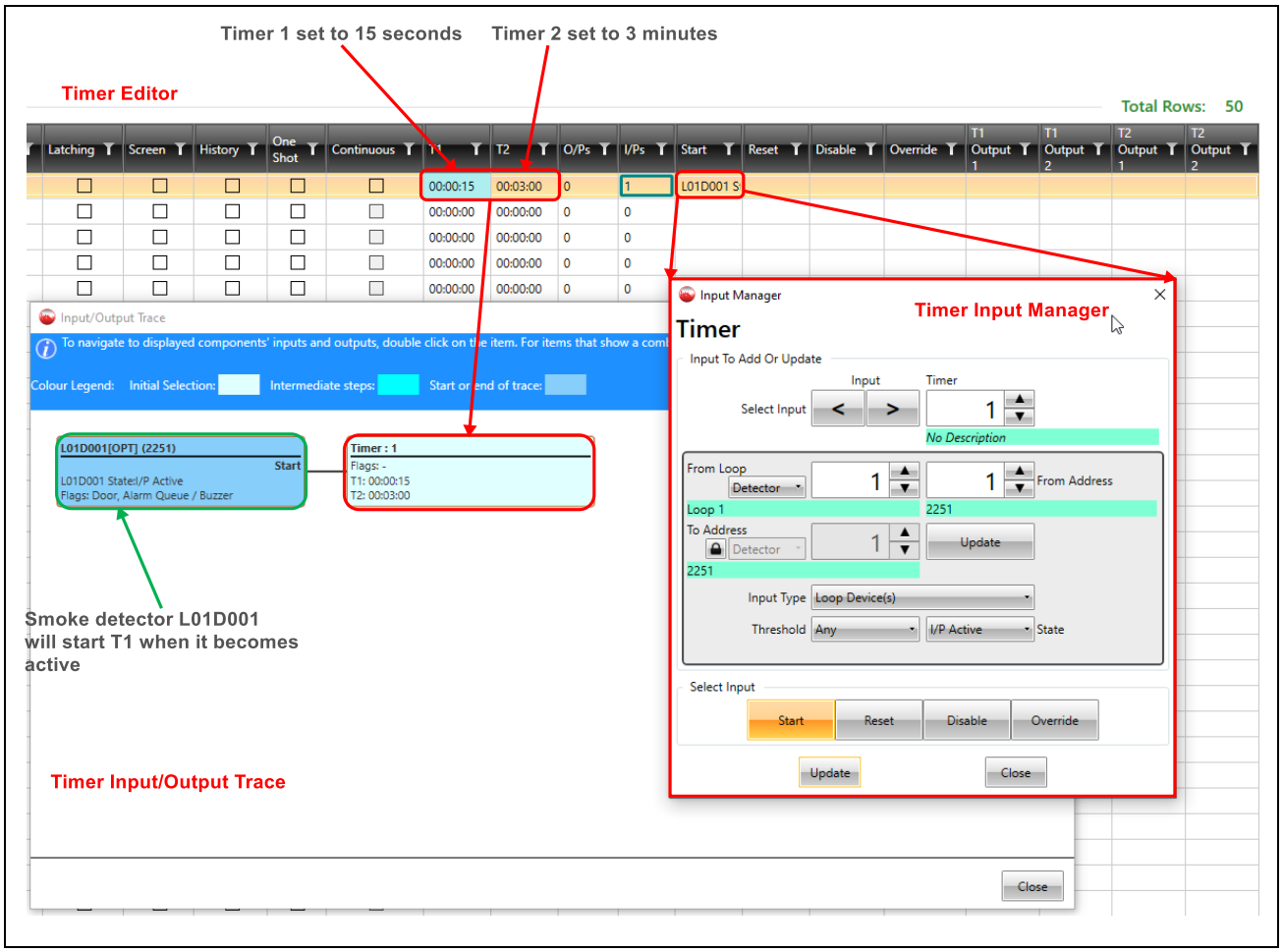


Figure 8-19: Setting up Timer 1 using FireUtils' Timer Editor, Input Manager, and I-O Tracer

8.6.4 Timer Outputs

There are four standard F220 outputs associated with each Timer:

- Two T1 outputs, which are activated while the T1 period is active
- Two T2 outputs which are active during the T2 period or when the Timer completes, depending on the options.

Each Output Registers can be mapped to activate one of the 19 Output Types from a drop-down list. These Output Types are listed in Table 8-1 and are identical to those used in Loop, Zone, Group, System Events and Logic Block mapping functions.

In addition to the 4 Output Registers, the logic blocks can be mapped to activate the 11 global system outputs/flags; the Warn Sys, Ext Bell, Brigade, Anciliary and Door Holder relays, the Alarm Queue/Buzzer, and the Latching, Screen, History, One Shot and Continous flags. Refer to Section 8.6.6 for more details on these configuration flags

8.6.5 Timer Output Configuration using FireUtils

In FireUtils, to configure a timer, access the Timer Output registers by double-clicking on the T1 and/or T2 Output cell. Now select one of the Output Types to activate when the smoke detector becomes active. In the example below (Figure 8-20), both T1 and T2 outputs have been assigned to turn the Delay LED on.

Note that a Disable input has also been added. If the detector is disabled in any way, Timer 1 will turn off.

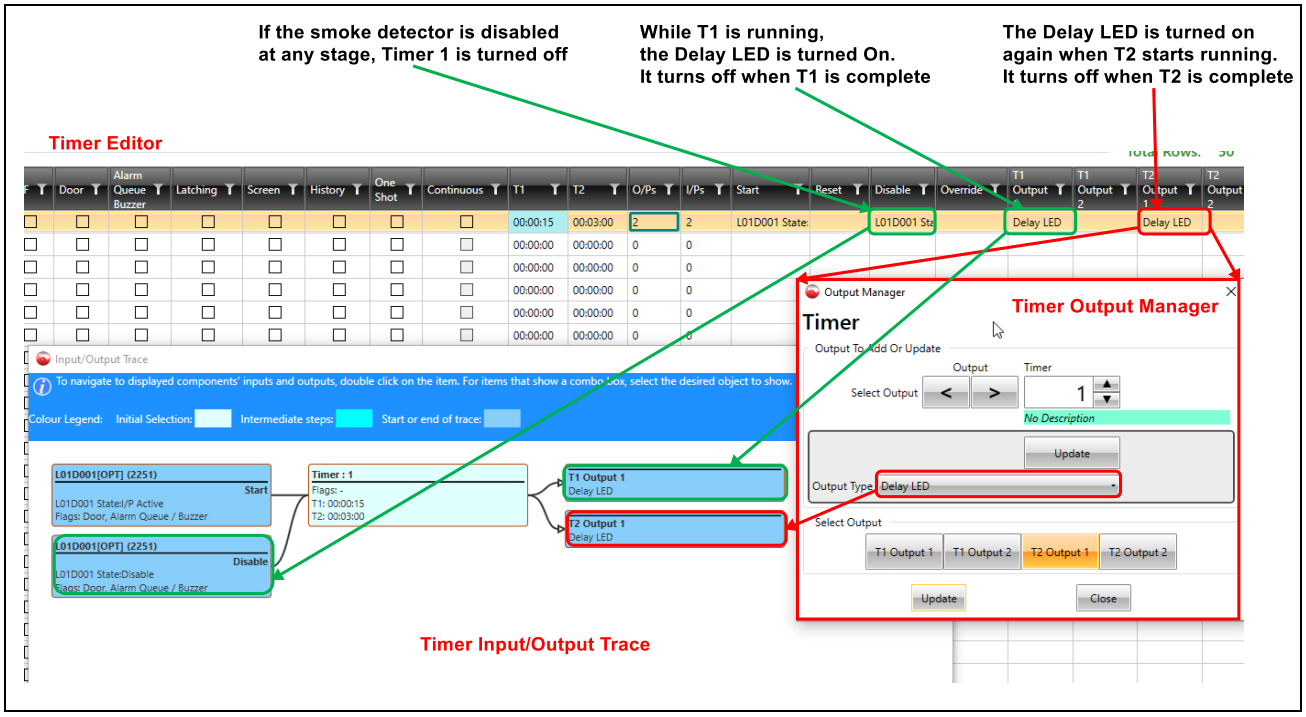


Figure 8-20: Setting Timer 1's Output Registers T1 and T2

8.6.6 Timer Configuration Flags

The Timer has a set of flags so that the Timer can activate, for example, the Externak Bell relay, call the Brigade, operate Door Holder relays, and so on. The full list is shown in Table 8-8

Flag	Symbol	Description
Warn Sys, Ext Bell	W, E	Activates the selected Bell relay.
Brigade	B	Calls Brigade.
Ancillary	A	Activates ACF & ACFM relays on the Mainboard
Door Holder	D	Activates Door Holder relay on the Mainboard
Alarm Queue/ Buzzer	Z	Activates warning buzzer. Forces OnScreen set and event into 'Alarm' queue.
Latching	L	Latches Timer complete at the end of T1 (T2 becomes redundant) until manually reset. Forces OnScreen to be set.
OnScreen	S	Forces events to be queued to display (defaults to Information queue) and forces History to be set.
History	H	Log events in historical event buffer.
OneShot	O	The Start input behaves like a momentary contact input – the Timer runs to completion even if the Start input is deactivated. Similarly, the Start input must be returned to normal before the Timer can be restarted.
Continuous	C	The Timer runs continuously (T1 to T2 to T1, …) until reset. This flag can only be set if bit 'L' is clear and 'T2' is non-zero.

Table 8-8: Timer Configuration Flags

8.6.7 Timer Descriptor

The Timer has a descriptor for assigning meaningful text to a Timer function. This descriptor is shown with all displayed or logged events.

8.6.8 Timer Events

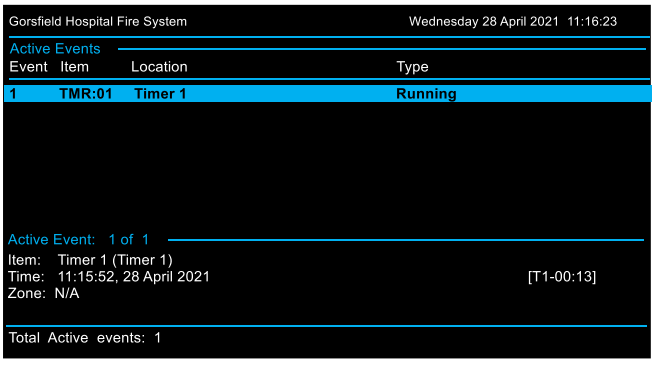
The OnScreen (S) and History (H) flags described above control the handling of the main Timer events, but there are other events, which behave differently. The full list of available Timer Events is shown in Table 8-9

Event	Description
Normal	Timer is normal or has normalised.
Started	Timer has started. Logged in the historical event buffer if S bit is not set.
Complete	Timer has timed out, or Override input was activated.
Isolate/Disable	Timer disabled. This event is always displayed regardless of S and H bits.
Reset	Timer was reset. This event is always logged to the event buffer only.
Over-ridden	Timer over-ride input was activated. Always logged to event buffer.
Stopped	Timer was stopped, either by deactivating Start or at the end of T2. Always logged.
Running	Same as Started event, but used if S bit is set.
Alarm	Same as Complete, but logged as an Alarm event (bit Z set).

Table 8-9: Timer Events

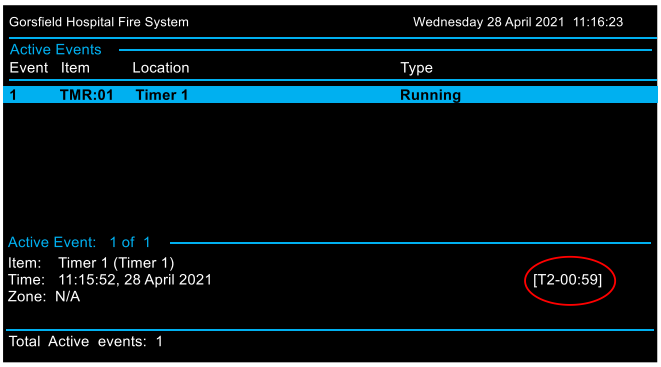
8.6.9 Timer Event Display

Once started, and if the OnScreen (S) flag is set, pressing the ‘OK’ button will display the Timer on the LCD screen:



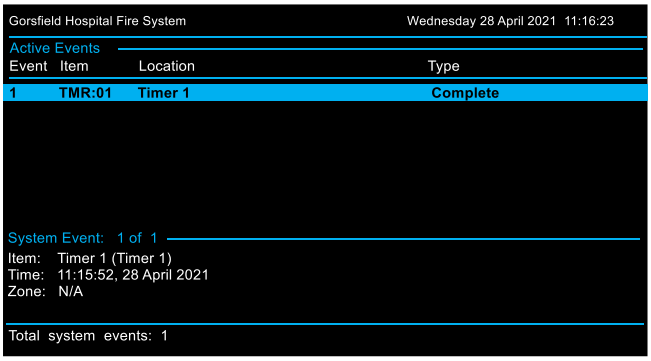
This shows that Timer 1 was started at 11:15:23, is in its T1 period, with 13 seconds to run.

The timer description is “Timer 1”.

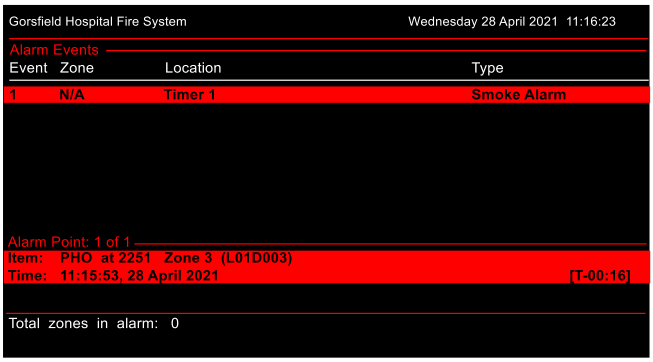


If the timer has a T2 period defined, T2 will be displayed once T1 is complete.

Note: In FireUtils, if the Latching (L) flag is enabled, a delay time can not be set in T2. Alternatively with a time set in T2, enabling the Latching flag will reset T2.



If the Latching (L) flag is set, at the end of the T1 period, the display will show 'Complete' as shown (diagram left)



. . . or in the case where Timer 1 had its Alarm Queue (Z) flag set, an alarm event would be generated.

8.6.10 Timer Example: Brigade Call After Smoke Delay

The requirement is to call the fire brigade after a constant period of activity (say 5 minutes) for a group of non-brigade-calling smoke detectors (detectors 43 to 58 on loop 5). A warning indication is to be given by a strobe (driven off the General Purpose Relay on the Mainboard) while the timer is running. An LED indicator is used to show that the smoke timer has raised the alarm. A push-button switch, attached to loop input module address 5 on loop 1 is used to restart the timer if more time is required for the investigating staff to clear the smoke.

The Timer settings for this could be:

Parameter	Value	Description
Start	Any of L05D043..D058	Timer will start when any of the specified detectors activates (and will reset if smoke clears within the T1 period).
Reset	Any of L01M005..M005	Activating the switch will restart the timer if there are still active detectors.
T1	5:00	The timer period.
T2	not set	Not required, as we are not using the Continuous flag.
Flags	WEBADZL	Activate all Bells, ACF, Door Holder, call Brigade, sound buzzer & latch at completion.
T1Out	GPRelay	Activate General Purpose relay to drive strobe.
T2Out	LED 14	Visual indication that brigade call was due to smoke timer.

Table 8-10: Timer Example

8.7 Alarm Acknowledgement Facility (AAF)

The AAF is a function which implements a delay from a local Non-Brigade Calling ‘Alarm’ before the Brigade is called. It is used to provide an ‘alarm investigation’ function for occupants of Sole Occupancy Units (SOU, or other defined spaces within a zone), to clear the ‘Alarm’ before the brigade is called.

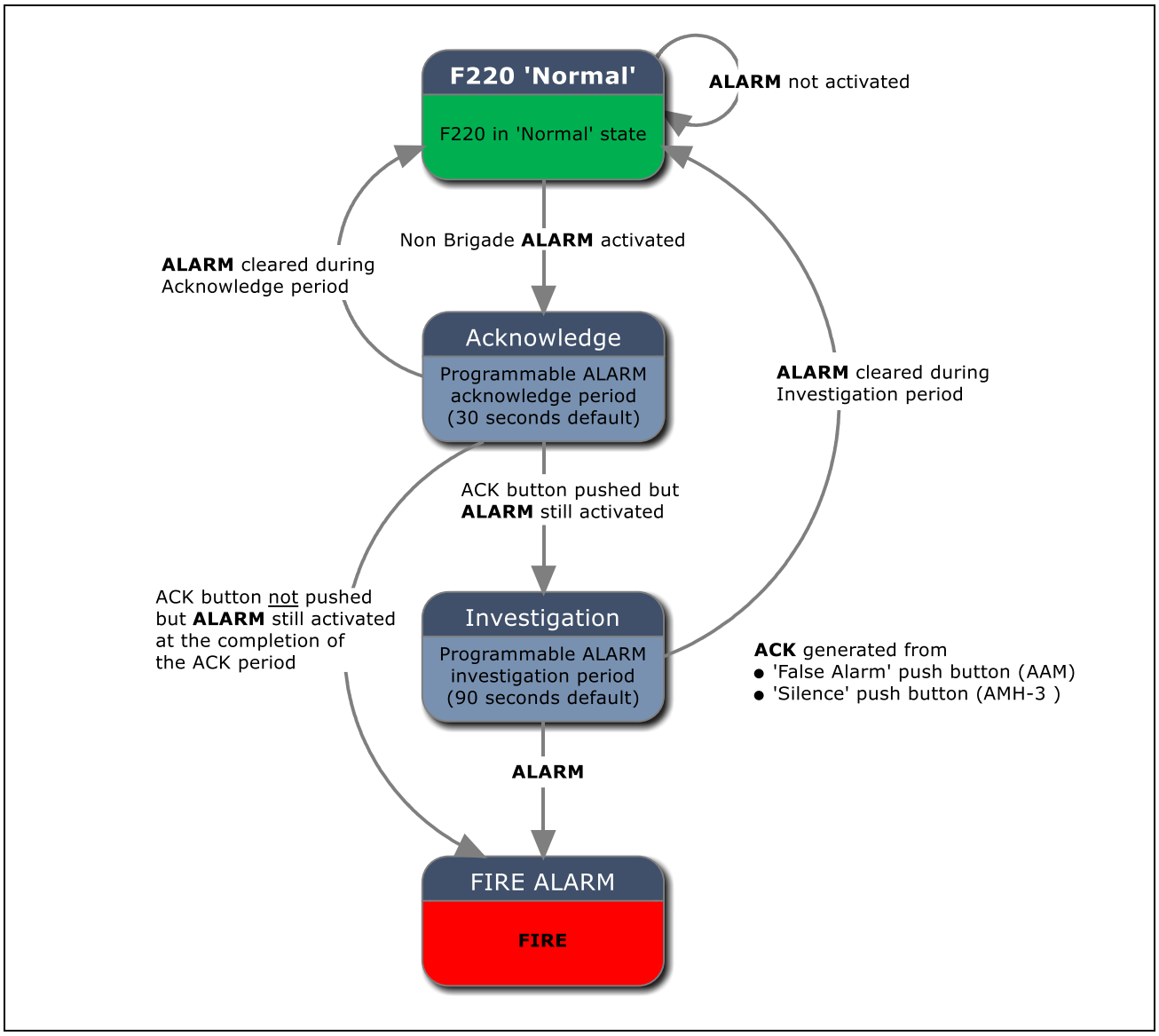


Figure 8-21: AAF Event Sequence

A typical installation would consist of one or more detectors located within the SOU, an Alarm Acknowledge Module (AAM) and configuration of the associated AAF logic block within the F220 panel.

Each AAF operates independently and may be configured with customised acknowledge and investigation times.

A maximum of 1200 AAF logic blocks, each with their own descriptor, are provided within the F220 system.

8.7.1 AAF Logic Input Descriptions

There are 2 inputs into the AAF logic:

Input	Description
Associated AAF Activation	This input is activated when any non-brigade configured device belonging to the zone trips into alarm. **This is automatic and cannot be configured.**
Acknowledge	This is a standard F220 logical input, so it can monitor loop devices, LED states, etc., as required. (Typically the “Press to acknowledge False Alarm” key on an AAM)

Table 8-11: AAF Input Descriptions

8.7.2 AAF Logic Output Descriptions

Each AAF block supports 3 outputs:

Output	Description
AckOut	Upto 2 AckOut Outputs. Active during the Acknowledge period.
Inv’gOut	Upto 2 Inv’gOut Outputs. Active during the Investigation period - after Acknowledge input has activated.
CompleteOut	Upto 4 CompleteOut Outputs. Active once either Acknowledge or Investigation periods have elapsed and Fire input is still active.

Table 8-12: AAF Output Descriptors

8.7.3 Acknowledge and Investigation Periods

Each AAF has two associated period parameters. The Acknowledge period defines the time period the building occupant has to Acknowledge the presence of fire in the building. Once acknowledged, the AAF initiates the Investigation period, which extends the time available to deal with the alarm. The Acknowledge operation can be performed once only. The periods can be set to any value between 10 seconds and 10 minutes. The default values in FireUtils are 30 seconds and 90 seconds respectively.

Note:

The timer continues to run to completion (with the exception of manual Reset via the front panel) regardless of the state of the alarm. This allows scenarios such as the Acknowledge input resetting the zone in alarm. In this case the alarm temporarily reverts to normal, so the timer should stay running. The decision to move the AAF to the Complete or Alarm state (as opposed to reverting to normal) is made by observing the Alarm state as the countdown timer reaches zero.

8.7.4 AAF Reset

If set, this option sends a non-brigade Reset command to the AAF when the Acknowledge input is activated. Although the initiating device may be non-latching in this application (and consequently it is not strictly necessary to reset), this option will temporarily turn the device LED’s off while the devices reset. This may be a useful indication to the occupant that the panel has registered the Acknowledge input.

8.7.5 Activation Flags

This parameter stores the ‘standard’ flags, so that the AAF can operate the main evacuate relays, call the brigade, etc. The ExtBell (E), WarnSys (W), Brigade (B) and other output flags are only active at the end of the investigation time period.

8.7.6 Event Generation

The AAF generates various events during operation that can be viewed in the event log and/or on the LCD display. The sequence of events for an alarm that eventually results in a “Brigade call” is shown below. The AAF logic block descriptor (if present) is attached to any AAF events

Event	Message	Description
NB Alarm	NB Alarm at------	A detector within the SOU has activated
Running	A001 AAF running	AAF has started due to NB Alarm.
Input Active (AAM Module)	Input Active at AAF----(LnnMnn-SW_H)	The switch on the associated AAM has been pressed to silence SOU sounder.
Acknowledged	A001 AAF Acknowledged	The investigation period has commenced
Running-acked	A001 AAF Running-acked	The investigation timer is running
Normal (AAM Module)	Normal at-----(LnnMnn-SW_H)	The AAM sounder has been turned off
Complete	A001 AAF Complete	The investigation time for AAF 1 has expired.
ALARM	Alarm at---------	The detector that initiated the “Alarm” condition has been latched in Alarm and the Alarm Routing activated.

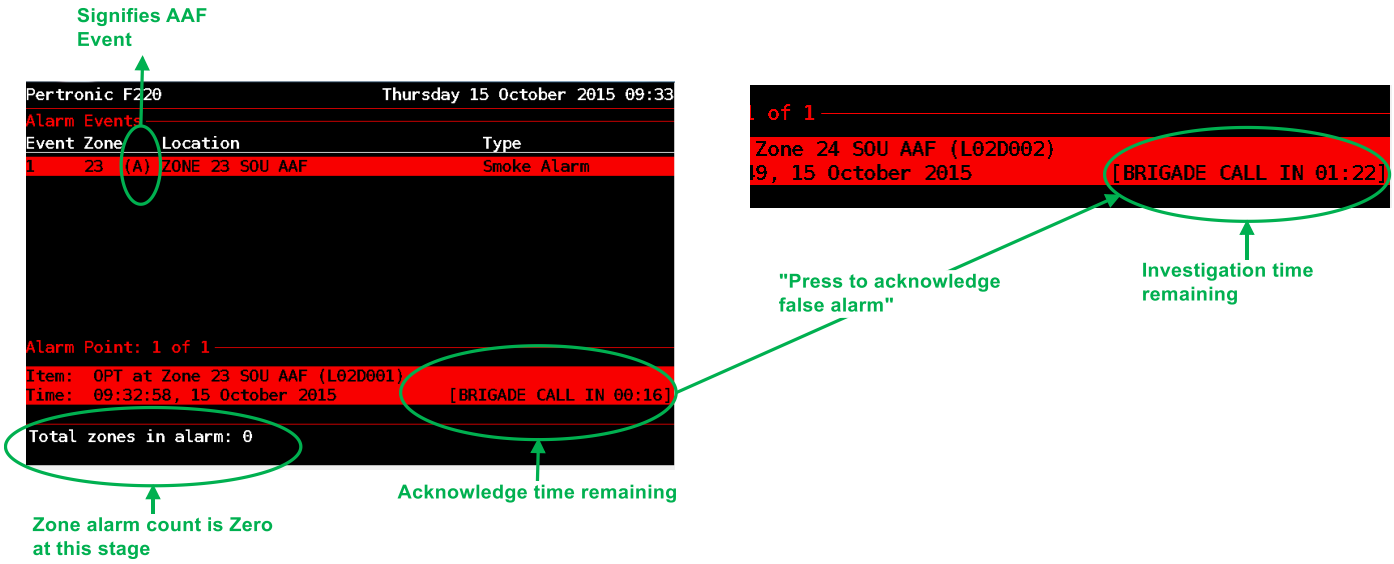
Table 8-13: Event messages

8.7.7 AAF Displays

Interaction with the fire panel when AAF activity is present is not usual. The following information will however be presented to users should they wish to view this activity.

The “non-brigade alarm” condition is presented in the Alarm list view as opposed to the usual Fire View.

The “acknowledge time remaining” is shown at the bottom right of the display and once the AAM button has been pressed the display will show “investigation time remaining”. See sample displays below:



Note:

The investigation timer will always run to completion. If an “Alarm” condition which has been cleared and returns within the remaining investigation period, a Brigade call will eventuate. Attempting to reset an Alarm from the panel will also result in a Brigade call if the detector activates again immediately after it has been reset.

8.7.8 Configuring AAF Using FireUtils

The following diagram gives an overview of the configuration required to implement an Alarm Acknowledge Facility for the F220 system

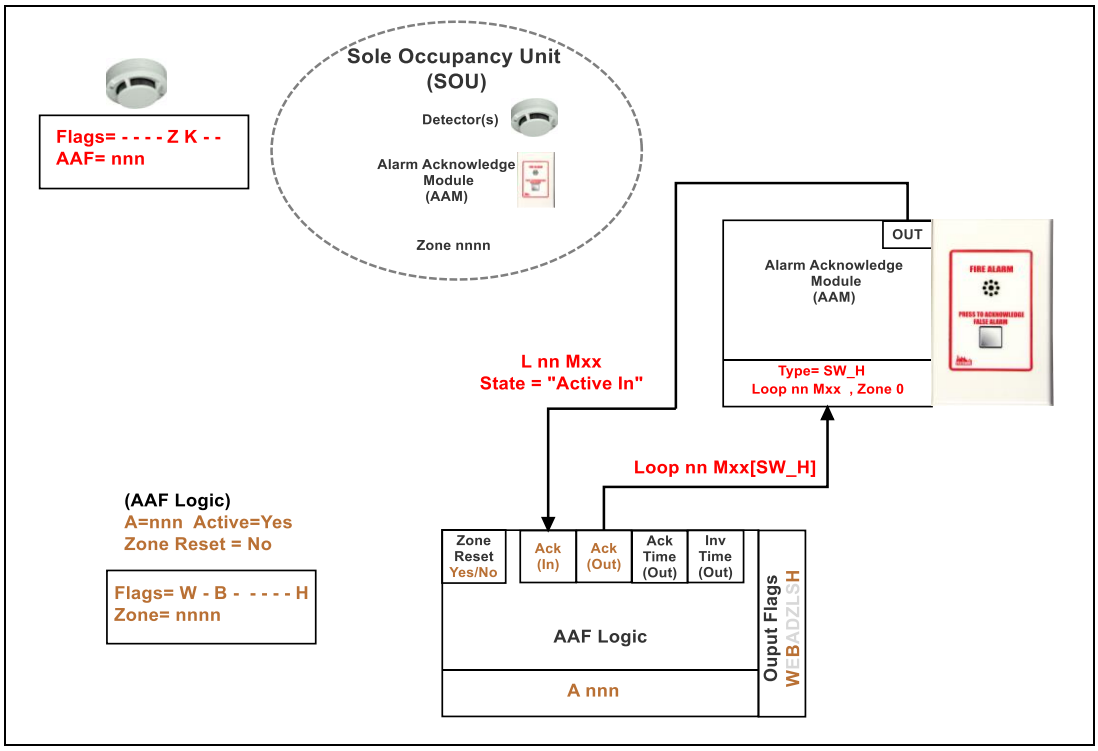


Figure 8-22: AAF Configuration

Two FireUtils' editors must be accessed to implement the Alarm Acknowledge facility; the Loop Editor and the AAF Editor.

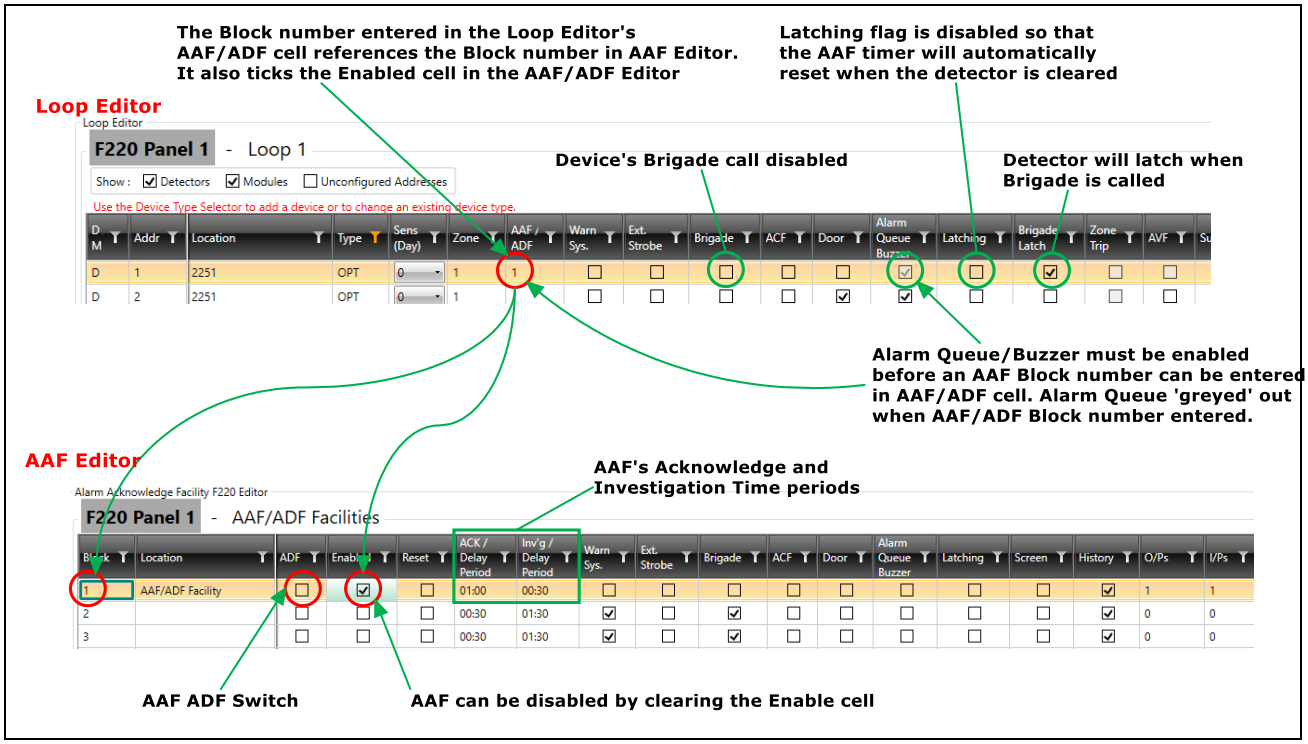


Figure 8-23: FireUtils Loop and AAF Editors

In Loop Editor:

For each detector in the Sole Occupancy Unit (SOU)

- Enable the 'Alarm Queue/Buzzer', and 'Brigade Latch' flags.
- Disable the 'Brigade' flag. The detector must not call the Brigade immediately when it becomes active.
- Disable the 'Latching' flag. Disabling the 'Latching' flag ensures that the AAF timer is automatically reset when the detector is cleared.
- Enter a AAF Block number (Range from 1 to 1200) into the AAF/ADF cell of the non-brigade calling device. Entering a Block number will enable that block in the AAF Editor and the 'Enabled' flag, in the AAF Editor, will be ticked.

Note:
An AAF Block number can not be entered in to the AAF/ADF cell if the Alarm Queue/Buzzer flag is disabled. Once a number has been entered into the AAF/ADF cell, the Alarm Queue/Buzzer is greyed out and can not be altered. To disable the Alarm Queue/Buzzer clear the AAF/ADF Block number first

In AAF Editor:

- Set Ack In and Ack Out.
  AckIn is mapped to read the status of the pushbutton on the AAM.
- Set the Output flags as required. (eg.Warn Sys, Brigade, and History)
- Set the timer.
  The default settings for the 'Acknowledge' and 'Investigating' Periods are 30 seconds and 1 minute 30 seconds respectively (Min: 10 seconds, max: 600 seconds). AS7240.2 allows a

maximum ‘Acknowledge’ period of 60 seconds and a maximum ‘Investigation’ period of 3 minutes.

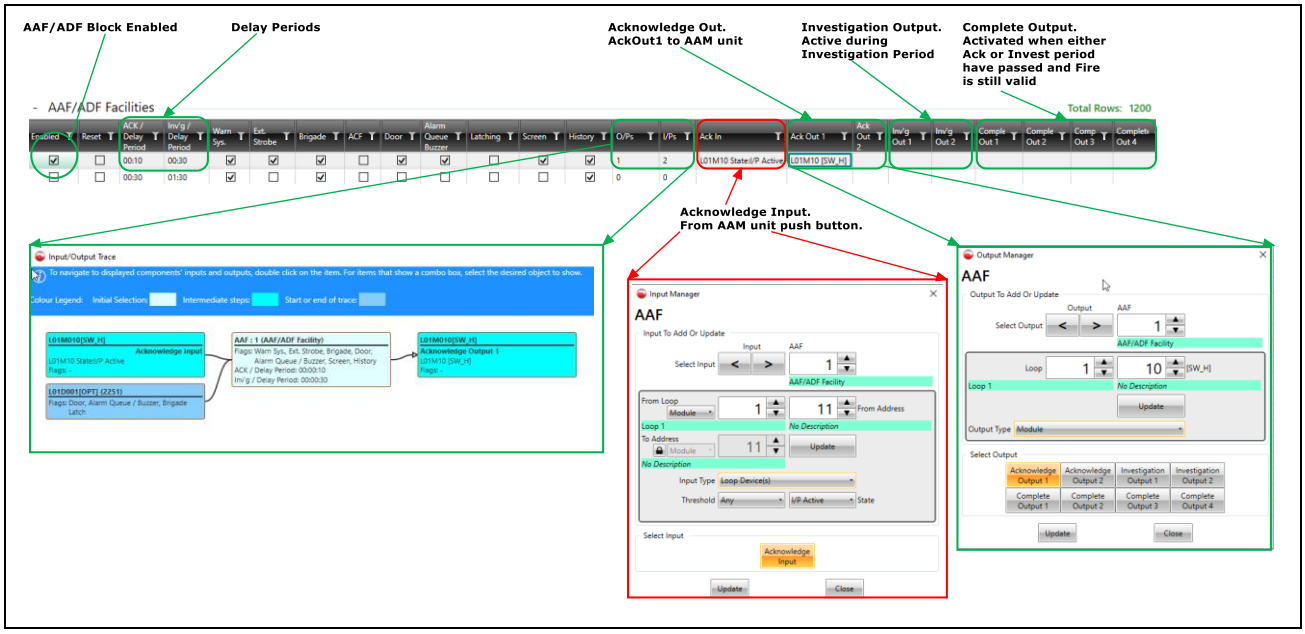


Figure 8-24: AAF Editor, Input and Output Managers, and Trace I-O

8.7.9 AAF Configuration using the Engineer’s Menu

Access the Engineer’s Menu (Menu > Service Menu > Classic LCD Mode > AAF) and set the configuration as follows:

Detector Configuration

Configure Detectors within the SOU

Set flags - - - - **Z K** - - - (Z= Alarm Queue/Buzzer flag, K = Brigade Latch flag)

Zone = Zone assigned to the SOU (This may be common to other SOU’s on the same floor of a mult-storied building)

AAF= nnnn (The number of the AAF logic block assigned to the SOU)

Alarm Acknowledge Module Configuration

Type= SW_H

LoopnnMxx

Zone 0

Output 1 = none

AAF Logic Configuration

Select the AAF Logic Block assigned to the SOU

State= Enabled

Set output flags as required (**W**E**B**AD- - - **H**)

Ack In= Loop nn Mnn State = Active in

Ack Out = LoopnnMxx [SW_H]

AAF Block Timers

The timers are preloaded with the following default values:

Acknowledge Timer = 30 seconds

Investigation Timer = 90 seconds

These may be adjusted if required.

Note:

1. AS7240.2 allows a maximum Acknowledge time period of 1 minute and a maximum Investigation period of 3 minutes.
2. Refer to Table **12-2** for a list of flag abbreviations.

8.8 Alarm Delay Facility (ADF)

The function of the Alarm Delay Facility is similar to AAF (refer Section 8.7) in that it provides, for occupants of apartments or other defined spaces, a time delay between when a smoke detector is activated and when the Brigade is called. With AAF, the occupant has a period of time to acknowledge that the alarm is false and another period of time, the Verfication period, to clear the alarming detector. With ADF, there is no requirement for the occupant to acknowledge the false alarm and the delay timer is started. If the detector is cleared before the end of the delay period, ADF is reset. If the alarm (and associated alarms) has not been cleared, the Alarm is latched and the Brigade is called.

Alarm Delay Facility is compliant to AS1670.1 2015.

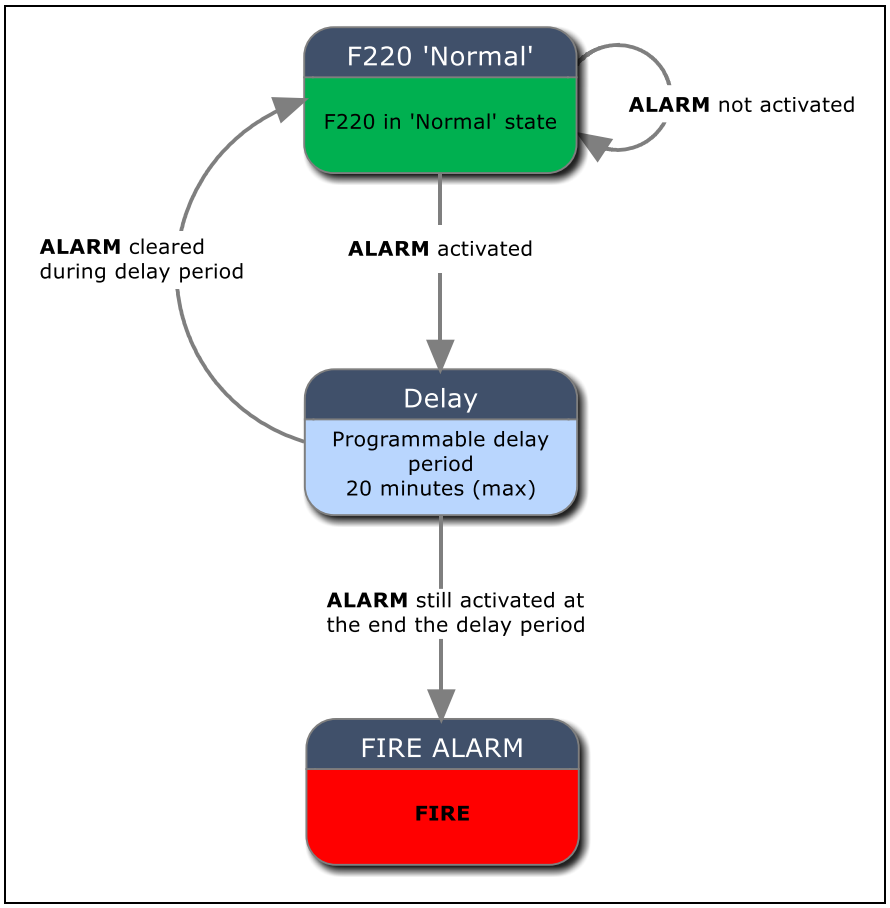


Figure 8-25: ADF Event Sequence

8.8.1 Configuring ADF using FireUtils

As ADF is similar to AAF, the process of configuring ADF in FireUtils is almost identical. The only differences are:

In AAF Editor

- ADF cell is ticked (highlighted in red
- Only the ACK/Delay time period is executed. The Investigation period is ignored.

These differences are highlighted in red in Figure 8-26

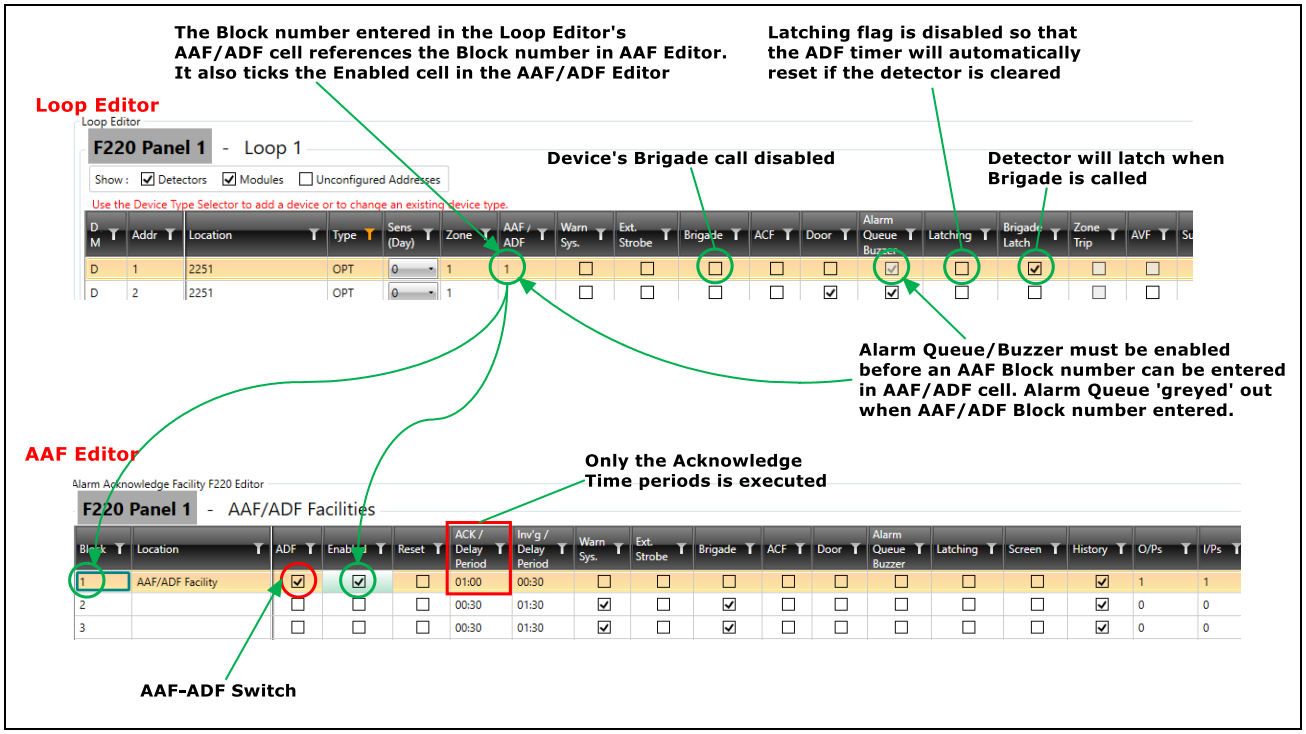


Figure 8-26: Configuring ADF in FireUtils

8.9 Alarm Verification Facility (AVF)

The Alarm Verification Facility is designed to minimise false alarms from input devices (except Heat detectors, MCPs, Disable and 3-Way switches) by monitoring the device for a period of time before an alarm is raised. AVF is also known as “Type A dependency” in standard AS7240.2 section 4.4.12.1.

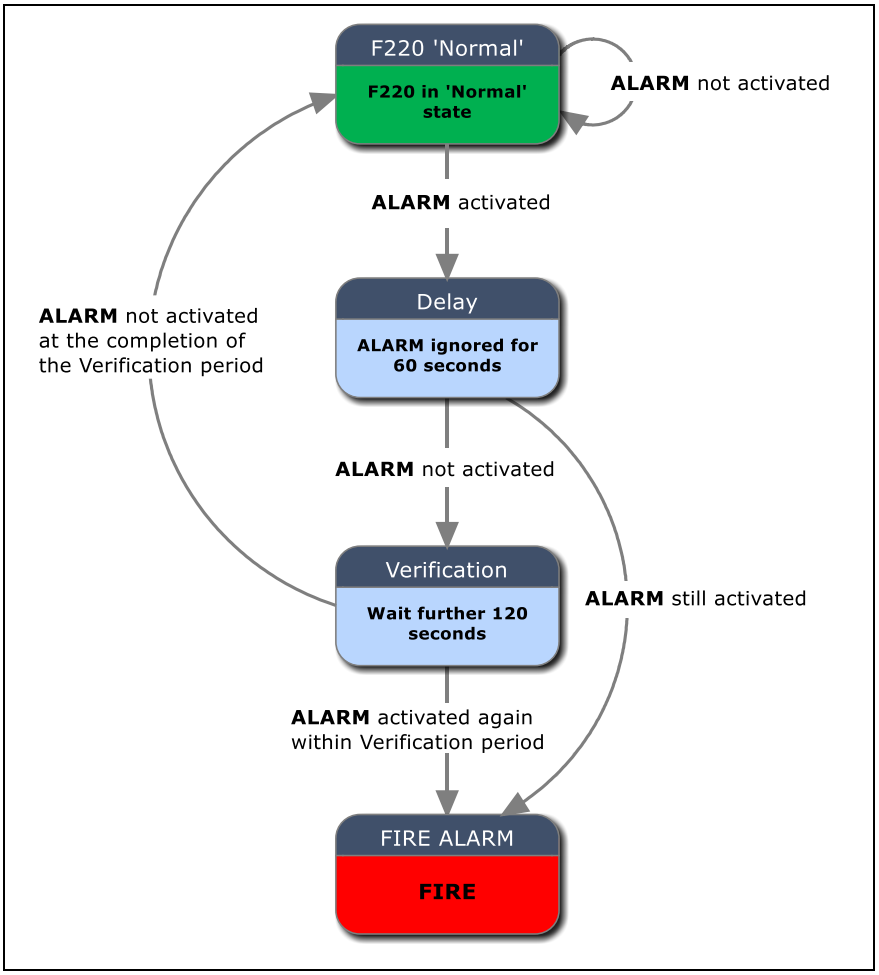


Figure 8-27: AVF Event Sequence

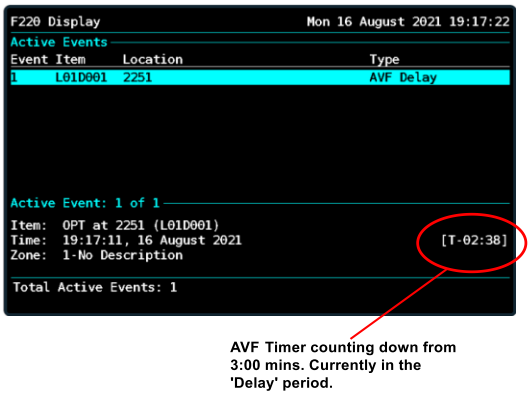
8.9.1 Delay Period

When AVF is enabled for a device and the device goes into an alarm state, there is a 60 second time window where a continuous or additional transient device alarm states have no further effect.

During the delay period,

- the ‘System’ screen will display ‘Active: x’ where x is the number of AVF enabled devices that are in an alarm state

Press ‘OK’ to display the ‘Active Events’ screen

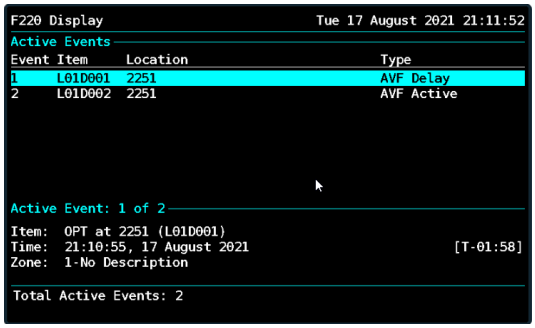


The ‘Active Events’ screen will display

- Either ‘AVF Active’, if the device is in alarm,
- or ‘AVF Delay’, if it is not.
- The AVF timer counting down from 3 mins.

- If another AVF device goes into alarm, another AVF timer event is started.

The panel does not go into an immediate alarm condition



At the end of the Delay Period, if the device is

- In alarm, the panel will immediately enter an alarm state
- Not in alarm, the panel will enter a 120 second verification period.

8.9.2 Verification Period

During the 120 second verification period,

- Another activation of the device will immediately cause the panel into an alarm state.
- If another AVF device goes into alarm, another AVF timer event is started. The panel will not go into alarm.

At the end of the Verification Period, if no alarm state occurs for that device the panel ceases to indicate “AVF Delay”.

The maximum time from first device alarm to cessation of the panel “AVF Delay” indication for the same device is 180 seconds.

8.9.3 Configuring AVF in FireUtils

AVF is enabled 'per device' in FireUtils' Loop Editor as shown in Figure 8-28 below

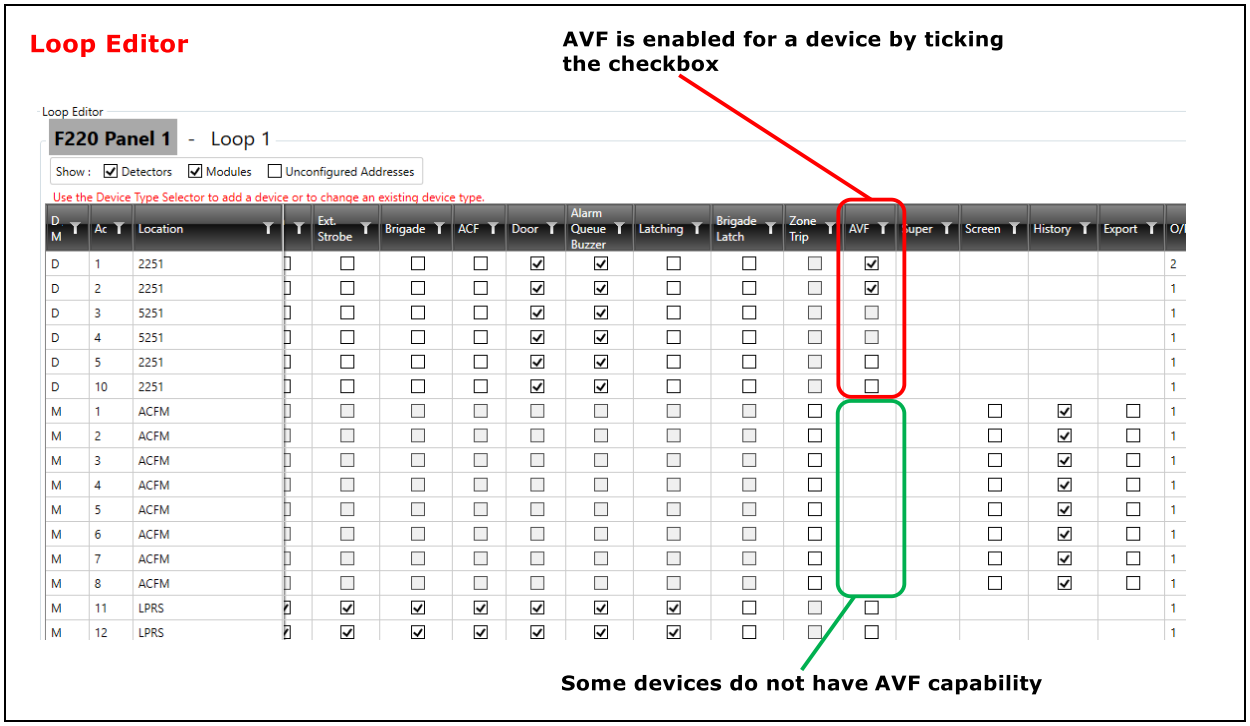


Figure 8-28: FireUtils' AVF

8.10 Fan Control Blocks

The Fan Control Block (FCB) is a variation on the general-purpose Logic Block (LB) on the F220. It is intended to support fan control functions conforming to AS/NZS1668.1:2015 in the extraction of smoke, the pressurising of evacuation routes and/or the supply of clean air to a structure.

Fan Control Blocks combine elements of both Logic Blocks and Timers for its operation to give fine control and feedback for fans connected to I/O modules. The F220 supports up to 400 FCB's. The basic Fan Control Block is:

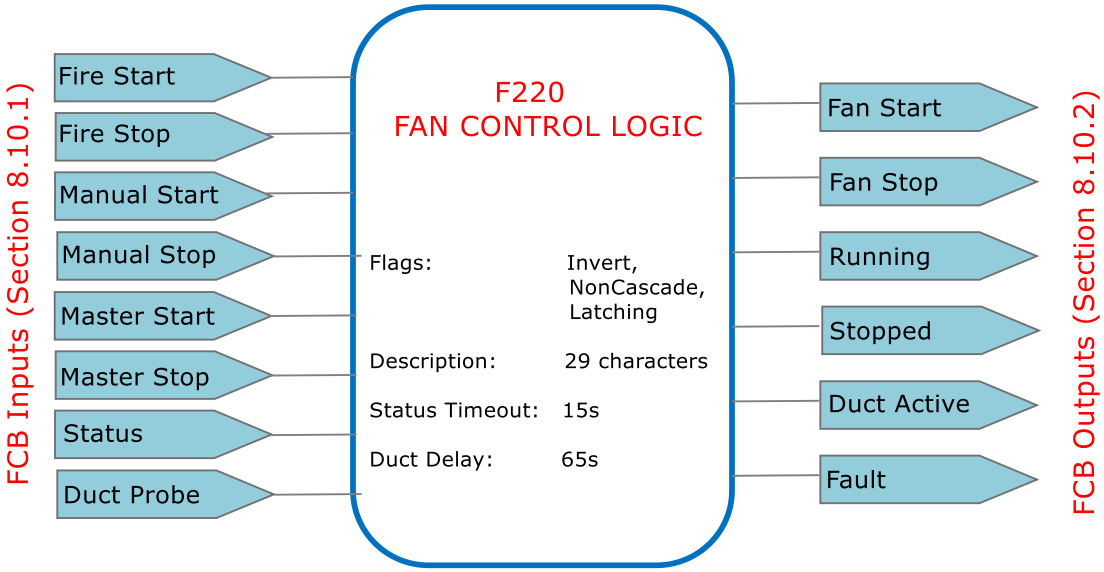


Figure 8-29: Fan Control Blocks

8.10.1 FCB Input Descriptions

Name	Short Name	Description
Fire Start	FStart	Fire Mode Start input (normally overrides FStop).
Fire Stop	FStop	Fire Mode Stop input.
Manual Start	MStart	Input for Manual start operation.
Manual Stop	MStop	Input for Manual stop operation (overrides Manual Start if both active).
Master Start	MstrStart	Input for Master manual Start operation (overrides both Manual inputs).
Master Stop	MstrStop	Input for Master manual Stop operation (overrides Master Start and both Manual inputs).
Status	ST	Feedback input from air handling system (input active = fan running).
Duct Probe	DPIn	Duct Probe input. When activated, initiates fan shutdown. The in-built 65s Duct Probe Timer starts whenever this input goes inactive & maintains the fan shutdown during this period or if the probe re-activates.

Table 8-14: FCB Input Descriptions

8.10.2 FCB Output Descriptions

Output	Description
StartOut	Fan Start output. Activated by MstrStart, MStart or FStart inputs. Can be overridden by MstrStop, MStop, DPIn or FStop, depending on state of operation.
StopOut	Fan Stop output. Activated by DPIn, MstrStop, MStop or FStop inputs. Can be overridden by MstrStart, MStart or FStart, depending on state of operation.
Stopped	Status of fan feedback input. Active when ST input is inactive.
Running	Status of fan feedback input. Active when ST input is active.
Flt	Fault status. Active when fan fails to start or stop on command.
DPOut	Duct Probe output. Activated only if fan has stopped due to duct probe input (or its related Timer) activation.

Table 8-15: FCB Output Descriptions

8.10.3 FCB Flags

The FCB configuration options are determined by flags.

Flag Name	Initial	Description
Invert	I	When set, this flag inverts the normal priority resolution when the FCB sees both FStart & FStop inputs active simultaneously. Normally FStop is ignored if FStart is active. With Invert set, FStart is ignored if FStop is active.

Flag Name	Initial	Description
Non-Cascade	N	Disables Cascading operation for the FCB. Normally, the FCB sets an internal latch if either FStart or FStop is activated. This latched state is maintained even if the original inputs return to normal. However, an active input can reverse the operation of the FCB if the previous state is only latched. Example: if FStop activates & then resets soon afterwards, the internal FStop state will be latched (with the StopOut output active). If FStart subsequently activates, the FStop latch will clear & the FStart will be activated. Setting NonCascade forces the FCB to latch the first state seen.
Latching	L	The (default) Latching mode ensures that the FCB remains in Fire mode once activated by FStart or FStop. The FCB can switch between Start and Stop as described above (if NonCascade is not set), but resetting the original FStart or FStop event will not return the FCB to normal operation. The internal FCB latches are reset when the Fan Reset output is triggered. If Latching is disabled (this is non-compliant with AS1668.1), the FCB returns to normal after the initiating FStart or FStop input clears. In this mode NonCascade is forced OFF.

Table 8-16: FCB Flags

8.10.4 Input Priorities

In the event of multiple input activities, the input priorities for an FCB and the affected control outputs are:

Priority	Input	Action
Highest	MstrStop	StopOut active
	MstrStart	StartOut active.
	MStop	StopOut active
	MStart	StartOut active.
	DPin	StopOut active
	FStart (FStop in Invert mode)	StartOut (StopOut) active.
Lowest	FStop (FStart)	StopOut (StartOut) active

Table 8-17: Input Priorities

8.10.5 Status Timeout

Each FCB has an associated Fan Status Timeout period parameter. This period defines the maximum time the FCB will wait for a fan to start or stop when commanded by the FCB. The timeout period can be set to any value between 5 and 90 seconds.

Note that the Status Timer starts only when the Stop or Start outputs are activated for the first time. This results in an instantaneous fault condition being generated if, for example, the fan stops after initially starting on command during the feedback period.

8.10.6 Stabilisation Period

A ‘Stabilisation Period’ (SP) parameter is provided to allow the Fire inputs to the FCB to stabilise prior to activation. This period can be set from 0 to 9 seconds, and sets the duration the FCB waits for the FStart & FStop inputs to stabilise after any state change.

This parameter is particularly important if the Non-Cascading flag is set, because the FCB latches the state of the first Fire event it registers, and this state remains even if the opposite sense Fire input is subsequently activated. The SP value should be set if near-simultaneous activation of FStart & Fstop is likely and the initial output state is important. F220 event processing is done in a series of blocks and the FCB processing may be interspersed between processing other events. This may mean, for example, that if FStart & FStop are generated by devices on different loops, then, even if the devices were activated simultaneously, it is possible for the FCB to register one event occurring before the other. This may result in the FCB latching into the “wrong” state, even though the Priority flag setting suggests this is not possible.

8.10.7 Duct Probe Delay

This is a fixed period of 65 seconds. AS/NZS1668.1:1998 allows a 60 to 75 sec window for this parameter.

8.10.8 Fan Interlock Delay

A fixed 5-second timer operates when either the StartOut or StopOut outputs is deactivated. This prevents either output from operating again until the timer expires, and prevents unwanted control conflicts.

8.10.9 Freeze Timer

The FCB Freeze timer prevents activation of non-cascading FCB’s sometime after the first non-cascading FCB activates. This is used if only a limited number of fan units can be activated simultaneously, due to airflow considerations.

If non-zero, the timer starts when the first Fire input (either FStart or FStop) activates on any non-cascading FCB. Once the timer times out, the FCB system becomes “frozen” After this point Fire inputs for all non-cascading FCB’s are ignored, and the operating state of all non-cascading FCB’s is locked, although Manual & Duct Probe inputs still override the Fire inputs as usual.

The ‘frozen’ state is reset by the system FanRst event, but only if there are no active Fire inputs present on any non-cascading FCB’s.

The timer does not interact with FCB’s that are non-latching, or are in the default (Cascading) mode.

The FCB Freeze timer can be set in either the General sub-menu of the Engineer’s Menu or, preferably, in FireUtils.

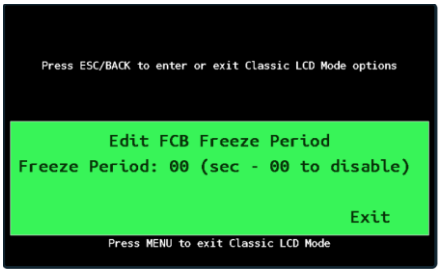
Using the Engineer Menu

Press the ‘Menu’ button on the front panel, select Service Menu, followed by Classic LCD Menu

Menu > Service Menu > Classic LCD Menu

Once in the User Menu, select ‘Engineer’ and enter the Engineer key-code. Navigate to the General and FCB menu options using a combination of the front panel Navigation and Soft keys.

Engineer > General > FCBFreeze

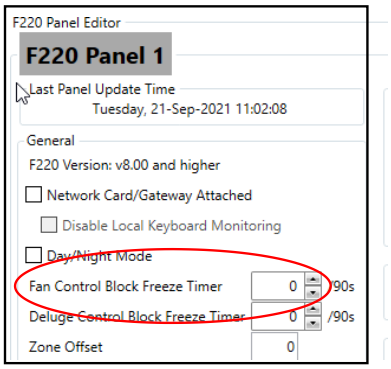


Configuring FCBFreeze using F220’s Engineer Menu

Using FireUtils

To access the FCB Freeze Timer in FireUtils, select the F220 Panel Editor in the Component Tree. The 'Fan Control Block Freezer Timer' is located in the General section.

A System Event (FCB Frozen) indicates whether the FCB Freeze timer has operated (Refer to Section 8.4).



Configuring FCBFreeze in FireUtils

8.10.10 Event Generation

The FCB generates various events during operation that can be viewed in the Event log:

Event	Description
Normal (Auto)	FCB has reverted to normal (Auto) operation – no control commands are active.
Manual ON	Manual ON operation has been selected via the MStart input.
Manual OFF	Manual OFF operation has been selected via the MStop input.
Fire Start	The FCB has been commanded to Start via the automatic FStart input.
Fire Stop	The FCB has been commanded to Stop via the automatic FStop input
FAULT - StopFail	The fan has been commanded to stop, but the fan is running & the status timeout period has expired. This event appears in the Fault queue on the LCD.
FAULT - StartFail	The fan has been commanded to start, but the fan is stopped & the status timeout period has expired. This event appears in the Fault queue on the LCD.
Fault Cleared	The StartFail or StopFail fault has cleared due to the fan reaching the correct operating condition.
DuctProbe Active	The DPIn input monitoring the duct probe has activated.
DuctProbe OFF	The fan has been turned off due to duct probe activity.
Reset	The FCB has been Reset via a "FanRst" output being activated.

Table 8-18: Event Generation

8.10.11 Configuring Fan Control Blocks using FireUtils

Two, and possibly three, FireUtils' editors are required to configure a F220 panel when it controls the fans for supplying clean air, extracting smoke or pressurising evacuation routes. The two are the Loop Editor and Fan Control Block Editor. The third, the Panel Editor, would need to be accessed only if the state of 'ACF Disable Inhibit Fan Relay' flag requires updating.

The FireUtils Fan Control Block Editor is shown in two parts - Figure 8-30 and Figure 8-31. Each figure has a brief overview of the parameters described in Section 8.10 above.

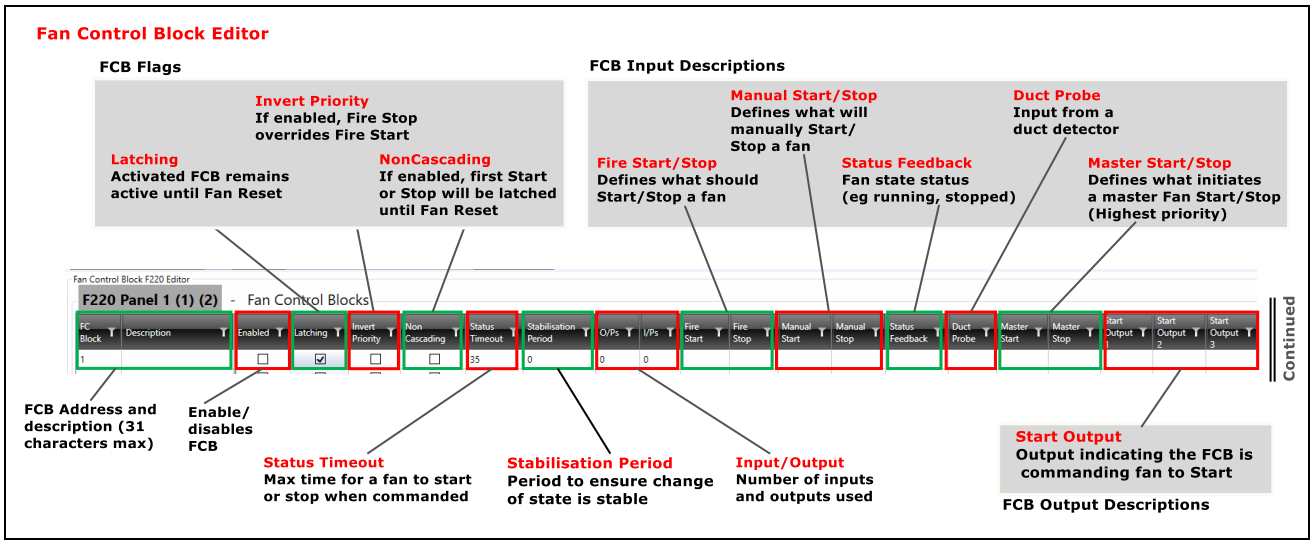


Figure 8-30: FireUtils Fan Control Block Editor part 1

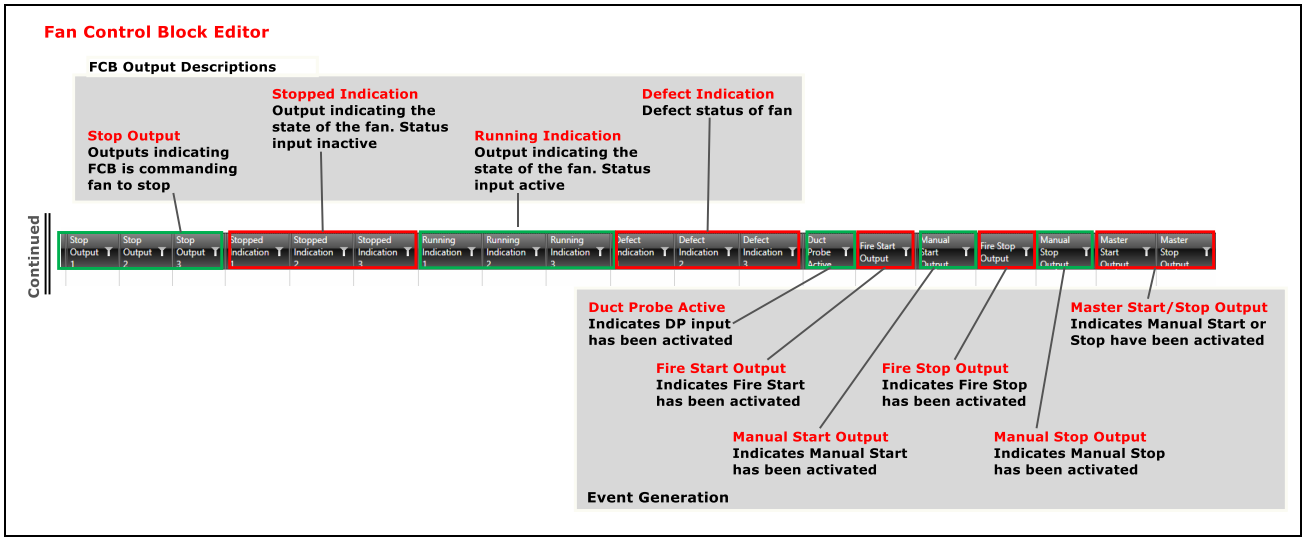


Figure 8-31: Fire Utils Fan Control Block Editor part 2

8.10.12 FCB Programming Example

The following is an example of a basic fan control system; with a system layout (Figure 8-32) and how its would be configured using FireUtils (Figure 8-33, Figure 8-34, Figure 8-35, and Figure 8-36). In this setup, the F220 Fan Control Blocks are interfaced to the Fan Control Switch Unit and a M500 DMR Dual Input/Dual Output module (although other loop relays can be used). Further details can be found in the Pertronic Fan Control Switch Technical Manual.

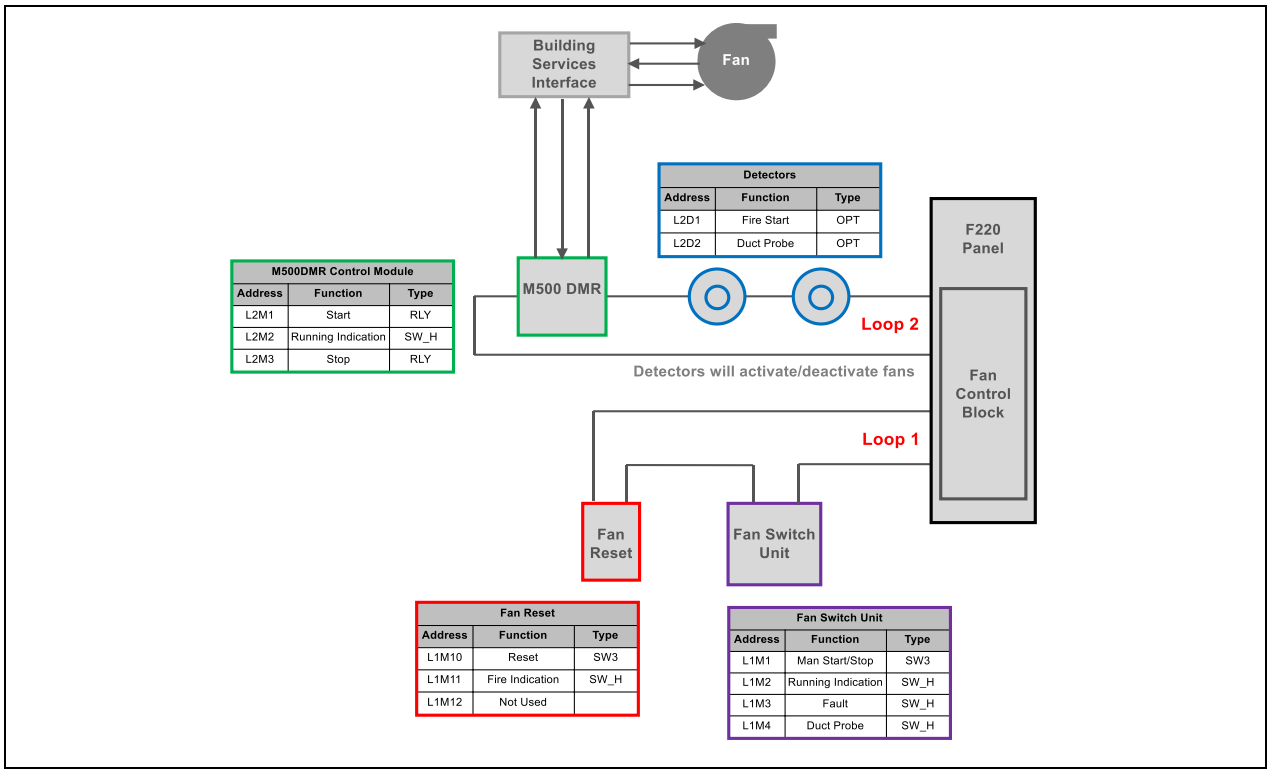


Figure 8-32: Example Fan Control Layout

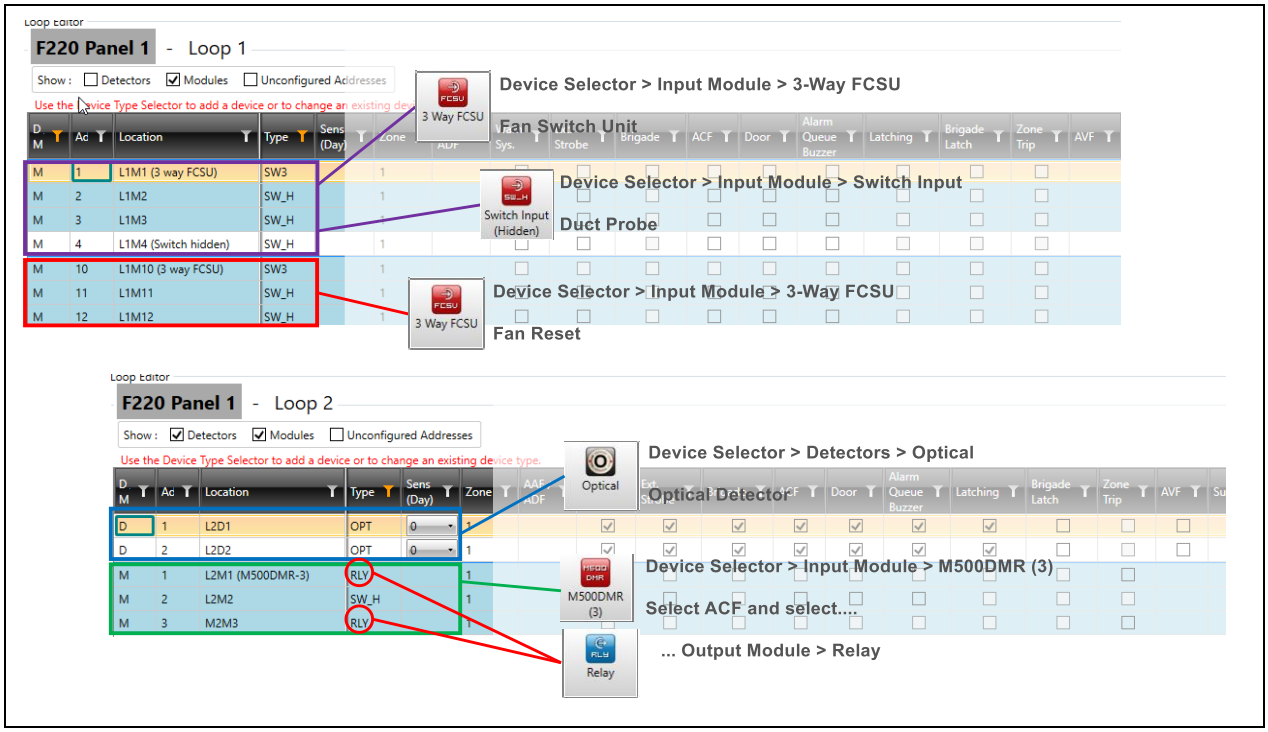


Figure 8-33: Populating Loops 1 and 2 in the Loop Editor

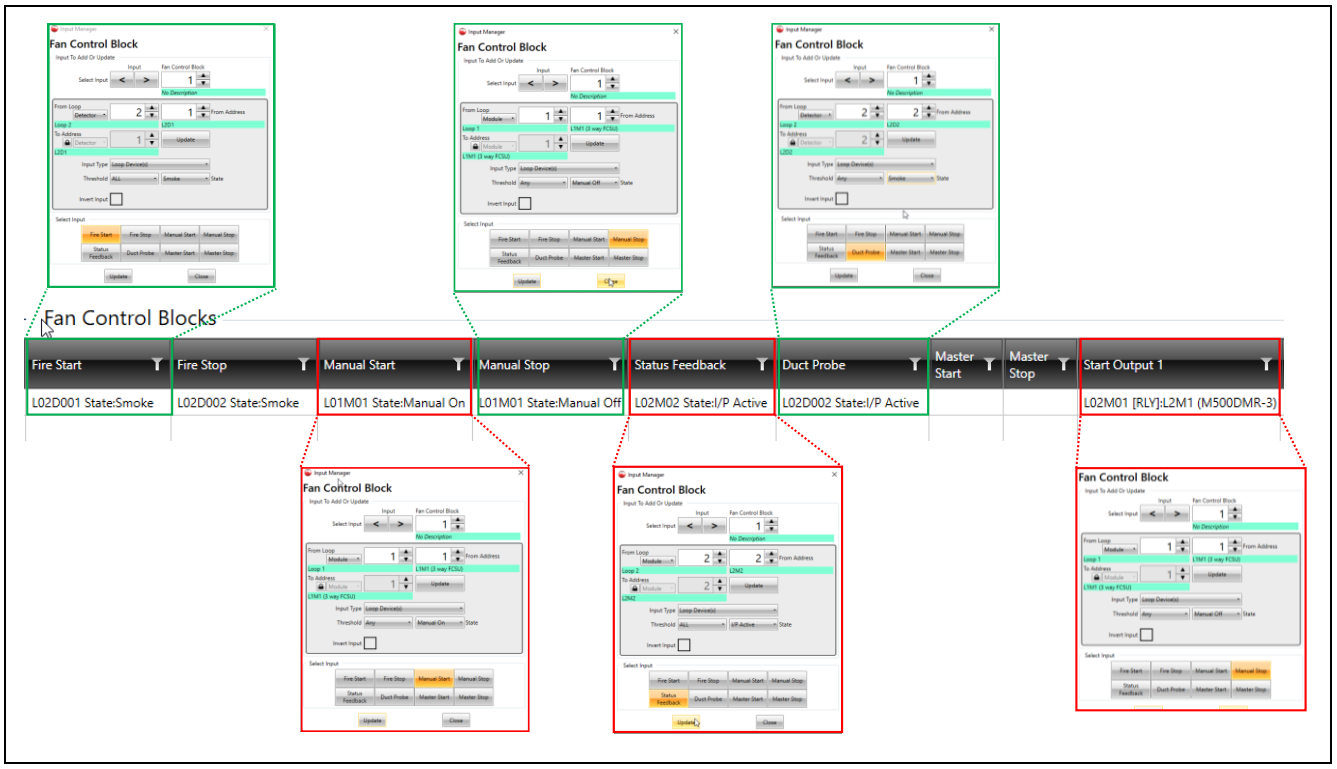


Figure 8-34: Configuring FCB Inputs

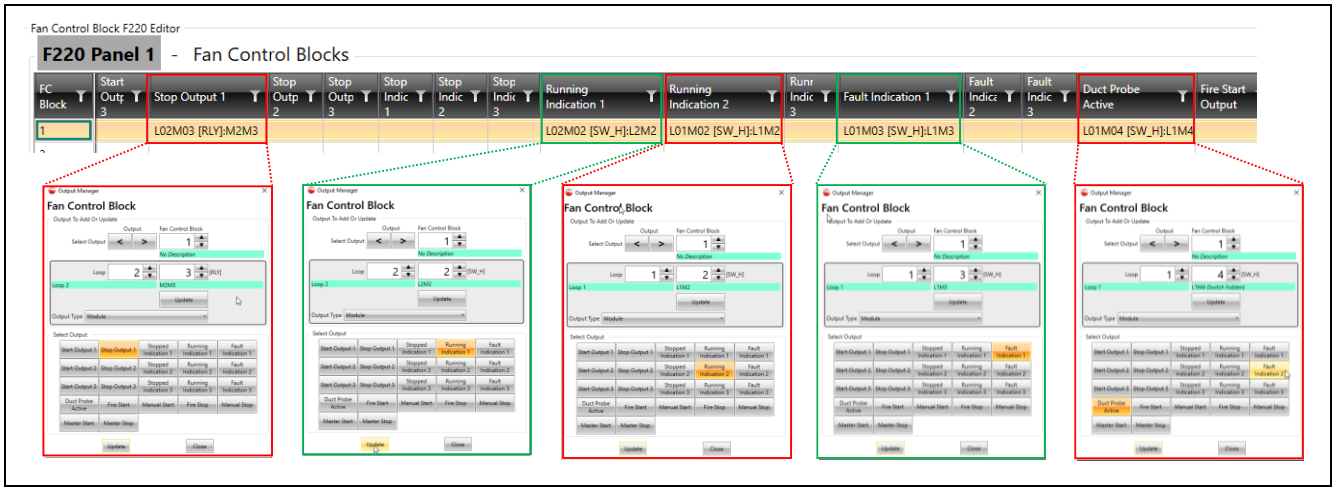


Figure 8-35: Configuring FCB Outputs

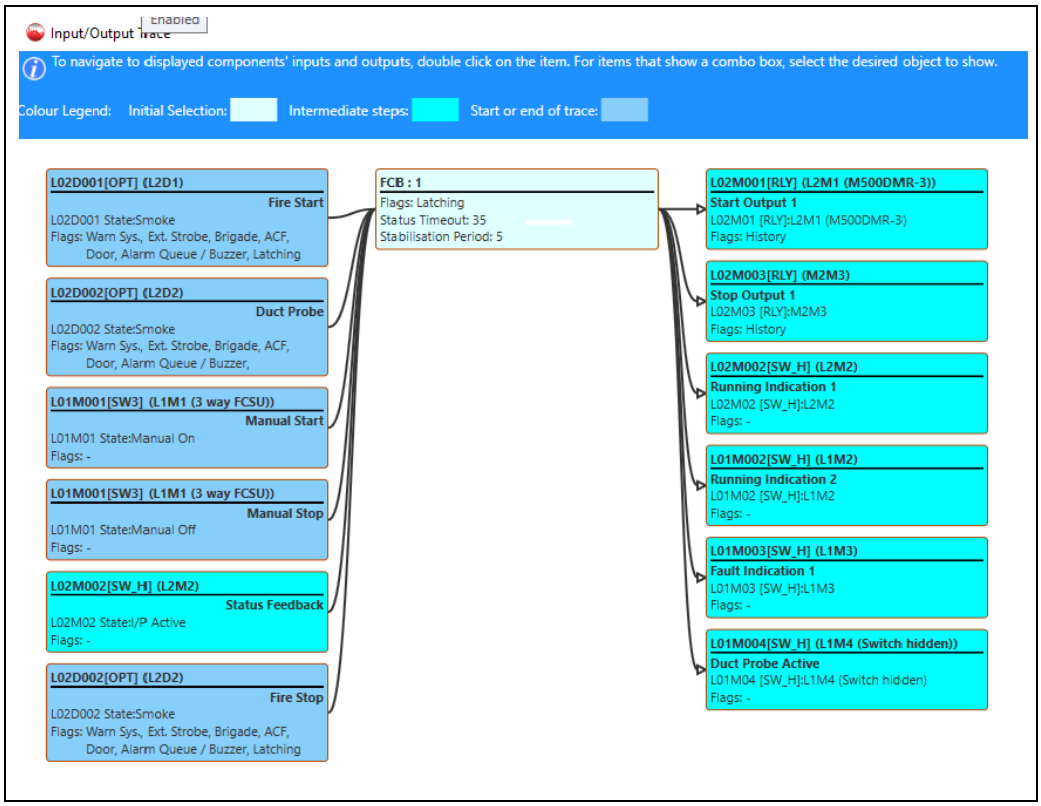


Figure 8-36: Input-Output Trace

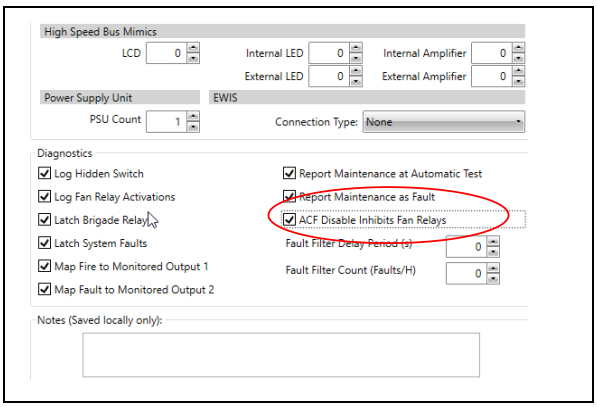
8.10.13 ACF DISABLE Inhibits Fan Relays

F220 Fire Panels typically use the Fan Control Switch Unit (F120FCSU) and loop relay modules, such as the M500DMR, for fan control (See the example in Figure 8-32). Alternatively the F220 can be interfaced to F100 Fan Control Units (AAFCU) and ACF controlled Fan Relays (AAFRLY).

Fan Control Units and any ACF fan relays (including the M500DMR, if not configured as RLY. Refer Figure 8-33 above) are, by default, disabled when the 'ACF DISABLE' push-button on the front panel is pushed (Refer to Section 13.8). This function can be disabled, or switched off, in either FireUtils or the Engineers Menu as follows

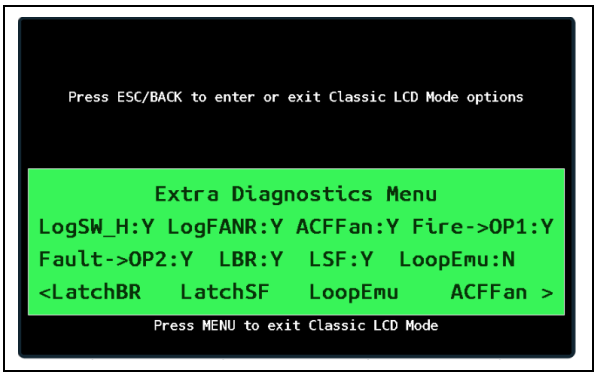
In FireUtils, uncheck the 'ACF Disable Inhibit Fan Relays' tick box in the Diagnostic section of the F220 Panel Editor.

With 'ACF Disabled Inhibit Fan Relays' unchecked, the 'ACF Disable' push-button will have no effect on the fan relays.



In the Engineer Menu, navigate to ‘ACFFan’ and press the soft-key.

Engineer Menu>General>Diags>More>ACFFan



8.11 Deluge Control Blocks

The Deluge Control Block (DCB) is a variation on the general-purpose Logic Block (LB) on the F220. It combines elements of both Logic Blocks and Timers for its operation. The DCB is not latching. The F220 supports up to 400 DCB’s.

The basic outline is:

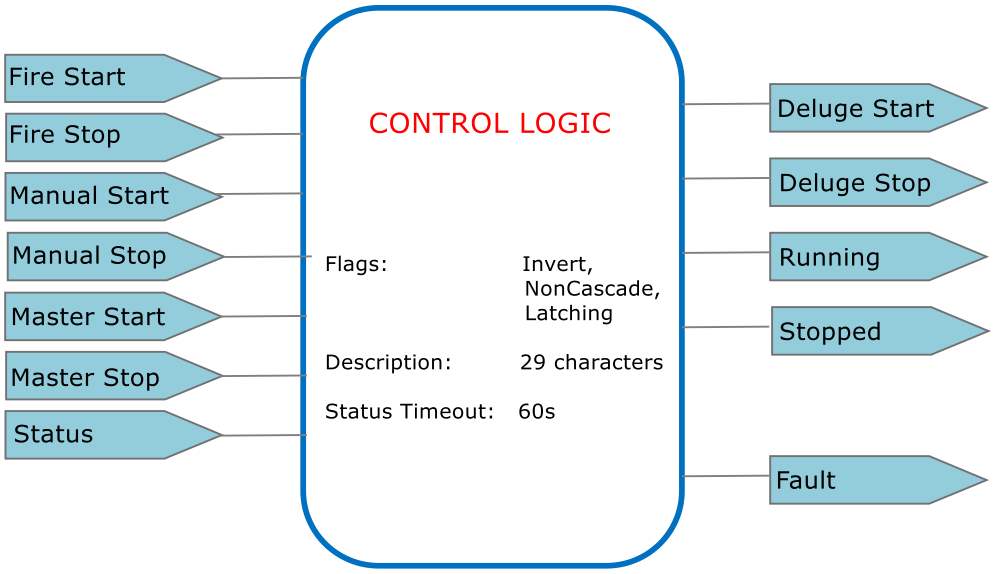


Figure 8-37: Deluge Control Blocks

8.11.1 DCB Input Descriptions

Name	Short Name	Description
Fire Start	FStart	Fire Mode Start input (normally overrides FStop).
Fire Stop	FStop	Fire Mode Stop input.
Manual Start	MStart	Input for Manual start operation.
Manual Stop	MStop	Input for Manual stop operation (overrides Manual Start if both active).
Master Start	MstrStart	Input for Master manual Start operation (overrides both Manual inputs).
Master Stop	MstrStop	Input for Master manual Stop operation (overrides Master Start and both Manual inputs).
Status	ST	Feedback input from the water handling system (input active = deluge running).

Table 8-19: DCB Input Descriptions

8.11.2 DCB Output Descriptions

Output	Description
StartOut	Deluge Start output. Activated by MstrStart, MStart or FStart inputs. Can be overridden by MstrStop, MStop, DPIn or FStop, depending on state of operation.
StopOut	Deluge Stop output. Activated by DPIn, MstrStop, MStop or FStop inputs. Can be overridden by MstrStart, MStart or FStart, depending on state of operation.
Stopped	Status of deluge feedback input. Active when ST input is inactive.
Running	Status of deluge feedback input. Active when ST input is active.
Flt	Fault status. Active when deluge fails to start or stop on command.

Table 8-20: DCB Output Descriptions

8.11.3 DCB Flags

The DCB configuration options are determined by flags.

Flag Name	Initial	Description
Invert	I	When set, this flag inverts the normal priority resolution when the DCB sees both FStart & FStop inputs active simultaneously. Normally FStop is ignored if FStart is active. With Invert set, FStart is ignored if FStop is active.
Non-Cascade	N	Disables Cascading operation for the DCB. Normally, the DCB sets an internal latch if either FStart or FStop is activated. This latched state is maintained even if the original inputs return to normal. However, an active input can reverse the operation of the DCB if the previous state is only latched. Example: if FStop activates & then resets soon afterwards, the internal FStop state will be latched (with the StopOut output active). If FStart subsequently activates, the FStop latch will clear & the FStart will be activated. Setting NonCascade forces the DCB to latch the first state seen.
Latching	L	The (default) Latching mode ensures that the DCB remains in Fire mode once activated by FStart or FStop. The DCB can switch between Start and Stop as described above (if NonCascade is not set), but resetting the original FStart or FStop event will not return the DCB to normal operation. The internal DCB latches are reset when the `Deluge Reset` output is triggered. If Latching is disabled (this is non-compliant with AS1668.1), the DCB returns to normal after the initiating FStart or FStop input clears. In this mode NonCascade is forced OFF.

Table 8-21: DCB Flags

8.11.4 Input Priorities

In the event of multiple input activities, the input priorities for an FCB and the affected control outputs are:

Priority	Input	Action
Highest	MstrStop	StopOut active
	MstrStart	StartOut active.
	MStop	StopOut active
	MStart	StartOut active.
	DPin	StopOut active
	FStart (FStop in Invert mode)	StartOut (StopOut) active.
Lowest	FStop (FStart)	StopOut (StartOut) active

Table 8-22: Input Priorities

8.11.5 Status Timeout

Each DCB has an associated Deluge Status Timeout period parameter. This period defines the maximum time the DCB will wait for a deluge to start or stop when commanded by the DCB. The timeout period can be set to any value between 5 and 90 seconds.

Note that the Status Timer starts only when the Stop or Start outputs are activated for the first time. This results in an instantaneous fault condition being generated if, for example, the deluge stops after initially starting on command during the feedback period.

8.11.6 Stabilisation Period

A ‘Stabilisation Period’ (SP) parameter is provided to allow the Fire inputs to the DCB to stabilise prior to activation. This period can be set from 0 to 9 seconds, and sets the duration the DCB waits for the FStart & FStop inputs to stabilise after any state change.

This parameter is particularly important if the Non-Cascading flag is set, because the DCB latches the state of the first Fire event it registers, and this state remains even if the opposite sense Fire input is subsequently activated. The SP value should be set if near-simultaneous activation of FStart & Fstop is likely and the initial output state is important. F220 event processing is done in a series of blocks and the DCB processing may be interspersed between processing other events. This may mean, for example, that if FStart & FStop are generated by devices on different loops, then, even if the devices were activated simultaneously, it is possible for the DCB to register one event occurring before the other. This may result in the DCB latching into the “wrong” state, even though the Priority flag setting suggests this is not possible.

8.11.7 Deluge Interlock Delay

A fixed 5-second timer operates when either the StartOut or StopOut outputs is deactivated. This prevents either output from operating again until the timer expires, and prevents unwanted control conflicts.

8.11.8 Freeze Timer

The DCB Freeze timer prevents activation of non-cascading DCB’s sometime after the first non-cascading DCB activates. This is used if only a limited number of deluge units can be activated simultaneously, due to water flow considerations.

If non-zero, the timer starts when the first Fire input (either FStart or FStop) activates on any non-cascading DCB. Once the timer times out, the DCB system becomes “frozen” After this point Fire inputs for all non-cascading DCB’s are ignored, and the operating state of all non-cascading DCB’s is locked, although Manual input still overrides the Fire inputs.

The ‘frozen’ state is reset by the system FanRst event, but only if there are no active Fire inputs present on any non-cascading DCB’s.

The timer does not interact with DCB’s in the default cascading mode.

The DCB Freeze timer can be set in either the General sub-menu of the Engineer’s Menu (Refer to Section 10.5.2) or, preferably, in FireUtils

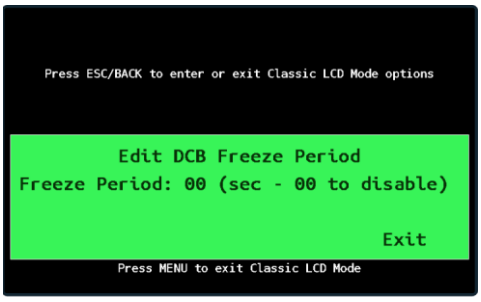
Using the Engineer Menu

Press the ‘Menu’ button on the front panel, select Service Menu, followed by Classic LCD Menu

Menu > Service Menu > Classic LCD Menu

Once in the User Menu, select Engineer and enter the Engineer key-code. Navigate to the General and DCB menu options using a combination of the front panel Navigation and Soft keys.

Engineer > General > DCBFreeze

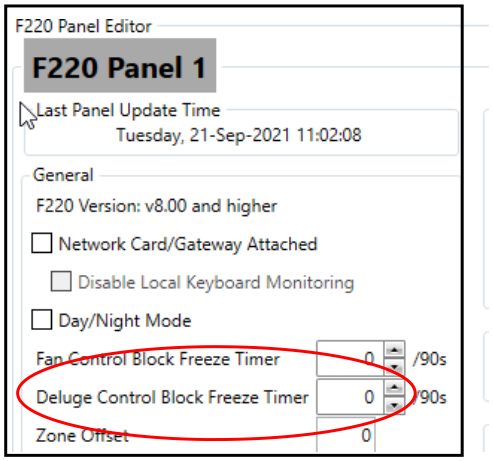


Configuring DCB Freeze using F220’s Engineer Menu

Using FireUtils

To access the DCB Freeze Timer in FireUtils, select the F220 Panel Editor in the Component Tree. The ‘Deluge Control Block Freezer Timer’ is located in the General section.

A System Event (DCB Frozen) indicates whether the DCB Freeze timer has operated (Refer to Section 8.4).



Configuring DCB Freeze in FireUtils

8.11.9 Event Generation

The FCB generates various events during operation that can be viewed in the Event log:

Event	Description
Normal (Auto)	DCB has reverted to normal (Auto) operation – no control commands are active.
Manual ON	Manual ON operation has been selected via the MStart input.
Manual OFF	Manual OFF operation has been selected via the MStop input.
Fire Start	The DCB has been commanded to Start via the automatic FStart input.
Fire Stop	The DCB has been commanded to Stop via the automatic FStop input
FAULT - StopFail	The deluge has been commanded to stop, but the deluge is running & the status timeout period has expired. This event appears in the Fault queue on the LCD.
FAULT - StartFail	The deluge has been commanded to start, but the deluge is stopped & the status timeout period has expired. This event appears in the Fault queue on the LCD.
Fault Cleared	The StartFail or StopFail fault has cleared due to the deluge reaching the correct operating condition.
Reset	The DCB has been Reset via a “FanRst” output being activated.

Table 8-23: Event Generation

8.11.10 Configuring Deluge Control Blocks in FireUtils

The FireUtils Deluge Control Block Editor is shown in two parts - Figure 8-38 and Figure 8-39. Each figure has a brief overview of the parameters described in Section 8.11 above.

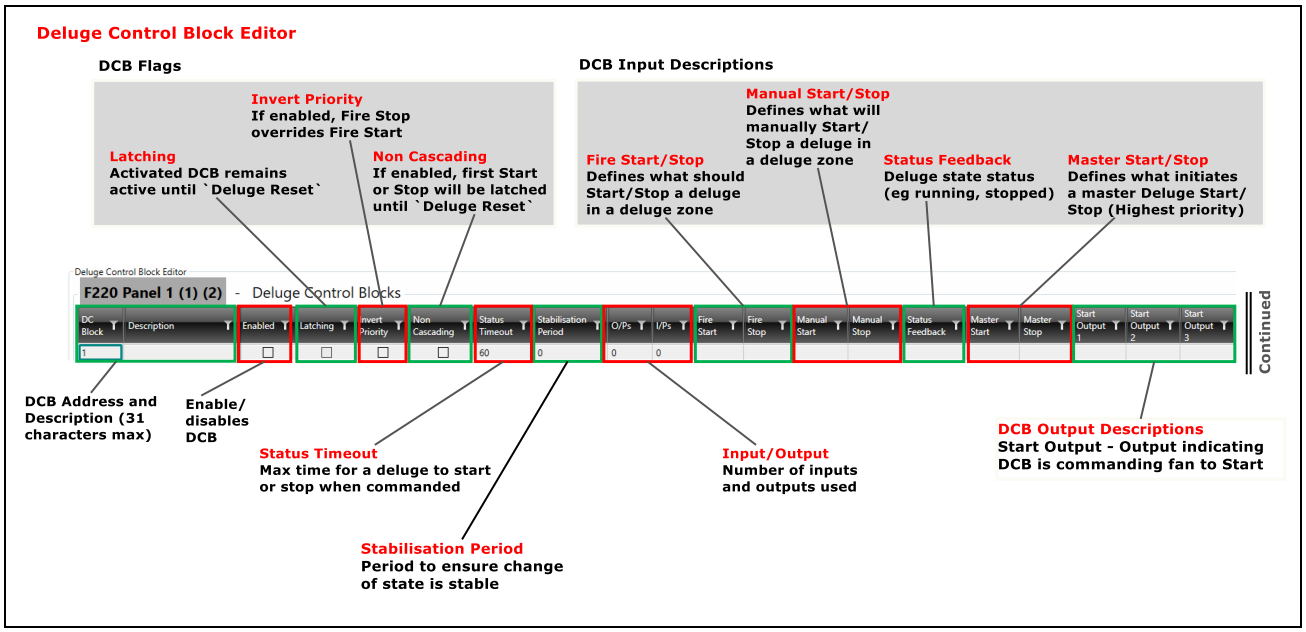


Figure 8-38: DCB Editor part 1

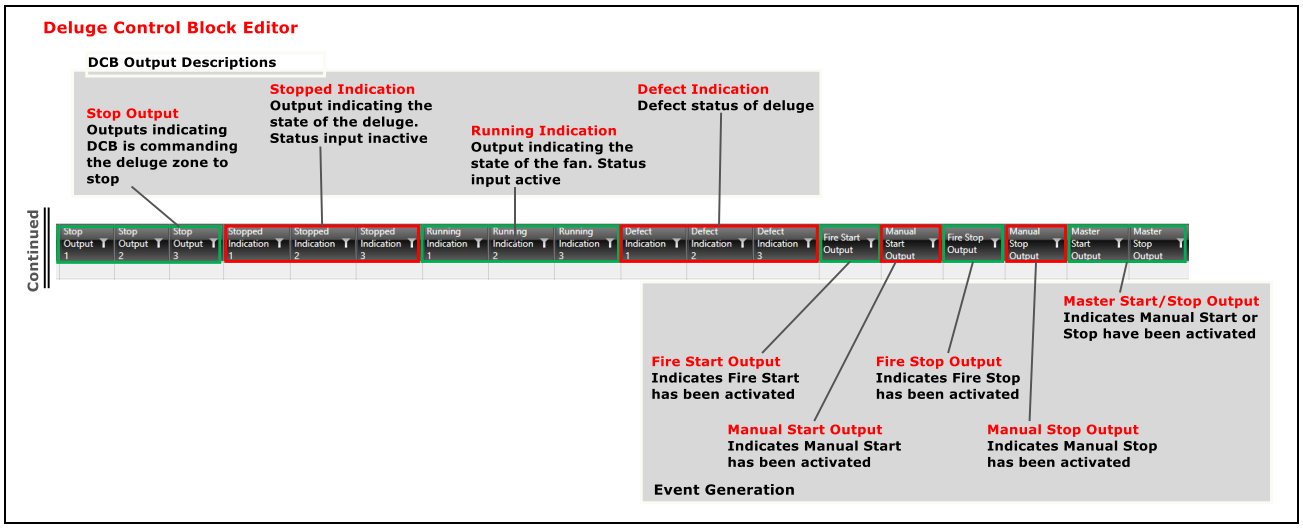


Figure 8-39: DCB Editor part 2

8.12 Supervisory Signals

The F220 can monitor input signals that relate to an abnormal status (other than a fault) from other life, safety or property protection systems.

These signals are identified as “Supervisory” by setting the Supervisory Flag for the modules associated with the signal input.

Supervisory signals are handled within the Supervisory queue where they can be viewed and reset.

Whenever a supervisory signal is present the Supervisory LED will FLASH. If this event is currently the highest priority then the Supervisory screen will also be displayed.

8.12.1 Configuring Input Modules for Supervisory monitoring

To comply with AS7240-2 Supervisory Signals must be manually reset at the panel.

IMPORTANT NOTE:

Input modules must have both their ‘Supervisory’ and ‘Latch’ flags in their configuration.

8.12.2 Viewing and Resetting Supervisory Signals

If there are current Supervisory events available for viewing these will be displayed in the Supervisory Events list providing these are the highest priority current events. If this is not the case press the OK key repeatedly until the Supervisory Events screen appears.

To reset Supervisory events select the event using the up or down arrow keys and then press Reset.

8.12.3 Supervisory Signal Log

Historical Supervisory Signal events can be viewed within the Supervisory Log—option 7 in the History Log menu. This log can contain up to 500 events and the oldest events will be overwritten with the latest events when this capacity is exceeded.

9. OPERATING THE FIRE-FIGHTER FACILITY

Note:

For information on the controls and indicators of the F220 front panel, and the System Panel in particular, refer to *Section 2: F220 Front Panel Controls and Display*

The Fire Brigade Panel highlights, and provides key controls, to enable an 'Alarm' to be satisfactorily dealt with. For reference, the layout of the Fire Brigade Panel is shown below.

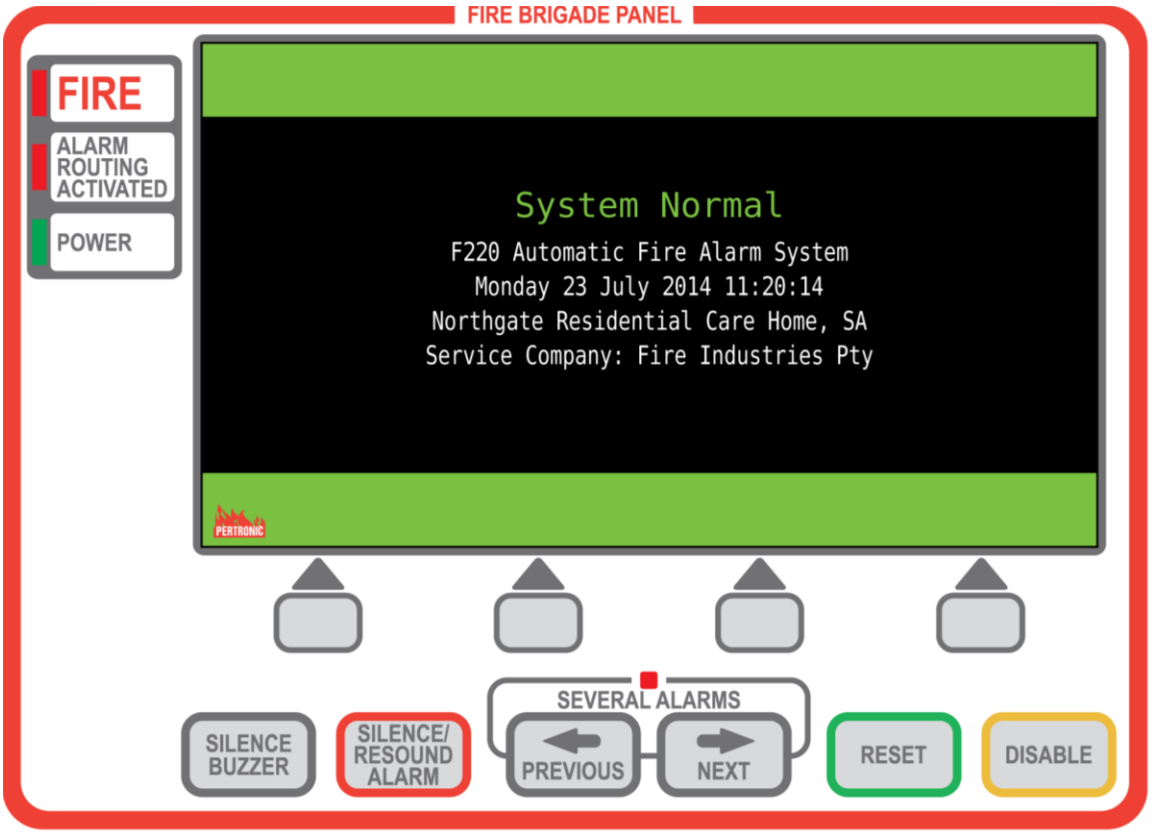
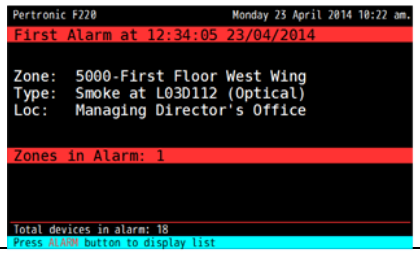
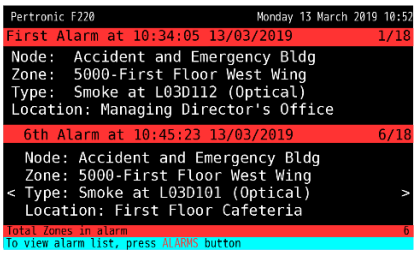


Figure 9-1: Fire Brigade Panel

9.1 Responding to a Fire using the Fire Brigade Panel

	FIRE ALARM ROUTING ACTIVATED	The FIRE and Alarm Routing Activated indicators will be ON Details of the Zone(s) in Alarm shown on the LCD display. 
	SILENCE BUZZER	Press the SILENCE BUZZER key. The buzzer sounds whenever there is either a • Fire (pulsing sound), or • Fault (steady sound)
	SILENCE/ RESOUND ALARM	Press the SILENCE / RESOUND ALARM key to silence warning system devices
	ALARMS SILENCED	The ALARMS SILENCED indicator will be ON.
	SILENCE/ RESOUND ALARM	When a new alarm is recognised by the F220 all “silenced” Warning System devices will resound and the ALARMS SILENCE LED will turn OFF Press the SILENCE / RESOUND ALARM key again
	SEVERAL ALARMS PREVIOUS NEXT	The SEVERAL ALARMS indicator will be ON when there are more than two zones in alarm. The PREVIOUS and NEXT keys are used to view multiple zones in alarm 
	SILENCE/ RESOUND ALARM RESET	Press the RESET key to reset zone(s) in alarm (after ALARMS SILENCE has been pressed)
	DISABLE	Press the DISABLE key to disable the displayed Device / Zone (after ALARMS SILENCE has been pressed)
	DISABLE-MENTS	The DISABLEMENTS Indicator will be ON indicating that selected Devices / Zones have been disabled

10. OPERATING THE USER MENU

The F220 can be configured using the Keyboard-Display and selecting the appropriate items from the following menu tree.

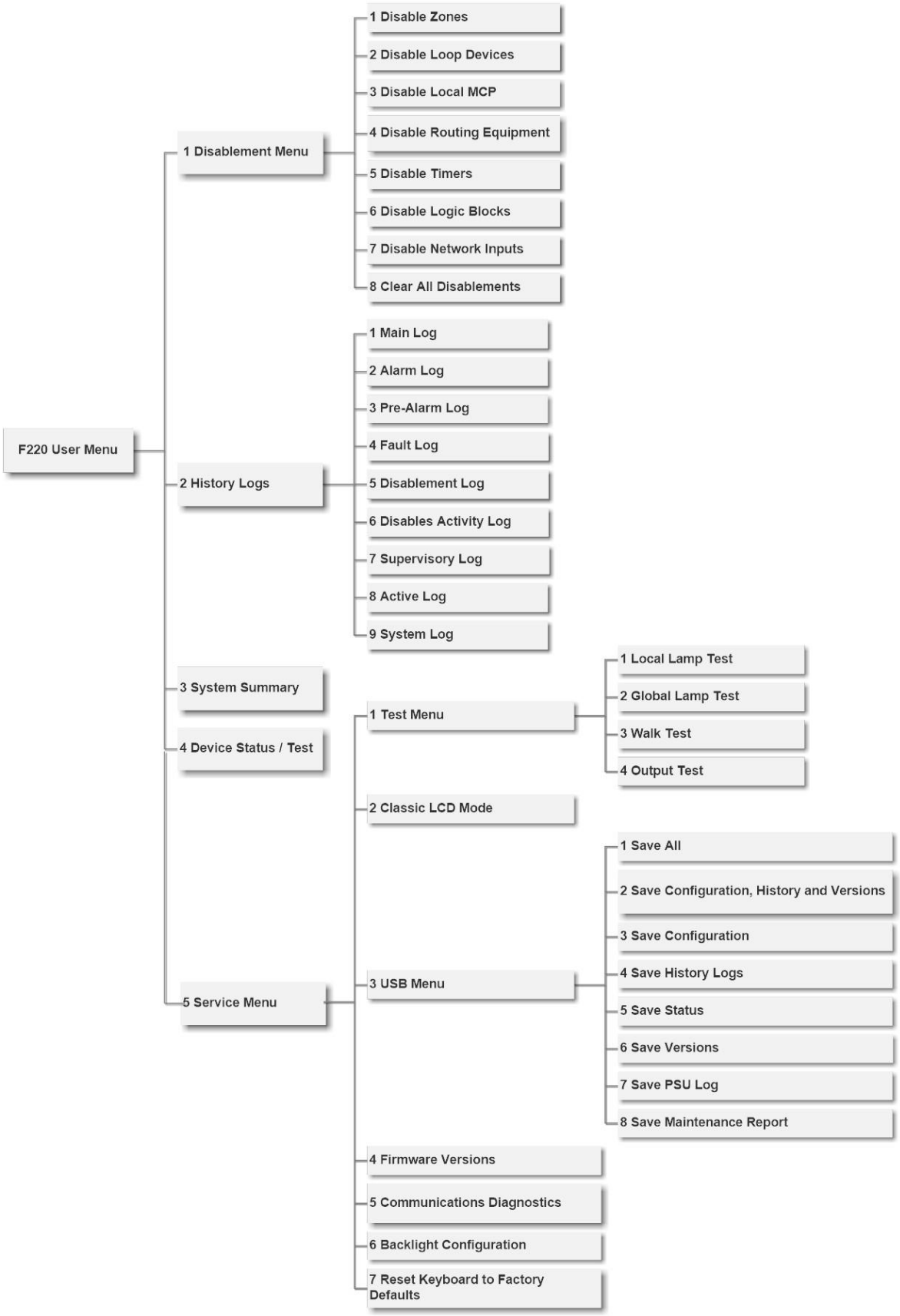
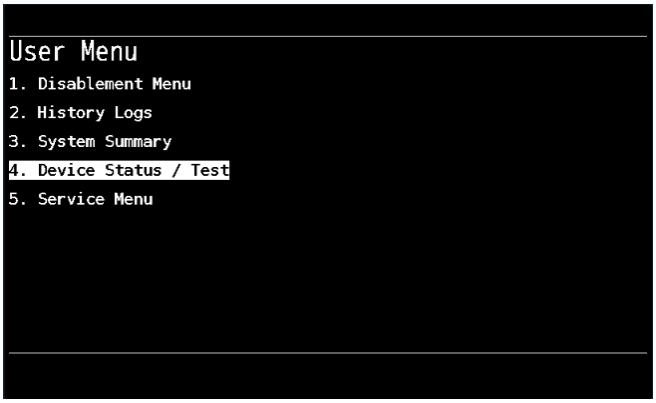


Figure 10-1: F220 User Menu Tree

The first, or top, level of the User Menu can be reached by pressing the Menu key on the front panel (Menu>)

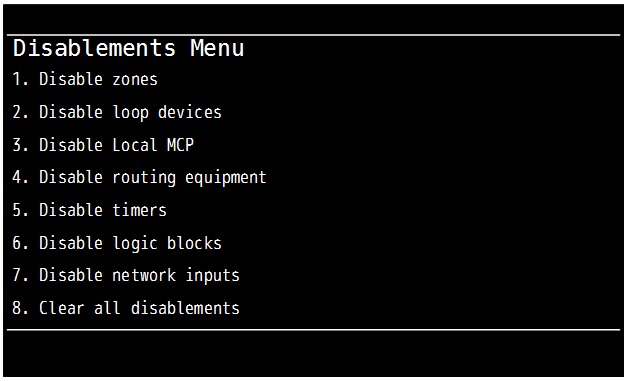


Items in the User Menu can be selected by pressing either the numeric keys, or by moving the selection highlight using the arrow keys, then pressing OK.

User Menu >

Press ESC/BACK to move back to a higher level in the User Menu tree

10.1 User Menu - Disablement menu (Option 1)

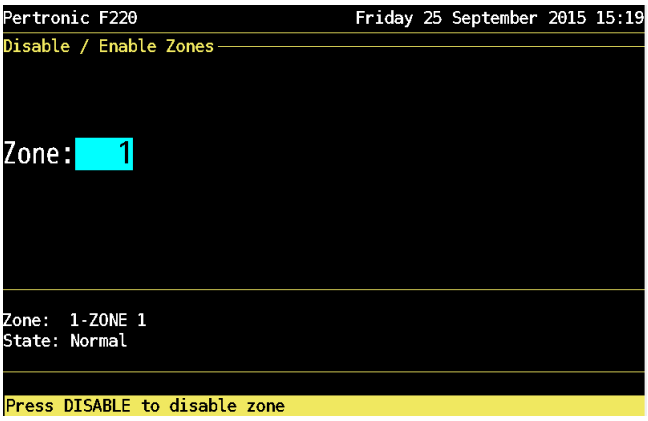


Press Disablement Menu in the User Menu

User Menu> Disablement Menu

Press the corresponding numeric key to select the Disablement type required.

10.1.1 Disable zones



In the Disablement Menu, select Disable Zones

User Menu>Disablement Menu>Disable Zones

Enter the required Zone number using the numeric keys.

The zone descriptor and current state are shown below.

Press DISABLE to disable the selected zone.

10.1.2 Disable Loop devices

In the Disablement Menu, select Disable Loop Devices

User Menu>Disablement Menu>Disable Loop Devices

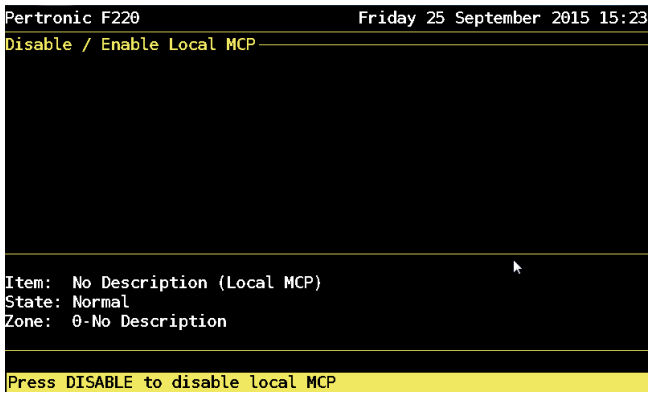
Move between Loop and Detector/Module fields using the left / right arrow key.

Enter loop number either by using up/down arrow keys or numeric keypad.

Select between Detector/Module using up/down arrow keys.

Enter Detector/Module number either by using up/down arrow keys or numeric keypad.

10.1.3 Disable Local MCP

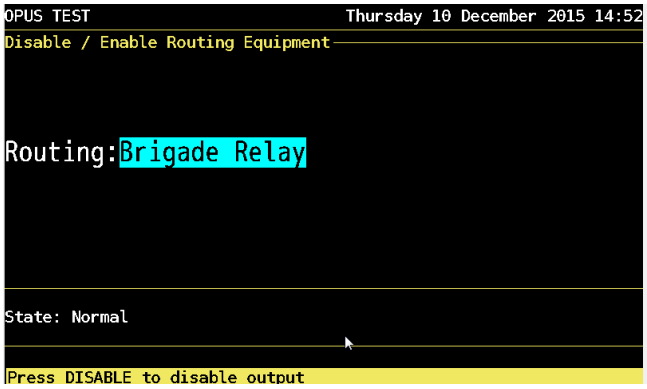


In the Disablement Menu, select Disable Loop MCP

User Menu>Disablement Menu>Disable Local MCP

The Local MCP is disabled by pressing the DISABLE key

10.1.4 Disable Routing Equipment



In the Disablement Menu, select Disable Routing Equipment

User Menu>Disablement Menu>Disable Routing Equipment

Select the item to be disabled using the up/down arrow keys.

Press DISABLE to disable the item or if it is already disabled to enable it.

Note:

Confirmation will be required to disable the Brigade Relay.

10.1.5 Disable Timers

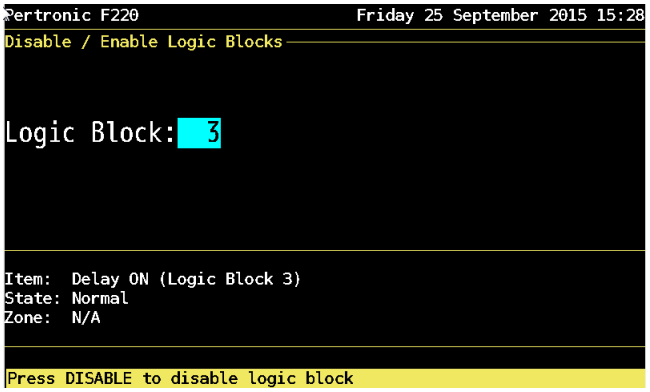
In the Disablement Menu, select Disable Timers

User Menu>Disablement Menu>Disable Timers

Enter Timer number using numeric keys or the up/down arrows.

Press DISABLE

10.1.6 Disable Logic Blocks



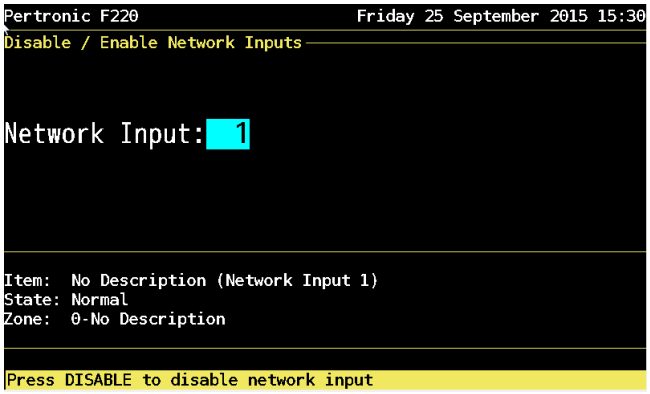
In the Disablement Menu, select Disable Logic Blocks

User Menu>Disablement Menu>Disable Logic Blocks

Enter Logic Block number using numeric keys or the up/down arrows.

Press DISABLE

10.1.7 Disable Network Inputs



In the Disablement Menu, select Disable Network Inputs

User Menu>Disablement Menu>Disable Logic Blocks

Enter Network Input number using numeric keys or the up/down arrows.

Press DISABLE

10.1.8 Clear All disablements

In the Disablement Menu, select Clear All Disablements

User Menu>Disablement Menu>Clear All Disablements

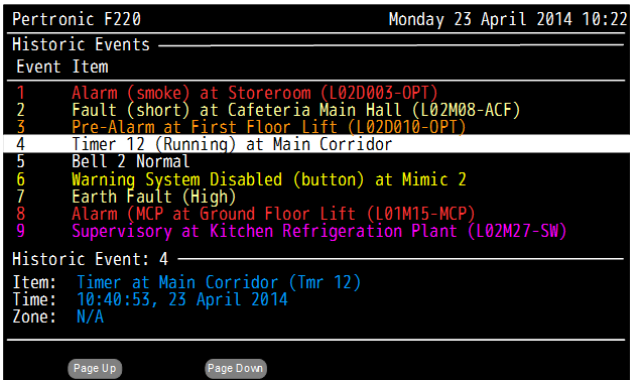
Pressing “8” will bring up confirmation or cancel soft-key labels.

10.2 User Menu - History Logs (Option 2)

History Logs is option 2 in the top level of the User Menu

User Menu > History Logs

10.2.1 Main Log (Option 1)

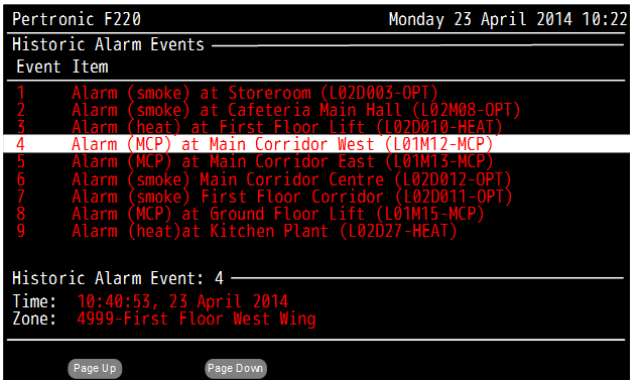


Selecting Main Log lists all the historic events in the reverse order in which they occurred. The most recent event (event 1) is at the top of the list.

User Menu > History Logs > Main Log

Use Esc/Back to return to the History Logs menu

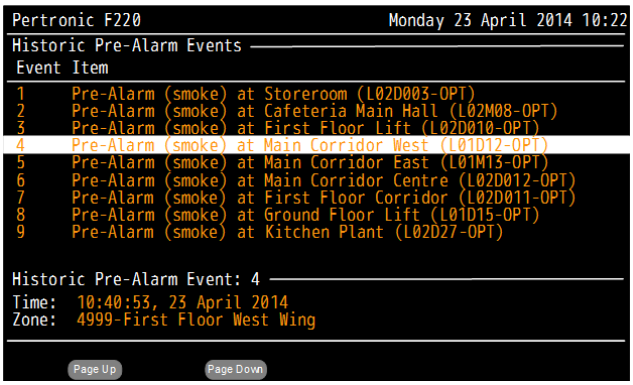
10.2.2 Alarm Log (Option 2)



The Historic Alarm Events log is option 2 in the History Logs menu

User Menu > History Logs > Alarm Log

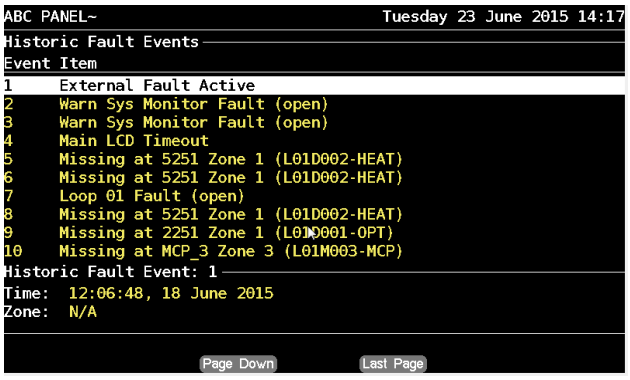
10.2.3 Pre-Alarm Log (Option 3)



The Historic Pre-Alarm Events log is option 3 in the History Logs menu

User Menu > History Logs > Pre-Alarm Log

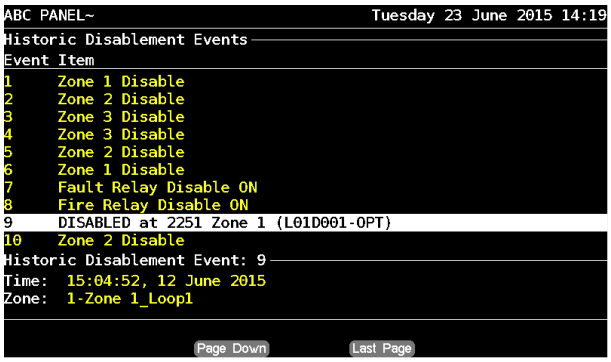
10.2.4 Fault Log (Option 4)



The Historic Fault Events log is option 4 in the History Logs menu

User Menu > History Logs > Fault Log

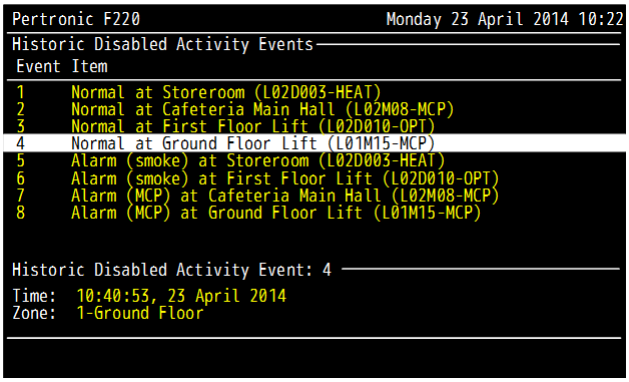
10.2.5 Disablements Log (Option 5)



The Historic Disablement Events log is option 5 in the History Logs menu

User Menu > History Logs > Disablement Log

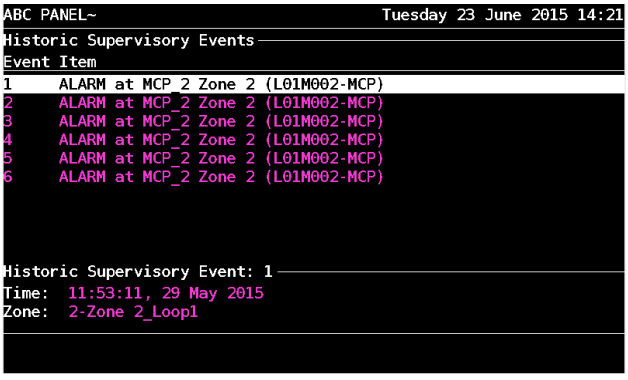
10.2.6 Disabled Activity Log (Option 6)



The Disabled Activity Log is option 6 in the History Logs menu

User Menu > History Logs > Disabled Activity Log

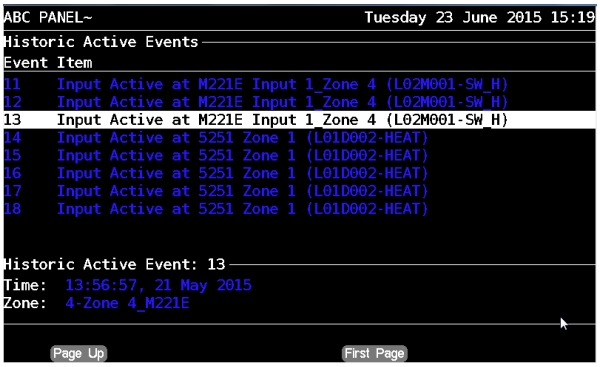
10.2.7 Supervisory Log (Option 7)



The Supervisory Log is option 7 in the History Logs menu

User Menu > History Logs > Supervisory Log

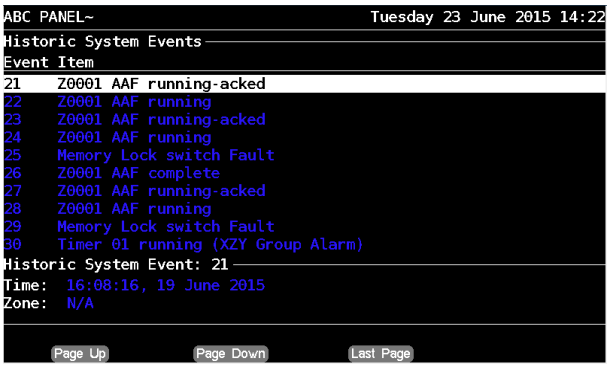
10.2.8 Active Log (Option 8)



The Historic Active Events log is option 8 in the History Logs menu

User Menu > History Logs > Active Log

10.2.9 System Log (Option 9)



The Historic System Events Log is option 9 in the History Logs menu

User Menu > History Logs > System Log

10.2.10 Recent Log (Softkey)

This shows a local F220 log of recent events. The mimics on the same F220 will have their own copies of the same recent log information. Only the last occurrence of each event type is displayed.

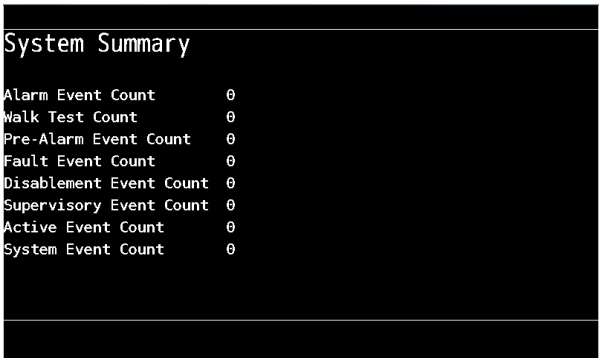
The recent log information stored on each of the F220 display and mimics can be reset at any time with the “Reset Log” softkey. This will only reset the local F220 or mimic display, other F220 or mimic displays on the same F220 will retain their current Recent Log information.

Network NCUs will store network wide recent events and node numbers.

Only the last occurrence of each event type is displayed.

The Reset Log soft key will only reset that NCU’s recent log information, all other NCUs will retain their current recent log information.

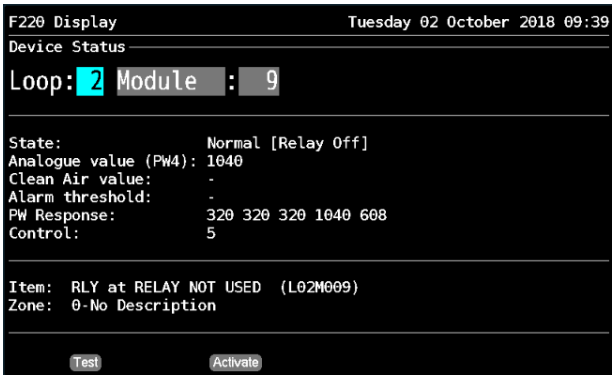
10.3 User Menu - System Summary (Option 3)



System Summary is option 3 in the User Menu

User Menu > System Summary

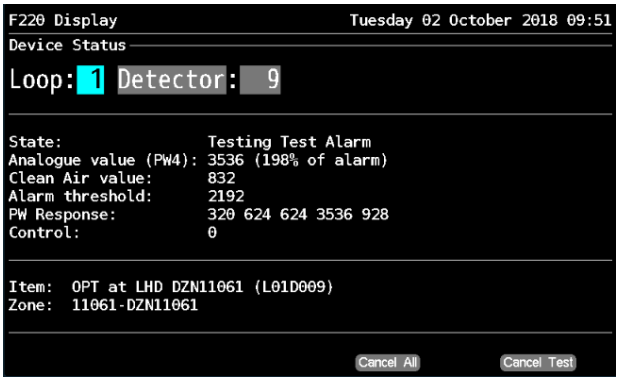
10.4 User Menu - Device Status / Test (Option 4)



Device Status/Test is option 4 in the User Menu.

User Menu > Device Status

Device status can be displayed as well as initiating device testing. Detection device testing will cause the Test LED to be lit and will be logged in the Alarm log

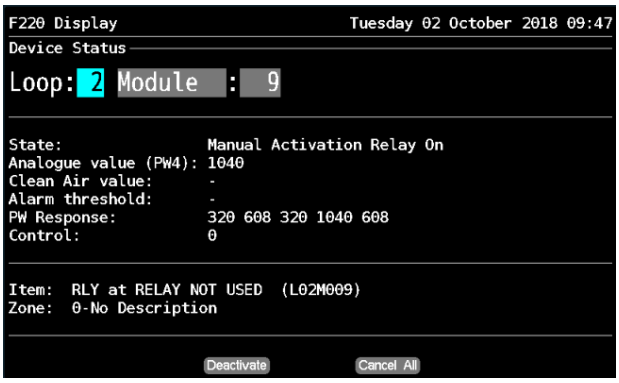


Device tests and output module activations can be initiated using the softkeys below the display.

Device tests and output module activations can be cancelled or deactivated using the softkeys below the display.

If there are devices in test and manually activated output modules, pressing the “Cancel All” softkey will raise a prompt to either cancel all the devices in test or cancel all the manually activated devices.

Disabled devices and modules can be put into test or manually activated



Output modules may also be manually activated. Manual activations and deactivations may be recorded in the Active Events log and recorded/displayed elsewhere depending on the module configuration.

10.4.1 Device Status Descriptors

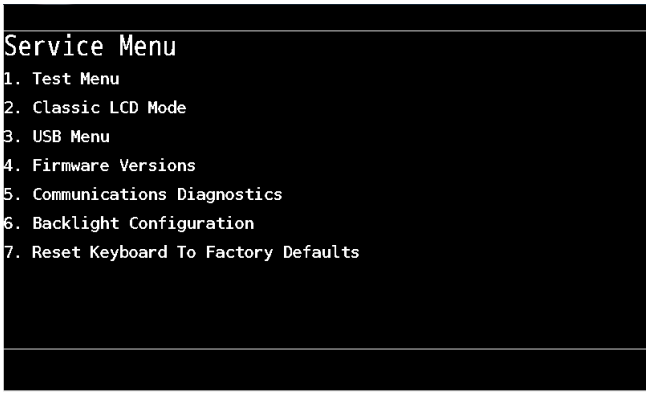
The status descriptors are:

Descriptor	Meaning
NORMAL	The device is in its 'Normal' state. The text "(non-existent)" is displayed when the current device is not configured.
ALARM (MCP) ALARM (SMOKE) ALARM (TEST) ALARM	The device is in 'Alarm'. Devices may generate different qualifiers depending on the type, for example, the LPRS (Loop Responder) can generate either SMOKE or MCP alarms.
ACTIVE	A device programmed as an 'Input' (i.e. non-brigade, relay or bell functions) is in 'Alarm'.
FAULT	A generic 'Fault' message if the particular Fault doesn't match any of the specific Fault conditions defined below.
MISSING	The device is not present on the loop, or not responding to a poll.
MISMATCH	The device found at this address doesn't match the programmed device type.
EXTRA	The device found at this address is not supposed to exist; i.e. it has not been programmed into the configuration memory.
TEST FAIL	The device failed its automatic self-test.
PREALARM	The device is in 'Pre-Alarm'. A 'Pre-Alarm' condition indicates that the device is close to the 'Alarm' threshold.
DUPLICATE	Two or more devices are responding to the same address.
RESTART	A Loop Responder has lost power and is restarting.
ISOLATOR	The built-in loop isolator relay on either a Loop Responder or a Loop Relay board has triggered, indicating a short-circuit beyond the device.
SUPPLY FLT	A Loop Responder has detected a problem with its internal voltage supply to the conventional detector circuits. A Loop Relay board has detected a fault in the external power supply (if used).
HI FAULT	Caused by a detector failing its internal threshold adjustment (same as MAINT DEF for some types), or by a Loop Responder circuit's level drifting up above the 'Normal' band (towards a short-circuit).

Descriptor	Meaning
LO FAULT	This Fault is a symptom of a problem with the sensing electronics on a detector resulting in abnormally low analogue readings. Replace the detector.
SHORT	A Loop Responder has detected a short-circuit condition. This will generate a 'Fault' condition.
OPEN	A Loop Responder has detected an open-circuit condition.
MAINT FLT	Maintenance Fault. The detector's Clean Air value has increased beyond a safe level and the Loop Driver board can no longer maintain the detector sensitivity. The detector should be cleaned.
AVF INIT	A device with AVF (Automatic Verification Facility) has triggered once, and is in the AVF window awaiting a second activation to trigger an 'Alarm'.
CCT RESET	A Loop Responder circuit is resetting after an 'Alarm' condition.
OFF	A 3-Position Switch (type SW3) is in the OFF position.
ON	A 3-Position Switch (type SW3) is in the ON position.
DIS/ISO	A FAAST device has been disabled or isolated via its local control panel.

Table 10-1: Device Status Descriptors

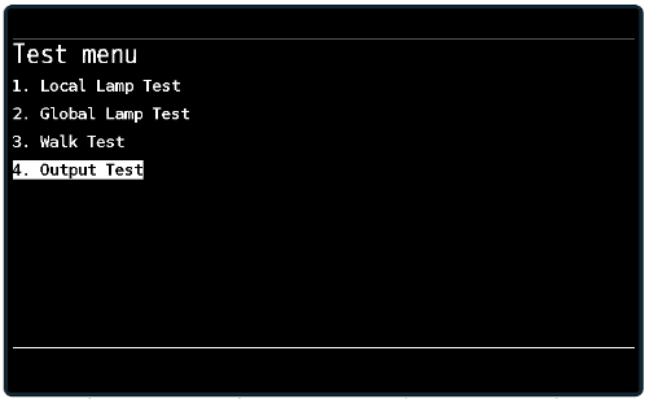
10.5 User Menu - Service Menu (Option 5)



Service Menu is option 5 in the User Menu

User Menu > Service Menu

10.5.1 Test Menu (Option 1)



The Test Menu is option 1 of the Service Menu

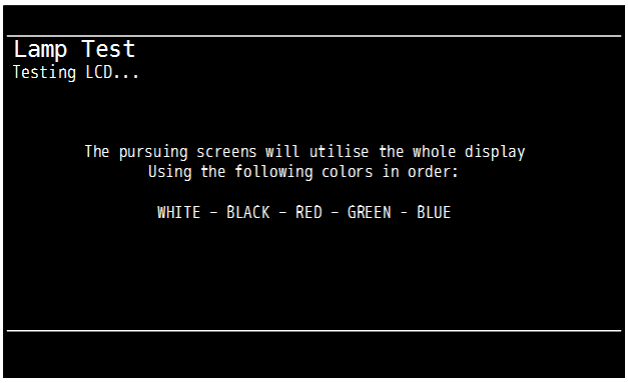
User Menu > Service Menu > Test Menu

10.5.1.1 Local Lamp Test (Option 1)

Local Lamp Test is option 1 of the Test Menu.

User Menu > Service Menu > Test Menu > Local Lamp Test

The test turns on and off each LED on the System and Front Panels in sequence



At the completion of the LED test, the 5 colours used on the LCD are displayed in sequence, followed by the testing of the local buzzer.

The Local Lamp Test will repeat before exiting to the Test Menu

10.5.1.2 Global Lamp Test

Global Lamp Test is option 2 of the Test Menu.

User Menu > Service Menu > Test Menu > Global Lamp Test

The same tests that are performed in the Local Lamp Test are performed in the Global Lamp Test. The test also sequences through the LEDs on any LED Display Boards (F100PDB, F100PDB12) attached to the internal RS-485 bus

10.5.1.3 Walk Test

Walk Test is option 3 of the Test Menu.

User Menu > Service Menu > Test Menu > Walk Test

Enter the zone number using the numeric keys

Select option “Silent Walk Test” or “Sounder Walk Test” using the appropriate soft-key.

The TEST LED will now be ON.

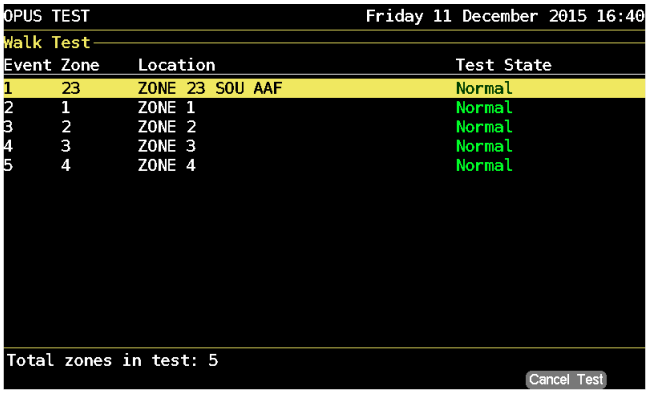
The F220 switches into a self-resetting non-latching mode.

Panel operation is essentially identical, except that when the operated device is restored to ‘Normal’, the F220 automatically resets that circuit.

A conventional detector on a Loop Responder requires two activations (minimum) before it will trigger. Once activated, the detector ‘reset’ time is approximately 30 to 60 seconds – this is a result of the buffering between the Loop Responder and the F220 Panel.

Note:

Once an initial zone has been selected with the “Silent” or “Sounder” option then any additional zones selected can only have that option—there will be only one soft-key option available.



After zones have been selected for test the Walk Test screen will be displayed and the Test LED will be ON. The current test status of each test zone is shown.

Once testing is completed test zones can be reset to normal by selecting with the up / down arrow keys and then pressing the Cancel Test soft-key

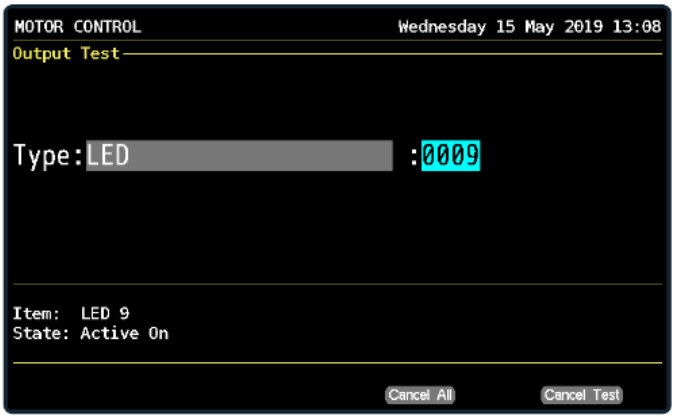
Alternatively, pressing Reset will cancel all zones in test however a confirmation message will appear

Note:

If the cabinet door is closed with the F220 in the Walk Test condition, the internal buzzer sounds and a ‘Fault’ condition (Door Interlock Fault) is signalled.

10.5.1.4 Output Test

All outputs from the F220 main board can be tested. Outputs for testing can be selected using the keyboard arrow keys. The Test softkey activates the output. The test remains active until cancelled using the softkeys. The output test can only set outputs from the normal to activated state. The state of the output under test is set by a logical OR of the output test and whatever other signal that may be driving the output. Multiple output tests can run concurrently. All output tests are cancelled in the event of an Alarm and the system will jump to Brigade view. Any test alarm will not cancel an output test.

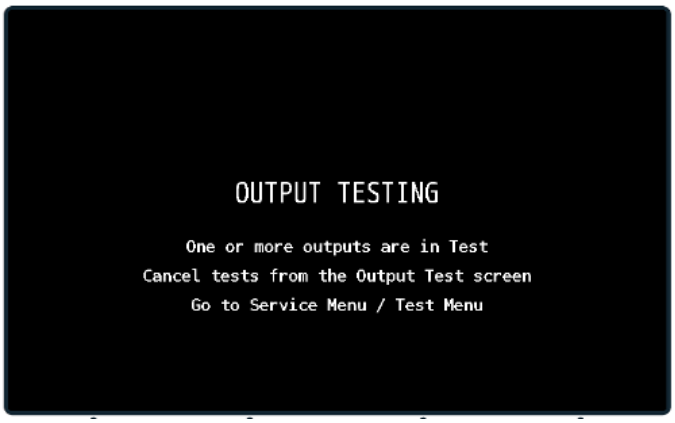


Output Test is option 4 of the Test Menu

User Menu > Service Menu > Test Menu > Output Test

The Cancel Test softkey will cancel testing of the output currently displayed.

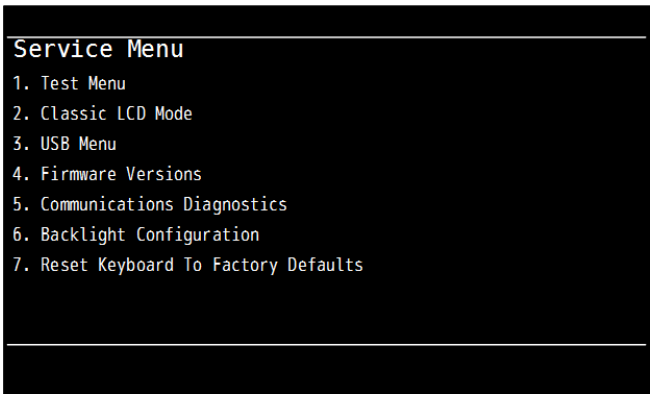
The Cancel All softkey will cancel all output tests on the F220 panel. If the F220 panel is part of a network, then tests on that panel originating from the network will also be cancelled.



A warning screen is displayed in place of the normal screen when output testing is in progress.

10.5.2 Classic LCD Mode (Option 2)

To configure the F220 system and program the array of advanced features provided, the service technician or engineer will find these tasks are easily managed using the FireUtils configuration tool. It is possible however to program the system using the Keyboard-Display and for those familiar with the Pertronic F120 system the familiar four line LCD screen is simulated in the Classic LCD mode.

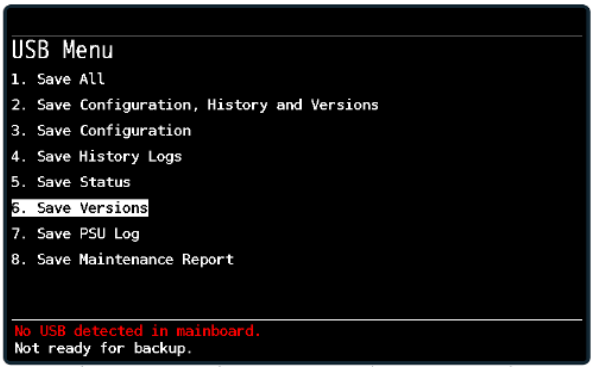


The Classic LCD Mode is option 2 of the Service Menu.

User Menu > Service Menu > Classic LCD Mode

The diagram below shows the interaction between the “Classic LCD mode” and the full colour F220 Keyboard-Display.

10.5.3 USB Menu (Option 3)



The USB Menu is option 3 of the Service Menu.

User Menu > Service Menu > USB Menu

The USB menu allows users to save configuration, history, status and other information to USB memory devices.

Before selecting an option ensure that a USB device is plugged into the mainboard.

If a valid device is detected this message will appear

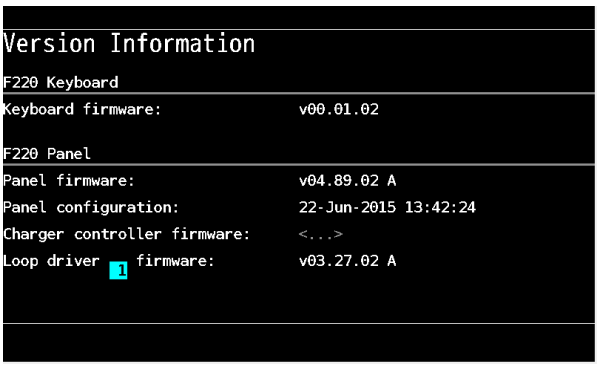
There are 8 options in the USB Menu

- SaveAll
- Save Configuration, History and Versions
- Save Configuration
- Save History Logs
- Save Status
- Save Versions
- Save PSU Log
- Save Maintenance Report

On selection of a USB Menu item, time stamped files are placed in automatically created directories on the USB drive.

Wait for the “SUCCESS” message before removing the USB drive.

10.5.4 Firmware Versions (Option 4)



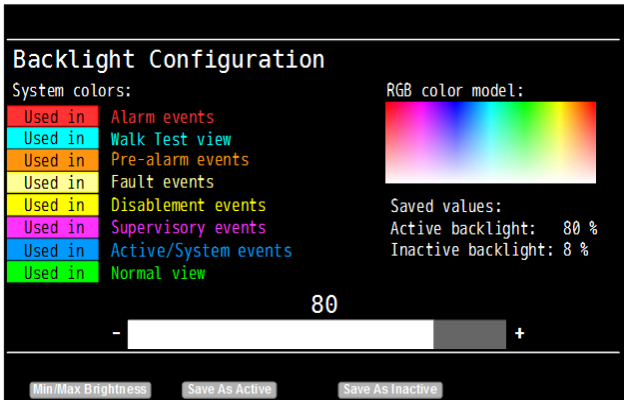
Firmware Versions is option 4 of the Service Menu.

User Menu > Service Menu > Firmware Versions

10.5.5 Communications Diagnostics (Option 5)

This function is reserved for use by Pertronic support staff.

10.5.6 Backlight Configuration (Option 6)



Backlight is option 6 of the Service Menu.

User Menu > Service Menu > Backlight Configurations

The F220 Keyboard-Display uses a backlight that must be on to view the display.

The backlight configuration option allows the user to set an active and inactive brightness level for the display.

Note:

Users should be aware that high brightness levels will increase the quiescent current drain on the system power supply.

Min /Max Brightness

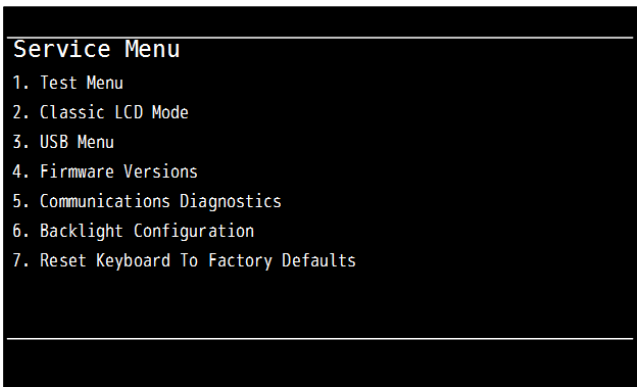
Pressing this soft key option will toggle the display between the minimum and maximum brightness levels that the display can be set to.

Adjusting the Active and Inactive Brightness levels

Use the left and right arrow keys to adjust the display to a desired brightness level. To set this level into the display configuration memory press the “Save As Active” or Save As Inactive” soft keys.

The current saved values are displayed on the configuration screen.

10.5.7 Reset Keyboard-Display to Factory Defaults (Option 7)



Reset Keyboard-Display to Factory Defaults is option 7 of the Service Menu

User Menu > Service Menu > Reset Keyboard-Display

Select this option to reset the display brightness levels to the factory default options.

Press “Yes” to confirm or “Cancel” to return to the Service Menu.

11. OPERATING THE USER MENU (CLASSIC LCD MODE)

Note:

The Classic LCD Mode provides access to “classic” USER functions. However, the majority of functions have been replaced with equivalent functionality using the F220 the Keyboard-Display (see Section 10).

The following table shows those functions that are best accessed using the enhanced functionality of the F220 Keyboard-Display.

Menu Item	Description	Comment
Engineer	Enter the Engineer’s menu.	See Section 12
Status	Show status for a loop device.	See Section 10.4
History	View historical event buffer.	See Section 10.2
Disable	Disable loop devices and zones.	See Section 10.1
System	Show system status information.	See Section 10.3
Test	Various system tests.	For Walk Test see Section 10.5.1 See below for other tests available
Clock	Adjust internal Real-Time Clock.	See below
Reset	Reset all alarms.	Use F220 Keyboard-Display functionality

Table 11-1: Keyboard-Display functionality

The menu tree in The F220 Classic LCD Mode is shown in Figure 11-1

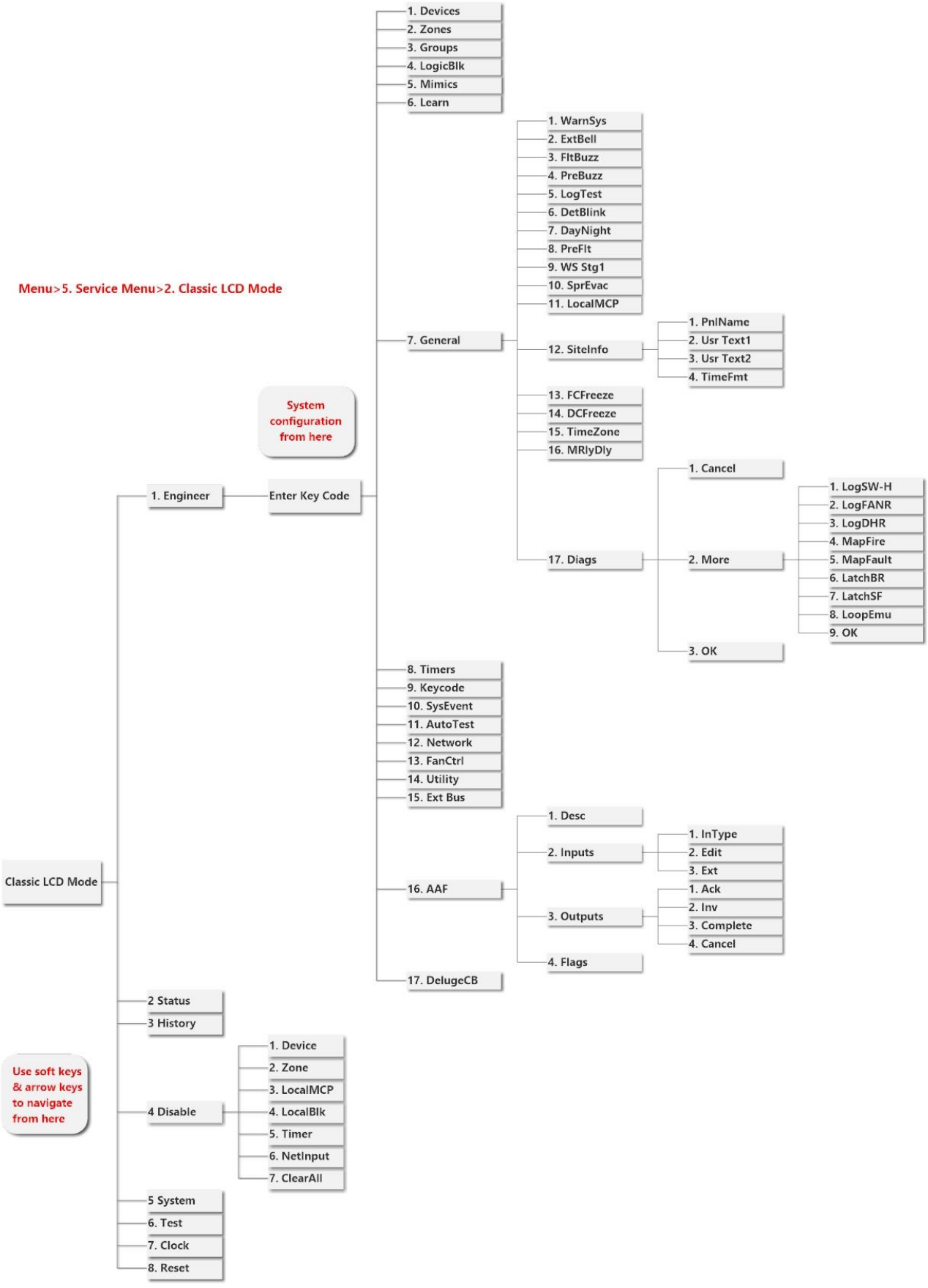
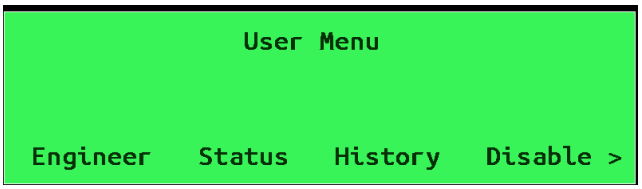


Figure 11-1: F220 Classic LCD Mode Menu Tree

The User Menu when accessed using Classic LCD Mode (see section 10.5.2) will appear as shown below:

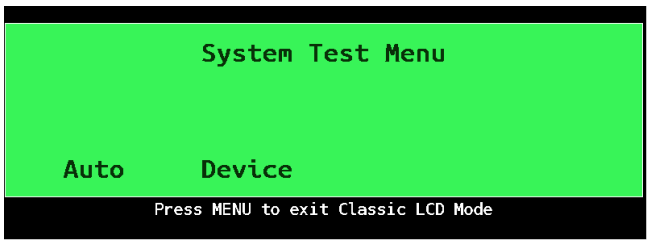


The arrow symbol indicates that there are more menu items. These can be displayed by pressing the ➔ key, pressing the ← key will display the previous menu items.

Select the option by pressing the soft-key directly below the menu item

11.1 Test- Systems Test

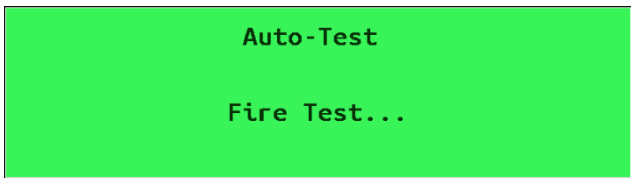
The System Test menu allows various aspects of the system to be tested without physically initiating events via external inputs. Upon selection, the following menu is displayed:



11.1.1 Auto Test

The Auto Test function tests the main Brigade interface connections, the charger interface and the loop devices. When selected the screen displays:

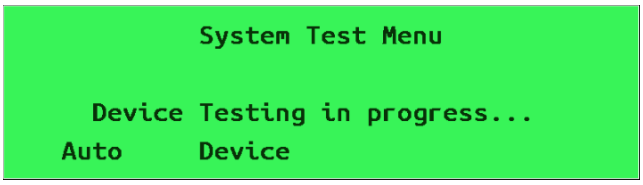
This is a reminder that the Brigade ‘Alarm’ and ‘Fault’ signals will be set by the test - disable the panel from the Brigade before proceeding. Press OK to start the test sequence:



The full sequence is:

Fire Test	Fire relay is activated for 5 seconds.
Fault Test	Fault relay is de-activated for 5 seconds.

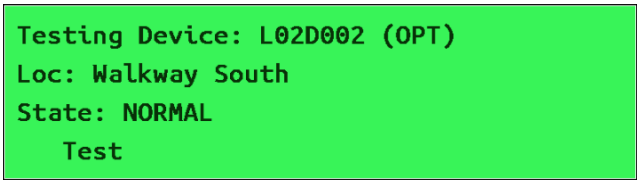
Power Supply Test	Switches the F220 to run on the Secondary power source for 5 seconds –the F220 is powered by the battery only.
Starting Loop Device Test	A 2-second message indicating the start of the loop device test sequence. This test is handled by the loop driver boards and may continue for some time after starting. The display shows



Press Esc/Back at any time to cancel the test. Press OK to skip to the next step of the test sequence.

11.1.2 Device Test

The Device Test menu allows functional testing of loop devices - the menu will look similar to this example:



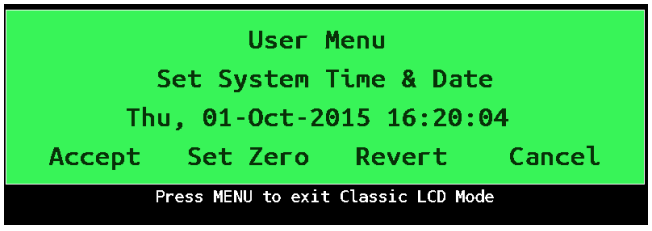
Select Test to toggle the test state for each device ON. When the device is in test mode, the text "[TEST]" appears after the device's state and the softkey changes to Reset. Press Reset to turn Test mode OFF for the device. Exiting the Device Test menu automatically resets all tests in progress.

The Test command puts input devices into their internal test mode, generating an active 'Alarm' condition for that device. Note that alarm processing in Test mode is identical to normal processing; the brigade may be called and all programmed flags and outputs for the device are triggered. The only exception is that the menu system is not aborted with test alarms; alarms on devices that are not being tested still operate normally; the menu is exited and all tests are cancelled.

Output modules turn ON when tested; providing a simple method of remotely operating relays.

11.2 Clock - Set System Time and Date

This option is used to change the system time and date:



Use the arrow keys to set the date and time. The soft-key options are:

Accept	Loads the new time and date values into the system clock. Same as Enter key.

Set Zero	Resets the seconds field to 0 and increments the minute field by 1 if the seconds field was greater than 30.
Revert	Reloads the displayed time and date from the system clock
Cancel	Aborts the menu without setting the time. Same as Menu key.

In a networked system, setting a new time on an F220 panel will also result in that new time becoming the network time for the connected network.

11.3 Reset – Global Reset

This option selects the reset function. The following message is displayed on the LCD.

```
          Global Reset
 Are you *SURE* you want to reset?
Yes                          No
```

Ensure that Silence/Resound Alarm has been operated and the Alarms Silenced LED is ON before proceeding

If Yes (or OK) is selected, the F220 resets all alarms on the panel. This is functionally equivalent to scrolling through the entire display queue & pressing RESET for every event. If any resets were performed, the panel exits from the menu and reverts to the Normal display with the following message.

```
      Device(s) Resetting
        Please Wait...
```

If there were no events to be reset, the panel simply reverts to the User Menu.

Note:

Because loop devices may take a few seconds to reset, it is possible that dependent logical inputs (from Logic Blocks or Timers) will remain active after the initial Reset operation, leaving the corresponding item active. In this case a second global reset is required to restore these items to Normal

12. OPERATING THE ENGINEER'S MENU (CLASSIC LCD MODE)

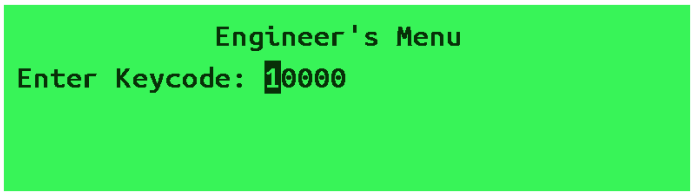
The Engineers Menu provides access to menus that can be used in the majority to "configure" the F220 system.

IMPORTANT NOTE:

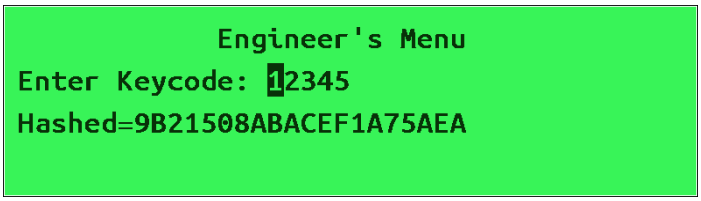
While it is possible to perform all tasks using the Keyboard-Display it is highly recommended that the FireUtils configuration tool is used for such tasks, and that changes using the Keyboard-Display be limited to very minor configuration changes.

The Engineer's Menu is accessed by selecting 'Engineer' from the User Menu using Classic LCD Mode-see 10.5.2. Also see Figure 11-1 for a complete Classic LCD Mode menu tree.

The operator must enter a 5-digit password before being allowed to proceed.



The password number is entered using the arrow keys and then pressing OK. If an incorrect code is entered, the LCD displays a hash code similar to this

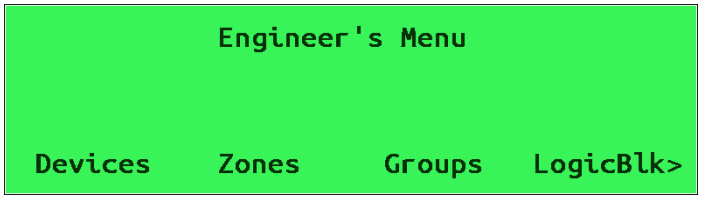


The F220 generates a one-time random password, which is encoded into the displayed hash value. The user must contact the local Pertronic Industries' distributor (phone numbers on cover sheet) to obtain the correct password, which can then be entered to access the Engineer's Menu.

If an incorrect password is entered, the random password hash code is not generated until ten (10) attempts have been made to enter the correct password – each attempt MUST use a different password combination.

The default password is '10000' and any incorrect password will generate a random password hash code.

When the correct password has been entered, the Engineer's Menu is displayed:



As for the User Menu, soft keys select the desired function and the ← and → keys step through the available menu items.

A summary of the Engineer's menu tree is:

Menu Item	Description
Devices	Edit or add loop devices.
Zones	Edit Zone descriptions & zonal non-brigade timers.
Groups	Edit group output lists.
LogicBlk	Set up Boolean Logic Blocks.
Mimics	Set up the number of LCD and/or LED mimics connected to the F220.
Learn	Automatically learn the system or loop configuration.
General	Set up general system options. (There is a sub-menu here.)
Timers	Edit general-purpose timers
Keycode	Change Engineer's keycode (password).
SysEvent	Set up actions to be taken on global system events.
AutoTest	Set daily test time.
Network	Enable/disable networked operation & set up Network Inputs.
FanCtrl	Set up Fan Control Blocks
Utility	Configuration Upload / Download, Status dump, Log dump via USB. New folder creation on USB drive.
Ext Bus	Detect or set the number of loop drivers on the F220 Extender bus.
AAF	Configure AAF logic block inputs /outputs and timers
DelugeCB	Set up Deluge Control Blocks

Table 12-1: Engineer's Menu Tree

Most Engineer Menu functions update or modify the non-volatile memory of the F220. For the memory to be modified, the Configuration Memory Lock switch (located on the F220 Mainboard) must be OFF.

If memory access is attempted, and Configuration Memory Lock is in the ON position, the warning message

```
Please turn Memory Lock switch OFF
```

is displayed to prompt the user to enable memory updates by moving the switch to the OFF position (disable memory lock). When the edit operations have been completed, the Configuration Memory Lock switch must be turned to the ON position to disable memory updates. If this is not done, the message

```
Please turn Memory Lock Switch ON
```

is displayed when attempting to exit from the Engineer's Menu. This prompts the user to move the switch to the ON position to protect the memory. If Menu is pressed again (to exit) and the switch remains in the OFF position (memory unprotected) the Engineer's Menu is exited and a fault is displayed.

12.1 Devices – Add, Modify Device Configuration

This option allows new devices to be added and modifications to be made to existing loop device settings:

```
Device:L01D001 Type:OPT  Zone:0001
AVF:OFF Sens:-1/+0 Flags:WEB---L
Desc: Abbey, Main Hall
   Desc     Outputs     Flags      Delete
```

The Left/Right cursor keys move the cursor between the configuration fields and the Up/Down keys increment or decrement the current item within its allowable range. Table 12-2 shows the fields and the range of each.

Press OK to accept the changes made to the current device and return to the Engineer's Menu. Changing the device address, automatically saves the new configuration data and displays the settings for the new device. Pressing Menu ignores any changes and returns to the Engineer's Menu.

For input devices that are modules (including Manual Call-Points) the Sens field is not displayed but AVF is displayed for all input devices except Heat detectors, MCPs, Disable and 3-Way switches.

Field	Description	Range
Lxx	Loop Number	01 – 20
Dxx Mxx	Device Address	D001 – D159 for Detectors M001 – M099 for Call-Points, Modules and Relays
Type	Device Type	Select one of: - - - - No device programmed
	Detectors:	OPT Photoelectric (Optical) Smoke Detector ION Ionisation Smoke Detector HEAT Heat Detector LASR Pinnacle™ Intelligent Laser Detector ACCL Acclimate™, COPTIR™ and PTIR™ Intelligent Photo/Thermal Detector FLTX Filtrex™ Filtered Optical Smoke Detector BEAM Intelligent Beam Detector FAST FAAST™ Aspirated Smoke Detector vXXXX Virtual Detector (XXXX denotes parent type)

Field	Description	Range
	Input Modules:	MCP Manual Call-Point LPRS Pertronic Loop Responder ZMU M502 Zone Input Module FSW Flow Switch VMD Valve Monitor PSW Pressure Switch SPR Sprinkler SIP Sub-Indicator Panel ISO Disable Switch SW Switch Input SW_H Hidden Switch Input VES VESDA Input BMIF Conventional Beam detector via Module Interface M512 System Sensor M210E-CZR Conventional Interface SW3 3-Position Switch PLNT Switch Input - PLNT MON Switch Input - MON
	Output Modules:	RLY Loop Relay RLYM Monitored Loop Relay ACF Loop Relay defined as an ACF Relay ACFM Monitored ACF Loop Relay DHR Loop Relay defined as a Door Holder Relay WRN Loop Relay defined as a Sounder Relay WRNM Loop Relay defined as a Sounder Relay (Monitored)
zone	Zone number	00000 – 64999 (see Section 12.12).
AVF	Automatic Verification Facility	OFF or ON (all input devices except Heat detectors, MCPs, Disable and 3-Way switches)
Sens	Detector Sensitivity (detectors only)	-5 to +3 (Depends on Detector Type) 0 is 'Normal' sensitivity, -1 to -5 are less sensitive, +1 to +3 are more sensitive Used with Day/Night mode and Virtual Detectors. When Day/Night mode is active, 2 sensitivities are shown: the "Day" value followed by the "Night"

Field	Description	Range
Flags	WEBADZKPL	The symbols shown represent functions to be acted upon when the device is in 'Alarm'. These functions are: W activate WARNING SYSTEM relay E activate EXTERNAL BELL relay B activate FIRE relay (call Brigade) A activate the ACF relay D activate the DOOR HOLDER relay Z sound Buzzer (Alarm event) K Brigade Latch (latches if Brigade called) P Supervisory (input modules) L the input device alarm is latched **Note:** certain flag combinations are not permitted - for example setting the Brigade bit forces the Latching bit to be set
Desc	Device Descriptor	Choose the Desc menu item to edit the device descriptor.

Table 12-2: Fields of the Device Edit function

12.1.1 Desc – Edit Descriptor:

Once selected, the cursor moves to the descriptor field and the text can be edited:

```
Device: L01D001 Type:OPT  Zone:00001
AVF:OFF Sens:+0 Flags:12B---L
Desc: Abbey, Main Hall_
  Space    BkSpace   Num/Alph  Tgl Case
```

The Left/Right cursor keys move the cursor and the Up/Down keys change the character under the cursor. The Space key inserts a space at the current position and BkSpace deletes the character to the left of the cursor. The Num/Alph key toggles the current character under the cursor between '1' and 'a'. Tgl Case switches between upper- and lower-case alphabetic characters.

When the descriptor entry has been completed, press Enter to accept the new text, or Menu to revert to the original text.

12.1.2 Outputs - Edit Outputs for the Selected Device

To program or update an output (1 to 4) for the selected device, select 'Outputs' to display the Edit Outputs screen:

```
   Editing Outputs for Device: L01D001
Output 01: LED 001
Activated by: Alarm
   Test     EvType   OutType    Exit
```

Use the arrow keys to select the output number (1 to 4), and select 'OutType' to choose the output type (Device, Group, Relay, LED, Group etc. See Table 8-1) for the selected output.

For each output type, use the arrow keys to select the item numbers or addresses, as required.

The 'Test' soft-key allows the current output, or all of the device's outputs, to be activated for testing. The display changes to

```
   Editing Outputs for Device: L01D001
Output 01: LED 001
       Select outputs to test...
           Current     All     Cancel
```

Select ‘Current’ or ‘All’ to turn the current output or all outputs programmed for the device ON. The display changes to:

```
   Editing Outputs for Device: L01D001
Output 01: LED 001
           Outputs activated.
       Press any key to return...
```

Press any button to cancel the test - the display reverts to the output editing menu.

For loop devices only, an extra option allows each output to be activated by Alarm (the default), Pre-Alarm, Fault, OFF and ON. Use ‘EvType’ softkey to cycle around the available options.

Note that, although the editor allows any event type to be programmed, only valid types actually have an effect; for instance, selecting Pre-Alarm will not do anything for a relay device. See Section 0 above for more information.

Note:

Pressing Enter or Menu from the ‘Edit Output’ menu is equivalent; the new information is saved, but only to a temporary copy of the device configuration data being edited. New data is not written to the configuration memory until the next address is selected or Enter is pressed from the main device editing screen

12.1.3 Flags – Edit Device Flags

The Flags item selects the flag-editing menu:

```
        Editing flags for L01D001
Flags: WEB--ZL
Flag Name: Warning System
  Cancel                          OK
```

The cursor Left/Right keys select the flags, with the description of the flag shown underneath. The Up/Down keys toggle the flag ON (displays the flag letter) or OFF (displays a dash).

Press Enter or select OK to confirm when finished. To ignore changes made, press Menu or select Cancel.

Note:

Not all combinations of flags are permitted. The F220 may ignore requests to change the flag, e.g. setting Brigade sets Latching; any attempt to turn the Latching flag OFF will fail.

12.1.4 Delete - Delete Device

Delete is used to remove the selected device from the system. A confirmation (Yes or No) is required before the action is taken. The device configuration and descriptor are cleared to the default condition.

A device can also be deleted by setting the device type to nothing (- - - -); in which case the device is removed, but the existing device settings and descriptor are retained.

12.2 Zones – Configure Zones and Edit Zone Descriptors

This option displays the edit function for the zones:

```
      Zone Editing Menu
Zone:00016
Desc: Level 7 Centre Core
   Desc     Outputs      More      Delete
```

The zone number required (0001 to 64999) is chosen by using the Up/Down arrow keys. Note that there are up to 999 zones in the panel; displayed zone numbers are affected by the Network Zone Offset parameter (see Section 12.12).

To edit the descriptor for the selected zone, select Desc and use the editing functions available on the zone descriptor edit screen. (refer to Section 0: Table 12-2: Fields of the Device Edit function

Desc – Edit Descriptor: for a description of the edit functions).

Each zone has 8 outputs associated. By selecting Outputs, output types can be assigned as required for each output. (refer to Section 12.1.2: Outputs - Edit Outputs for the Selected Device for a description for output type selection).

Similarly, as described in Section 12.1.4: Delete - Delete Device, the Delete selection will erase the configuration (i.e. outputs and descriptor for the zone) to the default condition.

Selecting More displays a sub-menu for editing the Zone Timer or AAF functions for the zone:

```
          Zone Editing Menu
Zone:00016
Desc: Level 7 Centre Core
  Timer       AAF                  Cancel
```

12.2.1 Zone Timer Configuration

Selecting Timer enters the configuration menu for the Zone Timer as shown:

```
      Zone 00001 Timer Configuration
Period: 05:00 Flags: WEBADZL
Run:LED0015  End:LED0016,L01M057
 Out:Run    Out:End     Flags     Cancel
```

The timer period can be adjusted from 00:00 (disable timer) to 60:00 (1 hour) in 1-second increments using the cursor keys. The timer flags behave in the same way as the flags for a device, except that the timer always generates an ‘Alarm’ event, even if all flags are clear.

There are 4 outputs available for each timer:

- two triggers while the timer is running
- two triggers when the timer completes.

These are set up as for any other output via the Out:Run and Out:End soft-keys.

Details of the Zone Timer operation can be found in Section 8.2.2

12.3 Groups - Configure Group Outputs

This option selects the Group editing function:

```
          Group Editing Menu
Group:001 Outputs in use:2
L01M001,LED003
            Edit      Undo    Delete
```

The group number (001 to 999) is selected using the Up/Down arrow keys.

The number of outputs configured for use for the selected group is indicated in the 'Outputs in Use' field. In this case two outputs have been configured. The output types used are listed (space permitting) on the next line of the display. In the example, a relay at module address 1 of loop 1 and LED 3 are in use.

Select Edit to access the group's Output Edit menu where the output types can be selected for each of the 15 outputs within the group:

```
   Editing Outputs for Group:01
Output 02: LED 003

   Test              OutType    Exit
```

This menu is identical to the Device and Zone Output menus, as described in Section 12.1.2: Outputs - Edit Outputs for the Selected Device.

12.4 LogicBlk – Configure Boolean Logic Blocks

This option selects the logic block editing functions. Details of Logic Block operation can be found in Section 8.5.

```
        Logic Block Editing Menu
Block:001  Mode:OR   Flags:-2-------H
Desc:Class Change
  Inputs   Outputs     Desc      Flags
```

The top-level menu allows the selection of the block number to edit the output flags, description and the Boolean mode of the block. The Left/Right cursor keys can be used to select the required field and the Up/Down keys cycle around the available values.

12.4.1 Logic Block Inputs

Select Inputs to start the input editing screen:

```
      Editing Inputs for Block:001
Input:1  Type:Loop Device  Invert:No
Any of L01D001..D001 State:Alarm
  InType     Edit     Invert      Exit
```

The Up/Down keys select the desired input for the block.

- the InType soft-key cycles the input type around all the available values.
- the Edit soft-key enables the cursor keys in order to change the parameters for the selected input type. - the Invert soft-key toggles the state of the inversion flag for the selected input.

12.4.2 Logic Block Outputs

The block outputs are edited similar to the loop devices as described in Section 12.1.2: Outputs - Edit Outputs for the Selected Device.

12.4.3 Logic Block Descriptor

The block descriptor is edited as for the loop device descriptor as described in Table 12-2: Fields of the Device Edit function

Desc – Edit Descriptor:

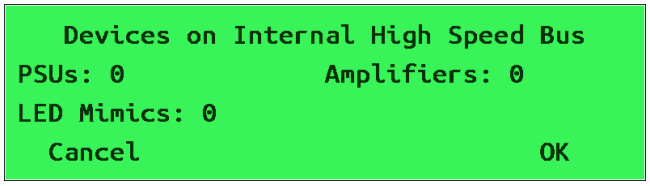
12.5 Mimics - Configure LED and LCD Mimics

This menu allows the number of addressed LED and LCD mimics present on the system to be set:

The arrow keys are used to select the fields and to increment or decrement the numeric fields.

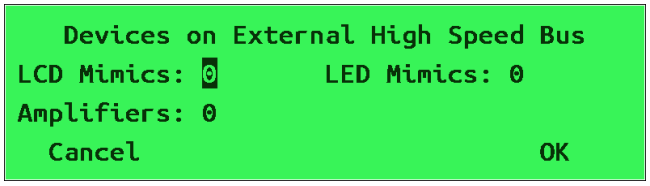
HS Int – these are for devices connected to the high speed internal bus.

The arrow keys are used to select the fields and to increment or decrement the numeric fields.



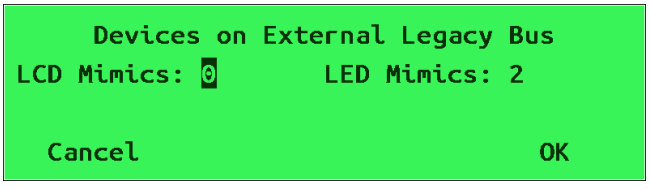
HS Ext— these are for devices connected to the high speed bus.

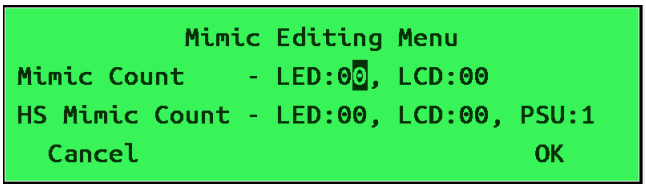
The arrow keys are used to select the fields and to increment or decrement the numeric fields.



Legacy— these are legacy bus devices.

The arrow keys are used to select the fields and to increment or decrement the numeric fields.



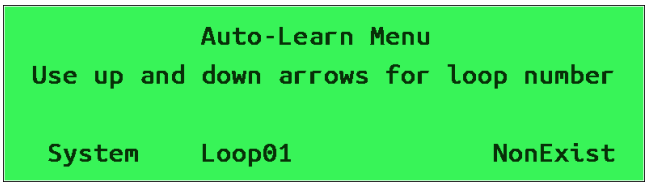


Mimic Count—these are legacy bus devices

HS Mimic Count—these are for devices connected to the high speed bus

12.6 Learn - Auto Learn Function

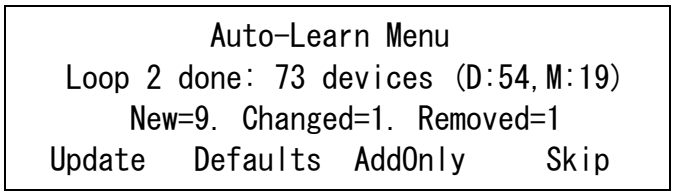
Learn allows each loop to be interrogated and the devices detected included in the system configuration.



Either select System to learn all the system or to learn individual circuits, use the Up/Down arrow keys to select the required circuit: LoopXX

The NonExist option erases any configured devices that are present beyond the last known loop on the system to avoid generation of “Missing” events for such devices.

After a loop has been learned (5-10 seconds for the first loop, 1 second each thereafter), the LCD displays:



This shows the total number of devices (Detectors & Modules) found on each loop, and indicates the number of new, changed (device type), and removed (no longer present) devices. Available options are

Update	New devices found are updated in the system configuration. Non-existent devices are removed. Each new device is given the default settings for that device type. Addresses with just a device type change will have just the new type stored.
Defaults	Each detected device is given the default settings for that device type. Non-existent devices are removed.
AddOnly	Similar to Update, but non-existent devices are not removed from the configuration.
Skip	No changes are saved and the results for the next loop are shown. Pressing Menu has the same effect.

12.7 General - Configure General System Options

The General option allows some miscellaneous system configuration options to be changed:

```
          General System Options
WSM:Y EBM:Y  FltBuzz:Y  PreBuzz:N
Log24:Y  Blnk:Y  DN:N  PreFlt:Y  WSS1:N
 WarnSys   ExtBell   FltBuzz   PreBuzz >
```

12.7.1 System Flags

These are all simple toggle functions that switch between Enabled (Y) and Disabled (N):

- The soft-key functions WarnSys and ExtBell allow monitoring of each of the main Bell relays to be enabled or disabled.
- The FltBuzz option toggles the “Fault Buzzer” from enabled to disabled. If enabled, the local buzzer sounds when any Fault state activates, and when OFF, the buzzer sounds only when an Alarm condition is generated. Default enabled.
- The PreBuzz option toggles the state of the global “Pre-Alarm Buzzer” flag. This controls whether any ‘Pre-Alarm’ condition on a detector will sound the buzzer.
- The LogTest button (on the 2nd ‘page’ of soft-keys) enables or disables the generation of daily test messages to the ‘Historical Event’ log.
- The DetBlink option globally enables or disables detector and input module LED blinking.
- The DayNight option controls whether Day/Night mode is used on the panel. The F220 panel Night Mode is activated by the “Night Mode” output type as described in Section 8.1.2
- The PreFlt option controls the F220 behaviour for Pre-Alarm events. When enabled, Pre-Alarms are treated as panel faults and appear in the main Fault queue on the Keyboard-Display, otherwise they are placed in the lower-priority System queue.
- The WS Stg1 option controls the output settings for relay modules. When active, the relay modules’ LEDs are not activated when the relay is active. For some loop-powered sounder hardware (e.g. KAC), this causes a different tone to be output. Note that the “Sounder S1 switch” output type (see 8.1.2) dynamically switches the output mode to the alternate behaviour.
- The SprEvac option toggles the state of the Sprinkler Evacuation Disable flag. This option, when active, prevents the F220from activating the Sprinkler LED signal sent to LED mimics & amplifiers via the RS-485 bus. This signal is generated whenever the local SPR input, or a FSW, PSW or SPR loop device is in alarm state and triggers evacuation on all connected amplifiers. This option is intended for use in a scenario when multiple sprinkler zones exist and a global evacuation from this source is not desired.

12.7.2 Day/Night Mode

Day/Night toggles whether Day/Night Mode is active. When Day/Night mode is active, all detectors can have a second Sensitivity value set to be used when the panel enters Night Mode. The F220 panel’s Night Mode is activated by the “Night Mode” output type as described in Section 8.1.2.

12.7.3 Local MCP Options

Selecting LocalMCP opens up a sub-menu for setting up options for the local MCP input on the F220 Mainboard

```
          Local MCP Setup Menu
Zone:0000  Flags:WEBADZL
Desc:
   Desc      Flags
```

The zone assignment can be changed using the cursor keys. The MCP descriptor can be changed by pressing the Desc key.

Flags: activates the cursor to allow selection of the Local MCP output flags using the cursor keys.

The output flags available, with display representations in brackets, are:

- WarnSys [W]
- ExtBell [E]
- Brigade [B] relay
- on-board ACF [A] relay
- on-board Door Holder [D] relay
- Alarm buzzer [Z]
- Latch flag [L]

For example, if the Flags field is WE—DZ, both Warning system circuits will operate, the Door Holder relay will operate and the internal buzzer will sound when the MCP has operated, however the ACF and Brigade relays will not.

12.7.4 SiteInfo- Edit Site–Specific Information

The SiteInfo option starts the Site Information Menu that allows customisation of the LCD display appearance in the ‘Normal’ condition. Note that all text shown on the ‘Normal’ display is centred.

```
          Site Information Menu


   PnlName  UsrText1  UsrText2  TimeFmt
```

The PnlName option is reserved for Network panels.

The UsrText1 and UsrText2 options allow editing of the “User Text” which appears on lines 3 and 4 of the display respectively.

The TimeFmt option allows a user-defined format for the time displayed on line 2. The format string can contain any normal characters, with the exception of the special characters defined below.

Character	Field	Notes
h	Hours	Leading zeroes determined by run length. Always in 24-hour format.
m	Minutes	Leading zeroes determined by run length.
s	Seconds	Leading zeroes determined by run length.
d	Day	Gives numerical date for runs of 1 or 2. Gives day name in truncated 3-character form for run of 3, otherwise full day name.

Character	Field	Notes
M	Month	Gives numerical month for runs of 1 or 2. Gives month name in truncated 3-character form for run of 3, otherwise full month name.
y	Year	Gives 2-digit year for runs of 2 or less, otherwise 4-digit year.
N,n	Day/Night Mode	Displays the status of Day/Night mode: N “D” or “N” NN “DM” or “NM” NNN “Day” or “Ngt” NNNN “DayMode” or “NightMode” Using “n” displays the text only when NightMode is active, otherwise the field is blank. Using “N” displays the text in Day or Night mode

Table 12-3: Time/date Format

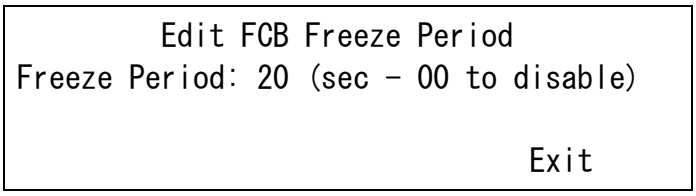
The following examples assume the current date is 9:05:15pm on Thursday, 29-Jun-2006 and the panel is in Night Mode.

Format String	Result
dddd, dd-MMM-yyyy hh:mm:ss NNNN	Thursday, 29-Jun-2006 21:05:15 NightMode
d/M/y h:mm n	29/6/06 21:05 N
NN yyyy-MM-dd hh:mm:ss	NM 2006-06-29 21:05
ddd dd-MM-yy hh:mm nnn	Thu 29-06-06 21:05:15 Ngt
MMMM d, yyyy hh:mm nnnn	June 29, 2006 21:05 NightMode

Table 12-4: Time/date String Format

12.7.5 FCFreeze – Edit FCB Freeze Timer Period

This option allows adjustment of the FCB Freeze delay period (see Section 8.10.9: Freeze Timer)



Use the cursor keys to adjust the time period. A zero value completely disables the FCB Freeze function. The maximum value is 90 seconds.

12.7.6 DCFreeze – Edit DCB Freeze Timer Period

This option allows adjustment of the FCB Freeze delay period (see Section 8.10.9: Freeze Timer)

```
        Edit DCB Freeze Period
Freeze Period: 20 (sec - 00 to disable)

                              Exit
```

Use the cursor keys to adjust the time period. A zero value completely disables the DCB Freeze function. The maximum value is 90 seconds.

12.7.7 Time Configuration

By choosing the correct time zone and location for the F220, the Daylight Saving will automatically be configured.

The current time zone and location will be displayed, pressing the Change softkey will bring up the time zone directories.

```
            Select Time Zone
5: Asia/ (dir)
6: Atlantic/ (dir)
7: Australia/ (dir)
```

Using the Up/Down keys locate the required time zone directory and press OK.

Within the directory use the Up/Down keys to locate the desired location and press OK

12.7.8 Monitored Relay Delay Configuration

A delay can be applied to relay monitoring to allow a relay circuit to settle to its new state before reading the new state. The delay and the scope of coverage can be selected from three configurations: No Delay, All Monitored Relays or Monitored Sounder Relays Only.

```
     Edit Monitored Relay Delay Mode
No Delay


  Cancel                          OK
```

Using the Up/Down keys choose the required delay and scope.

12.7.9 Diags – System Diagnostic Options

This starts a menu that is used to set up a number of special settings for diagnostic or commissioning purposes. The LCD screen is shown below:

```
    System Diagnostic Options
FaultFilter: MaxPerHr=OFF  Delay=OFF
MaintFilter:ON  Action=Fault
 Cancel                  More      OK
```

Use the cursor keys to scroll between items and to increment or decrement the values. The parameters are described below:

Name	Default	Range	Description
Fault Filter Count	0 (OFF)	0..50	Sets the maximum number of times that Brigade fault relay can be activated per hour. Faults are logged and displayed normally, but the relay is only activated up to the set number of times. Used for filtering out intermittent fault conditions from notifying the brigade too often. **Note**: only active if the main door input is active (door closed), so that normal relay behaviour can be observed while servicing is carried out.
Fault Filter Period	0 (OFF)	0..45s	Sets the duration a fault condition must be present on the F220before the Brigade fault relay is activated. Similar to above, except time based. Can be used for suppressing known intermittent faults from calling the brigade.
Maintenance Filter	ON	ON/OFF	Normally, Maintenance events generated by the loop drivers are ignored except for a 1 minute period at the end of the 24 hour test cycle. Turning the filter off means that Maintenance events will be generated immediately.
Maintenance Action	Fault	Fault/ LogOnly	Determines whether Maintenance events are treated as Faults, or simply logged into the panel's history buffer.

Table 12-5: System Diagnostic Options

Note that the Fault filter parameters act sequentially; the period requirement must be satisfied before the count is incremented.

Note that in all cases, standards may be violated by misuse!

Fault Filters should normally be used for commissioning purposes only, or at least temporarily where there is some persistent, intermittent fault condition that cannot be immediately rectified.

12.7.9.1 Extra Diagnostics Menu

Selecting More from the Diagnostic menu brings up the Extra Diagnostics Menu, shown below:

```
        Extra Diagnostics Menu
Log SW_H:Y  Log FANR:N  Log DHR:Y
Fire->OP1:Y  Fault->OP2:Y  LBR:Y  LSF:Y
 LogSW_H   LogFANR    LogDHR    MapFire >
```

LogSW_H, LogFANR, LogDHR— These first three items are to allow for event logging for the SW_H, FANR, and DHR device types to be suppressed. Normally, these devices generate messages in the log for every activation, although they do not appear on the display. For some installations these events may cause the event log to fill prematurely, making analysis difficult. Disabling the logging only prevents the normal activation messages from being logged, other events (such as faults) will still be logged.

Several other menu items are also available, use the right arrow to see all of them:

MapFire— Set by default to ON, toggle for OFF. When ON maps O/P1 to operate with Fire Relay Output.

MapFault—Set by default to ON, toggle for OFF. When ON maps O/P2 to operate with Fault Relay Output.

LatchBR—Set by default to ON, toggle for OFF. When ON, the Brigade Relay (Fire Relay) is latched on. When OFF the Brigade Relay is off if all alarms are disabled, any new alarms will operate the Brigade Relay.

LatchSF— Set by default to ON, toggle for OFF. When ON system faults are latched. When OFF, only current faults are indicated.

Note:

When MapFault is ON ensure that DIP Switch 6 on F220 Mainboard is also ON. This ensures that when a System Defect condition is present, such as a Watchdog restart, it will also be present on O/P2.

12.8 Timers – Edit General-Purpose Timers

This option allows manual editing of the general-purpose timers:

```
Editing Timer 01 - Flags: -------SHO-
T1: 00:05:00  T2: 00:00:00
Desc: 5-minute warning
  Inputs  Outputs      Desc    Flags
```

On this screen the cursor keys can be used to change the timer number to be edited, together with the timer configuration flags and the two timer periods. The value of T1 must be non-zero for the timer to operate. The T1 and T2 values are limited to 12 hours. Note that certain combinations of flags are not permitted; e.g. the Continuous flag cannot be set if either T2 is zero or the Latch flag is set.

12.8.1 Timer Inputs

Editing the timer inputs is essentially the same as for the Logic Block inputs in Section 12.4.1: Logic Block Inputs, with the exception that the input names are used (Start, Reset, Disable/Isolate and Override) instead of numbers.

12.8.2 Timer Outputs

Selecting **Outputs** brings up an intermediate menu so that the T1 or T2 outputs can be selected:

```
      Select Outputs for Timer 01


  T1Out     T2Out                Exit
```

Selecting either T1Out or T2Out brings up the standard output editing menu.

12.9 Keycode - Change the Engineer's Menu Password

This option is used to change the Engineer's Menu password or keycode: Default is 10000

```
       Engineer's Menu
New Keycode: 10000
```

Use the arrow keys to change the keycode digits, and press Enter to save, or Menu to return to the previous menu level.

12.10 SysEvent – System Event Outputs

This function displays a sub-menu that allows mapping of selected system events to up to 32 sets of 6 outputs. Refer to Section 8.4 for further information on the events that can be mapped.

The editing menu appears as shown below:

```
      System Event Editing Menu
Index:01
Event Type: Fire
   Type    Outputs     Undo     Delete
```

The cursor keys select the index of the “slot” in use; each slot can map a single system event to 6 standard outputs. If more than 6 are desired, a second slot can be programmed with the same event type to add another 6 outputs.

The Type softkey cycles around the available event types.

- the Undo softkey restores the selected slot to the copy held in the configuration memory.
- the Delete softkey erases the current slot.

12.11 Automatic Test Scheduling

This function sets the automatic test schedule:

```
    Automatic Test Configuration Menu
Automatic test time:   08:00
Battery test weekdays: -T-----
  Cancel                        OK
```

Use the arrow keys to set the automatic test start time (hours:minutes) and to select the days of the week the test will run, the automatic test will run at least once a week.

The automatic test will:

- Operate the F220 system from the Battery supply for 40 minutes, this tests the battery’s ability to carry the system load.
- Poll each loop sensor for correct operation

See Section 13.18 Regular Automatic Test.

12.12 Network

The F220 supports networking, allowing up to 128 F220 Fire Alarm panels to be interconnected. This provides the ability for indications and signalling of selected events to be reported to other panels. Network inputs are configured in a manner similar to other loop devices..

Select Network to enter the configuration menu for Network Inputs:

```
    Network Configuration Menu
Enabled:No


  Enable    Inputs
```

Select Enable to turn on the Network input function for the panel (refer to: 0124 NET2CARD Technical manual for the installation and operation of the Network Interface).

The display is:

```
      Network Configuration Menu
Enabled:Yes  Supervisory Panel:No
Zone Offset:00000
 Disable    Inputs   SupPanel  ZoneOfs
```

Use Disable to turn off the network function.

The SupPanel option toggles the “Supervisory” mode of the panel. When enabled, this simply disables monitoring of the local F220 display’s communications, so that a network display can substitute for the panel display.

The ZoneOfs parameter is used to set the global Zone Offset using the cursor keys. This option is used where a large number of panels on a network are required to use unique zone numbers for display. The offset simply increases all apparent zone numbers by the offset value. The range of zone numbers remains at 999, and zone 0 is still valid in those cases where a zone number is not required. The maximum value of the Zone Offset is 64000, resulting in a displayed zone range of 64000 to 64999, inclusive.

Note:

Both the Supervisory & Zone Offset settings remain active even if the network is disabled!

The **Inputs** options allows the editing of the individual Network Inputs:

```
      Network Configuration Menu
Input001  Zone:00120  Flags:----------
Desc: Engineering Annex
   Desc    Output     Flags
```

At this point, it is possible to change the network input number and its associated zone number using the cursor keys. The softkey options are outlined below.

Desc- Network Input Description

Desc allows the user to input a descriptor for the Network input selected

Output

Output allows the user to select outputs that will activate at the occurrence of the Network Input activation.

Flags

Flags allows the user to select the appropriate flags for the Network Input.

12.13 FanCtrl – Fan Control Block configuration

This option selects the Fan Control Block (FCB) editing functions.

Details of FCB operation can be found in Section 8.10:

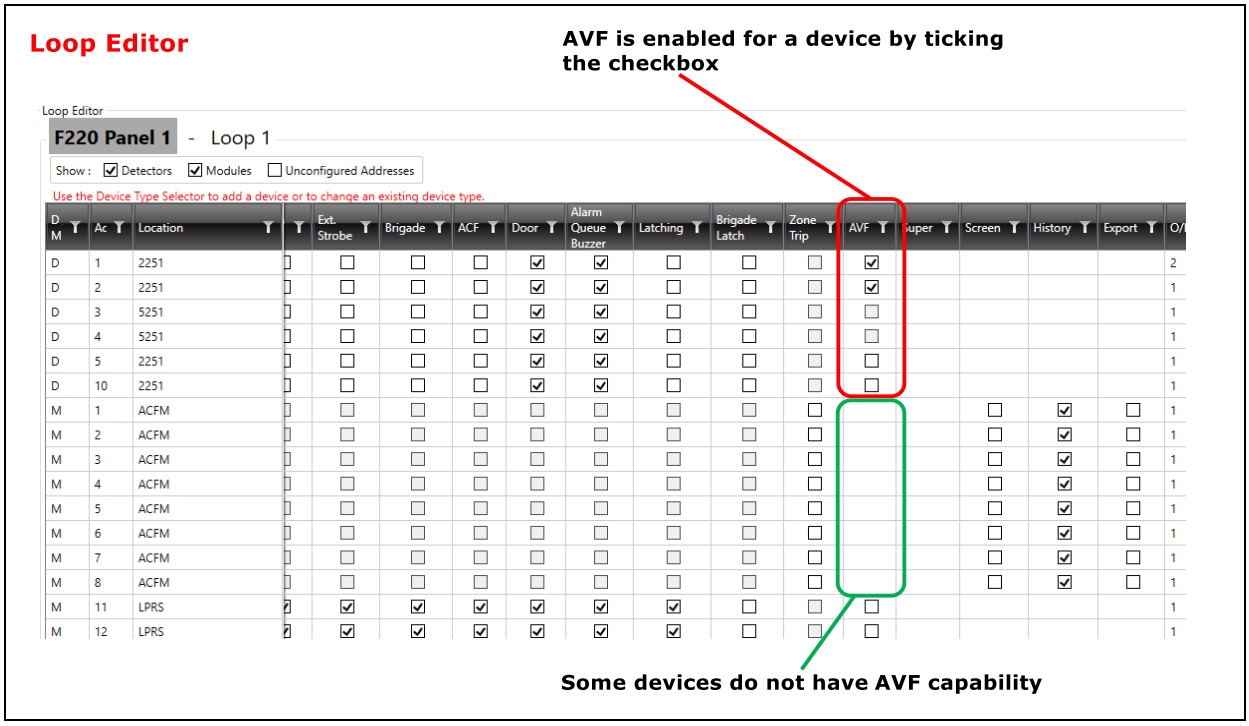


Figure 8-28: FireUtils' AVF

Fan Control Blocks

```
    Fan Control Block Editing Menu
FCB:001  Mode:ON Flags:--L STO:10 SP:2
Desc:West Stairwell Pressurisation
  Inputs   Outputs     Desc     Flags
```

The top-level menu allows the selection of the FCB number to edit the mode, flags, Status Timeout and the description of the block. The Left/Right cursor keys select the required field and the Up/Down keys cycle around the available values.

12.13.1 Status Timeout Period

The STO can be set to any value between 05 and 90 using the cursor keys. The STO sets the time delay between fan actuation and activating a fault condition due to incorrect fan operation.

12.13.2 Stabilisation Period

The SP value can be set from 0 to 9 using the cursor keys. The SP value determines the amount of settling time on the FStart and FStop inputs before processing by the FCB.

12.13.3 FCB Inputs

Select Inputs to start the input editing screen:

```
     Editing Inputs for Block:001
Input:FStart Type:Loop Device Inv:No
Any of L01D001..D001 State:Alarm
  InType     Edit     Invert     Exit
```

The Up/Down keys select the desired input for the block. FCB input functions are outlined in Section 8.10.1 FCB Input Descriptions.

- the InType soft-key cycles the input type around all the available values.
- the Edit soft-key enables the cursor keys in order to change the parameters for the selected input type.
- the Invert soft-key toggles the state of the inversion flag for the selected input.

12.13.4 FCB Outputs

The block outputs are edited similar to the loop devices as described in Section 12.1.2:Outputs - Edit Outputs for the Selected Device. The only difference for the FCB is that each output has a defined function, as described in Section: 8.10 Fan Control Blocks. The output is selected with the cursor keys, as for inputs.

12.13.5 FCB Descriptor

The descriptor is edited as for the loop device descriptor as described in Section 12.1.1 Desc – Edit Descriptor:

12.13.6 FCB Flags

Selecting Flags allows the user to select the appropriate flags for the Fan Control Block. See 8.10 Fan Control Blocks for a description of the FCB flags and their meanings.

12.14 USB Utilities Menu

The USB utilities Menu allows upload of a panel configuration from a USB drive.

Download of panel configuration, history, logs etc. is available through the User Menu, see section 10.5.3 USB Menu (Option 3).

Note:

It is recommended that the USB drive is plugged in before accessing the Utilities menu. This will allow the operating system time to recognise that a memory device has been connected.

12.14.1 CfgLoad- Upload Panel configuration from USB drive

Refer to Section: 13.20 Configuration Memory Lock

Access the Utilities Menu then press the CfgLoad softkey. Access to CfgLoad will result in a warning screen. Use the Up and Down arrow keys to navigate to the required folder then press OK.

Select the file within the folder and press OK to load.

The selected file will then be loaded from the USB drive.

12.15 Ext Bus - Extender configuration menu

This function allows Extender (Loop Driver) boards to be configured:

```
    Extender Configuration Menu
Total extender boards: 02
Board 01 Active
         Detect
```

The total number of Extender boards for the system may be changed using the arrow keys.

The Detect softkey interrogates the Extender bus for the number of controller cards.

If any changes were made, pressing Enter produces the following prompt:

```
   Extender Configuration Menu

Do you want to save your changes?
Yes                    No
```

Press Yes or Enter to save the new configuration information and return to the Engineer's Menu.

12.16 Alarm Acknowledge Facility AAF

```
AAF:002 Enabled:Y  AAFReset:N
ACK-00:30  INV-01:30  Flags:W-B----SH
Desc:SOU Zone  24
   Desc     Inputs   Outputs    Flags
```

This option allows AAF Logic blocks to be enabled or disabled for and sets up the operating parameters for the AAF function. The cursor keys can change the time periods and the Zone Reset option's state.

The Inputs soft key allows the Acknowledge input to be edited.

The Outputs soft key allows the 3 outputs (Acknowledge Time, Investigation Time and Complete) to be edited.

The Flags soft key allows the AAF timer completion flags to be set.

Details of the Zonal AAF operation can be found in Section 8.7: Alarm Acknowledgement Facility.

12.17 DelugeCB

This option selects the Deluge Control Block (DCB) editing functions.

Details of DCB operation can be found in Section 8.11 Deluge Control Blocks.

.

```
   Deluge Control Block Editing Menu
DCB:001  Mode:ON Flags:--L STO:10 SP:2
Desc:West Corridor
  Inputs   Outputs     Desc     Flags
```

The top-level menu allows the selection of the DCB number to edit the mode, flags, Status Timeout and the description of the block. The Left/Right cursor keys select the required field and the Up/Down keys cycle around the available values.

12.17.1 Status Timeout Period (STO)

The STO can be set to any value between 05 and 90 using the cursor keys. The STO sets the time delay between fan actuation and activating a fault condition due to incorrect fan operation.

12.17.2 Stabilisation Period (SP)

The SP value can be set from 0 to 9 using the cursor keys. The SP value determines the amount of settling time on the FStart and FStop inputs before processing by the DCB.

12.17.3 DCB Inputs

Select Inputs to start the input editing screen:

```
      Editing Inputs for Block:001
Input:FStart Type:Loop Device Inv:No
Any of L01D001..D001 State:Alarm
  InType     Edit     Invert      Exit
```

The Up/Down keys select the desired input for the block. DCB input functions are outlined in Section 8.11.1.

- the InType soft-key cycles the input type around all the available values.
- the Edit soft-key enables the cursor keys in order to change the parameters for the selected input type.
- the Invert soft-key toggles the state of the inversion flag for the selected input.

12.17.4 DCB Outputs

The block outputs are edited similar to the loop devices as described in Section 12.1.2:Outputs - Edit Outputs for the Selected Device. The only difference for the FCB is that each output has a defined function, as described in section 8.11.

The output is selected with the cursor keys, as for inputs.

12.17.5 DCB Descriptor

The descriptor is edited as for the loop device descriptor as described in Section 0: Table 12-2: Fields of the Device Edit function

Desc – Edit Descriptor:

12.17.6 DCB Flags

Selecting Flags allows the user to select the appropriate flags for the Fan Control Block. See section 8.11 for a description of the DCB flags and their meanings.

13. SYSTEM FEATURES

13.1 Fire Signalling Relay (Master Alarm)

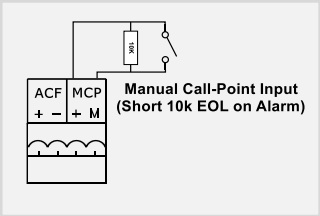
The FIRE relay is de-energised when the F220 is in the ‘Normal’ or non-Fire condition; it energises for the ‘Fire’ condition.

An F220 ‘Fire’ condition occurs when a device is in the ‘Alarm’ condition, the device has not been disabled, and when the device has ‘Brigade’ set in its configuration.

One set of change-over contacts is available via screw terminals. The contacts are rated 2.0A @ 30V (resistive load).

A second set of change-over contacts is available via IDC terminals. These terminals are available for use by brigade transmission devices (SGDs) together with contacts from the ‘Fault’ relay, ‘ATS Test’ and ‘ATS Disable’ relays. The contacts are rated 2.0A @ 30V (resistive).

13.2 MCP Input



An input is provided for a Manual Call-Point connection. This input is monitored with a 10kΩ resistor. The input is active when the input is short-circuited. This input is always latched, but may have the other standard activation flags as for loop devices (refer to Table 4-3). See Section 12.7.2 for programming details.

13.3 Fault Signalling Relay

This relay is energised when the F220 is in the ‘Normal’ condition i.e. there is no Fault, and is de-energised when a ‘Fault’ occurs.

An F220 ‘Fault’ condition occurs when:

- A fault exists in the fire alarm system (loop fault, low battery, missing detector, etc)
- The system microprocessor fails
- All power to the F220 is lost (battery and mains)

Refer to Section 15: F220 Keyboard-Display Messages for information on the types of Fault detected and displayed by the F220.

The system microprocessor periodically updates a ‘watchdog timer’. If the system microprocessor fails, the watchdog timer is no longer updated and times out, causing a ‘Fault’ condition.

When power to the F220 is lost, the Fault relay de-energises causing a ‘Fault’ condition.

One set of changeover contacts is available via screw terminals - the contacts are rated 2.0A @ 30V (resistive load).

A second set of changeover contacts is provided via an IDC terminal for use by brigade transmission devices along with contacts from the ‘Fire’ relay and ‘Battery Fault’ relay. The contacts are rated 2.0A @ 30Vdc (resistive).

13.4 Warning System Relay

A monitored relay contact**,** WARNING SYSTEM, is provided for connection to an external EWIS system (Early Warning Intercommunication System), internal bells, or building alarm sounders. The relay is normally-open, closing to activate the EWIS (or other) system. A 10kΩ end of line resistor monitors the integrity of the wiring. The relay can switch resistive loads up to 28V and is protected with a 3A blade fuse.

WARNING SYSTEM is activated when a device is in the alarm condition, the device has not been disabled, and that the device has ‘Warning System’ set in its configuration.

Operation of WARN SYS DISABLE de-activates the ‘Warning System’ relay.

Note:

Loop Relays and Apartment Modules, configured as ‘Sounder Relays’, are activated independently by loop input devices through the mapping system. SILENCE ALARMS also de-activates these relays

13.5 Disable Warning System (WARN SYS DISABLE)

This push-button disables the on-board relay, WARNING SYSTEM, and loop relays configured as ‘Warning System relays’ (WRN & WRNM types) by disabling operation of these relays. When the push-button LED is ON, the Warning System relays are disabled. WARN SYS DISABLE has a toggle function - alternate presses of the push-button correspondingly disable or enable use of the Warning System relays.

If WARN SYS DISABLE is left on for more than 7 hours, the internal buzzer activates. Press any push-button on the front panel to silence the internal sounder.

Activation of WARN SYSTEM ON over-rides WARN SYS DISABLE.

Operation of the Warning System Disable control located at mimic panels also disables the Warning System relays.

Note:

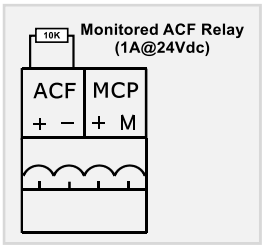
Some devices (such as amplifiers) may not be affected by WARN SYS DISABLE if there are no warning outputs (such as WARN SYS RELAY) configured.

13.6 External Bell Circuit.

The F220 provides one monitored External Bell circuit. The total Bell and Warning System load should not exceed the capacity of the power supply. These circuits are monitored and require a 10kΩ EOL resistor to give a system normal indication.

If the Bell circuit has an open-circuit, short-circuit or a partial short, a fault signal is generated and a fault message is shown on the Keyboard-Display - unless overwritten by a message with higher priority.

13.7 ACF Relay



The on-board relay, ACF RELAY, provides a monitored contact (10kΩ EOL resistor) for ancillary control purposes (e.g. air conditioning, lifts etc.). The relay is normally de-energised. The relay when activated provide a 28V DC output switched via a contact rated at 2.0A@ 30V (resistive). The relay is protected by a PTC resettable fuse.

ACF RELAY is activated when a device is in the alarm condition, the device has not been disabled, and the device has ‘ACF’ set in its configuration.

Operation of ‘ACF DISABLE’ de-activates the ACF RELAY and any loop relays configured as ‘ACF Relays’. Note that loop relays which are configured as ‘ACF Relays’, are activated independently through the mapping system.

13.8 Ancillary Control Facility Disable (ACF Disable)

The push-button ACF DISABLE is located on the front panel which is used to disable the Mainboard ACF relay and all loop relays configured as ‘ACF’. When the push-button LED is ON, the ACF relays are disabled; and when the LED is OFF, the ACF relays are enabled. This push button has a toggle function as alternate presses of ‘ACF DISABLE’ correspondingly enable or disable the ACF relays. All ACF relays are de-energised when the ‘Disable ACF’ function is active.

Note:

The F220 can interface to two Pertronic fan control systems:

- The AA Fan Control System which includes the Fan Control Unit (AAFCU) and associated Fan Control Relays (AAFCRLY), and
- The F120 Fan Control System which incorporates the F120 Fan Control Switch Unit (F120FCSU) and loop relay modules such as the M500DMR.

AA Fan Control Units and any ACF fan relays (including the M500DMR if configured as ACF) are, by default, disabled when the ‘ACF DISABLE’ front panel button is pushed. This option can be disabled by (Refer to Section 8.10.13)

- In FireUtils, unchecking the ‘ACF Disable Inhibit Fan Relays’ tick box in the Diagnostic section of the F220 Panel Editor, or
- In the Engineer Menu, navigating to the ACFFan and clicking on the soft-key Engineer Menu > General > Diags > More > ACFFan.

The FAULT Buzzer will sound when ACF DISABLE is on and this may be silenced by pressing SILENCE BUZZER.

13.9 O/P1, O/P2 Monitored Outputs

The on-board O/P1 and O/P2 relays provide monitored outputs (10kΩ EOL resistor) for ancillary control purposes (e.g. air conditioning, lifts etc.). The relays when activated provide a 28V DC output switched via a contact rated at 2.0A@ 30V (resistive).

The default operation of these outputs has them coupled to the operation of the FIRE and FAULT relays however they can be mapped to operate independently if this is required.

Note:

For independent operation the default coupling for each output must be turned OFF

see Section: 12.7.9.1

13.10 Door Holder Relay

The on-board relay, DOOR HOLDER, provides clean change-over contacts (rated 5A @ 24V) for Door Holder solenoid purposes. These contacts are not monitored.

DOOR HOLDER is activated when an initiating device (or timer, logic block…) becomes active and the 'Door Holder' configuration flag is set.

Operation of Door Holder Disable de-activates the on-board Door Holder relay.

Note:

1. Loop relays configured as Door Holder Relays must be activated independently through the mapping system. Door Holder Disable also de-activates these relays
2. For standards compliance the door holder output must be fitted with a monitoring device

13.11 Door Holder Disable

The push-button Door Holder Disable is located on the front panel and is used to disable the F220 Mainboard Door Holder Relay, and all Door Holder loop relays. When the push-button LED is ON, the Door Holders are disabled; and when the LED is OFF, the Door Holder relays are enabled. This push button has a toggle function as alternate presses Door Holder Disable correspondingly enable or disable the Door Holder relays. All Door Holder relays are de-energised when the 'Door Holder Disable' function is active.

13.12 Battery Fail Relay

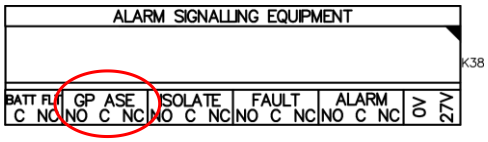
This relay de-energises when the battery voltage falls below 22.0Vdc or the battery is missing.

A set of clean contacts rated 2.0A @ 30V is provided.

13.13 General Purpose ASE Output

This relay provides a set of clean contacts rated 2.0A @ 30V and these are accessed via the "Alarm Signalling Equipment" connector K38.

Operation of this relay is configured using output mapping via device activations or system events.



13.14 Evacuation Test

The push-button labelled WARN SYSTEM ON, located on the front panel is provided to operate the External Bell and Warning System.

Operation of the WARN SYSTEM ON control located at mimic panels will also carry out the Evacuation Test function at the F220.

13.15 Device and Zone Disablement & Re-enablement

Refer to section 10.1: User Menu - Disablement menu (Option 1)

13.16 Buzzer (Internal Sounder)

The Buzzer is activated when any alarm or fault condition is active. The Buzzer will sound with the following cadences:

ALARM- Rapid ON / OFF

FAULT- ON continuous.

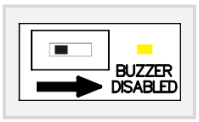
Pressing the SILENCE BUZZER key will silence the buzzer however it will re-sound if a new ALARM or FAULT condition is detected.

Terminals are provided on the Keyboard-Display for the connection of an external sounder see 13.27.

Note:

Buzzer on Fault can be globally enabled or disabled for networked panels in FireUtils or on individual panels by setting or resetting the DefBuzz flag. See Section 12.7.1: System Flags

13.17 Buzzer Disable



A “buzzer disable” switch is located on the rear of the Keyboard-Display PCB. Placing the switch in the disabled position will turn on the associated LED and cause a message “local buzzer disabled” to flash on the display

13.18 Regular Automatic Test

At specified times (refer to Section 12.11: Automatic Test Scheduling) the system automatically executes a system test. Both a loop sensor test and a battery test are performed.

Each loop sensor device is polled and tested for correct operation. Any problems are flagged as faults.

13.18.1 Power Supply Test

The charger/controller switches the power source so that the system is operating from the battery supply (secondary power source) for a period of 40 minutes. During this time the batteries will supply the systems quiescent load. The battery voltage must remain above 22.0Vdc otherwise a low battery error will result. If this error occurs, the appropriate Fault message is displayed on the LCD, and the Power Fault LED illuminates.

If an ‘Alarm’ or ‘Fault’ condition exists on the F220 before the commencement of the 24-Hour test, or occurs during the 24-Hour test, the test is aborted.

At the end of the test period the charger/controller re-connects the primary power source while at the same time disconnecting the secondary supply.

The battery charger is then turned on and the battery charged to restore its pre-test capacity.

13.19 PCB Master Reset Switch

The RESET push-button on the F220 PCB provides a software reset of the processor. This initialises and restarts the microprocessor, clears any latched ‘Fire’ conditions and energises the ‘Fault’ relay (‘Normal’ state).

Any faults generated during the start-up procedure are displayed, and a ‘Fault’ signal is transmitted by de-energising the FAULT relay.

13.20 Configuration Memory Lock

Refer to Section: 12.14.1 CfgLoad- Upload Panel configuration from USB drive.

When the Configuration Memory Lock switch (SW1) on the F220 Mainboard is in the ON position, writing configuration data to the memory of the F220 is disabled; when it is in the OFF position, configuration writing is enabled. The switch must be in the OFF position whenever changes are made to the configuration through the menu system, or via RS232 or Ethernet connections. Configuration via a Net2Card does not require memory lock switch enablement.

If access to the memory is attempted when the Configuration Memory Lock switch is in the ON position, the LCD displays

Please turn Memory Lock switch OFF

If an attempt is made to leave the Engineer's Menu when Configuration Memory Lock is OFF, a warning will be given on the LCD display:

Please turn Memory Lock switch ON

If the Configuration Memory Lock switch is OFF at any time outside the Engineer's Menu, a 'Memory Lock Switch Fault' will be displayed.

13.21 NCU Door Interlock

The F220 uses a microswitch to determine whether the panel door is open or closed. A 'Door Interlock' Fault signal is transmitted when the door is closed, if certain states are active or switches are 'Off-Normal'.

These states and switches will generate a DOOR INTERLOCK Fault		
Warning System Disable	Mains Lost	Configuration Memory Lock switch OFF
Walk Test	ACF Disable	Loops Resetting
Extender Board Reset	Door Holder Disable	Door Interlock Input
Mimic Door Open	Door Holder Isolate	Extender Board Reset

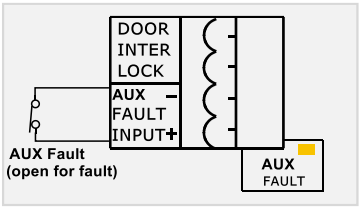
Table 13-1: Door Interlock Faults

The interlock messages remain on the display until the door is opened or the condition is cleared.

Note:

If the cabinet door of any Network Control Unit (NCU) is closed with the NCU's Silence Alarm, ATS Test, or Isolate active, a 'Door Interlock' fault will be generated

13.22 AUX Fault Input



This input can be connected to fault contacts of external equipment. In the normal condition the input terminals must be shorted, opening the connection will indicate an "External Fault" on the display and also turn ON the LED adjacent to the AUX FAULT INPUT connector.

13.23 Event Logs

The F220 maintains a 10000 general event log. All events that occur, including the ‘Door Open’, are stored in the event log with the time and date associated with the event. Other pertinent data such as loop number and address for a device Fault are also stored when applicable.

The F220 also has additional independent specialised logs for: Alarms (2000), Pre-alarms (500), Faults (500), Supervisory (500), Disablements (500), Disablement Activity (500), Active events (500) and System events (500).

For example: an event, such as a pre-alarm, will initially be stored in both the general log and the pre-alarms log. Over time, other events may push that pre-alarm event off the end of the general event log, but it will still be retained in the pre-alarms log (provided there has not been a large number of pre-alarm events).

For further details seeSection 10.2

13.24 Event Date and Time

A real-time clock maintains the F220 date and time. The date and time are updated using the ‘Clock’ option in the User Menu (see Section 11.2: Clock - Set System Time and Date)

13.25 Loop Driver Boards

Up to ten (10) 2-loop Loop Drivers can be connected to the F220, through the extender board bus (F220 Mainboard: K4 to Loop Driver: K3). Refer to Figure 20-6: .

For convenience, panel mounted loop devices may connect to the loops via IDC connectors (Extender board: K8 and K2) mounted adjacent to the screw terminal loop connectors (Extender board: K5 and K6) on the Loop Driver PCBs.

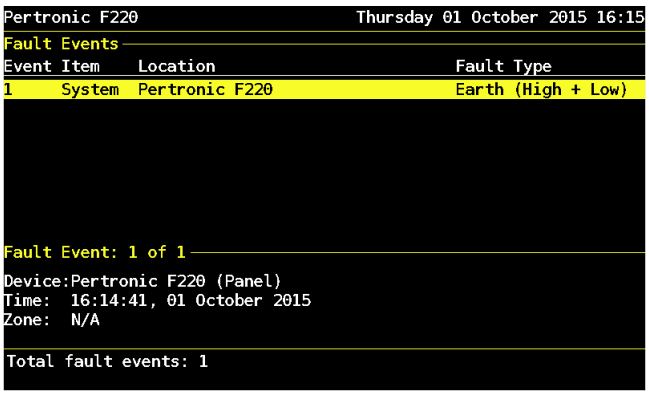
13.26 Earth Connection and Monitoring

13.26.1 Connections

It is important that a good Ground or Earth connection is made to the F220 for transient protection. Screw terminals are provided on the F220 PCB and F220 Loop Driver Boards for this purpose. These Earth terminals should be connected to the panel Earth, which in turn is connected to the Mains Earth.

13.26.2 Monitoring

If any component of the F220 (such as one of the loops) has a hard or partial short to Earth, Earth leakage detection circuitry on the F220 will detect that condition, transmit a Fault, write to the LCD display and turn on the Earth Fault LED on the Mainboard.



The Earth fault detection circuit also indicates whether the Earth detected is to a high or low level (or both, in the case of transients or communications activity on loops)

13.26.3 Earth Fault Indicator LED

A dedicated Earth Fault Indicator is provided on the F220 Mainboard.

Service personnel will find this useful when determining the location of a fault or faults that generate a large number of related fault messages.

Identify the faulty connection by removing connections one at a time and checking whether the Earth Fault indicator turns OFF.

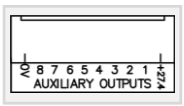
Note:

If there is more than one connection with earth defects then these can be identified by reconnecting circuits one at a time and observing if the Earth Defect Indicator turns ON.

13.27 External Sounder

Terminals are provided (Ext Buzz) on the Keyboard-Display for the connection of an external sounder. 24Vdc is provided at the (+) terminal, and the (-) terminal is pulled down to 0V, through an 820Ω resistor when the buzzer is active.

13.28 Auxiliary Outputs



Eight mappable auxiliary outputs are available for internal panel use. For convenience these outputs are available at two connector positions located at the centre and right hand edge of the F220 Mainboard.

Each output uses a current sink driver rated at 100 mA (8 drivers at 100% duty cycle)

14. POWER SUPPLIES

14.1 Power Sources (AS 7240.4)

Two power supply sources are provided for the F220 system: the primary power source and the secondary power source (battery).

The primary power source is derived from the AC mains and has sufficient capacity to supply the full Alarm Load, plus the battery charging requirement for the secondary supply.

During normal operation the F220 is supplied solely by DC from the mains power supply.

In the event of mains failure the secondary battery supply is connected by the Charger Controller.

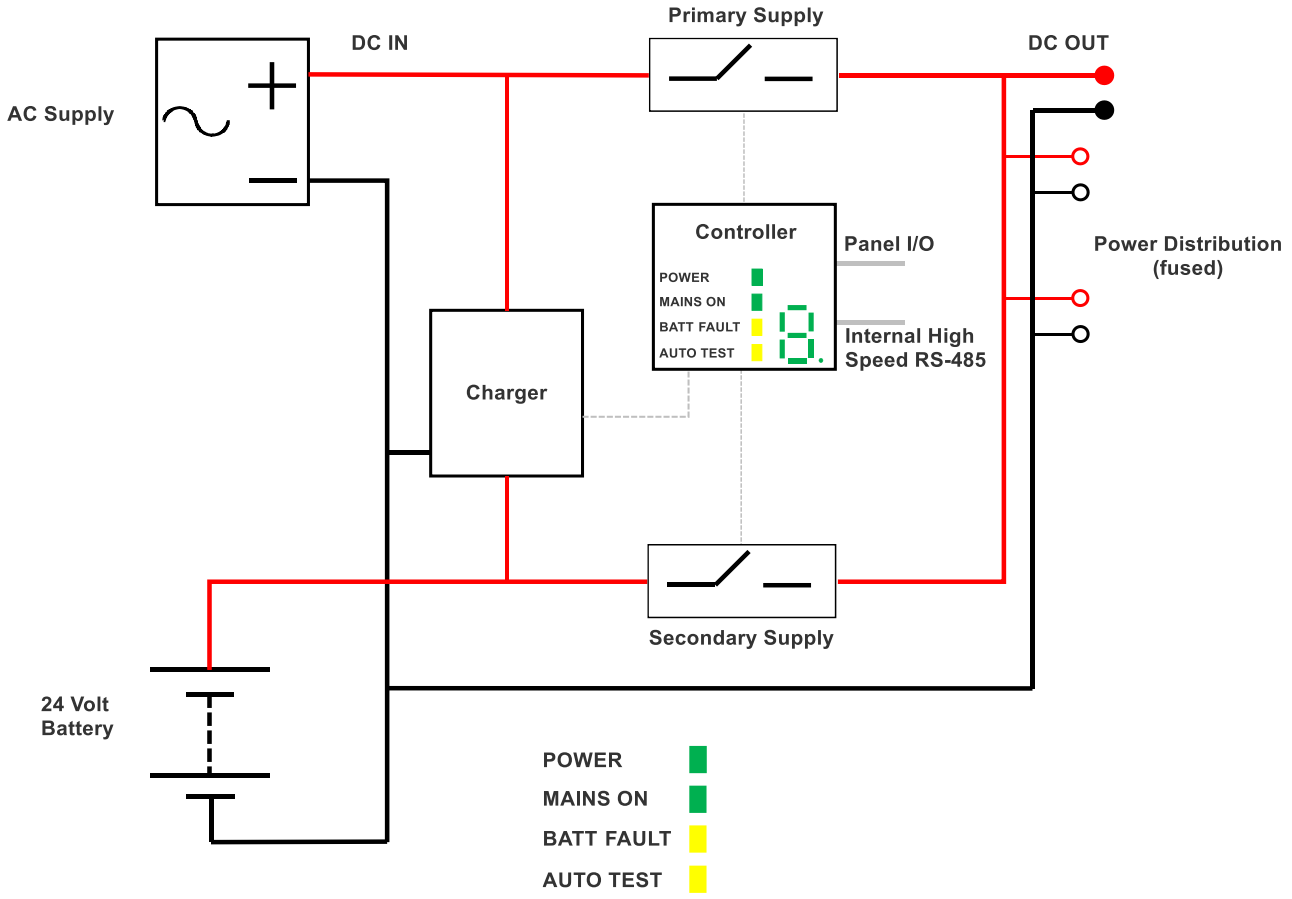


Figure 14-1: F220 Power Supply Overview

The choice of power supply and battery capacity depends on the system load. This depends on the number and type of optional extras, together with the number and type of external devices powered by the F220 fire alarm panel power supplies.

Pertronic Industries provides a web-based calculator for calculating the system load and battery capacity. This is available on-line at:

http://www.pertronic.com.au/resources/online-tools/battery-size-calculator/

The battery size calculator assumes the average battery operating temperature is between 15°C and 30°C, if the battery is operating outside this temperature range the battery compensation factor may need to be adjusted.

14.2 Primary Power Source Options

Three primary power source options are available for the F220 system; 5 Amp, 11 Amp and 22 Amp.

Primary Supply Option	Maximum System Load (full charging capability)	Maximum System Load (reduced charging capability)	Charging Output Current
5 Amp (Nominal)	2.7 Amp	4.5 Amp	2.1 Amp
11 Amp (Nominal)	8.25 Amp	10.5 Amp	2.1 Amp
22 Amp (Nominal)	15.5 Amp	21.5 Amp	5.2 Amp

Table 14-1: Primary Power Source Specifications

14.3 Secondary Power Source (Battery) Options

The Secondary Power Source consists of a series-connected pair of 12-volt sealed lead-acid batteries. Refer to Specifications (section 1.4) for information on available batteries.

Note:

It is important to select the correct battery capacity to ensure that the F220 functions properly in the absence of mains power, and to satisfy regulatory requirements.

System loading includes, among other considerations, devices on the analogue addressable loop, warning devices and devices on the RS-485 bus.

The formula for battery capacity is:

Ampere-hours required: $AH = 1.25[(24 \times I_Q) + F_C (0{\cdot}5 \times I_A)]$,

Where:

$\mathbf{I_Q}$ = quiescent current,
$\mathbf{I_A}$ = alarm current,
$\mathbf{F_C}$ = capacity de-rating factor (normally 2)
1.25 = compensation for end of life capacity.

Pertronic Industries provides a web-based calculator for calculating the system load and battery capacity. This is available on-line at:

http://www.pertronic.com.au/resources/online-tools/battery-size-calculator/

Note:

The maximum current drawn from the battery by the power supply unit when the Primary Power Source is disconnected is 15 mA

The battery is protected by a fuse on the F220 Power Distribution Board (see section 14.5).

14.4 Charger Controller

The Charger Controller is mounted on the primary (AC) power supply unit. The Charger Controller implements the following system functions:

1. Monitoring of Primary and Secondary supply status
2. Connecting and disconnecting Primary and Secondary supplies
3. Float charge voltage temperature compensation
4. Automatic Battery Capacity and Battery Presence tests

5. Displaying fault status on local display (see Table 14-6: Power Supply Fault Indication)
6. Operating external fault and timed power relays
7. Monitoring and reporting the following parameters to the F220 Mainboard:
    a. Input / Output DC Voltage
    b. Battery Voltage
    c. Charger Voltage
    d. Float Voltage
    e. Temperature
    f. Fault Status
    g. Charger Current
    h. Firmware Version

The Charger Controller must be correctly configured to power an F220 fire alarm panel. This unit has two operating modes: Panel mode, for powering a fire alarm panel; and Standalone mode, for use as a standalone battery charger and power supply. Refer to section 14.4.4 for configuration information.

In Panel mode, the Charger Controller communicates with the F220 Mainboard over the Internal High Speed RS-485 Bus (section 5.2).

14.4.1 Temperature, Voltage and Current Measurements

The following table shows the various power supply parameters that are measured and their sampling interval.

Parameter	Update Interval
Charge Current	Measured every 100ms. Updates the panel via the RS-485 bus with the averaged value every second.
Output Current	Measured every second. Updates the panel via the RS-485 bus with the averaged value every minute.
Battery Voltage	Measured and updated every minute after battery presence test.
Temperature	Measured every 10 minutes. Updates the panel via the RS-485 bus with the averaged value every hour.
Mains/Charge/Output Voltage	Measured every 100ms
Float Voltage	Calculated every 100ms based on the temperature measurement

Table 14-2: Temperature, current and voltage measurement intervals

14.4.2 Switch SW1 Operation

In Version 2.x **only,** the switch SW1 (Figure 20-2) operates in 2 modes.

- **Historic Defect Mode**.
  This mode is initiated when the switch is pressed for 1 to 2 seconds. The Charger Controller will cycle through all the historic defect states since power-up and display it on the 7-segment display (refer to Table 14-6). In this mode the decimal point on the display will flash rapidly (200ms On/Off). After 30 seconds the 7-segment display will come out of this mode. If there has been no historic defects since power-up, this mode will last for 5 seconds
- **Auto-test Mode**.
  Auto-test is only valid in the Standalone mode. In this mode, initiated when the switch is pressed for 3 to 5 seconds, the charger will either start or stop the 24 hour test. The decimal point on the 7-segment display will flash normally (500ms On/Off)

14.4.3 Charging Modes

Depending on the hardware version, the Charger Controller can operate in either two or three charging modes. Hardware version 1.x has 2 charging modes and version 2.x has three.

With version 1.X, when the charge current

- Is below 250mA for more than 10 seconds, the charger controller enters the 'Normal Charge' mode.
- Is greater than 500mA for more than 10 seconds, the charger controller enters the 'Boost Charge' mode. It leaves this mode when the charge current drops below 500mA for more than 60 seconds.

With version 2.X, when the charge current

- Is below 500mA for more than 60 seconds, the charge controller enters the 'Normal Charge' mode
- Is greater than 1A for for more than 60 seconds, the charge controller enters the 'Boost Charge' mode. It leaves, or exits, this mode when the charge current drops below 500mA for more than 60 seconds.

Hardware Version	Normal Charge Mode	Boost Charge Mode	
		Entering threshold	Exiting threshold
Version 1.x	Charge current < 250mA, for >10 secs	Charge current > 250mA, for >10 secs	Charge current < 250mA, for >10 secs
Version 2.x	Charge current < 500mA, for > 60 secs	Charge current > 1A, for > 60 secs	Charge current < 500mA, for > 60 secs

Table 14-3: Normal and Boost charging modes

14.4.3.1 Normal Charging Mode

In this mode:

- The float voltage is temperature compensated. Temperature readings are gathered from sensor every 10 minutes.
- The regular 'Battery Presence' check is performed 15 seconds after bootup, then once every 60 seconds during normal operation
- The 'Battery Capacity' check (or '24 hour test') is run once per day (in Standalone mode) or when initiated by the Panel (in Panel mode, see section 14.4.4).
- Actual battery voltage will be reported to the Panel (in panel mode).
- The decimal point on the Charger Controller 7 segment display will flash once a second.

14.4.3.2 Boost Charge Mode

In this mode:

- The float voltage is boosted to its maximum value (approximately 28 volts). There is no temperature compensation.
- The Charge Controller can operate in this mode for a maximum of 24 hours.
- The 'Battery Presence' check is suspended until the charger comes out of the 'Boost Charge' mode.
- The 'Battery Capacity' check.

In version 1.x, the first ‘Battery Capacity’ check after the controller enters the ‘Boost Charge’ mode is ignored, both in Panel and Standalone modes, but all successive test will be performed.
In version 2.x, in order to ensure that the batteries are charged for the entire ‘Boost Charge’ duration (max 48 hours), the controller will ignore all the ‘Battery Capacity’ checks. This occurs in both Panel and Standalone modes.

- After 48 hours, the charger controller will exit the ‘Boost Charge’ mode, even if the charge current is greater than the respective threshold limits. It must return to the ‘Normal Charge' mode before it can enter the ‘Boost Charge’ mode again.
- Battery voltage will be reported as equal to the charger voltage.
- The decimal point on the Charger Controller 7 segment display will be on continuously.

14.4.3.3 Trickle Charge Mode

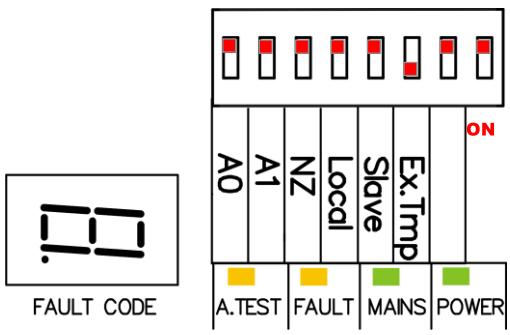
Note:
The ‘Trickle Charge’ mode is implement only in hardware versions 2.x

When the system current exceeds a particular threshold (refer to Table 14-4), the Charge Controller enters the ‘Trickle Charge’ mode. It exits this mode, and returns to the ‘Normal Charging’ mode, when the system current consistently drops below the threshold listed in Table 14-4 for over 60 seconds.

Product Variant	Entering Threshold (hardware controlled)	Exiting Threshold (software controlled)
5 Amp PSU (2.1 A Charger)	2.9 Amp	2.5 Amp, > 60 sec
11 Amp PSU (2.1A Charger)	8.5 Amp	7 Amp, > 60 sec
22 Amp PSU (5A Charger)	16 Amp	15 Amp, > 60sec

Table 14-4: Trickle charge entry and exit thresholds by product variant

14.4.4 Charger Controller Option Settings and Indicators



A DIP switch (SW2) is provided for configuring Charger Controller options.

SW2-1,	Not Used	Off	
SW2-2,	Not Used	Off	
SW2-3,	Ex. Tmp	On	To enable the external temperature sensor
SW2-4,	Master/ Repeater	Off	
SW2-5,	Panel/Local	Off	In Panel mode, or
		On	for Standalone mode
SW2-6,	NZ/NO	Off	
SW2-7,	A1	Off	
SW2-8,	A0	Off	

Figure 14-2: Charge Controller Settings and Indicators

Indicator	LED Details
A.TEST	Turns ON when ‘Battery Capacity’ test is operating
FAULT	Turns ON when a fault condition is present
MAINS	ON when mains is present
POWER	ON if Primary or Secondary power is available
FAULT CODE	7-segment display. Refer to Table 14-6 for details.

Table 14-5: Charge controller indicator

Note:

With Auxiliary or Standalone power supply systems the Mains, Fault, and A.Test LEDs are incorporated in the external panel.

14.4.5 External Temperature Sensor.

An external temperature sensor is connected to the Charger Controller and is supplied as standard with F220 systems.

The wiring provided will allow the sensor to be restrained against the batteries in the bottom of the cabinet—this ensures accurate representation of the battery temperature.

The Charger Controller is also fitted with an on-board temperature sensor. However, in almost all cases it is preferable to enable the external temperature sensor.

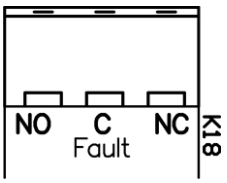
Note:

If the temperature sensor is disconnected from the controller, a fault will be generated. Either reconnect the temperature sensor or set the Ex.Tmp DIP switch to OFF to use the alternative on-board sensor.

14.4.6 External Fault Relay

This relay provides a set of changeover contacts that can be used to indicate a fault condition to external equipment.

The relay is energised in the normal state and released to indicate a fault.



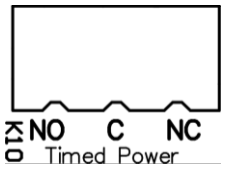
Note:

In Panel mode, the Fault Relay will only operate (ie. de-energise) if PSU fails completely (as per AS7240.2-2204). Complete PSU failure occurs when the output voltage drops below 19V. It is cleared when the output voltage is above 20V.

In Standalone mode, the Fault Relay will de-energise for all PSU related faults except DC Out (Refer to Table 14-6)

14.4.7 Timed Power Relay

This relay provides a set of changeover contacts rated at 5A @ 30V (resistive).



For charger controller firmware v1.04 and higher:

The relay is normally held in its energised state and released 30 seconds after mains power is missing. It is set back to its energised state when mains power is restored.

For charger controller firmware earlier than v1.04:

The relay will be energised 30 seconds after mains power is missing and release after mains power is restored.

A typical application is to use this relay to disconnect door-holder devices during a mains failure to extend c.i.e operation time from the secondary battery supply.

14.4.8 Power Supply Fault Indication

If a power supply fault occurs, the Power Fault LED turns ON immediately. For all faults a 'Fault' condition is also generated by the 'Fault' relay and remains active until the fault is rectified. The cause of the Fault is also shown on the Keyboard-Display.

Possible causes for power supply faults are shown in the following table:

Fault	LCD Message (Keyboard-Display)	Comments	Controller Code (Local 7 segment display)	Fault Relay De-energised	
				Standalone Mode	Panel Mode
Mains Lost	Mains Supply Fault	Occurs when input DC supply is less than 19.8 V. Clears when supply voltage is greater than 20.8 V and is stable for at least 1 second.	'1'	Y	N
Supply Low Voltage	Charger Low	Occurs when input DC supply falls below 25.2 V. Clears when supply voltage is 26.2 V or higher continuously for at least 1 second.	'2'	Y	N
Supply High Voltage	Charger High	Occurs when input DC supply is greater than 29.5 V. Clears when supply voltage falls below 28.5 V.	'3'	Y	N
Battery Missing	Battery Disconnected	Occurs when battery connected is less than 19 V or battery voltage falls below 19 V. Cleared when battery voltage is equal to 20V or higher. The first battery presence check is performed 15 seconds after boot up (giving the user sufficient time to connect the batteries) and subsequent battery presence checks are undertaken once every minute. Battery missing fault will be cleared within 10 seconds once the battery is	'b'	Y	N

Fault	LCD Message (Keyboard-Display)	Comments	Controller Code (Local 7 segment display)	Fault Relay De-energised	
				Standalone Mode	Panel Mode
		connected or the battery voltage is greater than 20 Volts.			
Battery Low	Battery Low	In normal operation, a battery low fault occurs when the mains supply is missing and battery voltage is between 20V and 22V. The fault is cleared when the battery voltage is 23 V or higher. During autotest (in both panel and standalone modes), a battery low fault will be indicated when the voltage drops below a threshold range of 19V and 0.9 x float voltage. When the battery voltage goes below 0.9 x float voltage, the auto test will be aborted and the battery low fault will be latched.	'L'	Y	N
Charger Fault	Charger Fault	In normal conditions, this fault occurs when charger voltage is below (0.9 x float voltage) or greater than 29.5V with mains supply present, where float voltage is based on current battery temperature. Charger fault clears when charger voltage is greater than (0.9 x float voltage) + 1V (AS7240.4 - 5.4d). In boost charge mode, this fault is indicated only when the charger voltage is greater than 29.5volts.	'5'	Y	N
External Temperature Sensor Missing	Temp Sensor	Occurs when there is a read error from external/internal temperature sensor. It is not limited to only the external temp sensor. It can also occur when the external temperature is missing or not connected	'6'	Y	N
DC Out Indication		Occurs when output DC voltage is below 24.4 V or higher than 29.0 V. This state will only be indicated on the PSU's 7-segment display. It is not a fault condition and will not activate the fault relay. Clears when output DC voltage is in the range 24.7 V – 28.7 V Will not occur during automatic 'Battery Capacity' test. Will not occur if the mains is missing.	'7'	N	N
Battery Charger Current High	Current High	**On PSU H/W version 1.x** Occurs when charger draws more than 4 Amps for 30 seconds. Clears when current drawn is below 4 Amps for 700 mSec. When the charger current increases more than 2 Amps for 5 seconds, the software reports a current high fault. **On PSU H/W verions 2.x** Except the threshold values across different product variants the logic to set/clear the fault remains the same. For	'8'	Y	N

Fault	LCD Message (Keyboard-Display)	Comments	Controller Code (Local 7 segment display)	Fault Relay De-energised	
				Standalone Mode	Panel Mode
		5A/11A variant: Charger high threshold is set to 3.5A For 22A variant, charger threshold is set to 6.5 A			
Charger Comms Lost	Comms Lost	Occurs when the communications between the panel and the charger board is lost for 10 seconds.	'9'	N/A	N
Charger Program CRC failure	Program CRC	Occurs when computed CRC value is not the same as the value stored in flash memory.	'C'	Y	N
Load Shutdown		Output DC voltage is cut off when mains supply is missing and battery voltage falls below 13.5 V. Clears when mains supply is turned on or battery voltage is 22V or greater.	'F'	Y	N
Auto Test		Not a fault. Just an indication on 7 segment display of charger controller. Occurs when charger controller goes for auto-test. This test is run for 40mins. The test will automatically abort if • Mains is disconnected (i.e. no mains) • Battery is disconnected (i.e. no battery) • Battery discharges to 0.9*float voltage (i.e it has reached battery low threshold).	'A'	N/A	N/A
Watchdog Reset		Occurs when the most recent reset of Charger Controller was due to watchdog failure	'd'	Y	N
Trickle Charge		**On PSU H/W version 2.x** Only indicated on 7-segment display and not present on 485 data output. PSU enters trickle charge mode when system current exceeds the thresholds list in Table 14-4).The PSU switches back into normal charging mode when system current falls below the thresholds listed in Table 14-4.	't'	N/A	N/A

Table 14-6: Power Supply Fault Indication

Note:

1. The decimal point of the 7-segment display will toggle every half second (500ms On, 500ms Off) in Normal Charge mode and be on, steadily, when the charger is in 'Boost Charge' mode.
2. In Panel Controlled mode, the fault relay will operate (de-energise) only in the case of complete PSU failure.
3. In Standalone Mode, the fault relay will de-energise for all PSU fault except 'DC Out'.

14.5 DC Power Distribution

Six fused outputs (K3-K8) are provided for connection of modules. If additional outlets are required then an additional fused distribution board can be connected to the DC out connector K2.

The Primary DC supply is connected to DC in (K1) and the Secondary battery supply to BATT (K9)—both of these inputs are fused for protection against overload or reversed connections.

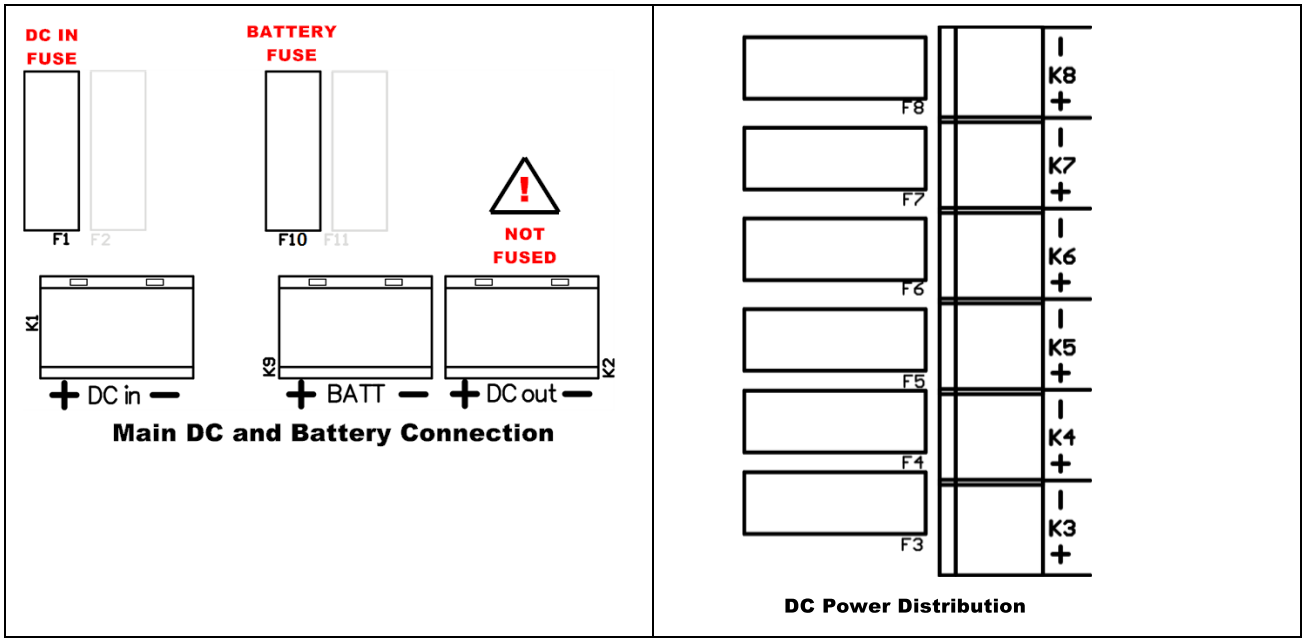


Figure 14-3: DC Power Distribution

14.6 Fuse Information

Fuse ID	Function	Model	Rating / Type	Replacement Part No
F1	DC IN	5A	15 Amp / Blade Fuse	FUBL15A
		11A	15 Amp / Blade Fuse	
		22A	25 Amp / Blade Fuse	FUBL25A
F2	BATT (Battery)	5A	15 Amp / Blade Fuse	FUBL15A
		11A	15 Amp / Blade Fuse	
		22A	25 Amp / Blade Fuse	FUBL25A
F3,F4	K3,K4 power distribution	5A	3 Amp / Blade Fuse	FUBL3A
		11A	3 Amp / Blade Fuse	
		22A	3 Amp / Blade Fuse	
F5	K5 power distribution	5A	3 Amp / Blade Fuse	FUBL3A
		11A	3 Amp / Blade Fuse	
		22A	5 Amp / Blade Fuse	FUBL5A
F6	K6 power distribution	5A	5 Amp / Blade Fuse	FUBL5A
		11A	5 Amp / Blade Fuse	
		22A	25 Amp / Blade Fuse	FUBL25A

F7	K7 power distribution	5A	10 Amp/Blade Fuse	FUBL10A
		11A	10 Amp/Blade Fuse	
		22A	10 Amp/Blade Fuse	
F8	K8 power distribution	5A	10 Amp/Blade Fuse	FUBL10A
		11A	10 Amp/Blade Fuse	
		22A	10 Amp/Blade Fuse	

Table 14-7: Power Supply Fuse ID and Ratings

14.7 Power Supply Standalone Operation.

This section is included for the standalone version of the F220 power supply. The standalone power supply may be used with an F220 or for powering system peripherals.

Standalone mode is set by setting DIP switch 5 (LOCAL) to ON (see section 14.4.4 Charger Controller Option Settings and Indicators).

The power supply standalone behaviour is the same as panel mode except no panel indications can be made and the battery capacity test will occur as described below.

The power supply will execute a battery capacity tests at 24-hour intervals, starting 23 hours after the last reset (or power up).

The power supply switches the power source so that the output is supplied from the battery supply (secondary power source) for a period of 40 minutes. The battery voltage must remain above 22.0Vdc otherwise a low battery error will result. If this error occurs the power supply fault relay will be de-energised and the fault LED will be lit. See section 14.4.4 Charger Controller Option Settings and Indicators.

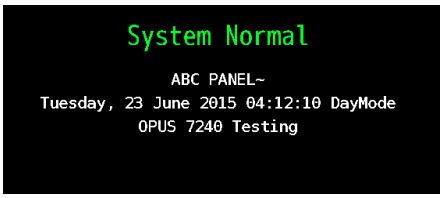
15. F220 KEYBOARD-DISPLAY MESSAGES

The LCD messages are of six main types - General Information, General Fault Warning, Device Alarm Warning, Start-Up dialogue, the User Menu dialogue, and the Engineer's Menu dialogue.

The sections below outline the LCD messages that may appear on the F220, either in the Current Event queue or from the Historical Event list as viewed from the User Menu.

15.1 General Information Messages

Normal operation - no 'Alarm's, 'Fault's, or other messages:



The following messages are informative only and are shown in the current event queue along with Fault events:

Message	Description
Walk Test ON ACF Disable ON Door Holder Disable ON	The specified button has been pressed. All of these conditions are common across all LCD mimics; pressing the button on any mimic will toggle the state, even if activated from another LCD display.
LED Mimic/WarnSys n Door LCD Mimic n Door	The door is open on the specified mimic panel. This will generate a Door Interlock Fault if the main panel door is closed.
Input Active	A loop device configured as input-only (no Bell or Brigade flags set) has activated. See Section 2.3.11

Table 15-1: LCD General Information Messages

15.2 Faults

These are faults detected on the F220 panel, other than those generated by loop devices and amplifiers.

Message	Description
Loop nn open	An open-circuit condition exists on the specified loop. Note that this may in fact be due to a line short between loop isolator devices which have activated to cause the loop to open.
Loop nn short	A short-circuit condition exists on the specified loop. This will be generated where the short occurs between the loop driver and the first isolator device on the loop.
Loops x+y FAILED!(Timeout)	The specified loops are offline, as the loop driver controlling them has failed to respond to commands sent by the Master.
Warn Sys Fault Ext Bell Fault	The specified Bell relay circuit is open or short-circuit.
ACF Monitor Fault	The ACF relay is open or short-circuited.
Earth Leakage Fault (msg)	The Earth monitor circuit has detected a connection to Mains Earth (see Section 13.26: Earth Connection and Monitoring). The value of "msg" is one of 'high', 'low' or 'high +low'

Message	Description
Program ROM CRC Check Failed	An error in the Program ROM area has been detected. This may indicate that panel operation will be unreliable.
Config ROM CRC Check Failed	An error in the Configuration ROM has been detected. The second line indicates the affected area. This may indicate that panel operation will be unreliable, but limited to the affected data only.
NAND Fault	An error in one of the two copies of the boot flash memory has been detected. The panel will still boot on one good copy.
Memory Lock Switch Fault	The Configuration Memory Lock switch is turned OFF, outside the Engineer's Menu.
External Fault Active	The EXT FLT input on the F220 Mainboard is open.
Door Interlock Fault	The main panel door has been closed with certain panel functions active (see Section 13.21: NCU Door Interlock).
{All Power Supply Fault indications}	See Section 14.4.8 Power Supply Fault Indication
LED Mimic/WarnSys n Timeout LCD Mimic n Timeout	The LCD/LED mimic (or Warning System amplifier) has not responded to commands sent by the F220 Mainboard.
LED Mimic/WarnSys n Extra LCD Mimic n Extra	There are more devices detected on the RS-485 mimic bus than are programmed into the configuration.
LED Mimic/WarnSys n Disp Fault	There is a fault in the LED mimic display board hardware.
LED Mimic/WarnSys n Interlock LCD Mimic n Interlock	The interlock circuitry on the relevant mimic is off-normal.
LED Mimic/WarnSys n Ext Fault	The External Fault input on the mimic is active
LED Mimic/WarnSys n Fault	Some fault condition other than the above has occurred on the mimic.
Main LCD Timeout	The primary LCD display board is not responding.
FanCtrl xxx FAULT - StartFail	A Fan Control Block has not detected its associated fan running (Status) signal in time after triggering its Start output.
FanCtrl xxx FAULT - StopFail	A Fan Control Block's associated fan running (Status) signal has remained active for too long after triggering its Stop output.
[COM PORT TIMEOUT] RS-485 FAILURE !!	Shown on various LCD displays or LCD mimics when there is lost communications from the Mainboard. These messages are generated on-board by the display hardware, as they are not receiving data from the panel.

Table 15-2: F220 Fault Messages

15.3 Amplifier Faults/Messages

These messages are reports detected, or generated by the F220 connected to an EA60 or EA120 Amplifier via the RS485 bus. For all of these faults the SNDR FAULT LED will turn ON. In all cases more information on the cause of the fault can be obtained by viewing the amplifier's LCD.

Message	Description
AM Fault	A generic amplifier fault. Check amplifier's LCD screen
AM Timeout	The amplifier is not responding to polls
AM Extra	An amplifier is responding that is not in the F220's configuration file
AM CRC Program	A checksum error in the amplifier's program firmware
AM CRC Config	A checksum error in the amplifier's configuration firmware
AM Watchdog	The amplifier has had a watchdog reset
AM Country	A country mismatch exists between the amplifier and panel
AM Disable	The amplifier has been isolated locally.The SOUNDER DISABLED LED will turn ON and 'Local Disable' displayed in the disable queue. The amplifier is re-enabled at the amplifier, not at the panel

Table 15-3: F220 Amplifier Fault Messages

15.4 Loop Device Events/Messages

Message	Description
ALARM	Applies to a loop input device – detector, Manual Call-Point, or input module; when the device activates. The alarm may be one of the following: Smoke Either an intelligent smoke detector or a conventional smoke detector activation from a Loop Responder input. Call-Point Either an MCP-type device or a Manual Call-Point activation from a Loop Responder circuit. Heat Thermal detector.
Fault	Generally, Faults can be decoded to one of the causes listed below, however for some events this is not possible.
Pre-Alarm	Applies to detectors only. The analogue value being returned is approaching the 'Alarm' level.
Duplicate Device	Two loop devices on the same loop have been assigned the same address.
Missing	A loop device that has been configured in the system memory is not present on the loop.
Extra Device	The loop driver board has detected one or more of: • Device(s) that don't exist in the panel configuration • Device(s) with loop address 000 (or 00 for modules) All detectors set to address 000 will have their LEDs turned on as though in alarm. Modules set to address 00 will not have their LEDs turned on.
Maintenance Alarm	The loop driver's internal drift compensation has reached its threshold limit - the detector requires cleaning.
Type Mismatch	A loop device does not match with the configuration assigned to it in the system memory.

Message	Description
Self-Test Fail	A loop device has failed its regular auto test.
DIS	A loop device has been disabled through the DISABLE push-button on the front panel display or the User Menu.
Alarm Reset	A loop device that was in 'Alarm' has been 'Reset' through the RESET push-button on the front panel display.
Low Fault	Generated by sensing chamber faults in System Sensor detectors
High Fault	Generated by sensing chamber faults in System Sensor detectors - this can mean that the chamber is too dirty for the detector's internal drift compensation algorithm to operate.
Short Circuit	A monitored relay has a short-circuit.
Open Circuit	Generated by open-circuits on either monitored loop relays or modules.
Board Reset	A Pertronic Loop Responder has restarted.
Supply Fault	There is either a 'Fault' in the detector supply on a Loop Responder, or the external power supply on a Pertronic Loop Relay board is out of range.
Isolator Active	The on-board isolator relay on a Pertronic Loop Responder or Relay has activated due to a short-circuit on the loop.
AVF Stage 1	A loop device with AVF enabled has been triggered once and is in the AVF delay period awaiting a second trigger.
Input Active	A loop device programmed with no output flags (i.e. one not generating an 'Alarm' event) has activated.
Fan Relay Latched	A Pertronic Fan Relay unit has been latched active by its associated Fan Controller unit.
Circuit Resetting	A Pertronic Loop Responder circuit is in its self-timed reset phase after receiving a reset command from the panel.
Comms Error	Indicates that there is a loop device present at the location, but the data has been corrupted and cannot be interpreted.
Manual OFF	A SW3 device has been switched off.
Manual ON	A SW3 device has been switched on.

Table 15-4: Messages Generated by Loop-Connected Analogue Addressable Devices

15.5 Network Messages

These are messages reported to the F220 from a connected network and are logged by the F220.

Each message will be prefixed by a network node number apart from the "SYSTEM OFFLINE" message.

Message	Description
SYSTEM OFFLINE Network Service Mode	The network the F220 is connected to has been put into "Service Mode". Network Service Mode is used for updating configurations for all nodes and all panels across the network from a single location. In network service mode, the network does not transfer normal operational information from panels so therefore no normal network functions are available. Each panel in the network will remain in service and operate independently, but the panels will not be able to send fire indications or fault indications over the network. F220 panels and mimics treat Network Service Mode as a System Event. Normal keyboard and display functions remain available (by pressing the keyboard buttons such as "ok" or "menu").

Message	Description
Node X Node Config Mismatch Fault	The connected network card configuration does not match that stored by the other network cards. This fault will be reported identically on all panels within the scope of the connected network card. The fault location will identify the network card (node) with the configuration mismatch.
Node X Panel Config Mismatch Fault	The panel configuration does not match that stored by the connected network card. This fault will be reported identically on all panels within the scope of the connected network card. The fault location will identify the panel with the configuration mismatch.
Node X Timeout Fault	Network Card X is not responding
Node X Earth Fault	Network Card X has detected an earth fault condition.
Node X Net In TImeout Fault	Network Card X has reported the loss of network data at the IN connection
Node X Net Out TImeout Fault	Network Card X has reported the loss of network data at the OUT connection
Node X Panel Comms Errors	Network Card X has communications errors with its connected panel
Node X UBoot CRC Fault	Network Card X has detected a critical file which has been corrupted
Node X Aux Fault I/P Fault	Network Card X has an active Aux Fault input
Node X Timezone Mismatch Fault	There are differences between panels configured timezone settings
Node X Net Disabled Fault	Network Card X is connected to a panel which has not had networking enabled in its configuration

Table 15-5: F220 Panel Network Messages

16. DETECTORS AND MODULES

16.1 Alarm Sensitivity Levels

For each detector, the loop driver has an ‘Alarm Level’ (AL), which represents the PW4 level that must be reached before the detector is recognised as being in Alarm. Each ‘AL’ corresponds to a sensitivity level set within the Loop Driver.

The Photo, Ion, and Heat detectors have PW4 levels that vary as the sensor level varies. The Loop Driver can therefore use any value to set as an ‘Alarm Level’. Pertronic use this feature to provide a number of sensitivity levels as defined in Table 16-1: Detector Sensitivity Table).

The Laser, Acclimate and Beam have fixed ‘Alarm’ levels specified by System Sensor – refer to Table 16-1: Detector Sensitivity Table)

16.2 Pre-Alarm Sensitivity Levels

Each Detector also has a Pre-Alarm Level. For the Ion, Heat, and Photo detectors, this is calculated as 67% of the difference between the nominal ‘Clean-Air’ value and the ‘Alarm Level’.

For the Laser and Acclimate, the Pre-Alarm is calculated as the ‘Alarm Level’ Number minus one. (i.e. if Alarm Level 8 is the ‘Alarm’ level, then the Pre-Alarm level is Alarm Level 7).

There is no Pre-Alarm level for Alarm Level 1 as there is no higher sensitivity.

16.3 Maintenance Level

All detectors, whether Drift Compensated or not, arrive at a point where the chamber becomes so dirty that there is a significant increase in detector sensitivity. Before this state is reached, a ‘Maintenance Alarm’ event is generated.

Detectors with internal Drift Compensation generate a maintenance signal internally, but for Photo, Ion, and Beam detectors, the Loop Driver tracks the PW4 value to determine if it has drifted from the normal operating range.

Smoke detector PW4 values are sampled and averaged over time to calculate the ‘Clean-Air’ (CA) value and determine whether a ‘Maintenance Alarm’ exists. The CA value represents the long-term baseline detector level under ‘Normal’ conditions. The CA level slowly tracks the PW4 value of the detector, so is immune to any transient conditions affecting the device. CA is averaged and adjusted every 24 hours.

At Loop Driver start-up, or after a missing detector condition has been restored, the CA value assumes the value of PW4 after the detector has reached a stable level - 60s after detector power-up.

Laser, Acclimate and COPTIR detectors have internal drift compensation. This provides a steady PW4 level, even when the detector is nearing its compensation limit. When the PW4 value exceeds its drift limit, the detector abruptly changes its PW4 value to a predetermined level to indicate that maintenance is required. This method has the disadvantage that the service agent does not know how dirty a detector is by looking at its PW value. There is no method for predicting when a detector will fail.

Heat Detectors do not have a maintenance level, as their PW4 can drift beyond the ‘Normal’ range due to normal ambient temperature fluctuations.

16.4 Low Fault Signal

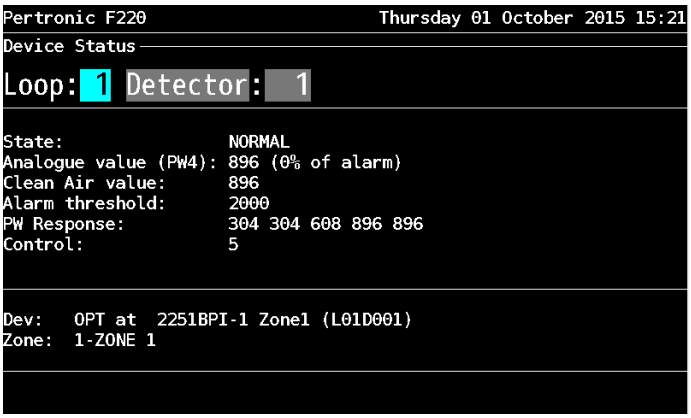
PW4 may drift below the ‘Normal’ operating range raising a ‘Low Fault’ when it drops below 10% of the ‘Normal’ range. This is not a maintenance fault, as a low PW4 usually signifies a faulty, not a dirty detector.

16.5 Selecting Detectors for Maintenance

Selecting the detectors to clean depends upon a number of factors:

a. the sensitivity at which a particular detector is configured – the higher the sensitivity, the lower the Alarm level and the sooner and more often the detector must be cleaned
b. the 'Clean Air' value of the detector as measured by the F220– the higher the CA value, the sooner the detector should be cleaned
c. the relative 'cleanliness' of the area in which the detector is installed – the 'dirtier' the area, the sooner and more often the detector must be cleaned

From the F220 User menu select Option 4 (Also see section 10.4)



Analogue value (PW4): 896 - the 'live' value returned by the photo detector
Clean Air Value : 896 - the mean 'Clean-Air' value calculated during the preceding 24 hour period
Alarm threshold : 2000 - the value which is required to activate the detector into 'Alarm'.

The 'Maintenance' level of a detector with AL=2000 (Sensitivity = 0) is 1328 – refer to: Table 16-1: Detector Sensitivity Table

.

Sensitivity	AL	CA	Maintenance	Contamination
0	2000	1200	1328	75.8%
-1	2192	1200	1424	64.1%
-2	2496	1200	1568	52.1%

As a rule, clean all detectors whose 'Clean-Air' value is greater than 1200

16.6 Detector Sensitivity Table

Table 16-1 provides a guide to the detector sensitivity configured and the actual level required to generate an 'Alarm'.

TYPE	LEVEL	NORMAL	LOW DEFECT	MAINT-ENANCE	PRE-ALARM (for CA = 800)	ALARM		
		PW4 (µs)	PW4 (µs)	PW4 (µs)	PW4 (µs)	PW4 (µs)	Obscuration/ Temperature	
							%/ft	%/m
Photo (2251BPI)	+1	528 - 976	<480	≥1168	>1328	≥1600	1.45%/ft	4.68%/m
	0			≥1328	>1600	≥2000	2.15/ft	6.88%/m
	-1			≥1424	>1728	≥2192	2.5%/ft	7.97%/m
	-2			≥1568	>1936	≥2496	3.0%/ft	9.51%/m
Ion (1251BPI)	+1	688 - 1184	<480	≥1296	>1456	≥1792		
	0			≥1392	>1600	≥2000		
	-1			≥1472	>1696	≥2144		

	-2			≥1536	>1792	≥2288	
	-3			≥1648	>1936	≥2496	
Thermal: Fixed (5251BPI)	+1	832 - 1408 (10 - 35°C)	<400	none	>1600 (40°C)	≥1888	53°C
	0				>1832 (50°C)	≥2000	57°C
	-1				>2192 (65°C)	≥2448	75°C
	-2				>2464 (75°C)	≥2640	83°C
Thermal: ROR (5251RBPI)	+1	>832 - 1408 (10 - 35°C)	<400	none	>1600 (40°C)	≥1888	53°C
	0				>1832 (50°C)	≥2000	57°C
	-1				>2192 (65°C)	≥2448	75°C
	-2				>2464 (75°C)	≥2640	83°C
5551/5551R	ONLY USE Sensitivity = 0						
- Slow ROR	- these temperatures represent the operating temperature if the Rate of Rise (ROR) of heat is slow						
- Fast ROR	- if the Rate of Rise (ROR) of heat is fast, the effective operating temperature may be lower						
Beam 6500S/6200	-1	720 - 1423	≤480	≥1424	NA	≥2192	Detector can be set for 25% to 50% obscuration.
Acclimate [2] (2251TMBPI)	+1	752 - 848	≤192	240 - 352	NA	≥1280	1%/ft 3.2%/m
	0 [1]				>1280	≥1648	1 - 2%/ft 3.2 – 6.4%/m
	-1				>1648	≥1968	2%/ft 6.4%/m
	-2 [1]				>1968	≥2400	2 – 3.5%/ft 6.4 – 11.0%/m
	-3				>2400	≥2784	3.5%/ft 11.0%/m
	-4					≥3200	63°C [3]
COPTIR (2251CTLE) PTIR (2251TLE)	+1	760 - 840	≤192	240 – 352	NA	≥1280	1%/ft 3.2%/m
	0				>1280	≥1648	2%/ft 6.4%/m
	-1				>1648	≥1968	3%/ft 9.5%/m
	-2				>1968	≥2400	3%/ft 9.5%/m
	-3 (COPTIR)				>2400	≥2784	4%/ft 12.5%/m
	-3 (PTIR)				>2400	≥2784	3%/ft 9.5%/m
	-4					≥3200	60°C [3]
Laser [2] Pinnacle (7251)	+3	864 - 928	≤192	240 - 688	NA	≥1280	.02%/ft 0.066%/m
	+2				>1280	≥1440	.03%/ft 0.098%/m
	+1				>1440	≥1728	.05%/ft 0.164%/m
	0				>1728	≥1840	.10%/ft 0.328%/m
	-1				>1840	≥2046	.20%/ft 0.665%/m
	-2				>2046	≥2288	.50%/ft 1.631%/m
	-3				>2288	≥2512	1.0%/ft 3.244%/m
	-4				>2512	≥2640	1.5%/ft 4.838%/m
	-5				>2640	≥2928	2.0%/ft 6.413%/m
FAAST [2] (8251BPI)	+1	752 - 848	≤150	NA	NA	≥1280	Alert [4]
	0				NA	≥1648	Action 1 [4]
	-1				NA	≥1968	Action 2 [4]
	-2				NA	≥2400	Fire 1 [4]
	-3				NA	≥2784	Fire 2 [4]

Table 16-1: Detector Sensitivity Table

Note:

1. The actual sensitivity of the Acclimate detector at levels 0 and -2 is determined by the internal algorithms of the detector itself. In “noisy” environments the actual sensitivity decreases towards the lower sensitivity in the range (higher %/m value), and in “quiet” environments the higher sensitivity (lower %/m) is used

2. For the intelligent detectors (Acclimate, Pinnacle & FAAST), the detector outputs a set of fixed, discrete levels for each sensitivity setting. Pre-alarm condition is determined by looking for an active level at the next-highest setting

   There is no Pre-Alarm warning available on the highest sensitivity level, therefore it is recommended that detectors are not ‘Brigade Calling’ at the highest sensitivity level

3. At the lowest sensitivity (-4), the Acclimate, COPTIR and PTIR are Heat only detectors

4. See 16.8 below

16.7 COPTIR/PTIR Sensitivity Table

The COPTIR is a multi-criteria detector comprising Carbon Monoxide (CO), photoelectric, heat and infra-red sensors which function as a single unit. Advanced algorithms provide a detector, which can be configured using different sensitivity settings to quickly respond to actual fires but have high immunity to nuisance alarms within different environments.

The PTIR is also a multi-criteria detector, similar to the COPTIR except for omission of the CO cell and actual smoke sensitivities.

Table 16-2 summarises the principal properties of the COPTIR and PTIR at the 6 available sensitivity settings.

	Sensitivity	Photoelectric Sensitivity	CO**	Photo Delay	False Alarm Resistance
COPTIR (2251CTLE)	+1	High	>45ppm	None	Low
	0	Medium		None	Medium
	-1	Low		None	Standard
	-2	Low		Up to 10 min	High
	-3	Low		Up to 10 min	Very High
	-4	Heat Only			Very High
PTIR (2251TLE)	+1	High		None	Low
	0	Medium		None	Medium
	-1	Low		Up to 45s	Standard
	-2	Low		45s to 90s	High
	-3	Low		> 90s	Very High
	-4	Heat Only			Very High

Table 16-2: COPTIR/PTIR Properties

Note:

The following Pertronic smoke detectors comply with the Band 1 response threshold of between 1.3%/m (0.05 dB/m) and 6.68%/m (0.3 dB/m) as per AS1670.1:2018 clause 3.27.1.

- 2251BPI and PTIR (2251TLE) detectors. F220 sensitivity setting at +1 or 0
- Acclimate detectors (2251TMBPI). F220 sensitivity settings at +1, 0 and -1

16.8 FAAST Sensitivities

The FAAST has 5 named alarm threshold values that are locally assigned to the device via the PipeIQ configuration software as follows:

Alarm Level	Default Threshold %/ft	Programmable Range %/ft	Default Threshold %/m	Programmable Range %/m
Alert	0.012	0.00046 – 6.25	0.0396	0.0015 – 20.5
Action1	0.050	0.00046 – 6.25	0.165	0.0015 – 20.5
Action2	0.100	0.00046 – 6.25	0.33	0.0015 – 20.5
Fire1	0.250	0.00046 – 6.25	0.825	0.0015 – 20.5
Fire2	0.500	0.00046 – 6.25	1.65	0.0015 – 20.5

Table 16-3: FAAST Sensitivities

When disabled at the Panel or at the FAAST's local control panel, the FAAST PW4 value changes to a value between 150 and 300µs. This is indicated on the Keyboard-Display as a "Disabled" state if disabled at the panel or "Local Disabled" if disabled at the device.

16.9 Actuating Devices

A list of addressable devices that may be connected to the F220:

System Sensor 1251BPI AA Ionisation Smoke Detector.

System Sensor 2251BPI AA Photoelectric Smoke Detector.

System Sensor 2251TMBPI AA Acclimate™ Smoke/Heat Detector.

System Sensor 22051TLE-34-IV AA PTIR™ Photo Smoke, Heat, CO and IR Detector.

System Sensor 2251CTLE-34-IV AA COPTIR™ Photo Smoke, Heat, CO and IR Detector.

System Sensor 5251BPI AA Fixed Temperature Heat Detector.

System Sensor 5251RBPI Analogue Addressable Rate-of-Rise Heat Detector.

System Sensor 5251B-WP Weatherproof AA Fixed Temperature Heat Detector.

System Sensor 5251RBPI-WP Weatherproof AA Fixed Temperature Heat Detector.

System Sensor 7251 AA Pinnacle™ Laser Detector.

System Sensor 7351 AA Pinnacle™ Laser Detector.

System Sensor 6500RS Intelligent Reflected Beam Detector.

System Sensor 7251BPI FAAST Aspirated Smoke Detector.

System Sensor 8251BPI FAAST Aspirated Smoke Detector.

System Sensor 9251BPI FAAST Aspirated Smoke Detector.

System Sensor FL2011EI FAAST Aspirated Smoke Detector, Single Channel Single Sensor.

System Sensor FL2012EI FAAST Aspirated Smoke Detector, Single Channel Dual Sensor.

System Sensor FL2022EI FAAST Aspirated Smoke Detector, Dual Channel Dual Sensor.

System Sensor M210E-CZR AA Conventional Zone Interface.

System Sensor M500M AA Monitor Module.

System Sensor M220E Dual Input Module.

System Sensor M221E Dual Input, Single Output Module.

System Sensor M501M AA Monitor Module (Miniature).

System Sensor M500DMR AA Dual Input, dual Output Module.

System Sensor IM-10 Ten-Way Input Module.

Pertronic AAMCPT AA Callpoint Module.

Pertronic AAMCP-TWP-MK2 AA Callpoint Module.

Pertronic AAMCPT-E AA 'Euro' style Callpoint Module.

Pertronic AALR-MF Multifunction AA Loop Responder 8-Circuit, 1-Relay.

Pertronic AM-3 & AMH-3 Apartment Modules.

16.10 System Modules

System Sensor M500S Single Supervised Output Module.

System Sensor M500R Single Non-Supervised Output Module.

System Sensor M500X Zone Isolator Module.

System Sensor B524IEFT-1 Isolator/Detector Base.

System Sensor BSO-DD-N34 Intelligent Base Sounder.

System Sensor M201E-240 Mains Switching Output module.

System Sensor M221E Dual Input, Single Output Module.

System Sensor 500DMR Dual Input / Output Module.

Pertronic AALREL Addressable 4-Way Loop Relay Board.

Pertronic AAFCU Fan Control Module.

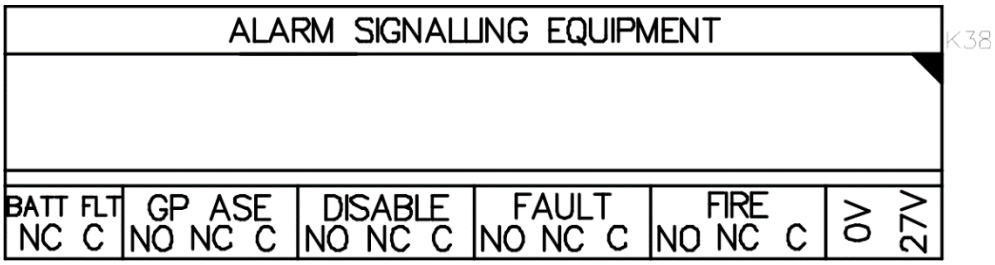
Pertronic AAFFCRLY Fan Control Relay Module.

17. CONNECTING ALARM & FAULT ROUTING EQUIPMENT

The **Alarm Signalling Equipment** connector K38 provides a single point where input signals are available for connection of Alarm and Fault routing equipment located within the c.i.e. cabinet.

If external monitored Alarm and Fault connections are required then the monitored outputs O/P1, O/P2 can be used if their operation is mapped to the FIRE and FAULT relays—see 12.7.9.1 for configuration.

These signals can be accessed by the connector on the back of the ASE panel.



17.1 General Purpose ASE Relay (GP ASE)

The General Purpose ASE Relay is available to assist with connections to various alarm signaling equipment. The physical connection to the relay is via K38 “Alarm Signaling Equipment”.

This relay is operated by mapping from System Events, Logic Blocks, Timers etc.

17.2 F220 AUX Relay Board

The F220 Aux Relay Board is mounted in front of the F220 Mainboard and provides four relays with single non-monitored contact outputs. These relays operate by direct connection to the O/P1, O/P2, ACF and Warning System outputs on the F220 Mainboard.

In addition connection terminals are available for wiring to Alarm Signalling Equipment.

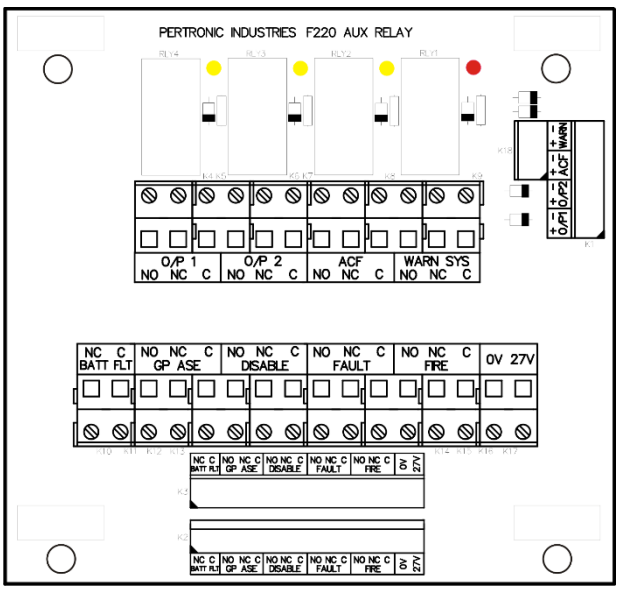


Figure 17-1: AUX Relay Board overlay

Connector assignments are as follows –

Connector	Connects to:
K2	F220 Mainboard K38
K3	Provides alternative connection for ASE
K18	F220 Mainboard K37

Table 17-1: AUX Relay Connectors

18. INSTALLATION INSTRUCTIONS

Installation of the F220 must be performed by suitably qualified personnel.

The following instructions are a guide to the successful installation and commissioning of an F220 Fire Alarm system.

18.1 Pre-Installation Check

Before opening the F220 system packaging, inspect the packaging for external damage.

Remove the F220 from its packaging and inspect the cabinet for external damage.

Check that the cabinet key is attached to the top of the cabinet.

Open the cabinet and visually check that all circuit boards and other components such as the Mains transformer and cabling are firmly in place.

Check that all fuses on the F220 Mainboard, the power supply and other auxiliary PCBs (where applicable) are in place, and have the correct value.

18.2 Panel Installation and Power Connection

Install the cabinet to its assigned position and height as required by the relevant installation standards.

The fixings used must be of sufficient strength to reliably carry the weight of the cabinet and its contents. The fixings must also use the existing cabinet mounting holes.

If drilling is required, such as for mounting on a concrete wall, then the cabinet can be put in place and the mounting hole locations marked on the wall from inside the cabinet. Remove the cabinet for drilling so that no drilling debris or swarf enters the cabinet.

Mount the cabinet and ensure that the F220 is clean internally and that no residual contamination, such as metal filings, is present.

Ensure that all monitored outputs requiring an EOL resistor, are correctly terminated at the panel. (It is assumed that the external loop and other external site wiring have been installed, but not connected to the F220 at this point).

Ensure that all external inductive loads, such as relays, magnetic door holders etc. are fitted with suitable diodes across the inductive load to reduce the effect of back-EMF which can cause damage and/or malfunction of the equipment. The diode should always be fitted at the inductive load end and not at the drive end of the circuit. Pertronic equipment is always supplied with back-EMF diodes already fitted.

Ensure that a detailed plan and address assignment table is available for each loop.

Remove the knockout panels as required for the external wiring and fit suitable wiring protection, such as conduit, cable glands or grommet edging.

Before connecting the external loops and other external wiring, install the mains power (240 Vac ±10%) - do NOT connect the batteries.

Check that the system is correctly Earthed.

Apply the Mains power to the system, and observe that the F220 goes through its initialisation phase - this takes about 30 seconds. Faults will be detected (such as loop faults and battery missing), but ignore these at this stage.

Connect the batteries and reset the system with the RESET pushbutton on the F220 Mainboard

CAUTION:	**RISK OF EXPLOSION IF BATTERY IS REPLACED BY AN INCORRECT TYPE.** **DISPOSE OF USED BATTERIES ACCORDING TO THE LOCAL REGULATIONS.**

18.3 Cable Requirement

All cabling for the Pertronic F220 shall comply with AS3000 (Australian Wiring Rules) and AS1670.1 (Fire Detection), together with relevant project requirements and local codes or regulations.

The mains circuit supplying power to the F220 panel shall be supplied from a circuit breaker with a rated capacity no greater than 16 Amps.

18.4 Analogue Addressable Loop Cabling

Analogue addressable loops must be configured according to Section 4 of this Technical Manual.

Pertronic Industries recommend that loop cabling should be tested with the Pertronic Loop Cable Tester (LOOPTEST-KIT-A) before connecting the loops to the F220 Fire Alarm Control Panel.

Note:

The maximum allowable loop cable resistance is 50 Ω. A comprehensive loop length calculator is available on the Pertronic Industries Pty Limited website www.Pertronic.com.au This can be used to confirm that installations are not exceeding maximum limits.

18.5 Loop Device Configuration

Configuration of the loop devices may be performed manually through the keyboard on the Keyboard-Display (see Section: 12 Operating the Engineer's Menu (Classic LCD MODE)), or by using FireUtils and uploading the configuration data from a file on a USB stick (see Section 7 Firmware uploads, and Section:12.14 USB Utilities Menu) or from the PC through an RS-232 connection (see Section: 6.1 RS-232 Port or Ethernet port (see Section: 6.3 Ethernet Port).

Note:

While it is possible to perform all tasks using the Keyboard-Display, it is highly recommended that the FireUtils configuration tool is used for such tasks and that changes using the Keyboard-Display be limited to very minor configuration changes.

Connect Loop 1, and either Learn (see Section 12.6: Learn - Auto Learn Function), or manually enter the detector, module and relay configuration data through the Engineer's Menu, such that each device on Loop 1 has been configured (when using a PC, just load the data for Loop 1).

Deal with any Faults - for loop or device Faults, investigate the source of the Fault (for example, wrong configuration data, duplicate addressing, etc.), and correct the Fault. For other (system) Faults, locate and deal with these before proceeding.

When Loop 1 has been configured correctly, and no other Faults are present, connect Loop 2 to the F220 and repeat the configuration and test process.

Repeat this for other loops as applicable.

18.6 Other External Devices

When the loops have been successfully configured and tested, connect and test the sounders connected to relays WARNING SYSTEM and EXTERNAL BELL.

Connect and test the devices controlled by ACF.

Test the operation of the loop relays.

Connect and test any other devices that are a requirement of the system.

Test the system as a complete functional unit, testing all input and output devices.

19. MONTHLY TESTING & MAINTENANCE

All testing and maintenance on F220 Fire Alarm systems shall be carried out by suitably trained and qualified personnel in accordance with the requirements of relevant Australian Standards.

Pertronic Industries recommend that the following tests should be carried out once per month.

(a) Open the Fire Alarm control unit cabinet, then operate the appropriate switches to disable the transmitter and disable the bells.

(b) Check that the voltage across the two 12V sealed lead acid batteries is in the range 27.3 to 27.5Vdc. Note that the float voltage is temperature compensated.

(c) Run Auto Test to check the addressable detectors.

(d) Test all alerting devices and indicators for correct operation. Refer to the particular detector information to determine how to test activate a detector.

(e) Check fault screen and fault log and take appropriate remedial action.

(f) After completing tests, enter all results into the system logbook.

(g) Ensure that the system is fully reset to ‘Normal’ and restore the isolation buttons and/or switches to ‘Normal’ before closing and locking the cabinet door.

20. DIAGRAMS

20.1 F220 Mainboard PCB Layout

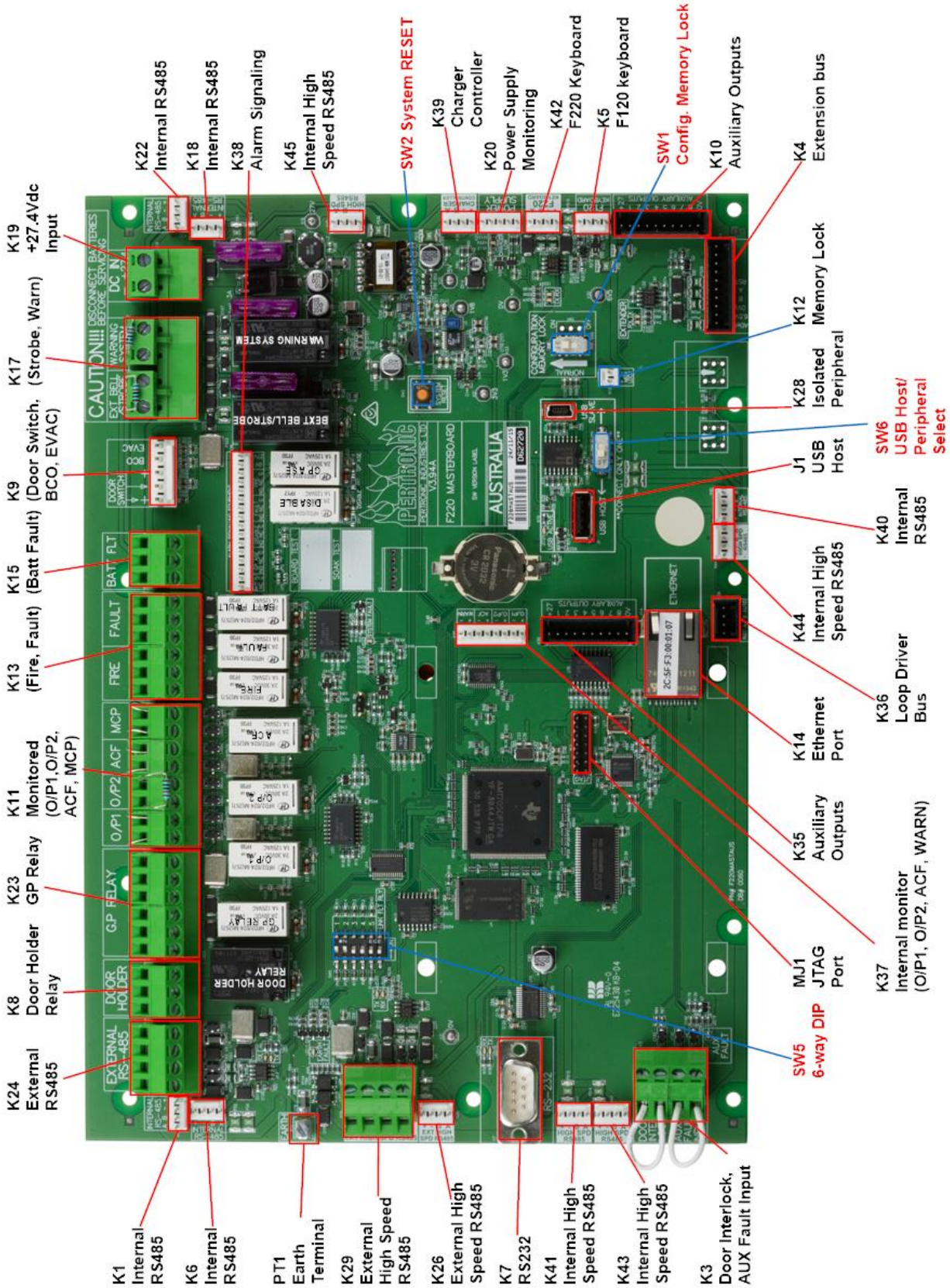


Figure 20-1: F220 Mainboard PCB Layout

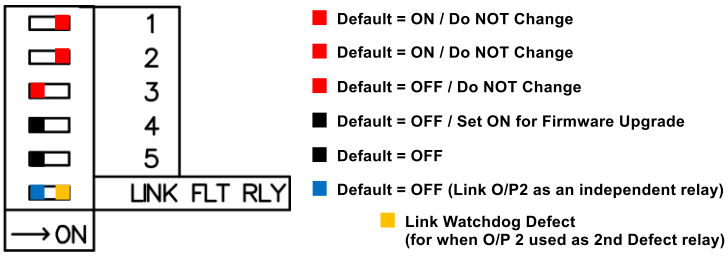
20.2 F220 Mainboard PCB Access Points

Connectors				
Component	**Description**	**Input/Output**	**Rating**	**Note**
K1	Internal RS-485 : Small	I/O		
K3	Door Interlock; External Fault	IN	-	
K6	Internal RS-485: Small (Legacy)	I/O		
K7	RS-232	I/O	-	
K8	'Door Holder' Relay	OUT	5A @ 30V resistive	SPDT
K9	Door Switch; Warn Sys Disable; Warn Sys ON	IN		
K10	Auxiliary O/C Outputs	OUT	100mA per output	
K11	Monitored O/P1,O/P2, Auxiliary (ACF)	OUT	2.0 A@30V resistive	
K11	Call-Point (MCP)	IN		
K13	'Fire' Relay and 'Fault' Relay	OUT	2A@ 30V resistive	SPDT
K14	Ethernet Connector	I/O		
K15	'Battery Fault' Relay	OUT	2A@ 30V resistive	SPDT
K17	'External Bell' and 'Warning System' Relay	OUT	5A @ 30V resistive	3A Fuse
K19	+27.4Vdc Input	Power Supply In	3A Fuse	
K22	Internal RS-485: Small	I/O		
K23	'General Purpose' Relay	OUT		DPDT
K24	External RS-485: Large (Legacy bus)	I/O		
K26	External RS-485: Small (High Speed)	I/O		
K29	External RS-485: Large (High Speed)	I/O		
K35	Auxiliary O/C Outputs (Duplicate of K10)			
K36	Loop Driver Bus			
K38	Alarm Signalling Equipment			
K39	Charger Controller	I/O		
K40	Internal RS-485: Samll (Legacy)	I/O		
K41	Internal RS-485: High Speed	I/O		
K42	F220 Keyboard			
K43	Internal RS-485: High Speed	I/O		
K44	Internal RS-485: High Speed	I/O		
K45	Internal RS-485: High Speed	I/O		
PT1	Earth Terminal			

Table 20-1: F220 Mainboard Access Points

20.3 F220 Mainboard Switches, Test Points and Fuses

Switches			
Component	**Description**		**Default**
SW1	Configuration Memory Lock		Normal
SW2	System Reset		-
SW5 (see below)	DIP switch 6-way	SW5-1	ON
		SW5-2	ON
		SW5-3	OFF
		SW5-4	OFF
		SW5-5	OFF
		SW5-6	OFF
SW6	USB Host / Repeater select		Host



SW5 - Master Board DIP Configuration

Test Points	
Component	**Description**
K16	+27 Vdc
K21	3V3 dc
K25	+5Vdc
K30	6V5 dc
K32	0V
K33	1V3 dc
K34	1V8 dc

Fuses			
Component	**Function**	**Rating and Type**	**Replacement Part No.**
FUSE1	External Strobe	3A Blade Fuse	FUBL3A
FUSE2	Warning System	3A Blade Fuse	FUBL3A
FUSE3	Power Supply	3A Blade Fuse	FUBL3A

20.4 F220 Power Supply PCB Layout

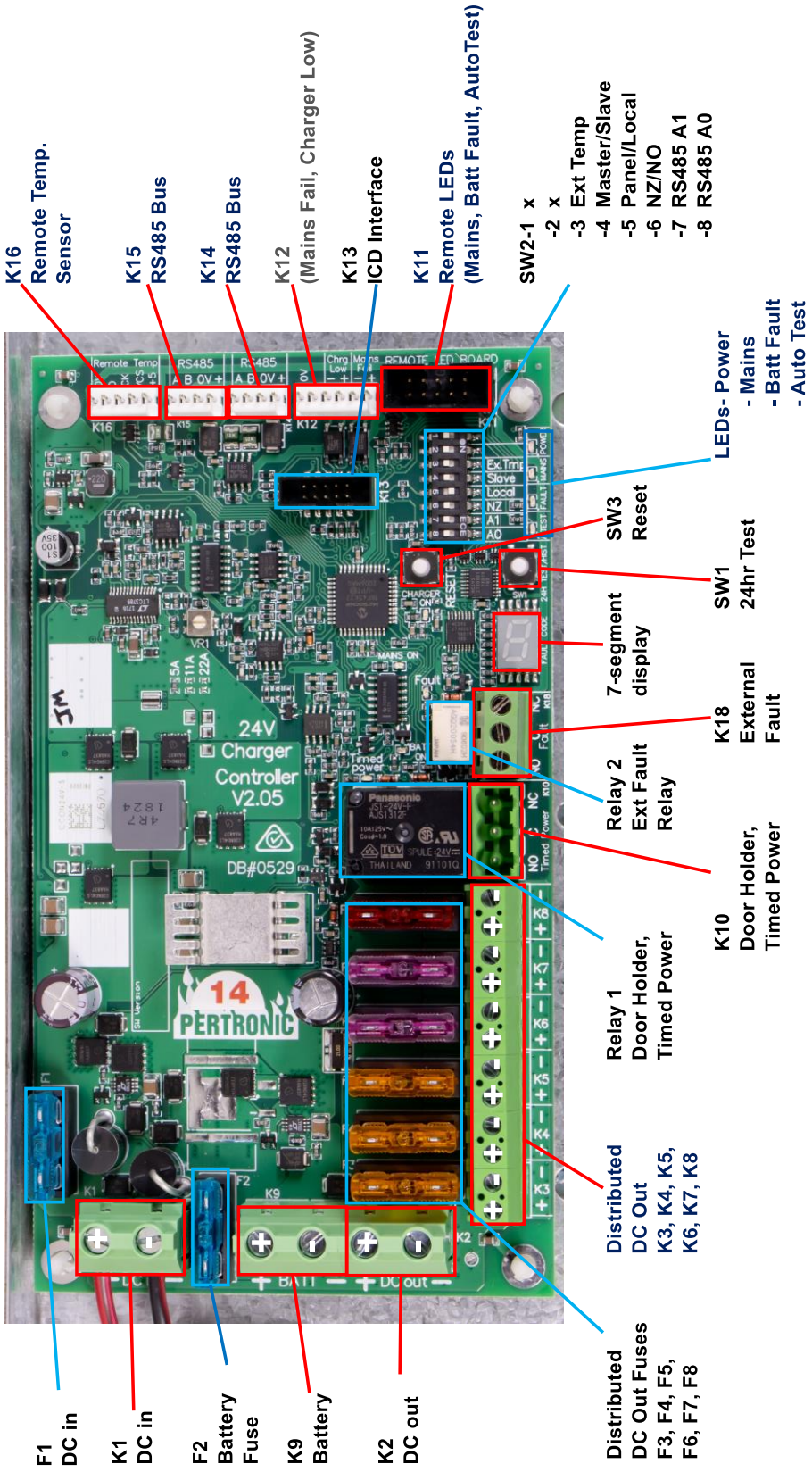


Figure 20-2: AS7240.4 Power Supply PCB Layout

20.5 Detector and MCP Wiring

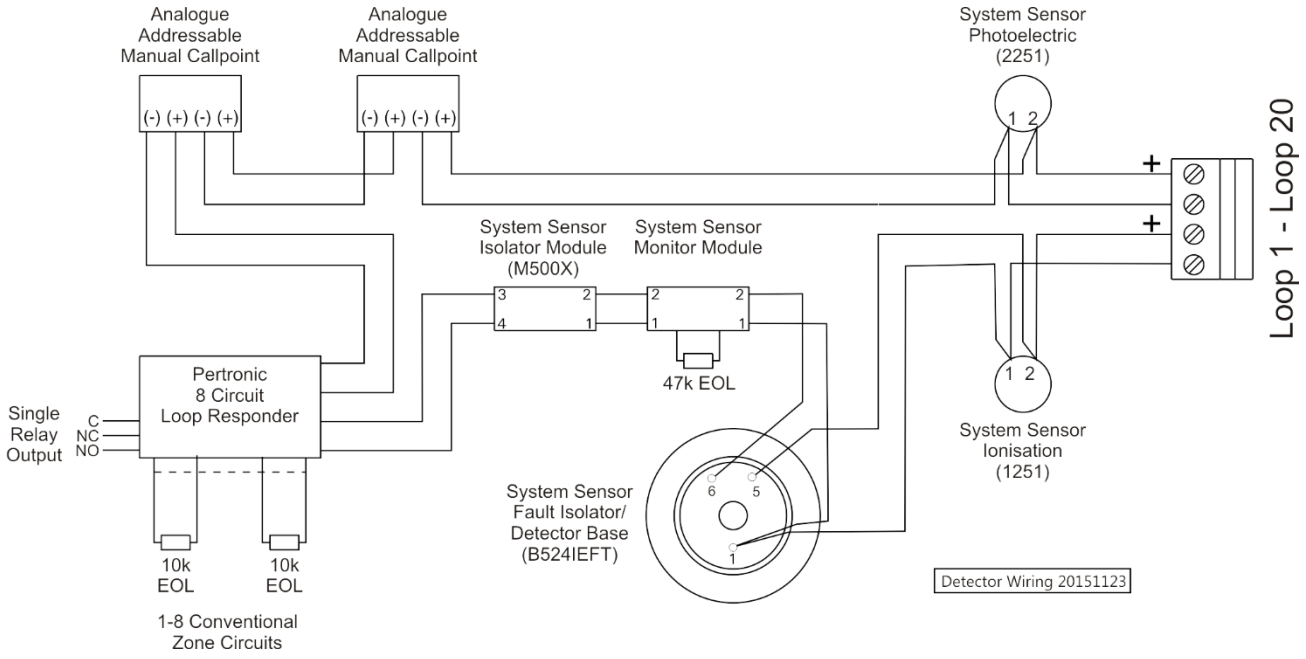


Figure 20-3: Detector Wiring

20.6 Warning System Wiring

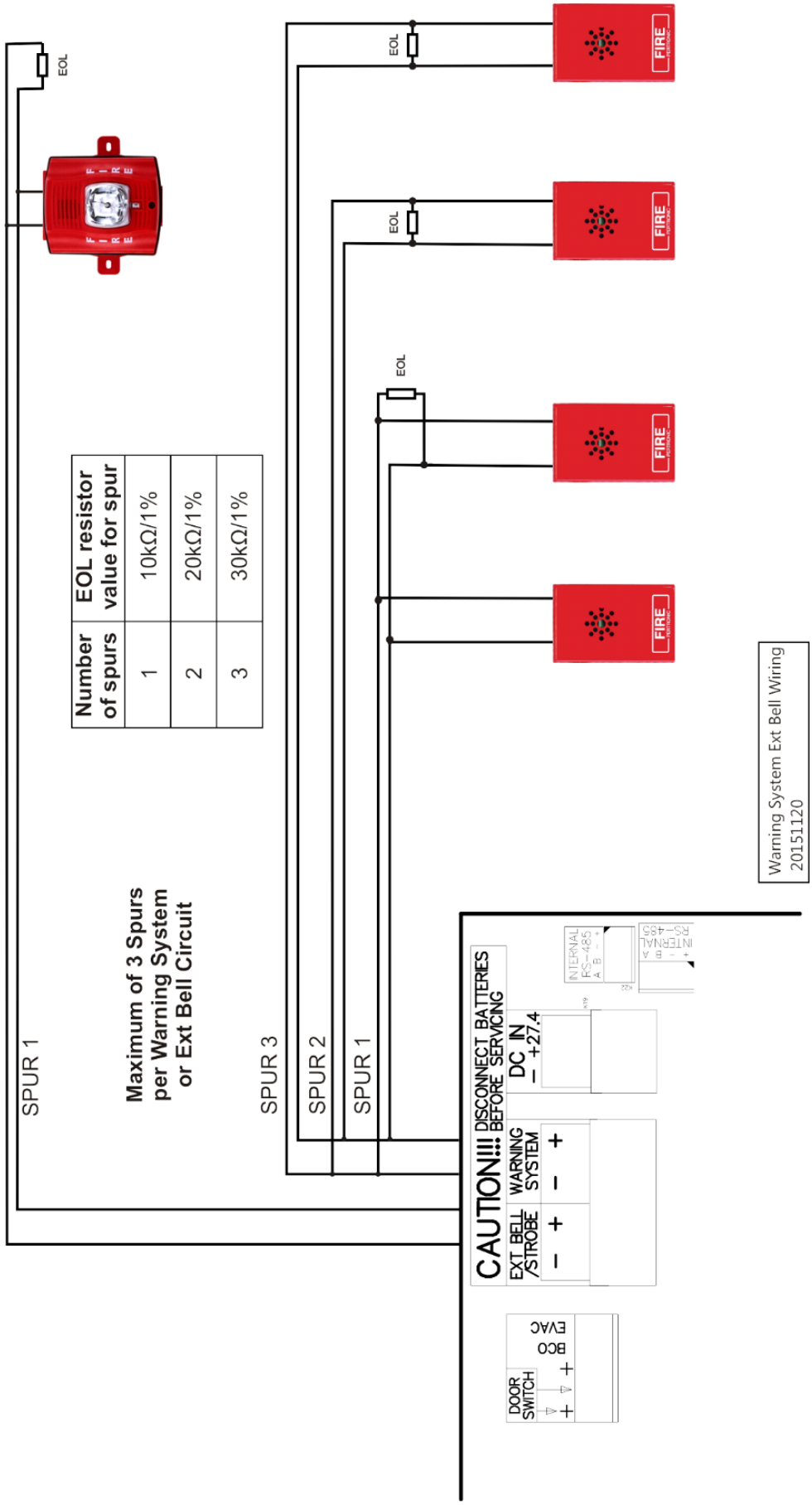


Figure 20-4: Warning System Ext Strobe Wiring

20.7 Loop Relay Wiring

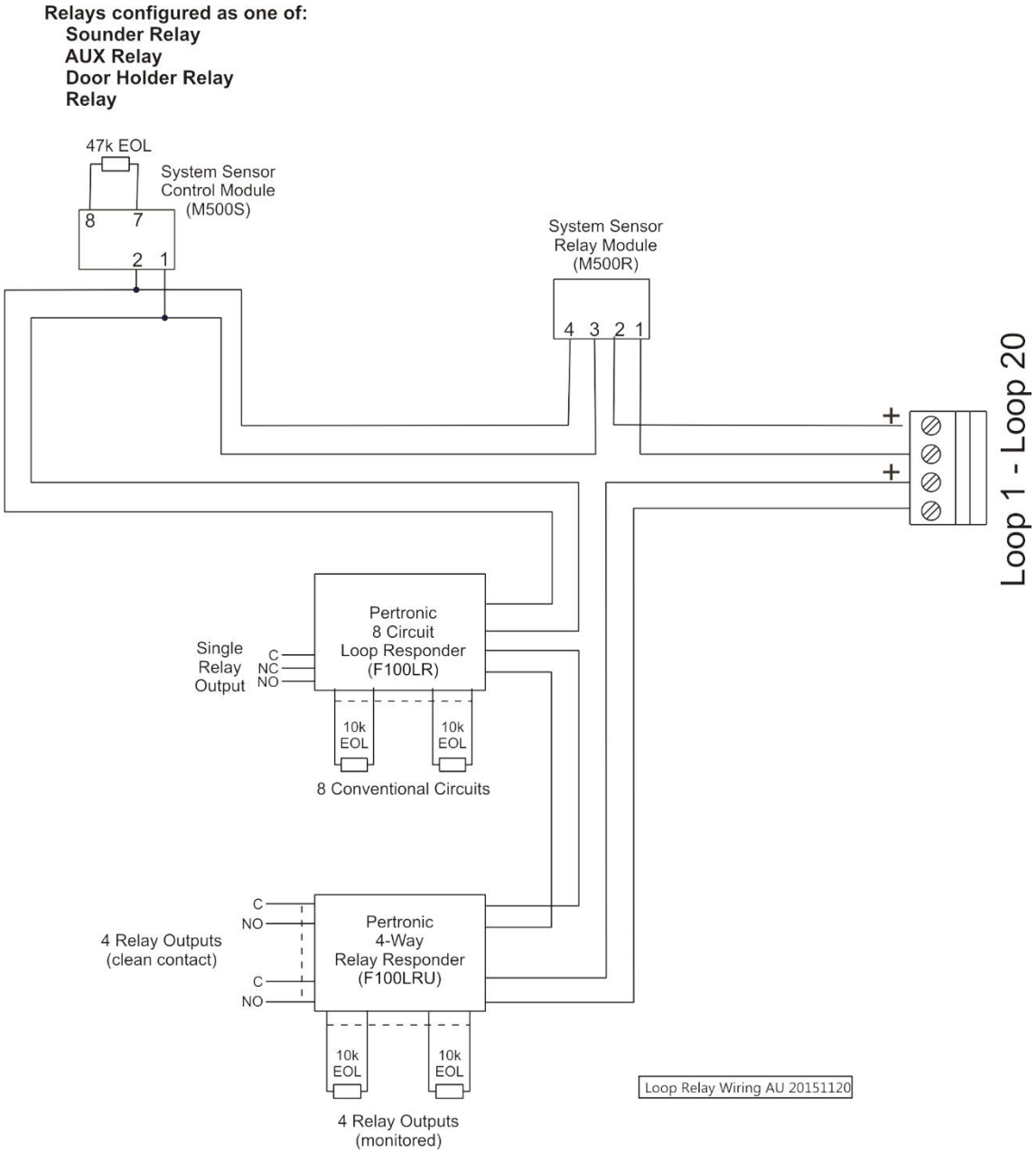


Figure 20-5: Loop Relay Wiring

20.8 System Wiring

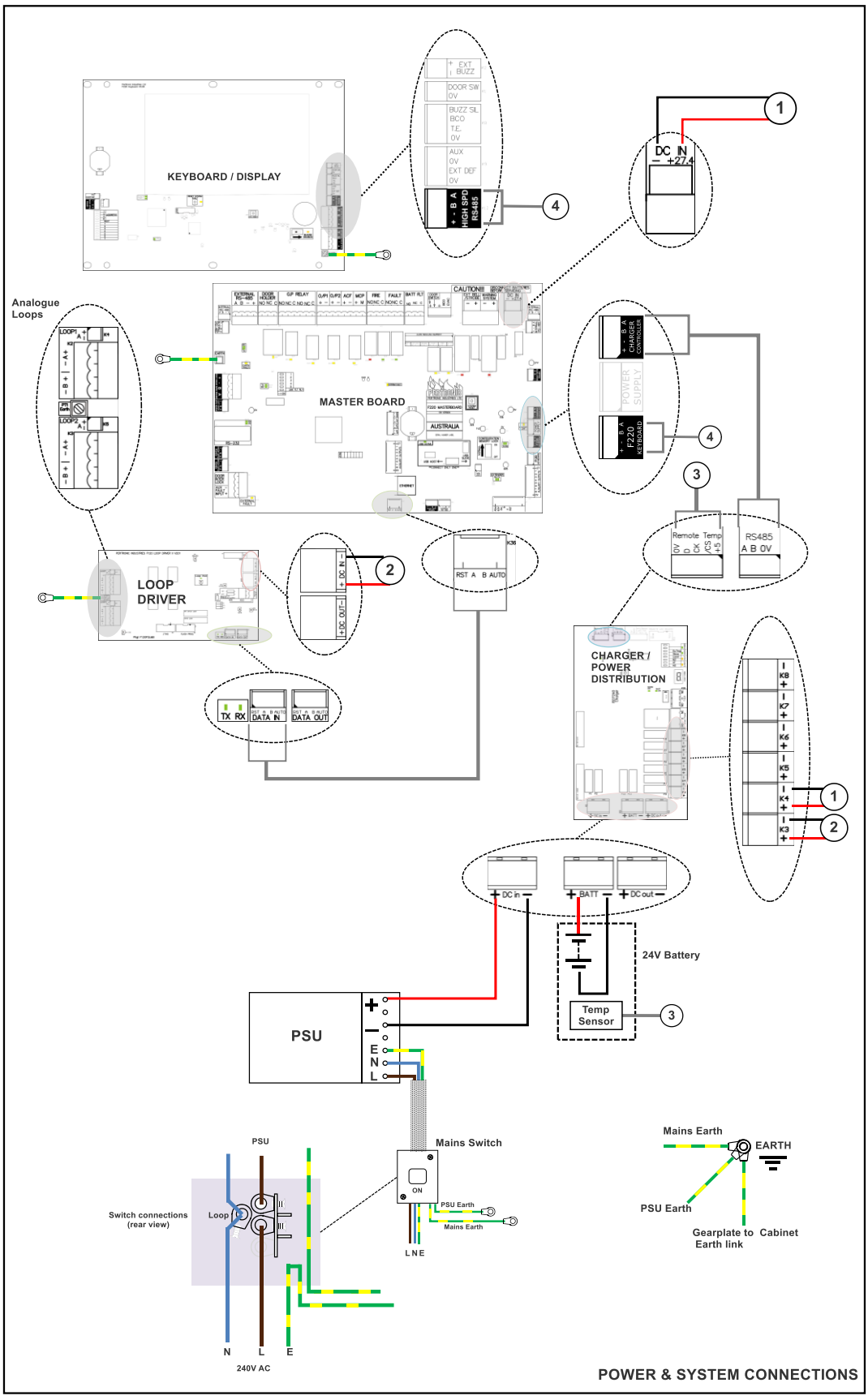


Figure 20-6: Power and System Connections

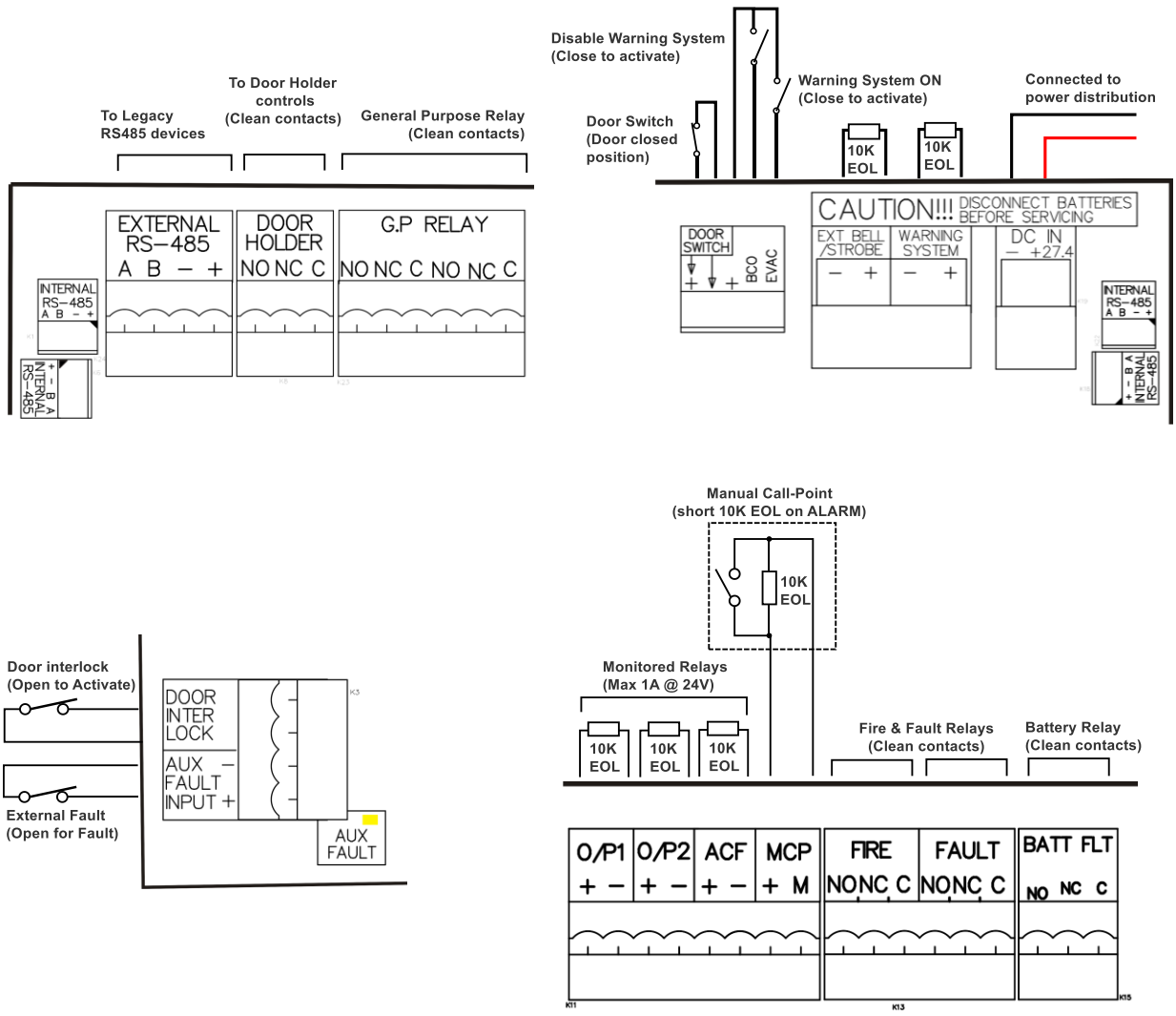


Figure 20-7: System wiring—External Connections

20.9 Spurred High-Speed Bus Implementation

The network topology most commonly implemented in RS485 networks is the ‘multidrop’ (‘bus’ or ‘daisy chain’) where a node, such as a LCD Mimic, EA60 Ampllfiier, or F220 Panel, is directly connected to the next node on the bus (via a short stub).

To negate the limitations of the multidrop topology in some installations, for example, in large buildings where remote LCD Mimics are to be installed in different wings and floors, a star-wired bus network can be employed. Refer to Figure 20-8.

This network uses a number of Pertronic Industries RS485 Repeater and Power Distribution boards. The Power Distribution board is designed to distribute power from one fused (5A) common supply bus to six fused (3A) outputs and an additional fused battery connector.

The RS485 Repeater board provides bidirectional communication between the F220’s single External High-Speed RS485 bus (‘master’) and five separate RS485 segments (‘Repeaters’). All five ‘repeater’ ports on the RS485 Repeater have data lines that are electrically isolated from the ‘master’ RS485 bus. The data lines of port 5 are also electrically isolated from the other 4, and, if required, this port can switch to an external power supply to provide full galvanic isolation. The maximum current consumption of the RS485 Repeater is 60mA at 24v

Installation considerations

- The F220 Mainboard has two External High-Speed bus connectors; K29 (screw terminal) and K26 (IDC).
- Total number of LCD Mimics, or other devices, on the High Speed RS485 bus is 32.
- Power Distribution Boards are used to provide power to the LCD Mimics, or other HS peripheral devices, as the panels external high-speed RS485 bus has limited power supply load capabilities (1.4A max)
- Maximum cable run per segment is 1.2km
- A terminating resistor must be installed on the last RS485 Repeater board.
- Each bus segment must be terminated at both ends; on the RS485 Repeater (install EOL resistor jumper) and on the last peripheral device (95R3 EOL resistor).

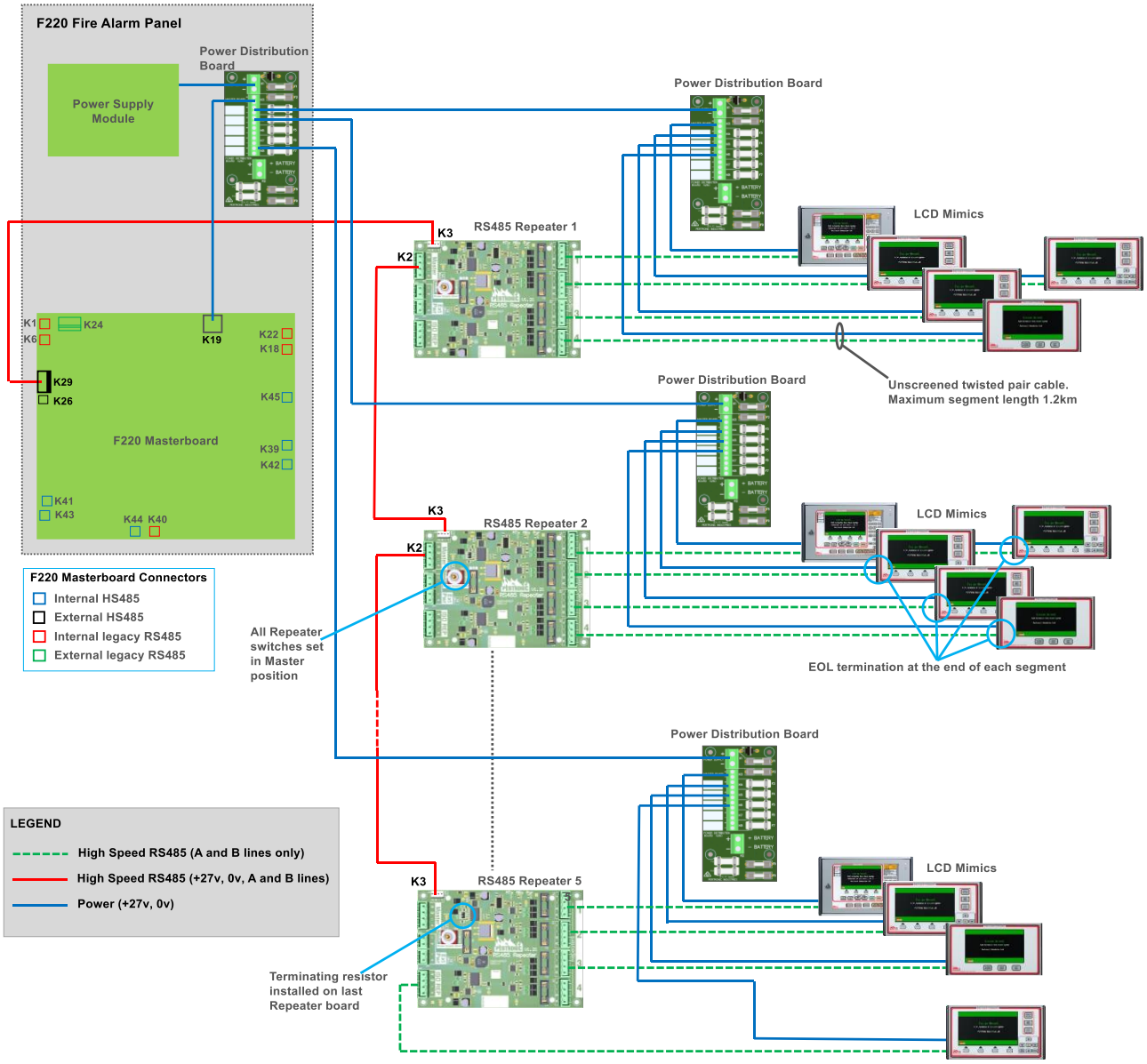


Figure 20-8: Star-wired bus network topology implementation for large sites or buildings

20.10 16U Cabinet

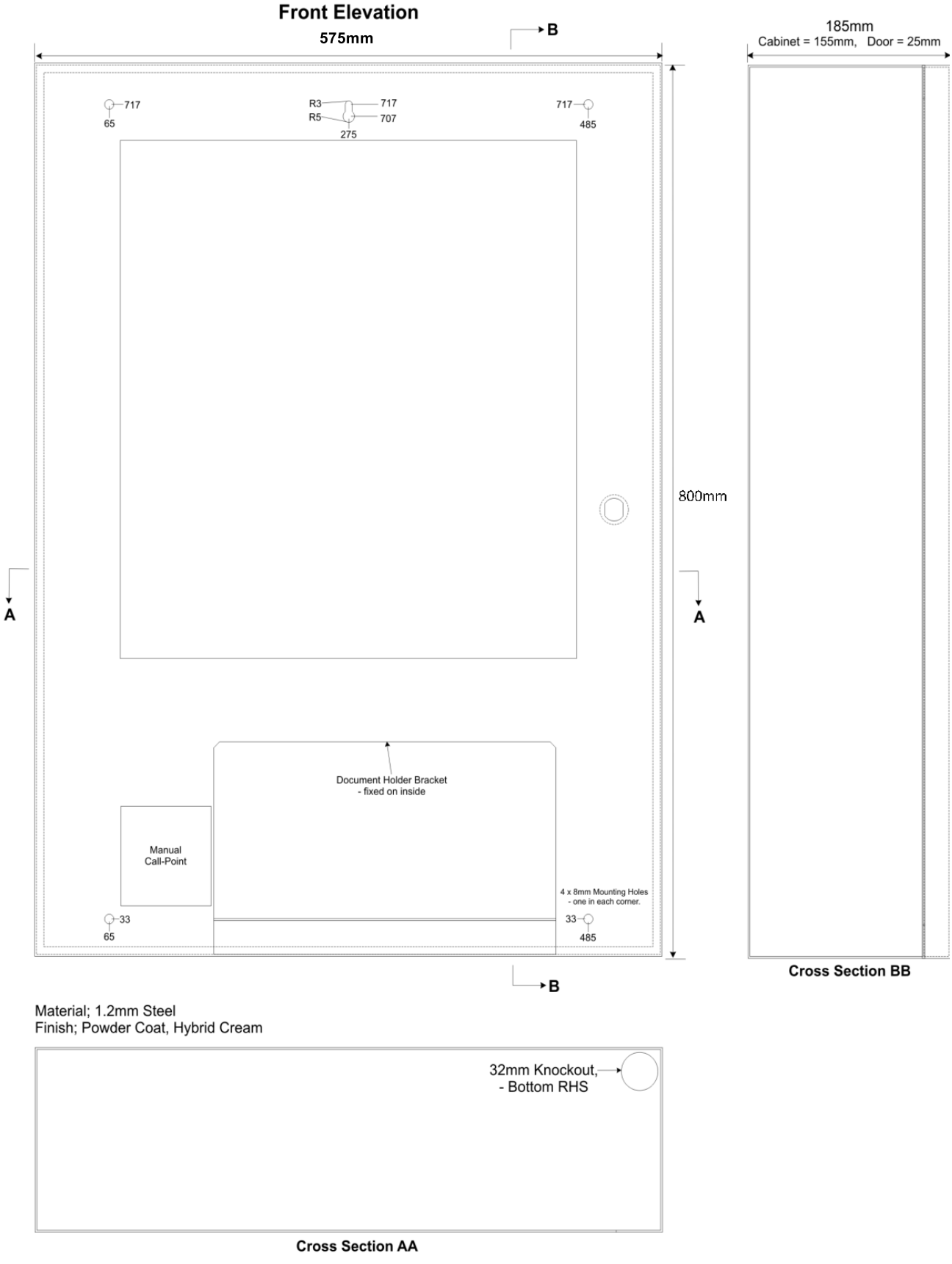


Figure 20-9: 16U Cabinet

20.11 External Power Supply 6U Cabinet

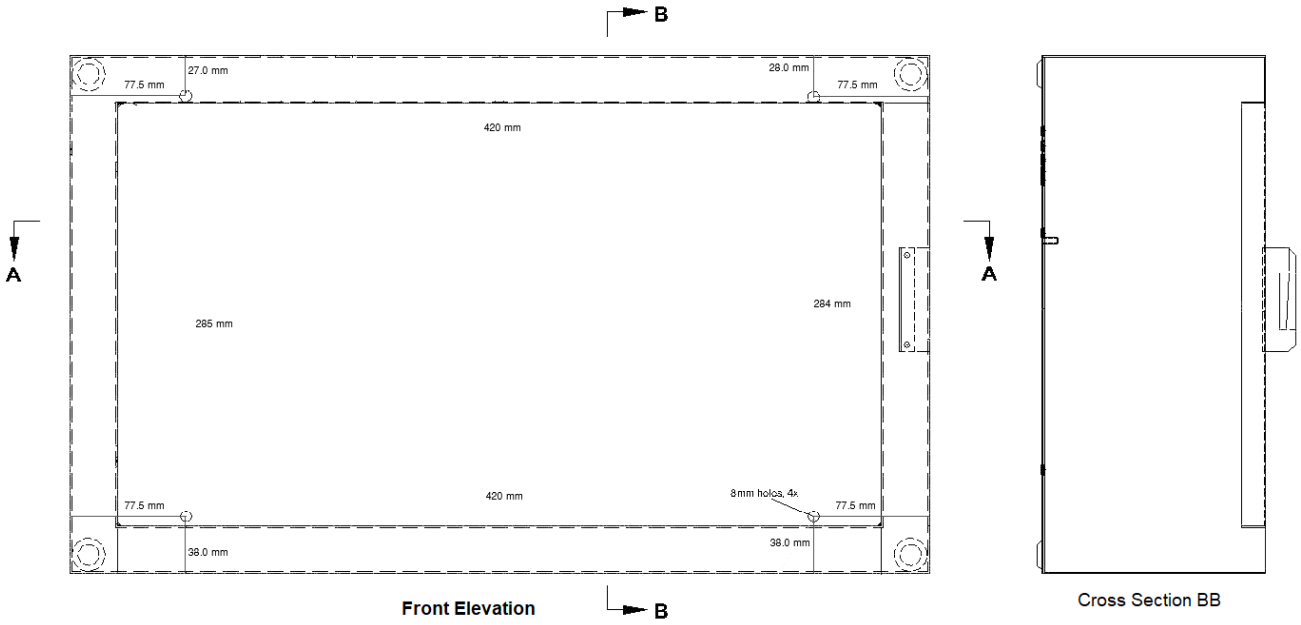


Figure 20-10: Exernal Power Supply 6U Cabinet (BatBox38)

Note: The external power supply must be abutted to the Fire Panel cabinet to comply with AS7240.4

21. ORDERING INFORMATION AND SPARE PARTS

21.1 Pertronic Panels & Optional Extras

Product Code	Description	Notes
F220-A10U/5A	F220, 10U cabinet with 2 loops and 5A PSU	
F220-A16U/…	F220, 16U cabinet	Consult your local Pertronic Sales and Technical Support Office for an F220 cabinet build that best meets your requirements.
F220-A28U/…	F220, 28U cabinet	Consult your local Pertronic Sales and Technical Support Office for an F220 cabinet build that best meets your requirements.
F220-A28US/…	F220, 28U slim cabinet	Consult your local Pertronic Sales and Technical Support Office for an F220 cabinet build that best meets your requirements.
F220-A40U/…	F220, 40U cabinet	Consult your local Pertronic Sales and Technical Support Office for an F220 cabinet build that best meets your requirements.
F120P2LMB-A	F220 2-Loop Driver PCB (v2)	Up to 10 in total (20 loops)
B12H-2424F	24Vdc:24Vdc, 15W Converter	Provides DC:DC isolation for isolated Loop Drivers
F220MIMIC	F220 Remote Keyboard-Display	Contains colour display, keyboard and Fire Brigade Panel. Uses high speed RS-485 connection
F220AUXRLY	F220 Aux Relay Board	Clean contact relay options for O/P1,O/P2,ACFand Warn Sys.
LAC485	Pertronic LED Address Controller	Controller for 8 way LED, 8 way relay or 48 way open collector boards. Connected via RS-485 serial interface
PC8WCOMR	Pertronic 8 Way Common Relay PCB	Relay Extension for LAC485 or F100PDB12
PC48WOCOU	Pertronic 48 Way open collector PCB	Open collector extension for LAC485
EVAC50W24V-A EVAC20W24V	Pertronic Amplifiers	50W, 24V Amplifier 20W, 24V Amplifier
AUX24/5PSU-7240	24V 5A Monitored PSU (AS7240.4) in BATBOX38 & 003 Camlock	
AUX24/11PSU-7240	24V 11A Monitored PSU (AS7240.4) in BATBOX38 & 003 Camlock	
AUX24/22PSU-7240	24V 11A Monitored PSU (AS7240.4) in BATBOX38 & 003 Camlock	

Table 21-1: Pertronic Panels

21.2 Analogue Addressable Loop Devices

Product Code	Description	Notes
1251BPI	Ionisation Detector	Uses B501AUS Base
2251BPI	Photoelectric Detector	Uses B501AUS Base
2251TMBPI	Photoelectric + Heat Detector (Acclimate™)	Multi-criteria fire detector, uses B501 base
2251CTLE-34-IV	COPTIR	Multi-criteria with CO, Photo, Thermal, and IR sensors **(Max 99 addresses per loop)**
5251BPI	Fixed Heat	
5251RBPI	Rate-of-rise Heat Detector	
7251	Laser Detector (Pinnacle™)	Very high sensitivity smoke detection **(Max 99 addresses per loop)**
BEAM200	Reflected Beam Detector	Uses projected light beam for large-area smoke detection
8251BPI	FAAST Aspirated Smoke Detector	Advanced aspirating smoke with wide sensitivity range & large area monitoring.
M500MB	Monitor Modules	Fits SMB 500 mounting box
M501MB	Monitor Modules	Miniature input module
M500DM	Dual Input Module	Dual Input Module
M500DMR	Dual Input, dual input module	
M201E-240	Mains Switching Output module	
M210E-CZR	Conventional Zone Interface Module	Conventional zone interface—smoke detectors only, use B401R base.
M500S	Single Supervised Output module	Relay Output with EOL monitoring.
M500R	Single non-Supervised Output module	Relay output-no monitoring
M500X	Zone Isolator Module	Short-circuit protection for analogue loop sections
B501AUS	Detector Bases	Required for all detectors except where noted
B524IEFT-1	Isolator Base	Short circuit isolator detector base
BSO-DD-N34	Addressable Sounder Base	Intelligent Base Sounder. AS2220 compliant
AALREL	Pertronic Addressable Loop Relay - 4 Relay	board only
AALRES-A	Pertronic Addressable Loop Responder	board only
M500K	Pertronic Analogue Addressable Manual Call-Point	Manual Call-Point (no backing box)

GENCONSU	Generic Control Switch Unit	
F120DCSW	F120A Damper Controller Switch Unit	Compatible with F220
F120DCSLSW	F120A Damper Controller Repeater Switch Unit	Compatible with F220
F120FCSU	F120 Fan Control Switch Unit	Compatible with F220
F120FCSLVSU	F120 Fan Control Repeater Switch Unit	Compatible with F220
AAFCRST	Addressable Fan Control Reset Unit	

Table 21-2: Analogue Addressable Loop Devices

21.3 Spare Parts

Product Code	Description
F220MASTAUS	F220 – Mainboard
F220LCDAUS	F220 – Keyboard-Display assembly (PCB only)
F120P2LMB-A	F220 Loop Driver 2 Mini Board
24/5PSU-7240	24V 5A Monitored PSU (AS7240.4)
24/11PSU-7240	24V 11A Monitored PSU (AS7240.4)

Table 21-3: Spare Parts

21.4 Document Change History

Issue Number	Reason for Update	Description of Changes	Author
1 DRAFT Nov 2015			RDB
0.1			KBWC
0.2	Updated power supply operation and communication information		KBWC
0.3	Interim release		JPF
0.39	Update after feedback from testing		JPF
0.395	More updates from testing.		JPF
1.0	First production release		JPF
1.01	Production updates		PF
1.02	Front page update		JPF
1.05	Networking implemented	Networking documentation added Tables 4.5 and 5.1 updated, Section 17.3 updated	JPF
1.07	Brigade view update	Changed scrolling behaviour. CN2284	JPF
2.00	Version 3 firmware release	CN2390, CN2397 and CN2412	JPF
3.00	Version 4 Firmware release	CN2528	JPF
4.00	Version 5 Firmware release	CN2619	JPF
5.00 AUS	Version 6 Firmware release	CN2749	RJK
5.20 AUS	AS47240.4 PSU changes, Spurred wiring, minor upates	CN2950	RJK
6.00 AUS	Added FireUtils references Version 7.02/7.04 Firmware releases	CN3060	RJK

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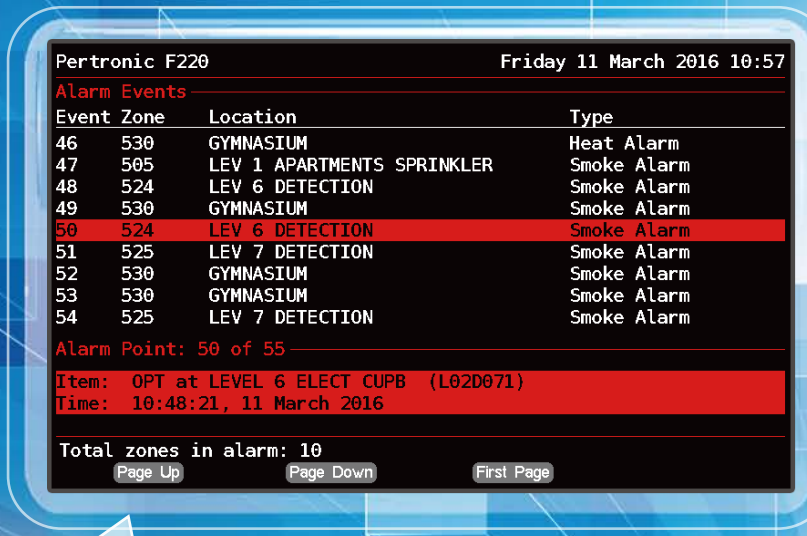
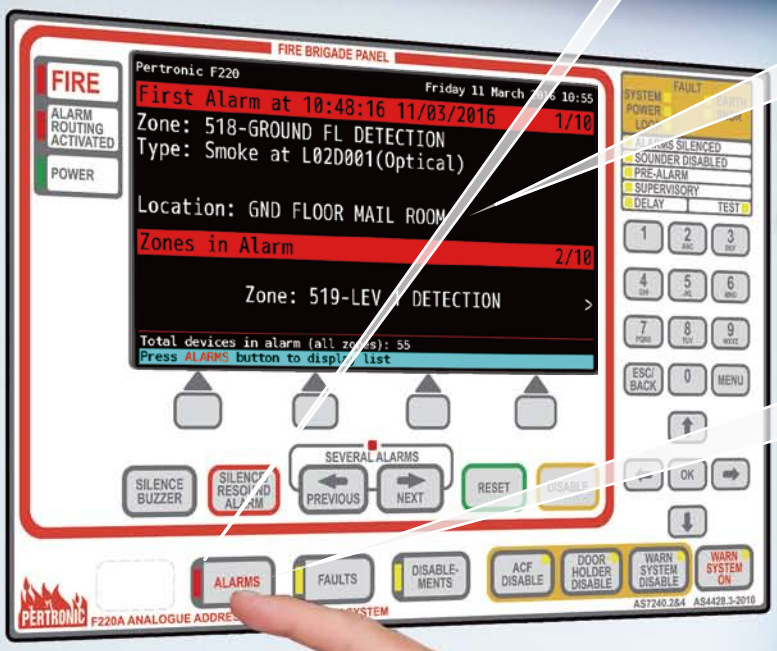
PERTRONIC F220

Fire Alarm System



Identifies Exact Location of Alarm

One Key Access to Complete Alarm List



Developed for Australian Fire Professionals

Fully compliant with AS 7240.2 & AS 7240.4 »

www.pertronic.com.au

16U 28U 40U

Pertronic F220

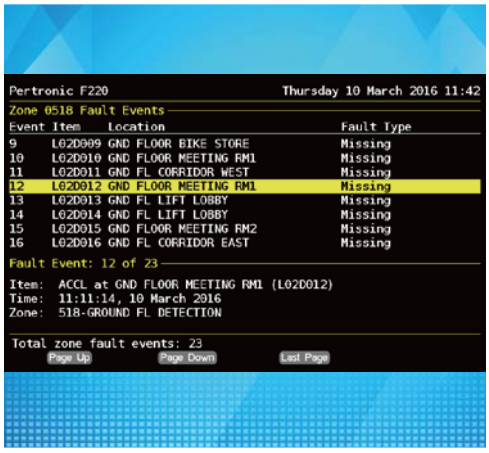
Exceeds the requirements of AS 7240.2

Easy
access to detailed lists of alarms, faults, and disablements, simplifying day-to-day system operation and management.

Dedicated
history logs and intuitive menu structure for better system diagnostics and maintenance.

Rapid Access to Detailed Information

Simple
user-friendly installation diagnostics, making it easier and faster to debug and commission large, complex installations.



Rapid
upload and download of configuration and firmware for quick, simple system maintenance and upgrades.

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March 2016

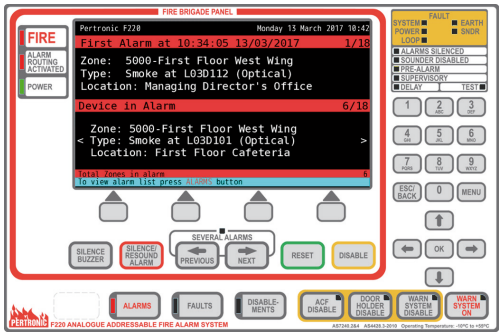
F220 Fire Alarm Control Panel

Instant fire alarm location – Easily readable large-text colour display
Power and Flexilility – User-friendly operation
Rapid configuration – Economical, intuitive installation

Product Overview

The Pertronic F220 is a modular, expandable, networkable, intelligent fire alarm control panel which fully complies with the ISO based AS 7240.2 Australian fire alarm standard. The F220 exceeds the minimum requirements of this standard by displaying the exact location of the alarm activation as well as the mandated zone location information.

The F220 uses a 7 inch (180 mm) 800 x 480 pixel colour display to unmistakably identify the panel status. The alarm mode is clearly identified by the use of red status bars, and by using large easy to read text descriptors. Fault information, device disablement information, pre-alarm conditions, walk test, supervisory and system information all have their own unique coloured display screens to provide comprehensive easy to use information for all users including fire brigade personnel, building managers, and service technicians.



The large-text colour display automatically identifies the exact location of an alarm

The F220 also has multiple event logs to provide all users with powerful diagnostic information.

F220 Analogue Addressable Fire Alarm Control Panel

A full range of LCD and LED mimic panels provide remote display, control and monitoring capabilities. The F220 is fully compatible with Pertronic FireMap™ PC Graphics.

Standard Features

- Seven-inch 800 x 480 pixel TFT LCD colour display
- Easily readable 5 mm text height on Alarm screen
- Monitors and controls up to 3,180 sensors, and 1,980 input / output modules, manual call points, or addressable warning devices
- Automatically identifies the exact location of an alarm
- Colour-coded status and event display
- Numeric keypad for rapid information access
- Multiple panels may be connected in a fault-tolerant Pertronic Net2 network system
- EWIS or BOWS system interface
- Virtual detection makes better use of information from intelligent sensors to combine maximum alarm sensitivity and excellent nuisance alarm immunity
- High-speed upload/download of configuration files (less than thirty seconds) via USB memory stick
- PC interface programming and interrogation with the user-friendly Pertronic FireUtils® application
- Serial buses (RS-485) for interfacing to LCD and LED mimic panels and ancillary peripheral devices
- Specialised history logs retain critical information even after large numbers of minor events
- User can disable individual sensors, loop devices, zones, local MCP, local buzzer, alarm routing, timers, logic blocks, and network inputs
- Compatible with a full range of peripherals including sounders, strobes, audio-visual signs, amplifiers, speakers, audible warning and evacuation systems, and Ethernet and SMS (text-messaging) interfaces
- Large range of cabinet sizes, including weatherproof
- Customised assembly options
- Complies with Australian Standards AS 7240-2, AS 7240-4, AS 4428-3, & AS 1668

F220 Options

Internal Options

Pertronic Industries supply an extensive range of options for the F220 Fire Alarm Control Panel. The number and type of internal options required for a specific project will affect the choice of cabinet size, power supply current rating, and battery capacity.*

Accessories

A full range of accessories is available for the F220, including the range of F220 Mimics and AS 7240 Power Supplies. Please refer to the Pertronic website or contact Pertronic for more information.

The following list outlines the popular internal options:

Two-Loop Driver (F120P2LMB-A) Provides two analogue addressable loops.

AA Multi-Function Loop Responder (AALR-MFA) Provides eight conventional detection zone or switch input circuits with one relay configurable as Form C clean contact or supervised 100 Volt Line output.

Addressable Loop Relay (AALREL) Provides four outputs, individually configurable as supervised or voltage-free relay contacts. Also provides an input for supervising the fault signal from an external power supply.

AA Isolator Board (8SAAIB) Provides eight isolated analogue addressable loop spurs. Allows conventional fire alarm zones to be converted to analogue addressable spurs using the existing cable, when upgrading from a conventional to an intelligent fire alarm control panel.

Evacuation Amplifiers Complete with evacuation tone generator and a single supervised 100 Volt Line output for speakers:

- 20 Watt (EVAC20W24V-T3),
- 50 Watt (EVAC50W24V-A),
- 120 Watt (EVAC120W24V).

(Note that the 120 Watt amplifier requires the evacuation tone generator)

Audio Distribution Module (ADM-2, ADM-4) Provides multiple audio channels from a single 100 Volt line. All channels are continuously supervised for line faults. A line fault on any channel does not prevent operation on other channels. An F220 may be fitted with multiple Audio Distribution Modules.

Evacuation Tone Generator (EVACGEN-EA) Provides inputs for local and remote microphones, evacuation tones, standard or custom evacuation messages, and supervision of audio amplifiers.

Emergency Warning and Information System (EWIS) Audible voice warning and emergency intercom system.

Fan Control Plate A 3U rack-mounted front plate that accepts any combination of control units and AFI displays. Each Fan Control Plate accepts 10 standard units or five AFI displays.

AS1668 Fan Control Unit Occupies one space on the Fan Control Plate.

AFI Display Alarm, fault, and isolate indicators for 8 zones. Occupies two spaces on the Fan Control Plate.

Fan Control Plate with AFI Display (left), Fan Control Reset Unit (centre) & Fan Control Switch Unit (right)

Special Purpose Control Units

- Building Occupant Warning System Controls
- 8 Way Solenoid Test Control
- 8 Way Zone Isolate Switch

Special Purpose Displays
A range of special purpose LED displays is available for the F220. The displays are designed to satisfy specific project requirements.

Please contact Pertronic Industries for more information about special purpose control units and displays.

Hand-Held Microphone and cradle, mounted on front panel.

Bell Monitor Board (ZMB24V) Provides additional supervised outputs for warning devices such as strobes, sounders (bells), and audio-visual signs.

Network Card (NET2CARD) Interface with a Pertronic Net2 Network System.

Ethernet Gateway (NET2GATE) Interface with any Ethernet network including a virtual private network (VPN), or the Internet. The Ethernet Gateway provides an interface for Pertronic FireMap™ PC Graphics.

Ancillary Peripherals

- 48-way Open Collector Board
- 8 Way Relay Mimic
- 8 Way Common Relay Board
- Auxiliary Panel Relay (2-pole 4-amp 24 Vdc form C contact)

General Purpose Interfaces BACNet, Modbus, Nurse Call Pager, Printer.

Fibre Optic Interface Adaptors available for RS-232, RS-485, or Ethernet.

Brigade Transmitter Interface Highly adaptable interface system designed to work with a wide range of Alarm Signalling Equipment. The F220 Auxiliary Relay Board, and the 8 Way Common Relay Board, may be used to provide additional connections if necessary.

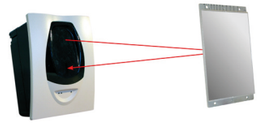
DC-DC Converter Isolated supply to increase noise immunity of one pair of analogue addressable loops.

24 Vdc Door Holder Power Supply 2 amp, 5 amp, 10 amp

* The fire alarm panel's maximum total current consumption, including any auxiliary power outputs, must not exceed the power supply's load capacity. Most optional components draw their maximum current when the system is in Alarm mode. The Pertronic website (www.pertronic.com.au) provides a calculator for computing supply current and battery capacity.

F220 Peripherals

Analogue Addressable Loop Devices

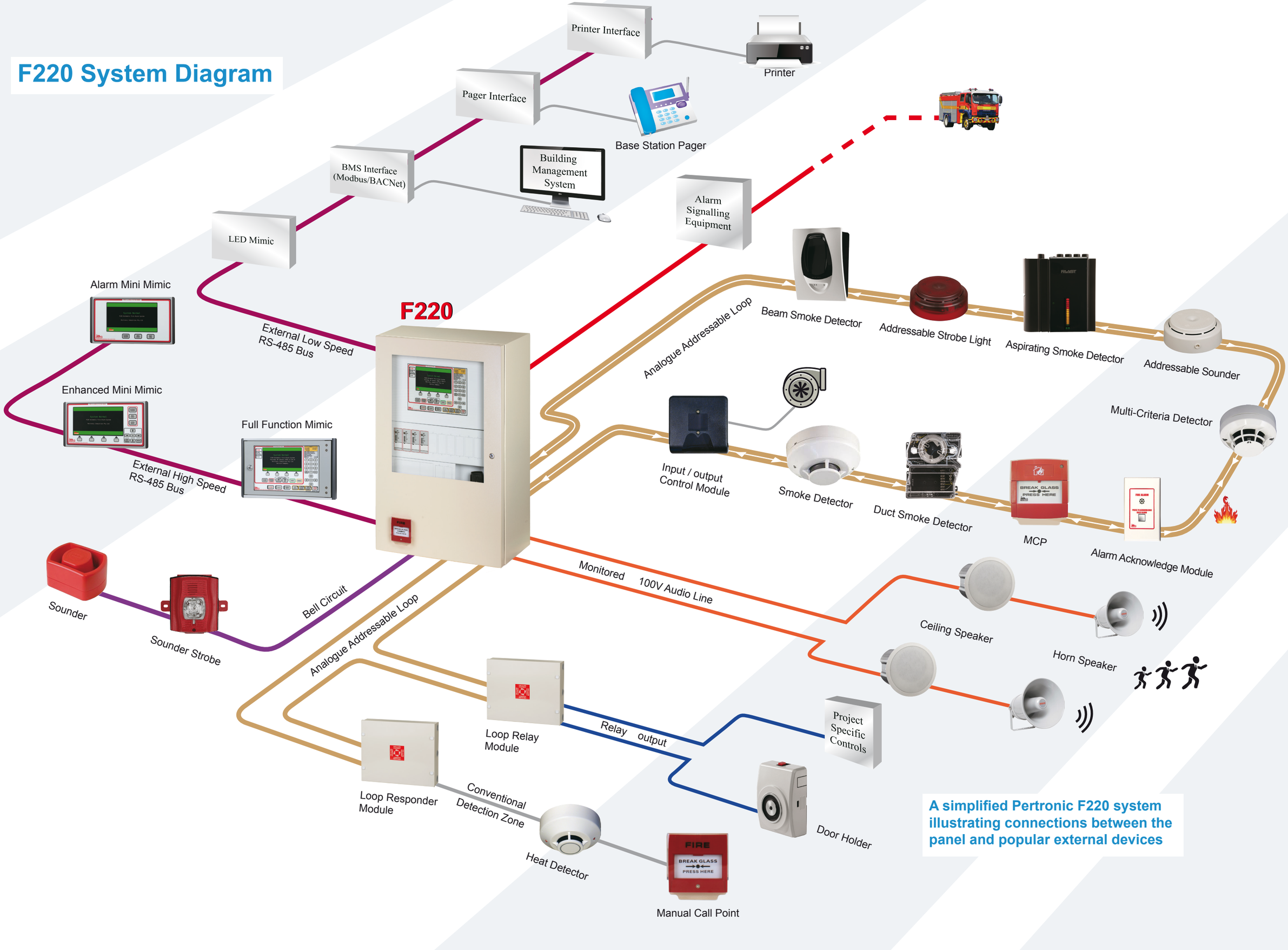
Aspirating Smoke Detectors	Smoke Detectors	Multi-Criteria Detectors	Heat Detectors
FAAST XT FAAST XS FAAST LT 	Photoelectric Laser 	Acclimate: Smoke + Heat PTIR: Smoke, Thermal + Infra-Red COPTIR: Carbon Monoxide, Smoke, Thermal + IR 	Static Temperature or Rate of Temperature Rise Indoor and Weatherproof Options
Duct Smoke Detector	**Beam Smoke Detector**	**Alarm Acknowledge Module**	**Manual Call Points**
Indoor and Watertight Options 		For use with Alarm Acknowledge Facility 	Indoor and IP 67 Weatherproof
Loop Responder Module	**Loop Relay Module**	**Input/Output Control Modules**	
Interface up to 8 conventional detection zones or switch contacts to analogue addressable loop 	4 relay outputs, individually configurable supervised or non-supervised 	Single Input Dual Input Dual Input, Single Output Dual Input, Dual Output Ten Input Single Output Single Output 240V Switching Six Output Conventional Zone Interface 	

Warning System Devices

DC Operated	Addressable Sounders	Addressable Strobes	Add. Sounder-Strobes
Strobe Light Sounder-Strobe Sounder Indoor and Weatherproof	Indoor synchronised, with or without integral detector base 	Indoor (synchronised) and Weatherproof options 	Indoor (synchronised, with or without integral detector base) and Weatherproof options
Audio Distribution Modules	**Ceiling Speakers**	**Horn Speakers**	
2-Way 4-Way 	3 W to 15 W Ratings 100 mm to 200 mm Diameter 	10 W Power Rating IP66, Outdoor IP66, Marine Grade 	

For more information please refer to the product datasheets, available from www.pertronic.com.au, or contact your nearest Pertronic office.

F220 System Diagram



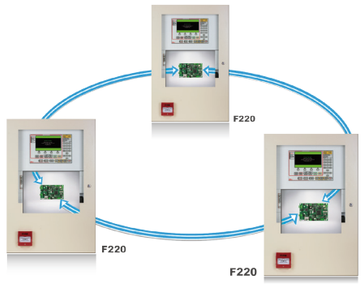
A simplified Pertronic F220 system illustrating connections between the panel and popular external devices

Networking the Pertronic F220

The **Pertronic Net 2 Network** connects multiple **F220** fire alarm control panels, Net 2 Network Control Units and Net 2 displays into a single fault-tolerant system, in which:

- All connected panels can be controlled and monitored from any Net 2 Network Control Unit
- Information from any connected panel can be viewed on any Net 2 Network Control Unit or Net 2 display
- Events anywhere on the network can trigger or influence events at any connected panel
- System time in all connected panels, control units and mimic displays is automatically synchronised

Please refer to Pertronic Net 2 Network System datasheet for more information about the **Net 2 Network System**.



The Pertronic Net2 Network System connects multiple F220 panels in a fault-tolerant bi-directional ring circuit

Configuring the F220 with FireUtils®

Pertronic FireUtils® is a computer application that makes it easy to configure a **Pertronic F220** system. For a stand-alone panel, **FireUtils®** uploads the configuration file to a USB stick, or direct to the panel via RS-232.

For a network, **FireUtils®** uploads all configuration files for panels, NCUs, displays, and network cards via Ethernet to any individual Net2 Card on the system. From there, the configuration files are automatically transferred to their destination devices.

FireUtils® provides diagnostic, debugging, and event log management tools, and runs on Microsoft Windows 7, 8 and 10. For more information, refer to the **FireUtils®** datasheet.

FireUtils® workstation in use

F220 Specifications

Display 7 inch 800 x 480 pixel colour TFT-LCD

Power Supplies

	Total Current	Charge Current
• 28 Vdc 5 Amp PSU	5 A	2.1 A
• 28 Vdc 11 Amp PSU	11 A	2.1 A

Maximum Battery Size

- 16 U Cabinet 33 Ah
- 28 U Slim Cabinet 40 Ah
- 28 U Deep Cabinet, 40 U Deep Cabinet 55 Ah

Relay Contact Ratings (Resistive Load)

- Fire, Fault, Battery Fault, Disable, General Purpose, GP ASE 2 A @ 30 Vdc
- Door Holder 5 A @ 30 Vdc

Supervised Outputs

- Ancillary Control Function (ACF), O/P 1, O/P 2 2 A @ 28 Vdc
- Warning System, External Bell 5 A @ 28 Vdc

Communication Ports

- External High-Speed RS-485 (data) 115.2 kbit/s
  (power) 1.4 Amp
- External Low-Speed RS-485 (data) 9,600 bit/s
  (power) 1.4 Amp
- RS-232 (auto-adapting) 9.6 or 115.2 kbit/s
- USB USB 2

Analogue Addressable (AA) Loop

- Number of Loops 2 to 20, in 2-loop increments
- Sensors Up to 159 per loop
- Input/output modules, addressable warning devices, or MCPs Up to 99 per loop
- Loop Current Maximum 350 mA
- Loop Resistance Maximum 50 Ω
- Length Up to 2500 metres end to end, with appropriate configuration.

Loop configuration must be verified using the loop calculator at http://www.pertronic.com.au/

Operating Temperature -10 °C to +50 °C
Humidity ≤ 95 % RH, non-condensing

F220 Compliance and Approvals

- Independent laboratory tested to AS 7240-2, AS 7240-4, & AS 4428-3
- Air handling controls (if fitted) comply with AS 1668
- ActivFire listing: afp – 3054

F220 Colour Specification

Item	Colour	Dulux Code
Cabinets and Doors	Off White Ripple	288-97072
Front (Rack) Plates	Arctic White	915-58861
Front Plates (optional)	Apo Grey	915-32786
Weatherproof cabinets also available in Brushed Stainless Steel		

F220 Cabinet Dimensions

	Height mm	Width mm	Depth mm	Protrusion mm
600mm Cabinet, with window & MCP	600	450	155	30 (MCP)
10U Cabinet, with window & MCP	530	550	185	30 (MCP)
13U Cabinet, with window & MCP	645	550	185	30 (MCP)
16U Cabinet, with window & MCP	800	550	185	30 (MCP)
28U Slim Cabinet, with window & MCP	1330	575	290	30 (MCP)
28U Deep Cabinet, with window & MCP	1330	575	385	30 (MCP)
40U Deep Cabinet, with window	1865	575	385	0
16U Weatherproof Cabinet, IP55, with window	800	600	260	30 (Handle)
28U Weatherproof Cabinet, IP55, with window	1330	600	260	30 (Handle)
16U Weatherproof Cabinet, IP65 (no window)	800	600	260	30 (Handle)
28U Weatherproof Cabinet, IP65 (no window)	1330	600	260	30 (Handle)

- Document holder is standard on 16U Cabinet, and optional on other cabinets (except 16U weatherproof.
- Manual call point optional on 40U Deep Cabinet.
- Other cabinet sizes and styles available for special orders.
- Refer to the Weatherproof Cabinets datasheet for more information about weatherproof cabinets.
- Specified depth is measured to front face. Some fittings protrude forward of the front face.
- This datasheet specifies nominal physical dimensions. Actual dimensions may vary slightly.

Weatherproof Cabinets 16U & 28U

F220 Ordering Information

Product Code*	Description
F220-A0.6/5A	F220, 600mm Cabinet with 2 Loops and 5 Amp PSU
F220-A10U/5A	F220, 10U Cabinet with 2 Loops and 5 Amp PSU
F220-A13U/5A	F220, 13U Cabinet with 2 Loops and 5 Amp PSU
F220-A13U/11A	F220, 13U Cabinet with 2 Loops and 11 Amp PSU
F220-A13UEA50/5A	F220, 13U Cabinet with 2 Loops and 50W Amplifier + Mic, 5 Amp PSU
F220-A13UEA50/11A	F220, 13U Cabinet with 2 Loops and 50W Amplifier + Mic, 11 Amp PSU
F220-A16U/5A	F220, 16U with 2 Loops, 5 Amp PSU
F220-A16U/11A	F220, 16U with 2 Loops, 11 Amp PSU
F220-A16UEA50/5A	F220, 16U with 2 Loops, 50W Amplifier + Mic, 5 Amp PSU
F220-A16UEA50/11A	F220, 16U with 2 Loops, 50W Amplifier + Mic, 11 Amp PSU
F220-A16UEA120/11A	F220, 16U with 2 Loops, 120W Amplifier + Mic, 11 Amp PSU
F220-A28U/5A	F220, 28U with 2 Loops, 5 Amp PSU
F220-A28U/11A	F220, 28U with 2 Loops, 11 Amp PSU
F220-A28UEA50/5A	F220, 28U with 2 Loops, 50W Amplifier + Mic, 5 Amp PSU
F220-A28UEA50/11A	F220, 28U with 2 Loops, 50W Amplifier + Mic, 11 Amp PSU
F220-A28UEA120/11A	F220, 28U with 2 Loops, 120W Amplifier + Mic, 11 Amp PSU
F220-A28UEA250/11A	F220, 28U with 2 Loops, 250W Amplifier + Mic, 11 Amp PSU
F220-A28US/5A	F220, 28U Slim with 2 Loops and 5 Amp PSU
F220-A28US/11A	F220, 28U Slim with 2 Loops and 11 Amp PSU
F220-A28USEA50/5A	F220, 28U Slim with 2 Loops, 50W Amplifier + Mic, 5 Amp PSU
F220-A28USEA50/11A	F220, 28U Slim with 2 Loops, 50W Amplifier + Mic, 11 Amp PSU
F220-A28USEA120/11A	F220, 28U Slim with 2 Loops, 120W Amplifier + Mic, 11 Amp PSU
F220-A28USEA250/11A	F220, 28U Slim with 2 Loops, 250W Amplifier + Mic, 11 Amp PSU
F220-A40U/5A	F220, 40U with 2 Loops, 5 Amp PSU
F220-A40U/11A	F220, 40U with 2 Loops, 11 Amp PSU
F220-A40UEA50/5A	F220, 40U with 2 Loops, 50W Amplifier + Mic, 5 Amp PSU
F220-A40UEA50/11A	F220, 40U with 2 Loops, 50W Amplifier + Mic, 11 Amp PSU
F220-A40UEA120/11A	F220, 40U with 2 Loops, 120W Amplifier + Mic, 11 Amp PSU
F220-A40UEA250/11A	F220, 40U with 2 Loops, 250W Amplifier + Mic, 11 Amp PSU

* These product codes specify white front plates. To specify grey front plates, add a suffix "-G" to the product code. For example: F220-A28U/5A-G.

16U

28U 40U

FireMap™

Pertronic FireMap™ is an economical fire system management tool that adds advanced features to any fire system. A FireMap system remotely monitors one or more fire indicating panels via Ethernet connections. Whenever a monitored fire indicating panel originates an alarm:

- FireMap sounds an audible warning and automatically displays a map of the zone that triggered the alarm, with the active zone outlined in red,
- FireMap's status window displays the word "Alarm" and details of the location,
- Fire panels with active alarms are highlighted in red on the FireMap display.
- In Pertronic F220 systems, FireMap's smart icons map the active detectors in red.

FireMap's information storage and retrieval capabilities provide quick and easy access to additional information, including contact information for key personnel, response procedures, and photographs. In Pertronic F220 systems, authorised FireMap users are able to acknowledge alarms, reset devices from alarm mode, and disable or enable devices or zones directly from any FireMap workstation.

F220 Software Features

- Configurable from front panel, USB stick or Personal Computer
- Numeric keypad for rapid information retrieval and efficient front panel configuration
- User definable text descriptors for: sensors, loop devices (modules), zones, logic blocks, AAF/ADF units
- AS 1670.1: 2015-compliant nuisance alarm management facilities: **Alarm Acknowledgement (AAF), Alarm Delay (ADF),** and **Alarm Verification (AVF)**
- Multiple configurable action levels per sensor (with appropriate sensor types)
- Sensor **Pre-Alarm** and **Maintenance** warnings
- Individual sensor dual sensitivity for configurable automatic **Day / Night** operation
- Versatile easy-to-programme **Cause and Effect** features with highly adaptable logic blocks, timers, and AS 1668 fan control blocks
- **Auto-Learn** function for fast loop configuration
- Automatic clock adjustment for daylight saving
- Automatic system test of charger, batteries and sensors. The test may be configured to occur at any one time of the day, on any day(s) of the week
- Fire alarm control panel door interlock switch
- **Memory Lock** switch to write-protect configuration data

Intelligent Sensors	3,180 (max.)
Intelligent Modules	1,980 (max.)
Zones	999
Cause-Effect Logic Blocks	999
Timers	50
AAF/ADF Units	1,200
AS1668 Controls	400
Groups	200
Network Inputs	999
Multiple Unique Panel History Logs	
Main All Event Log	10,000 events
Alarm Log	2,000 events
Pre-Alarm Log	500 events
Fault Log	500 events
Supervisory Log	500 events
Disablement Log	500 events
Disablement Activity Log	500 events
Active Event Log	500 events
System Event Log	500 events
Power Supply Log	5,000 entries

(Each power supply log entry includes: System voltage; Charge voltage & current; Battery voltage; and Temperature.)

Note: In total the panel history logs can store up to 20,500 entries. Logs may be saved to a USB stick or imported to a PC running FireUtils®

0060 F220 Panel Issue 3.3 20180201

F220 Operator Manual

1. INTRODUCTION

The Pertronic F220 is a modular, expandable, analogue addressable automatic fire alarm system designed for medium to large building applications. It is expandable from 2 to 20 addressable loops giving a maximum of up to 3180 addressable smoke or heat detectors plus up to 1980 manual call points, modules, or addressable relays for the system.

The panel uses a 7 inch (180 mm) 800 x 480 pixel colour display to unmistakably identify the panel status. The alarm mode is clearly identified by the use of red status bars, and by using large easy to read text descriptions. Fault information, device disablement information, pre-alarm conditions, walk test, supervisory and system information all have their own unique coloured display screens to provide comprehensive easy to use information for all users including fire brigade personnel, building managers, building owners and service technicians.

A lockable front door provides access to the Keyboard-Display.

The **F220** conforms to Australian Standards AS 7240.2–2004, AS 7240.4–2004 and AS 4428.3–2010.

This Operator Manual is intended for building owners or building managers. It does no describe all functions and system features nor does it cover all menu items. For more information contact your fire alarm system service company.

For building owners/managers, Pertronic Firemap® is recommended for fire alarm system management. Contact your fire alarm system service company for more information.

Figure 1.1 Pertronic F220 Analogue Addressable Fire Alarm Control Panel (16U Cabinet)

2. ANALOGUE ADDRESSABLE LOOP

Detection circuits in the Pertronic F220 fire alarm system use analogue addressable loop architecture. A system may have up to 20 analogue addressable loops. Each loop consists of a single-pair cable connected in a loop, from the loop driver (**A** terminals), to each analogue addressable device in turn, and finally back to the loop driver, (**B** terminals). The loop is effectively driven from both ends. This means that an open circuit fault, anywhere on the loop, will not affect its operation.

Analogue addressable fire system devices include smoke detectors, heat detectors, manual call points, monitor modules, loop responders, and loop relay units. A mixture of device types may be used.

Each loop provides detector addresses 1 to 159 for smoke and heat detectors, and module addresses 1 to 99 for manual call points, relays, loop responders, etc.

Up to 258 devices may be installed on each loop (159 detectors plus 99 modules). Each detector or module must have a unique address. No two detectors can have the same address and similarly no two modules can have the same address.

The zones within a loop are determined by the premises layout and the routing of the loop wiring. Each zone is allocated a zone number and can be allocated a 31 character zone description.

The F220 detects loop faults by performing a continuity test before each loop poll sequence. Loop isolators are used between zones to prevent more than one zone being lost in the event of a loop short-circuit.

Figure 2.1 illustrates a system with two analogue addressable loops, showing detectors (D), modules (M), isolators (ISO) and a typical device labelling scheme.

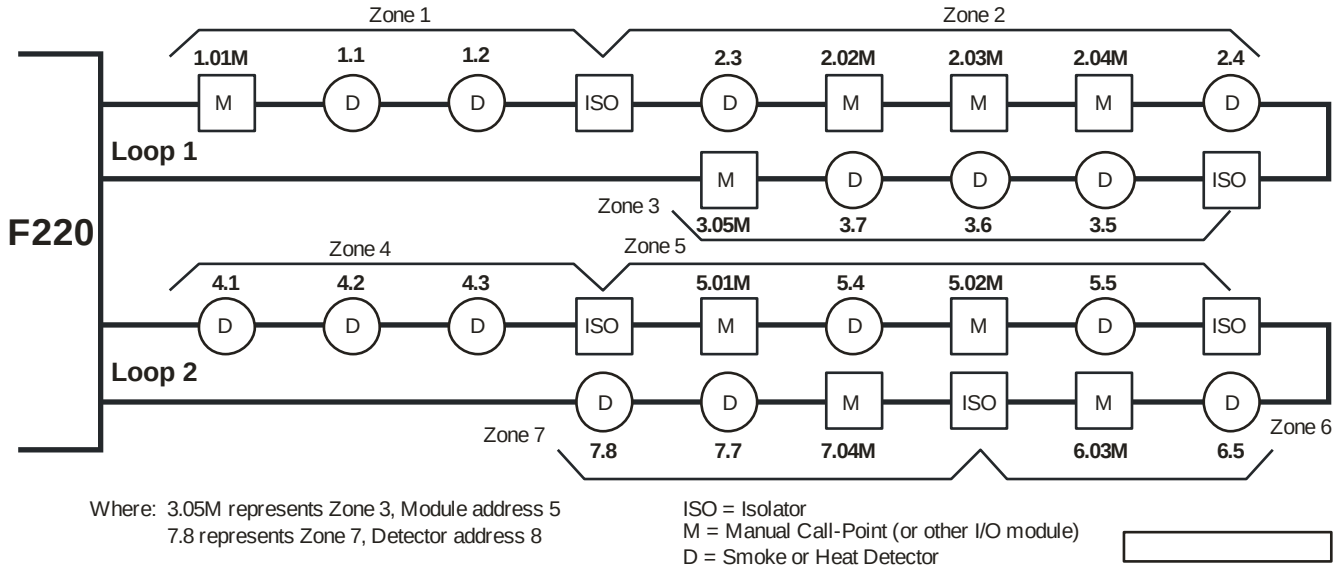


Figure 2.1: Typical Device Labelling

3. F220 FRONT PANEL

The front panel of the **F220** contains an 800 x 480 pixel colour alphanumeric LCD display.

The display is within the **Fire Brigade Panel** (enclosed by a red border), together with push-button controls and LED indicators.

Outside the **Fire Brigade Panel**, additional engineering push-button controls and LED indicators are available for use by the building manager and fire alarm engineers.

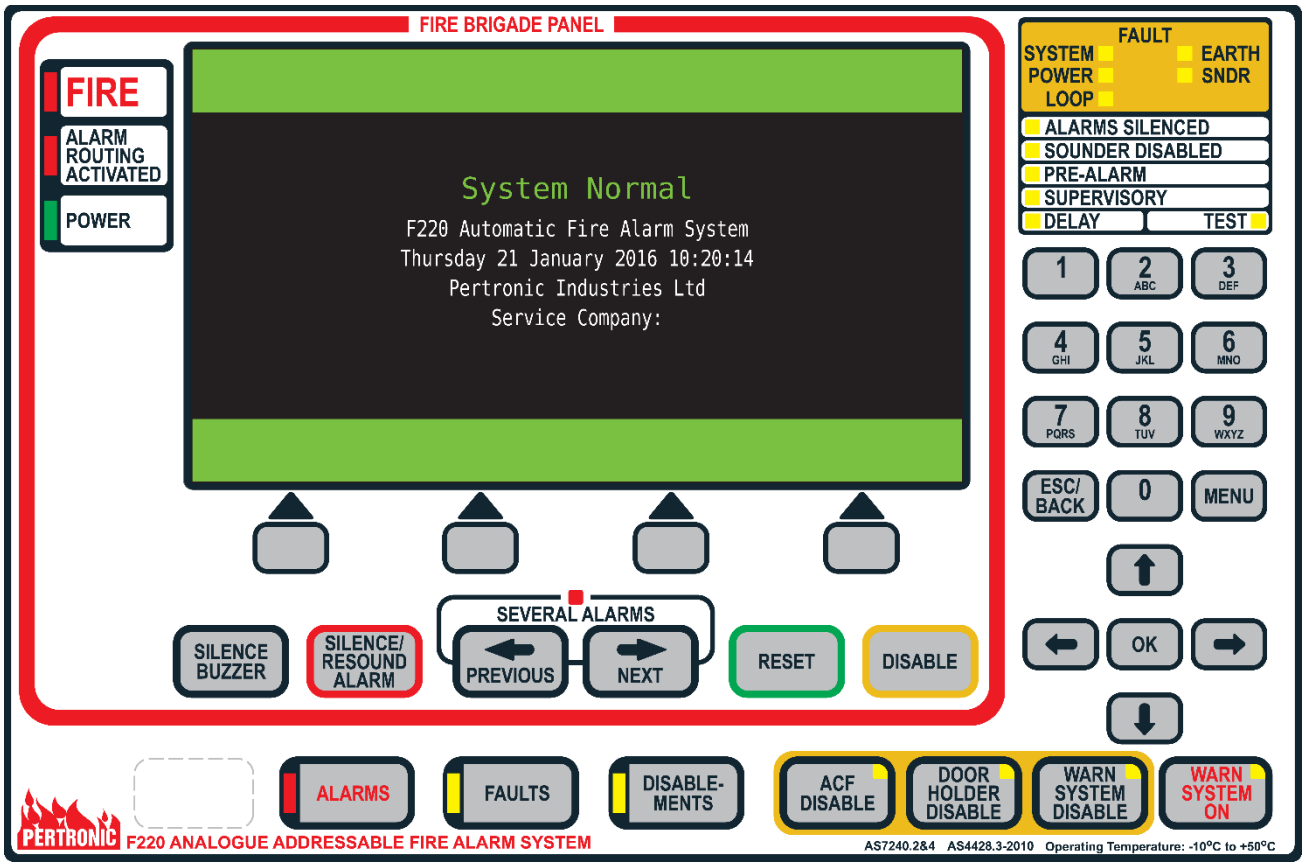


Figure 3.1: F220 Front Panel

4. ALPHANUMERIC LCD DISPLAY

4.1 Event Display and Event Queues

Whenever an event occurs on the F220 system it is placed into one of the queues in the table below. The queues are colour coded on the display.

Queue		Contains / example	Priority
Fire	**Fire**	Devices in Alarm	Highest
Walk Test	**Walk Test**	Zones that have “Walk Test” alarms	
Pre-Alarm	**Pre-Alarm**	Detectors that are very near the alarm threshold	
Fault	**Fault**	Contains all panel faults such as “double address”, missing devices, power supply faults, system faults, loop faults earth faults, sounder faults	
Disablement	**Disablement**	All devices and zones that have been disabled	
Supervisory	**Supervisory**	Outputs of systems monitoring suppression systems , air handling systems or other life, safety or property protection systems.	
System Events	**System Events**	An event which is not related to the function of the system, that affects the system's ability to perform it's function.	
Active Events	**Active Events**	Typically inputs from monitoring devices that are “off normal”.	Lowest
System Normal	**System Normal**	Normal View (no events in any queue).	

An event queue that contains an event is deemed active and the event queue with the highest priority will be displayed. If other queues are active with lower priority events this will be indicated by the appropriate LED indicator and the user can view these if required.

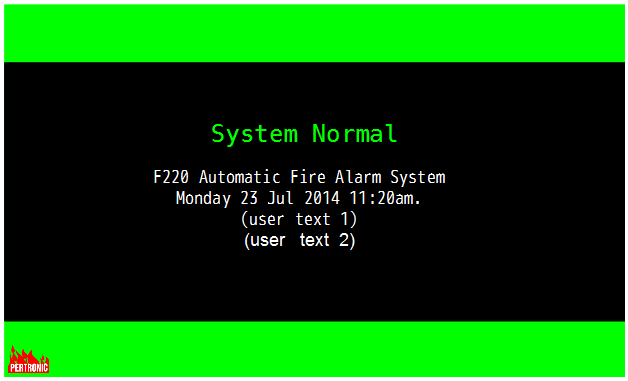
The user may switch between active queue displays by repeatedly pressing the **OK** button.

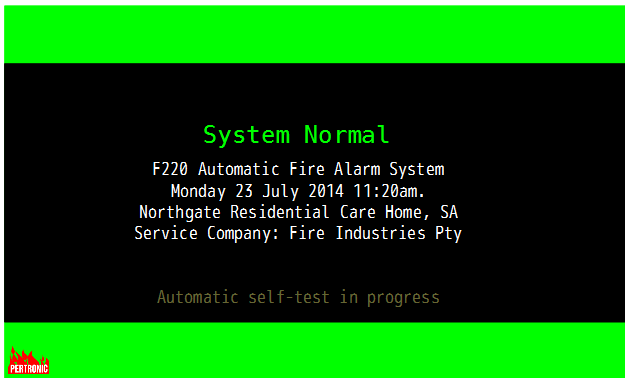
The “Fire” queue contains devices in alarm. If all the alarms have been either reset or disabled the “Fire” queue becomes inactive.

4.2 Normal / Date-Time Display

When the F220 is Normal the following screen is displayed showing date / time and two lines of user text. A variant of the Normal screen is also shown when the system is performing background testing.

These displays may also appear after 10 minutes of no keypad activity.

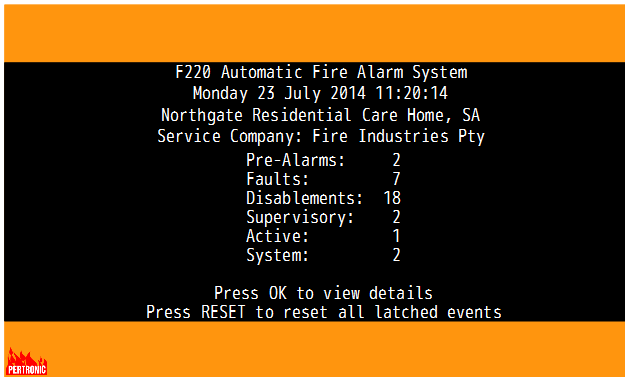




4.3 System Off-Normal Display

This display will occur if activity is present in the system that is not an alarm or the system is not in Walk test. The colour of the band at the top and bottom of this Off-Normal summary display will be that of the highest priority event being reported.

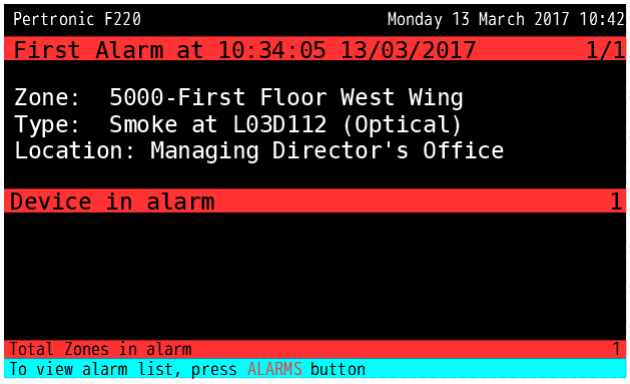
The example shown here has “orange” pre-Alarm bands showing.

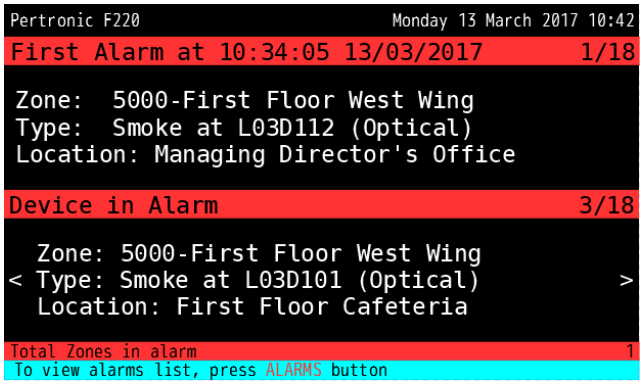


4.4 Fire Alarm Display

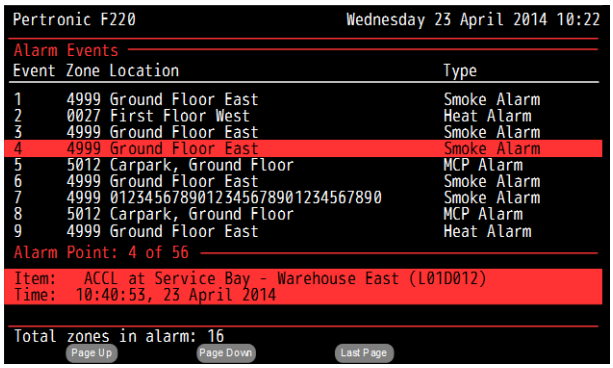
The First Alarm present on the CIE is always presented at the top of the display and remains until the system has been reset.

Any subsequent alarms that occur are displayed below first alarm and multiple subsequent alarms can be displayed using Previous or Next keys of the Several Alarms function.





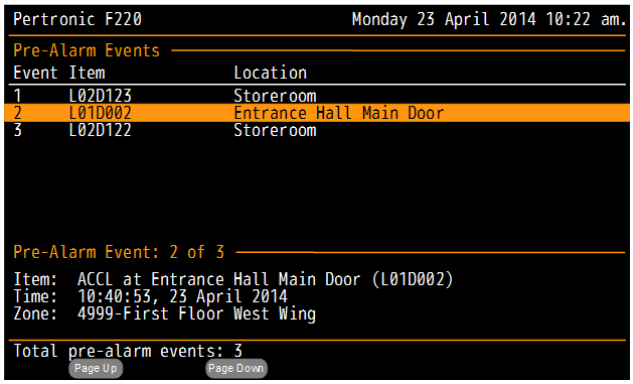
Whenever alarms are present the “Alarms” LED will be ON indicating that users can press the associated key to view details of all points that currently are in alarm (“points” includes: devices, logic blocks, timers etc.).



In the example shown there are a total of 56 points in alarm (“points” includes: devices, logic blocks, timers etc.) and these can be viewed by using the Page Up or Page Down soft keys. Select a particular event using the keyboard ↑ or ↓ keys.

4.5 Pre-Alarm List Display

The Pre-Alarm list will be displayed if it is the highest priority active queue. If alarms are present as well these will have priority and the presence of Pre-Alarms is indicated by the Pre-Alarm LED turning **ON**—press the **OK** key to view the Pre-Alarm list.



Pre-Alarm events can be selected using the keyboard ↑ or ↓ keys and once selected can be **Reset** or **Disabled**

Use Page Up or Page Down soft keys to view information not currently on-screen.

5. FRONT PANEL INDICATORS AND CONTROLS

5.1 Fire Brigade Panel (AS 4428.3-2010)

The red border as shown in Figure 3.1: F220 Front Panel encloses the Fire Brigade Panel.

5.1.1 Fire Brigade Panel Indicators

Indicator	Function	Colour	Description
	FIRE	Red	General **Fire Alarm** Indicator.
	Alarm Routing Activated	Red	Indicator for transmitted alarm routing equipment activated. Remains **ON** until the **fire alarm** condition is reset.
	Power	Green	**ON** when mains or battery power is available.
	Several Alarms	Red	Indicator for several alarms. **ON** if three or more devices are in alarm.

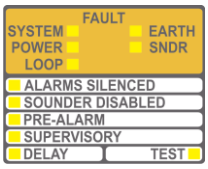
5.1.2 Fire Brigade Panel Controls

Control	Function
Silence Buzzer	Press to Silence the CIE alarm / fault buzzer. Note: Buzzer resounds for new Alarms
Silence / Resound Alarm	Press to Silence sounder devices or Resound alarm devices if the “Alarms Silenced” indicator is **ON**—toggle action.
Previous, Next (Several Alarms)	Scroll keys used to view devices in alarm. The scroll keys will only have effect if if three or more devices are in alarm.
Reset	Press to Reset the fire alarm panel to its Normal condition. Any faults remaining after the CIE has reset will be re-established within 20 seconds.
Disable	Press to disable the zone in Alarm. Also can be used to return devices that were “disabled” to their Normal state.

5.2 Engineering Indicators and Controls

The indicators and controls outside the Fire Brigade Panel are for the use of the building owner, manager or service and maintenance personnel. These are shown in Figure 3.1: F220 Front Panel.

5.2.1 Engineering Indicators

Function	Colour	Description
Alarm	Red	Indicates that devices are in alarm and can be viewed by pressing the associated key.
Fault (Common Fault)	Yellow	Common fault indicator. ON whenever any fault is present on the system. In addition one or more fault category indicators will also be ON.
Disablements	Yellow	Indicates that devices are disabled. Disablements can be viewed on the display pressing the associated key.
		
System	Yellow	**ON** if the internal system software is not running properly
Earth	Yellow	**ON** when an earth fault is detected by the CIE
Power	Yellow	**ON** when there is a power fault with the CIE or devices connected to the loop eg Mains missing, battery test failure
Sndr (Sounder)	Yellow	**ON** when a sounder fault is present eg wiring open or short
Loop	Yellow	**ON** when a fault is related to a device on the loop or loop wiring (open, short, isolator…)
Alarms Silenced	Yellow	**ON** if alarm devices have been silence by operation of “Silence / Resound Alarm”
Sounder Disabled	Yellow	**ON** if Warning System devices have been disabled
Pre-Alarm	Yellow	**ON** when detectors have gone off-normal and potentially could soon go into an Alarm state
Supervisory	Yellow	**ON** when a supervisory input is in the active state.
Delay	Yellow	**ON** when one or more output circuits are in a delayed operating mode
Test	Yellow	**ON** when one or more zones are in Walk Test mode

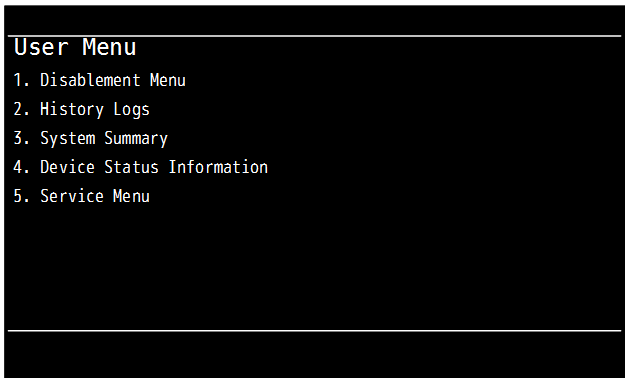
5.2.2 Engineering Controls

Control	Function
Alarms	Press to view a list of all points that are currently in Alarm state (“points” includes: devices, logic blocks, timers etc.)
Faults	Press to view a list of all current fault events
Disablements	Press to view a list of all devices currently disabled
ACF Disable	Press to toggle the disable state of **ACF** type devices (such as fan controllers or other equipment)
Door Holder Disable	Press to toggle the disable state of **Door Holder** type devices (prevents door release)
Warn System Disable	Press to toggle the disable state of **Warning System**
Warn System On	Press to turn **ON** or **OFF** the building **Warning System** (manual evacuation)
Function Keys	These four keys select the soft-key functions displayed at the bottom of the display (often ‘page-up’ and ‘page-down’)
OK key	Used to select a highlighted menu item.
Menu key	Used to open and exit User Menus.
Navigation Keys	Used to move between “fields” while viewing lists or “editing” functions. Can also be used to move a highlight in menus.
Numeric Keys	Can be used to make a menu selection and in some menus when a numeric value is required e.g. entering a zone number

6. USER MENU OPERATIONS

The User Menu is used for accessing functions such as Disablement functions, History Logs, System Summary, Device Status Information and Service Menu. Not all menu items are described but the user interface for most user menu items is similar.

The First Level User Menu is reached by pressing the **Menu Key** followed by the **numeric key** corresponding to the sub-menu option required.



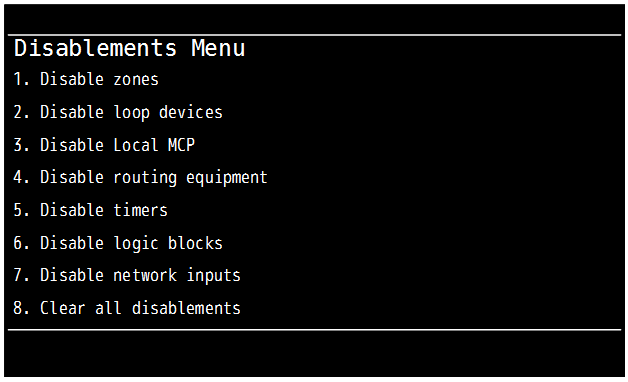
6.1 User Menu-Disablements menu (Option 1)

Press the corresponding numeric key to select the Disablement type required.

Disablements will leave parts of the alarm system inoperative.

Disablements should only be made by those authorised to do so and should be removed as soon as is practicable.

Disablements are useful for faulty sensors that are causing false alarms or where building maintenance activity, such as welding, may cause a false alarm. In either case, full function must be restored as soon as is practicable.



6.1.1 Disable Loop devices (Option 2)

Move between Loop and Detector/Module fields using the left / right arrow key.

Enter loop number either by using up/down arrow keys or numeric keypad.
Select between Detector/Module using up/down arrow keys.
Enter Detector/Module number either by using up/down arrow keys or numeric keypad.
Press the disable key to disable/enable the device.

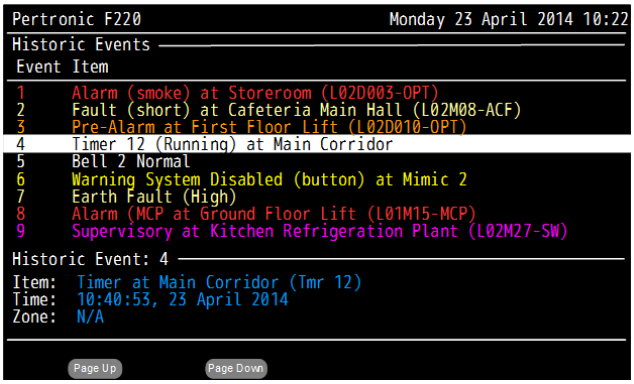
6.1.2 Clear All disablements

Pressing “8” will bring up confirmation or cancel soft-key labels as shown below.

6.2 User Menu-History Logs (Option 2)

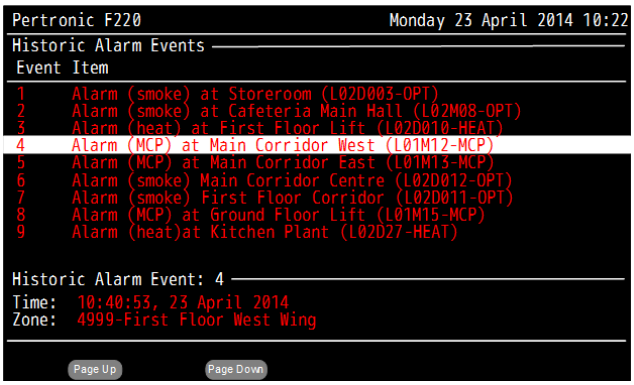
6.2.1 Main Log (Option 1)

Shows all logged events in order of occurance.



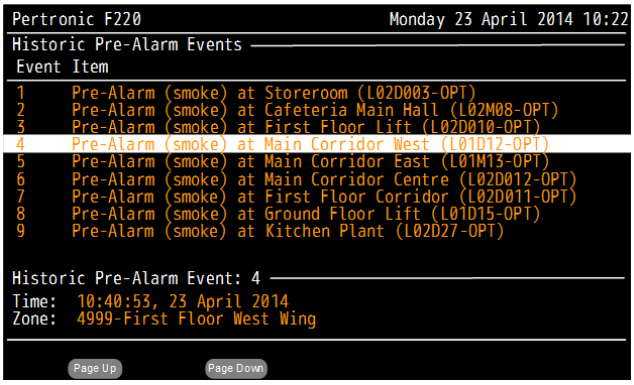
6.2.2 Alarm Log (Option 2)

Shows the Alarm log only.



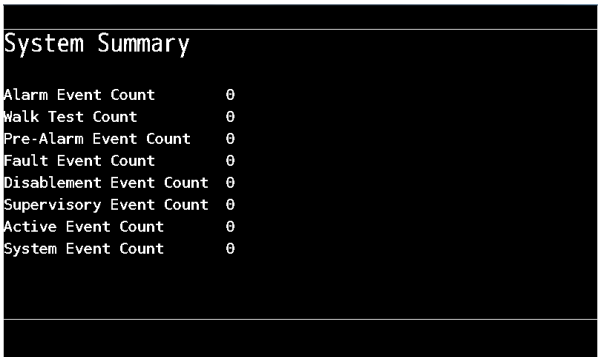
6.2.3 Pre-Alarm Log (Option 3)

Shows the Pre-Alarm log only.



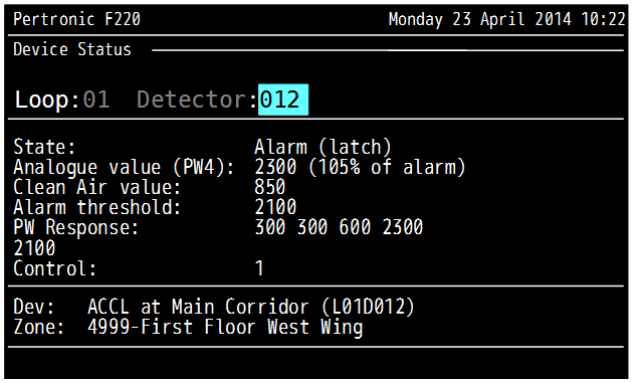
6.3 User Menu-System Summary (Option 3)

Shows a summary list of system events.



6.4 User Menu-Device Status / Test (Option 4)

Individual device status can be displayed.



7. OTHER SYSTEM FEATURES

7.1 Evacuation Test

The push-button labelled **WARN SYSTEM ON**, located on the front panel is provided to operate the External Bell and Warning System.

Operation of the **WARN SYSTEM ON** control located at mimic panels will also carry out the Evacuation Test function at the **F220**.

7.2 Buzzer (Internal Sounder)

The Buzzer is activated when any alarm or fault condition is active. The Buzzer will sound with the following cadences:

ALARM- Rapid ON / OFF

FAULT- ON continuous.

Pressing the SILENCE BUZZER key will silence the buzzer however it will re-sound if a new ALARM or FAULT condition is detected.

Pressing any push-button on the front panel (usually Enter) silences the sounder, as well as performing the action associated with that push-button.

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SECTION 8

TECHNICAL DATA

8.1 FIRE SPRINKLER COMPONENTS

Bulletin 014 March 2019

Reliable®

Model F1FR Series Quick Response Glass Bulb Sprinklers

Model F1FR56 Sprinkler Types

Standard Spray Upright
Standard Spray Pendent
Conventional Upright/Pendent
Vertical Sidewall
Horizontal Sidewall

Model F1FR56 Recessed Sprinkler Types

Standard Spray Pendent
Horizontal Sidewall

Model F1FR56 Concealed Sprinkler Types

Standard Spray Pendent

Model F1FR42, F1FRXLH & F1FR28 Sprinkler Types

Standard Spray Upright
Standard Spray Pendent

Model F1FR40 Sprinkler Types

Standard Spray Pendent

Model F1FR42, F1FR40, F1FRXLH & F1FR28 Recessed Sprinkler Types

Standard Spray Pendent

Model F1FR56LL & F1FR42LL Low Lead Sprinkler Types

Standard Spray Pendent with less than 0.25% Lead Content

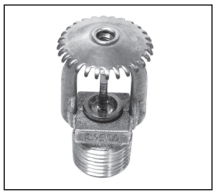
Listing & Approvals

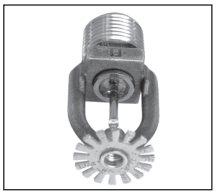
The following organizations provide Listings or Approvals for various Model F1FR series sprinklers. See the Design and Installation table in this Bulletin for information on specific listings and approvals applicable to each sprinkler.

1. Underwriters Laboratories Inc. and Certified for Canada (cULus) in accordance with ANSI/UL199.
2. FM Approvals (FM)
3. Loss Prevention Certification Board (LPCB)
4. VdS Schadenverhütung GmbH (VdS)
5. Underwriters Laboratories Inc. and Underwriters Laboratories of Canada Certified for Health Effects to NSF/ANSI Standard 61 Annex G (ULH)
6. EC Certificate: 0786-CPD-40239 (RA1414), 0786-CPD-40251 (RA1425), 0786-CPD-40252 (RA1475) (EC)

UL Listing Category

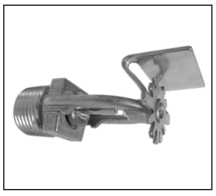
Sprinklers, Automatic & Open (VNIV)
Quick Response Sprinkler


Upright

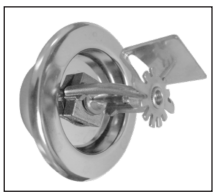

Pendent

Conventional

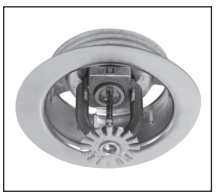
Vertical Sidewall

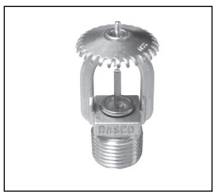

Horizontal Sidewall

Recessed Pendent/F1/F2


Recessed Horizontal Sidewall

Concealed Pendent


Recessed Pendent/FP


XLH Upright

XLH Pendent

XLH Recessed Pendent F1/F2

XLH Recessed Pendent FP

Product Description

Reliable Model F1FR series sprinklers are quick-response automatic sprinklers with a glass bulb thermal element. Model F1FR series sprinklers are Standard Spray sprinklers, with the exception of the Model F1FR56 Conventional sprinkler which is an Old-style/Conventional sprinkler.

The Model F1FR Series automatic sprinklers utilize a 3.0 mm frangible glass bulb. These sprinklers have demonstrated response times in laboratory tests which are five to ten times faster than standard response sprinklers. This quick response enables the Model F1FR Series sprinklers to apply water to a fire faster than standard-response sprinklers of the same temperature rating.

The glass bulb consists of an accurately controlled amount of special fluid hermetically sealed inside a precisely manufactured glass capsule. This glass bulb is specially constructed to provide fast thermal response.

At normal temperatures, the glass bulb contains the fluid in both the liquid and vapor phases. The vapor phase can be seen as a small bubble. As heat is applied, the liquid expands, forcing the bubble smaller and smaller as the liquid pressure increases. Continued heating forces the liquid to push out against the bulb, causing the glass to shatter, opening the waterway and allowing the deflector to distribute the discharging water.

Model F1FR Series sprinklers provide a wide range of options where quick-response, glass bulb sprinklers are used:

- Pendent, recessed pendent, upright, horizontal sidewall, and vertical sidewall deflectors
- K-factors of 2.8 (40 metric), 4.0 (57 metric), 4.2 (60 metric), and 5.6 (80 metric)
- Flush, recessed, and concealed installations

See the Design and Installation Information table in this Bulletin for information on the approvals and availability of specific Model F1FR series sprinkler configurations.

Model F1FR Recessed Pendent and Recessed Horizontal Sidewall sprinklers are required to be used with Reliable Model F1, F2, or FP recessed escutcheons. See the Recessed Escutcheon Data table in this Bulletin for listing and approval information with each specific Model F1FR series sprinkler. Model F1 and F2 recessed escutcheons, shown in Fig. 1 and 3, are a friction fit assembly allowing for 3/4-inch (19mm) and 1/2-inch (12.7mm) of adjustment, respectively. Model FP recessed escutcheons, shown in Fig. 2, provide a 1/2-inch (12.7mm) threaded adjustment.

Model F1FR56 Concealed Pendent and Model F1FR56LL Concealed Pendent sprinklers are required to be used with Model CCP cover plates. A standard profile Model CCP cover plate is available that provides up to 1/2-inch (12.7mm) of cover plate adjustment. In addition, a low profile Model CCP cover plate is also available that provides up to 5/16-inch (8.0mm) of cover plate adjustment. See the Design and Installation Information and Listed and Approved Temperature Ratings tables in this Bulletin for further information on approved cover plate options.

Application

Model F1FR Series sprinklers are intended for use in accordance with NFPA 13, FM Property Loss Prevention Data Sheets, and the requirements of the Authority Having Jurisdiction. Care must be exercised that the k-factor, temperature rating, deflector style, and sprinkler type are in accordance with the requirements of the applicable design and installation standards. In addition, Model F1FR Series sprinklers must be used in accordance with their listings and approvals, as well as the information provided in this Bulletin.

Installation

Glass bulb sprinklers have orange bulb protectors or protective caps to minimize bulb damage during shipping, handling and installation. Reliable sprinkler installation wrenches are designed to install sprinklers with bulb protectors in place. Remove the bulb protector at the time when the sprinkler system is placed in service for fire protection. Removal of the bulb protector before this time may leave the bulb vulnerable to damage. Remove bulb protectors by undoing the clasp by hand. Do not use tools to remove bulb protectors.

Model F1FR Series sprinklers must be installed with the Reliable sprinkler installation wrench identified in the Design and Installation Information table in this Bulletin. Any other wrench may damage the sprinkler. A leak tight sprinkler joint can be obtained with a torque of 8 to 18 lb-ft (11 to 24 N-m). Do not tighten sprinklers over the maximum recommended installation torque. Exceeding the maximum recommended installation torque may cause leakage or impairment of the sprinkler.

Recessed Sprinklers

Model F1FR Series Recessed sprinklers are to be installed as shown in Fig. 1, Fig. 2, or Fig. 3, as applicable to the specific model being installed. The Recessed Escutcheon Data table in the Bulletin identifies the only recessed escutcheons that are permitted to be used with each Model F1FR Series Recessed sprinkler. The use of any other recessed escutcheon will void all approvals and negate all warranties.

Concealed Sprinklers

Model F1FR Series Concealed Pendent sprinklers are to be installed as shown in Fig. 4 or Fig. 5, as applicable to the selected cover plate. Model F1FR56 Concealed Pendent and Model F1FR56LL Concealed Pendent sprinklers have a factory-installed Model CCP cup. A protective cap is installed at the factory that should remain on the sprinkler until the sprinkler is installed and should then be reinstalled on the sprinkler until the cover plate is installed. The concealed sprinkler assemblies are completed by the installation of a Model CCP push-on/thread-off cover plate assembly. The cover plate and sprinkler cup assemblies are joined using a cover plate skirt with flexible tabs for threaded engagement. A choice of two Model CCP cover plate assemblies provides either 1/2-inch (13mm) or 5/8-inch (8mm) of cover adjustment. Do not install Model F1FR Series Concealed Pendent sprinklers in ceilings which have positive pressure in the space above.

Model F1FR Series Concealed Pendent sprinklers require a 2-5/8-inch (67mm) diameter hole to be cut in the ceiling. The Model GFR2 wrench is used to engage the sprinkler wrenching surfaces and to install the sprinkler in the fitting. Remove the protective cap to install the sprinkler, then reinstall the protective cap until the cover plate is installed. When inserting or removing the wrench from the sprinkler/cup assembly, care should be taken to prevent damage to the sprinkler. Do not wrench any other part of the sprinkler/cup assembly. Installation is completed by removing the protective cap from the sprinkler and pushing the cover plate onto the cup. Final adjustment is made by hand turning the cover plate until the skirt flange makes full contact with the ceiling. Cover plate removal requires turning the cover plate in the counter clockwise direction. After installation, inspect all sprinklers to ensure that there is a gap between the cover plate and ceiling and that the four cup slots are open and free from any air flow impediment to the space above.

Concealed cover plate/cup assemblies are listed only for use with specific sprinklers. The use of any concealed cover plate/cup assembly other than the Reliable Model CCP with Model F1FR56 Concealed Pendent and Model F1FR56LL Concealed Pendent sprinklers or the use of the Model CCP Concealed cover plate assembly on any sprinkler with which it is not specifically listed my prevent good fire protection and will void all guarantees, warranties, listings and approvals.

Technical Data:

Sensitivity: Quick-response
Thread Size: 1/2-inch NPT standard; ISO 7-R1/2 optional
Maximum Working Pressure: 175 psi (12 bar) - 100% Factory tested hydrostatically to 500 psi (34.5 bar)
SIN RA1425, RA1414 & RA1435 cULus listed for 250 psi (17 bar)

Design and Installation Information											
Model	Nominal K-factor		Nominal Orifice Diameter		Deflector/ Orientation	Nominal Sprinkler Height		Installation Wrench	SIN	Listings and Approvals	Approval Notes
	US	Metric	inches	mm		inches	mm				
F1FR28	2.8	40	3/8	10	Pendent	2.25	57	W2	RA1411	cULus	2
					Recessed Pendent	2.25	57	GFR2	RA1411	cULus	2
					Upright	2.25	57	W2	RA1421	cULus	1,2
F1FR40	4.0	57	3/8	10	Pendent	2.25	57	W2	RA1418	VdS	
					Recessed Pendent	2.25	57	GFR2	RA1418	VdS	
F1FR42	4.2	60	7/16	10	Pendent	2.25	57	W2	RA1413	cULus	2
					Recessed Pendent	2.25	57	GFR2	RA1413	cULus	2
					Upright	2.25	57	W2	RA1423	cULus	1,2
F1FR42LL	4.2	60	7/16	10	Pendent	2.25	57	W2	RA1410	cULus, ULH	
					Recessed Pendent	2.25	57	GFR2	RA1410	cULus, ULH	
F1FRXLH (F1FR42 with Pintle)	4.2	60	7/16	10	Pendent	2.25	57	W2	RA1413	cULus	2
					Recessed Pendent	2.25	57	GFR2	RA1413	cULus	2
					Upright	2.25	57	W2	RA1423	cULus	1,2
F1FR56	5.6	80	1/2	15	Pendent	2.25	57	W2	RA1414	cULus, FM, LPCB, VdS, EC	1,2,3,4
					Recessed Pendent	2.25	57	GFR2	RA1414	cULus, FM, LPCB, VdS, EC	1,2,3,4
					Concealed Pendent	2.25	57	GFR2	RA1414	cULus,VdS,EC	5,6
					Upright	2.25	57	W2	RA1425	cULus, FM, LPCB, VdS, EC	1,2,3,4
					"Conventional (Pendent or Upright)"	2.25	57	W2	RA1475	LPCB, VdS, EC	4
F1FR56LL	5.6	80	1/2	15	Pendent	2.25	57	W2	RA1415	cULus, ULH	1
					Recessed Pendent	2.25	57	GFR2	RA1415	cULus, ULH	
					Concealed Pendent	2.25	57	GFR2	RA1415	cULus, ULH	6
F1FR56	5.6	80	1/2	15	Horizontal Sidewall	2.63	67	W2	RA1435	cULus, FM	1,2,3,7
					Recessed Horizontal Sidewall	2.63	67	GFR2	RA1435	cULus, FM	8
F1FR56	5.6	80	1/2	15	Vertical Sidewall (Pendent or Upright)	2.25	57	W2	RA1485	cULus, FM, LPCB	1,2,3,9

(1) cULus Listed Corrosion Resistant sprinkler when ordered with available Polyester coating.
(2) cULus Listed Corrosion Resistant sprinkler when ordered with available Electroless Nickel PTFE plating.
(3) Available with FM approved Polyester coating in black or white.
(4) Available with LPCB and VdS approved Polyester coating.
(5) VdS and EC approvals of the F1FR56 Concealed Pendent sprinkler are for 155°F (68°C) temperature rated sprinklers only. VdS approved sprinklers must use Norbulb brand glass bulbs with the 1/2-inch (12.7mm) adjustment Model CCP cover plate only.
(6) Model F1FR56 Concealed Pendent and Model F1FR56LL Concealed Pendent sprinklers must be used with Reliable Model CCP cover plates, available as either standard depth with 1/2-inch (12.7mm) of adjustment or low profile with 5/16-inch (8.0 mm) of adjustment.
(7) cULus Listing of the F1FR56 Horizontal Sidewall sprinkler is for Light and Ordinary Hazard occupancies only. Minimum to maximum deflector to ceiling distance shall be 4 inches to 12 inches (102mm to 305mm). FM Approval of the F1FR56 Horizontal Sidewall sprinkler is for Light Hazard occupancies only.
(8) cULus Listing and FM Approval of the F1FR56 Recessed Horizontal Sidewall sprinkler is for Light Hazard occupancies only.
(9) The F1FR56 Vertical Sidewall sprinkler is listed and approved for use only in Light Hazard occupancies. LPCB approval of the F1FR56 Vertical Sidewall sprinkler is for installation in the Pendent position only.

Listed and Approved Temperature Ratings

Model	Deflector/ Orientation	Ordinary Temp. Classification 100°F (38°C) Max. Ambient Temp.		Intermediate Temp. Classification 150°F (65°C) Max. Ambient Temp.		High Temp. Classification 225°F (107°C) Max. Ambient Temp.
		135°F (57°C) Temp. Rating	155°F (68°C) Temp. Rating	175°F (79°C) Temp. Rating	200°F (93°C) Temp. Rating	286°F (141°C) Temp. Rating
		Orange Bulb	Red Bulb	Yellow Bulb	Green Bulb	Blue Bulb
F1FR28	Pendent	cULus				
	Recessed Pendent	cULus				--
	Upright	cULus				
F1FR40	Pendent	VdS				
	Recessed Pendent	VdS				--
F1FR42	Pendent	cULus				
	Recessed Pendent	cULus				--
	Upright	cULus				
F1FR42LL	Pendent	--			cULus, ULH	--
	Recessed Pendent	--			cULus, ULH	--
F1FRXLH	Pendent	cULus				
	Recessed Pendent	cULus				--
	Upright	cULus				
F1FR56	Pendent	cULus, FM, LPCB, VdS, EC				
	Recessed Pendent	cULus, FM, LPCB, VdS, EC				--
	Concealed Pendent*	cULus	cULus,VdS,EC	cULus		--
	Upright	cULus, FM, LPCB, VdS, EC				
	"Conventional (Pendent or Upright)"	LPCB, VdS, EC				
F1FR56LL	Pendent	--			cULus, ULH	--
	Recessed Pendent	--			cULus, ULH	--
	Concealed Pendent*	--			cULus, ULH	--
F1FR56	Horizontal Sidewall	cULus, FM				
	Recessed Horizontal Sidewall	cULus, FM				--
F1FR56	Vertical Sidewall (Pendent or Upright)	cULus, FM, LPCB				

* Model F1FR56 Concealed Pendent and F1FR56LL Concealed Pendent sprinklers must be used with Reliable Model CCP cover plates. For Ordinary Temperature Classification sprinklers use a 135°F (57°C) temperature rated cover plate. For Intermediate Temperature Classification sprinklers use a 165°F (74°C) temperature rated cover plate.

Recessed Escutcheon Data

Model	Deflector/ Orientation	Listed and Approved Recessed Escutcheons			SIN
		Model F1 (Fig. 1 & 3) 3/4-inch (19mm) adjustment	Model F2 (Fig. 1 & 3) 1/2-inch (12.7mm) adjustment	Model FP (Fig. 2) 1/2-inch (12.7mm) adjustment	
F1FR28	Recessed Pendent	cULus	cULus	cULus	RA1411
F1FR40	Recessed Pendent	VdS	VdS	VdS	RA1418
F1FR42	Recessed Pendent	cULus	cULus	cULus	RA1413
F1FR42LL	Recessed Pendent	cULus, ULH	cULus, ULH	cULus, ULH	RA1410
F1FR42XLH	Recessed Pendent	cULus	cULus	cULus	RA1413
F1FR56	Recessed Pendent	cULus, LPCB, VdS, EC	cULus, FM, LPCB, VdS, EC	cULus, VdS, EC	RA1414
F1FR56LL	Recessed Pendent	cULus, ULH	cULus, ULH	cULus, ULH	RA1415
F1FR56	Recessed Horizontal Sidewall	cULus	cULus, FM	cULus	RA1435

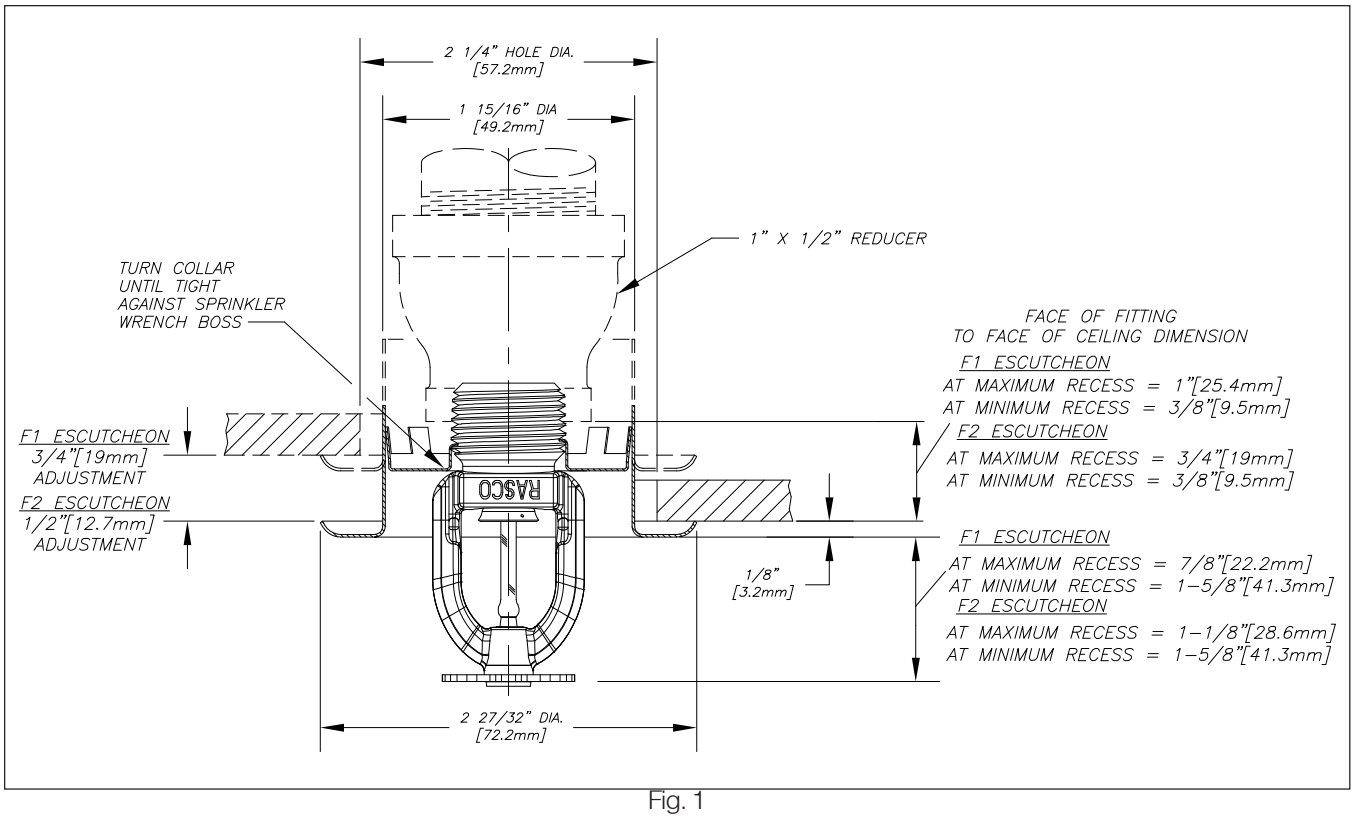


Fig. 1
Model F1FR56, F1FR56LL, F1FR42, F1FR40, F1FR42LL, F1FRXLH & F1FR28
Recessed Pendent sprinkler with Model F1 or F2 escutcheon

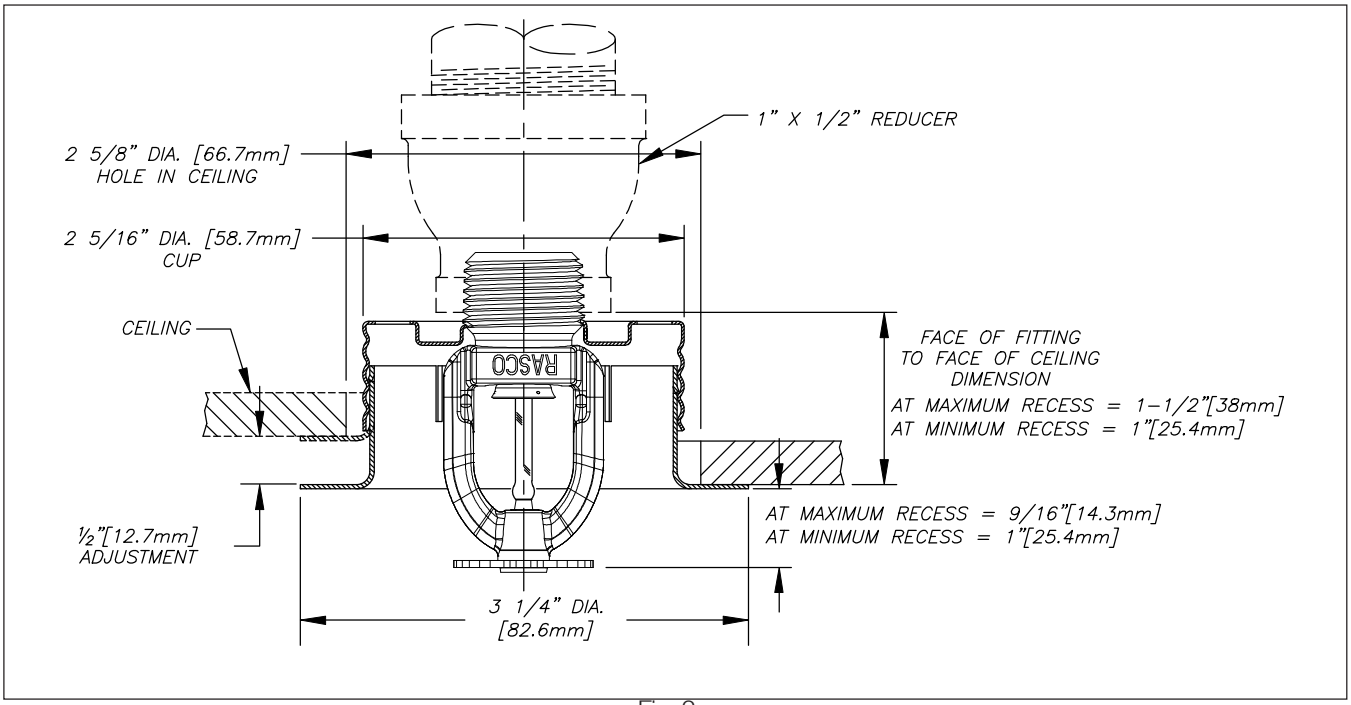


Fig. 2
Model F1FR56, F1FR56LL, F1FR42, F1FR40, F1FR42LL, F1FRXLH & F1FR28
Recessed Pendent sprinkler with Model FP escutcheon

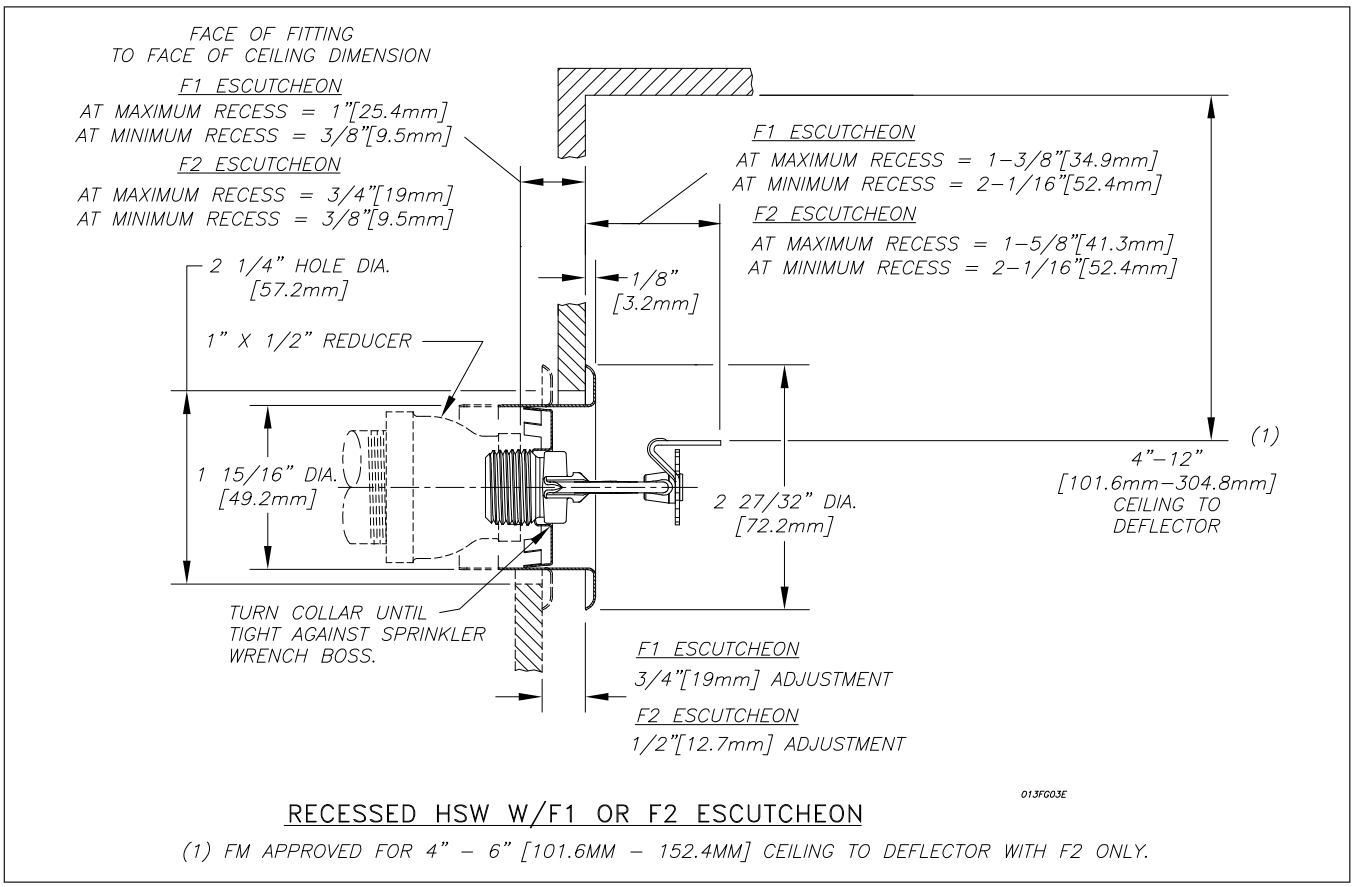


Fig. 3
Model F1FR56 Recessed Horizontal Sidewall sprinkler with Model F1 or F2 escutcheon

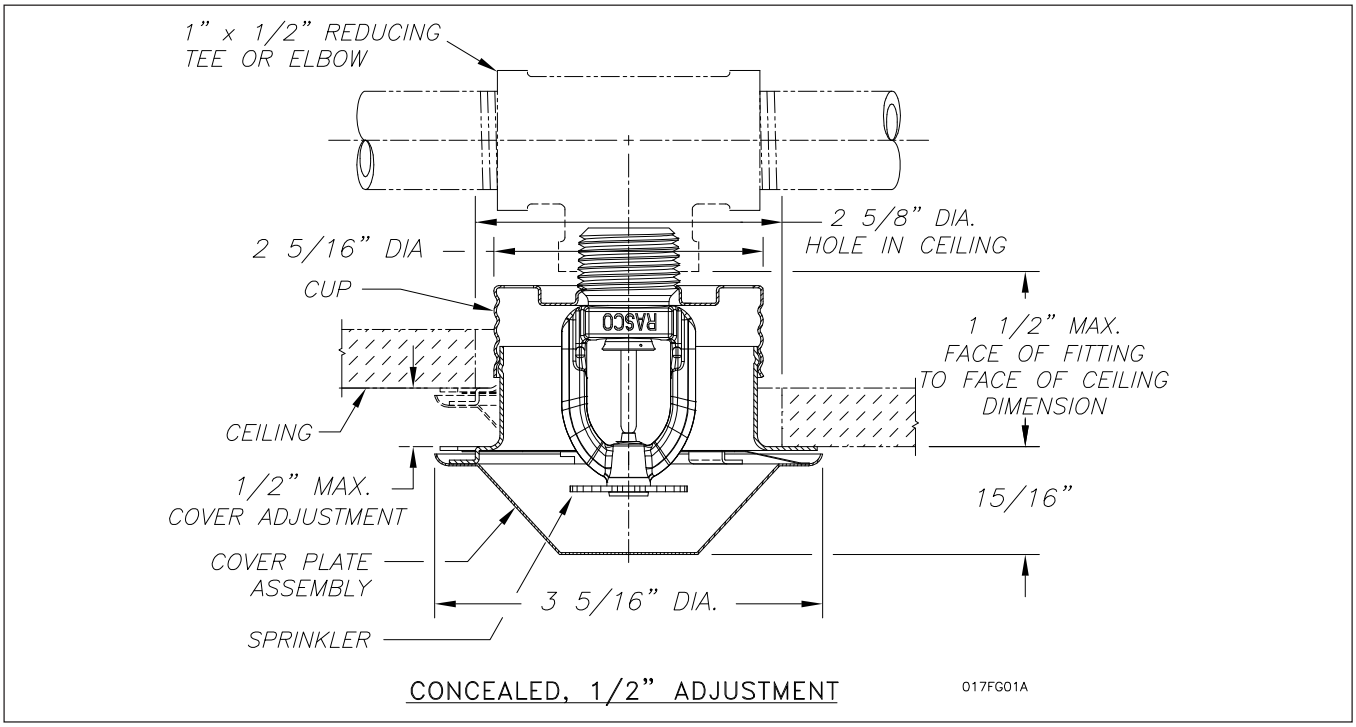


Fig. 4
Model F1FR56/F1FR56LL Concealed Pendent sprinkler with standard depth
1/2-inch (12.7mm) adjustment - Model CCP cover plate

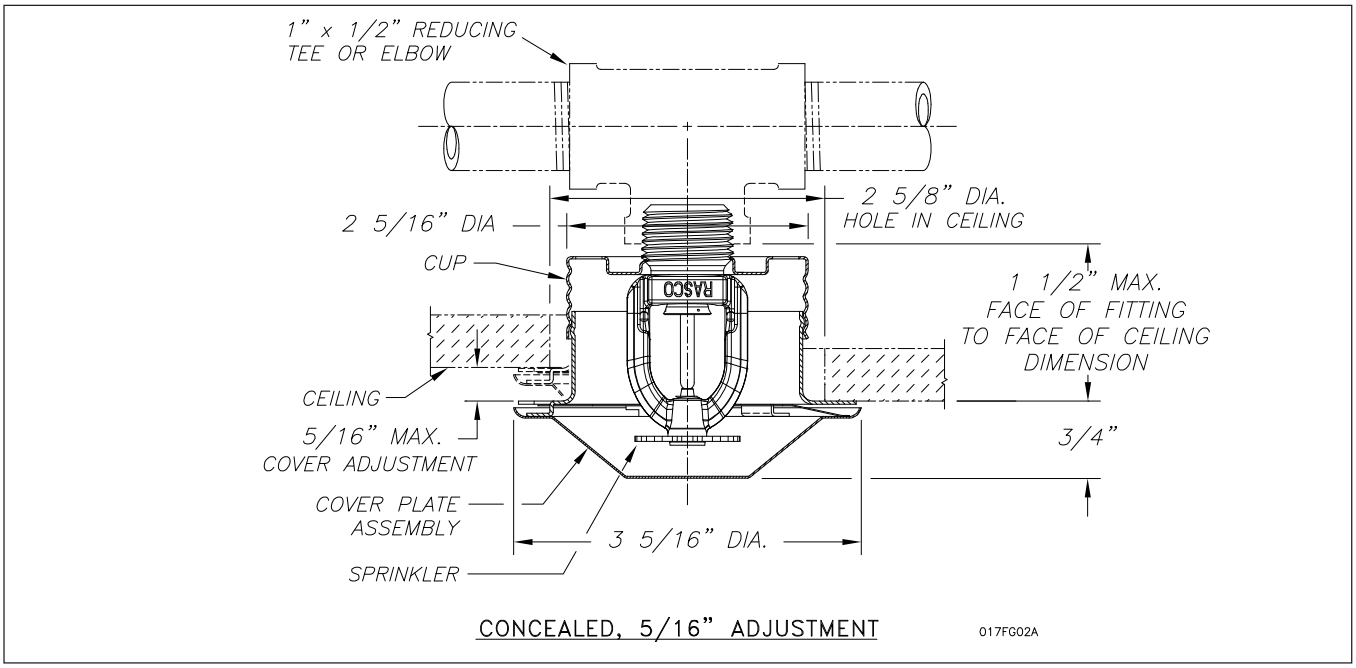


Fig. 5 - Model F1FR56/F1FR56LL Concealed Pendent sprinkler with low profile 5/16-inch (8.0mm) adjustment - Model CCP cover plate

Maintenance

The Model F1FR Series sprinklers should be inspected and the sprinkler system maintained in accordance with NFPA 25. Do not clean sprinklers with soap and water, ammonia or any other cleaning fluids. Remove dust by using a soft brush or gentle vacuuming. Replace any sprinkler which has been painted (other than factory applied) or damaged in any way. A stock of spare sprinklers should be maintained to allow quick replacement of damaged or operated sprinklers.

Finishes [1]

Standard Finishes		
Sprinkler	**Escutcheon**	**Cover plate[1]**
Bronze	Brass	Chrome
Chrome Plated	Chrome Plated	White
Polyester Coated [4][5][6]	White Painted	
Special Application Finishes		
Sprinkler	**Escutcheon**	**Cover plate[1]**
Electroless Nickel PTFE[7]	Electroless Nickel PTFE	Bright Brass
Bright Brass[3]	Bright Brass	Black Plating
Black Plated	Black Plated	Black Paint
Black Paint[2][6]	Black Paint	Off White
Off White[2][6]	Off White	Satin Chrome
Chrome Dull	Chrome Dull	

[1] Other finishes and colors are available on special order. Consult the factory for details. Custom color painted sprinklers may not retain their UL Corrosion resistance listing. Coverplate custom paint is semi-gloss, unless specified otherwise.

[2] cULus Listed only.

[3] 200°F (93°C) maximum.

[4] cULus listed "corrosion resistance" applies to SIN Numbers RA1435 (HSW), RA1485(VSW), RA1425 (Upright), RA1414 (Pendent) and RA1415 (Pendent) in standard black or white. Corrosion resistance in other polyester colors is available upon request.

[5] FM Approvals finish as "Polyester coated" applies to SIN Number RA1414, RA1435 and RA1425 in standard black or white.

[6] LPCB and VdS Approved finish applies only to RA1425, RA1414, RA1418 (VdS) and RA1475.

[7] cULus listed Corrosion Resistant

Material Data	
Frame:	DZR Brass, QM Brass, or Low Lead Brass
Deflector:	CDA Alloy 220, 260, or 510
Load Screw\Pintle:	CDA Alloy 360 or 544
Cup:	CDA Alloy 651 or 693
Washer:	Nickel Alloy 440 or 360, coated with PTFE Adhesive Tape
Bulb:	Glass

Ordering Information

Specify:

1. Sprinkler Model: [F1FR28][F1FR40][F1FR42] [F1FR42LL][F1FRXLH][F1FR56][F1FR56LL]
2. Sprinkler Deflector/Orientation: [Pendent][Recessed Pendent][Upright][Conventional][Horizontal Sidewall] [Recessed Horizontal Sidewall][Vertical Sidewall]
3. Sprinkler threads: [1/2-inch NPT][ISO 7-R1/2]
4. Sprinkler Temperature Rating: [135°F (57°C)][155°F (68°C)][175°F (79°C)][200°F (93°C)][286°F (141°C)]
5. Sprinkler Finish
6. Escutcheon Model: [F1][F2][FP]
7. Escutcheon Finish (where applicable)
8. Cover plate Model: [standard profile CCP 1/2-inch (12.7mm) adjustment][low profile CCP 5/16-inch (8.0mm) adjustment]
9. Cover plate Temperature Rating: [135°F (57°C) for use with Ordinary Temperature sprinklers][165°F (74°C) for use with Intermediate Temperature sprinklers]
10. Cover plate Finish

Note: When Model F1FR Series Recessed sprinklers are ordered, the sprinklers and escutcheons are packaged separately.

Reliable...For Complete Protection

Reliable offers a wide selection of sprinkler components. Following are some of the many precision-made Reliable products that guard life and property from fire around the clock.

- Automatic sprinklers
- Flush automatic sprinklers
- Recessed automatic sprinklers
- Concealed automatic sprinklers
- Adjustable automatic sprinklers
- Dry automatic sprinklers
- Intermediate level sprinklers
- Open sprinklers
- Spray nozzles
- Alarm valves
- Retarding chambers
- Dry pipe valves
- Accelerators for dry pipe valves
- Mechanical sprinkler alarms
- Electrical sprinkler alarm switches
- Water flow detectors
- Deluge valves
- Detector check valves
- Check valves
- Electrical system
- Sprinkler emergency cabinets
- Sprinkler wrenches
- Sprinkler escutcheons and guards
- Inspectors test connections
- Sight drains
- Ball drips and drum drips
- Control valve seals
- Air maintenance devices
- Air compressors
- Pressure gauges
- Identification signs
- Fire department connection

The equipment presented in this bulletin is to be installed in accordance with the latest published Standards of the National Fire Protection Association, Factory Mutual Research Corporation, or other similar organizations and also with the provisions of governmental codes or ordinances whenever applicable. Products manufactured and distributed by Reliable have been protecting life and property for almost 100 years.

Manufactured by

Reliable®

Reliable Automatic Sprinkler Co., Inc.

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Reliable®

RBV Series
Bronze Butterfly Valves

Product Description

The Reliable Model RBV series bronze butterfly valves are indicating control valves for fire protection systems. Model RBVT valves have ANSI B1.20.1 NPT threaded end connections and are available in 1" (25 mm), 1-1/4" (32mm), 1-1/2" (38mm), 2"(51mm), and 2-1/2" (65mm) nominal sizes. The Model RBVG valves have ANSI/AWWA C606 grooved end connections and are available in 1-1/4" (32mm), 1-1/2" (38mm), 2"(51mm), and 2-1/2" (65mm) nominal sizes. The valves are listed for 300 psi (20.7 bar) working pressure.

The valves have an integral 10 Amp pre-wired supervisory tamper switch assembly for indoor and outdoor use. The tamper switch signals movement of the valve seal from the full open position.

Threaded end

Grooved end

Installation

Model RBV series butterfly valves must be installed in accordance with NFPA 13, NFPA 72, FM Global Property Loss Prevention Data Sheets, and the requirements of any authorities having jurisdiction. Failure to follow installation instructions may void the warranty and listing of the valve. Verify compatibility of the valve materials with the water supply and the environment where the valve will be installed prior to installation.

The valve can be installed in any orientation on a piping system with standard ASME B1.20.1 NPT threaded (Model BFVT) or ANSI/AWWA C606 grooved (Model BFVG) connections. Install Model BFVT valves by applying PTFE-based thread sealant to the male pipe threads and tightening the threaded connection using a wrench on only the hexagonal wrench-flats of the valve. Over-tightening threaded connections may damage the valve body resulting in leakage. Attached Model BFVG valve using UL Listed or FM Approved grooved couplings.

The integral tamper switch assembly consistent of two switches. Switch 1 has dual leads on the terminals and is used for connection of the supervisory circuit of a listed fire alarm control panel.

Switch 2 has a single lead and is used for connection of the auxiliary equipment. A 14 ga. green wire is connected to the gearbox housing as a ground connection. All unused wires need to be capped with wire nuts and tucked into a junction box. All electrical connections must be in accordance with NFPA 72 and the requirements of any authorities having jurisdiction.

End Configuration Options — **Table A**

Model	End Connections	Sizes in (mm)	Approvals
RBVT	Threaded	1" (25)	UL Listed, FM Approved
		1-1/4" (32), 1-1/2" (38), 2" (51), 2-1/2" (65)	cULus Listed, FM Approved
RBVG	Grooved	1-1/4" (32), 1-1/2" (38), 2" (51), 2-1/2" (65)	cULus Listed, FM Approved

Model RBVT Bronze Butterfly Valve - Threaded End

Technical Specifications
Pressure Rating:
300 psi (20.7 bar)

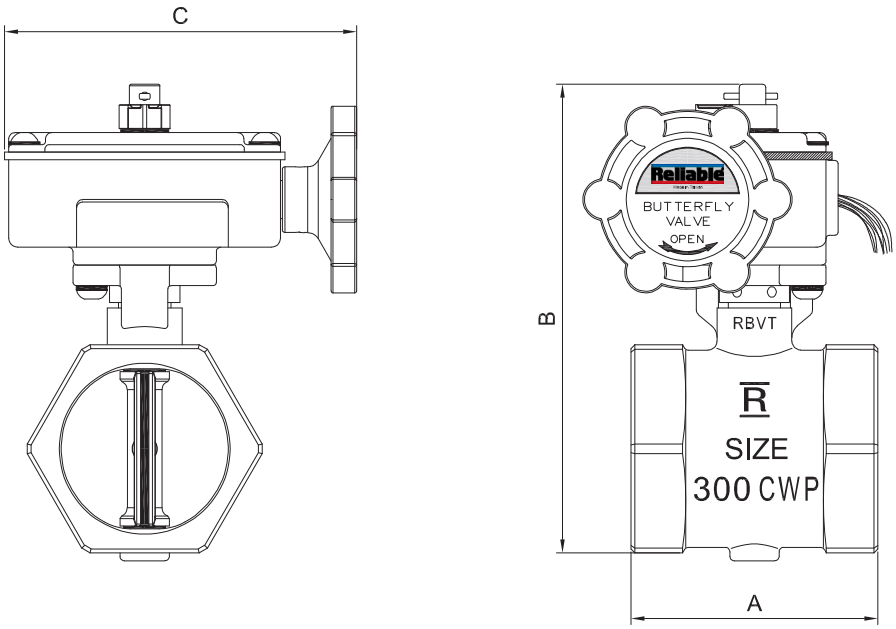
End Connections
ANSI B1.20.1 NPT Threads

Material Specifications
Body: Bronze ASTM 584 C83600
Disc: SS304 Sheet Stamping
Handwheel: Ductile Iron ASTM A536
Seat: ASTM D2000 Viton
Indicator: Powder Metal FD0205 95HT
Housing: Forged Brass JIS C3771 (Ref. ASTM C37700)
Cover: Forged Brass JIS C3771 (Ref. ASTM C37700)

Listings and Approvals
UL Listed - All Sizes
cULus Listed - 1-1/4" (32mm), 1-1/2" (38mm), 2" (51mm), 2-1/2" (65mm)
FM Approved - All Sizes

Model RBVT Bronze Butterfly Valve - Threaded Components and Dimensions

Figure 1



Model RBVT Bronze Butterfly Valve - Threaded Dimensions - in. (mm)

Table B

Valve Size	A	B	C
1"	2-1/8" (54)	4-15/16" (125)	4-5/8" (118)
1-1/4"	2-5/8" (67)	5-1/8" (130)	4-5/8" (118)
1-1/2"	2-7/8" (73)	5-5/8" (142)	4-5/8" (118)
2"	3-1/4" (83)	6-1/8" (156)	4-5/8" (118)
2-1/2"	4-1/2" (114)	6-5/8" (167)	4-5/8" (118)

Model RBVG Bronze Butterfly Valve - Grooved End

Technical Specifications
Pressure Rating:
300 psi (20.7 bar)

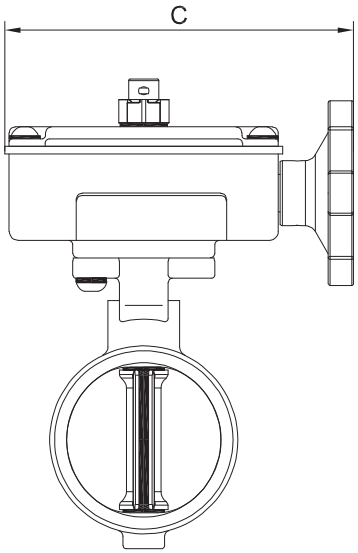
End Connections
ANSI/AWWA C606 grooves

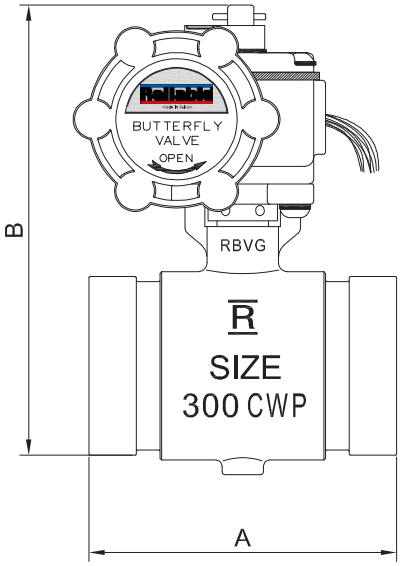
Material Specifications
Body: Bronze ASTM 584 C83600
Disc: SS304 Sheet Stamping
Handwheel: Ductile Iron ASTM A536
Seat: ASTM D2000 Viton
Indicator: Powder Metal FD0205 95HT
Housing: Forged Brass JIS C3771 (Ref. ASTM C37700)
Cover: Forged Brass JIS C3771 (Ref. ASTM C37700)

Listings and Approvals
cULus Listed
FM Approved

Model RBVG Bronze Butterfly Valve - Grooved Components and Dimensions

Figure 2





Model RBVG Bronze Butterfly Valve - Grooved Dimensions - in. (mm)

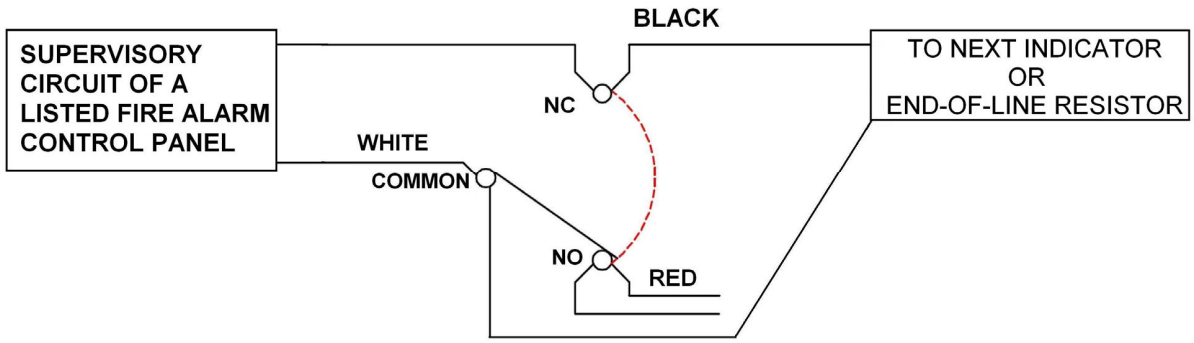
Table C

Valve Size	A	B	C
1-1/4”	3-7/8” (98)	5-3/16” (132)	4-5/8” (118)
1-1/2”	4” (102)	5-1/2” (139)	4-5/8” (118)
2”	4-1/8” (104)	6-1/16” (154)	4-5/8” (118)
2-1/2”	4-1/2” (114)	6-9/16” (167)	4-5/8” (118)

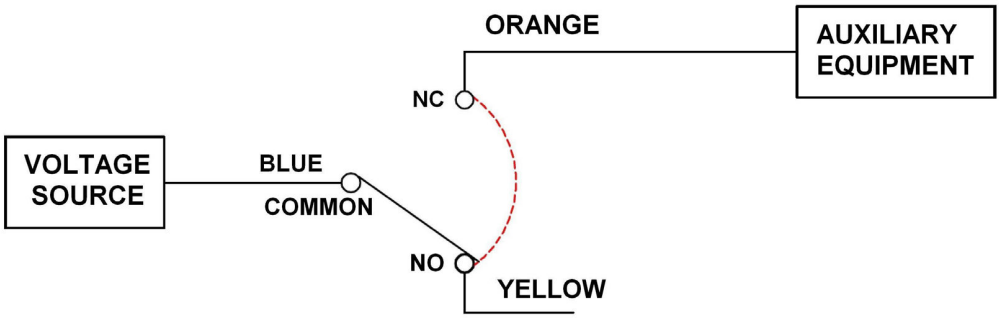
Butterfly Valve Wiring Diagrams

Switch shown in position with valve fully open.

Switch 1: Dual Leads Soldered to Switch Tabs — **Figure 3**



Switch 2: Single Leads Soldered to Switch Tabs — **Figure 4**



Notes:
1. Green wire is provided as ground for the switch housing.
2. Switch rating: 10.1 Amps-125/250VAC-60Hz
3. Actual switch application rating: 10 Amps/115 VAC-60Hz, 0.5 Amps/28 VDC
4. Cap unused leads with wire nuts and tuck into a junction box (not provided).

Maintenance

The owner is responsible for maintaining the fire protection system in proper operating condition. Any system maintenance or testing that involves placing a control valve out of service will eliminate the fire protection that is provided by the fire protection system.

The Reliable Bronze Butterfly valves and associated equipment shall periodically be given a thorough inspection and test. NFPA 25, “Inspection, Testing and Maintenance of Water Based Fire Protection Systems,” provides minimum maintenance requirements.

Guarantee

For Reliable Automatic Sprinkler Co., Inc. guarantee, terms, and conditions, visit www.reliablesprinkler.com.

Ordering Information

Specify the following when ordering:

Valve Model
- RBVT (threaded)
- RBVG (grooved)

Valve Size
- 1” (25mm) (RBVT only)
- 1-1/4” (32mm)
- 1-1/2” (38mm)
- 2” (51mm)
- 2-1/2” (65mm)

999970580

Reliable®

Model G Swing Check Valve

1-1/2”, 2”, 2-1/2”, 3”, 4”, 6”, 8”, & 10” Sizes

cULus Listed, FM Approved

Features

- Grooved end connections.
- Compact, lightweight design.
- Non–slamming, spring loaded clapper to minimize water hammer.
- Approved for horizontal and vertical installation.
- Streamlined body design provides very low friction loss.

Product Description

Reliable Model G Swing Check Valves are low friction loss check valves approved for use in fire protection systems. Typical applications include connections between public water supplies and private fire systems, at the discharge from fire pumps, at gravity tank connections and at fire department pumper connections. All Model G Check Valves are provided with ½” NPT (R½) supply side and discharge side connections (Item 12, Figure 1). Grooved end connections provide fast and easy installation using listed or approved mechanical grooved couplings. Rigid style grooved couplings can be used for positive clamping to resist flexural and torsional loads.

Installation

The Model G Check Valve shall be installed in accordance with NFPA 13, “Standard for the Installation of Sprinkler Systems,” as well as the requirements of any authorities having jurisdiction. When installed vertically, the direction of flow shall be up through the valve (install with flow arrow pointed up). For horizontal installations, the hinge pin must be located to the top. Failure to follow installation instructions may void the warranty and listing of the valve. Verify compatibility of the Model G Check Valve materials with the water supply and the environment where the valve will be installed prior to installation. Do not apply lubricants, sealants, or other chemicals to the clapper seal or seat.

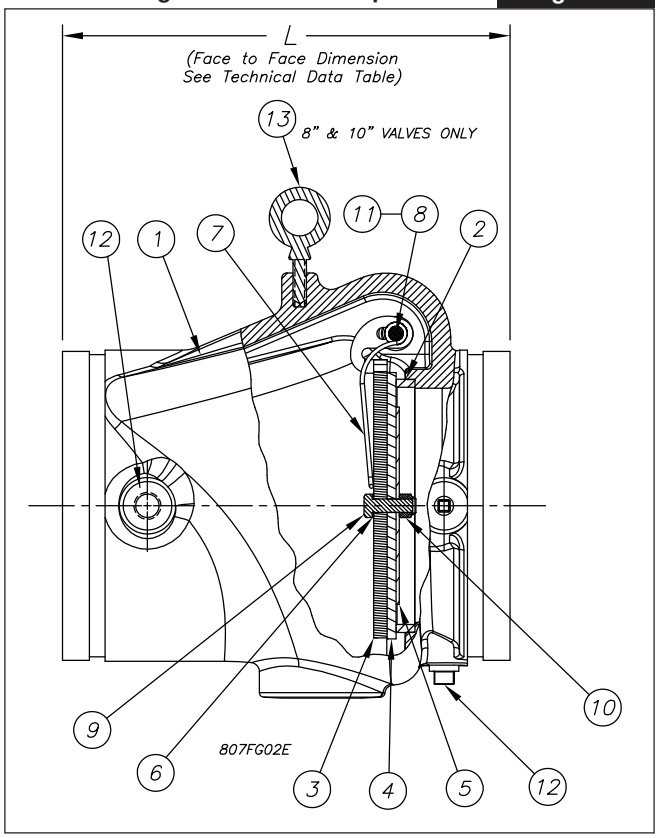
Reliable Model G Swing Check Valve (3”)

Note: Model G Check Valves may be damaged by excessively turbulent water flow. Model G Check Valves should be installed a reasonable distance from pipe transitions, such as pumps, elbows, expanders, reducers, or similar devices. Typical piping practices suggest a minimum distance of five times the pipe diameter for general use.

Technical Data **Table A**

Valve Size	Pressure Rating	Face-to-Face Dimension	Eq. Length C = 120	Eq. Length C = 100	Cv Factor	Shipping Weight
1-1/2” (40 mm)	300 psi (20.7 bar)	6-1/4 “ (159 mm)	6.7’ (2.0 m)	4.8’ (1.5 m)	36	5 lbs (2.3 kg)
2” (50 mm)		6-1/2” (165 mm)	9.6’ (2.9 m)	6.8’ (2.1 m)	67	6 lbs (2.7 kg)
2-1/2” (65 mm)	250 psi (17.3 bar)	7.12” (181 mm)	6.0’ (1.8m)	4.3’ (1.3m)	212	9 lbs (4.1 kg)
76 mm		7.12” (181 mm)	6.0’ (1.8m)	4.3’ (1.3m)	212	9 lbs. (4.1 kg)
3” (80 mm)		7.62” (194 mm)	5.3’ (1.6m)	3.8’ (1.2m)	376	11 lbs. (5.0 kg)
4” (100 mm)		8.44” (214 mm)	7.1’ (2.2m)	5.0’ (1.5m)	656	17 lbs. (7.7 kg)
6” (150 mm)		10.25” (260 mm)	13.7’ (4.2m)	9.8’ (3.0m)	1395	38 lbs. (17.2 kg)
165 mm		10.25” (260 mm)	13.7’ (4.2m)	9.8’ (3.0m)	1395	38 lbs. (17.2 kg)
8” (200 mm)		12.5” (318 mm)	15.9’ (4.8m)	11.3’ (3.4m)	2818	63 lbs. (28.6 kg)
10” (250 mm)	300 psi (20.7 bar)	14.5” (368 mm)	28.8’ (8.8m)	20.6’ (6.3m)	3928	102 lbs. (46.3 kg)

Model G Swing Check Valve Components **Figure 1**



Valve Components (refer to Figure 1) **Table B**

Item No.	Part Name	Material
1	Valve Body	Gray Cast Iron Class 30
2	Seat	Bronze C83600 or C93200
3	Clapper	Stainless Steel 304 or 17-4
4	Facing Seal *	EPDM Rubber
5	Clamping Ring	Stainless Steel 304
6	Gasket *	EPDM Rubber or PTFE
7	Spring	Stainless Steel 302
8	Hinge Pin	Stainless Steel 303
9	Bolt	Stainless Steel 18-8
10	Locknut *	Stainless Steel 18-8
11	Plug, 1/8" NPT	Steel
12	Plug, ½" NPT	Steel
13	Shoulder Eye	Steel

* Part of Replacement Seal Kit

Replacement Seal Kit Part Numbers **Table C**

Part Number									
1-1/2" (40 mm)	2" (50 mm)	2½" (65 mm)	76 mm	3" (80 mm)	4" (100 mm)	6" (150 mm)	165 mm	8" (200 mm)	10" (250 mm)
6888000015	6888000020	6888040025	6888040025	6888040030	6888040040	6888040060	6888040060	6888040080	6888040090

Maintenance

The owner is responsible for maintaining the fire protection system in proper operating condition. Any system maintenance or testing that involves placing a system out of service may eliminate the fire protection that is provided by the fire protection system. Notify any required authorities having jurisdiction and implement appropriate precautions prior to proceeding.

The Reliable Model G Check Valve shall periodically be given a thorough inspection and test. NFPA 25, "Inspection, Testing and Maintenance of Water Based Fire Protection Systems," provides minimum maintenance requirements. Inspect the interior of the valve and all components for corrosion, damage, and wear at least every five (5) years. Replace any components found to be corroded, damaged, or worn. Increase the frequency of inspections when the valve is exposed to corrosive conditions or chemicals that could impact the valve materials.

Guarantee

For Reliable Automatic Sprinkler Co., Inc. guarantee, terms, and conditions, visit www.reliablesprinkler.com.

Ordering Information

Specify:

1. Model G Check Valve.
2. Size.

P/N 9999970071

Reliable®

Model RFC Series Residential Sprinklers

Flat Concealed Pendent

cULus Listed

Features

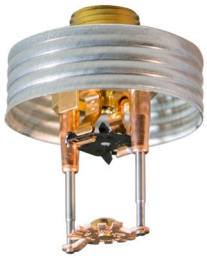
- cULus Listed as Residential Sprinklers
- Push-On cover plate installation
- Low water flow requirements

Product Description

Model RFC Series residential sprinklers are flat cover plate, concealed pendent sprinklers intended for installation in accordance with NFPA 13, NFPA 13R, or NFPA 13D. The sprinklers are cULus Listed as Residential Sprinklers in accordance with UL 1626. In addition, Model RFCLL Series sprinklers are cULus Certified for Health Effects to NSF/ANSI standard 61 Annex G (LL) and Australian WaterMark Certified (WMCS).

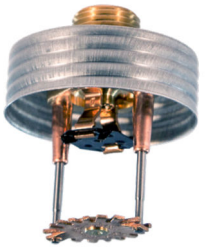
Model RFC30 sprinklers have a 165°F (74°C) temperature rated fusible-link operating element. Model RFC43, RFC49, RFC58, and RFC76 sprinklers are offered with either a 165°F (74°C) or 212°F (100°C) temperature rated fusible-link operating element. Sprinklers with a 165°F (74°C) temperature rating are ordinary temperature classification and are listed for use with a 135°F (57°C) temperature rated cover plate. Sprinklers with a 212°F (100°C) temperature rating are intermediate temperature classification and are listed for use with a 165°F (74°C) temperature rated cover plate.

Model RFC Series sprinklers are installed with a Model RFC or Model G5 Cover Plate. Model G5 Cover Plates may be installed by either pushing or threading the cover plate into the sprinkler cup. Model RFC30, RFC30LL, RFC43, RFC43LL, RFC49 and RFC49LL sprinklers allow 1/2" (13 mm) of cover plate adjustment. Model RFC58 and RFC76 sprinklers allow 3/4" (19 mm) of cover plate adjustment. Model RFC and G5 Cover Plates are available in a variety of finishes as listed in Table H.



Model RFC30 & RFC30LL

Model RFC43 & RFC43LL



Model RFC49 & RFC49LL

Model RFC58

Model RFC76

Model RFC & G5 Cover Plate

Table A

Sprinkler Model	Nominal K-Factor gpm/psi$^{1/2}$ (l/min/bar$^{1/2}$)	Max. Coverage Area ft x ft (m x m)	Listings & Approvals	Sprinkler Identification Number (SIN)
RFC30	3.0 (43)	14 x 14 (4.3 x 4.3)	cULus	RA0611
RFC30LL	3.0 (43)	14 x 14 (4.3 x 4.3)	cULus, LL, WMCS	RA3211
RFC43	4.3 (62)	20 x 20 (6.1 x 6.1)	cULus	RA0612
RFC43LL	4.3 (62)	20 x 20 (6.1 x 6.1)	cULus, LL, WMCS	RA3212
RFC49	4.9 (71)	20 x 20 (6.1 x 6.1)	cULus	RA0616
RFC49LL	4.9 (71)	20 x 20 (6.1 x 6.1)	cULus, LL, WMCS	RA3216
RFC58	5.8 (84)	20 x 20 (6.1 x 6.1)	cULus	RA0613
RFC76	7.6 (109)	20 x 20 (6.1 x 6.1)	cULus	RA0618

cULus: cULus Listed to UL1626, Residential Sprinklers for Fire Protection Service.
LL: cULus Certified for Health Effects to NSF/ANSI Standard 61 Annex G (Less than 0.25% Lead content).
WMCS: Australian WaterMark Certified.

Model RFC30 & RFC30LL Residential Sprinklers

RFC30: SINRA0611
RFC30LL: SINRA3211

Technical Specifications
Style: Flat Concealed Pendent
Threads: 1/2" NPT or ISO 7-1R1/2
Nominal K-Factor: 3.0 (43 metric)
Max. Working Pressure: 175 psi (12 bar)
Min. Spacing: 8 ft. (2.4 m)

Material Specifications
Thermal Sensor: Nickel Alloy Solder Link
Sprinkler Body: Brass Alloy
Levers: Bronze Alloy
Yoke: Brass Alloy
Sealing Assembly: Nickel Alloy with PTFE
Load Screw: Bronze Alloy
Towers: Copper Alloy
Pins: Stainless Steel
Deflector: Bronze Alloy
Cup: Steel

Cover Plate Finishes
(See Table H)

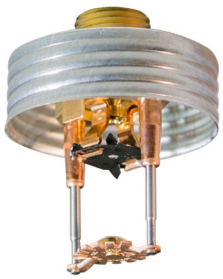
Sensitivity
Fast-response

Temperature Rating
165°F (74°C) sprinkler
135°F (57°C) cover plate

Cover Plate
Model RFC Cover Plate
Model G5 Cover Plate

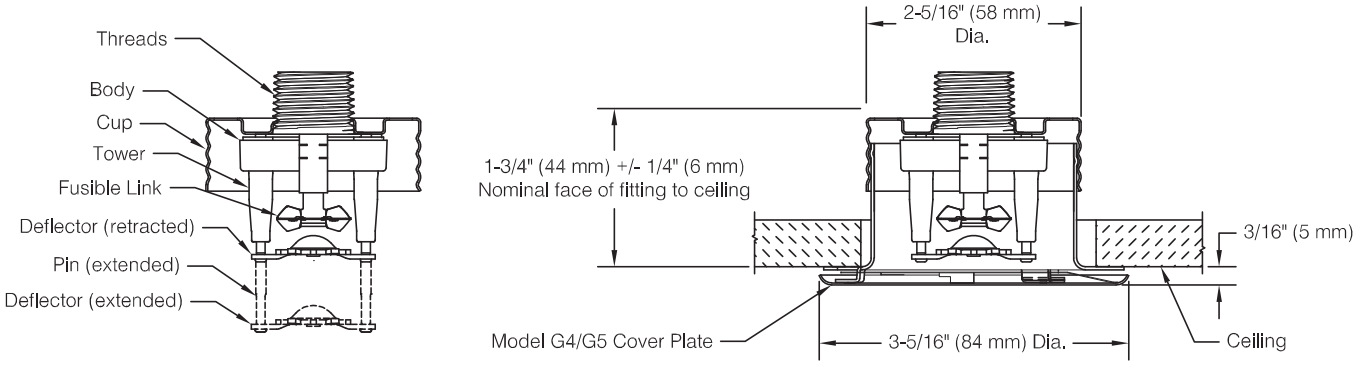
Sprinkler Wrench
Model FC (without wrench-able cap)
Model W3 (with wrench-able cap)

Listings and Approvals
cULus Listed to UL 1626
cULus Certified for Health Effects to NSF/ANSI Standard 61 Annex G (RFC30LL only)
Watermark Certified (RFC30LL only)



Bottom View

Model RFC30 & RFC30LL Sprinkler Components and Dimensions — Figure 1



Model RFC30 and RFC30LL Sprinkler Hydraulic Design Criteria — Table B

Minimum Flow and Residual Pressure [1]		
Max. Coverage Area [2] ft. x ft. (m x m)	**Flow gpm (l/min)**	**Pressure psi (bar)**
12 x 12 (3.6 x 3.6)	9 (34)	9.0 (0.62)
14 x 14 (4.3 x 4.3)	10 (38)	11.0 (0.76)

Notes:
1. For NFPA 13 installations the flow per sprinkler must be the greater of: (1) the flow listed in Table B above and (2) the flow required to achieve a minimum design density of 0.1 gpm/sq ft over the design area of the sprinkler.
2. For coverage area dimensions less than those listed above, use the minimum required flow for the next larger max. coverage area listed.

Model RFC43 & RFC43LL Residential Sprinklers

RFC43: SINRA0612
RFC43LL: SINRA3212

Technical Specifications
Style: Flat Concealed Pendent
Threads: 1/2" NPT or ISO 7-1R1/2
Nominal K-Factor: 4.3 (62 metric)
Max. Working Pressure: 175 psi (12 bar)
Min. Spacing: 8 ft. (2.4 m)

Material Specifications
Thermal Sensor: Nickel Alloy Solder Link
Sprinkler Body: Brass Alloy
Levers: Bronze Alloy
Yoke: Brass Alloy
Sealing Assembly: Nickel Alloy with PTFE
Load Screw: Bronze Alloy
Towers: Copper Alloy
Pins: Stainless Steel
Deflector: Bronze Alloy
Cup: Steel

Cover Plate Finishes
(See Table H)

Sensitivity
Fast-response

Temperature Rating
Ordinary:
165°F (74°C) sprinkler
135°F (57°C) cover plate
Intermediate:
212°F (100°C) sprinkler
165°F (74°C) cover plate

Cover Plate
Model RFC Cover Plate
Model G5 Cover Plate

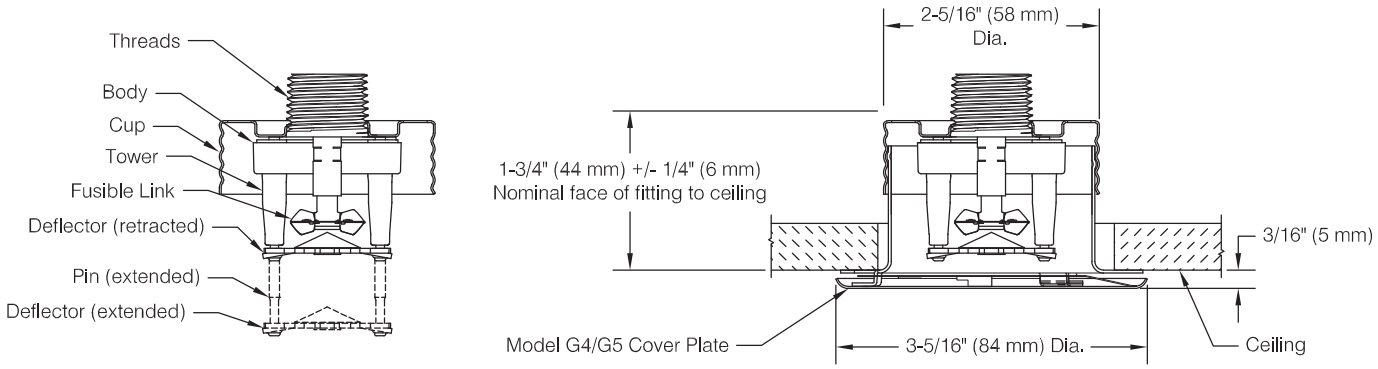
Sprinkler Wrench
Model FC (without wrench-able cap)
Model W3 (with wrench-able cap)

Listings and Approvals
cULus Listed to UL 1626
cULus Certified for Health Effects to NSF/ANSI Standard 61 Annex G (RFC43LL only)
Watermark Certified (RFC43LL only)

Bottom View

Model RFC43 & RFC43LL Sprinkler Components and Dimensions

Figure 2



Model RFC43 & RFC43LL Sprinkler Hydraulic Design Criteria

Table C

Minimum Flow and Residual Pressure [1]				
Max. Coverage Area [2] ft. x ft. (m x m)	**Ordinary Temperature**		**Intermediate Temperature**	
	Flow gpm (l/min)	**Pressure psi (bar)**	**Flow gpm (l/min)**	**Pressure psi (bar)**
15 x 15 (4.6 x 4.6)	12 (45)	7.8 (0.54)	12 (45)	7.8 (0.54)
16 x 16 (4.9 x 4.9)	13 (49)	9.1 (0.63)	13 (49)	9.1 (0.63)
18 x 18 (5.5 x 5.5)	18 (68)	17.5 (1.21)	--	--
20 x 20 (6.1 x 6.1)	21 (79)	23.8 (1.64)	--	--

Notes:
1. For NFPA 13 installations the flow per sprinkler must be the greater of: (1) the flow listed in Table C above and (2) the flow required to achieve a minimum design density of 0.1 gpm/sq ft over the design area of the sprinkler.
2. For coverage area dimensions less than those listed above, use the minimum required flow for the next larger max. coverage area listed.

Model RFC49 & RFC49LL Residential Sprinklers

RFC49: SINRA0616
RFC49LL: SINRA3216

Technical Specifications
Style: Flat Concealed Pendent
Threads: 1/2" NPT or ISO 7-1R1/2
Nominal K-Factor: 4.9 (71 metric)
Max. Working Pressure: 175 psi (12 bar)
Min. Spacing: 8 ft. (2.4 m)

Material Specifications
Thermal Sensor: Nickel Alloy Solder Link
Sprinkler Body: Brass Alloy
Levers: Bronze Alloy
Yoke: Brass Alloy
Sealing Assembly: Nickel Alloy with PTFE
Load Screw: Bronze Alloy
Towers: Copper Alloy
Pins: Stainless Steel
Deflector: Bronze Alloy
Cup: Steel

Cover Plate Finishes
(See Table H)

Sensitivity
Fast-response

Temperature Rating
Ordinary:
165°F (74°C) sprinkler
135°F (57°C) cover plate
Intermediate:
212°F (100°C) sprinkler
165°F (74°C) cover plate

Cover Plate
Model G5 Cover Plate

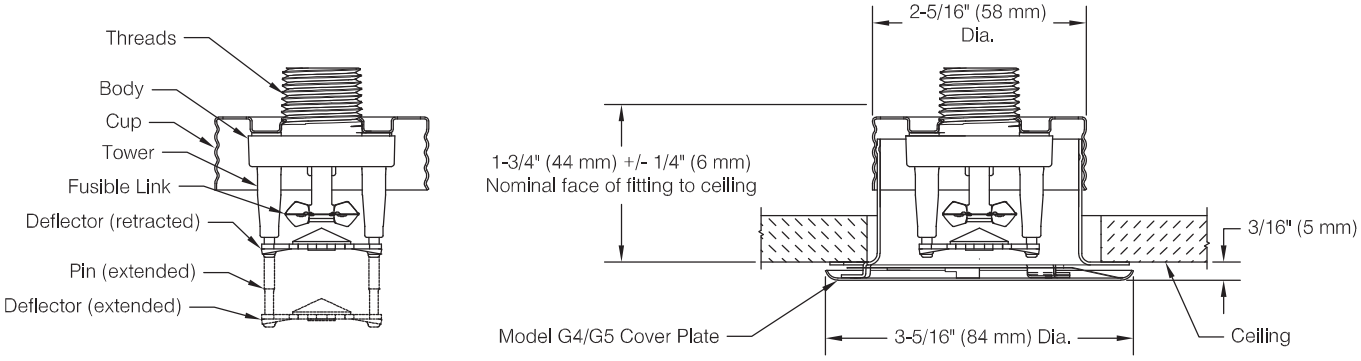
Sprinkler Wrench
Model FC (without wrench-able cap)
Model W3 (with wrench-able cap)

Listings and Approvals
cULus Listed to UL 1626
cULus Certified for Health Effects to NSF/ANSI Standard 61 Annex G (RFC49LL only)
Watermark Certified (RFC49LL only)

Bottom View

Model RFC49 & RFC49LL Sprinkler Components and Dimensions

Figure 3



Model RFC49 & RFC49LL Sprinkler Hydraulic Design Criteria

Table D

Minimum Flow and Residual Pressure [1]				
Max. Coverage Area [2] ft. x ft. (m x m)	**Ordinary Temperature**		**Intermediate Temperature**	
	Flow gpm (l/min)	**Pressure psi (bar)**	**Flow gpm (l/min)**	**Pressure psi (bar)**
16 x 16 (4.9 x 4.9)	13 (49.0)	7.0 (0.48)	13 (49.0)	7.0 (0.48)
18 x 18 (5.5 x 5.5)	17 (64.3)	12.0 (0.83)	17 (64.3)	12.0 (0.83)
20 x 20 (6.1 x 6.1)	20 (75.7)	16.7 (1.15)	21 (79.5)	18.4 (1.27)

Notes:
1. For NFPA 13 installations the flow per sprinkler must be the greater of: (1) the flow listed in Table D above and (2) the flow required to achieve a minimum design density of 0.1 gpm/sq ft over the design area of the sprinkler.
2. For coverage area dimensions less than those listed above, use the minimum required flow for the next larger max. coverage area listed.

Model RFC58 Residential Sprinkler — SIN RA0613

Technical Specifications
Style: Flat Concealed Pendent
Threads: 1/2" NPT or ISO 7-1R1/2
Nominal K-Factor: 5.8 (84 metric)
Max. Working Pressure: 175 psi (12 bar)
Min. Spacing: 8 ft. (2.4 m)

Material Specifications
Thermal Sensor: Nickel Alloy Solder Link
Sprinkler Body: Brass Alloy
Levers: Bronze Alloy
Yoke: Brass Alloy
Sealing Assembly: Nickel Alloy with PTFE
Load Screw: Bronze Alloy
Towers: Copper Alloy
Pins: Stainless Steel
Deflector: Chrome Plated Bronze Alloy
Cup: Steel

Cover Plate Finishes
(See Table H)

Sensitivity
Fast-response

Temperature Ratings
Ordinary:
165°F (74°C) sprinkler
135°F (57°C) cover plate
Intermediate:
212°F (100°C) sprinkler
165°F (74°C) cover plate

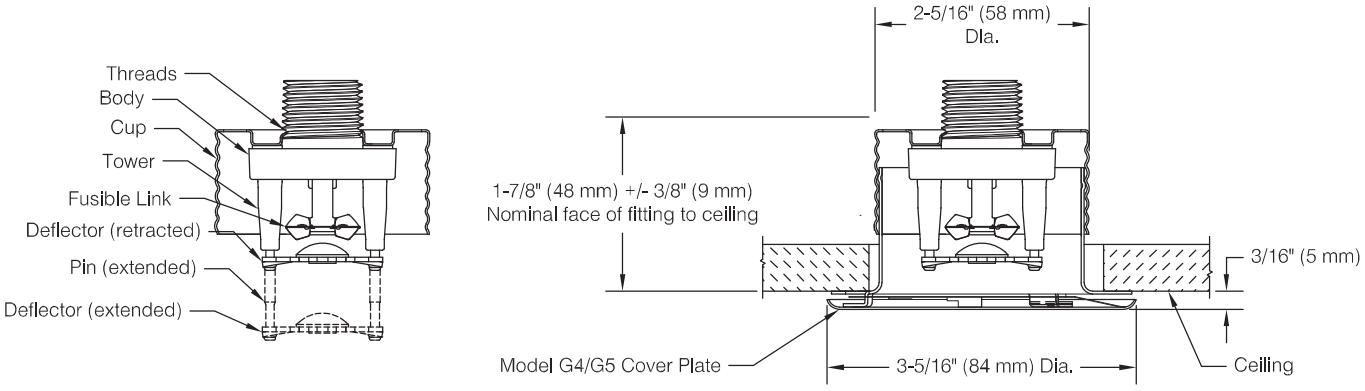
Cover Plate
Model G5 Cover Plate

Sprinkler Wrench
Model FC (without wrench-able cap)
Model W3 (with wrench-able cap)

Listings and Approvals
cULus Listed

Bottom View

Model RFC58 Sprinkler Components and Dimensions — Figure 4



Model RFC58 Sprinkler Hydraulic Design Criteria — Table E

Minimum Flow and Residual Pressure[1]		
Max. Coverage Area [2] ft. x ft. (m x m)	**Flow gpm (l/min)**	**Pressure psi (bar)**
16 x 16 (4.9 x 4.9)	16 (60.6)	7.6 (0.53)
18 x 18 (5.5 x 5.5)	18 (68.1)	9.6 (0.66)
20 x 20 (6.1 x 6.1)	20 (75.7)	11.9 (0.82)

Notes:
1. For NFPA 13 installations the flow per sprinkler must be the greater of: (1) the flow listed in Table E above and (2) the flow required to achieve a minimum design density of 0.1 gpm/sq ft over the design area of the sprinkler.
2. For coverage area dimensions less than those listed above, use the minimum required flow for the next larger max. coverage area listed.

Model RFC76 Residential Sprinkler — SIN RA0618

Technical Specifications
Style: Flat Concealed Pendent
Threads: 3/4" NPT or ISO 7-1R3/4
Nominal K-Factor: 7.6 (109 metric)
Max. Working Pressure: 175 psi (12 bar)
Min. Spacing: 8 ft. (2.4 m)

Material Specifications
Thermal Sensor: Nickel Alloy Solder Link
Sprinkler Body: Brass Alloy
Levers: Bronze Alloy
Yoke: Brass Alloy
Sealing Assembly: Nickel Alloy with PTFE
Load Screw: Bronze Alloy
Towers: Copper Alloy
Pins: Stainless Steel
Deflector: Bronze Alloy
Cup: Steel

Cover Plate Finishes
(See Table H)

Sensitivity
Fast-response

Temperature Ratings
Ordinary:
165°F (74°C) sprinkler
135°F (57°C) cover plate
Intermediate:
212°F (100°C) sprinkler
165°F (74°C) cover plate

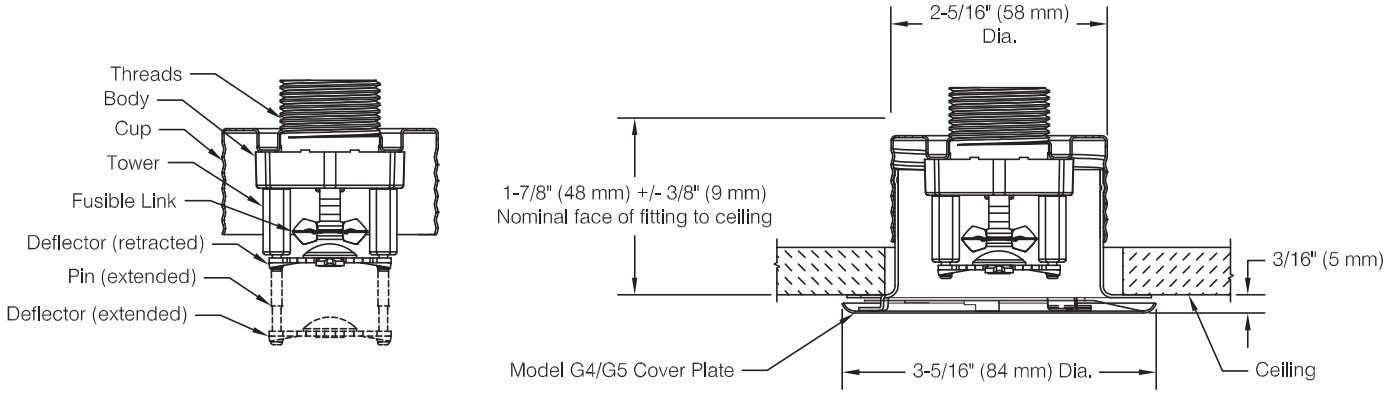
Cover Plate
Model G5 Cover Plate

Sprinkler Wrench
Model FC (without wrench-able cap)
Model W3 (with wrench-able cap)

Listings and Approvals
cULus Listed

Bottom View

Model RFC76 Sprinkler Components and Dimensions — Figure 5



Model RFC76 Flat Concealed Sprinkler Hydraulic Design Criteria — Table E

Minimum Flow and Residual Pressure[1]		
Max. Coverage Area [2] ft. x ft. (m x m)	**Flow gpm (l/min)**	**Pressure psi (bar)**
16 x 16 (4.9 x 4.9)	21 (79.5)	7.6 (0.52)
18 x 18 (5.5 x 5.5)	24 (90.8)	9.9 (0.68)
20 x 20 (6.1 x 6.1)	34 (128.7)	20 (1.4)

Notes:
1. For NFPA 13 installations the flow per sprinkler must be the greater of: (1) the flow listed in Table E above and (2) the flow required to achieve a minimum design density of 0.1 gpm/sq ft over the design area of the sprinkler.
2. For coverage area dimensions less than those listed above, use the minimum required flow for the next larger max. coverage area listed.

Cover Plate Finishes[1] **Table H**

Standard Finishes	Special Application Finishes		
White Polyester	Off White Paint	Black Paint	Raw Brass
Chrome Plated	Bright Brass	Finished Bronze	Black Plated
	Satin Chrome	Stainless Steel Clad[3]	Custom Color Paint[2]

Notes:
1. Paint or any other coating applied over the factory finish will void all approvals and warranties.
2. Custom color paint is semi-gloss, unless specified otherwise.
3. Stainless steel clad cover plates are Type 316 Stainless Steel on the finished side and C102 Copper Allow on the back side. Cover plates are not listed or approved as corrosion resistant.

Installation Dimensions **Table J**

Sprinkler Model	Cover Plate Model	Cover Plate Diameter inch (mm)	Recommended Hole Diameter in Ceiling inch (mm)	Cover Plate Adjustment inch (mm)	Min. to Max. Face of Fitting to Ceiling[1] inch (mm)	Min. to Max. Dropped Deflector Distance below Ceiling inch (mm)	Cover Plate Temperature Rating
RFC30, RFC30LL	RFC or G5	3-5/16 (84)	2-5/8 (67)	1/2 (13)	1-1/2 to 2 (38 to 51)	1/2 to 1 (13 to 25)	135°F (57°C)
RFC43, RFC43LL, RFC49, RFC49LL	RFC or G5	3-5/16 (84)	2-5/8 (67)	1/2 (13)	1-1/2 to 2 (38 to 51)	1/2 to 1 (13 to 25)	135°F[2] (57°C) or 165°F[3] (74°C)
RFC58, RFC76	RFC or G5	3-5/16 (84)	2-5/8 (67)	3/4 (19)	1-1/2 to 2-1/4 (38 to 57)	1/4 to 1 (6 to 25)	135°F[2] (57°C) or 165°F[3] (74°C)

Notes:
1. Face of fitting to ceiling dimensions are based on a nominal thread make up. Verify dimensions based on fitting and thread sealing method prior to installation. A 1/2" x 1/2" brass nipple extension (Reliable P/N 6999991900) is available where necessary for replacement of existing sprinklers.
2. For use with 165°F (74°C) temperature rated sprinklers where the Maximum Ceiling Temperature does not exceed 100°F (38°C).
3. For use with 212°F (100°C) temperature rated sprinklers where the Maximum Ceiling Temperature does not exceed 150°F (66°C).

Installation

Model RFC series sprinklers are intended to be installed in accordance with NFPA 13, NFPA 13R, or NFPA 13D, as well as the requirements of applicable authorities having jurisdiction. Model RFC series sprinklers must not be installed in ceilings with positive pressure in the space above. Ensure that the 4 slots in the cup are open and unobstructed following installation. Model RFC series sprinklers are shipped with a wrench-able protective cap that should remain on the sprinkler until the sprinkler system is placed in service following construction.

Model RFC series sprinklers can be installed without removing the wrench-able protective cap using the Model W3 wrench. Alternatively, Model RFC series sprinklers can be installed using the Model FC wrench by temporarily removing the protective cap during installation of the sprinkler. The use of any other wrench to installed Model RFC series sprinklers is not permitted and may damage the sprinkler. Fully insert the Model W3 wrench over the cap until it reaches the bottom of the cup, or the Model FC wrench over the sprinkler until the wrench engages the body. Do not wrench any other part of the sprinkler/cup assembly. The Model W3 and FC wrenches are designed to be turned with a standard 1/2" square drive. Tighten the sprinkler into the fitting after applying a PTFE based thread sealant to the sprinkler's threads. Recommended installation torque is 8 to 18 ft-lbs (11 to 24 N-m) for 1/2" thread sprinklers and 14 to 20 ft-lbs (19 to 27 N-m) for 3/4" thread sprinklers.

Do not exceed the maximum recommended torque. Exceeding the maximum recommended torque may cause leakage or impairment of the sprinkler. Use care when inserting or removing the wrench from the sprinkler to avoid damage to the sprinkler.

Install the cover plate by hand by pushing the cover plate into the cup and turning the cover in the clockwise direction until it is tight against the ceiling.

Application

Model RFC series sprinklers are intended for installation where residential sprinklers are permitted or required by NFPA 13, NFPA 13R, and NFPA 13D. The sprinklers are concealed pendent residential sprinklers.

Model RFC 30 and RFC30LL sprinklers are available in ordinary temperature classification for installation where the Maximum Ceiling Temperature does not exceed 100°F (38°C). Model RFC43, RFC43LL, RFC49, RFC49LL, RFC58, and RFC76 sprinklers are available in either ordinary or intermediate temperature classification for installation where the Maximum Ceiling Temperature does not exceed 100°F (38°C) or 150°F (66°C), respectively.

Wrench

Model FC
For use with Model RFC Series sprinklers without wrench-able cap installed

Model W3
For use with Model RFC Series sprinklers with wrench-able cap installed

Maintenance

Model RFC series sprinklers should be inspected and the sprinkler system maintained in accordance with NFPA 25. Do not clean sprinklers with soap and water, ammonia or any other cleaning fluids. Remove dust by gentle vacuuming. Replace any sprinkler cover plate assembly which has been painted (other than factory applied) or damaged in any way. A stock of spare sprinklers should be maintained to allow quick replacement of damaged or operated sprinklers. Prior to installation, sprinklers should be maintained in the original cartons and packaging until used to minimize the potential for damage to sprinklers that would cause improper operation or non-operation.

Listings and Approvals

Listed by Underwriters Laboratories, Inc. and UL Certified for Canada to UL1626, Residential Sprinklers for Fire-protection Service (cULus).

Certified by Underwriters Laboratories, Inc. and Underwriters Laboratories of Canada for Health Effects to NSF/ANSI Standard 61 Annex G (LL) (RFC30LL, RFC43LL, and RFC49LL only).

Australian WaterMark Certified (RFC30LL, RFC43LL, and RFC49LL only).

Guarantee

For the Reliable Automatic Sprinkler Co., Inc. guarantee, terms, and conditions, visit www.reliablesprinkler.com.

Patents

Model RFC30, RFC30LL, RFC43, RFC43LL, RFC49, RFC49LL, RFC58, and RFC76 sprinklers are covered by U.S. Patent No. 9,248,327 and U.S. Patent No. 7,275,603.

Model RFC30, RFC30LL, RFC43 and RFC43LL sprinklers are additionally covered by U.S. Patent No. 8,776,903.

Ordering Information

Specify the following when ordering.

Sprinkler
- Model (RFC30, RFC30LL, RFC43, RFC43LL, RFC49, RFC49LL, RFC58, RFC76)
- Temperature Rating

Cover Plate
- Model RFC or G5
- Temperature Rating
- Finish (See Table H)

Sprinkler Wrench
- Model FC
- Model W3

P/N 999970261

Bulletin 135 Rev. M

Reliable®

Model F1 Residential Sprinklers for Design Density of .05 gpm/ft²

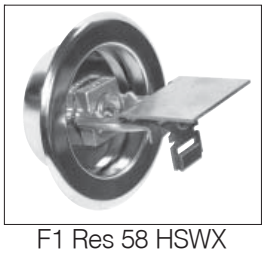
Model F1 Res Sprinklers engineered for the lowest flows to meet the minimum design density of .05 gpm/ft²

Types:

1. F1 Res 30 Pendent
2. F1 Res 30 Recessed Pendent/F2
3. F1 Res 30 Recessed Pendent/FP
4. F1 Res 49 Pendent
5. F1 Res 49 Recessed Pendent/F1
6. F1 Res 49 Recessed Pendent/FP
7. F1 Res 58 Pendent
8. F1 Res 58 Recessed Pendent/F1
9. F1 Res 58 Recessed Pendent/FP
10. F1 Res 76 Pendent
11. F1 Res 76 Recessed Pendent/F1
12. F1 Res 76 Recessed Pendent/FP
13. F1 Res 30 CCP Pendent
14. F1 Res 49 CCP Pendent
15. F1 Res 58 CCP Pendent
16. F1 Res 76 CCP Pendent
17. F1 Res 44 HSW
18. F1 Res 44 Recessed HSW/F2
19. F1 Res 58 HSW
20. F1 Res 58 HSWX
21. KRes58 HSWX
22. F1 Res 58 HSW Recessed HSW/F2
23. F1 Res 44 SWC

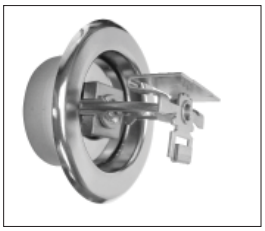
F1 Res 30, 49, 58 & 76 Recessed Pendent / F1

F1 Res 30, 49, 58 & 76 Recessed Pendent / FP



F1 Res 58 HSWX

F1 Res 30, 49, 58 & 76 CCP Pendent



F1 Res 44 & 58 Recessed HSW/F2

F1 Res 44 SWC

Listings & Approvals

1. Listed by Underwriters Laboratories Inc. and UL Certified for Canada (cULus)

Sprinklers for .10 Density: Refer to Bulletin 176

UL Listing Category

Residential Automatic Sprinkler

UL Guide Number

VKKW

Patents

US Patent No. 6,516,893 applies to the Model F1 Res 49 & 58 Pendent Sprinklers
US Patent No. 7,353,882 applies to Model F1 Res 44 & 58 HSW Sprinklers
US Patent No. 7,784,555 applies to Model F1 Res 44 SWC Sprinklers

Product Description

Model F1 Res Pendent sprinklers (Figs. 1, 2, 3, & 4) are fast response sprinklers combining excellent durability, high sensitivity glass-bulb and low profile decorative design. The F1 Res Horizontal Sidewall sprinklers (Figs. 5, 6 & 7) are equally attractive when above ceiling piping cannot be used.

The 3mm glass-bulb pendent sprinklers permit the efficient use of residential water supplies for sprinkler coverage in residential fire protection design.

The low flow F1 Res sprinklers are specially engineered for fast thermal response to meet the sensitive fire protection application needs of the latest residential market standards (UL 1626 Standard). Upon fire conditions, rising heat causes a sprinkler's heat-sensitive element, glass bulb or link to actuate, releasing the waterway for water flow onto the deflector, evenly distributing the discharged water to control a fire.

Technical Data:

- Thermal Sensor: Soldered Element (Link) or Nominal 3mm glass-bulb
- Sprinkler Frame : Brass Casting
- Sprinklers' Pressure Rating : 175 psi
  Factory Hydrostatically Tested to 500 psi
- Thread Size: ½" NPT (R½)
- K-Factor: 3.0 (43.2) (Actual) - F1 Res 30 Pendent Sprinkler
  4.9 (70.6) (Actual) - F1 Res 49 Pendent Sprinkler
  5.8 (83.5) (Actual) - F1 Res 58 Pendent & HSW Sprinkler
  7.6 (109)(Actual) - F1 Res 76 Pendent Sprinkler
  4.4 (63) (Actual) - F1 Res 44 HSW Sprinkler
- Density: Minimum 0.05 gpm/ft²

Reliable Automatic Sprinkler Co., Inc., 103 Fairview Park Drive, Elmsford, New York 10523

Application

Model F1 Res Sprinklers are used for Residential Fire Protection according to UL 1626 Standard*. For ceiling types: Smooth Flat Horizontal, or beamed, or sloped, in accordance with NFPA 13D, 13R, or 13 2013 editions. Be sure that orifice size, temperature rating, deflector style and sprinkler type are in accordance with the latest published standards of The National Fire Protection Association or the approving authority having jurisdiction.

Installation

Models F1 Res sprinklers are to be installed as shown. Model F1, F2 and FP Escutcheons, illustrated herewith, are the only recessed escutcheons to be used with Model F1 Res sprinklers. Use of any other recessed escutcheon will void all approvals and warranties. For installing Model F1 Res Pendent sprinklers use only the Model D sprinkler Wrench; for installing Models F1 Res Recessed Pendent, CCP & SWC sprinklers use only the Model GFR2 sprinkler wrench; for installing Model F1 Res Recessed HSW sprinklers use only the Model GFR2 Sprinkler Wrench. Use of wrenches other than those specified may damage these sprinklers. Install F1 Res 44 with a ceiling to deflector distance of 4" - 12". Flow arrow on deflector must point away from near wall and "Top" marking must face ceiling.

Escutcheon*, F1 or F2, Data:

Type	Adjustment Inch (mm)	"A" Inch (mm)	Face of fitting to ceiling Inch (mm)	"B" Deflector Distance below bottom of beam Inch (mm)
F1	¾ (19.0)	Min. Recessed = 1⅝ (41.3) Max. Recessed = ⅞ (22.2)	⅜ (9.5) 1⅛ (28.6)	1¾ (44.4) 1 (25.4)
F2	½ (12.7)	Min. Recessed = 1⅝ (41.3) Max. Recessed = 1⅛ (28.6)	⅜ (9.5) ⅞ (22.2)	1¾ (44.4) 1¼ (31.7)

*** Note:** Escutcheons F1 or F2 may be used with Model F1 Res 49, 58 & 76 Recessed Pendent Sprinkler

- **Model F1 Res 30, 49, 58 & 76 Pendent**

- **Model F1 Res 30 Recessed Pendent / F2**
- **Model F1 Res 49, 58 & 76 Recessed Pendent / F1**

F1 escutcheon, ¾" (19mm) adjustment

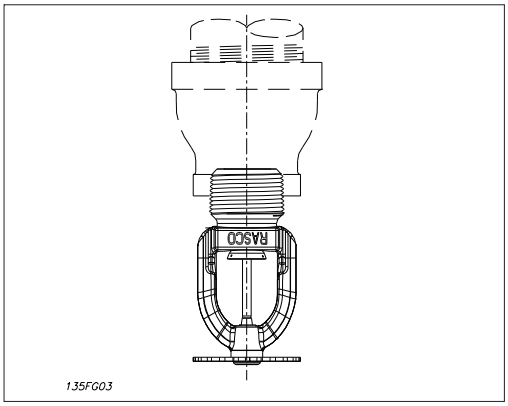


Fig. 1

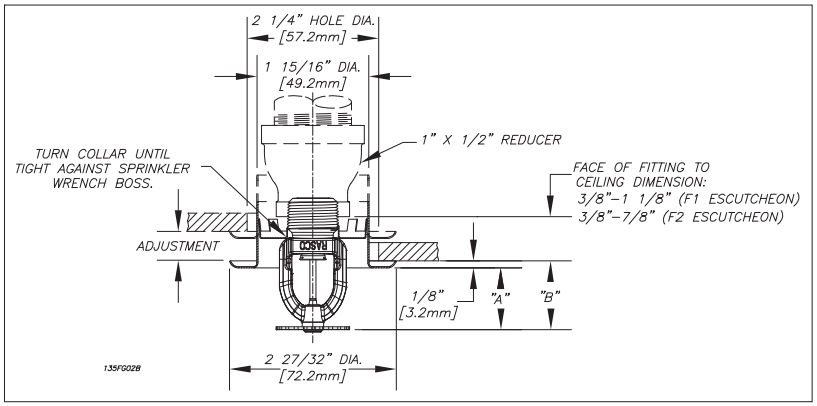


Fig. 2

Technical Data: F1Res 30 Pendent and Recessed Pendent (SIN R3511)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Sprinkler Temp. Rating °F	Sprinkler Temp. Rating °C	Max. Ambient Temp. °F	Max. Ambient Temp. °C	Actual K Factor	Sprinkler Length Inch (mm)
½" NPT (R½)	21/64" (8.2)	175 (12)	155 175	68 79	100	38	3.0 (43.2)	2.25 (57)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C) Flow GPM (L/min)	Ordinary Temp. Rating (155°F/68°C) Pressure PSI (bar)	Intermediate Temp. Rating (175°F/79°C) Flow GPM (L/min)	Intermediate Temp. Rating (175°F/79°C) Pressure PSI (bar)	Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
12 x 12 (3,6 x 3,6)	12 (3,6)	8 (30,3)	7.0 (0,48)	8 (30,3)	7.0 (0,48)	Smooth Ceilings 1¼ to 4 (31.7 to 102) using F2 escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams 1¼ to 1¾ (31.7 to 44.4) using F2 escutcheon	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	10 (37,8)	11 (0,76)	10 (37,8)	11 (0,76)		
16 x 16 (4,9 x 4,9)	16 (4,9)	13 (49)	18.8 (1,3)	13 (49)	18.8 (1,3)		

For Ceiling types refer to NFPA 13, 13R or 13D

Technical Data: F1Res 49 Pendent and Recessed Pendent (SIN R3516)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Sprinkler Temp. Rating		Max. Ambient Temp.		Actual K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
½" NPT (R½)	7/16" (11)	175 (12)	155 175	68 79	100 150	38 66	4.9 (70.6)	2.25 (57)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Intermediate Temp. Rating (175°F/79°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)	Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	13 (49)	7.0 (0,48)	13 (49)	7.0 (0,48)	Smooth Ceilings 1¼ to 4 (31.7 to 102) using F2 escutcheon. 1 to 4 (25.4 to 102) using F1 escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams 1¼ to 1¾ (31.7 to 44.4) using F2 escutcheon, 1 to 1¾ (25.4 to 44.4) using F1 escutcheon	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	13 (49)	7.0 (0,48)	13 (49)	7.0 (0,48)		
16 x 16 (4,9 x 4,9)	16 (4,9)	13 (49)	7.0 (0,48)	13 (49)	7.0 (0,48)		
18 x 18 (5,5 x 5,5)	18 (5,5)	17 (64,3)	12 (0,83)	17 (64,3)	12 (0,83)		
20 x 20 (6,1 x 6,1)	20 (6,1)	20 (75,7)	16.7 (1,14)	20 (75,7)	16,7 (1,14)		

For Ceiling types refer to NFPA 13, 13R or 13D

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Intermediate Temp. Rating (175°F/79°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)	Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	15 (57)	9.4 (0,65)	15 (57)	9.4 (0,65)	Smooth Ceilings 4 to 8 (100 to 203) using F2 escutcheon. 4 to 8 (100 to 203) using F1 escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams 4¼ to 8 (108 to 203) using F2 escutcheon, 4 to 8 (100 to 203) using F1 escutcheon	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	16 (60,5)	10.6 (0,73)	16 (60,5)	10.6 (0,73)		
16 x 16 (4,9 x 4,9)	16 (4,9)	17 (64,3)	12.0 (0,83)	17 (64,3)	12.0 (0,83)		
18 x 18 (5,5 x 5,5)	18 (5,5)	19 (72)	15.0 (1,0)	19 (72)	15.0 (1,0)		
20 x 20 (6,1 x 6,1)	20 (6,1)	22 (83,2)	20.2 (1,4)	22 (83,2)	20.2 (1,4)		

Technical Data: F1Res 58 Pendent and Recessed Pendent (SIN R3513)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Sprinkler Temp. Rating		Max. Ambient Temp.		Actual K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
½" NPT (R½)	½" (13)	175 (12)	155 175	68 79	100 150	38 66	5.8 (83.5)	2.25 (57)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Intermediate Temp. Rating (175°F/79°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)	Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	16 (61)	7.6 (0,53)	16 (61)	7.6 (0,53)	Smooth Ceilings 1¼ to 4 (31.7 to 102) using F2 escutcheon. 1 to 4 (25.4 to 102) using F1 escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams 1¼ to 1¾ (31.7 to 44.4) using F2 escutcheon, 1 to 1¾ (25.4 to 44.4) using F1 escutcheon	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	16 (61)	7.6 (0,53)	16 (61)	7.6 (0,53)		
16 x 16 (4,9 x 4,9)	16 (4,9)	16 (61)	7.6 (0,53)	16 (61)	7.6 (0,53)		
18 x 18 (5,5 x 5,5)	18 (5,5)	19 (72)	10.8 (0,75)	19 (72)	10.8 (0,75)		
20 x 20 (6,1 x 6,1)	20 (6,1)	22 (83,3)	14.4 (1,0)	22 (83,3)	14.4 (1,0)		

For Ceiling types refer to NFPA 13, 13R or 13D

Technical Data: F1 Res 76 Pendent and Recessed Pendent (SIN R7618)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Sprinkler Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
3/4" NPT (R3/4)	17/32" (13.5)	175 (12)	155 175	68 79	100 150	38 66	7.6 (109)	2.25 (57)

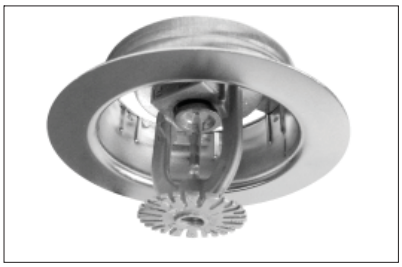
Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Intermediate Temp. Rating (175°F/79°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)	Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	21 (79,5)	7.6 (0,53)	21 (79,5)	7.6 (0,53)	Smooth Ceilings 4¼ to 8 (108 to 203) using F2 escutcheon. 4 to 8 (100 to 203) using F1 escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams 4¼ to 8 (108 to 203) using F2 escutcheon, 4 to 8 (100 to 203) using F1 escutcheon	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	21 (79,5)	7.6 (0,53)	21 (79,5)	7.6 (0,53)		
16 x 16 (4,9 x 4,9)	16 (4,9)	21 (79,5)	7.6 (0,53)	21 (79,5)	7.6 (0,53)		
18 x 18 (5,5 x 5,5)	18 (5,5)	21 (79,5)	7.6 (0,53)	21 (79,5)	7.6 (0,53)		
20 x 20 (6,1 x 6,1)	20 (6,1)	23 (87,1)	9.2 (0,63)	23 (87,1)	9.2 (0,63)		

For Ceiling types refer to NFPA 13, 13R or 13D

- **Model F1 Res 30, 49, 58 & 76 CCP Pendent***

* Not listed for corrosion resistance.

- **Model F1 Res 30, 49, 58 & 76 Recessed Pendent / FP**



FP push-on/thread-off escutcheon

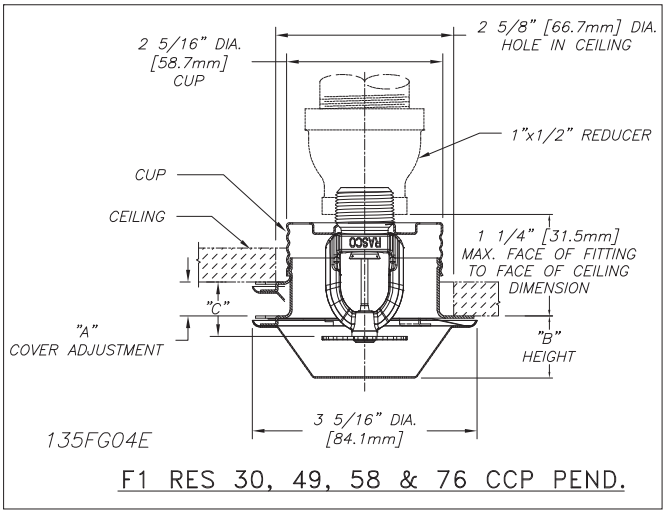


Fig. 3

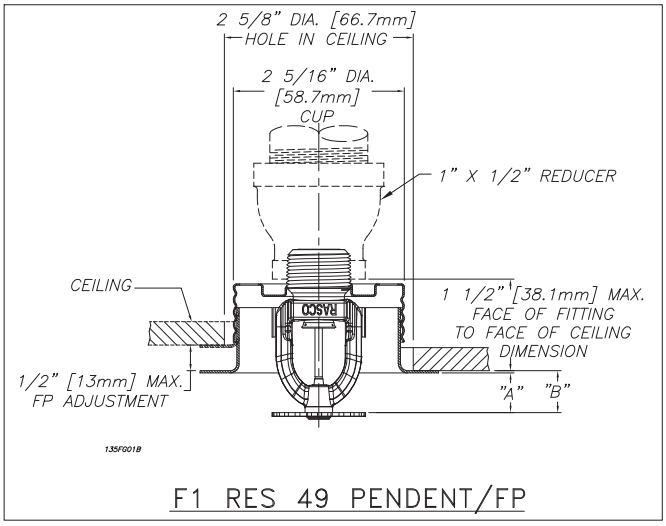


Fig. 4

Note: The F1 Res 76 will use a 1" x ¾" reducer.

CCP Cover Plate Data:

"A" Cover Adjustment Inch (mm)	"B" CCP Height Inch (mm)	"C" Deflector Distance below bottom of beam Inch (mm)
½ (12.7)	15/16 (24)	½ (13) - 1 (25.4)
5/16 (7.9)	3/4 (19)	½ (13) - 1 (25.4)

FP Escutcheon Data:

FP Position	"A" Inch (mm)	"B" Deflector Distance below bottom of beam Inch (mm)
Max. Recessed	7/16 (11)	½ (12.7)
Min. Recessed	15/16 (24)	1 (25.4)

Note: Sprinklers shown in Fig. 3 and Fig. 4 are not suitable for installation in ceilings which have positive pressure in the space above.

Technical Data: F1Res 30 CCP Pendent and Recessed Pendent/FP (SIN R3511)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	CCP Assembly Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
½" NPT (R½)	21/64" (8.2)	175 (12)	135	57	100	38	3.0 (43.2)	2.25 (57)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	8 (30,3)	7.0 (0,48)	Smooth Ceilings ½ to 1 (13 to 25.4) using CCP. ½ to 1 (13 to 25.4) using FP escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams ½ to 1 (13 to 25.4) using CCP. ½ to 1 (13 to 25.4) using FP escutcheon.	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	11 (37,8)	13.4 (0,92)		

For Ceiling types refer to NFPA 13, 13R or 13D

Technical Data: F1Res 49 CCP Pendent and Recessed Pendent/FP (SIN 3516)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	CCP Assembly Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
½" NPT (R½)	7/16" (11)	175 (12)	135	57	100	38	4.9 (70.6)	2.25 (57)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	13 (49)	7.0 (0,48)	Smooth Ceilings ½ to 1 (13 to 25.4) using CCP. ½ to 1 (13 to 25.4) using FP escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams ½ to 1 (13 to 25.4) using CCP. ½ to 1 (13 to 25.4) using FP escutcheon.	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	13 (49)	7.0 (0,48)		
16 x 16 (4,9 x 4,9)	16 (4,9)	14 (53)	8.2 (0,56)		
18 x 18 (5,5 x 5,5)	18 (5,5)	18 (68,1)	13.5 (0,93)		
20 x 20 (6,1 x 6,1)	20 (6,1)	20 (75,7)	16.7 (1,14)		

For Ceiling types refer to NFPA 13, 13R or 13D

Technical Data: F1Res 58 CCP Pendent and Recessed Pendent/FP (SIN R3513)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	CCP Assembly Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
½" NPT (R½)	1/2" (13)	175 (12)	135	57	100	38	5.8 (83.5)	2.25 (57)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	16 (61)	7.6 (0,53)	Smooth Ceilings ½ to 1 (13 to 25.4) using CCP. ½ to 1 (13 to 25.4) using FP escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams ½ to 1 (13 to 25.4) using CCP. ½ to 1 (13 to 25.4) using FP escutcheon.	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	16 (61)	7.6 (0,53)		
16 x 16 (4,9 x 4,9)	16 (4,9)	16 (61)	7.6 (0,53)		
18 x 18 (5,5 x 5,5)	18 (5,5)	19 (72)	10.8 (0,75)		
20 x 20 (6,1 x 6,1)	20 (6,1)	22 (83,3)	14.4 (1,0)		

For Ceiling types refer to NFPA 13, 13R or 13D

Technical Data: F1Res 76 CCP Pendent and Recessed Pendent/FP (SIN R7618)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	CCP Assembly Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
3/4" NPT (R3/4)	17/32" (13.5)	175 (12)	135	57	100 150	38 66	7.6 (109)	2.25 (57)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	21 (79,5)	7.6 (0,53)	Smooth Ceilings ½ to 1 (13 to 25.4) using CCP. ½ to 1 (13 to 25.4) using FP escutcheon. Beamed Ceilings per NFPA 13D, 13R or 13 installed in beams ½ to 1 (13 to 25.4) using CCP. ½ to 1 (13 to 25.4) using FP escutcheon.	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	21 (79,5)	7.6 (0,53)		
16 x 16 (4,9 x 4,9)	16 (4,9)	21 (79,5)	7.6 (0,53)		
18 x 18 (5,5 x 5,5)	18 (5,5)	22 (83,3)	8.4 (0,58)		
20 x 20 (6,1 x 6,1)	20 (6,1)	25 (94,6)	10.8 (0,74)		

For Ceiling types refer to NFPA 13, 13R or 13D

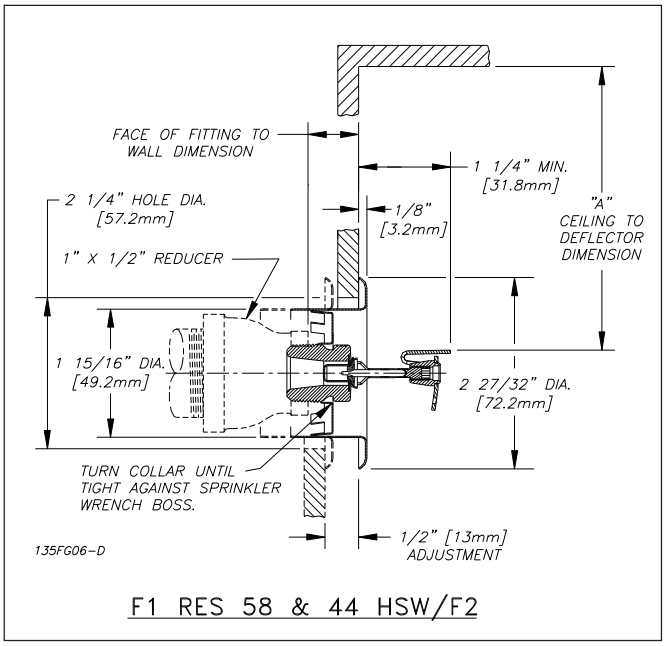
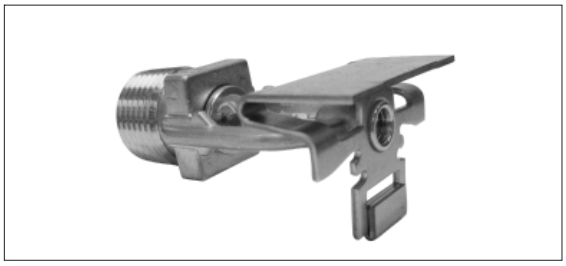
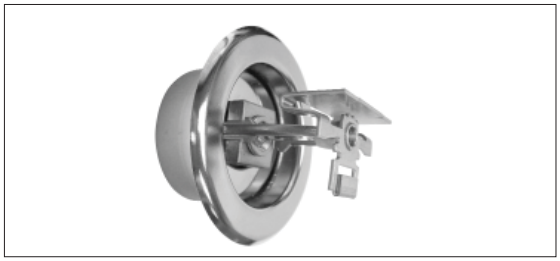


Fig. 5

- **Model F1 Res 44 & 58 HSW**



- **Model F1 Res 44 & 58 Recessed HSW/F2**



F2 escutcheon,
1/2" (13mm) adjustment

Technical Data: F1Res 44 HSW & HSW/F2 (SIN R3531)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Sprinkler Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
½" NPT (R½)	3/8" (10)	175 (12)	155 175	68 79	100 150	38 66	4.4 (63)	2.45 (62)

Escutcheon, F2, Data:

Type	Adjustment Inch (mm)	Face of Fitting to wall Inch (mm)
F2	1/2 (13)	3/16 - 11/16 (4.7 - 17.4)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Intermediate Temp. Rating (175°F/79°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)	Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	12 (45,4)	7.5 (0,52)	12 (45,4)	7.5 (0,52)	4 to 6 (100 to 152); ½ (13) recessed using F2 escutcheon	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	14 (53,0)	10.2 (0,71)	14 (53,0)	10.2 (0,71)		
16 x 16 (4,9 x 4,9)	16 (4,9)	16 (60,6)	13.3 (0,92)	16 (60,6)	13.3 (0,92)		
16 x 18 (4,9 x 5,5)	16 (4,9)	18 (68,1)	16.8 (0,53)	18 (68,1)	16.8 (0,53)		
18 x 18 (5,5 x 5,5)	18 (5,5)	19 (72,0)	18.7 (1,29)	19 (72,0)	18.7 (1,29)		
16 x 20 (4,9 x 6,1)	16 (4,9)	23 (87,1)	27.4 (1,89)	23 (87,1)	27.4 (1,89)		
12 x 12 (3,6 x 3,6)	12 (3,6)	14 (53,0)	10.2 (0,71)	14 (53,0)	10.2 (0,71)	6 to 12 (152 to 305); ½ (13) recessed using F2 escutcheon	
14 x 14 (4,3 x 4,3)	14 (4,3)	16 (60,6)	13.3 (0,92)	16 (60,6)	13.3 (0,92)		
16 x 16 (4,9 x 4,9)	16 (4,9)	17 (64,4)	15.0 (1,04)	17 (64,4)	15.0 (1,04)		
16 x 18 (4,9 x 5,5)	16 (4,9)	20 (75,7)	20.7 (1,43)	20 (75,7)	20.7 (1,43)		
16 x 20 (4,9 x 6,1)	16 (4,9)	23 (87,1)	27.4 (1,89)	23 (87,1)	27.4 (1,89)		

For Ceiling types refer to NFPA 13, 13R or 13D

Technical Data: F1Res 58 HSW & HSW/F2 (SIN R3533)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Sprinkler Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
½" NPT (R½)	½" (13)	175 (12)	155 175	68 79	100 150	38 66	5.8 (83.5)	2.45 (62)

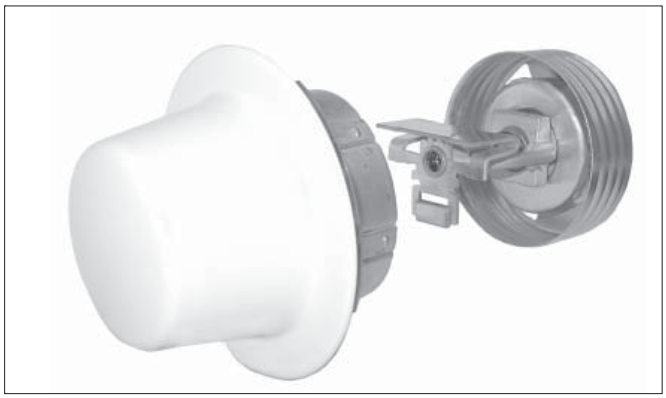
Escutcheon, F2, Data:

Type	Adjustment Inch (mm)	Face of Fitting to wall Inch (mm)
F2	½ (13)	$^{3}/_{16}$ - $^{11}/_{16}$ (4.7 - 17.4)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Intermediate Temp. Rating (175°F/79°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)	Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	16 (60,6)	7.6 (0,53)	16 (60,6)	7.6 (0,53)	4 to 6 (100 to 152); ½ (13) recessed using F2 escutcheon	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	18 (68,2)	9.7 (0,69)	18 (68,2)	9.7 (0,69)		
16 x 16 (4,9 x 4,9)	16 (4,9)	21 (79,5)	13.2 (0,91)	21 (79,5)	13.2 (0,91)		
16 x 18 (4,9 x 5,5)	16 (4,9)	25 (94,7)	18.6 (1,28)	25 (94,7)	18.6 (1,28)		
16 x 20 (4,9 x 6,1)	16 (4,9)	29 (109,8)	25.0 (1,73)	29 (109,8)	25.0 (1,73)		
12 x 12 (3,6 x 3,6)	12 (3,6)	22 (83,3)	14.4 (1,0)	22 (83,3)	14.4 (1,0)	6 to 12 (152 to 305); ½ (13) recessed using F2 escutcheon	
14 x 14 (4,3 x 4,3)	14 (4,3)	22 (83,3)	14.4 (1,0)	22 (83,3)	14.4 (1,0)		
16 x 16 (4,9 x 4,9)	16 (4,9)	26 (98,4)	20.1 (1,39)	26 (98,4)	20.1 (1,39)		
16 x 18 (4,9 x 5,5)	16 (4,9)	31 (117,4)	28.6 (1,97)	31 (117,4)	28.6 (1,97)		

For Ceiling types refer to NFPA 13, 13R or 13D

- **Model F1 Res 44 SWC***



* Not listed for corrosion resistance.

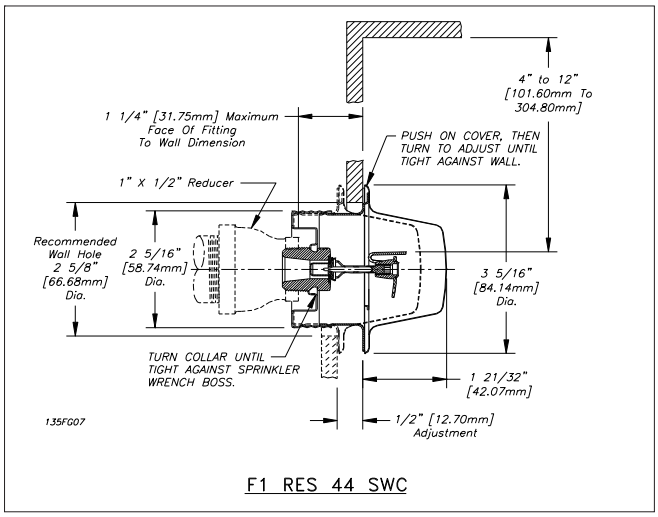


Fig. 6

Technical Data: F1Res 44 SWC (SIN R3531)

Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Cover Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)
			°F	°C	°F	°C		
½" NPT (R½)	⅜" (10)	175 (12)	135	57	100	38	4.4 (63)	2.45 (62)

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)		
12 x 12 (3,6 x 3,6)	12 (3,6)	13 (49,2)	8.7 (0,60)	4 to 6 (100 to 152); ½ (13) recessed using F2 escutcheon	8 (2,4)
14 x 14 (4,3 x 4,3)	14 (4,3)	14 (53,0)	10.2 (0,71)		
16 x 16 (4,9 x 4,9)	16 (4,9)	17 (64,3)	15.0 (1,1)		
16 x 18 (4,9 x 5,5)	16 (4,9)	19 (71,8)	18.7 (1,13)		
16 x 20 (4,9 x 6,1)	16 (4,9)	23 (87,1)	27.4 (1,89)		
12 x 12 (3,6 x 3,6)	12 (3,6)	14 (52,9)	10.2 (0,71)	6 to 12 (152 to 305); ½ (13) recessed using F2 escutcheon	
14 x 14 (4,3 x 4,3)	14 (4,3)	15 (56,7)	11.7 (0,81)		
16 x 16 (4,9 x 4,9)	16 (4,9)	18 (68,1)	16.8 (1,16)		
16 x 18 (4,9 x 5,5)	16 (4,9)	20 (75,6)	20.7 (1,43)		

For Ceiling types refer to NFPA 13, 13R or 13D

Technical Data: F1Res 58 HSWX (SIN RA3533)

	Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Sprinkler Temp. Rating		Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)	Sprinkler Identification Number (SIN)
				°F	°C	°F	°C			
Bulb	½" NPT (R½)	½" (13)	175 (12)	155 175	68 79	100 150	38 66	5.8 (83.5)	2.45 (62)	RA3533

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (155°F/68°C)		Intermediate Temp. Rating (175°F/79°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)	Flow GPM (L/min)	Pressure PSI (bar)		
18 x 20 (5,5 x 6,1)	18 (5,5)	30 (114)	26.8 (1,85)	30 (114)	26.8 (1,85)	4 to 6 (100 to 152); ½ (13) recessed using F2 escutcheon	8 (2,4)
20 x 20 (6,1 x 6,1)	20 (6,1)	30 (114)	26.8 (1,85)	30 (114)	26.8 (1,85)		
16 x 22 (4,9 x 7,3)	16 (4,9)	33 (125)	32.4 (2,23)	33 (125)	32.4 (2,23)		
16 x 24 (4,9 x 7,3)	16 (4,9)	38 (144)	42.9 (2,96)	38 (144)	42.9 (2,96)		
14 x 26 (4,3 x 7,9)	14 (4,3)	42 (160)	52.4 (3,75)	42 (160)	52.4 (3,75)		
18 x 20 (5,5 x 6,1)	18 (5,5)	35 (133)	36.4 (2,5)	35 (133)	36.4 (2,5)	6 to 12 (152 to 305); ½ (13) recessed using F2 escutcheon	
16 x 22 (4,9 x 6,7)	16 (4,9)	38 (144)	42.9 (2,96)	38 (144)	42.9 (2,96)		
16 x 24 (4,9 x 7,3)	16 (4,9)	42 (160)	52.4 (3,6)	42 (160)	52.4 (3,6)		
14 x 26 (4,3 x 7,9)	14 (4,3)	46 (174)	62.9 (4,34)	46 (174)	62.9 (4,34)		

For Ceiling types refer to NFPA 13, 13R or 13D

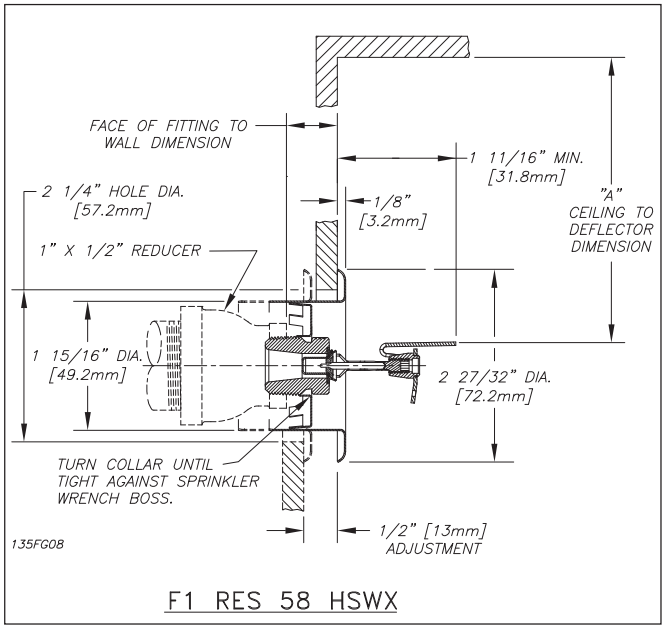
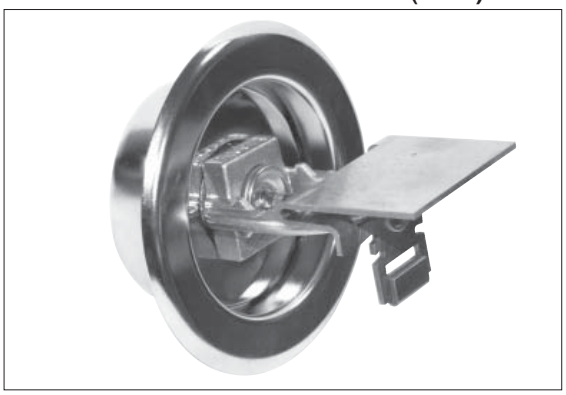
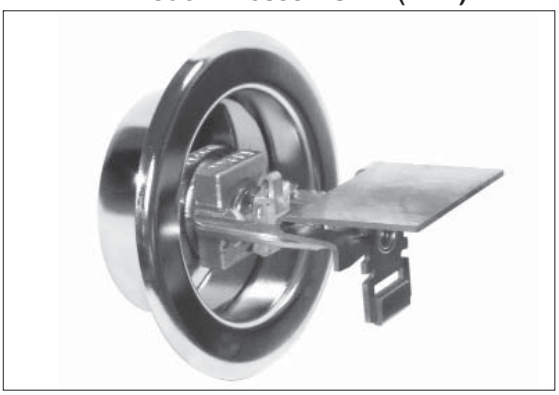


Fig. 7

- **Model F1 Res 58 HSWX (Bulb)**



- **Model KRes58 HSWX (Link)**



Technical Data: KRes58 HSWX (RA3593)

	Thread Size	Nominal Orifice Inch (mm)	Max. Pressure psi (bar)	Max. Ambient Temp.		K Factor	Sprinkler Length Inch (mm)	Sprinkler Identification Number (SIN)
				°F	°C			
Link	½" NPT (R½)	½" (13)	175 (12)	100	38	5.8 (83.5)	2.45 (62)	RA3593

Max. Coverage area Ft x Ft (m x m)	Max. Spacing Ft (m)	Ordinary Temp. Rating (165°F/74°C)		Top of Deflector to Ceiling Inch (mm)	Minimum Spacing Ft (m)
		Flow GPM (L/min)	Pressure PSI (bar)		
18 x 20 (5,5 x 6,1)	18 (5,5)	29 (109)	25 (1,72)	4 to 6 (100 to 152); ½ (13) recessed using F2 escutcheon	8 (2,4)
20 x 20 (6,1 x 6,1)	20 (6,1)	30 (114)	26.8 (1,85)		
16 x 22 (4,9 x 7,3)	16 (4,9)	33 (125)	32.4 (2,23)		
16 x 24 (4,9 x 7,3)	16 (4,9)	38 (144)	42.9 (2,96)		
14 x 26 (4,3 x 7,9)	14 (4,3)	42 (160)	52.4 (3,75)		
18 x 20 (5,5 x 6,1)	18 (5,5)	35 (133)	36.4 (2,5)	6 to 12 (152 to 305); ½ (13) Recessed using F2 escutcheon	
16 x 22 (4,9 x 6,7)	16 (4,9)	38 (144)	42.9 (2,96)		
16 x 24 (4,9 x 7,3)	16 (4,9)	42 (160)	52.4 (3,6)		
14 x 26 (4,3 x 7,9)	14 (4,3)	46 (174)	62.9 (4,34)		

For Ceiling types refer to NFPA 13, 13R or 13D

Maintenance

Model F1 Res 30, 49, F1 Res 58, F1 Res 76 and F1 Res 44 Sprinklers should be inspected and the sprinkler system maintained in accordance with NFPA 25, 13, 13D, and 13R. Do not clean sprinkler with soap and water, Ammonia or any other cleaning fluids. Remove dust by using a soft brush or gentle vacuuming. Remove any sprinkler which has been painted (other than factory applied) or damaged in any way. A stock of spare sprinklers should be maintained to allow quick replacement of damaged or operated sprinklers. Prior to installation, sprinklers should remain in the original cartons and packaging until used. This will minimize the potential for damage to sprinklers that could cause improper operation or non-operation.

Model F1 Res 30, 49 & 58 Pendent Sprinkler Specifications

Sprinklers shall be [cULus Listed] [New York City MEA Approved (258-93-E)] low flow residential pendent sprinklers engineered to provide a minimum design density of 0.05 gpm/ft^2 over the listed coverage area. Listed flows as specified by the manufacturer's technical data sheets are to be used. Residential sprinklers shall be installed in conformance with the manufacturer's installation guidelines and the applicable installation standard. Deflector-to-ceiling distance listing shall be 1" to 8" maximum, only for F1Res 49. Sprinkler frame and deflector shall be of bronze frame construction having a ½" NPT thread. Water seal assembly shall consist of a Teflon* coated Belleville spring washer with top-loaded extruded or cold head cup with 3 mm glass bulb containing no plastic parts, and having a temperature rating of [155°F (68°C)] [175°F (79°C)]. Sprinklers shall have a nominal K-factor of 3.0, 4.9 and 5.8. Standard finish: [Bronze] [Chrome-plated] [White Polyester] [Special finish– specify]. Residential pendent sprinklers shall be Reliable Model F1 Res 30, 49 & 58, SIN R3511, R3516 & R3513 (Bulletin 135).

Model F1 Res 49 & 58 Recessed Pendent/F1, Model F1 Res 30, 49 & 58 Recessed Pendent/F2, Model F1 Res 30, 49 & 58 Recessed Pendent/FP

Sprinklers shall be [cULus Listed] [New York City MEA Approved (258-93-E)] low flow residential recessed pendent sprinklers engineered to provide a minimum design density of 0.05 gpm/ft^2 over the listed coverage area. Listed flows as specified by the manufacturer's technical data sheets are to be used. Residential sprinklers shall be installed in conformance with the manufacturer's installation guidelines and the applicable installation standard. Deflector-to-ceiling distance listing shall be 1" to 8" maximum, only for F1Res 49. Sprinkler frame and deflector shall be of bronze frame construction having a ½" NPT thread. Water seal assembly shall consist of a Teflon* coated Belleville spring washer with top-loaded extruded

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or cold head cup with 3 mm glass bulb containing no plastic parts, and having a temperature rating of [155°F (68°C)] [175°F (79°C)]. Sprinklers shall have a nominal K-factor of 3.0, 4.9 & 5.8. Standard finish: [Bronze] [Chrome-plated] [White Polyester] [Special finish– specify]. Recessed escutcheon assembly shall be a steel, two-piece escutcheon [with ½" adjustment (Model F2)] [with ¾" adjustment (Model F1)] [of push-on and thread off design with ½" adjustment (Model FP)]. Standard finish shall be [brass][bright chrome] [white painted]. Residential recessed pendent sprinklers shall be Reliable [Model F1 Res 30, 49 & 58 Recessed Pendent/F1] [Model F1 Res 30, 49 & 58 Recessed Pendent/F2] [Model F1 Res 30, 49 & 58 Recessed Pendent/FP] SIN R3511, R3516 & R3513 (Bulletin 135).

Model F1 Res 30, 49 & 58 CCP Pendent (Concealed)

Sprinklers shall be [cULus Listed] [New York City MEA Approved (258-93-E)] low flow residential concealed sprinklers engineered to provide a minimum design density of 0.05 gpm/ft^2 over the listed coverage area. Listed flows as specified by the manufacturer's technical data sheets are to be used. Residential sprinklers shall be installed in conformance with the manufacturer's installation guidelines and the applicable installation standard. Sprinkler frame and deflector shall be of bronze frame construction having a ½" NPT thread. Water seal assembly shall consist of a Teflon* coated Belleville spring washer with top-loaded extruded or cold head cup with 3 mm glass bulb containing no plastic parts, and having a temperature rating of 155°F (68°C). Cover plate assembly shall consist of a brass cover plate and copper alloy retainer flange. Method of attaching the cover plate to the sprinkler cup shall be a push-on and thread-off design allowing a ½" cover plate adjustment. Cover plate temperature rating shall be 135°F (57°C). A plastic protective cap shall be provided and factory installed inside the sprinkler cup to protect the sprinkler from damage, which could occur during construction before the cover plate is installed. Standard cover plate finish: [White] [Custom Color– specify].]. Concealed pendent sprinklers shall be Reliable Model F1 Res 30, 49 & 58 CCP, SIN R3511, R3516 & R3513 (Bulletin 135).

Model F1 Res 44, F1 Res 58 Horizontal Sidewall, F1 Res 58 HSWX & KRes58 HSWX Residential Sprinkler Specifications

Sprinklers shall be [cULus Listed] low flow residential horizontal sidewall sprinklers engineered to provide a minimum design density of 0.05 gpm/ft^2 over the listed coverage area. Listed flows as specified by the manufacturer's technical data sheets are to be used. Residential sprinklers shall be installed in conformance with the manufacturer's installation guidelines and the applicable installation standard. Sprinkler frame and deflector shall be of bronze frame construction having a ½" NPT thread. Water seal assembly shall consist of a Teflon* coated Belleville spring washer with top-loaded extruded or cold head cup with 3 mm glass bulb containing no plastic parts, and having a temperature rating of [155°F (68°C)] [175°F (79°C)]. The solder element (Link) version, the water seal consist of a cap with a bellville spring washer and a temperature rating of 165°F (74°C). The recessed assembly forthe HSWX (Bulb & Link) should be a steel two pieces escutcheon with 1/2" adjustment (Model F2) standard finish should be Bright Chrome and white painted. The F1 Res 58 HSW is also available with low lead frame. F1 Res 58 HSW and HSWX sprinklers shall have a nominal K Factor of 5.8 and F1 Res 44 a nominal K factor of 4.4. Standard finish: [Bronze] [Chrome-plated] [White Polyester] [Special finish– specify]. Residential horizontal sidewall sprinklers shall be Reliable Model F1 Res 44, F1 Res 58, F1 Res 58 HSWX & Model KRes58 HSWX, SIN R3531, RA3533 & RA3593 (Bulletin 135).

Model F1 Res 44 Recessed Horizontal Sidewall Sprinkler

Use description for the Model F1 Res 44 horizontal sidewall sprinkler with the following modifications: Replace "horizontal sidewall sprinkler" with "recessed horizontal sprinkler." Add: Recessed escutcheon assembly shall be a steel, two-piece escutcheon with ½" adjustment (Model F2). Standard finish shall be [brass][bright chrome] [white painted] [Special finish– specify]. Residential recessed horizontal sidewall sprinklers shall be Reliable Model F1 Res 44/F2, SIN R3531 (Bulletin 135).

Model F1 Res 76 Pendent

Sprinklers shall be [cULus Listed] low flow residential pendent sprinklers engineered to provide a minimum design density of 0.05 gpm/ft^2 over the listed coverage area. Listed flows as specified by the manufacturer's technical data sheets are to be used. Residential sprinklers shall be installed in conformance with the manufacturer's installation guidelines and the applicable installation standard. Sprinkler frame and deflector shall be of bronze frame construction having a ¾" NPT thread. Water seal assembly shall consist of a Teflon* coated Belleville spring washer with machined or cold head cup with 3 mm glass bulb containing no plastic parts, and having a temperature rating of [155°F (68°C)] [175°F (79°C)]. Sprinklers shall have a nominal K-factor of 7.6. Standard finish: [Bronze] [Chrome-plated] [White Polyester] [Special finish– specify]. Residential pendent sprinklers shall be Reliable Model F1 Res 76, SIN R7618 (Bulletin 135).

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Model F1 Res 76 Recessed Pendent/F1, Model F1 Res 76 Recessed Pendent/F2, Model F1 Res 76 Recessed Pendent/FP

Sprinklers shall be [cULus Listed] low flow residential recessed pendent sprinklers engineered to provide a minimum design density of 0.05 gpm/ft^2 over the listed coverage area. Listed flows as specified by the manufacturer's technical data sheets are to be used. Residential sprinklers shall be installed in conformance with the manufacturer's installation guidelines and the applicable installation standard. Sprinkler frame and deflector shall be of bronze frame construction having a ¾" NPT thread. Water seal assembly shall consist of a Teflon* coated Belleville spring washer with machined or cold head cup with 3 mm glass bulb containing no plastic parts, and having a temperature rating of [155°F (68°C)] [175°F (79°C)]. Sprinklers shall have a nominal K-factor of 7.6. Standard finish: [Bronze] [Chrome-plated] [White Polyester] [Special finish– specify]. Recessed escutcheon assembly shall be a steel, two-piece escutcheon [with ½" adjustment (Model F2)] [with ¾" adjustment (Model F1)] [of push-on and thread off design with ½" adjustment (Model FP)]. Standard finish shall be [brass][bright chrome] [white painted]. Residential recessed pendent sprinklers shall be Reliable [Model F1 Res 76 Recessed Pendent/F1] [Model F1 Res 76 Recessed Pendent/F2] [Model F1 Res 76 Recessed Pendent/FP] SIN R7618 (Bulletin 135).

Model F1 Res 76 CCP Pendent (Concealed)

Sprinklers shall be [cULus Listed] low flow residential concealed sprinklers engineered to provide a minimum design density of 0.05 gpm/ft^2 over the listed coverage area. Listed flows as specified by the manufacturer's technical data sheets are to be used. Residential sprinklers shall be installed in conformance with the manufacturer's installation guidelines and the applicable installation standard. Sprinkler frame and deflector shall be of bronze frame construction having a ¾" NPT thread. Water seal assembly shall consist of a Teflon* coated Belleville spring washer with machined or cold head cup with 3 mm glass bulb containing no plastic parts, and having a temperature rating of 155°F (68°C). Cover plate assembly shall consist of a brass cover plate and copper alloy retainer flange. Method of attaching the cover plate to the sprinkler cup shall be a push-on and thread-off design allowing a ½" cover plate adjustment. Cover plate temperature rating shall be 135°F (57°C). A plastic protective cap shall be provided and factory installed inside the sprinkler cup to protect the sprinkler from damage, which could occur during construction before the cover plate is installed. Standard cover plate finish: [White] [Custom Color– specify].]. Concealed pendent sprinklers shall be Reliable Model F1 Res 76 CCP, SIN R7618 (Bulletin 135).

Finishes [1]

Standard Finishes		
Sprinkler	**F1, F2, FP Escutcheons**	**Cover Plates**
Bronze Chrome Plated White and Black Polyester[2] Coated	Brass Bright Chrome Plated White Painted	White Painted Chrome

Special Application Finishes	
Sprinkler	**F1, F2, FP Escutcheons**
Electroless Nickel PTFE(Teflon®)[2] Bright Brass Black Plated Black Paint Off White Chrome Dull	Electroless Nickel PTFE (Teflon®) Bright Brass Black Plated Black Paint Off White Chrome Dull

[1] Other finishes and colors are available on special order. Consult factory for details.

[2] cULus listed Corrosion Resistant

Note: Paint or any other coating applied over the factory finish will void all approvals and warranties.

Ordering Information

Specify:

1. Sprinkler Model
2. Sprinkler Type
3. Temperature Rating
4. Sprinkler Finish
5. Escutcheon Finish
6. Cover Plate Finish

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FG-3-0202

FlameGuard™ LIMITED WARRANTY

Except as otherwise mandated by law, Spears Manufacturing Company warrants that the goods which have been directly manufactured by them shall be free from defects in material and workmanship for a period of ten (10) years, from the date of shipment. CUSTOMER AGREES THAT THIS WARRANTY SHALL BE EFFECTIVE SO LONG AS THE GOODS ARE USED SOLELY FOR THE NORMAL PURPOSES FOR WHICH THEY ARE INTENDED AND IN CONFORMANCE WITH INDUSTRY ESTABLISHED ENGINEERING, INSTALLATION, OPERATING, AND MAINTENANCE SPECIFICATIONS, RECOMMENDATIONS AND INSTRUCTIONS. VIOLATION THEREOF SHALL VOID THIS WARRANTY AND RELIEVE COMPANY FROM ANY OBLIGATION UNDER THIS WARRANTY. COMPANY CANNOT AND DOES NOT ASSUME RESPONSIBILITY, AND EXPRESSLY DISCLAIMS ANY LIABILITY, DUE TO CUSTOMER'S, ANY INSTALLER'S OR END USER'S FAILURE TO COMPLY WITH SUCH SPECIFICATIONS, RECOMMENDATIONS AND INSTRUCTIONS.

If Customer receives any goods that appear to be defective, upon receipt of a Return Authorization (RA#) issued by Spears Customer Services Department, Customer may return such questionable goods. The material must be returned prepaid to Company at 15853 Olden Street, Sylmar, California 91342 along with completed Return Authorization documentation. After examination if the goods are determined to be defective in materials or workmanship directly provided by Company, Company, at its sole option, may either repair or replace the defective goods, or reimburse Customer for the cost of such goods. This shall be Customer's only remedy. All costs of shipping such questionable goods and any replacements thereof to and from Company's facility shall be borne by Customer. Customer agrees that Company will not be responsible for other parts or labor in connection with repairing, replacing, or returning such goods while goods are in possession of Company for analysis, nor for any delays beyond Company's reasonable control (including, with limitation, delays due to unavailability of materials, equipment, other supplies or labor, strikes, governmental regulation or other acts of God), provided that any delay shall toll the warranty period for the same amount of time as the delay itself.

COMPANY EXTENDS ONLY THIS WARRANTY AND EXPLICITLY WAIVES ALL OTHER WARRANTIES, EXPRESSED OR IMPLIED, ORAL OR STATUTORY (INCLUDING ANY IMPLIED WARRANTIES OR AFFIRMATION, SUITABILITY, MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) APPLICABLE TO THE GOODS. NO AFFIRMATION BY COMPANY OR ANY OF ITS REPRESENTATIVES, BY WORDS OR CONDUCT, SHALL CONSTITUTE A WARRANTY. THIS WARRANTY MAY NOT BE EXTENDED, ALTERED OR OTHERWISE MODIFIED EXCEPT BY WRITTEN AGREEMENT SIGNED BY COMPANY.

BY ITS ACCEPTANCE OF THE GOODS, CUSTOMER HEREBY SPECIFICALLY AND EXPRESSLY WAIVES ALL OTHER LIABILITY OR OBLIGATION OF ANY KIND OR CHARACTER OF COMPANY, INCLUDING WITHOUT LIMITATION LIABILITY PREDICATED UPON STRICT LIABILITY OR TORT, AND ALL DAMAGES AND LOSSES AS A RESULT THEREOF, INCLUDING BUT NOT LIMITED TO ALL KNOWN, UNKNOWN, FORESEEABLE, UNFORESEEABLE, ABSOLUTE, CONTINGENT, LIQUIDATED, NON-LIQUIDATED, COMPENSATORY, GENERAL, SPECIAL, CONSEQUENTIAL, INCIDENTAL, OR PUNITIVE DAMAGES, AND WITH RESPECT TO THE GOODS, THEIR RETURN, REPAIR, RESTORATION AND REPLACEMENT. WITH RESPECT TO SUCH WAIVER, CUSTOMER HEREBY EXPLICITLY WAIVES CALIFORNIA CIVIL CODE §1542 WHICH STATES "A GENERAL RELEASE DOES NOT EXTEND TO CLAIMS WHICH THE CREDITOR DOES NOT KNOW OR SUSPECT TO EXIST IN HIS FAVOR AT THE TIME OF EXECUTING THIS RELEASE, WHICH IF KNOWN BY HIM MUST HAVE MATERIALLY ADVERSELY AFFECTED HIS SETTLEMENT WITH DEBTOR" AND ALL OTHER SIMILAR STATUTORY, COMMON AND CASE LAW RIGHTS, DEFENSES AND LIMITATIONS.

Having independently inspected a sample of the goods as fully as desired or having refused to make such examination upon acceptance of delivery of the goods, and except as otherwise herein provided, Customer hereby accepts the goods in its "AS IS" condition "WITH ALL FAULTS" without any other warranty, expressed or implied, and hereby accepts and assumes the entire risk and cost of all necessary servicing, repairs and remedy thereof.

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IMPORTANT INFORMATION

Please Read The Following Section Before Proceeding

Use of this Manual

Spears FlameGuard™ CPVC Fire Sprinkler Products are approved for use in combination with other listed manufacturers' products (see, "Use With Other Manufacturers' Pipes, Fittings, and Solvent Cements" section). However, specific application approvals may not be the same amongst manufacturers. **It is the installer's responsibility to verify suitability of products used in combination according to each manufacturer's installation instructions.** Engineering data related to the installation and use of CPVC Fire Sprinkler *Pipe* provided in this manual is based on product manufactured by the Victaulic Company of America (Victaulic FireLock™) or Harvel Plastics, Inc. (Harvel BlazeMaster®), as designated herein. If products other than Victaulic or Harvel are used, follow the appropriate manufacturer's installation instructions. Contact Spears if questions on any application not addressed in this manual.

This manual is intended for use by specifiers, installers, and users in the selection, design, installation, and inspection of Spears FlameGuard™ CPVC Fire Sprinkler Products for fire protection service. Due to the critical safety and loss prevention uses of such systems, all information contained herein is considered vital to obtain proper system performance and **must be read and understood carefully before starting the installation**. The information contained within this manual is accurate at the time of publication to the best of our knowledge. It is not meant as a replacement for formal installer training. We do not make any guarantees nor assume any liabilities arising out of its use. If you need additional copies, or if you have any questions about the safe installation and use of these products, contact Spears Manufacturing Company, P.O. Box 9203, Sylmar, CA 91392 or call (800)862-1499. Additional copies of this manual may be downloaded from our web site: www.spearsmfg.com.

Hazards & Information Definitions

Definitions for identifying the various hazard levels are as follows:

- **WARNING - The use of the word "WARNING" identifies the presence of hazards or unsafe practices that could result in severe personal injury if instructions, including recommended precautions, are not followed.**

- **CAUTION -** The use of the word "CAUTION" identifies possible hazards or unsafe practices that could result in personal injury, product damage, and/or property damage if instructions, including precautions, are not followed.

- **NOTICE** - The use of the word "NOTICE" identifies special instructions that are highly important but not related to hazards.

- **Text information in bold print** – Text in bold print identifies additional important information that may or may not be related to a hazard, according to the topic and context.

System Engineering, Installation & Maintenance

CPVC Fire Sprinkler Systems must be engineered, installed and maintained in accordance with local codes, standards and Spears FlameGuard™ CPVC Fire Sprinkler Products Installation Instructions. Code requirements and field conditions may differ. It is the responsibility of the installing contractor to insure that the product is suitable for the intended use and that all requirements have been satisfied.

Installer Training

Spears Manufacturing Company recommends that installers receive proper installation training and that training be renewed every two (2) years. Training will be provided at no charge by contacting an authorized Spears FlameGuard™ CPVC Fire Sprinkler Products distributor or your nearest Spears Regional Distribution Center.

General Installation Safety Instructions

- Use only recommended accessories. **Use of improper accessories or unapproved system components in conjunction with Spears FlameGuard™ CPVC Fire Sprinkler products will void the warranty and may result in improper operation of the system.**

- **CAUTION: Avoid dangerous environments**. If utilizing electrically powered tools for installation, be sure that the area is free of moisture or wetness that could create an unsafe condition. Keep work area clean and well illuminated. Allow sufficient space for measuring and system dry-fit to accommodate proper installation.

- Prevent back injury. Always practice safe lifting and installation techniques.

- Use only tools specifically designed for plastic pipe and fittings.

- Inspect the products. Be sure that all parts are included and that you have all necessary tools available to properly install the system.

- **CAUTION:** Follow all workplace safety requirements. Wear safety glasses, hardhat, and safety footwear. Always practice safety first.

- When solvent cementing, always work in a well-ventilated area. Avoid sources of heat or open flames. DO NOT smoke. Wear protective gloves. PVA-coated protective gloves are recommended for use while solvent cementing. If hands come in contact with solvent cement, use a waterless, abrasive soap.

- Wear ear protection. Protect your hearing if you are exposed to long periods of very noisy job-site operations.

INTRODUCTION

Spears FlameGuard™ CPVC Fire Sprinkler products are manufactured from high quality, Post-Chlorinated Poly Vinyl Chloride (CPVC), a specialty thermoplastic material tested and approved by certifying agencies for use in CPVC fire sprinkler systems. Spears FlameGuard™ CPVC Fire Sprinkler products provide unique advantages over traditional metal fire sprinkler systems through superior hydraulics, ease of installation and handling and quick assembly using readily available, inexpensive tools.

Handling & Storage

Pipe & Fittings

Spears FlameGuard™ CPVC Fire Sprinkler Products resist attack from a large group of chemicals that are corrosive to metallic piping. However, care must be taken to avoid contact with chemicals that are harmful to CPVC. Specific chemicals or chemical vapors that contact CPVC can weaken or severely damage the system. Consult with the chemical manufacturer or Spears before use.

<u>WARNING</u>: DO NOT expose Spears FlameGuard™ CPVC Fire Sprinkler Products to edible oils, esters, ketones, or petroleum-based products, such as cutting oils, packing oils, traditional pipe thread paste or dopes, and some lubricants. Consult with the chemical manufacturer or Spears before use. Contact with incompatible chemicals could cause serious personal injury, property damage, and product damage.

Spears recommends that CPVC Fire Sprinkler Pipe be stored indoors. If storing outdoors, the products must be *covered* with a non-transparent material to prevent extended exposure to sunlight. Brief exposure to direct sunlight on the job site may result in color fade, but it will not affect the physical properties. Spears FlameGuard™ CPVC Fire Sprinkler Fittings should be stored indoors in their original containers to keep them free from dirt and to help reduce the possibility of damage.

WARNING: Spears FlameGuard™ CPVC Fire Sprinkler Products and pipe must not be subjected to prolonged sunlight exposure. The use of pipe and fittings that have been damaged due to improper storage could cause serious personal injury, property damage, and product damage.

Reasonable care must be exercised in handling Spears FlameGuard™ CPVC Fire Sprinkler Products. DO NOT drop the products or drop anything on them. If improper handling results in scratches, splits, or gouges, the damaged fitting or section of pipe must be discarded.

WARNING: DO NOT install Spears FlameGuard™ CPVC Fire Sprinkler Products that have been scratched, split, or gouged. The use of pipe and fittings that have been damaged due to improper handling could cause serious personal injury, property damage, and product damage.

One-Step Solvent Cement

Spears FS-5 One-Step Low VOC Solvent Cement must be stored out of direct sunlight in an ambient temperature between 40°F (4°C) and 110°F (43°C). The solvent cement may be used for a period of two years from the date stamped on the container. Expired solvent cement must be discarded in an environmentally friendly fashion, in accordance with local regulations. To prolong the life of the cement, the containers must be kept tightly closed when not in use and covered as much as possible when in use.

WARNING:

- **Spears FS-5 One-Step Low VOC Solvent Cement is highly flammable. Eliminate all ignition sources.**
- **Avoid breathing vapors. Use only with adequate ventilation. Explosion-proof, general mechanical ventilation or local exhaust is recommended to maintain vapor concentrations below recommended exposure limits. In confined or partially enclosed areas, a NIOSH approved organic vapor cartridge respirator with a full**

face-piece is recommended. Avoid frequent contact with skin. It is recommended that you wear PVA coated gloves and an impervious apron.

- **Avoid contact with eyes. Splash-proof chemical goggles are recommended.**

- **Review the Material Safety Data Sheet (MSDS) and the important product information provided on the label for Spears FS-5 One-Step Low VOC Solvent Cement.**

Failure to follow the above recommendations could result in death or serious personal injury.

Listings, Approvals, Application & Use

Spears FlameGuard™ CPVC Fire Sprinkler products are fully tested and approved for use in wet pipe fire sprinkler systems by Underwriters Laboratories Inc., FM Global, and the Loss Prevention Certification Board. Spears FlameGuard™ CPVC Fire Sprinkler products are listed by NSF International for use in potable water systems. For specific listing information not covered in this manual concerning Factory Mutual, The loss Prevention Certification Board or NSF International, please contact your nearest Spears Regional Distribution Center.

NOTICE: National Fire Protection Association (NFPA) Standards 13, 13R, and 13D must be referenced for design and installation requirements in conjunction with this manual and all local codes.

CAUTION: Spears FlameGuard™ CPVC Fire Sprinkler products are NOT listed for outdoor applications. Outdoor installation could result in product failure and property damage and will not be covered under the Spears FlameGuard™ CPVC Fire Sprinkler products warranty.

CAUTION: Spears FlameGuard™ CPVC Fire Sprinkler products are to be used in wet pipe systems only. A wet pipe system is one that contains water and is connected to a water supply system so that the water will discharge immediately when the sprinkler is opened.

WARNING: Spears FlameGuard™ CPVC Fire Sprinkler products must never be used or tested in a system of compressed air or other gases. Failure to follow this warning could result in product failure, property damage and severe personal injury or death.

Light Hazard Occupancies

Spears FlameGuard™ CPVC Fire Sprinkler products are UL Listed for use in Light Hazard Occupancies, as defined in the NFPA 13.

In accordance with NFPA 13, paragraph 3-3.5, "Pipe or tube listed for light hazard occupancies shall be permitted to be installed in ordinary hazard rooms of otherwise light hazard occupancies where the room does not exceed 400 square feet. **NOTICE: Local jurisdictions must approve of this exception.**

Residential Occupancies

Spears FlameGuard™ CPVC Fire Sprinkler products are UL Listed for use in:

Residential occupancies up to and including four stories in height, as defined in NFPA 13R.

Residential occupancies, as defined in the Standard for the Installation of Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes, NFPA 13D.

Concealed Installations

In concealed installations, the minimum protection shall be one layer of 3/8-inch gypsum wallboard, ½-inch plywood soffits, or a suspended membrane ceiling with lay-in panels or tiles having a minimum weight of not less than 0.35 lbs/ft^2 when installed with metal support grids. The minimum protection for residential occupancies, defined in NFPA 13D and 13R, may consist of one layer of ½-inch plywood.

Spears FlameGuard™ CPVC Fire Sprinkler Products must be used in sprinkler systems employing sprinkler heads rated at 170° F (77°C) or lower. Factory Mutual (FM) requires the use of non-removable, fire-resistant barriers.

NOTICE: Spears FlameGuard™ CPVC Fire Sprinkler Products CANNOT be installed exposed in spaces defined by NFPA 13 as combustible, concealed areas that require sprinklers. NFPA 13D and NFPA 13R permit the omission of sprinklers in combustible, concealed spaces. Spears FlameGuard™ CPVC Fire Sprinkler Products can be installed in these areas when sprinkling residential occupancies in accordance with these standards.

Exposed Installations

Spears FlameGuard™ CPVC Fire Sprinkler Products are UL Listed for use in installations without protection (exposed), with the following restrictions:

Exposed CPVC Fire Sprinkler piping is installed below a smooth, flat, horizontal ceiling construction utilizing UL Listed support devices.

Listed, Quick-Response, ordinary temperature-rated pendent sprinklers having deflectors installed within 8 inches from the ceiling. Listed, Residential, ordinary temperature-rated, pendent sprinklers located in accordance with their Listing. The maximum distance between sprinklers must not exceed 15 feet. The piping must be mounted directly to the ceiling.

Listed, Quick-Response, ordinary temperature-rated horizontal sidewall sprinklers having deflectors installed within 6 inches from the ceiling and within 4 inches from the sidewall. Listed, Residential, ordinary temperature rated horizontal sidewall sprinklers located in accordance with their Listing. The maximum distance between sprinklers must not exceed 14 feet. The piping must be mounted directly to the sidewall.

Listed, Quick-Response, upright sprinklers having a maximum temperature rating of 155°F (68°C) must be installed so that the deflectors are a maximum of 4" from the ceiling. The maximum distance from the ceiling to the centerline of the main run of pipe must be 7-1/2". The distance from the centerline of a sprinkler head to a hanger must be 3". Rigid pipe hangers secured to the ceiling must be used.

Return Air Plenum Installation

Spears FlameGuard™ CPVC Fire Sprinkler products meet the combustibility requirements for thermoplastic sprinkler pipe, as described in the Standard for Installation of Air Conditioning and Ventilating Systems, NFPA 90A.

Spears FlameGuard™ CPVC Fire Sprinkler products must be installed in the plenum space at a horizontal distance of at least 24 inches from openings in the ceiling, such as ventilation grills.

Garage Installations

Spears FlameGuard™ CPVC Fire Sprinkler Products are suitable for use in garages requiring sprinklers, as defined in NFPA 13R, with the following requirements:

Minimum protection consisting of either one layer of 3/8-inch thick gypsum or ½-inch thick plywood must be provided.

Listed pendent or sidewall sprinklers with a maximum temperature rating of 170°F (77° C) must be used.

All sprinklers must be installed per the manufacturer's published installation instructions.

The system must be installed per the requirements of NFPA 13R and these installation instructions.

Ambient Temperature Limitations

Spears FlameGuard™ CPVC Fire Sprinkler products are suitable for use in areas where ambient temperatures are within the range of 35° F (2° C) to 150° F (65° C). The Loss Prevention Certification Board (LPCB) listing states the maximum ambient temperature shall not exceed 120° F (50° C).

High Temperature Areas

Spears FlameGuard™ CPVC Fire Sprinkler products can be installed in areas, such as an attic, where the ambient temperature exceeds 150° F (65° C) if ventilation is provided or if insulation is used around the product to maintain a cooler environment.

WARNING: DO NOT install Spears FlameGuard™ CPVC Fire Sprinkler products in areas where the ambient temperature exceeds 150° F (65° C) without adequate ventilation or insulation around the product to maintain a cooler environment.

Cold Temperature Areas

Spears FlameGuard™ CPVC Fire Sprinkler products can be used in areas where the ambient temperature remains above 35°F (2°C). These products can also be used in an area subject to freezing temperatures if the sprinkler system installation is protected from freezing. Many standard cold weather piping design and installation practices can be used to protect the system from freezing, including, but not limited to, the use of glycerin, insulation installation techniques, and pipe insulation. Contact the manufacturers for compatibility of their products with Spears FlameGuard™ CPVC Fire Sprinkler products. NOTE: Attention must be given to local insulating techniques and codes that require a particular method. Since very cold weather will

make Spears FlameGuard™ CPVC Fire Sprinkler Products more susceptible to damage, extra care should be taken to avoid rough handling or impact to these products.

WARNING: DO NOT allow a sprinkler system to freeze. A frozen system will deactivate and the pressures built up can cause the sprinkler heads to open or damage the pipe and fittings.

Antifreeze solutions of water and USP or CP grade GLYCERIN are acceptable for use with Spears FlameGuard™ CPVC Fire Sprinkler products. **Refer to NFPA 13, NFPA 13R, NFPA 13D and consult the local authority having jurisdiction before using glycerin solutions in fire sprinkler applications**.

WARNING: DO NOT use glycol-based antifreeze solutions. Glycol solutions are not chemically compatible with the CPVC material and can cause damage to the CPVC Fire Sprinkler System.

The following information can be used to determine the quantity of a glycerin based antifreeze solution needed to protect the piping system.

Nominal Pipe Size –inch (Actual mm Size)	US Gallons of Water Per Foot
3/4 (26,9)	.0311
1 (33,7)	.0494
1-1/4 (42,4)	.0792
1-1/2 (48,3)	.1042
2 (60,3)	.1636
2-1/2 (73,0)	.2395
3 (88,9)	.3555

Note: The gallons per foot column can be used for calculations when adding GLYCERIN to the piping system for freeze protection. All fire protection systems winterized with glycerin solutions must conform to local, state, and NFPA requirements. Glycerin based solutions are the only antifreeze solutions recommended for use. Glycol solutions are not chemically compatible with the CPVC material, and their use may result in damage to the CPVC Fire Sprinkler System.

Fire Sprinkler System Risers

Spears FlameGuard™ CPVC Fire Sprinkler products are UL Listed for use as system risers in NFPA 13R and 13D installations. Minimum protection must consist of one layer of 3/8-inch gypsum wallboard or ½-inch plywood. CPVC Fire Sprinkler Risers must be installed in accordance with NFPA 13, Support of Risers, the listed CPVC pipe manufacturer's installation instructions, and with these installation instructions . System risers employing listed CPVC pipe and Spears FlameGuard™ CPVC Fire Sprinkler fittings must not be installed exposed. Refer to the "Hanger Supports" section for detailed installation instructions for riser supports.

Underground Fire Service

Spears FlameGuard™ CPVC Fire Sprinkler products are suitable for use with CPVC pipe that is UL Listed for use in underground water service.

Factory Mutual Approvals

Spears FlameGuard™ CPVC Fire Sprinkler products have been approved by Factory Mutual for use in unexposed, non-removable, fire-resistant barriers:

Light Hazard occupancies, as defined in NFPA 13, the Standard for "Installation of Sprinkler Systems."

Residential occupancies, as defined in NFPA 13R, the Standard for "Installation of Sprinkler Systems in Residential Occupancies up to and Including Four Stories in Height."

Residential occupancies, as defined in NFPA 13D, the Standard for "Installation of Sprinkler Systems in One and Two Family Dwellings and Manufactured Homes."

Underground fire service systems, as defined in NFPA 24, the "Standard for Installation of Private Fire Service Mains and Their Appurtenances."

Loss Prevention Certification Board LPCB

Spears FlameGuard™ CPVC Fire Sprinkler Products are approved for use as agreed between plastics suppliers, purchaser/installer, authority having jurisdiction and/or insurer in accordance with documented supplier Installation Instructions but subject to the following criteria taking precedence:

- Use of plastic pipe and fittings is subject to water authority agreement for the territory concerned.
- LPCB Approved quick response sprinklers shall be used with exposes (i.e., fire exposure) plastic pipe and fittings.
- Plastic pipe and fittings are suitable for use only with wet pipe systems.
- Care should be exercised to ensure that joints are adequately cured, in accordance with the manufacturer's installation instructions prior to pressurization.
- Plastic pipe and fittings shall not be installed outdoors.
- Where plastic pipe and fittings are exposed (i.e., fire exposure), the system shall be installed close to a flat ceiling construction.
- Sprinkler systems which employ plastic pipe and fittings shall be designed where possible to ensure no "no flow" sections of pipework in the event of sprinkler operation.

In addition, the maximum normal ambient temperature shall not exceed 120°F (50°C). The product shall only be installed in the UK by LPCB Certificated or Registered installing companies or by firms outside the UK who can provide evidence of personnel training in the installation of the product.

NSF International

Spears FlameGuard™ CPVC Fire Sprinkler products have been approved by NSF for potable water applications. These products meet all applicable performance standards for a pressure rated application, as required in ANSI/NSF Standard 14, and they comply with ANSI/NSF Standard 61 for health effects. Spears FlameGuard™ CPVC Fire Sprinkler products are tested against ASTM Standards F438 and F439.

Penetrating Fire-rated Walls & Partitions

Before beginning, consult the building codes and authorities having jurisdiction in your area. Several UL Classified, through-penetration firestop systems are approved for use with CPVC pipe. Consult the UL Building Materials Directory, the UL Fire Resistance Directory, and the system manufacturer for proper selection and application. Two manufacturers of Listed systems for use with CPVC pipe are Nelson Fire Stop Products (800-331-7325) and Tremco (800-321-7906). Consult Spears Manufacturing Company for further information.

Heat Sources & Open Ceiling Areas

Piping systems using Spears FlameGuard™ CPVC Fire Sprinkler products must be laid out so that the piping is not closely exposed to heat producing sources, such as light fixtures, ballasts, and steam lines. Pipe must not be positioned directly over open ventilation grills. During remodeling or ceiling repair, appropriate precautions must be implemented to properly protect the piping.

Use With Other Manufacturers' Pipes, Fittings, & Solvent Cements

Spears FlameGuard™ CPVC Fire Sprinkler products are UL Listed for use in combination with UL Listed CPVC sprinkler products manufactured by Victaulic (pipe and fittings), Harvel (pipe), Ipex (pipe and fittings), Grinnell (pipe and fittings), or Central (pipe and fittings), or TYCO Fire Products (pipe and fittings).

NOTICE: While Spears FlameGuard™ CPVC Fire Sprinkler Products are UL Listed for use in combination with other listed manufacturers' products, specific application approvals may not be the same amongst manufacturers. It is the installer's responsibility to verify suitability of products used in combination according to each manufacturer's installation instructions. Contact Spears if you have questions on any application not addressed in this manual.

Spears recommends the use of FS-5 One Step Low VOC Solvent Cement. However, Victaulic 899; Ipex BM-5; Central Sprinkler CSC-500; and TYCO Fire Products TFP-500 CPVC Solvent Cements can also be used in place of the FS-5 One Step Low VOC Solvent Cement, provided that the assembly and curing information referenced within this manual is used.

Installation & Joining

Spears FS-5 One Step Low VOC Solvent Cement eliminates the need for primers that are typical in two-step cementing processes. The One-Step joining method simplifies installations by reducing labor and offers faster curing times before pressure testing (in most cases).

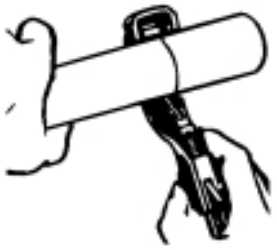
WARNING: Before assembling any Spears FlameGuard™ CPVC Fire Sprinkler products, you must inspect all components for cuts, scratches, gouges, split ends, or any other irregularities that have occurred during shipping and handling. Listed CPVC Fire Sprinkler pipe should be checked for any damage or evidence of cracking . If evident, cut off at least two inches of the pipe beyond any visible crack.

WARNING: Make sure you follow all assembly and curing information referenced within this manual when installing Spears FlameGuard™ CPVC Fire Sprinkler products. Failure to follow this instruction could cause improper curing, resulting in serious personal injury, significant property damage, joint leakage, or joint failure.

Pipe Cutting & Preparation

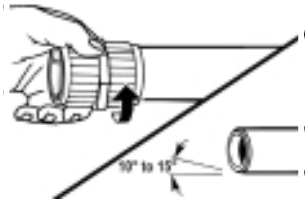
Step 1 **Cut Pipe Square.**

Cutting the pipe as square as possible provides the maximum bonding surface area and assures proper alignment of the assembled joint. Pipe ends must be cut square using either a ratchet cutter, wheel-type cutter, fine-toothed hand saw & miter box, or power cut-off saw. When using a ratchet-type cutter, be careful not to split the pipe, especially in temperatures below 50°F (10°C). A fine-toothed hand saw (16-18 teeth/inch) with little or no set is recommended. A power cut-off saw with carbide blade is recommended for high volume cutting.



Step 2 Deburr & Bevel Pipe.

Regardless of cutting method used in Step 1, burrs are created that can prevent contact between the pipe and the fitting during assembly and must be removed from the outside and the inside of the pipe. All pipe ends must be beveled 10° to 15°. Commercially available deburring & beveling tool is recommended, or a mill file may be used.



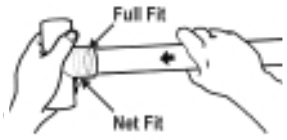
Step 3 Clean Joint Components.

Using a clean, dry rag, wipe any loose dirt and moisture from the fitting's socket and pipe end. Moisture can slow the cure time, and at this stage of assembly, excessive water can reduce joint strength.

WARNING: DO NOT attempt to join moisture -wet surfaces.

Step 4 Check Joint Interference Fit (Dry Fit) .

An interference fit between pipe and fitting socket is necessary for proper fusion of the joint. To check, lightly insert pipe into fitting socket. DO NOT FORCE. The pipe should enter the fitting socket 1/4 or 3/4 of the way (full interference fit). If the pipe bottoms out with little interference (net fit), use extra solvent cement in making the joint. DO NOT use any components that appear irregular or do not fit properly.



Solvent Cement Welded Joints

WARNING: You must read the "Handling and Storage" section "Warning" information applicable to solvent cement prior to proceeding.

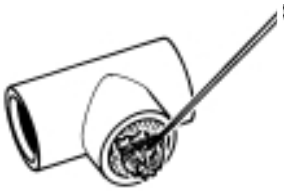
For best results, installation should be made at temperatures between 40° F and 110° F. All components must be clean and dry. Before assembling any Spears FlameGuard™ CPVC Fire Sprinkler products, verify the manufactured date located on the FS-5 cement container. The cement can be used for a period of two years from the date stamped on the container. When cementing pipe and fittings in extremely cold temperatures, make sure the cement has not "JELLED."

CAUTION: Jelled or expired cement will not provide the strength needed to make a proper joint. Jelled or expired cement must be discarded in an environmentally friendly fashion, in accordance with local regulations. To prolong the life of the cement, keep the containers tightly closed when not in use, and cover the container as much as possible during use.

Step 1 Apply Cement.

Using an applicator no less than ½ the size of the pipe diameter, work the cement into the joining surfaces in a circular motion. Apply a liberal coat to the outside of the pipe end.

Apply a medium coat to the inside of the fitting socket.

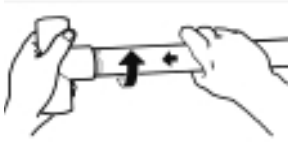


If the pipe bottoms out in the fitting during the dry fit, apply a second coat of cement to the pipe end. Always apply a second coat of cement to the pipe for joints that are 1-1/4 inch and larger.

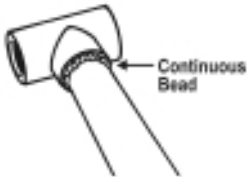
CAUTION: Avoid puddling the cement on or within the fitting and pipe. Puddled cement causes excess softening and damage to the CPVC material. Care should be taken in cementing Sprinkler Head Adapters and Adjustable Sprinkler Head Adapters to avoid cement running into threads or adjustable adapter body. Where possible, it is recommended that the Head Adapter be pre-installed to a pre-cut Drop (section of pipe) and allowed to achieve initial set in an inverted position. The Head Adapter and drop combination can then be installed into the system fitting.

Step 2 Join Components.

Immediately following application of cement and **before it starts to set**, insert pipe into the fitting socket using a 1/4-turn, twisting motion until it meets the fitting pipe stop.



A continuous bead of cement should form around the circumference of the joint. If bead is not continuous, insufficient cement was applied and must be cut and discarded from the system. Hold joint together for approximately 30 seconds to make sure the pipe does not move or back out of the fitting socket. Any cement in excess of the bead can be wiped off using a cloth.



Step 3 Initial Set & Cure Times.

The set and cure times for Spears FS-5 Low VOC Solvent Cement depend on pipe size, temperature, relative humidity, and tightness of fit. Drying time is faster for drier environments, smaller pipe sizes, higher temperatures, and tighter fits.

Special care must be taken when assembling Spears FlameGuard™ CPVC Fire Sprinkler products in extremely low temperatures (below 40°F/4°C) or extremely high temperatures (above 80°F/27°C). Extra set and handling times must be allowed in colder temperatures. When cementing pipe and fittings in extremely cold temperatures, make sure the cement has not "JELLED." Jelled cement must be discarded.

In extremely hot temperatures, make sure both surfaces to be joined are still wet with cement during assembly.

You must allow the assembly to set, without any stress on the joint, for five minutes. Following the initial set period, the assembly can be handled by carefully avoiding stresses to the joint.

Sprinklers can be installed ONLY after all CPVC pipe and fittings, including sprinkler head adapters, are solvent cemented to the piping system and allowed to cure for a minimum of 30 minutes. It is unacceptable practice to install sprinklers on the head adapter fittings and then solvent cement the assembly to the “drop.”

Refer to the following tables for minimum cure times before pressure testing. NOTE: These cure times have been tested and approved for Spears FlameGuard™ CPVC Fire Sprinkler products. Grinnell CPVC fire sprinkler products have different cure time requirements. Please refer to Grinnell installation instructions when using Spears products in combination with Grinnell CPVC fire sprinkler products.

Table 1: 225 psi / 1551 kPa (maximum) Test Pressure

Ambient Temperature During Cure			
Pipe Size Nominal In. (Actual mm)	60°F to 120°F (16°C to 49°C)	≥ 40° F (≥ 4°C)	≥ 0° F (≥ -18°C)
3/4” (26,7)	1 hour	4 hours	48 hours
1” (33,7)	1-1/2 hours	4 hours	48 hours
1-1/4” & 1-1/2” (42,4 & 48,3)	3 hours	32 hours	10 days
2” (60,3)	8 hours	48 hours	Note 1
2-1/2” & 3" (73,0 & 88,9)	24 hours	96 hours	Note 1

Table 2: 200 psi / 1379 kPa (maximum) Test Pressure

Ambient Temperature During Cure			
Pipe Size Nominal In. (Actual mm)	60°F to 120°F (16°C to 49°C)	≥ 40° F (≥ 4°C)	≥ 0° F (≥ -18°C)
3/4" (26,7)	45 minutes	1-1/2 hours	24 hr.
1" (33,7)	45 minutes	1-1/2 hours	24 hr.
1-1/4" & 1-1/2" (42,4 & 48,3)	1-1/2 hours	16 hours	120 hours
2" (60,3)	6 hours	36 hours	Note 1
2-1/2" & 3" (73,0 & 88,9)	8 hours	72 hours	Note 1

Note 1: Solvent cement can be applied at temperatures below 40°F (4°C) in all sizes. For the 2 - inch size & larger, the temperature must be raised to 40°F (4°C) or above and allowed to cure per the recommended times before the system is filled and pressurized.

Table 3: 100 psi / 689 kPa (maximum) Test Pressure

Ambient Temperature During Cure			
Pipe Size Nominal In. (Actual mm)	60°F to 120°F (16°C to 49°C)	≥ 40° F (≥ 4°C)	≥ 0° F (≥ -18°C)
3/4" (26,7)	15 minutes	15 minutes	30 minutes
1" (33,7)	15 minutes	30 minutes	30 minutes
1-1/4" (42,4)	15 minutes	30 minutes	2 hours

NOTICE: 1-1/2-inch and larger must be tested ONLY in accordance with Table 1 and Table 2.

WARNING: Make sure you allow the cement to cure according to the times listed in the charts for the pipe size and ambient temperature. These cure times have been tested and approved for Spears FlameGuard™ CPVC Fire Sprinkler products. DO NOT install any sprinkler heads until the piping system has cured for a minimum of 30 minutes.

The following guidelines provide an estimate of the quantities of Spears FS-5 Low VOC Solvent Cement that you will need to complete the assembly.

Solvent Cement Requirements

Fitting Size Nominal Inch (Actual mm)	Solvent Cement Number of Joints Per Quart (estimated)
3/4" (26,7)	270
1" (33,7)	180
1-1/4" (42,4)	130
1-1/2" (48,3)	100
2" (60,3)	70
2-1/2" (73,0)	50
3" (88,9)	40

Threaded Connections

Threaded connections require application of thread sealants that have been tested and approved for use with the CPVC fire sprinkler material. Spears recommends the use of Spears Blue 75 ™ Thread Sealant. These products have been tested for compatibility with Spears FlameGuard™ CPVC Fire Sprinkler Products; however, it is important to consult the sprinkler head manufacturer to verify chemical compatibility with their products.

WARNING: Use only thread sealant recommended by Spears. Other joint compounds or pastes may contain substances that could cause stress cracks in the CPVC or brass materials. Spears DOES NOT recommend the use of TFE tape ("Teflon tape"). Tape sealants can create an adverse "wedging" action with tapered pipe threads that can produce excessive stresses resulting in fitting failure.

WARNING: Cutting oils used in metal pipe threading cause stress cracking in CPVC materials. All cutting oils must be removed and the metal pipe thoroughly flushed and degreased prior to assembly with CPVC systems.

Step 1 Apply Thread Sealant.

Apply the sealant to the male threads only. Make sure all threads are covered. DO NOT clog the waterway with excess sealant. DO NOT use a combination of tape and thread sealant on the joint.

Step 2 Assemble Joint by Hand.

Thread pipe or sprinkler head "finger tight" for initial assembly (just enough to fully engage thread clearance). CAUTION: Care must be taken in properly aligning male to female threads to avoid possible cross threading.

Step 3 Wrench Make-Up.

Threaded fittings must always be installed using commercially available strap wrenches. Do not use conventional pipe wrenches that can damage the plastic fitting. Apply wrench make-up of no more than one to two turns beyond finger tight engagement. Care must be taken in final positioning to avoid the need to "back-up" the wrenched assembly.

WARNING: DO NOT over-torque any threaded connections. Generally, one to two turns beyond finger-tight are required to make a threaded connection. Factory testing has indicated that 10-25 ft-lbs of torque is adequate to obtain a leak free seal.

NOTICE: Sprinkler heads must be installed only after all fire sprinkler pipe fittings, including the sprinkler head adapters, are cemented to the piping and have been allowed to cure for a minimum of 30 minutes. Plastic, threaded plugs are available for use in pressure testing. Before installing the sprinkler head, the sprinkler head fittings must be visually inspected or probed with a wooden dowel to ensure that the waterway and threaded areas are free of any excess cement that may restrict the flow of water.

Painting Pipe & Fittings

CAUTION: The UL Listing DOES NOT cover painted CPVC fire sprinkler piping products. Use of certain paints, such as oil-based, can damage CPVC fire sprinkler piping products. Before painting any CPVC fire sprinkler piping products, you must consult with your local authority having jurisdiction for restrictions.

Cleaning

Spears FlameGuard™ CPVC Fire Sprinkler Products can be cleaned using a mild soap and water solution. DO NOT use ammonia or other harsh chemical cleaners.

Transitions to Other Materials

Specifically designed female threaded adapters, grooved coupling adapters, and flanges are Listed for connecting systems incorporating Spears FlameGuard™ CPVC Fire Sprinkler Products to other materials, valves, and accessories. A special, reinforced female threaded adapter is available for connection to the sprinkler head.

Flanged Connections

Piping runs joined to the flanges must be installed in a straight line in relation to the flange to avoid stress at the flange due to misalignment. In addition, piping must be secured and supported to prevent lateral movement, which can create stress and damage the flange. Use only full-faced, Grade E, EPDM, 1/8" thick flange gaskets.

Step 1 Attach Flange to Pipe.

The flange must be attached to UL Listed CPVC pipe following procedures for Solvent Cement Welded Joints in this manual.

NOTICE: When using "One-Piece" type flanges (fixed flange ring), care must be taken to align bolt holes with mating flange during solvent welding installation to pipe, or assure that pipe in system can be adequately rotated for correct hole alignment.

Step 2 Position Gasket & Align Flanges.

With gasket between flanges, align gasket and mating flange bolt holes by rotating flange ring (see notice above).

Step 3 Install Bolts, Nuts, & Washers.

Bolts should be lubricated with an acceptable anti-seize lubricant (such as IMS Copper Flake). Insert required bolts through flange bolt holes being sure to use two (2) flat washers per bolt, one at head and one below nut. Make sure that mating flanges are flush against gasket and properly aligned. Tighten nuts by hand until snug.

WARNING: Certain lubricants can cause stress cracking in CPVC materials.

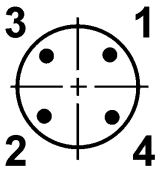
Step 4 **Tighten Flange Bolts.**

Establish uniform pressure over the flange face by tightening bolts in 5-ft. lbs. Increments using the sequence shown in Figure 1 and specified torque values.

CAUTION: DO NOT use bolts to draw together improperly mated flanges. Care must be taken to avoid "bending" the flange ring when attached to a raised-face flange or wafer style valves.

Flange Data & Bolt Torque

The following recommendations are based on the use of two standard flat washers, standard nuts, and 1/8-inch thick EPDM full-face gasket. Actual field conditions may require a variation in these recommendations.



Flange Size Nominal in (Actual mm)	Recommended Torque ft-lbs (N-m)
3/4 to 1-1/2 (26,7 - 48,3)	12 (16,3)
2 to 3 (60,3 - 88,9)	25 (33,9)

Flange Size Nominal in. (Actual mm)	Bolt Holes	Bolt Diameter inches (mm)	Minimum Bolt Length inches (mm)
3/4 (26,7)	4	½ (12,7)	2 (50,8)
1 (33,7)	4	½ (12,7)	2-1/4 (57,2)
1-1/4 (42,4)	4	½ (12,7)	2-1/4 (57,2)
1-1/2 (48,3)	4	½ (12,7)	2-1/2 (63,5)
2 (60,3)	4	5/8 (15,9)	3 (76,2)
2-1/2 & 3 (73,0 & 88,9)	4	5/8 (15,9)	3-1/4 (82,6)

Grooved Coupling Adapters

Spears FlameGuard™ CPVC Grooved Coupling Adapters are designed for use with Victaulic Style 75 and Style 77 Flexible Couplings. Other UL Listed couplings of similar flexible design may be used.

CAUTION: The use of rigid style couplings will damage the Grooved Coupling Adapter. Consult coupling manufacturer for proper selection

Step 1 Inspect Pipe & Adapter.

Check to ensure that both pipe and Grooved Coupling Adapter are free of indentations, projections, or roll marks on the gasket seating areas. Pipe end must be cut square and any loose scale, paint or dirt removed.

NOTICE: Use a standard grade "E" (EPDM) compound gasket with a green stripe or a grade "E," type "A" gasket with a purple stripe that is suitable for wet fire sprinkler service.

Step 2 Inspect & Lubricate Gasket.

Be sure the gasket is clean and free of any cracks, cuts, or other defects that could cause leaks. DO NOT allow solvent cement to contact the sealing surface of the gasket. Lubricate the gasket with a vegetable soap-based gasket lubricant, such as IPS Weld On Gasket/Joint Lubricant #787 or Seacord Corp. Ease-On Pipe Joint Lubricant to prevent pinching and to assist in the seating and alignment process. Apply a thin layer of lubricant to the gasket lips and exterior surface. Pre-lubricated gaskets, such as VIC-PLUS manufactured by Victaulic, may be used. It is the installer's responsibility to determine both the gasket suitability and chemical compatibility of the lubricant. Consult gasket manufacturer.

WARNING: Certain lubricants may contain petroleum based or other chemical than can damage the gasket or adapter. Verify the suitability of the lubricant with the manufacturer before use.

Step 3 Align Components & Install Gasket.

Place the gasket over the pipe end making sure the gasket lip does not overhang the end of the pipe. Align the grooved coupling adapter with the end of the pipe and slide the gasket over the seating surface of the adapter, centering the gasket between the two grooves. Make sure the gasket is not pinched between the pipe and the adapter fitting. No portion of the gasket should extend into the grooves.

Step 4 Install Coupling.

Place the coupling housings over the gasket, making sure the housing keys engage into the grooves of the pipe and the adapter fitting. Insert the bolts and apply the nuts finger-tight. Using a socket wrench or other appropriate tool, tighten the nuts alternately and equally until you achieve metal-to-metal contact at the housings' bolt pads.

WARNING: You must tighten the bolts alternately and evenly to achieve metal-to-metal contact at the housings' bolt pads.

Inspect the joints before and after pressure testing. Look for gaps between the bolts pads and for housing keys that are not inside the grooves. Ensure that the pipe alignment does not place undue stress on the grooved coupling adapters.

The maximum recommended pipe hanger distance from the grooved coupling adapter fitting is shown in the following table.

Pipe Size Nominal in (Actual mm)	Maximum Recommended Hanger Spacing feet (meters)
1-1/4 (42,4)	6-1/2 (2,0)
1-1/2 (48,3)	7 (2,1)
2 (60,3)	8 (2,4)
2-1/2 (73,0)	9 (2,7)
3 (88,9)	10 (3,0)

As an added precaution to enhance the structural design of the system, it is suggested that a hanger or support be located at or near the grooved coupling adapter joint. This hanger or support can be on either side of the coupling. However, this is not a requirement, since the hanger spacing shown in the above table meets the minimum requirements established by UL.

Adjustable Sprinkler Head Adapter Installation

Spears FlameGuard™ CPVC Adjustable Fire Sprinkler Head Adapter comes pre-assembled. There is no need for lubrication. It is recommended that the adjustable sprinkler head adapter be adjusted out completely before beginning the installation process.

Step 1 Install Adapter on Drop.

The Adjustable Sprinkler Head Adapter must be installed in accordance with the approved procedures for Solvent Cement Welded Joints, as outlined in this manual. It is recommended that the drop/riser pipe be solvent cemented into the adjustable sprinkler head adapter first, and then into the drop/ riser tee or elbow.

CAUTION: Care must be taken to prevent solvent cement from coming in contact with the internal O-ring seal or sealing surface.

Step 2 Install Sprinkler Head.

Sprinkler head installation must be in accordance with the approved procedures for Threaded Connections, as outlined in this manual. The Adjustable Sprinkler Head Adapter has multiple wrench flats provided to hold the adjustment barrel while installing the sprinkler head. These same wrench flats must be used to adjust the sprinkler head adapter to its required position,

CAUTION: Never use wrenches, pliers, or any other tool on the threaded portion of the adjustment barrel.

Step 3 Adjust Finished Height.

Always use multiple wrench flats for making adjustments

CAUTION: Care must be taken not to extend or retract the adjustment barrel excessively, since this may result in damage to the adapter.

For the purpose of hydraulic calculations, the 3/4-inch and 1-inch adjustable sprinkler head adapters have an average equivalent length of pipe in feet of 0.75' (3/4-ft).

Hydrostatic Testing

When an installation is complete and the pipe joints are fully cured, per the requirements within this manual, the system MUST be pressure tested in accordance with NFPA 13, NFPA 24, or any other applicable NFPA standard requirement. The system must be tested with water. The purpose of the hydrostatic pressure test is to check for leakage, and it may not identify improperly assembled joints. This test MUST NOT be considered a substitute for full compliance to our published installation instructions.

When using Spears FlameGuard™ CPVC Fire Sprinkler Products in systems supplied by pumps, the system must be designed to ensure that surge potentials generated by pump operation will not cause damage to the piping system.

Air must be removed from piping systems (plastic or metal) to prevent it from being locked in the system when pressure is applied. Entrapped air can generate excessive surge pressures that are potentially damaging and life threatening, regardless of the piping materials used.

WARNING: Spears FlameGuard™ CPVC Fire Sprinkler Products must never be used or tested in a system of compressed air or other gases. Air must be removed from piping systems. Entrapped air can generate excessive surge pressures, regardless of the piping materials used. Failure to follow this warning could result in product failure, property damage and severe personal injury or death.

If a leak is found, the fitting must be cut out and discarded. A new section can be installed using couplings or a union. Unions must be used in accessible areas only.

Engineering Data

Product Specifications

Spears FlameGuard™ CPVC Fire Sprinkler Products are made for use with Listed CPVC Fire Sprinkler Pipe produced in SDR 13.5 dimensions, as specified in ASTM F-442. Engineering data on Material Properties and Expansion & Contraction for CPVC *pipe* in this manual are provided for both (A) Victaulic FireLock™ and (B) Harvel BlazeMaster® CPVC Fire Sprinkler Pipe. Consult other pipe manufacturers for applicable variations.

Spears FlameGuard™ CPVC Fire Sprinkler Fittings are produced in Schedule 40 and Schedule 80 dimensions for sizes 3/4" through 1-1/4" and in Schedule 80 for sizes 1-1/2" through 3", in accordance with ASTM F-437, ASTM F-438, and ASTM F-439, as applicable. These products are UL Listed, FM/Approved for a rated working pressure of 175 psi (1200 kPa) at 150°F (65°C) for sprinkler service and LPCB Listed for a rated working pressure of 175 psi (1200 kPa) at 120°F (49°C).

CPVC Fire Sprinkler Pipe Dimensions

SDR 13.5 (Ref. ASTM F442)			Weight lbs/ft (kg/m)
Size Nominal inches (Actual mm)	Average OD inches (mm)	Average ID inches (mm)	
3/4 (26,7)	1.050 (26,7)	0.874 (22,5)	0.168 (0,2)
1 (33,7)	1.315 (33,4)	1.101 (28,2)	0.262 (0,4)
1-1/4 (42,4)	1.660 (42,2)	1.394 (35,6)	0.418 (0,6)
1-1/2 (48,3)	1.900 (48,3)	1.598 (40,7)	0.548 (0,7)
2 (60,3)	2.375 (60,3)	2.003 (50,9)	0.859 (1,2)
2-1/2 (73,0)	2.875 (73,0)	2.423 (61,5)	1.257 (1,2)
3 (88,9)	3.500 (88,9)	2.950 (75,0)	1.867 (1,2)

Hydraulic Design

Hydraulic calculations for the sizing of systems incorporating Spears FlameGuard™ CPVC Fire Sprinkler Products must be calculated using a Hazen-Williams C value of 150. Pipe friction loss calculations must be made according to NFPA Standard 13. The following table shows the allowance for friction loss for fittings, expressed as equivalent length of pipe. For additional information regarding friction loss, contact Spears.

Allowance for Friction Loss in Fittings

Equivalent Feet (meters) of Pipe

	3/4" 26,7 mm	1" 33,7 mm	1-1/4" 42,4 mm	1-1/2" 48,3 mm	2" 60,3 mm	2-1/2" 73,0 mm	3" 88,9 mm
Tee Run	1 (0,3)	1 (0,3)	1 (0,3)	1 (0,3)	1 (0,3)	2 (0,6)	2 (0,6)
Tee Branch	3 (0,9)	5 (1,5)	6 (1,8)	8 (2,4)	10 (3,1)	12 (3,7)	15 (4,6)
90° Elbow	7 (2,1)	7 (2,1)	8 (2,4)	9 (2.7)	11 (3,4)	12 (3,7)	13 (4,0)
45° Elbow	1 (0,3)	1 (0,3)	2 (0,6)	2 (0,6)	2 (0,6)	3 (0,9)	4 (1,2)
Coupling	1 (0,3)	1 (0,3)	1 (0,3)	1 (0,3)	1 (0,3)	2 (0,6)	2 (0,6)

Hangers & Supports

Since CPVC Fire Sprinkler pipe is rigid, it requires fewer supports than flexible, plastic systems. Spears recommends use of hangers that are designed and listed for supporting the CPVC Fire Sprinkler pipe. However, some hangers designed for steel pipe may be used if their suitability is clearly established. These hangers must have a minimum1/2-inch, load-bearing surface, and they must be selected to accommodate the specific pipe size. In addition, they cannot contain rough or sharp edges that contact the pipe, and they must not bind the pipe from axial movement. Vertical runs must be supported so that the weight of the run is not on a fitting or a joint.

Horizontal runs must be braced so that the stress loads (caused by bending or snaking pipe) will not be placed on a fitting or a joint. Support spacing is shown in the following table. See “Pipe Deflection” in this manual for information regarding bending or snaking CPVC Fire Sprinkler Pipe.

Pipe Size Nominal inches (Actual mm)	Maximum Support Spacing feet (meters)	Wt. of Water Filled Pipe lbs/ft (kg/m)
3/4 (26,7)	5-1/2 (1,7)	0.427 (0,6)
1 (33,7)	6 (1,8)	0.674 (0,9)
1-1/4 (42,4)	6-1/2 (2,0)	1.078 (1,5)
1-1/2 (48,3)	7 (2,1)	1.412 (1,9)
2 (60,3)	8 (2,4)	2.223 (3,0)
2-1/2 (73,0)	9 (2,7)	3.254 (61,5)
3 (88,9)	10 (3,0)	4.831 (75,0)

Since CPVC Fire Sprinkler pipe is rigid, it requires fewer supports than flexible, plastic systems. Spears recommends use of hangers that are designed and listed for supporting the CPVC Fire Sprinkler. However, some hangers designed for steel pipe may be used if their suitability is clearly established. These hangers must have a minimum1/2-inch, load-bearing surface, and they must be selected to accommodate the specific pipe size. In addition, they cannot contain rough or sharp edges that contact the pipe, and they must not bind the pipe from axial movement. NFPA 13D permits “support methods comparable to those required by local plumbing codes.” The above hanger/support requirements must also be followed on NFPA 13D systems.

CAUTION: DO NOT use hanger items such as plumber’s tape or “nail-on” devices. Pipe hanger must comply with NFPA 13, 13D and 13R.

When a sprinkler head activates, a significant reactive force can be exerted on the pipe. With a pendent head, this reactive force can cause the pipe to lift vertically if it is not secured properly, especially if the sprinkler drop is from small diameter pipe. The pipe must be braced against the vertical lift-up with the closest hanger. Refer to the following illustration and Table A & B.

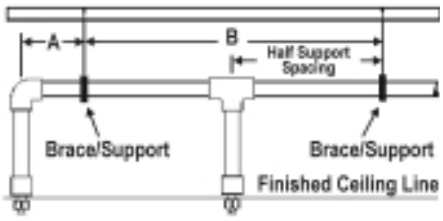


Table A - Maximum Support Spacing Distance End Line Sprinkler Head Drop Elbow

Pipe Size Nominal inches (Actual mm)	Line pressure < 100 psi (< 689 kPa)	Line pressure > 100 psi (> 689 kPa)
3/4 (26,7)	9 inches (228,6 mm)	6 inches (168,3 mm)
1 (33,7)	12 inches (304,8 mm)	9 inches (228,6 mm)
1-1/4 (42,4)	16 inches (406,4 mm)	12 inches (304,8 mm)
1-1//2 - 3 (48,3 - 88,9)	24 inches (610,0 mm)	12 inches (304,8 mm)

Note: Support spacing can be increased by approximately 50% for lower pressures.

Table B - Maximum Support Spacing Distance Inline Sprinkler Head Drop Tee

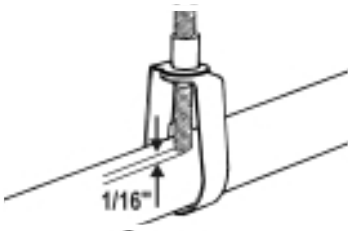
Pipe Size Nominal inches (Actual mm)	Line pressure < 100 psi (< 689 kPa)	Line pressure > 100 psi (> 689 kPa)
3/4 (26,7)	4 feet (1,22 meters)	3 feet * (0,91 meters)
1 (33,7)	5 feet (1,52 meters)	4 feet * (1,22 meters)
1-1/4 (42,4)	6 feet (1,83 meters)	5 feet * (1,52 meters)
1-1/2 - 3 (48,3-88,9)	7 feet (2,13 meters)	7 feet (2,13 meters)

Note: *Support spacing can be increased by one foot for lower pressures.

Numerous common methods are used to brace Fire Sprinkler Pipe. A few acceptable methods include: use of a standard band hanger by positioning the threaded support rod to 1/16-inch above the pipe (however, it is important that the rod does not contact the pipe), a wrap around U-hanger, a special escutcheon which prevents upward movement of the sprinkler through the ceiling or band hangers with Surge Restraints to provide surge protection for the system.

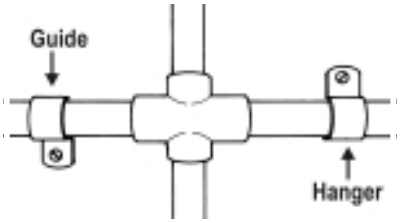
Pipe hangers are available that are tested and UL Listed for fire sprinkler service. These hangers comply with NFPA 13 requirements for use with CPVC fire sprinkler piping systems. The following illustrations depict several of these.

Band Hanger - designed to support CPVC piping systems when used in conjunction with a hanging steel threaded rod that is suspended from a ceiling or other flat, horizontal surface. The threaded rod must be leveled properly before installing the hanger and restraint.

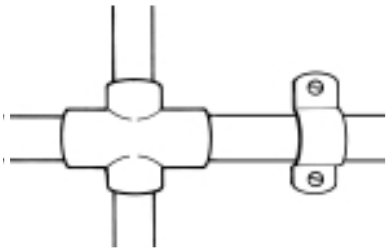


Surge Restraint - when installed with the Band Hanger, as shown below, provides surge protection for the system.

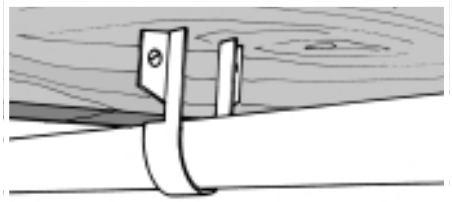
One Hole Wrap-Around Strap - designed to support CPVC piping systems only when the hanger tab is in the vertical position, and the screw-type fastener is in the horizontal position. The one-hole strap can be used as a pipe restrainer when the hanger tab is in the downward position, but it cannot be used as a hanger to hold any weight of the system. In addition, the one-hole strap can be used as a piping system guide when the system lies on top of the beam, and the beam supports the system's weight. The one-hole strap is not intended to support the CPVC piping system from under a ceiling or any other flat, horizontal surface. For this application, install two-hole strap.



Two-Hole Strap - designed to support CPVC piping systems when attached to a flat, horizontal surface with the screw-type fasteners in the vertical position. In addition, the two-hole strap is designed to support CPVC piping systems when attached to a flat, vertical surface with one mounting tab in the vertical position and the screw-type fasteners in the horizontal position. The two-hole strap can be used as a piping system guide when the system lies on top of a beam, and the beam supports the system's weight.



Two-Hole 90° Side Mount Strap - designed to support CPVC piping systems when attached to a horizontal beam with the screw-type fasteners in the horizontal position and the pipe hanging below the beam. The fastener's mounting edges are designed to allow the screws to be installed horizontally. This is a benefit when overhead clearance is limited. In addition, the 90° side mount strap can be used in a restrainer fashion when it is attached to the top of a beam, and the system lies on top of the beam.



Riser Supports

Risers must be supported by pipe clamps or by hangers located on the horizontal connection close to the riser. Only Listed hangers and clamps can be used. Vertical lines must be supported at intervals to avoid placing excessive load on a fitting at the lower end. This can be done by using riser clamps or double-bolt pipe clamps listed for this service.

Hangers and supports must not compress, distort, cut, or abrade the piping, and they must allow free movement of the pipe for thermal expansion and contraction. DO NOT use riser clamps that squeeze the pipe and depend on compression of the pipe to support the weight.

Maintain vertical piping in straight alignment with supports at each floor level or 10-foot intervals, whichever is less. CPVC risers in vertical shafts or buildings with ceilings over 25 feet must be aligned straight and supported at each floor level or 10-foot intervals, whichever is less.

Clamps must not exert compressive stresses on the pipe. If possible, the clamps should be located directly below a coupling so that the shoulder of the coupling rests against the clamp. A coupling can be modified to achieve this by cutting a CPVC coupling just above the stop at the socket bottom. Then, cut this piece in half lengthwise to provide two halves that do not contain the stop. Follow the "Solvent Cement Welding Instructions" to cement the two halves to the pipe at the required location, and make sure that the shoulder of the modified coupling rests on the clamp. Allow the assembly to cure before placing any stress on the joint.

WARNING: CPVC pipe and/or system components must not be used to provide structural support for the system. Care should be used when installing, hanging, or bracing to prevent unnecessary stress loads on the CPVC piping system.

Exposed Installations

For exposed installations that incorporate pendent or sidewall sprinklers, UL Listed support devices for thermoplastic sprinkler piping, or other listed support devices shall be used to mount the piping directly to the ceiling or sidewall.

Earthquake Bracing

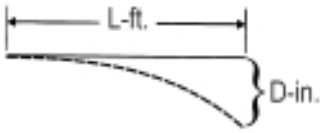
Since CPVC fire sprinkler plastic piping is more ductile than metallic sprinkler pipe, it has a greater capacity to withstand earthquake damage. In areas subject to earthquakes, CPVC fire sprinkler systems should be designed and braced in accordance with local codes and NFPA Standard 13.

Pipe Deflection

Installation of systems incorporating Spears FlameGuard™ CPVC Fire Sprinkler Products may require bending or snaking of piping. The following information can be used in determining maximum deflection allowable for various run lengths and pipe sizes. Consult UL Listed Fire Sprinkler pipe manufacturer's installation instructions for additional information on trenching, snaking, underground installation, and backfilling.

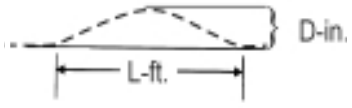
Maximum Bending Deflections in Inches For Given Lengths of CPVC, SDR 13.5 (73°F)

Pipe Size SDR 13.5	Length of Run (L) in Feet													
	2	5	7	10	12	15	17	20	25	30	35	40	45	50
	Pipe Deflection (D) in Inches													
3/4	1.3	7.8	15.4	31.3	45.1	70.5	90.6	124.4	195.9	282.1	383.9	-	-	-
1	1.0	6.3	12.3	25.0	36.0	56.3	72.3	100.1	156.5	225.2	306.6	400.4	-	-
1-1/4	0.8	5.0	9.7	19.8	28.5	44.6	57.3	79.3	123.9	178.4	242.8	317.2	401.4	-
1-1/2	0.7	4.3	8.5	17.3	24.9	39.0	50.1	69.3	108.2	155.9	212.2	277.1	350.7	433.0
2	0.6	3.5	6.8	13.9	20.0	31.2	40.0	55.4	86.6	124.7	169.7	221.7	280.6	346.4
2-1/2	0.5	2.9	5.6	11.4	16.5	25.8	33.1	45.8	71.5	103.0	140.2	183.1	231.8	286.2
3	0.4	2.4	4.6	9.4	13.5	21.2	27.2	37.6	58.8	84.6	115.2	150.4	190.4	235.1



Maximum Snaking Deflections in Inches For Given Lengths of CPVC, SDR 13.5 (73°F)

Pipe Size SDR 13.5	Length of Run (L) in Feet													
	2	5	7	10	12	15	17	20	25	30	35	40	45	50
	Pipe Deflection (D) in Inches													
3/4	0.3	2.0	3.8	7.8	11.3	17.6	22.6	31.3	49.0	70.5	96.0	125.4	158.7	195.9
1	0.3	1.6	3.1	6.3	9.0	14.1	18.1	25.0	39.1	56.3	76.6	100.1	126.7	156.4
1-1/4	0.2	1.2	2.4	5.0	7.1	11.2	14.3	19.8	31.0	44.5	60.7	79.3	100,4	123.9
1-1/2	0.2	1.1	2.1	4.3	6.2	9.7	12.5	17.3	27.1	39.0	53.0	69.3	87.7	108.2
2	0.1	0.9	1.7	3.5	5.0	7.8	10.0	13.9	21.6	31.2	42.4	55.4	70.1	86.6
2-1/2	0.1	0.7	1.4	2.9	4.1	6.4	8.3	11.4	17.9	25.8	35.1	45.8	57.9	71.5
3	0.1	0.6	1.2	2.4	3.4	5.3	6.8	9.4	14.7	21.2	28.8	37.6	47.6	58.8



Material Properties

Table I-A
Modulus of Elasticity & Stress vs. Temperature
For Victaulic FireLock™ CPVC Fire Sprinkler Pipe

Property	Temperature °F							
	73	80	90	100	110	120	140	150
Modulus of Elasticity "E" x 10^5 psi	3.90	3.84	3.78	3.70	3.46	3.21	3.05	2.84
Working Stress "S" psi	1,900	1,785	1,630	1,485	1,345	1,270	950	875

Table I-B
Modulus of Elasticity & Stress vs. Temperature
For Harvel BlazeMaster® CPVC Fire Sprinkler Pipe

Property	Temperature °F							
	73	80	90	100	110	120	140	150
Modulus of Elasticity "E" x 10^5 psi	4.23	4.14	3.99	3.85	3.70	3.55	3.23	3.08
Working Stress "S" psi	2,000	1,875	1,715	1,560	1,415	1,275	1,000	875

Table II
Physical & Thermal Properties

Property		A-Victaulic FireLock™ CPVC Pipe	B-Harvel BlazeMaster® CPVC Pipe	ASTM
Specific Gravity	"Sp. Gr."	1.51	1.55	D 792
IZOD Impact Strength (ft. lbs/inch of notch)		5.0	3.0	D 256A
Modulus of Elasticity, psi	"E"	3.9 X 10^5	4.23 x 10^5	D 638
Ultimate Tensile Strength, psi		8,000	8,400	D 638
Compressive Strength, psi		9,000	9,600	D 695
Poisson's Ratio		.35 - .38	.35 - .38	-
Working Stress @ 73°F, psi		1,900	2,000	D 1598
Hazen-Williams "C" Factor		150	150	-
Coefficient of Linear Expansion in./(in. °F)	"e"	3.2 X 10-5	3.4 X 10^{-5}	D 696
Thermal Conductivity BTU/(hr°F Win')	"k"	0.95	0.95	C 177
Upper Temperature Limit	"°F"	205	210	-
Flammability		Flame Retardant	Flame Retardant	
Electrical Conductivity		Non Conductor	Non Conductor	

Expansion and Contraction

Spears FlameGuard™ CPVC Fire Sprinkler Products, like all piping materials, expand and contract with changes in temperature. If the coefficient of linear expansion is 3.2 x10^{-5} inch /inch-°F. A 25°F change in temperature will cause an expansion of 1 inch for a 100-foot straight length. For most operating and installation conditions, expansion and contraction can be accommodated at changes of direction.

Table III-A
Thermal Expansion in Inches
For Victaulic FireLock™ CPVC Fire Sprinkler Pipe

Temp. Change △T °F	Length of Run in Feet													
	5	10	15	20	25	30	35	40	45	50	70	90	120	160
	Thermal Expansion △L (in.)													
20	0.04	0.08	0.12	0.15	0.19	0.23	0.27	0.31	0.35	0.38	0.54	0.69	0.92	1.23
30	0.06	0.12	0.17	0.23	0.29	0.35	0.40	0.46	0.52	0.58	0.81	1.04	1.38	1.84
40	0.08	0.15	0.23	0.31	0.38	0.46	0.54	0.61	0.69	0.77	1.08	1.38	1.84	2.46
50	0.10	0.19	0.29	0.38	0.48	0.58	0.67	0.77	0.86	0.96	1.34	1.73	2.30	3.07
60	0.12	0.23	0.35	0.46	0.58	0.69	0.81	0.92	1.04	1.15	1.61	2.07	2.76	3.69
70	0.13	0.27	0.40	0.54	0.67	0.81	0.94	1.08	1.21	1.34	1.88	2.42	3.23	4.30
80	0.15	0.31	0.46	0.61	0.77	0.92	1.08	1.23	1.38	1.54	2.15	2.76	3.69	4.92
90	0.17	0.35	0.52	0.69	0.86	1.04	1.21	1.38	1.56	1.73	2.42	3.11	4.15	5.53
100	0.19	0.38	0.58	0.77	0.96	1.15	1.34	1.54	1.73	1.92	2.69	3.46	4.61	6.14

Table III-B
Thermal Expansion in Inches
For Harvel BlazeMaster® CPVC Fire Sprinkler Pipe

Temp. Change △T °F	Length of Run in Feet													
	5	10	15	20	25	30	35	40	45	50	70	90	120	160
	Thermal Expansion △L (in.)													
20	0.04	0.08	0.12	0.16	0.20	0.24	0.29	0.33	0.37	0.41	0.57	0.73	0.98	1.31
30	0.06	0.12	0.24	0.24	0.31	0.37	0.43	0.49	0.55	0.61	0.86	1.10	1.47	1.96
40	0.08	0.16	0.33	0.41	0.41	0.49	0.57	0.65	0.74	0.82	1.14	1.47	1.96	2.61
50	0.10	0.20	0.41	0.51	0.51	0.61	0.72	0.82	0.92	1.02	1.43	1.84	2.45	3.26
60	0.12	0.24	0.49	0.61	0.61	0.73	0.86	0.98	1.10	1.22	1.71	2.20	2.94	3.92
70	0.19	0.29	0.57	0.71	0.71	0.88	1.00	1.14	1.29	1.43	2.00	2.57	3.43	4.57
80	0.16	0.33	0.65	0.82	0.82	0.98	1.14	1.31	1.47	1.63	2.28	2.94	3.92	5.22
90	0.18	0.37	0.73	0.92	0.92	1.04	1.10	1.29	1.47	1.66	2.84	3.30	4.41	5.88
100	0.20	0.41	0.82	1.02	1.02	1.22	1.43	1.63	1.84	2.04	2.86	3.67	4.90	6.53

△L = 12 eL (△T)
e = 3.4 x10^{-5} in./in. °F (Coefficient of Linear Expansion for Harvel BlazeMaster® CPVC Fire Sprinkler Pipe)
— or —
e = 3.2 x10^{-5} in./in. °F (Coefficient of Linear Expansion for Victaulic FireLock™ CPVC Fire Sprinkler Pipe)
L = Length of Run in Feet
△T = Temperature Change in °F

Example:
How much will a 40 ft. run of 2" Harvel BlazeMaster® CPVC Fire Sprinkler Pipe expand if the expected ambient temperature will range from 45°F to 85°F?
△L = 12 eL (△T)
△L = 12 (.000034) x 40 x 40
△L = .65”

Expansion Loop & Offset Configurations

Hangers or guides should only be placed in the loop, offset or change of direction as indicated below. Piping supports should restrict lateral movement and should direct axial movement into the expansion loop.

Expansion Loop and Offset Configurations

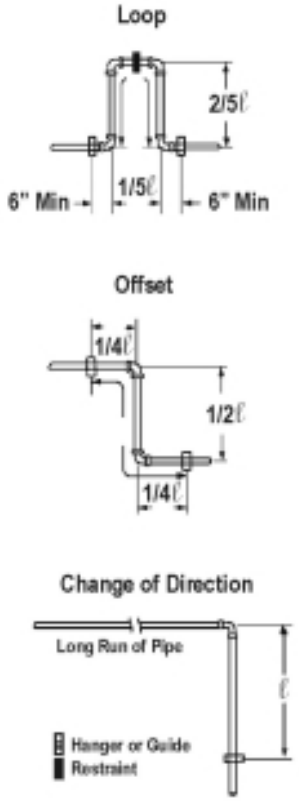


Table IV-A
Expansion Loop Length in Inches
For Victaulic FireLock™ CPVC Fire Sprinkler Pipe

Nominal Pipe Size	Avg. O.D.	Length of Run in Feet													
		5	10	15	20	25	30	35	40	45	50	70	90	120	160
		Length of Loop (in.) Temperature =30°F-100°F, △T = 70°F													
3/4	1.050	7	10	13	15	16	18	19	21	22	23	27	31	36	41
1	1.315	8	11	14	16	18	20	22	23	24	26	30	34	40	46
1-1/4	1.660	9	13	16	18	20	22	24	26	27	29	34	39	45	52
1-1/2	1.900	10	14	17	20	22	24	26	28	29	31	37	41	48	55
2	2.375	11	15	19	22	24	27	29	31	33	35	41	46	54	62

Note: Victaulic FireLock™ CPVC Fire Sprinkler Pipe available up to 2-inch size only.

Table IV-B
Expansion Loop Length in Inches
For Harvel BlazeMaster® CPVC Fire Sprinkler Pipe

Nominal Pipe Size	Avg. O.D.	Length of Run in Feet													
		5	10	15	20	25	30	35	40	45	50	70	90	120	160
		Length of Loop (in.) Temperature =30°F-100°F, △T = 70°F													
3/4	1.050	7	11	13	15	17	18	20	21	22	24	28	32	37	42
1	1.315	8	12	14	17	19	20	22	24	25	26	31	35	41	47
1-1/4	1.660	9	13	16	19	21	23	25	26	28	30	35	40	46	53
1-1/2	1.900	10	14	20	22	22	25	27	28	30	32	38	43	49	57
2	2.375	11	16	19	22	25	27	30	32	34	35	42	48	55	63
2-1/2	2.875	12	18	21	25	27	30	33	35	37	39	46	52	60	70
3	3.500	13	19	24	27	30	33	36	38	41	43	51	58	67	77

Note: Table IV-A and IV-B are based on Stress & Modulus Elasticity at 100°F

$$\ell = \sqrt{\frac{3ED\triangle L}{2S}}$$

ℓ = Length of Expansion Loop in Inches
E = Modulus of Elasticity at 100°F (Table I-A or I-B)
D = Average O.D. of Pipe
$\triangle L$ = Change in Length of Pipe Due to Change in Temperature (Table III-A or III-B)
S = Working Stress at 100° F (Table I-A or I-B)

Note: Data in Table I-A must be used with Table III-A and data in Table I-B with Table III-B

Example: How much expansion can be expected in a 200 ft. run of 2" Victaulic FireLock™ CPVC Fire Sprinkler Pipe and how long should the expansion loop be to compensate for this expansion? (The expected temperature range will be from 40° F to 110°F).

First Find:
$\triangle T$ = (Change in Temperature)
$\triangle T$ = T2 – T1
$\triangle T$ = 110°F – 40°F
$\triangle T$ = 70°F

To Find:
$\triangle L$ = (Amount of Expansion in inches from Table III-A)
$\triangle L$ = $\triangle L$ of 160 ft. with a $\triangle T$ of 70°F + $\triangle L$ of 40 ft. with a $\triangle L$ of 70°F
$\triangle L$ = 4.30" + 1.08"
$\triangle L$ = 5.38"

-OR-

$\triangle L = 12eL(\triangle T)$
e = 3.2×10^{-5} (from Table II, Victaulic FireLock™ CPVC Pipe)
L = Length of Run in Feet
$\triangle T$ = Change in Temperature in °F
$\triangle L = 12 \times .000032 \times 200 \times 70$
$\triangle L = 5.38$”

To find the length of the expansion loop or offset in inches:

$$\ell = \sqrt{\frac{3ED\triangle L}{2S}}$$

ℓ = Length of Expansion Loop in Inches
E = Modulus of Elasticity at 110°F (Table I-A)
D = Average O.D. of Pipe
$\triangle L$ = Change in Length of Pipe Due to Change in Temperature (Table III-A)
S = Working Stress at 100° F (Table I-A)

$$\ell = \sqrt{\frac{3ED\triangle L}{2S}}$$

$$\ell = \sqrt{\frac{3 \times 346{,}000 \times 2.375 \times 5.38}{2 \times 1345}}$$

$$\ell = \sqrt{4931}$$

ℓ = 70.2”

Review – Do's & Don'ts

Do's

- Read the manufacturer's installation instructions.
- Follow recommended safe work practices.
- Make certain that thread sealants, gasket lubricants, or fire stop materials are compatible with CPVC.
- Keep pipe and fittings in original packaging until needed.
- Cover pipe and fittings with an opaque tarp if stored outdoors.
- Follow proper handling procedures.
- Use tools specifically designed for use with plastic pipe and fittings.
- Use the proper solvent cement and follow application instructions.
- Use a drop cloth to protect interior finishes.
- Cut the pipe ends square.
- Deburr and bevel the pipe end with a chamfering tool.
- Rotate the pipe ¼ turn when bottoming pipe in fitting socket.
- Avoid puddling of cement in fittings and pipe.
- Make certain no solvent cement is on sprinkler head and adapter threads.
- Make certain that solvent cement does not run and plug the sprinkler head orifice.
- Follow the manufacturer's recommended cure times prior to pressure testing.
- Fill lines slowly and bleed the air from the system prior to pressure testing.
- Support sprinkler head properly to prevent lift up of the head through the ceiling when activated.
- Keep threaded rod within 1/16" of the pipe or use a surge arrestor.
- Install Spears FlameGuard™ CPVC Fire Sprinkler Products in wet systems only.
- Use only glycerin and water solutions for freeze protection.
- Allow for movement due to expansion and contraction.
- Renew your Spears FlameGuard™ CPVC Fire Sprinkler Products installation training every two years.

Don’ts

- Do not use edible oils such as Crisco as a gasket lubricant.
- Do not use petroleum or solvent-based sealants, lubricants, or fire stop materials.
- Do not use any glycol-based solutions as an anti-freeze.
- Do not mix glycerin and water solutions in contaminated containers.
- Do not use solvent cement that exceeds its shelf life or has become discolored or jellied.
- Do not allow solvent cement to plug the sprinkler head orifice.
- Do not connect rigid metal couplers to CPVC grooved adapters.
- Do not thread, groove, or drill CPVC pipe.
- Do not use solvent cement near sources of heat, open flame, or when smoking.
- Do not pressure test with air.
- Do not pressure test until recommended cure times are met.
- Do not use ratchet cutters below 50°F.
- Do not use CPVC pipe that has been stored outdoors, unprotected and is faded in color.
- Do not allow threaded rod to come in contact with the pipe.
- Do not install Spears FlameGuard™ CPVC Fire Sprinkler Products in cold weather without allowing for expansion.
- Do not install Spears FlameGuard™ CPVC Fire Sprinkler Products in dry systems.

Material Safety Data Sheet

IPS WELD-ON
Date Revised: FEB 2000
Supersedes: FEB 1999

Information on this form is furnished solely for the purpose of compliance with the Occupational Safety and Health Act and shall not be used for any other purpose. IPS Corporation urges the customers receiving this Material Safety Data Sheet to study it carefully to become aware of the hazards, if any, of the product involved. In the interest of safety, you should notify your employees, agents and contractors of the information on this sheet.

Section I

Manufacturer's Name: IPS Corporation
Address: 17109 S. Main St., PO Box 379, Gardena, CA 90248
Transportation Emergencies: CHEMTREC: (800) 424-9300 or
3 E COMPANY (800) 451-8346
Medical Emergencies: 3 E (24 Hour No.) (800) 451-8346
Business: (310) 898-3300
CHEMICAL NAME and FAMILY: Solvent Cement for CPVC Plastic Pipe
Mixture of CPVC Resin and Organic Solvents
Trade Name: SPEARS FS-5
Formula: Proprietary

Section II - Hazardous Ingredients

None of the ingredients below are listed as carcinogens by IARC, NTP or OSHA

Ingredient:	Chlorinated Polyvinyl Chloride Resin (CPVC)
Cas#:	NON/HAZ
ACGIH-TLV:	N/A
OSHA-PEL:	N/A
Ingredient:	Tetrahydrofuran (THF)**
Cas#:	109-99-9
ACGIH-TLV:	200 PPM
ACGIH-STEL:	250 PPM
OSHA-PEL:	200 PPM
OSHA-STEL:	250 PPM
DUPONT (A) AEL:	25 PPM
DUPONT (B) STEL:	75 PPM
Ingredient:	Methyl Ethyl Ketone (MEK)
Cas#:	78-93-3
Approx%:	2*
ACGIH-TLV:	200 PPM
ACGIH-STEL:	300 PPM
OSHA-PEL:	200 PPM
OSHA-STEL:	300 PPM
Ingredient:	Cyclohexanone
Cas#:	108-94-1
ACGIH-TLV:	25 PPM Skin
OSHA-PEL:	25 PPM Skin
Ingredient:	Acetone
Cas#:	67-64-1
ACGIH-TLV:	750 PPM
ACGIH-STEL:	1000 PPM
OSHA-PEL:	750 PPM
OSHA-STEL:	1000 PPM

*Title III Section 313 Supplier Notification: This product contains toxic chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-to-Know Ac t of 1986 and of 40CFR372. This information must be included in all MSDS's that are copied and distributed for this material.

(A) Dupont's Acceptable Exposure Limit (AEL) guidelines for 8 hour and 12 hour TWA, (B) Dupont's recommended STEL for 15 minute TWA.

** Information found in a report from the National Toxicology Program (NTP) on an inhalation study in rats and mice suggests that Tetrahydrofuran (THF) can cause tumors in animals. In the study the rats and mice were exposed to THF vapor levels up to 1800 PPM for two years (their lifetime), 6 hours/day, 5 days/week. Test results showed evidence of liver tumors in female mice and kidney tumors in male rats. No evidence of tumors was seen in female rats and male mice. There is no data linking Tetrahydrofuran exposure with cancer in humans.

BULK SHIPPING INFORMATION /CONTAINERS GREATER THAN ONE LITER

DOT Shipping Name: Adhesive
DOT Hazard Class: 3
Identification Number: UN 1133
Packaging Group: II
Label Requirement: Flammable Liquid

SHIPPING INFORMATION FOR CONTAINERS LESS THAN ONE LITER

DOT Shipping Name: Consumer Commodity
DOT Hazard Class: ORM-D

	HMIS	NFPA	HAZARD RATING
HEALTH:	2	2	0 - MINIMAL
FLAMMABILITY:	3	3	1 - SLIGHT
REACTIVITY:	0	1	2 - MODERATE
PROTECTIVE:			3 - SERIOUS
EQUIPMENT:	H		4 - SEVERE
H = Eye, Hand/Skin, Respiratory Protection and Impermeable Apron			

Section III - Physical Data

Appearance: Red, medium syrupy liquid
Specific Gravity @ 73°F ±3.6° (20°C ± 2°): Typical 1.0 ± 0.040
Vapor Density (Air=1): 2.49
ODOR: Ethereal
VAPOR PRESSURE (mm Hg.): 143mm Hg. based on first boiling component, THF @ 68°F (20°C)
EVAPORATION RATE (BUAC=1): > 1.0
BOILING POINT (°F/°C): 151°F (67°C) Based on first boiling component: THF
PERCENT VOLATILE BY VOLUME (%): Approx. 70-80%

VOC STATEMENT: VOC as manufactured: 720 Grams/Liter. Maximum VOC emission per SCAQMD Rule 1168, Test Method 316A: 490 Grams/Liter.

Section IV Fire and Explosion Hazard Data

FLASH POINT: -4°F (20°C) T.C.C. based on THF
FLAMMABLE LIMITS (Percent by Volume)
LEL: 2.0
UEL: 11.8

FIRE EXTINGUISHING MEDIA: Ansul "Purple K" potassium bicarbonate dry chemical, carbon dioxide, National Aer-O-Foam universal alcohol resistant foam, water spray.

SPECIAL FIRE FIGHTING PROCEDURES: Evacuate enclosed areas, stay upwind. Close or confined quarters require self-contained breathing apparatus, positive, pressure masks or airline masks. Use water spray to cool containers, to flush spills from source of ignition and to disperse vapors.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Fire hazard because of low flash point and high volatility. Vapors are heavier than air and may travel to source(s) of ignition at or near ground or lower levels and flash back.

Section V - Health Hazard Data

PRIMARY ROUTES OF ENTRY: Inhalation, Skin Contact

EFFECT OF OVEREXPOSURE
ACCUTE:
Inhalation: Severe overexposure may result in nausea, dizziness, headache. Can cause drowsiness, irritation of eyes and nasal passages.

Skin Contact: Skin irritant. Liquid contact may remove natural skin oils resulting in skin irritation. Dermatitis may occur with prolonged contact.

Skin Absorption: Prolonged or widespread exposure may result in the absorption of harmful amounts of material.

Eye Contact: Overexposure may result in severe eye injury with corneal or conjunctival inflammation on contact with the liquid. Vapors slightly uncomfortable.

Ingestion: Moderately toxic. May cause nausea, vomiting, diarrhea. May cause mental sluggishness.

CHRONIC: Symptoms of respiratory tract irritation and damage to respiratory epithelium were reported in rats exposed to 5000 ppm THF for 90 days. Elevation of SGPT suggests a disturbance in liver function. The NOEL was reported to be 200 ppm.

REPRODUCTIVE EFFECTS: N. AP.
TERATOGENICITY: N. AP.
MUTAGENICITY: N. AP.
EMBROYOTOXICITY: N. AP.
SENSITIZATION TO PRODUCT: N. AP.
SYNERGISTIC PRODUCTS: N. AV.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Individuals with pre-existing diseases of the eyes, skin or respiratory system may have increased susceptibility to the toxicity of excessive exposures.

EMERGENCY AND FIRST AID PROCEDURES

Inhalation: If overcome by vapors, remove to fresh air and if breathing stopped, give artificial respiration. If breathing is difficult, give oxygen. Call physician.

Eye Contact: Flush eyes with plenty of water for 15 minutes and call a physician.

Skin Contact: Remove contaminated clothing and shoes. Wash skin with plenty of soap and water for at least 15 minutes. If irritation develops, get medical attention.

Ingestion: Give 1 or 2 glasses of water or milk. Do not induce vomiting. Call physician or poison control center immediately.

Section VI - Reactivity

Stability: Stable

Conditions to Avoid: Keep away from heat, sparks, open flame and other sources of ignition.

Incompatibility: (Materials to avoid) Caustics, ammonia, inorganic acids, chlorinated compounds, strong oxidizers and isocyanates.

Hazardous Decomposition Products: When forced to burn, this product gives out carbon monoxide, carbon dioxide, hydrogen chloride and smoke.

Hazardous Polymerization: Will not occur.

Conditions To Avoid: Keep away from heat, sparks, open flame and other sources of ignition.

Section VII - Spill Or Leak Procedures

Steps To Be Take In Case Material Is Released Or Spilled: Eliminate all ignition sources. Avoid breathing of vapors. Keep liquid out of eyes. Flush with large amount or water. Contain liquid with sand or earth. Absorb with sand or nonflammable absorbent material and transfer into steel drums for recovery or disposal. Prevent liquid from entering drains.

Waste Disposal Method: Follow local, State and Federal regulations. Consult DISPOSAL EXPERT. Can be disposed of by incineration. Excessive quantities should not be permitted to enter drains. Empty containers should be air dried before disposing. Hazardous Waste Code: 214.

Section VIII - Special Protection Information

Respiratory Protection (Specify type): Atmospheric levels should be maintained below established exposure limits contained in Section II. If airborne concentrations exceed those limits, use of a NIOSH approved organic vapor cartridge respirator with full face-piece is recommended. The effectiveness of an air purifying respirator is limited. Use it only for a single short-term exposure. For emergency and other conditions where short-term exposure guidelines may be exceeded, use an approved positive pressure self-contained breathing apparatus.

Ventilation - Use only with adequate ventilation. Provide sufficient ventilation in volume and pattern to keep contaminants below applicable exposure limits set forth in Section II. Use only explosion proof ventilation equipment.

Protective Gloves: PVA coated

Eye Protection: Splash proof chemical goggles

Other Protective Equipment And Hygienic Practices: Impervious apron and a source of running water to flush or wash the eyes and skin in case of contact.

Section IX - Special Precautions

Precautions To Be Take In Handling And Storing: Store in the shade between 40°F - 90°F (5°C - 32.5°C). Keep away from heat, sparks, open flame and other sources of ignition. Avoid prolonged breathing of vapor. Use with adequate ventilation. Avoid contact with eyes, skin and clothing. Train employees on all special handling procedures before they work with this product.

Other Precautions: Follow all precautionary information given on container label, product bulletins and our solvent cementing literature. All material handling equipment should be electrically grounded.

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of this data or the results to be obtained from the use thereof.

Notes

Notes

Notes

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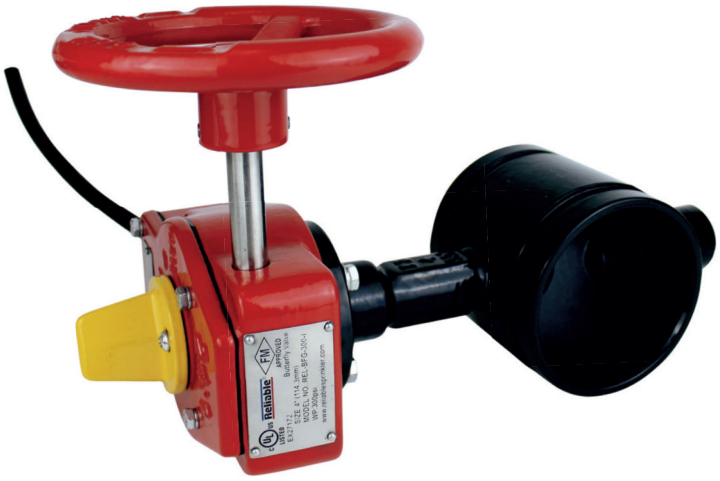
FM & UL Groove Butterfly Valve

REL-BFG-300-I



Material List

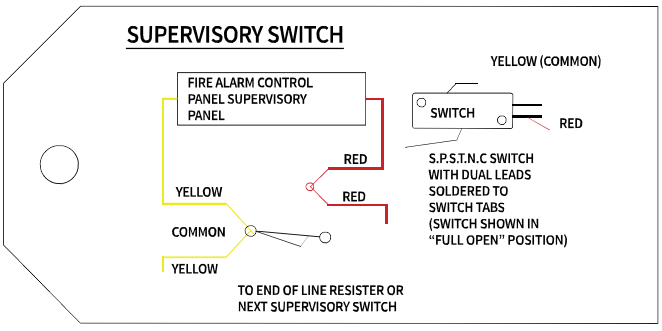
No.	Component	Material
1	Upper shaft sealing nut	WCB ASTM A216
2	Shaft seal	EPDM ASTM D2000
3	Body	DI ASTM A536
4	Upper shaft	SS416 ASTM A582
5	Disc	DI + EPDM
6	Lower shaft	SS416 ASTM A582
7	Lower shaft sealing nut	WCB ASTM A216
8	Stem bushing (2.5” to 6”)	PTFE ASTM D4894
8	Stem bushing (8”)	C95400 ASTM B148
9	Gear box	

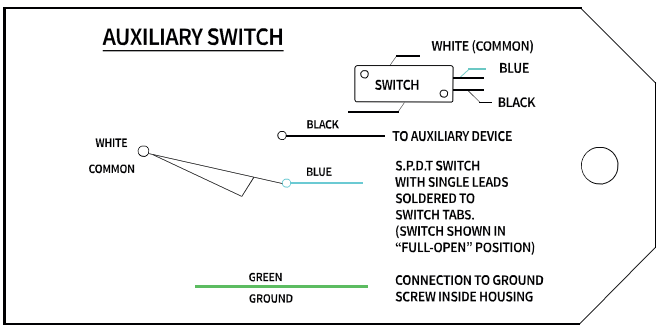
Carried Standard

Max Working Pressure:	300PSI / 21.4 Bar
Design Standard:	API609
Groove Standard:	ANSI/AWWA C606
Top Flange Standard:	ISO 5211
Test Standard:	API 598
Temperature:	from -20 ° C to 110° C

Design and materials are subject to change without notice.

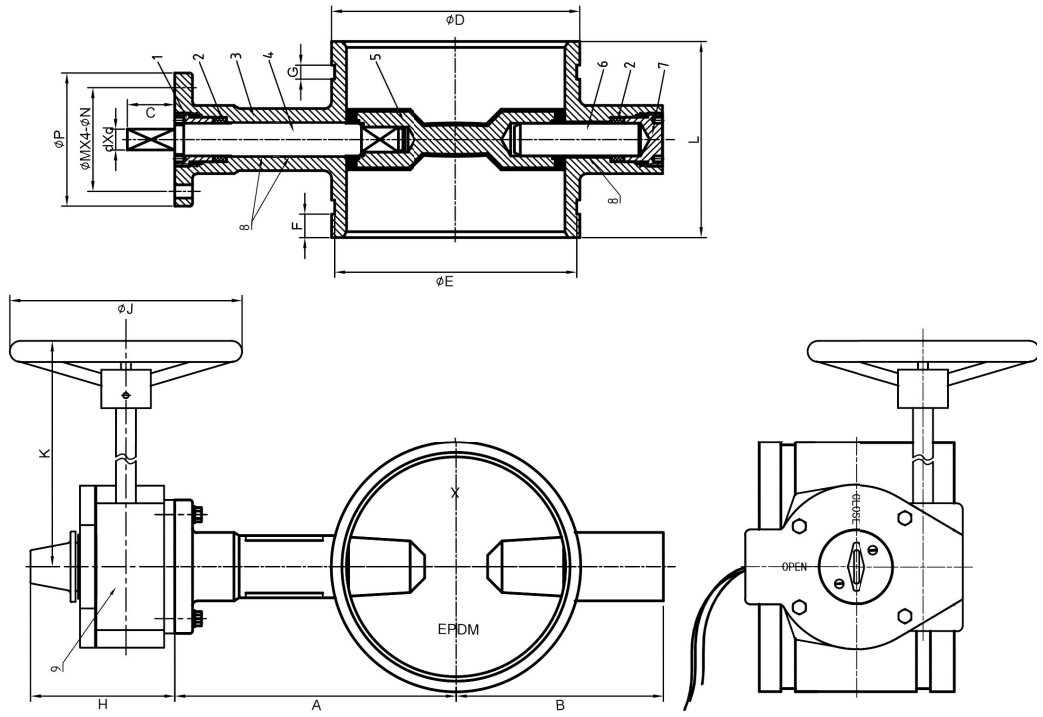
Wiring Diagram





FM & UL Groove Butterfly Valve

REL-BFG-300-I



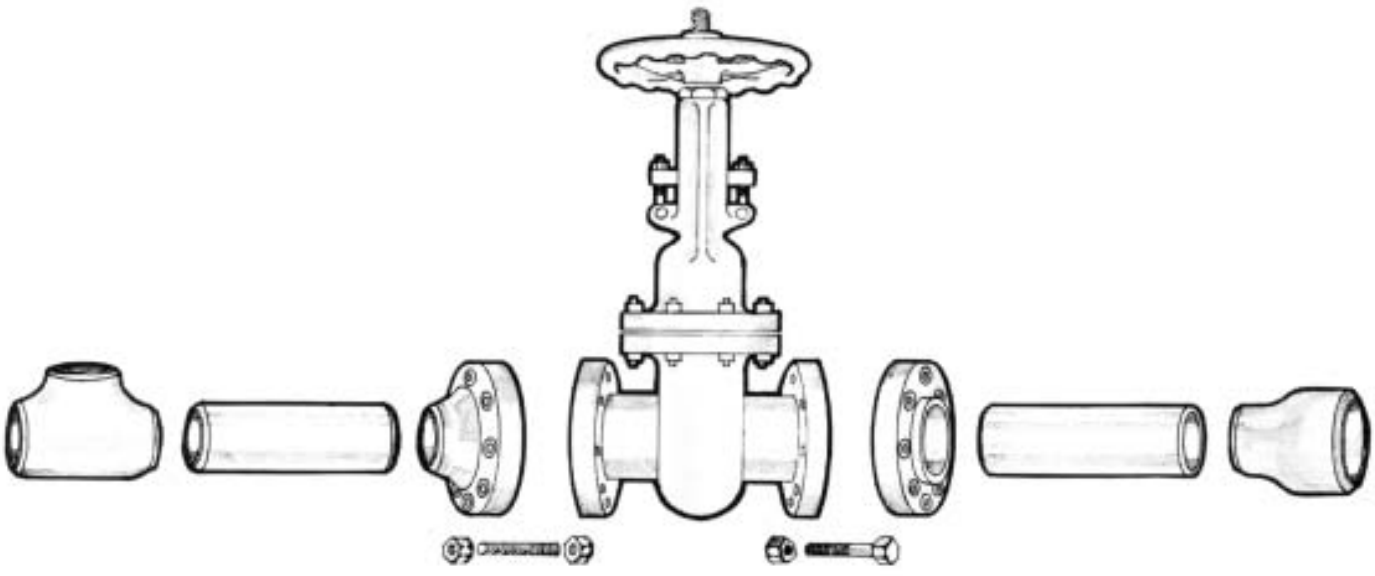
Dimensions (mm)

DN	A	B	C	D	E	F	G	H	K		J	P	M	N	d	L	Weight
65 (2.5”)	125	95	32	73	69.1	15.9	7.9	111	153	218	152	90	70	9	10	96.4	8.4kg
				76.1	72.3												
80 (3”)	140	100	32	88.9	84.9	15.9	7.9	111	153	218	152	90	70	9	11	97	9.1kg
100 (4”)	160	100	32	114.3	110.1	15.9	9.5	111	153	218	152	90	70	9	14	115.1	10.1kg
165 (6”)	190	140	32	165.1	160.9	15.9	9.5	111	153	218	200	90	70	9	16	132.4	14.7kg
				168.3	164												
200 (8”)	230	175	32	219.1	214.4	19	11.1	126	210	232	290	125	102	12	16	147.4	28.7kg
				216.3	211.6												

Ordering Information

Description	Size (mm)	Part Number
Butterfly Valve FM/UL Grooved 300 PSI (Rasco) (73mm)	65 (2.5”)	7U99002223
Butterfly Valve FM/UL Grooved 300 PSI (Rasco) (76mm)	65 (2.5”)	7U99002224
Butterfly Valve FM/UL Grooved 300 PSI (Rasco)	80 (3”)	7U99002225
Butterfly Valve FM/UL Grooved 300 PSI (Rasco)	100 (4”)	7U99002226
Butterfly Valve FM/UL Grooved 300 PSI (Rasco) (165mm)	165 (6”)	7U99002228
Butterfly Valve FM/UL Grooved 300 PSI (Rasco) (168mm)	168 (6”)	7U99002227
Butterfly Valve FM/UL Grooved 300 PSI (Rasco)	200 (8”)	7U99002229

ANTEC
PIPING PRODUCTS



Face side of Chart

Reverse side of Chart

YOUR TOTAL PIPING PACKAGE

This data chart is part of a comprehensive series of catalogues, brochures and data sheets which are provided to our customers and associated industry groups.

VALVES

Types
- Gate • Globe • Check • Plug • Ball • Butterfly Diaphragm • Knifegate
- Regulating • Safety Relief • Pressure & Temperature Control • Actuators
- Accessories & Instrumentation • Strainers • Steam Equipment

Materials
- Brass • Bronze • Cast Iron • Ductile Iron • Stainless Steel • Alloy Steel • PVC
- Urethane Lined • Rubber Lined

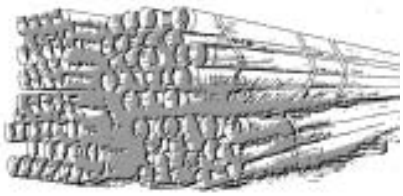
- Turnflo • Kitz • Audco • Saunders • Emico • SRI • Bonney • Stockham
- Neway • VAAS • Bettis • Elomatic

PIPE

Types
- Aust Standard Painted and Galvanized • Seamless Linepipe • ERW Linepipe
- SAW • Plain end • Threaded • Grooved • Shouldered

Materials
- Carbon Steel • Stainless Steel • Alloy Steel • Polyethylene • PVC

Brands
- OneSteel • NSC • NKK • Seah • Sumitomo • Iscor • Dalmine
- Vinidex • TPCO



PIPE FITTINGS

Types
- Screwed BSP & NPT • Socket Weld • Buttweld Grooved • Shouldered
- Compression • Solvent Weld • Fusion Weld • Mech Tees

Materials
- Malleable Iron • Mild Steel • Carbon Steel • Stainless Steel • Alloy Steel • PVC
- CPVC • ABS • Polyethylene

Brands
- MECH • Delcorte • Tube Fittings • Benkan • Awaji • Ulma • Interfit • TK Corp
- Mech • WNP

FIRE SPECIALTIES

Types
- Hose Reels • Landing Valves • Hanging Gear • Strut Products • Backflow Prevention Devices • Alarm Valves • Deluge Valves • Lock-open/closed Valves
- Threaded Rod • Sprinkler Heads & Access • Double ended Droppers • Profile Sockets • Paps • H pattern Boosters • Fabricated piping products • Hardware & Tools • Pressure Gauges • Rope • Soap, etc.

ACCESSORIES

Types
- Pipe Supports • Kamlocks • Hose Fittings • Gaskets • Bolts • Stud Bolts
- Thread Sealants • Pipe Coatings • Tape systems

Brands
- Erico • Denso • OME • Klinger

SERVICES

Types
- Pipe Cutting & Grooving • Coating and Lining • Valve monitoring • Valve cataloguing • Vendor Inventory Management • E-Commerce • Project Supply Management • Indent sourcing • Booster Assembly • Valve assemblies
- Tool and machine hire.

Antec provides the information contained in this data chart as a guide only for your information. Antec has taken reasonable care to ensure the accuracy of the material but you should not rely on the whole or any part of the information. Antec expressly disclaims all liability whatsoever for (including any direct or indirect loss or damage, costs or expenses howsoever incurred by any person) or reliance on the whole or any part of the information contained in or omitted from this brochure. Antec recommends that you verify any information regarding products with your independent expert adviser and rely solely on that adviser's recommendations.

Notes on Metric Conversion Many international industry groups have retained imperial measurement as their standard unit of measure. In metricating international standards we have rounded to nearest full units in certain cases. Should dimensional accuracy be critical to your requirements we suggest that reference be made to the appropriate original standards.

STEEL PIPES TO AMERICAN STANDARD ASME B36.10

NOMINAL SIZE		OUT-SIDE DIAM.	NOMINAL WALL THICKNESS FOR WELDED & SEAMLESS STEEL PIPE ASME B36.10 All dimensions are shown in millimetres												
DN	NPS	mm	STAN-DARD	EXTRA STRONG	XX STRONG	SCHED. 10	SCHED. 20	SCHED. 30	SCHED. 40	SCHED. 60	SCHED. 80	SCHED. 100	SCHED. 120	SCHED. 140	SCHED. 160
6	1/8	10.3	1.73	2.41	–	–	–	–	SAME AS STANDARD W.T. (Std. W.T.)	–	SAME AS EXTRA STRONG W.T. (X.S.)	–	–	–	–
8	1/4	13.7	2.24	3.02	–	–	–	–		–		–	–	–	–
10	3/8	17.1	2.31	3.20	–	–	–	–		–		–	–	–	–
15	1/2	21.3	2.77	3.73	7.47	–	–	–		–		–	–	–	4.78
20	3/4	26.7	2.87	3.91	7.82	–	–	–		–		–	–	–	5.56
25	1	33.4	3.38	4.55	9.09	–	–	–		–		–	–	–	6.35
32	1-1/4	42.2	3.56	4.85	9.70	–	–	–		–		–	–	–	6.35
40	1-1/2	48.3	3.68	5.08	10.15	–	–	–		–		–	–	–	7.14
50	2	60.3	3.91	5.54	11.07	–	–	–		–		–	–	–	8.74
65	2-1/2	73.0	5.16	7.01	14.02	–	–	–		–		–	–	–	9.53
80	3	88.9	5.49	7.62	15.24	–	–	–		–		–	–	–	11.13
90	3-1/2	101.6	5.74	8.08	–	–	–	–		–		–	–	–	–
100	4	114.3	6.02	8.56	17.12	–	–	–		–		–	11.13	–	13.49
125	5	141.3	6.55	9.53	19.05	–	–	–		–		–	12.70	–	15.88
150	6	168.3	7.11	10.97	21.95	–	–	–		–		–	14.27	–	18.26
200	8	219.1	8.18	12.70	22.23	–	6.35	7.04		10.31		15.09	18.26	20.62	23.01
250	10	273.1	9.27	12.70	25.40	–	6.35	7.80		XS	15.09	18.26	21.44	XXS	28.58
300	12	323.9	9.53	12.70	25.40	–	6.35	8.38	10.31	14.27	17.48	21.44	XXS	28.58	33.32
350	14	355.6	9.53	12.70	–	6.35	7.92	Std.W.T.	11.13	15.09	19.05	23.83	27.79	31.75	35.71
400	16	406.4	9.53	12.70	–	6.35	7.92	Std.W.T.	XS	16.66	21.44	26.19	30.96	36.53	40.49
450	18	457	9.53	12.70	–	6.35	7.92	11.13	14.27	19.05	23.83	29.36	34.93	39.67	45.24
500	20	508	9.53	12.70	–	6.35	Std.W.T.	XS	15.09	20.62	26.19	32.54	38.10	44.45	50.01
550	22	559	9.53	12.70	–	6.35	Std.W.T.	XS	–	22.23	28.58	34.93	41.28	47.63	53.98
600	24	610	9.53	12.70	–	6.35	Std.W.T.	14.27	17.48	24.61	30.96	38.89	46.02	52.37	59.54
650	26	660	9.53	12.70	–	7.92	XS	–	–	–	–	–	–	–	–
700	28	711	9.53	12.70	–	7.92	XS	15.88	–	–	–	–	–	–	–
750	30	762	9.53	12.70	–	7.92	XS	15.88	–	–	–	–	–	–	–
800	32	813	9.53	12.70	–	7.92	XS	15.88	17.48	–	–	–	–	–	–
850	34	864	9.53	12.70	–	7.92	XS	15.88	17.48	–	–	–	–	–	–
900	36	914	9.53	12.70	–	7.92	XS	15.88	19.05	–	–	–	–	–	–
1050	42	1067	9.53	12.70	–	–	–	–	–	–	–	–	–	–	–

Formula to attain approximate mass in kilograms per metre (kg/m) for Steel Round Pipe and Tubing

m = (D – t) t x 0.02466

Where,
m = mass to the nearest 0.01 kg/m
D = Outside Diameter in millimetres
(To nearest 0.1mm for OD up to 406.4mm)
(To nearest 1.0mm for OD 457mm and above)
t = Wall Thickness to nearest 0.01mm

EXAMPLE:

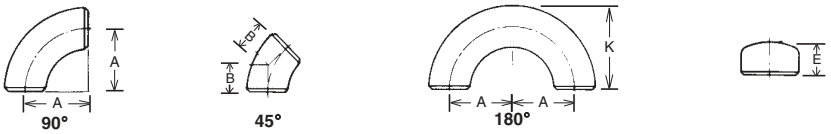
Nominal Size
DN300 NPS12
OD = 323.9mm
W.T. = 9.53mm

Step 1. 323.9 – 9.53 = 314.37
Step 2. 314.37 x 9.53 = 2995.9461
Step 3. 2995.9461 x 0.024 66
= 73.88kg/m

NOMINAL SIZE DN	OUTSIDE DIAM. mm	NOMINAL WALL THICKNESS & INSIDE DIAMETER – millimetres							
		SCHEDULE 5S		SCHEDULE 10S		SCHEDULE 40S		SCHEDULE 80S	
		Wall Thickness	Inside Diameter	Wall Thickness	Inside Diameter	Wall Thickness	Inside Diameter	Wall Thickness	Inside Diameter
6	10.29	–	–	1.24	7.81	1.73	6.83	2.41	5.47
8	13.72	–	–	1.65	10.42	2.24	9.24	3.02	7.68
10	17.15	–	–	1.65	13.85	2.31	12.53	3.20	10.75
15	21.34	1.65	18.04	2.11	17.12	2.77	15.80	3.73	13.88
20	26.67	1.65	23.37	2.11	22.45	2.87	20.93	3.91	18.85
25	33.40	1.65	30.10	2.77	27.86	3.38	26.64	4.55	24.30
32	42.16	1.65	38.86	2.77	36.62	3.56	35.04	4.85	32.46
40	48.26	1.65	44.96	2.77	42.72	3.68	40.90	5.08	38.10
50	60.33	1.65	57.03	2.77	54.79	3.91	52.51	5.54	49.25
65	73.03	2.11	68.81	3.05	66.93	5.16	62.71	7.01	59.01
80	88.90	2.11	84.68	3.05	82.80	5.49	77.92	7.62	73.66
100	114.30	2.11	110.08	3.05	108.20	6.02	102.26	8.56	97.18
125	141.30	2.77	135.76	3.40	134.50	6.55	128.19	9.52	122.25
150	168.28	2.77	162.74	3.40	161.47	7.11	154.05	10.97	146.33
200	219.08	2.77	213.54	3.76	211.56	8.18	202.72	12.70	193.68
250	273.05	3.40	266.24	4.19	264.67	9.27	254.51	12.70*	247.65
300	323.85	3.96	315.93	4.57	314.71	9.52	304.08	12.70*	298.45
350	355.60	3.96	347.68	4.78	346.05	–	–	–	–
400	406.40	4.19	398.02	4.78	396.85	–	–	–	–
450	457.20	4.19	448.82	4.78	447.65	–	–	–	–
500	508.00	4.78	498.45	5.54	496.93	–	–	–	–
600	609.60	5.54	598.53	6.35	596.90	–	–	–	–
750	762.00	6.35	749.30	7.92	746.16	–	–	–	–

CARBON STEEL BUTTWELDING FITTINGS TO ASME B16.9, B16.28 & BS.1640

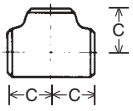
B16.9
LONG RADIUS WELDING ELBOWS, RETURN BENDS & CAPS



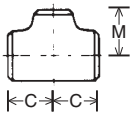
B16.28
SHORT RADIUS WELDING ELBOWS & RETURN BENDS

Nom. Size DN	PIPE OD mm	WALL THICKNESS — MILLIMETRES (mm)													A	B	K	D	V	E. Std.Wt. & Ex.Stg.	Nom. Size DN
		Sch. 10	Sch. 20	Sch. 30	Std. Wt.	Sch. 40	Sch. 60	X Stg.	Sch. 80	Sch. 100	Sch. 120	Sch. 140	Sch. 160	X.X. Stg.							
15	21.3	—	—	—	2.77	SAME AS STD. WT.	—	3.73	SAME AS X. STG.	—	—	—	4.78	7.47	38	16	47.5	—	—	25.4	**15**
20	26.7	—	—	—	2.87		—	3.91		—	—	—	5.56	7.82	38	19	43	19	33	25.4	**20**
25	33.4	—	—	—	3.38		—	4.55		—	—	—	6.35	9.09	38	22	55.5	25.4	41	38.1	**25**
32	42.2	—	—	—	3.56		—	4.85		—	—	—	6.35	9.70	47.5	25.4	70	32	52	38.1	**32**
40	48.3	—	—	—	3.68		—	5.08		—	—	—	7.14	10.15	57	29	82.5	38	62	38.1	**40**
50	60.3	—	—	—	3.91		—	5.54		—	—	—	8.74	11.07	76	35	106	51	81	38.1	**50**
65	73.0	—	—	—	5.16		—	7.01		—	—	—	9.53	14.02	95	44.5	132	63.5	100	38.1	**65**
80	88.9	—	—	—	5.49		—	7.62		—	—	—	11.13	15.24	114	51	159	76	121	50.8	**80**
90	101.6	—	—	—	5.74		—	8.08		—	—	—	—	16.15	133	57	184	89	140	63.5	**90**
100	114.3	—	—	—	6.02		—	8.56		—	11.13	—	13.49	17.12	152	63.5	210	102	159	63.5	**100**
125	141.3	—	—	—	6.55		—	9.53		—	12.70	—	15.88	19.05	190	79	262	127	197	76.2	**125**
150	168.3	—	—	—	7.11		—	10.97		—	14.27	—	18.26	21.95	229	95	313	152	237	88.9	**150**
200	219.1	—	6.35	7.04	8.18		10.31	12.70		15.09	18.26	20.62	23.01	22.23	305	127	414	203	313	102	**200**
250	273.1	—	6.35	7.80	9.27		12.70	12.70	15.09	18.26	21.44	25.40	28.58	25.40	381	159	517	254	390	127	**250**
300	323.9	—	6.35	8.38	9.53	10.31	14.27	12.70	17.48	21.44	25.40	28.58	33.32	25.40	457	190	619	305	467	152	**300**
350	355.6	6.35	7.92	9.53	9.53	11.13	15.09	12.70	19.05	23.83	27.79	31.75	35.71	—	533	222	711	356	533	165	**350**
400	406.4	6.35	7.92	9.53	9.53	12.70	16.66	12.70	21.44	26.19	30.96	36.53	40.49	—	610	254	813	406	610	178	**400**
450	457	6.35	7.92	11.13	9.53	14.27	19.05	12.70	23.83	29.36	34.93	39.67	45.24	—	686	286	914	457	686	203	**450**
500	508	6.35	9.53	12.70	9.53	15.09	20.62	12.70	26.19	32.54	38.10	44.45	50.01	—	762	318	1016	508	762	229	**500**
600	610	6.35	9.53	14.27	9.53	17.48	24.61	12.70	30.96	38.89	46.02	52.37	59.54	—	914	381	1219	610	914	267	**600**
750	762	7.92	12.70	15.88	9.53	—	—	12.70	—	—	—	—	—	—	1143	470	1524	762	1143	267	**750**
900	914	7.92	12.70	15.88	9.53	19.05	—	12.70	—	—	—	—	—	—	1372	565	—	914	1372	267	**900**

STRAIGHT TEES (B16.9)



REDUCING TEES (B16.9)



CONCENTRIC & ECCENTRIC REDUCERS (B16.9)

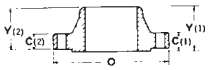
NOMINAL SIZE DN		C	M	H
Large End	Small End			
20	**20**	28.6	—	—
	15	28.6	28.6	38.1
25	**25**	38.1	—	—
	20	38.1	38.1	50.8
	15	38.1	38.1	50.8
32	**32**	47.6	—	—
	25	47.6	47.6	50.8
	20	47.6	47.6	50.8
	15	47.6	47.6	50.8
40	**40**	57.2	—	—
	32	57.2	57.2	63.5
	25	57.2	57.2	63.5
	20	57.2	57.2	63.5
	15	57.2	57.2	63.5
50	**50**	63.5	—	—
	40	63.5	60.3	76.2
	32	63.5	57.2	76.2
	25	63.5	50.8	76.2
	20	63.5	44.5	76.2
65	**65**	76.2	—	—
	50	76.2	69.9	88.9
	40	76.2	66.7	88.9
	32	76.2	63.5	88.9
	25	76.2	57.2	88.9
80	**80**	85.7	—	—
	65	85.7	82.6	88.9
	50	85.7	76.2	88.9
	40	85.7	73.0	88.9
	32	85.7	69.9	88.9
	25	85.7	66.9	88.9
90	**90**	95.3	—	—
	80	95.3	92.1	102
	65	95.3	88.9	102
	50	95.3	82.6	102
	40	95.3	79.4	102

NOMINAL SIZE DN		C	M	H
Large End	Small End			
100	**100**	105	—	—
	90	105	102	102
	80	105	98.4	102
	65	105	95.3	102
	50	105	88.9	102
	40	105	85.7	102
125	**125**	124	—	—
	100	124	117	127
	90	124	114	127
	80	124	111	127
	65	124	108	127
	50	124	105	127
150	**150**	143	—	—
	125	143	137	140
	100	143	130	140
	90	143	127	140
	80	143	124	140
	65	143	121	140
200	**200**	178	—	—
	150	178	168	152
	125	178	162	152
	100	178	155	152
	80	178	152	152
250	**250**	216	—	—
	200	216	203	178
	150	216	194	178
	125	216	191	178
	100	216	184	178
300	**300**	254	—	—
	250	254	241	203
	200	254	229	203
	150	254	219	203
	100	254	210	203
350	**350**	279	—	—
	300	279	270	330
	250	279	257	330
	200	279	248	330
	150	279	238	330

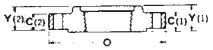
NOMINAL SIZE DN		C	M	H
Large End	Small End			
400	**400**	305	—	—
	350	305	305	356
	300	305	295	356
	250	305	283	356
	200	305	273	356
	150	305	264	356
450	**450**	343	—	—
	400	343	330	381
	350	343	330	381
	300	343	321	381
	250	343	308	381
	200	343	298	381
500	**500**	381	—	—
	450	381	368	508
	400	381	356	508
	350	381	356	508
	300	381	346	508
	250	381	333	508
	200	381	324	508
600	**600**	432	—	—
	500	432	432	508
	450	432	419	508
	400	432	406	508
	350	432	406	508
	300	432	397	508
	250	432	384	508
750	**750**	559	—	—
	600	559	533	610
	500	559	508	610
	450	559	495	610
	400	559	483	610
900	**900**	673	—	—
	750	673	635	610
	600	673	610	610
	500	673	584	610
	450	673	572	610

NOTE: All dimensions are in millimetres — (mm)

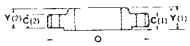
DN 15 to 600 are to ASME B16.5 (BS 1560). DN 750 & 900 are to BS 3293 for Slip-On & Weldneck only.



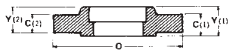
Welding Neck Flange



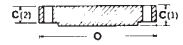
Threaded Flange



Slip-On Flange



Socket Welding (DN 15 - 80)



Blind Flanges up to DN600
(Above DN600 see notes below‡)

Nominal Size DN	PN20 (CLASS 150) Dia. of Fig. O	Thick-ness of Fig. Min. C(1)*	Length Thru Hub Thrd. Slip-On Soc/ Weld Y(1)*	Length Thru Hub Weld Neck Y(1)*	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	PN50 (CLASS 300) Dia. of Fig. O	Thick-ness of Fig. Min. C(1)*	Length Thru Hub Thrd. Slip-On Soc/ Weld Y(1)*	Length Thru Hub Weld Neck Y(1)*	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	PN100 (CLASS 600) Dia. of Fig. O	Thick-ness of Fig. Min. C(2)†	Length Thru Hub Thrd. Slip-On Soc/ Weld Y(2)†	Length Thru Hub Weld Neck Y(2)†	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	Nominal Size DN
15	90	11.5	16	48	60.5	16	4	95	14.5	22	52	66.5	16	4	95	14.5	22	52	66.5	16	4	15
20	100	13.0	16	52	70.0	16	4	120	16.0	25	57	82.5	20	4	120	16.0	25	57	82.5	20	4	20
25	110	14.5	17	56	79.5	16	4	125	17.5	27	62	89.0	20	4	125	17.5	27	62	89.0	20	4	25
32	120	16.0	21	57	89.0	16	4	135	19.5	27	65	98.5	20	4	135	21.0	29	67	98.5	20	4	32
40	130	17.5	22	62	98.5	16	4	155	21.0	30	68	114.5	22	4	155	22.5	32	70	114.5	22	4	40
50	150	19.5	25	64	120.5	20	4	165	22.5	33	70	127.0	20	8	165	26.5	37	73	127.0	20	8	50
65	180	22.5	29	70	139.5	20	4	190	25.5	38	76	149.0	22	8	190	29.0	41	79	149.0	22	8	65
80	190	24.0	30	70	152.5	20	4	210	29.0	43	79	168.5	22	8	210	32.0	46	83	168.5	22	8	80
90	215	24.0	32	71	178.0	20	8	230	30.5	44	81	184.0	22	8	230	35.0	49	86	184.0	26	8	90
100	230	24.0	33	76	190.5	20	8	255	32.0	48	86	200.0	22	8	275	38.5	54	102	216.0	26	8	100
125	255	24.0	36	89	216.0	22	8	280	35.0	51	98	235.0	22	8	330	44.5	60	114	267.0	30	8	125
150	280	25.5	40	89	241.5	22	8	320	37.0	52	98	270.0	22	12	355	48.0	67	117	292.0	30	12	150
200	345	29.0	44	102	298.5	22	8	380	41.5	62	111	330.0	26	12	420	55.5	76	133	349.0	33	12	200
250	405	30.5	49	102	362.0	26	12	445	48.0	67	117	387.5	30	16	510	63.5	86	152	432.0	36	16	250
300	485	32.0	56	114	432.0	26	12	520	51.0	73	130	451.0	33	16	560	66.5	92	156	489.0	36	20	300
350	535	35.0	57	127	476.0	30	12	585	54.0	76	143	514.5	33	20	605	70.0	94	165	527.0	39	20	350
400	600	37.0	64	127	540.0	30	16	650	57.5	83	146	571.5	36	20	685	76.5	106	178	603.0	42	20	400
450	635	40.0	68	140	578.0	33	16	710	60.5	89	159	628.5	36	24	745	83.0	117	184	654.0	45	20	450
500	700	43.0	73	145	635.0	33	20	775	63.5	95	162	686.0	36	24	815	89.0	127	190	724.0	45	24	500
600	815	48.0	83	152	749.5	36	20	915	70.0	106	168	813.0	42	24	940	102.0	140	203	838.0	52	24	600
750	985	54.0‡	89	130.2	914.0	35	28	1090	92.0	210	210	997.0	48	28	1130	114.0	248	248	1022.0	54	28	750
900	1170	60.3‡	95	136.5	1086.0	41	32	1270	105.0	241	241	1168.0	54	32	1315	124.0	283	283	1194.0	67	28	900

Nominal Size DN	PN150 (CLASS 900) Dia. of Fig. O	Thick-ness of Fig. Min. C(2)†	Length Thru Hub Thrd. Slip-On Y(2)†	Length Thru Hub Weld Neck Y(2)†	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	PN250 (CLASS 1500) Dia. of Fig. O	Thick-ness of Fig. Min. C(2)†	Length Thru Hub Thrd. Slip-On Soc/ Weld Y(2)†	Length Thru Hub Weld Neck Y(2)†	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	PN420 (CLASS 2500) Dia. of Fig. O	Thick-ness of Fig. Min. C(2)†	Length Thru Hub Thrd. Slip-On Soc/ Weld Y(2)†	Length Thru Hub Weld Neck Y(2)†	Dia. of Bolt Circle	Dia. of Bolt Holes	No. of Bolts	Nominal Size DN
15								120	22.5	32	60	82.5	22	4	135	30.5	40	73	89.0	22	4	15
20								130	25.5	35	70	89.0	22	4	140	32.0	43	79	95.0	22	4	20
25	USE PN250 DIMENSIONS IN THESE SIZES							150	29.0	41	73	101.5	26	4	160	35.0	48	89	108.0	26	4	25
32								160	29.0	41	73	111.0	26	4	185	38.5	52	95	130.0	30	4	32
40								180	32.0	44	83	124.0	30	4	205	44.5	60	111	146.0	33	4	40
50								215	38.5	57	102	165.0	26	8	235	51.0	70	127	171.5	30	8	50
65								245	41.5	64	105	190.5	30	8	270	57.5	79	143	197.0	33	8	65
80	240	38.5	54	102	190.5	26	8	270	48.0	73	118	203.0	33	8	305	67.0	92	168	228.5	36	8	80
100	295	44.5	70	114	235.0	32	8	310	54.0	90	124	241.5	36	8	355	76.5	108	190	273.0	42	8	100
125	350	51.0	79	127	279.5	35	8	375	73.5	105	155	292.0	42	8	420	92.5	130	229	324.0	48	8	125
150	380	56.0	86	140	317.5	32	12	395	83.0	119	171	317.5	39	12	485	108.0	152	273	368.5	56	8	150
200	470	63.5	102	162	393.5	39	12	485	92.0	143	213	393.5	45	12	550	127.0	178	318	438.0	56	12	200
250	545	70.0	108	184	470.0	39	16	585	108.0	159	254	482.5	52	12	675	165.5	229	419	539.5	68	12	250
300	610	79.5	117	200	533.5	39	20	675	124.0	181	283	571.5	56	16	760	184.5	254	464	619.0	76	12	300
350	640	86.0	130	213	559.0	42	20	750	133.5		298	635.0	60	16								350
400	705	89.0	133	216	616.0	45	20	825	146.5		311	705.0	68	16								400
450	785	102.0	152	229	686.0	52	20	915	162.0		327	774.5	76	16								450
500	855	108.0	159	248	749.5	54	20	985	178.0		356	832.0	80	16								500
600	1040	140.0	203	292	901.5	68	20	1170	203.5		406	990.5	94	16								600

All dimensions are shown in millimetres — mm

NOTES:

* **1.** The 2mm Raised Face is included in thickness C(1) and length through hub Y(1). This applies to PN20 and PN50 Pressure Ratings.

† **2.** The 7mm Raised Face is **not** included in thickness C(2) and length through hub Y(2). PN100, 150, 250 and 420 Pressure Ratings are regularly furnished with 7mm Raised Face which is **additional** to the flange thickness C(2) and Y(2).

3. Always specify bore when ordering weldneck flanges. Bore dimensions shown opposite also provide inside pipe diameters.

LARGE DIAMETER FLANGES ABOVE DN 600

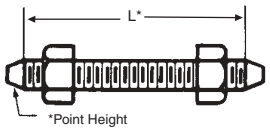
‡ For Blind Flanges refer to MSS SP44.
BS 3293 covers Slip-On and Weldneck but excludes Blind Flanges.
MSS SP44 covers Blind and Weldneck but excludes Slip-On Flanges.
BS 3293 Weldneck PN20 flange thickness, C(1), is less than MSS SP44 equivalents.
API - 605 Dimensions for Large Diameter Flanges vary considerably from both BS 3293 and MSS SP44 — Details on request.

Raised Face Diam. All Press. Ratings mm	NOMINAL SIZE DN	O.D. of PIPE mm	APPROXIMATE WELDING NECK FLANGE BORES — mm SCH. 10	SCH. 20	SCH. 30	STD. WT.	SCH. 40	SCH. 60	EXT. STG.	SCH. 80	SCH. 100	SCH. 120	SCH. 140	SCH. 160	X.X. STG.
35	15	21.3				15.8	↑		13.9	↑				11.8	6.4
43	20	26.7				20.9			18.9					15.5	11.0
51	25	33.4				26.6			24.3					20.7	15.2
64	32	42.2				35.1			32.5					29.5	22.8
73	40	48.3				40.9			38.1					34.0	27.9
92	50	60.3				52.5			49.2					42.9	38.2
105	65	73.0				62.7			59.0					54.0	45.0
127	80	88.9				77.9			73.7					66.7	58.4
140	90	101.6				90.1			85.4					—	—
157	100	114.3				102.3			97.2			92.1		87.3	80.1
186	125	141.3				128.2			122.3			115.9		109.6	103.2
216	150	168.3				154.1			146.3			139.7		131.8	124.4
270	200	219.1		206.4	205.0	202.7		198.5	193.7		188.9	182.6	177.8	173.1	174.6
324	250	273.1		260.3	257.5	254.5		247.7	247.7	242.9	236.5	230.2	222.3	215.9	222.3
381	300	323.9		311.1	307.1	304.8	303.2	295.3	298.5	288.9	281.0	273.1	266.7	257.2	273.1
413	350	355.6	342.9	339.8	336.6	336.6	333.3	325.4	330.2	317.5	307.9	300.0	292.1	284.2	
470	400	406.4	393.7	390.6	387.4	387.4	381.0	373.1	381.0	363.5	354.0	344.5	333.3	325.4	
533	450	457.0	444.5	441.4	434.9	438.2	428.7	419.1	431.8	409.5	398.5	387.4	377.9	366.7	
584	500	508.0	495.3	489.0	482.6	489.0	477.8	466.8	482.6	455.6	442.9	431.8	419.1	408.0	
692	600	610.0	596.9	590.6	581.1	590.6	574.6	560.4	584.2	547.7	531.8	517.6	504.9	490.5	
857	750	762.0	746.2	736.6	730.2	743.0			736.6						
1022	900	914.0	898.6	889.0	882.6	895.4	876.3		889.0						

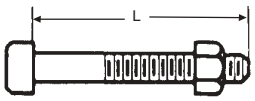
↑ SAME AS STD. WT. ↑ SAME AS EXT. STG.

BOLTING

To suit R.F. Flange sizes DN 15 to 600 to ASME — B16.5 (BS. 1560) and DN 750 & 900 to BS. 3293



STUD BOLT WITH NUTS



MACHINE BOLT WITH NUT

Diameter of Bolts is shown in inches. For nominal diameters 1 inch and smaller, threads are U.N.C.; nominal diameters 1-1/8 inch and larger threads are 8 U.N. (8 T.P.I.).
Length of Bolts (L) is shown in millimetres **rounded** to the nearest 5 mm. Stud Bolt lengths (L*) **do not** include the height of points. Machine Bolt lengths (L) include the height of point. The length shown includes the height of the Raised Face in all cases.

NOM FLGE SIZE	PN20 (CLASS 150)				PN50 (CLASS 300)				PN100 (CLASS 600)			PN150 (CLASS 900)			PN250 (CLASS 1500)			PN420 (CLASS 2500)			NOM FLGE SIZE
	No. Bolts	Dia. Bolts	L Stud Bolts	L Mach. Bolts	No. Bolts	Dia. Bolts	L Stud Bolts	L Mach. Bolts	No. Bolts	Dia. Bolts	L Stud Bolts	No. Bolts	Dia. Bolts	L Stud Bolts	No. Bolts	Dia. Bolts	L Stud Bolts	No. Bolts	Dia. Bolts	L Stud Bolts	
DN		ins.	mm	mm		ins.	mm	mm		ins.	mm		ins.	mm		ins.	mm		ins.	mm	DN
15	4	1/2	60	45	4	1/2	65	55	4	1/2	80				4	3/4	105	4	3/4	125	15
20	4	1/2	65	50	4	5/8	75	60	4	5/8	90				4	3/4	115	4	3/4	125	20
25	4	1/2	65	55	4	5/8	80	65	4	5/8	90	USE PN250 DIMENSIONS IN THESE SIZES			4	7/8	125	4	7/8	140	25
32	4	1/2	70	55	4	5/8	80	65	4	5/8	100				4	7/8	125	4	1	150	32
40	4	1/2	70	60	4	3/4	90	75	4	3/4	105				4	1	140	4	1 1/8	170	40
50	4	5/8	80	65	8	5/8	90	75	8	5/8	105				8	7/8	145	8	1	175	50
65	4	5/8	90	75	8	3/4	100	85	8	3/4	120				8	1	160	8	1 1/8	195	65
80	4	5/8	90	75	8	3/4	110	90	8	3/4	125	8	7/8	145	8	1 1/8	180	8	1 1/4	220	80
90	8	5/8	90	75	8	3/4	110	95	8	7/8	140	—	—	—	—	—	—	—	—	—	90
100	8	5/8	90	75	8	3/4	110	95	8	7/8	145	8	1 1/8	170	8	1 1/4	195	8	1 1/2	255	100
125	8	3/4	90	80	8	3/4	120	100	8	1	165	8	1 1/4	190	8	1 1/2	250	8	1-3/4	300	125
150	8	3/4	100	85	12	3/4	125	105	12	1	170	12	1 1/8	195	12	1 3/8	260	8	2	345	150
200	8	3/4	110	90	12	7/8	140	110	12	1 1/8	195	12	1 3/8	220	12	1 5/8	290	12	2	380	200
250	12	7/8	115	95	16	1	155	130	16	1 1/4	215	16	1 3/8	235	12	1 7/8	335	12	2 1/2	485	250
300	12	7/8	120	100	16	1 1/8	170	145	20	1 1/4	220	20	1 3/8	255	16	2	375	12	2 3/4	540	300
350	12	1	130	110	20	1 1/8	175	150	20	1 3/8	235	20	1 1/2	275	16	2 1/4	405				350
400	16	1	135	115	20	1 1/4	190	160	20	1 1/2	255	20	1 5/8	285	16	2 1/2	445				400
450	16	1 1/8	150	125	24	1 1/4	195	170	20	1 5/8	275	20	1 7/8	325	16	2 3/4	495				450
500	20	1 1/8	160	135	24	1 1/4	205	180	24	1 5/8	290	20	2	345	16	3	540				500
600	20	1 1/4	175	145	24	1 1/2	230	195	24	1 7/8	330	20	2 1/2	435	16	3 1/2	615				600
750	28	1 1/4	190	160	28	1 3/4	290	250	28	2	355	PN150, 250 & 420 — Not listed in BS 3293									750
900	32	1 1/2	215	180	32	2	325	280	28	2 1/2	400										900

Raised Face height of 2 mm for PN20 & 50 and 7 mm for PN100, 150, 250 & 420 is included in dimension L (Bolt Length).

MATERIAL SPECIFICATIONS

ASTM A193 Grade B7

Standard specification for alloy steel and stainless steel bolting materials for high temperature service.

ASTM A194 Grade 2H

Standard specification for carbon and alloy steel nuts for bolts for high pressure and high temperature service.

ASTM A320

Standard specification for alloy steel bolting materials for low temperature service.
Grade L7 covers alloy steel stud bolts.
Grade L4 covers alloy steel nuts to suit Grade L7 stud bolts.

Inch/Metric Bolting interchangeable for ASME B16.5 flanges as below	
FOR ↓	USE ↓
1/2″	M14
5/8″	M16
3/4″	M20
7/8″	M24
1″	M27
1 1/8″	M30
1 1/4″	M33
1 3/8″	M36
1 1/2″	M39
1 5/8″	M42
1 3/4″	M45
1 7/8″	M48
2″	M52
2 1/4″	M56
2 1/2″	M64
2 3/4″	M72

ASME B36.10 STEEL PIPE DIMENSIONS					APPROXIMATE MASS OF POPULAR SIZES											
					PIPE	BUTTWELD FITTINGS			A.S.M.E. FLANGES							
									PN20 (150)			PN50 (300)			PN100 (600)	PN150 (900)
NOMINAL PIPE SIZE	Outside Diam.	Inside Diam.	Identification		Steel Pipe	90° L/R Elbows	Tees Equal	Con. & Ecc. Red.	SOW/ SW Thrded	W/N	Blind	SOW/ SW Thrded	W/N	Blind	W/N	W/N
			Std.	Sch.												
DN	mm	mm	X.S.	No.	kg/m	kg/ea	kg/ea	kg/ea	kg/ea	kg/ea	kg/ea	kg/ea	kg/ea	kg/ea	kg/ea	kg/ea
15	21.3	15.8	Std.	40	1.27	0.08	0.16	—	.45	.79	.57	.73	.91	.79	.91	2.00
		13.9	XS	80	1.62	0.10	0.21	—								
20	26.7	20.9	Std.	40	1.69	0.08	0.21	0.07	.68	.86	.91	1.25	1.41	1.13	1.59	2.72
		18.9	XS	80	2.20	0.11	0.27	0.10								
25	33.4	26.6	Std.	40	2.50	0.17	0.34	0.14	.95	1.09	1.09	1.36	1.81	1.77	1.86	3.86
		24.3	XS	80	3.24	0.21	0.43	0.18								
32	42.2	35.1	Std.	40	3.39	0.28	0.64	0.18	1.13	1.41	1.25	2.04	2.27	2.68	2.72	4.54
		32.5	XS	80	4.47	0.39	0.75	0.23								
40	48.3	40.9	Std.	40	4.05	0.39	0.95	0.27	1.36	1.81	1.70	2.81	3.06	2.83	3.74	6.35
		38.1	XS	80	5.41	0.50	1.13	0.32								
50	60.3	52.5	Std.	40	5.44	0.68	1.45	0.41	2.22	2.83	2.77	3.13	3.74	3.52	4.65	10.89
		49.2	XS	80	7.48	1.00	1.72	0.54								
65	73.0	62.7	Std.	40	8.63	1.36	2.45	0.68	3.82	4.42	4.04	4.54	5.56	5.44	6.44	16.33
		59.0	XS	80	11.41	1.82	2.95	0.91								
80	88.9	77.9	Std.	40	11.29	2.18	3.45	0.91	4.08	5.22	5.44	6.12	7.37	7.26	8.50	14.51
		73.7	XS	80	15.27	2.86	4.30	1.27								
90	101.6	90.1	Std.	40	13.57	3.05	4.5	1.36	4.99	5.44	6.35	7.71	9.53	9.98	12.25	—
		85.4	XS	80	18.63	4.1	5.9	1.81								
100	114.3	102.3	Std.	40	16.07	4.2	5.7	1.59	5.94	7.48	7.37	9.53	11.79	11.79	17.24	23.13
		97.2	XS	80	22.32	5.7	7.3	2.18								
125	141.3	128.2	Std.	40	21.77	6.8	9.1	2.7	6.12	9.53	9.07	12.70	15.42	15.88	30.84	39.01
		122.3	XS	80	30.97	10.0	11.8	3.8								
150	168.3	154.1	Std.	40	28.26	10.9	13.6	3.9	8.16	11.34	12.70	16.33	19.96	20.87	34.02	49.90
		146.3	XS	80	42.56	16.3	19.0	5.4								
200	219.1	202.7	Std.	40	42.55	21.8	25	5.9	12.70	19.05	21.77	25.40	32.21	38.10	52.16	84.82
		193.7	XS	80	64.64	33.1	33.5	8.6								
250	273.1	254.5	Std.	40	60.31	38.6	41	10	17.24	25.40	31.75	35.38	44.00	53.34	90.36	121.56
		247.7	XS	60	81.55	52	54	14								
300	323.9	304.8	Std.	—	73.88	57	57	15	27.22	38.10	45.36	50.80	64.41	86.18	101.60	168.74
		298.5	XS	—	97.46	75	77	20								
350	355.6	336.6	Std.	30	81.33	73	73	28	35.38	51.26	58.97	74.39	84.37	107.05	157.40	254.92
		330.2	XS	—	107.39	97	93	37								
400	406.4	387.4	Std.	30	93.27	98	91	35	42.18	63.50	77.11	101.60	111.58	145.15	209.11	310.71
		381.0	XS	40	123.30	130	120	46								
450	457	438.2	Std.	—	105.16	120	135	40	52.62	68.04	102.51	126.10	138.35	181.89	217.27	419.12
		431.8	XS	—	139.15	165	190	53								
500	508	489.0	Std.	20	117.15	150	168	61	65.32	81.65	123.38	149.69	174.63	231.33	312.98	527.98
		482.6	XS	30	155.12	200	245	82								
600	610	590.6	Std.	20	141.12	220	240	77	91.63	118.84	203.21	222.26	247.21	342.92	443.16	680.39
		584.2	XS	—	187.06	280	350	95								
750	762	743.0	Std.	—	176.84	332	388	107	142.88	163.29	326.59	367.41	421.84	680.39	589.67	975.22
		736.6	XS	20	234.67	440	484	143								
900	914	895.4	Std.	—	212.56	481	588	129	217.72	235.87	510.29	544.31	589.67	1031.92	793.79	1564.89
		889.0	XS	20	282.27	638	731	172								
← DIMENSIONS →					← MASS IN KILOGRAMS – kg. →											

APPROXIMATE MASS PER UNIT FOR AUSTENITIC STAINLESS STEEL PIPE AND FITTINGS CAN BE OBTAINED BY APPLYING A FACTOR OF 1.015

MEDIUM & HEAVY PIPE TO AUSTRALIAN STANDARDS

SPECIFICATION

C250 pipe is manufactured and tested to meet the requirement of the following specifications:

- AS 1074 Steel tubes and tubulars for ordinary service.
- AS 1163 Structural steel hollow sections. (Grade C250, C250L0).

MECHANICAL PROPERTIES

Minimum Yield Strength	250MPa
Minimum Tensile Strength	320MPa
Minimum Elongation in 5.65 √So	20%

SUPPLY CONDITIONS

Surface Finish	Black/Painted/Galvanized/ILG
Straightness	Refer to Australian standards
Thickness Tolerance	
Dimension Tolerance	
Standard Length	6.5m
Length Tolerance	+50mm/-0mm

WORKING PRESSURES – WELDED JOINTS

Where AS 1074 pipe is used in pressure piping covered by AS 4041, the maximum pressure shall not exceed 1210 kPa for AS 1074 pipe up to and including DN 100 and 1030 kPa for AS 1074 pipe exceeding DN 100.

END PROCESSING OPTIONS

- Plain End
- Roll Grooved
- Shouldered
- Threaded

THREADED PIPE

Screwed on one or both ends in accordance with AS 1074. The tapered Whitworth thread used complies with the requirements of AS 1722, Part 1 and is suitable for both parallel and taper threaded sockets.

WORKING PRESSURES – THREADED JOINTS TAPER/PARALLEL THREAD

TYPE OF SERVICE											
Nom. Size DN	Water & Inert Oil		LPG	Fuel Oil				Other Applications (including Steam & Compressed Air)			
	Med.	Heavy	Med. & Heavy	Medium		Heavy		Medium		Heavy	
				Press	Temp	Press	Temp	Press	Temp	Press	Temp
(mm)	kPa	kPa	kPa	kPa	°C	kPa	°C	kPa	°C	kPa	°C
25	2070	2410	140	1030	100	1210	192	1210	100	1210	192
32	1720	2070	140	1030	100	1030	192	1030	100	1030	192
40	1720	2070	140	1030	100	1030	192	1030	100	1030	192
50	1380	1720	140	860	100	860	192	860	100	860	192
65	1380	1720	—	860	100	860	192	860	100	860	192
80	1380	1720	—	860	100	860	192	860	100	860	192
100	1030	1380	—	690	100	850	192	690	100	690	192
125	1030	1380	—	—	—	—	—	—	—	—	—
150	860	1030	—	—	—	—	—	—	—	—	—

CHS Grade C250	MASS AND BUNDLING DATA – Calculated in accordance with AS 1163										
DIMENSIONS		BUNDLING			MASS						
Designation d_o t	Nominal Size DN	Bundle Dimensions mm	Lengths Per Bundle	Metres Per Bundle	Nominal Mass				Mass per Bundle	
					kg/m		m/tonne		tonnes	
(mm) (mm)	(mm)	W x H	6.5m	m	Black	Galv.	Black	Galv.	Black	Galv.
26.9 x 2.6 CHS	20 M	350 306	127	825.5	1.56	1.62	642	613	1.29	1.32
3.2 CHS	20 H	350 306	127	825.5	1.87	1.93	535	522	1.54	1.59
33.7 x 3.2 CHS	25 M	372 327	91	591.5	2.41	2.49	415	406	1.43	1.47
4.0 CHS	25 H	372 327	91	591.5	2.94	3.02	340	330	1.74	1.78
42.4 x 3.2 CHS	32 M	383 337	61	396.5	3.10	3.20	322	310	1.23	1.27
4.0 CHS	32 H	383 337	61	396.5	3.80	3.90	263	255	1.51	1.54
48.3 x 3.2 CHS	40 M	436 384	61	396.5	3.57	3.68	280	270	1.41	1.46
4.0 CHS	40 H	436 384	61	396.5	4.38	4.49	228	221	1.74	1.78
60.3 x 3.6 CHS	50 M	422 374	37	240.5	5.03	5.18	199	192	1.21	1.25
4.5 CHS	50 H	422 374	37	240.5	6.19	6.33	161	157	1.49	1.52
76.1 x 3.6 CHS	65 M	533 472	37	240.5	6.43	6.61	156	150	1.55	1.59
4.5 CHS	65 H	533 472	37	240.5	7.93	8.12	126	123	1.91	1.95
88.9 x 4.0 CHS	80 M	445 397	19	123.5	8.37	8.58	120	116	1.03	1.06
4.9 CHS	80 H	445 397	19	123.5	10.3	10.5	96.8	94.4	1.28	1.30
101.6 x 4.0 CHS	90 M	508 454	19	123.5	9.63	9.88	104	100	1.19	1.22
4.9 CHS	90 H	508 454	19	123.5	11.9	12.2	84	81.7	1.47	1.50
114.3 x 4.5 CHS	100 M	571 509	19	123.5	12.2	12.4	82.2	79.8	1.50	1.54
5.4 CHS	100 H	571 509	19	123.5	14.5	14.3	69.1	67.4	1.79	1.82
139.7 x 5.0 CHS	125 M	698 382	13	84.5	16.6	16.9	60.2	58.6	1.40	1.43
5.4 CHS	125 H	698 382	13	84.5	17.9	18.2	55.9	54.6	1.51	1.54
165.1 x 5.0 CHS	150 M	660 451	10	65	19.7	20.1	50.7	49.3	1.28	1.31
5.4 CHS	150 H	660 451	10	65	21.7	21.57	45.9	46	1.38	1.41

NOTES: 1. M = Medium, H = Heavy

Note: The term "tube" is synonymous with the term "pipe"

Grade C350 pipe is a lightweight, high strength pipe for general mechanical and structural applications.

C350 is manufactured by cold-forming and high frequency electric resistance welding.

C350 is available in black, ILG and galvanized finishes.

Also available with one or both ends swaged as follows:

NB	XL	L
20	✓	X
25	✓	✓
32	✓	✓
40	✓	✓
50	✓	X

SPECIFICATION

Grade C350 pipe is manufactured and tested to meet the requirement of the following specifications:

- AS 1163 Structural Steel Hollow Sections (Grade C350, C350L0).
- AS/NZ 54792 Hot dip galvanized (zinc) coatings on ferrous hollow sections by a continuous or a specialised process.

MECHANICAL PROPERTIES

Minimum Yield Strength	350MPa
Minimum Tensile Strength	450MPa
Minimum Elongation in 5.65 √So	20%

SUPPLY CONDITIONS

Surface Finish	Black/ILG/Galvanized
Straightness, Thickness Tolerance, Dimension Tolerance	Refer to Australian standards
Standard Length	6.5m
Length Tolerance	+50mm/-0mm

GALVANIZING

Grade C350 pipe is manufactured and tested to meet the requirement of AS 4792 Galvanized Coatings.

Min. Ave Coating Mass 300g/m^2

The coating adherence of the galvanizing is satisfactory for the pipe to be bent to a radius 6 times the diameter of the pipe.

WELDING

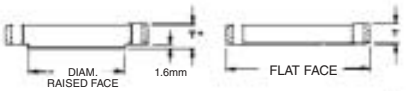
The following consumables are recommended by AS 1554.1 when welding C350 sections.

Manual metal-arc (MMAW) E41XX, E48XX

Gas metal-arc (MIG) (GMAW) W50X

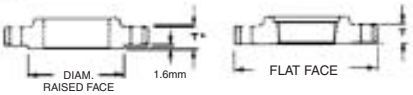
CHS Grade C250	MASS AND BUNDLING DATA – Calculated in accordance with AS 1163										
DIMENSIONS		BUNDLING			MASS					
Designation d_o t	Nominal Size DN	Bundle Dimensions mm	Lengths Per Bundle	Metres Per Bundle	Nominal Mass				Mass per Bundle	
					kg/m		m/tonne		tonnes	
(mm) (mm)	(mm)	W x H	6.5m	m	Black	Galv.	Black	Galv.	Black	Galv.
26.9 x 2.0 CHS	20 XL	350 306	127	825.5	1.23	1.29	814	767	1.010	1.070
2.3 CHS	20 LT	350 306	127	825.5	1.40	1.46	717	680	1.150	1.200
33.7 x 2.0 CHS	25 XL	372 327	91	591.5	1.56	1.64	640	602	0.920	0.970
2.6 CHS	25 LT	372 327	91	591.5	1.99	2.07	501	497	1.180	1.230
42.4 x 2.0 CHS	32 XL	383 337	61	396.5	1.99	2.10	502	473	0.790	0.830
2.6 CHS	32 LT	383 337	61	396.5	2.55	2.65	392	374	1.010	1.050
48.3 x 2.3 CHS	40 XL	436 384	61	396.5	2.61	2.73	383	364	1.030	1.080
2.9 CHS	40 LT	436 384	61	396.5	3.25	3.36	308	295	1.290	1.330
60.3 x 2.3 CHS	50 XL	422 374	37	240.5	3.29	3.44	304	288	0.790	0.830
2.9 CHS	50 LT	422 374	37	240.5	4.11	4.25	244	234	0.990	1.020
76.1 x 2.3 CHS	65 XL	533 472	37	240.5	4.19	4.33	239	231	1.007	1.040
3.2 CHS	65 LT	533 472	37	240.5	5.75	5.94	174	167	1.380	1.430
88.9 x 2.6 CHS	80 XL	445 397	19	123.5	5.53	5.75	181	174	0.683	0.710
3.2 CHS	80 LT	445 397	19	123.5	6.76	6.98	148	143	0.840	0.860
101.6 x 2.6 CHS	90 XL	508 454	19	123.5	6.35	6.60	158	152	0.784	0.815
3.2 CHS	90 LT	508 454	19	123.5	7.70	8.04	129	124	0.960	0.990
114.3 x 3.2 CHS	100 XL	572 510	19	123.5	8.77	9.05	114	110	1.083	1.118
3.6 CHS	100 LT	572 510	19	123.5	9.83	10.11	102	98.6	1.214	1.249
139.7 x 3.0 CHS	125 XL	698 382	13	84.5	10.11	10.50	98.9	95.2	0.855	0.887
3.5 CHS	125 LT	698 382	13	84.5	11.76	12.10	85.1	82.4	0.993	1.022
165.1 x 3.5 CHS	150 LT	660 451	10	65	13.95	14.40	71.7	69.4	0.907	0.936

Notes: 1. LT = Light, 2. XL = Extra Light



BLANK OR BLIND FLANGE

DIMENSIONS FOR LOOSE FLANGES



BOSS FLANGE – SLIP ON WELD OR SCR. B.S.P.

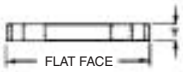
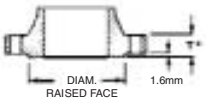


PLATE FLANGE
SLIP ON WELD



WELD NECK FLANGE

COPPER ALLOY
T.3 – Plate or Boss or Blank
T.10 – Plate or Boss
T.11 – Blank

FORGED OR PLATE STEEL
T.6 – Plate or Boss or Blank, or Weldneck (Except for valves)
T.18 – Plate or Blank or Weldneck (Except for valves)

NOMINAL SIZE DN	TABLE D FLANGE OD mm	TABLE D FLANGE THICKNESS T3 mm	TABLE D FLANGE THICKNESS ** T6 mm	TABLE D DRILLING Bolt Circle Dia. mm	TABLE D DRILLING No. of Bolts	TABLE D DRILLING Dia. of Bolts mm	TABLE E FLANGE OD mm	TABLE E FLANGE THICKNESS T10 mm	TABLE E FLANGE THICKNESS T11 mm	TABLE E FLANGE THICKNESS ** T6 mm	TABLE E DRILLING Bolt Circle Dia. mm	TABLE E DRILLING No. of Bolts	TABLE E DRILLING Dia. of Bolts mm	TABLE F FLANGE OD mm	TABLE F FLANGE THICKNESS T10 mm	TABLE F FLANGE THICKNESS T11 mm	TABLE F FLANGE THICKNESS ** T6 mm	TABLE F DRILLING Bolt Circle Dia. mm	TABLE F DRILLING No. of Bolts	TABLE F DRILLING Dia. of Bolts mm	NOMINAL SIZE DN
15	95	6	5	67	4	M12	95	6	6	6	67	4	M12	95	8	8	10	67	4	M12	15
20	100	6	5	73	4	M12	100	6	6	6	73	4	M12	100	8	8	10	73	4	M12	20
25	115	8	5	83	4	M12	115	8	8	7	83	4	M12	120	10	10	10	87	4	M16	25
32	120	8	6	87	4	M12	120	8	8	8	87	4	M12	135	10	10	13	98	4	M16	32
40	135	10	6	98	4	M12	135	10	10	9	98	4	M12	140	11	11	13	105	4	M16	40
50	150	10	8	114	4	M16	150	10	10	10	114	4	M16	165	11	12	16	127	4	M16	50
65	165	11	8	127	4	M16	165	11	11	10	127	4	M16	185	13	13	16	146	8	M16	65
80	185	13	10	146	4	M16	185	13	13	11	146	4	M16	205	14	15	16	165	8	M16	80
100	215	16	10	178	4	M16	215	16	16	13	178	8	M16	230	17	17	19	191	8	M16	100
125	255	17	13	210	8	M16	255	17	17	14	210	8	M16	280	19	20	22	235	8	M20	125
150	280	17	13	235	8	M16	280	17	17	17	235	8	M20	305	22	23	22	260	12	M20	150
200	335	19	13	292	8	M16	335	19	20	19	292	8	M20	370	25	28	25	324	12	M20	200
250	405	19	16	356	8	M20	405	22	25	22	356	12	M20	430	25	32	29	381	12	M24	250
300	455	22	19	406	12	M20	455	25	28	25	406	12	M24	490	29	37	32	438	16	M24	300
350	525	25	22	470	12	M24	525	25	32	29	470	12	M24	550	32	42	35	495	16	M27	350
400	580	25	22	521	12	M24	580	25	36	32	521	12	M24	610	32	47	41	552	20	M27	400
450	640	29	25	584	12	M24	640	29	41	35	584	16	M24	675	35	52	44	610	20	M30	450
500	705	32	29	641	16	M24	705	32	46	38	641	16	M24	735	38	57	51	673	24	M30	500
600	825	35	32	756	16	M27	825	38	–	48	756	16	M30	850	41	68	57	781	24	M33	600
700	910	–	35	845	20	M27	910	–	–	51	845	20	M30	935	–	–	60	857	24	M33	700
750	995	–	41	927	20	M30	995	–	–	54	927	20	M33	1015	–	–	67	940	28	M33	750
800	1060	–	41	984	20	M33	1060	–	–	54	984	20	M33	1060	–	–	68	984	28	M33	800
900	1175	–	48	1092	24	M33	1175	–	–	64	1092	24	M33	1185	–	–	76	1105	32	M36	900
1000	1255	–	51	1175	24	M33	1255	–	–	67	1175	24	M36	1275	–	–	83	1194	36	M36	1000
1200	1490	–	60	1410	32	M33	1490	–	–	79	1410	32	M36	1530	–	–	95	1441	40	M39	1200

NOMINAL SIZE DN	TABLE H FLANGE OD mm	TABLE H FLANGE THICKNESS T10 mm	TABLE H FLANGE THICKNESS T11 mm	TABLE H FLANGE THICKNESS * T6 mm	TABLE H DRILLING † Dia. R/F mm	TABLE H DRILLING Bolt Circle Dia. mm	TABLE H DRILLING No. of Bolts	TABLE H DRILLING Dia. of Bolts mm	TABLE J FLANGE OD mm	TABLE J FLANGE Thick-ness * T6 mm	TABLE J DRILLING Dia. R/F mm	TABLE J DRILLING Bolt Circle Dia. mm	TABLE J DRILLING No. of Bolts	TABLE J DRILLING Dia. of Bolts mm	TABLE R FLANGE OD mm	TABLE R FLANGE Thick-ness * T18 mm	TABLE R DRILLING Dia. R/F mm	TABLE R DRILLING Bolt Circle Dia. mm	TABLE R DRILLING No. of Bolts	TABLE R DRILLING Dia. of Bolts mm	NOMINAL SIZE DN
15	115	10	11	13	57	83	4	M16	115	16	57	83	4	M16	115	19	64	83	4	M16	15
20	115	10	11	13	57	83	4	M16	115	16	57	83	4	M16	115	19	64	83	4	M16	20
25	120	11	12	14	64	87	4	M16	120	19	64	87	4	M16	125	22	76	95	4	M16	25
32	135	11	13	17	76	98	4	M16	135	19	76	98	4	M16	135	22	76	98	4	M16	32
40	140	13	14	17	83	105	4	M16	140	22	83	105	4	M16	150	25	89	114	4	M20	40
50	165	13	16	19	102	127	4	M16	165	25	102	127	4	M20	165	25	102	127	8	M16	50
65	185	14	17	19	114	146	8	M16	185	25	114	146	8	M20	185	29	114	146	8	M20	65
80	205	16	19	22	127	165	8	M16	205	32	127	165	8	M20	205	32	127	165	8	M20	80
100	230	19	23	25	152	191	8	M16	230	35	152	191	8	M20	240	35	152	197	8	M24	100
125	280	22	27	29	178	235	8	M20	280	38	178	235	8	M24	280	41	178	235	12	M24	125
150	305	25	30	29	210	260	12	M20	305	38	210	260	12	M24	305	44	210	260	12	M24	150
200	370	32	39	32	260	324	12	M20	370	41	260	324	12	M24	370	51	260	324	12	M27	200
250	430	35	45	35	311	381	12	M24	430	48	311	381	12	M27	430	60	311	387	16	M27	250
300	490	38	52	41	362	438	16	M24	490	51	362	438	16	M27	510	70	362	457	16	M30	300
350	550	41	58	48	419	495	16	M27	550	57	419	495	16	M30	585	79	419	527	16	M33	350
400	610	44	64	54	483	552	20	M27	610	64	483	552	20	M30	640	89	483	584	20	M33	400
450	675	48	71	60	533	610	20	M30	675	70	533	610	20	M33	735	98	572	673	20	M36	450
500	735	51	78	67	597	673	24	M30	735	79	597	673	24	M33	805	105	622	730	20	M39	500
600	850	57	92	76	699	781	24	M33	850	92	699	781	24	M36	–	–	–	–	–	–	–

NOTES:

(1) All dimensions are in millimetres (mm).
(2) Only metric preferred sizes listed, except for DN 750 which is a Non-preferred size.
** (3) It is impractical to use flange thickness less than 12mm for Steel Plate Flanges.
* (4) Thickness includes 1.6mm height for the Raised Face.
† (5) The Raised Face is non-preferred for Table "H".
(6) It is normal practice to supply **Steel Flanges** to Tables A, D, C, E, F and H. — **Flat Faced**.
(7) All copper alloy flanges shall be **Flat Faced**.
(8) All flanges shall be drilled to Standard Tables unless otherwise specified. (For Bolt dimensions see separate page).

IMPORTANT: For DN 150 and DN 200 Flanges, the O.D. of pipe being used must be specified. Dimensions for Flange Tables A, C, K, S and T on application.

Steel hexagon Bolts and Nuts (XOX) are recommended for use within a temperature range of –50°C to +300°C. Outside of this temperature range, Stud Bolts should be used as recommended in AS.2528.

A quick reference chart for sizing bolts and nuts for a range of regularly used standard flanges is given below:

APPLICABLE TO PLATE & FORGED STEEL LOOSE FLANGES ONLY

Note: Integral valve flanges quite often differ in thickness to equivalent loose flanges. When integral flanges are involved due allowance should be made to bolt lengths.

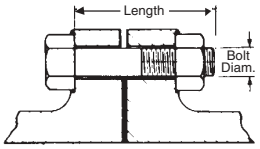
NOMINAL FLANGE SIZE DN	TABLE D		TABLE E		TABLE F		TABLE H	
	No. Bolts Per Flange	XOX Bolt & Nut dia. x lgth	No. Bolts Per Flange	XOX Bolt & Nut dia. x lgth	No. Bolts Per Flange	XOX Bolt & Nut dia. x lgth	No. Bolts Per Flange	XOX Bolt & Nut dia. x lgth
15	4	M12 x 40mm*	4	M12 x 40mm*	4	M12 X 40mm*	4	M16 x 45mm*
20	4	M12 x 40mm*	4	M12 x 40mm*	4	M12 X 40mm*	4	M16 x 45mm*
25	4	M12 x 40mm*	4	M12 x 40mm*	4	M16 X 45mm*	4	M16 x 50mm*
32	4	M12 x 40mm*	4	M12 x 40mm*	4	M16 X 45mm*	4	M16 x 55mm*
40	4	M12 x 40mm*	4	M12 x 40mm*	4	M16 X 45mm*	4	M16 x 55mm*
50	4	M16 x 45mm*	4	M16 x 45mm*	4	M16 X 50mm*	4	M16 x 60mm*
65	4	M16 x 45mm*	4	M16 x 45mm*	8	M16 X 50mm*	8	M16 x 60mm*
80	4	M16 x 45mm*	4	M16 x 45mm*	8	M16 X 50mm*	8	M16 x 65mm*
100	4	M16 x 45mm*	8	M16 x 45mm*	8	M16 X 60mm*	8	M16 x 70mm*
125	8	M16 x 45mm*	8	M16 x 50mm*	8	M20 X 70mm*	8	M20 x 80mm*
150	8	M16 x 45mm*	8	M20 x 60mm*	12	M20 X 70mm*	12	M20 x 80mm*
200	8	M16 x 45mm*	8	M20 x 60mm*	12	M20 X 75mm*	12	M20 x 90mm*
250	8	M20 x 55mm*	12	M20 x 70mm*	12	M24 X 85mm*	12	M24 x 100mm*
300	12	M20 x 60mm*	12	M24 x 80mm*	16	M24 X 100mm*	16	M24 x 110mm*
350	12	M24 x 75mm*	12	M24 x 85mm*	16	M27 X 100mm*	16	M27 x 130mm*
400	12	M24 x 75mm*	12	M24 x 100mm*	20	M27 X 120mm*	20	M27 x 140mm*
450	12	M24 x 80mm*	16	M24 x 100mm*	20	M30 X 130mm*	20	M30 x 160mm*
500	16	M24 x 85mm*	16	M24 x 110mm*	24	M30 X 140mm*	24	M30 x 170mm*
600	16	M27 x 100mm*	16	M30 x 130mm*	24	M33 X 150mm*	24	M33 x 190mm*
700	20	M27 x 100mm*	20	M30 x 140mm*	24	M33 X 160mm*		
750	20	M30 x 120mm*	20	M33 x 150mm*	28	M33 X 170mm*		
800	20	M33 x 120mm*	20	M33 x 150mm*	28	M33 X 180mm*		
900	24	M33 x 140mm*	24	M33 x 170mm*	32	M36 X 200mm*		
1000	24	M33 x 140mm*	24	M36 x 180mm*	36	M36 X 220mm*		
1200	32	M33 x 160mm*	32	M36 x 200mm*	40	M39 X 240mm*		

All dimensions are in millimetres (mm).

Notes

High strength structural bolts to AS 1252 may be substituted for property class 8.8 bolts if agreed to by the purchaser.

Bolts to AS 1252 are heavy hexagon series and the selection of such bolts would be subject to space being available on the relevant flange.



Flat faced joint illustrated

Bolt lengths listed apply to flat-faced or 1.6mm raised face flanges with allowance for 1.6mm gasket thickness.

*For approximate Stud Bolt Lengths take the **XOX Bolt Length** and **add** the metric diameter in mm rounded to the nearest 5mm increment up.

Note: (This does not include length of point)

This chart shows bolt diameters as recommended in AS.2129. Some of these are Non-preferred sizes e.g. (M27), (M33) and (M39) which are not readily available in Australia.

Stud Bolts should be used as alternatives to bolts where the size is greater than M24 and it is therefore suggested that Stud Bolts as specified in AS.2528 or BS.4882 should be used.

Inch series bolts interchangeable as follows:

FOR	USE	FOR	USE
1/4″	M6	7/8″	M24
5/16″	M8	1″	(M27)
3/8″	M10	1 1/8″	M30
1/2″	M12	1 1/4″	(M33)
5/8″	M16	1 3/8″	M36
3/4″	M20	1 1/2″	(M39)

BOLT HOLE DIAMETERS

For bolts to M24, clearance hole 2mm larger.

Above M24, clearance hole 3mm larger.

XOX BOLTS & NUTS

XOX is the trade term used for H.R.H. commercial steel bolts and nuts.

H.R.H. denotes Hexagon Head x Round Shank x Hexagon Nut.

XOX BOLTING		
Temp. Range: –50°C to +300°C		
Flange Table	Specifications	
	Bolts	Nuts
D, E, & F	AS 1110 Gr.4.6 or AS 1111 Gr.4.6	AS1112 Gr.5
H	AS 1110 Gr.8.8	AS 1112 Gr.8

The SI unit of MASS is the KILOGRAM – Symbol kg

The **mass** of an object is the quantity of matter it contains and is constant irrespective of the location or altitude.

The **weight** of an object is the force exerted on it by gravity and thus varies from place to place and according to height above sea level or the distance from the Earth's centre. (Hence weightlessness of astronauts in outer space).

MASS CONVERSION CHART

(A) To use, locate "given mass" in "given mass" column (coloured GREY) whether lbs. or kg.
(B) If "given mass" is in pounds (lbs.), read **kilograms (kg)** in right hand column.
(C) If "given mass" is in kilograms (kg), read **pounds (lbs.)** in left hand column.
(D) **Example:** (i) Given mass is **70 lbs = 31.75 kg** from right hand column
(ii) Given mass is **70 kg = 154.32 lbs.** from left hand column

1 to 65			66 to 130			131 to 375			380 to 700			705 to 1500		
lbs.	Given Mass	kg	lbs.	Given Mass	kg	lbs.	Given Mass	kg	lbs.	Given Mass	kg	lbs.	Given Mass	kg
2.20	1	0.45	145.50	66	29.94	288.80	131	59.42	838	380	172.37	1554	705	319.79
4.41	2	0.91	147.71	67	30.39	291.01	132	59.88	849	385	174.64	1565	710	322.06
6.61	3	1.36	149.91	68	30.84	293.21	133	60.33	860	390	176.90	1576	715	324.32
8.82	4	1.81	152.12	69	31.30	295.42	134	60.78	871	395	179.17	1587	720	326.59
11.02	5	2.27	154.32	70	31.75	297.62	135	61.24	882	400	181.44	1598	725	328.86
13.23	6	2.72	156.53	71	32.21	299.83	136	61.69	893	405	183.71	1609	730	331.13
15.43	7	3.18	158.73	72	32.66	302.03	137	62.14	904	410	185.98	1620	735	333.40
17.64	8	3.63	160.94	73	33.11	304.24	138	62.60	915	415	188.24	1631	740	335.66
19.84	9	4.08	163.35	74	33.57	306.44	139	63.05	926	420	190.51	1642	745	337.93
22.05	10	4.54	165.35	75	34.02	308.64	140	63.50	937	425	192.78	1653	750	340.20
24.25	11	4.99	167.55	76	34.47	310.85	141	63.96	948	430	195.05	1664	755	342.47
26.46	12	5.44	169.75	77	34.93	313.05	142	64.41	959	435	197.32	1676	760	344.74
28.66	13	5.90	171.96	78	35.38	315.26	143	64.87	970	440	199.58	1687	765	347.00
30.86	14	6.35	174.16	79	35.83	317.46	144	65.32	981	445	201.85	1698	770	349.27
33.07	15	6.80	176.37	80	36.29	319.67	145	65.77	992	450	204.12	1709	775	351.54
35.27	16	7.26	178.57	81	36.74	321.87	146	66.23	1003	455	206.39	1720	780	353.81
37.48	17	7.71	180.78	82	37.20	324.08	147	66.68	1014	460	208.66	1731	785	356.08
39.68	18	8.16	182.98	83	37.65	326.28	148	67.13	1025	465	210.92	1742	790	358.34
41.89	19	8.62	185.19	84	38.10	328.49	149	67.59	1036	470	213.19	1753	795	360.61
44.09	20	9.07	187.39	85	38.56	330.69	150	68.04	1047	475	215.46	1764	800	362.88
46.30	21	9.53	189.60	86	39.01	341.71	155	70.31	1058	480	217.73	1775	805	365.15
48.50	22	9.98	191.80	87	39.46	352.74	160	72.58	1069	485	220.00	1786	810	367.42
50.71	23	10.43	194.00	88	39.92	363.76	165	74.84	1080	490	222.26	1797	815	369.68
52.91	24	10.89	196.21	89	40.37	374.78	170	77.11	1091	495	224.53	1808	820	371.95
55.12	25	11.34	198.41	90	40.82	385.80	175	79.38	1102	500	226.80	1819	825	374.22
57.32	26	11.79	200.62	91	41.28	396.83	180	81.65	1113	505	229.07	1830	830	376.49
59.52	27	12.25	202.82	92	41.73	407.85	185	83.92	1124	510	231.34	1841	835	378.76
61.73	28	12.70	205.03	93	42.18	418.87	190	86.18	1135	515	233.60	1852	840	381.02
63.93	29	13.15	207.23	94	42.64	429.90	195	88.45	1146	520	235.87	1863	845	383.29
66.14	30	13.61	209.44	95	43.09	440.92	200	90.72	1157	525	238.14	1874	850	385.56
68.34	31	14.06	211.64	96	43.55	451.94	205	92.99	1168	530	240.41	1885	855	387.83
70.55	32	14.52	213.85	97	44.00	462.97	210	95.26	1179	535	242.68	1896	860	390.10
72.75	33	14.97	216.05	98	44.45	473.99	215	97.52	1190	540	244.94	1907	865	392.36
74.96	34	15.42	218.26	99	44.91	485.01	220	99.79	1202	545	247.21	1918	870	394.63
77.16	35	15.88	220.46	100	45.36	496.04	225	102.06	1213	550	249.48	1929	875	396.90
79.37	36	16.33	222.67	101	45.81	507.06	230	104.33	1224	555	251.75	1940	880	399.17
81.57	37	16.78	224.87	102	46.28	518.08	235	106.60	1235	560	254.02	1951	885	401.44
83.77	38	17.24	227.07	103	46.72	529.10	240	108.86	1246	565	256.28	1962	890	403.70
85.98	39	17.69	229.28	104	47.17	540.13	245	111.13	1257	570	258.55	1973	895	405.97
88.18	40	18.14	231.48	105	47.63	551.15	250	113.40	1268	575	260.82	1984	900	408.24
90.39	41	18.60	233.69	106	48.08	562.17	255	115.67	1279	580	263.09	1995	905	410.51
92.59	42	19.05	235.89	107	48.54	573.20	260	117.94	1290	585	265.36	2006	910	412.78
94.80	43	19.50	238.10	108	48.99	584.22	265	120.20	1301	590	267.62	2017	915	415.04
97.00	44	19.96	240.30	109	49.44	595.24	270	122.47	1312	595	269.89	2028	920	417.31
99.21	45	20.41	242.51	110	49.90	606.27	275	124.74	1323	600	272.16	2039	925	419.58
101.41	46	20.87	244.71	111	50.35	617.30	280	127.01	1334	605	274.43	2050	930	421.85
103.62	47	21.32	246.92	112	50.80	628.31	285	129.28	1345	610	276.70	2061	935	424.12
105.82	48	21.77	249.12	113	51.26	639.33	290	131.54	1356	615	278.96	2072	940	426.38
108.03	49	22.23	251.32	114	51.71	650.36	295	133.81	1367	620	281.23	2083	945	428.65
110.23	50	22.68	253.53	115	52.16	661.38	300	136.08	1378	625	283.50	2094	950	430.92
112.43	51	23.13	255.73	116	52.62	672.40	305	138.35	1389	630	285.77	2105	955	433.19
114.64	52	23.59	257.94	117	53.07	683.43	310	140.62	1400	635	288.04	2116	960	435.46
116.84	53	24.04	260.14	118	53.53	694.45	315	142.88	1411	640	290.30	2127	965	437.72
119.05	54	24.49	262.35	119	53.98	705.47	320	145.15	1422	645	292.57	2138	970	439.99
121.25	55	24.95	264.55	120	54.43	716.50	325	147.42	1433	650	294.84	2149	975	442.26
123.46	56	25.40	266.76	121	54.89	727.52	330	149.69	1444	655	297.11	2161	980	444.53
125.66	57	25.86	268.96	122	55.34	738.54	335	151.96	1455	660	299.38	2172	985	446.80
127.87	58	26.31	271.17	123	55.79	749.56	340	154.22	1466	665	301.64	2183	990	449.06
130.07	59	26.76	273.37	124	56.25	760.59	345	156.49	1477	670	303.91	2194	995	451.33
132.28	60	27.22	275.58	125	56.70	771.61	350	158.76	1488	675	306.18	2205	1000	453.60
134.48	61	27.67	277.78	126	57.15	782.63	355	161.03	1499	680	308.45	2425	1100	498.96
136.69	62	28.12	279.98	127	57.61	793.66	360	163.30	1510	685	310.72	2646	1200	544.32
138.89	63	28.58	282.19	128	58.06	804.68	365	165.56	1521	690	312.98	2866	1300	589.68
141.09	64	29.03	284.39	129	58.51	815.70	370	167.83	1532	695	315.25	3086	1400	635.04
143.30	65	29.48	286.60	130	58.97	826.73	375	170.10	1543	700	317.52	3307	1500	680.40

CONVERSION FACTORS

1 Pound (lb.) x 0.4536 = kilograms (kg) 1 kilogram (kg) x 2.2046 = pounds (lbs.)

FLANGE IDENTIFICATION CHART

A guide to the key dimensions of popular steel flange types

Size mm	Table/Class	Diam. of Flange	Bolt Circle Diam.	No. of Bolts	Diam./Length Bolts/Studs Steel Flanges	Diam. Holes	Flange Thickness Cast/Forged Steel
15	Table D	95	67	4	M12 x 45	14	5*
	Table E	95	67	4	M12 x 45	14	6*
	Table H	115	83	4	M16 x 60	18	13
	ANSI 150	89	60.3	4	1/2 x 60	16	11.5
	ANSI 300	95	66.7	4	1/2 x 65	16	14.5
	ANSI 600	95	66.7	4	1/2 x 80	16	14.5
	PN 16	95	65	4	—	14	—
20	Table D	100	73	4	M12 x 45	14	5*
	Table E	100	73	4	M12 x 45	14	6*
	Table H	115	83	4	M16 x 60	18	13
	ANSI 150	98	69.8	4	1/2 x 65	16	14
	ANSI 300	117	82.5	4	5/8 x 75	20	16
	ANSI 600	117	82.5	4	5/8 x 90	20	16
	PN 16	105	75	4	—	14	—
25	Table D	115	83	4	M12 x 45	14	5*
	Table E	115	83	4	M12 x 45	14	7*
	Table H	120	87	4	M16 x 60	18	14
	ANSI 150	108	79.4	4	1/2 x 65	16	14
	ANSI 300	124	88.9	4	5/8 x 80	20	18
	ANSI 600	124	88.9	4	5/8 x 105	20	18
	PN 16	115	85	4	—	14	—
32	Table D	120	87	4	M12 x 50	14	6*
	Table E	120	87	4	M12 x 50	14	8*
	Table H	135	98	4	M16 x 65	18	17
	ANSI 150	117	88.9	4	1/2 x 70	16	16
	ANSI 300	133	98.4	4	5/8 x 80	20	22
	ANSI 600	133	98.4	4	5/8 x 100	20	22
	PN 16	140	100	4	—	18	—
40	Table D	135	98	4	M12 x 50	14	6*
	Table E	135	98	4	M12 x 50	14	9*
	Table H	140	105	4	M16 x 65	18	17
	ANSI 150	127	98.4	4	1/2 x 70	16	17
	ANSI 300	156	114.3	4	3/4 x 90	23	22
	ANSI 600	156	114.3	4	3/4 x 105	23	22
	PN 16	150	110	4	—	18	—
50	Table D	150	114	4	M16 x 60	18	8*
	Table E	150	114	4	M16 x 60	18	10*
	Table H	165	127	4	M16 x 75	18	19
	ANSI 150	152	120.6	4	5/8 x 80	20	20
	ANSI 300	165	127	8	5/8 x 90	20	22
	ANSI 600	165	127	8	5/8 x 105	20	26
	PN 16	165	125	4	—	16	—
65	Table D	165	127	4	M16 x 60	18	8*
	Table E	165	127	4	M16 x 60	18	10*
	Table H	185	146	8	M16 x 75	18	19
	ANSI 150	178	139.7	4	5/8 x 90	20	23
	ANSI 300	191	149.2	8	3/4 x 100	23	26
	ANSI 600	191	149.2	8	3/4 x 120	23	30
	PN 16	185	145	4	—	18	—
80	Table D	185	146	4	M16 x 60	18	10*
	Table E	185	146	4	M16 x 60	18	11*
	Table H	205	165	8	M16 x 75	18	22
	ANSI 150	191	152.4	4	5/8 x 90	20	24
	ANSI 300	210	168.3	8	3/4 x 110	23	32
	ANSI 600	210	168.3	8	3/4 x 125	23	32
	PN 16	200	160	8	—	18	—
100	Table D	215	178	4	M16 x 65	18	10*
	Table E	215	178	8	M16 x 65	18	13
	Table H	230	191	8	M16 x 85	18	25
	ANSI 150	229	190.5	8	5/8 x 90	20	24
	ANSI 300	254	200	8	3/4 x 110	23	32
	ANSI 600	273	215.9	8	7/8 x 145	26	38
	PN 16	220	180	8	—	18	—

FLANGE IDENTIFICATION CHART

Size mm	Table/Class	Diam. of Flange	Bolt Circle Diam.	No. of Bolts	Diam./Length Bolts/Studs Steel Flanges	Diam. Holes	Flange Thickness Cast/Forged Steel
125	Table D	255	210	8	M16 x 65	18	22
	Table E	255	210	8	M16 x 65	18	14
	Table H	280	235	8	M20 x 95	22	29
	ANSI 150	254	215.9	8	3/4 x 90	23	24
	ANSI 300	279	234.9	8	3/4 x 120	23	35
	ANSI 600	330	266.7	8	1 x 165	29	45
	PN 16	250	210	8	—	18	—
150	Table D	280	235	8	M16 x 65	18	13
	Table E	280	235	8	M20x 65	22	17
	Table H	305	260	12	M20 x 95	22	29
	ANSI 150	279	241.3	8	3/4 x 100	23	26
	ANSI 300	318	269.9	12	3/4 x 125	23	37
	ANSI 600	356	292.1	12	1 x 170	29	48
	PN 16	285	240	8	—	22	—
200	Table D	335	292	8	M16 x 65	18	13
	Table E	335	292	8	M20 x 65	22	19
	Table H	370	324	12	M20 x 100	22	32
	ANSI 150	343	298.4	8	3/4 x 110	23	29
	ANSI 300	381	330.2	12	7/8 x 140	26	41
	ANSI 600	419	349.2	12	1 1/8 x 195	32	56
	PN 10	340	295	8	—	22	—
	PN 16	340	280	12	—	22	—
250	Table D	405	356	8	M20 x 75	22	—
	Table E	405	356	12	M20 x 75	22	22
	Table H	430	381	12	M24 x 120	26	35
	ANSI 150	406	361.9	12	7/8 x 115	29	30
	ANSI 600	510	431.8	16	1 1/4 x 215	35	64
	PN 10	395	350	8	—	22	—
	PN 16	405	350	12	—	22	—
300	Table D	455	406	12	M20 x 85	22	22
	Table E	455	406	12	M24 x 85	26	25
	Table H	490	438	16	M24 x 110	26	41
	ANSI 150	483	431.8	12	7/8 x 120	26	32
	ANSI 300	520	450.8	16	1 1/8 x 170	32	51
	PN 10	445	400	12	—	22	—
	PN 16	450	410	12	—	25	—
350	Table D	525	470	12	M24 x 95	26	25
	Table E	525	470	12	M24 x 95	26	29
	Table H	550	495	16	M27 x 130	30	48
	ANSI 150	535	476.2	12	1 x 130	29	35
	ANSI 300	585	514.3	20	1 1/8 x 175	32	54
375	Table D	550	495	12	M24 x 95	26	22
	Table E	550	495	12	M24 x 95	26	32
400	Table D	580	521	12	M24 x 95	26	22
	Table E	580	521	12	M24 x 100	26	32
	Table H	610	552	20	M27 x 140	30	54
	ANSI 150	597	539.7	16	1 x 130	29	37
	ANSI 300	650	571.5	20	1 1/4 x 190	35	57
450	Table D	640	584	12	M24 x 95	26	25
	Table E	640	584	16	M24 x 120	26	35
	Table H	675	610	20	M30 x 160	33	60
	ANSI 150	635	577.8	16	1 1/8 x 150	32	40
	ANSI 300	710	628.6	24	1 1/4 x 195	35	60
500	Table D	705	641	16	M24 x 110	26	29
	Table E	705	641	16	M24 x 110	26	38
	Table H	735	673	24	M30 x 170	33	67
	ANSI 150	700	635	20	1 1/8 x 160	32	43
	ANSI 300	775	685.8	24	1 1/4 x 205	35	64
600	Table D	825	756	16	M27 x 120	30	32
	Table E	825	756	16	M30 x 140	33	48
	Table H	850	781	24	M33 x 200	36	76
	ANSI 150	815	749.3	20	1 1/4 x 175	35	48
	ANSI 300	915	812.8	24	1 1/2 x 230	42	70

It is impractical to use thickness less than 12.00mm for plate flanges.
Dimensions AS 2129 – ANSI/ASME B16.5

The SI unit of pressure and stress is the NEWTON PER SQUARE METRE which has been given the special name PASCAL – Symbol Pa.

The pascal is too small for most normal uses and suitable multiple units preferred for Australia are:

kilopascal: Symbol – kPa (= 1000 Pa) (1 N/m^2 = 0.000145 lbf/in^2 = 1Pa)

megapascal: Symbol – MPa (= 1,000,000 Pa) (1 N/mm^2 = 145 lbf/in^2 = 1MPa)

PSI (lbf/in^2) to kPa • PRESSURE – STRESS CONVERSION CHART

(A) To use, locate "given pressure" in "given pressure" column (coloured GREY) whether lbf/in^2 or kPa.
(B) If "given pressure" is in pounds force per square inch (lbf/in^2), read kilopascals (kPa) in right hand column.
(C) If "given pressure" is in kilopascals (kPa), read pounds force per square inch (lbf/in^2) in left hand column.
(D) **Example:** (i) Given pressure is **100 lbf/in^2 = 689 kPa** from right hand column
(ii) Given pressure is **100kPa = 14.50 lbf/in^2** from left hand column

1 to 35			36 to 70			71 to 125			130 to 80,000				
lbf/in^2	Given Pressure	kPa	lbf/in^2	Given Pressure	kPa	lbf/in^2	Given Pressure	kPa	lbf/in^2	Given Pressure	kPa	=	MPa
0.15	1	6.89	5.22	36	248.21	10.30	71	490	18.85	130	896	=	0.90
0.29	2	13.79	5.37	37	255.11	10.44	72	496	19.58	135	931	=	0.93
0.44	3	20.68	5.51	38	262.00	10.59	73	503	20.31	140	965	=	0.97
0.58	4	27.58	5.66	39	268.90	10.73	74	510	21.03	145	1000	=	1.00
0.73	5	34.47	5.80	40	275.79	10.88	75	517	21.76	150	1034	=	1.03
0.87	6	41.37	5.95	41	282.69	11.02	76	524	22.48	155	1069	=	1.07
1.02	7	48.26	6.09	42	289.58	11.17	77	531	23.21	160	1103	=	1.10
1.16	8	55.16	6.24	43	296.48	11.31	78	538	23.93	165	1138	=	1.14
1.31	9	62.05	6.38	44	303.37	11.46	79	545	24.61	170	1172	=	1.17
1.45	10	68.95	6.53	45	310.26	11.60	80	552	25.38	175	1207	=	1.21
1.60	11	75.84	6.67	46	317.16	11.75	81	558	26.11	180	1241	=	1.24
1.74	12	82.74	6.82	47	324.05	11.89	82	565	26.83	185	1276	=	1.28
1.89	13	89.63	6.96	48	330.95	12.04	83	572	27.56	190	1310	=	1.31
2.03	14	96.53	7.11	49	337.84	12.18	84	579	28.28	195	1344	=	1.34
2.18	15	103.42	7.25	50	344.74	12.33	85	586	29.01	200	1379	=	1.38
2.32	16	110.32	7.40	51	351.63	12.47	86	593	36.26	250	1724	=	1.73
2.47	17	117.21	7.54	52	358.53	12.62	87	600	43.51	300	2068	=	2.07
2.61	18	124.11	7.69	53	365.42	12.70	88	607	58.02	400	2758	=	2.76
2.76	19	131.00	7.83	54	372.32	12.91	89	614	72.52	500	3447	=	3.45
2.90	20	137.90	7.98	55	379.21	13.05	90	621	108.78	750	5171	=	5.17
3.05	21	144.79	8.12	56	386.11	13.20	91	627	145.04	1000	6894	=	6.89
3.19	22	151.69	8.27	57	393.00	13.34	92	634	217.56	1500	10,342	=	10.34
3.34	23	158.58	8.41	58	399.90	13.49	93	641	290.08	2000	13,790	=	13.79
3.48	24	165.47	8.56	59	406.79	13.63	94	648	435.11	3000	20,684	=	20.68
3.63	25	172.37	8.70	60	413.69	13.78	95	655	580.15	4000	27,579	=	27.58
3.77	26	179.26	8.85	61	420.58	13.92	96	662	725.19	5000	34,473	=	34.47
3.92	27	186.16	8.99	62	427.48	14.07	97	669	1,450.38	10,000	68,948	=	68.95
4.06	28	193.05	9.14	63	434.37	14.21	98	676	2,175.57	15,000	103,421	=	103.4
4.21	29	199.95	9.28	64	441.26	14.34	99	683	2,900.76	20,000	137,895	=	137.9
4.35	30	206.84	9.43	65	448.16	14.50	100	689	4,351.14	30,000	206,843	=	206.8
4.50	31	213.74	9.57	66	455.05	15.23	105	724	5,801.52	40,000	275,790	=	275.8
4.64	32	220.63	9.72	67	461.95	15.95	110	758	7,251.90	50,000	344,738	=	344.7
4.79	33	227.53	9.86	68	468.84	16.68	115	793	8,702.28	60,000	413.686	=	413.7
4.93	34	234.42	10.01	69	475.74	17.40	120	827	10,152.7	70,000	482,633	=	482.6
5.08	35	241.32	10.15	70	482.63	18.13	125	862	11,603.0	80,000	551,581	=	551.6

NOTE: IT IS USUAL FOR PRESSURES IN EXCESS OF 1000 kPa TO BE EXPRESSED IN MEGAPASCALS – MPa
1 megapascal (MPa) = 1000 kilopascals (kPa) = 1 newton per mm^2 (N/mm^2) = 145 lbf/in^2

USEFUL CONVERSION FACTORS – APPROXIMATE

MULTIPLY →	BY →	TO OBTAIN
TO OBTAIN ←	BY ←	DIVIDE
bars	1.0197	kg f/cm^2
	100.0	kPa
	14.504	lbf/in^2
	0.1	MPa
kg f/cm^2	14.223	lbf/in^2
	98.07	kPa
	0.09807	MPa
kg f/mm^2	1422.33	lbf/in^2
	9.807	MPa
	0.635	ton f/in^2

MULTIPLY →	BY →	TO OBTAIN
TO OBTAIN ←	BY ←	DIVIDE
lb f/in^2 (PSI)	6.895	kPa
	0.00689	MPa
ton f/in^2	15.444	MPa

APPROXIMATE EQUIVALENTS		
1 Atmosphere (atm)	=	14.696 lbf/in^2
1 bar	=	14.50 lbf/in^2
1 kg f/cm^2	=	14.22 lbf/in^2
100 kPa (1 bar)	=	14.50 lbf/in^2

NOTE: lbf/in^2 (pounds force per square inch) is often expressed as PSI (pounds per square inch)

The SI Unit of thermodynamic temperature is the KELVIN – Symbol K. For most practical purposes of temperature measurement and most calculations involving temperatures, DEGREE CELSIUS, symbol °C will be used. The name CELSIUS was adopted internationally in 1948 instead of Centigrade, to avoid possible confusion with the identically named unit of angle used in some European countries.

TEMPERATURE CONVERSION CHART

(A) To use, locate "given temperature" in "given temperature" column (coloured GREY) whether °C or °F.
(B) If "given temperature" is in degrees Celsius (°C), read **degrees Fahrenheit (°F)** in right hand column.
(C) If "given temperature" is in degrees Fahrenheit (°F), read **degrees Celsius (°C)** in left hand column.
(D) **Example:** (i) Given temperature is **35°C = 95°F** from right hand column
(ii) Given temperature is **35°F = 1.7°C** from left hand column

–320 to 27			28 to 77			78 to 235			240 to 485			490 to 2400		
°C	Given Temp.	°F	°C	Given Temp.	°F	°C	Given Temp.	°F	°C	Given Temp.	°F	°C	Given Temp.	°F
–196	**–320**	—	– 2.2	**28**	82.4	25.6	**78**	172.4	116	**240**	464	254	**490**	914
–184	**–300**	—	– 1.7	**29**	84.2	26.1	**79**	174.2	118	**245**	473	257	**495**	923
–173	**–280**	—	– 1.1	**30**	86.0	26.7	**80**	176.0	121	**250**	482	260	**500**	932
–162	**–260**	–436	– 0.6	**31**	87.8	27.2	**81**	177.8	124	**255**	491	266	**510**	950
–151	**–240**	–400	0.0	**32**	89.6	27.8	**82**	179.6	127	**260**	500	271	**520**	968
–140	**–220**	–364	0.6	**33**	91.4	28.3	**83**	181.4	129	**265**	509	277	**530**	986
–129	**–200**	–328	1.1	**34**	93.2	28.9	**84**	183.2	132	**270**	518	282	**540**	1004
–115	**–175**	–283	1.7	**35**	95.0	29.4	**85**	185.0	135	**275**	527	288	**550**	1022
–101	**–150**	–238	2.2	**36**	96.8	30.0	**86**	186.8	138	**280**	536	293	**560**	1040
– 90	**–130**	–202	2.8	**37**	98.6	30.6	**87**	188.6	141	**285**	545	299	**570**	1058
– 84	**–120**	–184	3.3	**38**	100.4	31.1	**88**	190.4	143	**290**	554	304	**580**	1076
– 79	**–110**	–166	3.9	**39**	102.2	31.7	**89**	192.2	146	**295**	563	310	**590**	1094
– 73	**–100**	–148	4.4	**40**	104.0	32.2	**90**	194.0	149	**300**	572	316	**600**	1112
– 68	**– 90**	–130	5.0	**41**	105.8	32.8	**91**	195.8	152	**305**	581	321	**610**	1130
– 62	**– 80**	–112	5.6	**42**	107.6	33.3	**92**	197.6	154	**310**	590	327	**620**	1148
– 57	**– 70**	– 94	6.1	**43**	109.4	33.9	**93**	199.4	157	**315**	599	332	**630**	1166
– 51	**– 60**	– 76	6.7	**44**	111.2	34.4	**94**	201.2	160	**320**	608	338	**640**	1184
– 46	**– 50**	– 58	7.2	**45**	113.0	35.0	**95**	203.0	163	**325**	617	343	**650**	1202
– 40	**– 40**	– 40	7.8	**46**	114.8	35.6	**96**	204.8	166	**330**	626	349	**660**	1220
– 34	**– 30**	– 22	8.3	**47**	116.6	36.1	**97**	206.6	168	**335**	635	354	**670**	1238
– 29	**– 20**	– 4	8.9	**48**	118.4	36.7	**98**	208.4	171	**340**	644	360	**680**	1256
– 23	**– 10**	14	9.4	**49**	120.2	37.2	**99**	210.2	174	**345**	653	366	**690**	1274
– 17.8	**0**	32	10.0	**50**	122.0	37.8	**100**	212.0	177	**350**	662	371	**700**	1292
– 17.2	**1**	33.8	10.6	**51**	123.8	41	**105**	221	179	**355**	671	377	**710**	1310
– 16.7	**2**	35.6	11.1	**52**	125.6	43	**110**	230	182	**360**	680	382	**720**	1328
– 16.1	**3**	37.4	11.7	**53**	127.4	46	**115**	239	185	**365**	689	388	**730**	1346
– 15.6	**4**	39.2	12.2	**54**	129.2	49	**120**	248	188	**370**	698	393	**740**	1364
– 15.0	**5**	41.0	12.8	**55**	131.0	52	**125**	257	191	**375**	707	399	**750**	1382
– 14.4	**6**	42.8	13.3	**56**	132.8	54	**130**	266	193	**380**	716	404	**760**	1400
– 13.9	**7**	44.6	13.9	**57**	134.6	57	**135**	275	196	**385**	725	410	**770**	1418
– 13.3	**8**	46.4	14.4	**58**	136.4	60	**140**	284	199	**390**	734	416	**780**	1436
– 12.8	**9**	48.2	15.0	**59**	138.2	63	**145**	293	202	**395**	743	421	**790**	1454
– 12.2	**10**	50.0	15.6	**60**	140.0	66	**150**	302	204	**400**	752	427	**800**	1472
– 11.7	**11**	51.8	16.1	**61**	141.8	68	**155**	311	207	**405**	761	432	**810**	1490
– 11.1	**12**	53.6	16.7	**62**	143.6	71	**160**	320	210	**410**	770	438	**820**	1508
– 10.6	**13**	55.4	17.2	**63**	145.4	74	**165**	329	213	**415**	779	443	**830**	1526
– 10.0	**14**	57.2	17.8	**64**	147.2	77	**170**	338	216	**420**	788	454	**850**	1562
– 9.4	**15**	59.0	18.3	**65**	149.0	79	**175**	347	218	**425**	797	468	**875**	1607
– 8.9	**16**	60.8	18.9	**66**	150.8	82	**180**	356	221	**430**	806	482	**900**	1652
– 8.3	**17**	62.6	19.4	**67**	152.6	85	**185**	365	224	**435**	815	510	**950**	1742
– 7.8	**18**	64.4	20.0	**68**	154.4	88	**190**	374	227	**440**	824	538	**1000**	1832
– 7.2	**19**	66.2	20.6	**69**	156.2	91	**195**	383	229	**445**	833	566	**1050**	1922
– 6.7	**20**	68.0	21.1	**70**	158.0	93	**200**	392	232	**450**	842	593	**1100**	2012
– 6.1	**21**	69.8	21.7	**71**	159.8	96	**205**	401	235	**455**	851	621	**1150**	2102
– 5.6	**22**	71.6	22.2	**72**	161.6	99	**210**	410	238	**460**	860	649	**1200**	2192
– 5.0	**23**	73.4	22.8	**73**	163.4	102	**215**	419	241	**465**	869	704	**1300**	2372
– 4.4	**24**	75.2	23.3	**74**	165.2	104	**220**	428	243	**470**	878	760	**1400**	2552
– 3.9	**25**	77.0	23.9	**75**	167.0	107	**225**	437	246	**475**	887	816	**1500**	2732
– 3.3	**26**	78.8	24.4	**76**	168.8	110	**230**	446	249	**480**	896	1093	**2000**	3632
– 2.8	**27**	80.6	25.0	**77**	170.6	113	**235**	455	252	**485**	905	1316	**2400**	4352

CONVERSION FACTORS

DEGREES FAHRENHEIT TO CELSIUS
(°F – 32) x 5/9 = °C

DEGREES CELSIUS TO FAHRENHEIT
(°C x 9/5) + 32 = °F

USEFUL CONVERSION FACTORS – IMPERIAL TO METRIC (Approximate)

"SI" denotes the INTERNATIONAL SYSTEM of Metric Units adopted in Australia

THIS TABLE MAY BE USED IN TWO WAYS: MULTIPLY COLUMN "A" BY COLUMN "B" TO OBTAIN COLUMN "C" ALTERNATIVELY DIVIDE COLUMN "C" BY COLUMN "B" TO OBTAIN COLUMN "A"

REMARKS	A MULTIPLY	B BY	C TO OBTAIN
AREA: Symbol m^2 The SI unit of AREA is the SQUARE METRE.	Square inches	645.16	mm^2
	Square feet	0.929	m^2
	Square yards	0.836	m^2
	Acre	4047	m^2
	Hectare (ha)	10 000	m^2
DENSITY: Symbol kg/m^3 The SI unit of DENSITY is the kilogram per cubic metre.	lb/in^3	27.68	t/m^3
	lb/ft^3	16.02	kg/m^3
	lb/yd^3	0.5933	kg/m^3
ENERGY: Symbol J The SI unit of ENERGY is the JOULE. 1 J = 1 N.m A joule is the energy expended or the work done when a force of one newton moves the point of application a distance of one metre in the direction of that force.	**1. ELECTRICAL ENERGY**		
	kilowatt hour (kW.h)	3.6	MJ
	2. HEAT ENERGY		
	British thermal unit (Btu)	1.055	kJ
	Btu/gal	0.2321	kJ/L ††
	Btu/ft^3	37.26	kJ/m^3
	3. MECHANICAL ENERGY		
	foot poundal		
	ft.pdl	.04214	J
	inch pound-force		
	in.lbf	0.1130	J
	foot pound-force		
	ft.lbf	1.356	J
	foot ton force		
	ft.tonf	3.037	kJ
	Metre kilogram force m.kgf	9.807	J
FORCE: Symbol N (NEWTON) The SI unit of FORCE ($kg.m/s^2$) has been given the special name – NEWTON. The newton is the force which when applied to a body having a mass of one kilogram, causes an acceleration of one metre per second in the direction of application of the force.	Poundal (pdl)	0.1383	N
	Pound-force (lbf)	4.448	N
	ton-force (tonf)	9.964	kN
	*kilogram-force (kgf) *also known as kilopond (kp)	9.807	N
FORCE PER UNIT LENGTH: The SI unit is NEWTON PER METRE: **Symbol N/m**	pounds-force per inch (lbf/in)	175.1	N/m
	pounds-force per foot (lbf/ft)	14.59	N/m
	ton-force per foot (ton/ft)	32.69	kN/m
LENGTH: Symbol m The SI unit of LENGTH is the METRE.	inches	25.4	millimetres (mm)
	feet	0.3048	metres (m)
	yards	0.9144	metres (m)
	chain	20.12	metres (m)
	mile	1609	metres (m)
	mile	1.609	kilometres (km)
MASS: Symbol kg The SI unit of MASS is the KILOGRAM.	ounce	28.35	grams (g)
	pound	0.4536	kilograms (kg)
	slug	14.59	kg
	ton (2240 lb)	1016.05	kg
	short ton (2000 lb)	907.2	kg
	ton (2240 lb)	1.016	tonne (t)
	pounds per foot (lb/ft)	1.488	kg/m
	pounds per yard (lb/yd)	0.4961	kg/m

REMARKS	A MULTIPLY	B BY	C TO OBTAIN
POWER: Symbol W The SI unit of POWER is the WATT.	Btu per hour (Btu/hr)	0.2931	W
	horsepower (hp)	0.7457	kW
	ton of refrigeration	3.517	kW
PRESSURE: Symbol Pa The SI unit of PRESSURE or stress is the NEWTON PER SQUARE METRE which has been given the name PASCAL. 1 N/m^2 = 1Pa = 0.000145lbf/in^2 A pascal is the pressure or stress which arises when a force of one newton is applied uniformly over an area of one square metre.	lbf/in^2	6.895	kPa
	kip/in^2 (1000 psi)	6.895	MPa
	lbf/ft^2	47.88	Pa
	kgf/cm^2	98.07	kPa
	bar	100	kPa
	Vertical column (head) of water. (H_20 at 20°C)		
	metres of water	9.79	kPa
	feet of water	2.984	kPa
	torr (vacuum)	0.1333	kPa
	1mm Hg. (mercury)	0.1333	kPa
	1in. Hg. (mercury)	3.386	kPa
	atmosphere (atm)	101.325	kPa
	microns	0.133	Pa
TORQUE: Symbol N.m (Moment of force) The SI unit of TORQUE is the NEWTON METRE. The newton metre is the work done when a force of one newton moves the point of application a distance of one metre in the direction of that force. 1 N.m = 1 J	Poundal-foot		
	pdl.ft	.04214	N.m
	pound-force inch		
	lbf.inch	0.1130	N.m
	lbf.inch	1.152	kgf.cm
	pound-force feet		
	lbf.ft	1.356	N.m
	lbf.ft	13.83	kgf.cm
	ton-force feet		
	tonf.ft	3.037	kN.m
	kilogram-force		
	kgf.m	9.807	N.m
	kgf.cm	0.09807	N.m
VELOCITY: Symbol m/s The SI unit of VELOCITY is the METRE PER SECOND.	ft. per second (ft/s)	0.3048	m/s
	ft. per minute (ft/min)	0.00508	m/s
	miles per hour	0.4470	m/s
	miles per hour	1.609	km/h
VOLUME: CAPACITY: Symbol m^3 The SI unit of VOLUME is the CUBIC METRE. **NOTE:** †† Capital "L" is now the legal preferred symbol for litre in Australia.	**DRY:**		
	cubic inch (in^3)	16387	mm^3
	cubic foot (ft^3)	0.02832	m^3
	cubic yard (yd^3)	0.7646	m^3
	litre (L) ††	1 000 000	mm^3
	litre (L) ††	0.001	m^3
	gallons (Imp.)	0.004546	m^3
	IMPERIAL LIQUID		
	fluid ounce	28.41	millilitre (ml)
	pint (20 fl. oz)	568.3	millilitre (ml)
	quart (2 pints)	1.137	litre (L) ††
	gallon (Imp.)	4.546	litre (L) ††
	gallon (US)	3.785	litre (L) ††
	litre (water 4°C)	1.000	kilogram (kg)
	Imp. gallons (water 20°C)	4.536	kilograms (kg)
VOLUME: RATE OF FLOW Symbol m^3/s The SI unit of VOLUME RATE OF FLOW is the CUBIC METRE PER SECOND.	Imp. gal. per minute (gal/min)	.0000758	m^3/s
	Imp. gal. per minute	0.272765	m^3/hr
	Imp. gal. per minute	.0758	litre per second (L/s)
	cubic ft. per minute	.000472	m^3/s
	cubic ft. per minute	0.472	litre per second (L/s) 1 m^3 = 1 kL
SUNDRY ITEMS:	miles per gallon	0.3540	km per litre
	gallons per mile	2.825	litres per km

TEMPERATURE

The SI unit of TEMPERATURE is the KELVIN – Symbol K

For most practical purposes of temperature measurement and most calculations involving temperatures, degrees Celsius, symbol °C will be used.

DEGREES FAHRENHEIT TO CELSIUS
(°F – 32) x 5/9 = °C

DEGREES CELSIUS TO FAHRENHEIT
(°C x 9/5) + 32 = °F

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F: +61 8 8304 7544

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P: +61 8 6350 9600
F: +61 8 6350 9601

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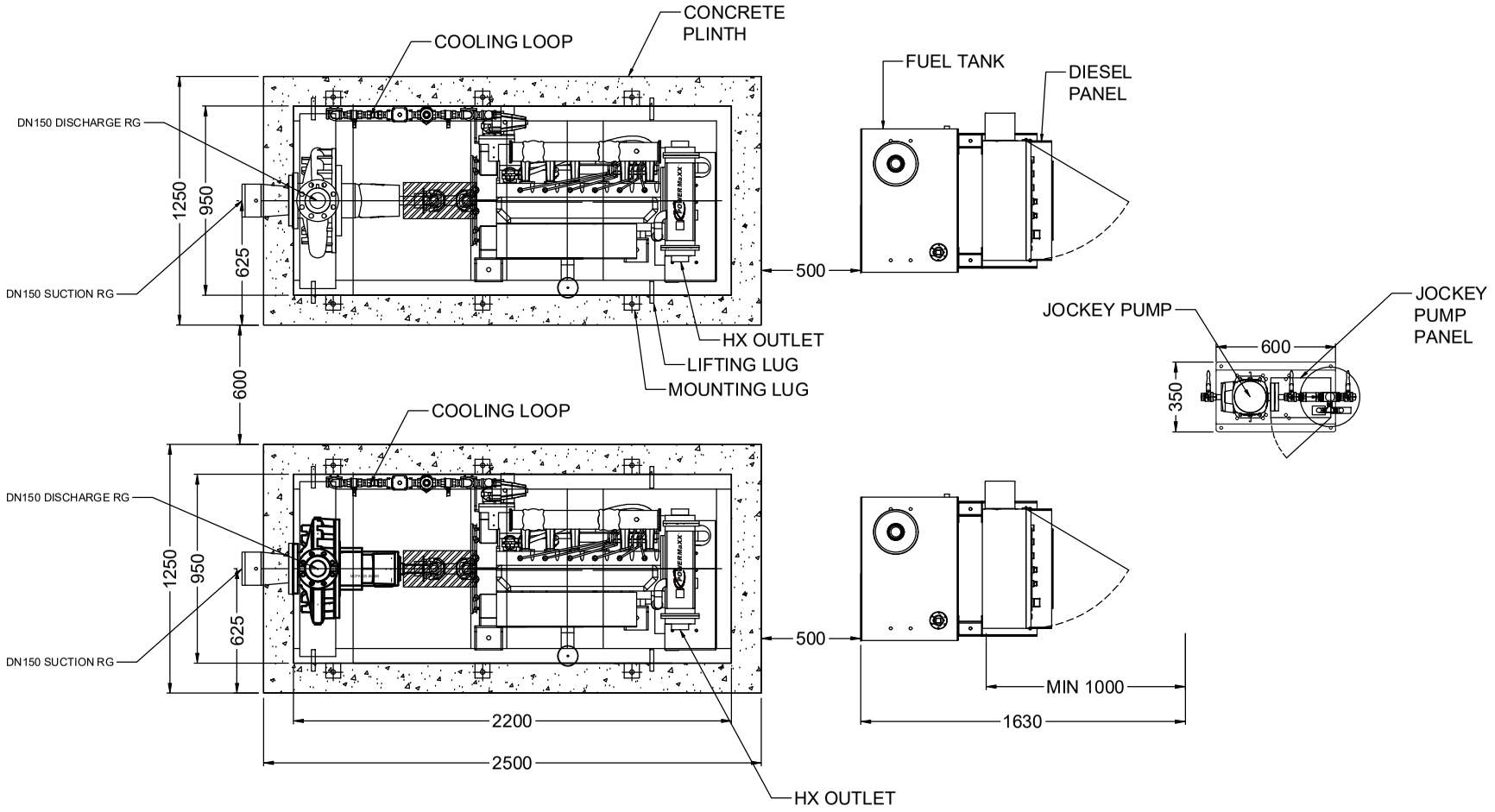
All trademarks are property of their respective owners.

TECHNICAL DATA

8.2 PUMPSETS

PUMP DETAILS		DRIVER DETAILS		JOCKEY PUMP DETAILS	
PUMP:	BKB 125-80-400	MAKE:	POWERMAXX	MODEL:	BKB 1-25
IMPELLER DIA.:	438 mm	MODEL:	DP6700T	POWER:	1.5 kW
DUTY 100%:	1395 LPM @ 1445 kPa	POWER:	121 kW	SPEED:	2900 rpm
DUTY 130%:	1860 LPM @ 1156 kPa	SPEED:	2500 rpm	VOLT:	240 VAC
CENTRE HEIGHT:	280 mm	SHAFT:	1410	FREQUENCY:	50 Hz
SHAFT:	42 mm	WEIGHT:	550 KG	WEIGHT:	50 KG
WEIGHT:	169 kg				

NOTES:
1. BASE AND STANDS PAINTED SIGNAL RED R13
2. TOLERANCE +/-10MM
3. RESIDENTIAL MUFFLER & FLEXIBLES TO BE SUPPLIED
4. CLIENT TO ALLOW FOR HEAT EXCHANGER DISCHARGE
5. WIRING/PIPING FROM THE CONTROL PANEL/FUEL TANK WILL BE DONE AS INDICATED IN THE DRAWING. COST OF REPIPING/REWIRING RESULTING FROM THE RELOCATION OF THE PANEL/FUEL TANK WILL BE BORNE BY THE CLIENT
6. CLIENT TO PROVIDE POWER SUPPLIES; 1 POWER SUPPLY (MIN. 16 AMPS; ESSENTIAL SERVICE) FOR EACH OF THE DIESEL PUMP PANEL; AND 1 POWER SUPPLY (MIN. 16 AMPS; NON-ESSENTIAL SERVICE) FOR THE JOCKEY PUMP PANEL
7. PLINTH SURROUND WILL BE PROVIDED (CONCRETE BY OTHERS)



REV	DETAILS	DATE	INITIALS			
0	ORIGINAL ISSUE	13/09/2022	FA	APPROVED BY CLIENT:		DATE:
				APPROVED BY BKB:		DATE:

BKB PUMPING SOLUTIONS

BKB PUMPING SOLUTIONS
Committed to our Customers

Address: 33 Fowler Road, Dandenong South, VIC 3175
Website: www.bkbgroup.com.au
Ph: 1300 252 227

DRAWN	FA
CHECK	AM
APPROVED	KC
DATE	13/09/2022
SCALE	N.T.S

CUSTOMER: AUSCOAST FIRE

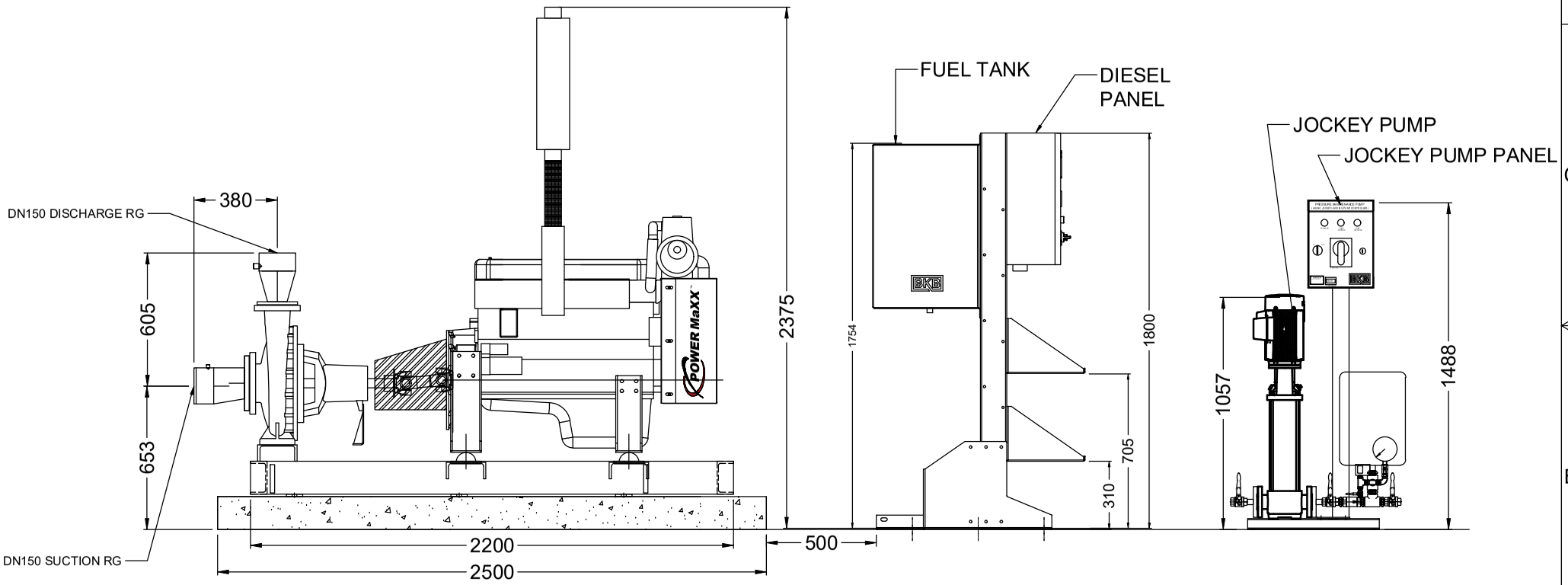
PROJECT: THE PATTERSON

DETAILS: SPRINKLER FIRE PUMP SYSTEM
DOUBLE DIESEL PUMPSET
PLAN

DRAWING NO: F14583-02

PUMP DETAILS		DRIVER DETAILS		JOCKEY PUMP DETAILS	
PUMP:	BKB 125-80-400	MAKE:	POWERMAXX	MODEL:	BKB 1-25
IMPELLER DIA.:	438 mm	MODEL:	DP6700T	POWER:	1.5 kW
DUTY 100%:	1395 LPM @ 1445 kPa	POWER:	121 kW	SPEED:	2900 rpm
DUTY 130%:	1860 LPM @ 1156 kPa	SPEED:	2500 rpm	VOLT:	240 VAC
CENTRE HEIGHT:	280 mm	SHAFT:	1410	FREQUENCY:	50 Hz
SHAFT:	42 mm	WEIGHT:	550 KG	WEIGHT:	50 KG
WEIGHT:	169 kg				

NOTES:
1. BASE AND STANDS PAINTED SIGNAL RED R13
2. TOLERANCE +/-10MM
3. RESIDENTIAL MUFFLER & FLEXIBLES TO BE SUPPLIED
4. CLIENT TO ALLOW FOR HEAT EXCHANGER DISCHARGE
5. WIRING/PIPING FROM THE CONTROL PANEL/FUEL TANK WILL BE DONE AS INDICATED IN THE DRAWING. COST OF REPIPING/REWIRING RESULTING FROM THE RELOCATION OF THE PANEL/FUEL TANK WILL BE BORNE BY THE CLIENT
6. CLIENT TO PROVIDE POWER SUPPLIES; 1 POWER SUPPLY (MIN. 16 AMPS; ESSENTIAL SERVICE) FOR EACH OF THE DIESEL PUMP PANEL; AND 1 POWER SUPPLY (MIN. 16 AMPS; NON-ESSENTIAL SERVICE) FOR THE JOCKEY PUMP PANEL
7. PLINTH SURROUND WILL BE PROVIDED (CONCRETE BY OTHERS)



REV	DETAILS	DATE	INITIALS			
0	ORIGINAL ISSUE	13/09/2022	FA	APPROVED BY CLIENT:		DATE:
				APPROVED BY BKB:		DATE:

BKB PUMPING SOLUTIONS

BKB PUMPING SOLUTIONS — Committed to our Customers

Address: 33 Fowler Road, Dandenong South, VIC 3175
Website: www.bkbgroup.com.au
Ph: 1300 252 227

DRAWN	FA
CHECK	AM
APPROVED	KC
DATE	13/09/2022
SCALE	N.T.S

CUSTOMER: AUSCOAST FIRE

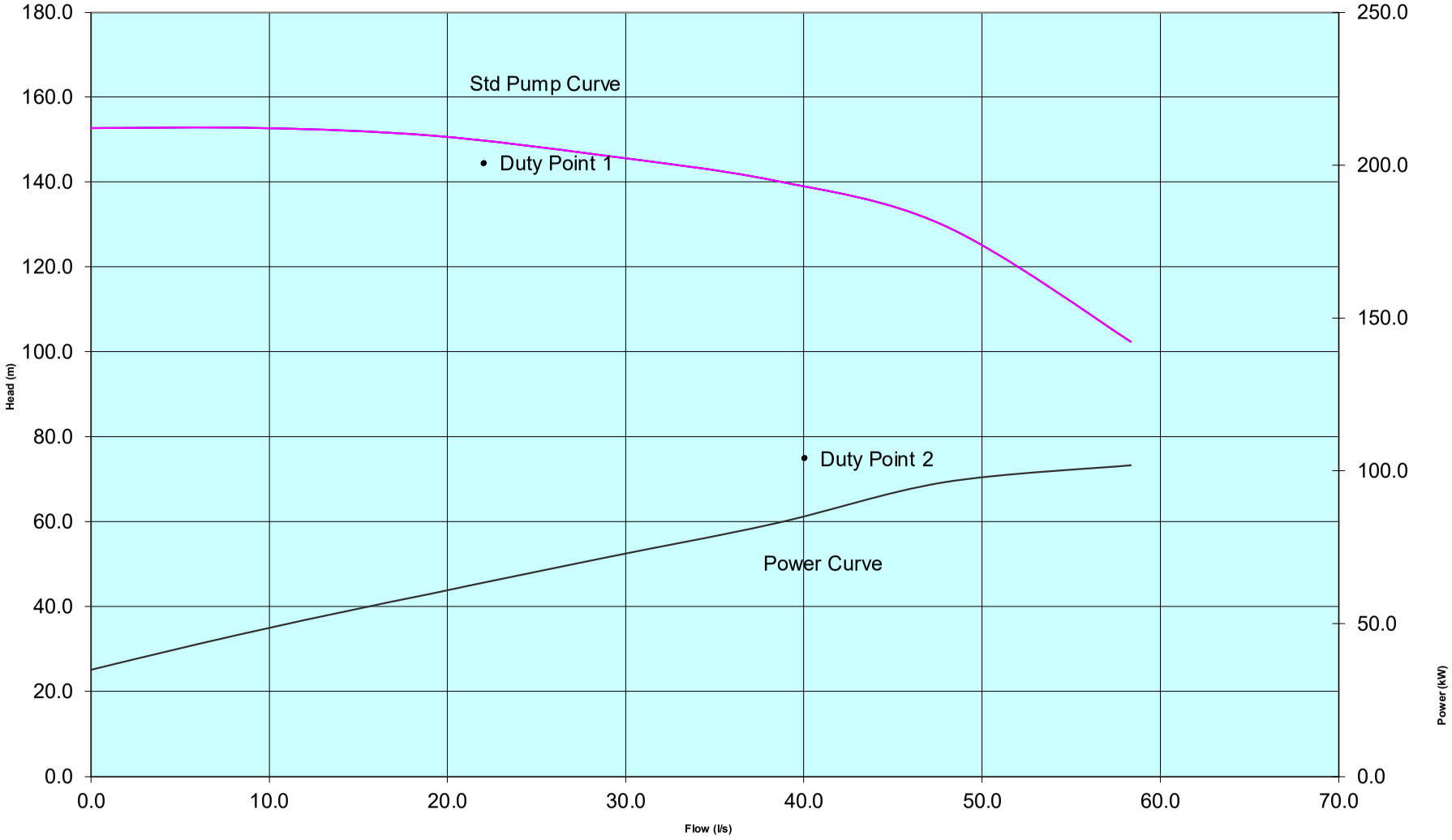
PROJECT: THE PATTERSON

DETAILS: SPRINKLER FIRE PUMP SYSTEM
DOUBLE DIESEL PUMPSET
ELEVATION

DRAWING NO: F14583-01

Diesel Fire Pump

Model 125 x 80 x 400
Speed 2200 rpm
Diameter 438 mm



TECHNICAL DATA

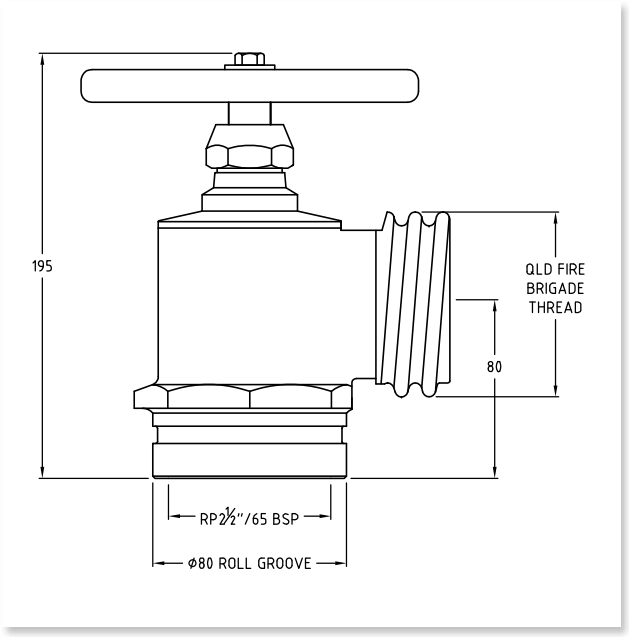
8.3 HYDRANT COMPONENTS

381297RGRE - Fire Hydrant Valves - Queensland

Pictured is a #381297RGRE

Features

- Fire Hydrant Valves are approved to AS 2419.2 for all states of Australia.
- Designed using ideas solicited from hydraulic consultants, government departments, fire authorities, and installers.
- Easily installed using the range of Fire Hydrant Risers and Dual Heads.



 # 381297RGRE - Red Emperor Fire Hydrant Landing Valve [QLD] - Roll Groove Inlet with Cap.

© Galvin Engineering Pty Ltd: 2012

TECHNICAL DATA

8.4 HOSE REEL COMPONENTS

redemperor®
fire + civil + plumbing

Fixed Fire Hose Reel

Specification Data Sheet

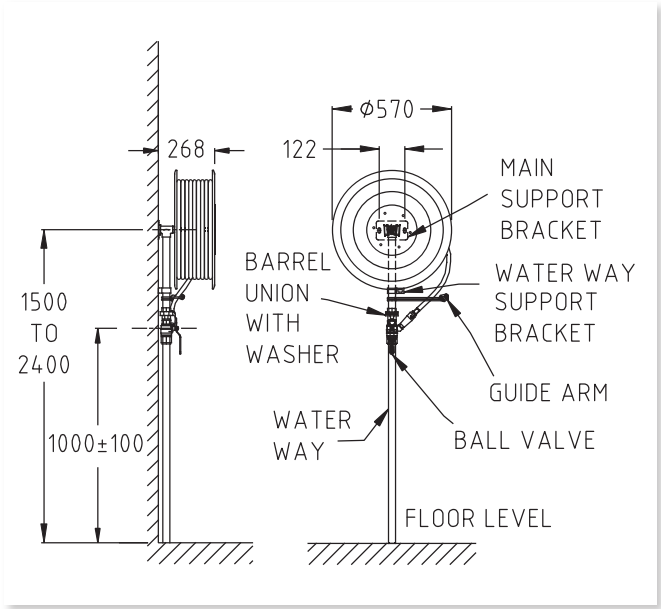
383026RE

F1 Fixed Fire Hose Reel with Swing Guide Arm 36 Metres.

Features

- Certified to AS/NZS 1221.
- 1 year warranty when installed and commissioned in accordance with AS 2441.
- Test pressure 1700kPa.
- Maximum working pressure 1200kPa.
- Spray distance approximately 7 metres.
- Minimum discharge at 220k ± 10 kPa inlet pressure should be 30l/min.
- Nominal hose diameter 19mm.
- Hose reel length 36 meters.
- Fire Hose Reel comes standard with:
  - A fitted brass fire hose reel nozzle and a brass ball valve to ensure long life and durability.
  - A guide arm that is fitted with roller beads to ensure the hose flows freely and doesn't kink.
  - Side plates that are made from tough powder coated zincalume steel (per AS 4506).

Typical Dimensions



Maintenance

Regular maintenance should be carried out in accordance with installation and troubleshooting guides provided with the product, the relevant Australian Standards, local authorities and state codes.

Warranty

Red Emperor products are covered under our Manufacturer's Warranty at www.galvinengineering.com.au. Red Emperor products must be installed in accordance with the installation instructions and in accordance with AS3500, PCA, relevant Australian Standards and local authorities applicable to product being installed. Water and electrical supply conditions must also comply to the applicable national and/or state standards, failing to comply with these provisions may void the product warranty and affect performance of the product.

Whilst all reasonable care has been taken in compiling the information in this document, the designs, dimensions and products shown are indicative only and should not be relied upon without our prior approval. Due to our policy of continuous development, we reserve the right to alter any details of specifications or products without notice. All information, drawings, technical specifications and product designs remains the property of Galvin Engineering Pty Ltd.

Certified System Environment ISO 14001 SAI GLOBAL
Certified System Quality ISO 9001 SAI GLOBAL

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TECHNICAL DATA

8.5 FIRE DETECTION COMPONENTS

PERTRONIC INDUSTRIES LTD

DATASHEET

Analogue Addressable Smoke Detectors

2251BPI-IV, 2251BPI-W, 2251BPI-BK

Overview

The Analogue Addressable Smoke Detector (2251BPI) is a plug-in photoelectric smoke detector with analogue addressable communication.

The smoke level in the sensor chamber is continuously monitored and reported to the fire panel. For each individual 2251BPI detector, the alarm, fault, and maintenance thresholds are programmable in the fire panel configuration software.

A suitably configured fire panel will identify the location of any detector which has triggered an alarm, fault, or maintenance signal. The fire panel can also identify any active detector by lighting up two red LEDs on the detector housing.

Analogue Addressable Smoke Detector 2251BPI-IV in B501AUS-IV Base

The fire panel may be configured to briefly light up the LEDs (“blink”) when the detector is polled.

The detector’s address on the analogue addressable loop is easily set using rotary address switches.

Features

- Analogue addressable communications
- Automatic drift compensation
- Stable communication with excellent noise immunity
- Smoke sensitivity configurable in the fire panel
- Low standby current
- Rotary address switches
- Address range 1 to 159
- Up to
  - 159 detectors per loop (Pertronic F220, F120A)
  - 99 detectors per loop (Pertronic F100A)
- Dual red LEDs for 360° visibility
- Optional remote LED indicator available (Note 1)
- Compatible with B501AUS, B501AP, and other System Sensor B500 series bases
- Independently tested and ActivFire listed to AS 7240.7:2018, certificate afp-3384
- Meets the requirements of NZS 4512:2021 s. 2.16.2
- FPANZ listing PI/365

Specification

Operating Voltage	15 to 32 Vdc
Standby Current	150 to 300 µA (see note 2)
LED Current	6.5 mA @ 24 Vdc
Remote Output Voltage	22 v dc, @ 24 V dc supply voltage
Remote Output Current	9.9 mA minimum @ 24 V dc (note 3)
Isolator Load Rating	0.0063 (note 4)
Dimensions (diameter x height)	102 x 51 mm (in B501AUS base) 102 x 58 mm (in B524IEFT-1 base)
Weight	89 g (excluding base)
Operating Temperature	-10 °C to +50 °C
Humidity	10 % to 93 % RH, non-condensing
Air Velocity	0 to 20.3 m/s (for installation in ducts)

Detector Sensitivity Levels in Pertronic Fire Panels

F220		F100A	
1	4.68 %/m		
0	6.88 %/m	**1**	6.88 %/m
-1	7.97 %/m	**2**	7.97 %/m
-2	9.51 %/m	**3**	9.51%/m

Ordering Information

Product Code	Description	Product Code	
2251BPI-IV	AA Photo Smoke Detector, Ivory	B501AUS-IV	AA Base, Ivory
2251BPI-W	AA Photo Smoke Detector, White	B501AUS-W	AA Base, White
2251BPI-BK	AA Photo Smoke Detector, Black (note 5)	B501AUS-BK	AA Base, Black (note 5)
		B524IEFT-1	AA Base with Isolator, Ivory

Notes

1. Please refer to the *Remote Indicators* (AU) or *Pertronic Remote LED Indicator* (NZ) datasheets for details of remote LED indicators.
2. Typical maximum standby (quiescent) current with LED blink enabled, and one poll every five seconds, is 300 µA
3. Remote output current is specified with terminal 3 shorted to terminal 1
4. The sum of the Isolator Load Ratings of all devices attached to a single isolator must not exceed 1.0
5. Please contact us to confirm availability of black detectors and bases.

The information in this document must not be treated as partial or complete instructions for the design, construction, installation, commissioning, or maintenance of fire detection, fire alarm, or building evacuation systems. Fire and evacuation systems must be designed and installed by properly qualified persons, in accordance with all regulatory requirements.
Unless explicitly stated otherwise, this document provides typical specifications and nominal dimensions. Actual product performance and dimensions may vary.
All information in this document is subject to change. Please consult Pertronic Industries or visit our web site for up to date information.
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Analogue Addressable Mounting Bases

B501AUS, B501/W detector base:	*For analogue addressable detectors.*
B501AP base:	*For detectors, sounders and strobes.*
WB-1AP base enclosure:	*For humid environments.*

Product Overview:

Analogue Addressable Mounting Bases provide a variety of mounting options for System Sensor analogue addressable detectors, sounders, and strobes.

WB-1AP-IV

B501AUS

B501AP-BK

Analogue Addressable Mounting Bases

Features & Specifications:

- » Quick and secure detector plug-in
- » SEMS screws provide easy wiring connection
- » Support for 0.5 ~ 1.5 mm² provides installation flexibility

	B501AUS	B501AP-IV	WB-1AP-IV
» Base Diameter	102 mm	102 mm	110 mm
» Base Height	18.8 mm	22.5 mm	69 mm
» Weight	59 g	39 g	200 g
» Operating Voltage	15 to 32 Vdc		
» Standby Current	150 µA		

Products:

	B501AUS / B501/W The **B501AUS** is a plug-in analogue addressable detector base intended for use in an intelligent system with screw terminals provided for loop (+), loop (-), and remote annunciator connections. (Not suitable for WST wall mount strobes or sounders.) B501AUS: Ivory B501/W: White
	B501AP-IV / B501AP-BK The **B501AP-BK** is a plug-in analogue addressable base designed for use with System Sensor detectors and all WST wall mount strobes and sounders. B501AP-IV: Ivory B501AP-BK: Black B501AP-PW: Pure White
	WB-1AP-IV **WB-1AP-IV** is sensor base enclosure for humid environments where excessive humidity can cause nuisance alarms. The enclosure reduces the effect of condensation on the sensor. The enclosure is designed to accommodate 18.6 mm conduit. Two mounting options are available: Surface mounting and Pendant mounting.

Ordering Information:

Product Code	Description
B501AUS	AA Detector Base (Not for WST sounders or strobes)
B501/W	AA Detector Base – White (Not for WST sounders or strobes)
B501AP-BK	AA Detector Base – Black
B501AP-IV	AA Detector Base – Ivory
B501AP-PW	AA Detector Base – White
WB-1AP-IV	Detector Adapter Base Enclosure for Humid Environments

Also available:

B524IEFT-1	AA Detector Base with Isolator
BCK-200B	Black Cover to suit 100B & 200B Series Detectors
WCK-200B	White Detector Cover Kits for 200B Series Detectors

Product Guide
C 2160A 100mm (4") 100V 5W Plastic Grille Ceiling Speaker White AS ISO7240.24
C 2161A 100mm (4") 100V 5W Plastic Grille Ceiling Speaker Black AS ISO7240.24

One-Shot® 'Rat-Trap' EWIS Fire Ceiling Speakers

- ✓ Designed to meet Australian Standard AS ISO7240.24
- ✓ Excellent speech intelligibility
- ✓ Low profile design is only 65mm deep – penetrates ceiling by only 53mm (with 12mm thickness ceiling tile).
- ✓ Tuned PA driver designed to meet the latest fire standards
- ✓ High quality speaker driver developed for BGM, paging and emergency warning applications
- ✓ Patented 3 way latching ensures a neat, sag free installation.
- ✓ Fitted with 4 way wire protect terminal for loop in, loop out wiring.
- ✓ Fitted with flame retardent safety cover.
- ✓ Fitted with supervisory capacitor for line monitoring.
- ✓ Assembled in Australia.
- ✓ 5 year warranty.

Application

This range of speakers have been engineered to meet the requirements of evacuation and occupant warning paging systems. The high efficiency speaker and transformer combination ensures high SPL, wide frequency response, superior speech intelligibility and reproduction for mission critical applications. All components of the fixture are manufactured from high quality, long lasting, flame retardant material and tested to the rigours of the new standard. On site installation will be simple and straight forward. Press fit rubber grommets and terminal blocks will make on site termination easier than other competing products. Finally the speaker will just 'snap fit' into the ceiling. Far easier than competitors models being offered on the market.

Manufacturing & Performance

Redback® drivers are engineered and manufactured to stringent specifications ensuring maximum reliability under all operating conditions. Each driver has a power rating well above the max tapping of the transformer, ensuring reliable operation and excellent longevity. A strict quality control procedure is employed during every step of the manufacturing process. Finally, every finished speaker is 100% QC checked prior to shipping.

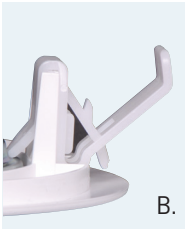
About Redback® Speaker Drivers

Each custom designed speaker and transformer combination has been specifically engineered to ensure a wide frequency range and dispersion angle, plus a high sound pressure level (SPL) ensuring excellent music and speech intelligibility; which is critical for emergency paging applications.

Each transformer is fitted with multiple power settings which are user selectable via taps on the transformer.

The Labour Saving One-Shot® Mounting System

Redback® "One-Shot®" speaker units install in seconds providing substantial labour cost savings for the professional installer compared to traditional mounting methods.



The "Rat-Trap" utilises a spring latching system. Each latch is set like a rat trap before installation into the speaker hole (picture A). When the speaker is pushed into the ceiling, the latches spring open, securing the speaker in place (picture B).

The snap clip material is formulated to retain long service life strength and spring action, ensuring a firm vibration free fit to either gyprock tiles, mineral fibre tiles or fixed gyprock ceilings.

Installation Guidelines

These models are fitted with a 4 way wire protect screw terminal block suitable for loop in, loop out cabling. The cable is secured via the safety cover cable glands provided.

All One-Shot® speakers are designed for fast installation due to the integral pressure clips which grip to the reverse side of the ceiling tile. They suit any 10-13mm ceiling tile, including gyprock, mineral fibre or fixed gyprock ceilings. Redback provide a range of optional tile supports to minimise sag and vibration.

Ceiling support pans: These pans fit inside the 't-bar' supports for the tile ceiling and provide a solid surface on which the One-Shot® clips secure to. Once the hole is cut, these simply slide up into the hole, the speaker is then pushed in until the clips release.

Ceiling support ring: This plastic 'split-ring' offers the same protection for soft tiles. With the added benefit of being lightweight and compact.

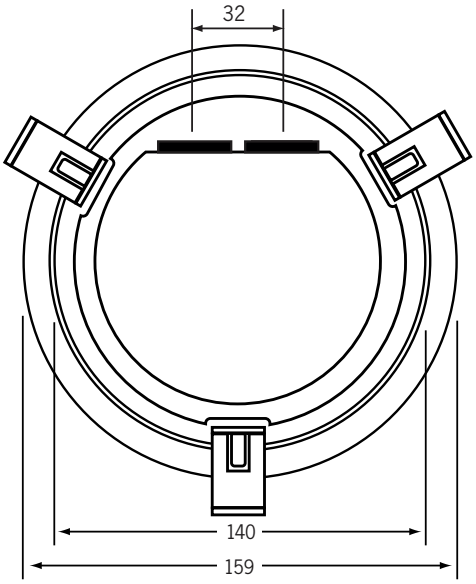
We recommend a speaker hole of 140mm. This is easily cut using the T 2312A holesaw.

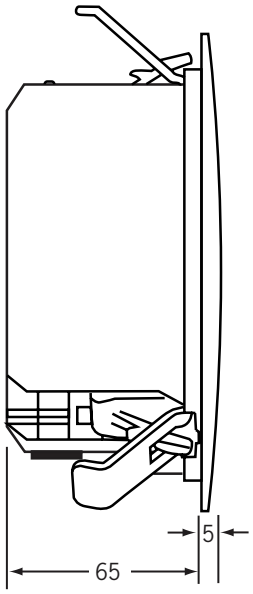
Assembled in Australia by Altronic Distributors Pty. Ltd. **Ph:** (08) 9428 2199 **Fax:** (08) 9428 2198 **Internet:** www.redbackaudio.com.au

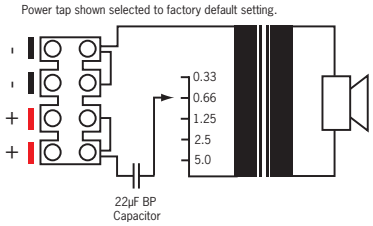
Product Guide

C 2160A 100mm (4") 100V 5W Plastic Grille Ceiling Speaker White AS ISO7240.24
C 2161A 100mm (4") 100V 5W Plastic Grille Ceiling Speaker Black AS ISO7240.24

Dimensions & Transformer Detail







Specifications

Electrical

Power taps:	0.33, 0.66, 1.25, 2.5, 5W
Impedance:	30kΩ, 15kΩ, 8kΩ, 4kΩ, 2kΩ
SPL 1W @ 1m:	89dB
SPL 1W @ 4m:	77dB
SPL 5W @ 1m:	96dB
SPL 5W @ 4m:	84dB
Frequency response:	100Hz-15kHz
Coverage Angles:	1000Hz 180°, 2000Hz 160°, 4000Hz 75°
Connection:	4 way terminal block + 22uF bipolar capacitor
Approval:	AS ISO7240.24
Applicable cable:	2.5mm2 (14AWG) max conductor area
Environmental Type:	A (for indoor applications)

Mechanical

Material:
White or black flame retardant ABS grille (Taitalac 8540T)
Clear Flame retardant ABS spring clips (Makrolon 6557)
Red flame retardant ABS transformer dome cover (Starex VH-0800)

Driver construction:	Paper cone
Ceiling cutout:	140mmØ
Grille diameter:	159mmØ
Mounting depth:	65mm (including ceiling tile thickness)
Overall weight:	710g

Environmental

IP Rating:	IP23C
Operating temperature:	-25°C to +55°C
Relative humidity:	< 95%

Additional Installation Accessories

C 2165 Steel ceiling tile support pan
C 2164 Ceiling tile support split ring
T 2312A 140mm holesaw

Architectural Specifications

C 2160A
The speaker shall be of 100mm diameter and be low profile fitted with a 100V transformer with power taps of 5W, 2.5W, 1.25W, 0.66W and 0.33W. It shall have a SPL of 89dB (1W@1m). It shall be approved to the AS ISO7240.24 fire and evacuation announcement standard. It shall be fitted with a 4 way wire protect terminal block for connection and 22uf bipolar capacitor for line monitoring. The speaker shall be attached to a flame retardant white plastic grille, One-Shot mounting mechanism and red safety cover. The safety cover shall be fitted with dual press fit rubber grommets. The speaker/grille combination shall be a Redback model C 2260A.

C 2161A
The speaker shall be of 100mm diameter and be low profile fitted with a 100V transformer with power taps of 5W, 2.5W, 1.25W, 0.66W and 0.33W. It shall have a SPL of 89dB (1W@1m). It shall be approved to the AS ISO7240.24 fire and evacuation announcement standard. It shall be fitted with a 4 way wire protect terminal block for connection and 22uf bipolar capacitor for line monitoring. The speaker shall be attached to a flame retardant black plastic grille, One-Shot mounting mechanism and red safety cover. The safety cover shall be fitted with dual press fit rubber grommets. The speaker/grille combination shall be a Redback model C 2261A.

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Horn Speaker 10 Watt IP66 CF2053

Product Overview

The **Horn Speaker, 10 Watt, IP66** is a high-efficiency AS ISO 7240.24-certified 100V-Line speaker designed for emergency warning systems. It is more than seven decibels louder than a cone-type speaker with the same input power.

Adjustable power taps provide sound level adjustment to meet project requirements such as area coverage and ambient noise level.

The rear cover is attached with a twist-lock mechanism. This provides tool-free access to the screw terminals, to save time when terminating the cables.

The offset mounting bracket can be installed without detaching the speaker.

The enclosure is made from tough UV-stabilised flame-retardant ABS.

To ensure compatibility with commonly-used fire evacuation systems, the speaker incorporates a series blocking capacitor and 100V-Line transformer.

Horn Speaker 10 Watt IP66 AS ISO 7240.24, White (CF2053W)

Features

- High acoustic efficiency
- Wide sound dispersion
- Available in black (CF2053B), grey (CF2053G), and white (CF2053W)
- Offset mounting bracket
- Tool-free access to terminal block
- Two cable glands provide for separate loop in and loop out cables
- Four-way screw terminals for loop in/loop out connection
- Adjustable power tappings
- Sensitivity: 98 dB SPL at 1 Watt, 1 metre (pink noise per AS ISO 7240.24)
- Fitted with series blocking capacitor and 100 VRMS line transformer
- Compatible with EWS line supervision systems
- IP66 dust and water resistance
- UV-stabilised fire-retardant ABS construction
- Stainless steel mounting hardware
- Independently tested to AS ISO 7240.24:2015, Type B (requires active equalisation)
- Activfire Certificate Number afp-3200

Specifications

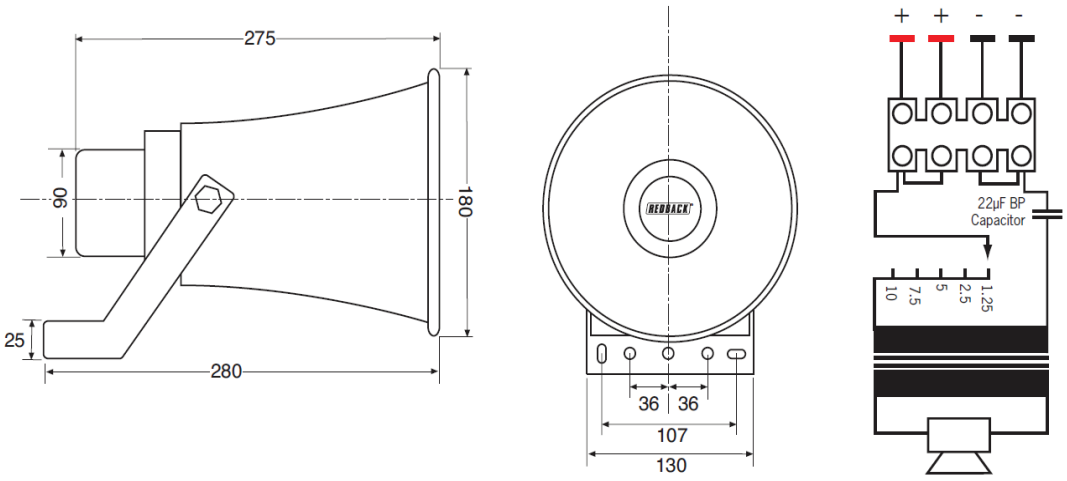
Rated Power	10 W @ 100 Volts RMS
Rated Input Voltage	100 Volts RMS
Transformer Power Taps	1.25 W, 2.5 W, 5 W, 7.5 W, 10 W
Sensitivity (Pink noise per AS 7240.24)	98 dB SPL @ 1 W, 1 m
	86 dB SPL @ 1 W, 4 m
Max. Sound Pressure	110 dB SPL @ 10 W, 1 m
	98 dB SPL @ 10 W, 4 m
Frequency Response (with equalisation)	250Hz - 10kHz
	500Hz - 4kHz 0±5dB
Coverage Angle (-6dB)	500Hz: 88°, 1000Hz: 127°, 2000Hz: 79°, 4000Hz 58°
Applicable Cable	Fire-resistant cable
Connection	4-way terminal blk, Loop In – Loop Out
Max. Conductor Area	2.5 mm² (single core)
IP Rating	IP66
	AS ISO 7240.24 Type B
Dimensions (excl. bracket)	ø 180 mm x 275 mm
Weight	1.8 kg
Operating Temperature	-20 °C to + 55 °C
Humidity	< 95 % RH, non-condensing
Material, Housing	UV-stabilised flame-retardant ABS
Material, Mtg Hardware	Stainless Steel

Equalisation

1/3rd Octave Band Centre (Hz)	Equalisation (dB)
800	-1.0
1000	-3.0
1250	-4.5
1600	-4.5
2000	-2.5
2500	-1.0
3150	0.5
4000	2.0
5000	5.0
6300	6.5
8000	7.0
10000	7.0

A twist-lock mechanism simplifies access for termination.

Outline, Dimensions, and Connections



Ordering Information

Product Code	Description
CF2053B	Horn Speaker 10W IP66 AS ISO 7240.24 Black
CF2053G	Horn Speaker 10W IP66 AS ISO 7240.24 Grey
CF2053W	Horn Speaker 10W IP66 AS ISO 7240.24 White

0940 Datasheet AU Horn Speaker 10 W IP66 CF2053 Issue 1.0 20180730

Data Sheet

CF2134 200mm (8”) 100V 5W Ceiling Speaker White AS ISO7240.24
CF2135 200mm (8”) 100V 5W Ceiling Speaker Black AS ISO7240.24

Description

CF2134 & CF2135 are ceiling mount speakers certified to the AS ISO7240.24 standard for fire & evacuation announcements in buildings. Each speaker is fitted with a fire retardant speaker/transformer dome and is fitted with sealed gland cable entries and terminal blocks for easy on site termination. The speaker utilises the One-Shot ‘snap fit’ mounting system.

Specifications

Rated Noise Power	5 Watts (100V line)
Power Taps & Impedance (100V line)	0.33W (30kΩ), 0.66W (15kΩ), 1.25W (8kΩ), 2.5W (4kΩ), 5W (2kΩ)
Sensitivity	94dB (1W @ 1m), 82dB (1W @ 4m)
Maximum Sound Pressure Level	100dB (5W @ 1m), 88dB (5W @ 4m)
Frequency Response	100Hz - 15kHz, 500-4kHz: ±5dB
Coverage Angle (-6dB)	500Hz: >180°, 1000Hz: 170°, 2000Hz: 90°, 4000Hz 60°
Environmental Type	A (for indoor applications as per standard)
Speaker Component	200mm (8”) paper cone speaker
Mounting Hole	246mmØ
Mounting Method	6 x plastic spring loaded clip
Line Monitoring	Yes, 22µF bipolar capacitor
Applicable Cable	2.5mm^2 (14AWG) max conductor area
Connection	4 way screw terminal
Finish	White (CF2134) or black (CF2135) flame retardant ABS grille (Taitalac 8540T) Clear Flame retardant ABS spring clips (Makrolon 6557) Red flame retardant ABS transformer dome cover (Starex VH-0800)
Dimensions	266Ø x 103Dmm
Weight	1.25kg
Quantities	6 per carton, 240 per pallet.

Test Method

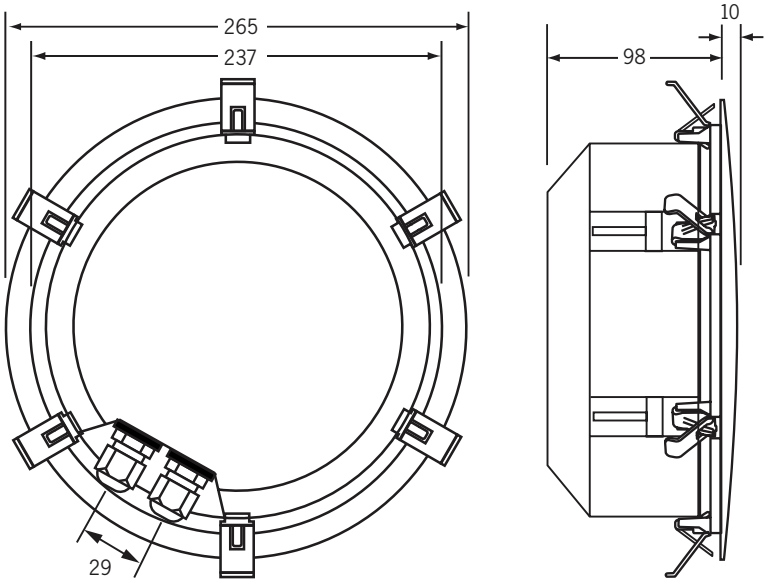
This specification data was measured in an anechoic chamber with the microphone 4m from the speaker under test, according to the AS ISO7240.24. Specifications at 1m were calculated from the measurements at 4m in accordance with AS ISO7240.24.

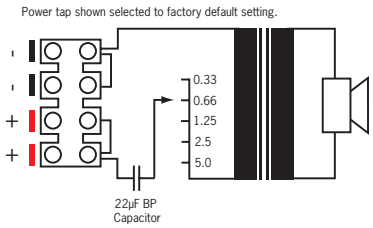
Reference axis: Axis is on the centre of the grille surface and perpendicular to the grille surface.

Reference plane: Plane is on the grille surface and perpendicular to the reference axis.

Horizontal plane: Plane is containing the reference axis and perpendicular to the reference plane.

Dimensions (mm)



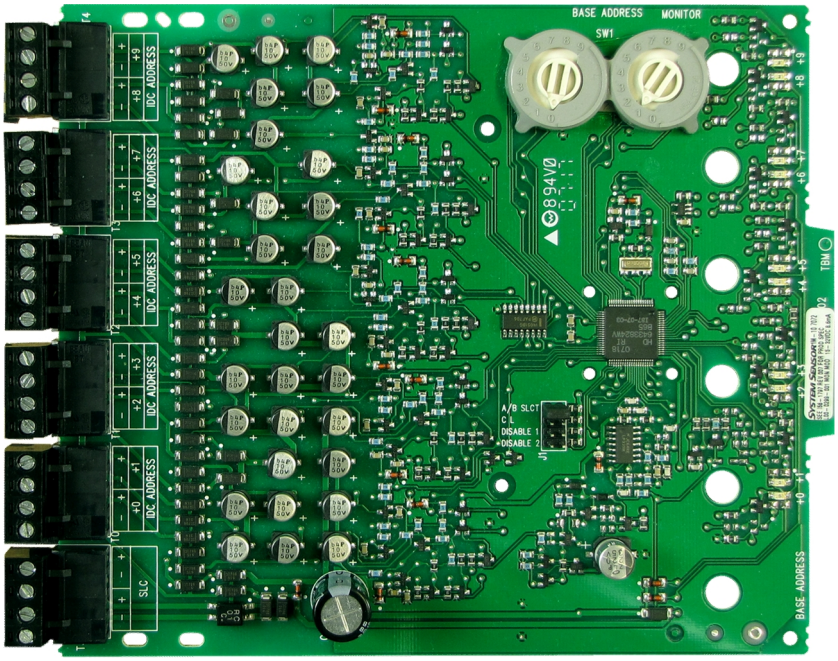


Addressable Module Multi Monitor

Product Overview:

The **Multi Monitor (10 Input)** module is designed to meet a range of applications in which several individually addressable supervised inputs are needed, for use in Pertronic Intelligent Fire Alarm Systems. Each monitor module is intended to interface between a fire alarm control panel and normally open contact devices. A common loop input is used for all ten modules, and the initiating circuits share a common supervisory supply. Otherwise, each monitor module operates independently from the others, having its own unique address.

A pair of rotary code switches sets the address of the first module from 01 to 90. The remaining modules are automatically assigned to the next nine higher addresses. Provisions are included for disabling up to two of the highest addresses to release them for use elsewhere. Each module also has panel controlled green LED indicators. The panel can cause the LEDs to blink, latch on or latch off.



IM-10 Analogue Addressable Module Multi Monitor (10-Input)

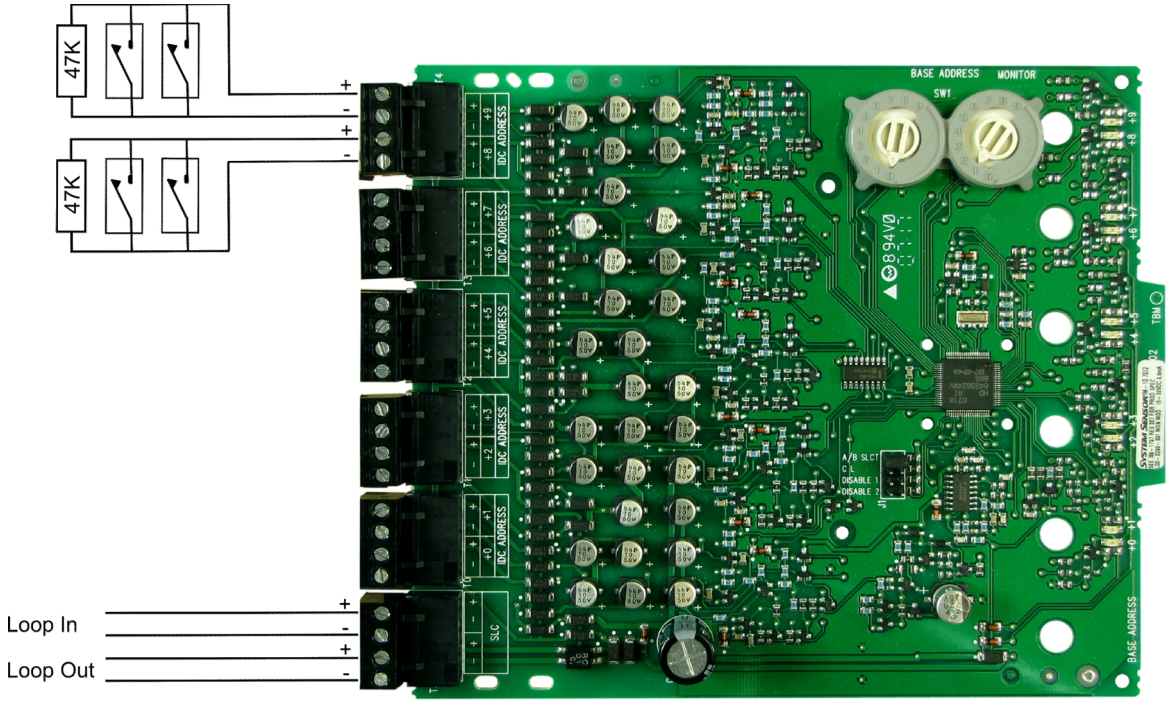
Features:

- Robust microprocessor-based design
- Removable plug-in terminals for quick and simple installation
- Connectors accept 0.8 to 3.3 mm² cable
- 10 individual LED indicators, one per input
- Up to 2 unused addressable may be disabled
- Analogue Addressable communications
- Stable communication technique with noise immunity
- Rotary Decade Address switches
- Multi-mount chassis available for up to 4 multi-modules

Specifications:

»	Dimensions	173 x 147 x 31.8	W x H x D mm	Chassis Mount
»	Wiring/Connection	0.8 to 3.3 mm², plug-in connectors		
»	Operating Temperature Range	-10°C to 49°C		
»	Relative Humidity	10% to 85% RH	Non-Condensing	
»	Voltage Range	15 to 32VDC		
»	Standby Current @ 24VDC	3.5mA	Maximum	
»	Alarm Current	60mA	assumes all 10 LEDs ON Steady	
»	Maximum IDC Wiring Resistance	40 Ω		
»	Maximum Monitoring Circuit Voltage	12 VDC		
»	Maximum Monitoring Circuit Current	1mA		

Connection Diagram:



Typical Connections for an IM-10 Module

Ordering Information:

Product Code	Description
IM-10	Addressable Module Multi Monitor (10 inputs)
BKPI663CH-4	CH-4, 4 Way Chassis for up to 4 Multi AA Modules

PERTRONIC INDUSTRIES LTD

DATASHEET

LASS Series Strobes & Sounder-Strobes

Overview

The LASS series AA Synchronised Strobes and Sounder-Strobes are loop-powered audible and visual alarm devices that plug in to System Sensor analogue addressable detector bases such as the B501AUS.

Each LASS-series alarm device can be individually activated (addressed) by a fire panel over an analogue addressable loop. In a Pertronic F220 system, the control panel's loop driver board controls the audible and visual signals. Tones and light flashes from all LASS alarm devices connected to a single loop driver can be synchronised, provided that the loop driver is fitted with firmware version 4.08.00 or later. An F220 loop driver can control two analogue addressable loops. So, all LASS devices on a pair of loops can be synchronised.

Two audible alarm tones can be controlled by the fire panel. These tones indicate alarm Stage 1 (Evacuate) and alarm Stage 2 (Alert). The pair of tones may be configured from any one of four optional two-stage tone-sets. The sounder-strobe's visual alarm is internally synchronised with the audible alarm.

LASS series alarm devices are compatible with the optional anti-tamper feature on the B501AUS and compatible detector bases. When activated, the anti-tamper feature inhibits unauthorised removal of the alarm device. Note that if an LASS device is used with a B501AP deep base, there will be a 3-4 mm gap between the device and the mounting surface.

Addressable Synchronised Strobe and Sounder-Strobe
Left: LASS-WST-NC
Right: LASS-BSS-NC
fitted with Smoke Detector

The sounder component of the Addressable Synchronised Sounder-Strobes (LASS-WSS-NC, LASS-BSS-NC) is independently certified to the souder (AAD) standard, AS ISO 7240.3:2014.

Features

- Addressable audible and visual alarm devices
- Suitable for mounting on wall or ceiling
- Plug in to B501AUS and compatible detector bases
- Sounder-strobes produce two-stage audible alarm signals with light-flash patterns synchronised to the audible alarms
- Two volume settings, configurable by DIP switch
- Four DIP switch configurable audible tone sets including ISO 8201 temporal pattern (T3) evacuation signals
- Field test mode enabled by DIP Switch
- DIP switches accessible only when the device is not plugged in to a base
- All LASS devices on a loop pair can be synchronised in Pertronic F220 systems (Requires loop driver II firmware version 4.08.00 or later)
- Compatible with detector base anti-tamper feature
- Rotary address switches for loop address configuration
- Base Sounder-Strobe (LASS-BSS-NC) colour-matched to 200 Series detectors (Ivory)
- Sounder component independently tested and SAI Global StandardsMark certified to AS ISO 7240.3:2014
- Suitable for retrofit to Pertronic F120A systems using existing detector base(s)

Specification

	LASS-WST-NC	LASS-WSS-NC	LASS-BSS-NC	Note
High Volume	N/A	90 ± 4 dB (A)	92 ± 3 dB (A)	1m, Tone 21 @ 24 V
		92 ± 3 dB (A)	95 ± 3 dB (A)	1m, Tone 13 @ 24 V
		91 ± 5 dB (A)	95 ± 4 dB (A)	1m, Tone 12 @ 24 V
		95 ± 5 dB (A)	94 ± 7 dB (A)	1m, Tone 19 @ 24 V
Low Volume	N/A	86 ± 3 dB (A)	89 ± 3 dB (A)	1m, Tone 21 @ 24 V
		86 ± 4 dB (A)	89 ± 3 dB (A)	1m, Tone 13 @ 24 V
		81 ± 3 dB (A)	85 ± 5 dB (A)	1m, Tone 12 @ 24 V
		84 ± 6 dB (A)	85 ± 5 dB (A)	1m, Tone 19 @ 24 V
Alarm Current	< 8 mA	< 11 mA		High Volume, 24 V dc
		< 8.5 mA		Low Volume, 24 V dc
Weight	156 ± 6 g	176 ± 6 g	196 ± 6 g	
Coverage Volume	W-3-6/O-3-6		C-3-3	
Dimensions	47 x 122 mm		52 x 122 mm	(H x Dia.)
Operating Voltage	15 V dc to 32 V dc			Nominal 24 V dc
Avg. Standby Current	< 400 µA			24 Vdc, no alarm signal
Flash Intensity	> 1 cd			
Operating Temp	- 25 ºC to 70 ºC			
Humidity	10 % to 95 %			RH, non-condensing
Ingress Protection	IP 33			

Sound (Tone) Settings

Tone Set	First Stage	Second Stage
0 0	Tone 21 T3 ISO8201 Evacuate (Sweep) 1200HZ 400HZ 1 Sec 4 Sec	Tone 12 AS2220 Alert 420HZ Off 0.625 Sec 0.625 Sec
0 1	Tone 13 AS2220 Evacuate 1200HZ 500HZ 0.25 Sec 3.75 Sec	Tone 12 AS2220 Alert 420HZ Off 0.625 Sec 0.625 Sec
1 0	Tone 12 AS2220 Alert 420HZ Off 0.625 Sec 0.625 Sec	Tone 13 AS2220 Evacuate 1200HZ 500HZ 0.25 Sec 3.75 Sec
1 1	Tone 19 T3 ISO8201 Evacuate (Intermittent) 950HZ Off 1 Sec 4 Sec	Tone 12 AS2220 Alert 420HZ Off 0.625 Sec 0.625 Sec

.

Ordering Information

Product Code	Description
LASS-WSS-NC	Addressable Sounder-Strobe (requires B501AUS Base)
LASS-BSS-NC	Addressable Base Sounder-Strobe (requires B501AUS Base)
LASS-WST-NC	Addressable Strobe (requires B501AUS Base)

The information in this document must not be treated as partial or complete instructions for the design, construction, installation, commissioning, or maintenance of fire detection, fire alarm, or building evacuation systems. Fire and evacuation systems must be designed and installed by properly qualified persons, in accordance with all regulatory requirements.
Unless explicitly stated otherwise, this document provides typical specifications and nominal dimensions. Actual product performance and dimensions may vary.
All information in this document is subject to change. Please consult Pertronic Industries or visit our web site for up to date information.
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AA Dual Input, Dual Output Module

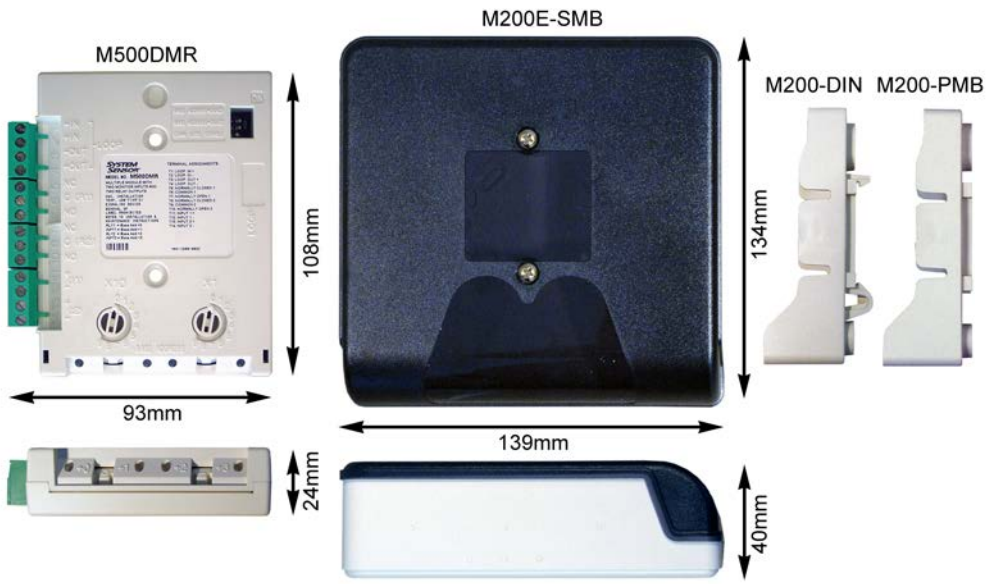
Product Overview:

The System Sensor **M500DMR Analogue Addressable Dual Input, Dual Output Module** supervises two input circuits from external switch devices and also provides two unmonitored single pole volt-free changeover contacts for external devices. Input channels are capable of both latched and analogue supervision: there are three separate latched states, normal, open circuit and combined alarm/short. The analogue supervision continuously monitors the supervised circuit, returning a signal proportional to the circuit resistance.

The module may be mounted in either a wall box, on a DIN rail, or inside any type of enclosure. Irrespective of the chosen mounting method, the address switch is both visible and accessible for selection.

To assist maintenance and fault-finding, both the LEDs and the address switches are visible without removing the surface mounting box cover.

The M500DMR incorporates a loop isolator that isolates the loop in and loop out connections in the event of a short circuit on either loop connection.



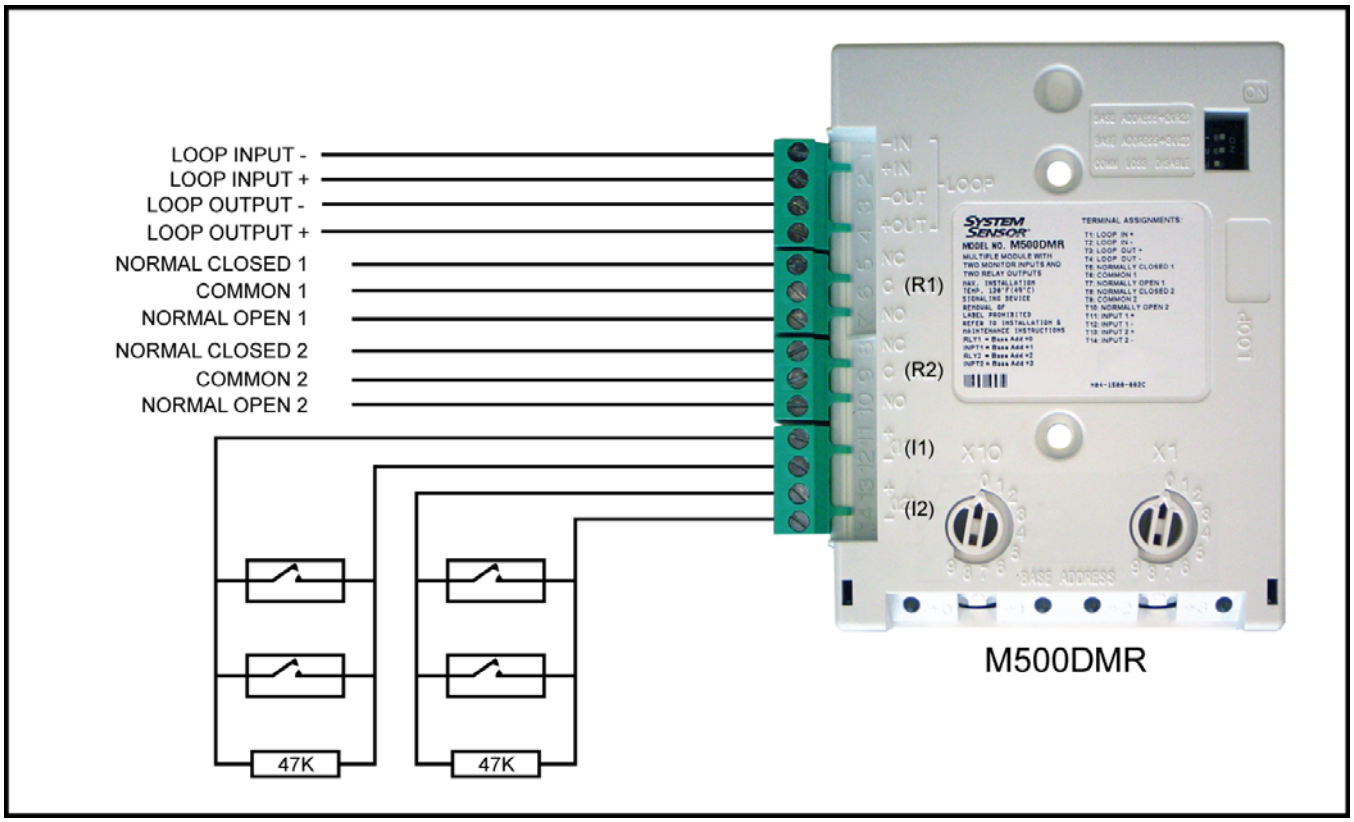
Features:

- » Dual Input, Dual Output Module
- » Input 2 (I2) and Relay 2 (R2) may be disabled individually using module DIP switches
- » Incorporates an Isolator for the Analogue Addressable Loop
- » Common mechanical platform for box, panel and DIN Rail mount versions
- » Four red indicator LEDs with wide viewing angle
- » Module base address programmed with rotary address switches: Visible and selectable in two planes
- » Uses 2, 3, or 4 loop address spaces

Specifications:

»	Addressing	Module Base Address	= Relay #1	R1
		Module Base Address +1	= Input #1	I1
		Module Base Address +2	= Relay #2	R2
		Module Base Address +3	= Input #2	I2
»	Dimensions	94 x 108 x 24	W x H x D mm	
»	Surface Mount Box Dimensions	137 x 132 x 40	W x H x D mm	
»	Maximum Wire Gauge	2.5 mm²		
»	Operating Voltage Range	15 VDC to 32 VDC		
»	EOL Resistance (monitor input)	47 kΩ		
»	Supervisory Voltage (monitor input)	8.8 VDC		
»	Standby Current for complete product	1 mA		
»	Relay Contact Rating	2 A @ 30 VDC		
»	Operating Temperature Range	-5°C to 50°C		
»	Humidity Range	10% to 93% RH, non-condensing		

Connection Diagram:



Ordering Information:

Product Code	Description
M500DMR	Addressable Dual Input, Dual Output Module (Uses M200E-SMB Mounting Box)
M200E-SMB	Surface Mount Box for 200 Series Addressable Modules -Euro
M200E-DIN	DIN Rail Mounting Brackets

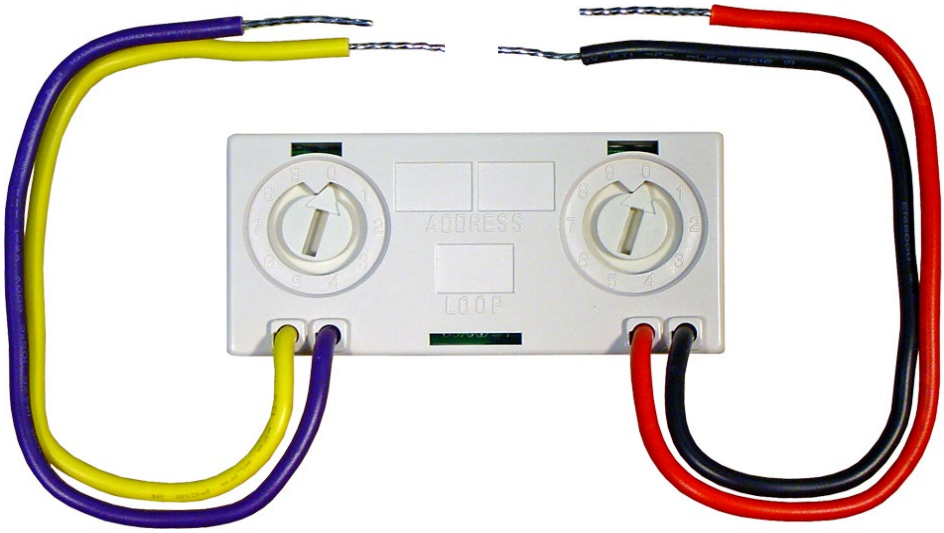
Addressable Single Input Mini Module

Product Overview:

The M501M Mini-Module is designed to fit inside devices or inside junction boxes, behind the devices. It may be used to interface with contact devices, such as security contacts, water-flow switches, Manual Call-Points etc. It cannot be used to supply power to any device, such as conventional detectors.

Conventional four-wire smoke detectors can be monitored through the Alarm contacts, wired across the initiating circuit of the module, but they still require a separate power source.

In addition to transmitting the supervised state of the monitored device (Normal, Short/Alarm or Open) the full analogue measurement of the supervised circuit is sent to the panel. The advantage of this additional feature is that impedance changes in the supervised loop to the monitored device can be detected.



M501M Mini-Module

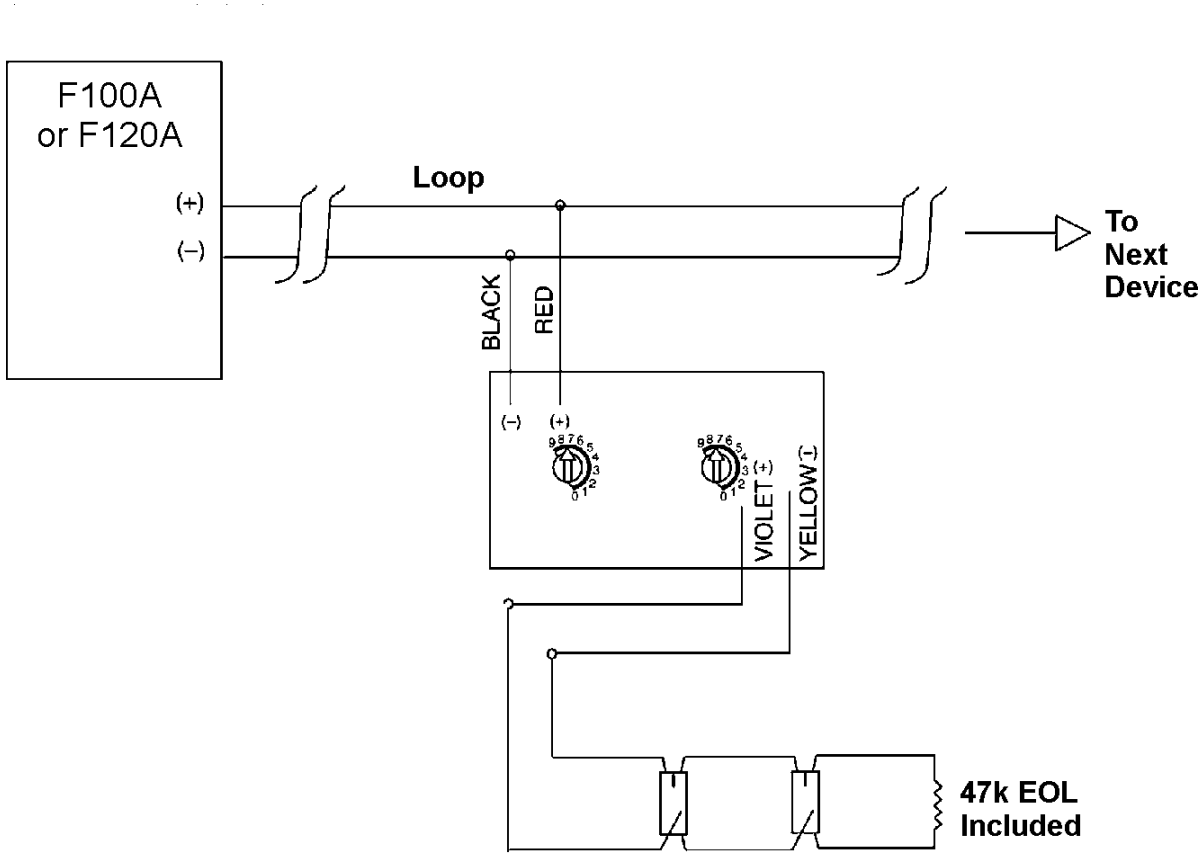
Features:

- » Analogue addressable communications
- » Interface with sprinkler switches, 4-wire conventional detectors
- » Direct dial decade address entry
- » Low standby current
- » Flexible mounting options
- » Independently tested and SAI Global StandardsMark certified to AS ISO 7240.18:2015

Specifications:

»	Dimensions	72 x 35 x 13	W x H x D mm (excluding cables)
»	Shipping Weight	37 g	
»	Wire Length Supplied	150 mm Minimum	
»	Operating Temperature Range	0°C to 50°C	
»	Relative Humidity	10 to 93% RH, Non-Condensing	
»	Voltage Range	15 to 32VDC	
»	Standby Current @ 24VDC	400 µA Max	with 47 kΩ EOL fitted
»	Alarm Current @ 24VDC	550 µA	
»	Maximum Circuit Resistance	20 Ω	supervised circuit
»	Colour	Red, RAL3001	

Connection Diagram:



Ordering Information:

Product Code	Description
M501M	Addressable Single Input Mini Module

PERTRONIC INDUSTRIES LTD

DATASHEET

Outdoor Strobe SRHKRLFIRE

Overview

The Outdoor Strobe (SRHKRLFIRE) is a conventional (dc-operated) alarm device with a red lens. It is suitable for applications requiring a very bright red visual alarm, over and above the performance of standard AS ISO 7240.23 listed devices.

UL listed for wall and ceiling mount applications in wet environments, the SRHKRLFIRE provides seven configurable brightness levels. Rear-mounted switches allow the brightness to be configured in the field.

This alarm device is supplied with a plug-in mounting plate that allows the wiring to be installed and tested without fitting the alarm device. A shorting spring in the mounting base provides electrical continuity when the device is not plugged in.

A captive mounting screw secures the installed device to the mounting base.

The SRHKRLFIRE is supplied complete with a weatherproof plastic back box that accommodates “line in + line out” wiring. The back box features removable side flanges, ¾-inch threaded top and bottom conduit entries, and 19 mm knock-outs at the back.

SpectrAlert Advance
Outdoor Strobe
SRHKRLFIRE

Features

- Weatherproof to NEMA 4X and IP56
- Switch-configurable brightness settings, marked: “15”, “15/75”, “30”, “75”, “95”, “110”, “115”, “135”, “150”, “177” and “185” (see note)
- Red lens
- Fully compatible with 24 volt dc and 24 volt FWR (full wave rectified) systems
- Also operates on 12 volt systems at 15 or 15/75 candela brightness settings
- Mounting plate shorting spring allows wiring continuity check before device installation
- Tamper-resistant construction
- Compatible with Pertronic fire panel Warning System and External Bell outputs
- Plug-in design with minimal intrusion into the back box
- UL listed to UL 1638, “Visible Signaling Devices for Fire Alarm and Signaling Systems, Including Accessories” (public mode)
- This device flashes when provided with a DC power supply of correct voltage and polarity

Note: Brightness Settings

The SRHKRLFIRE is fitted with a red lens. The lens reduces the flash brightness by 85% with respect to the candela settings marked on the device. For example, at the maximum brightness setting (Marked “185”), the SRHKRLFIRE can be expected to provide a brightness of 27 candela.

Note: Listing

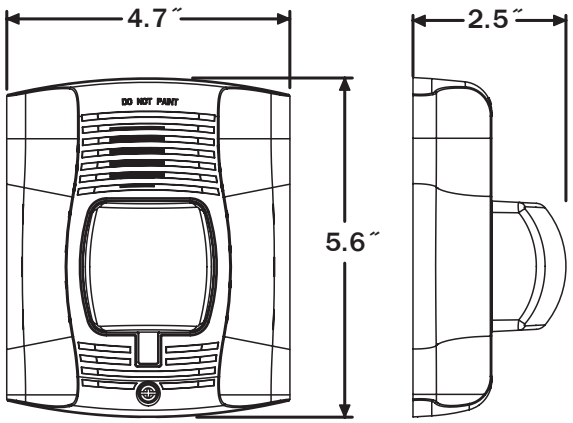
The SRHKRLFIRE is not listed under AS 7240.

Specification

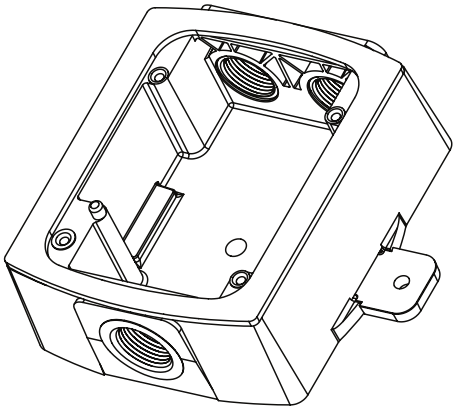
Strobe Flash Rate		1 flash per second
Nominal Voltage		Regulated 24 volt dc or 24 volt FWR (see note)
		Regulated 12 volt dc or 12 volt FWR (15 and 15/75 candela settings only)
Operating Voltage Range	**24 volt**	16 to 33 volts
	12 volt	8 to 17.5 volts
Dimensions		145 H x 130 W x 115 mm D mm (including lens and back box, excluding mounting tabs)
Operating Temperature		- 40 °C to 66 °C

Note: Full wave rectified (FWR) voltage is a non-regulated, time-varying power source that is used on some supply and panel outputs.

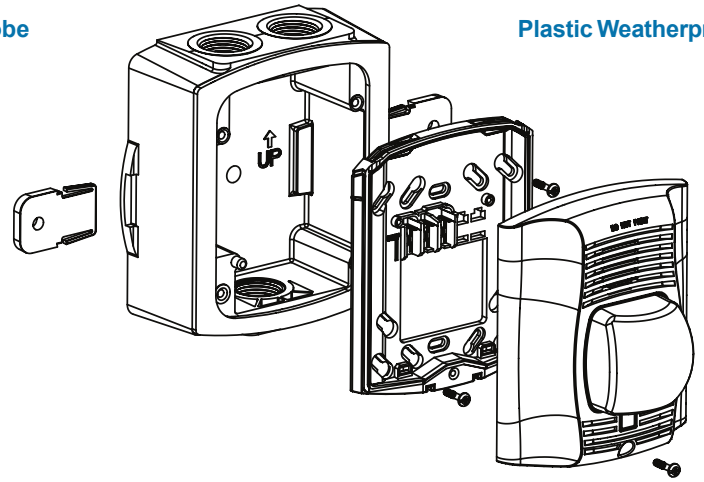
Outline Drawings



Strobe and Sounder + Strobe



Plastic Weatherproof Back Box



Sounder + Strobe with Plastic Weatherproof Back Box

Ordering Information

Product Code	Description
SRHKRLFIRE	2 Wire Outdoor VAD, High Candela, Red Body, Red Flash, 12/24 V dc

The information in this document must not be treated as partial or complete instructions for the design, construction, installation, commissioning, or maintenance of fire detection, fire alarm, or building evacuation systems. Fire and evacuation systems must be designed and installed by properly qualified persons, in accordance with all regulatory requirements.
Unless explicitly stated otherwise, this document provides typical specifications and nominal dimensions. Actual product performance and dimensions may vary.
All information in this document is subject to change. Please consult Pertronic Industries or visit our web site for up to date information.
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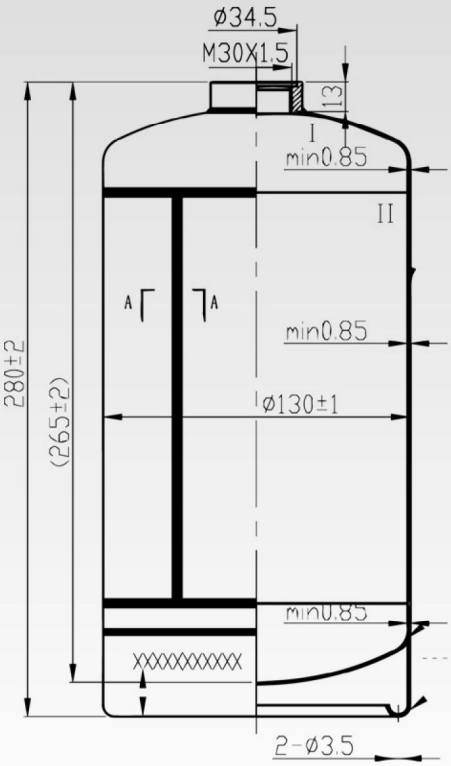
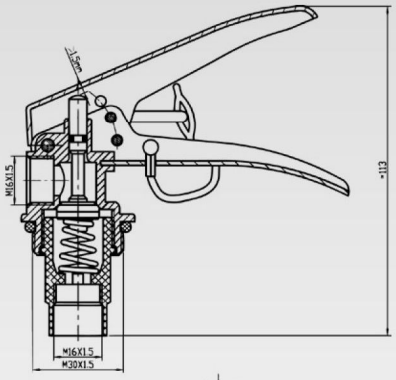
TECHNICAL DATA

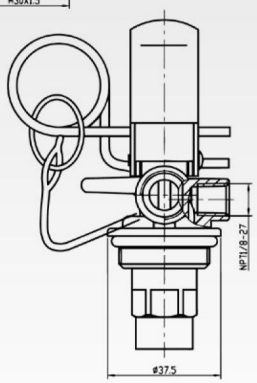
8.6 FIRE EXTINGUISHERS

G2.5ABEVB

TECHNICAL DATA SHEET







Technical Details

Part Number	**G2.5ABEVB**
Model Number	FSZ2520GO
Agent Capacity	2.5kg
Agent Type	ABE Dry Chemical Powder
Agent Manufacturer	FlameStop Australia Pty Ltd
Total Mass	4.3kg
Fire Rating	**4A:40B:E**
Approvals	AS/NZS 1841.5
Nozzle Size	3.8mm
Pressure	1400kPa
Discharge Time	14.3 seconds
Dimensions	W130 x H383mm
Cylinder Pressure Test	5 Yearly
Periodic Test Pressure	2.5MPa
Cylinder Construction	Steel
Valve Construction	Brass
Cylinder Finish	Powder Coated Red
Handle Finish	Stainless Steel
Valve Finish	Nickel Plated Brass

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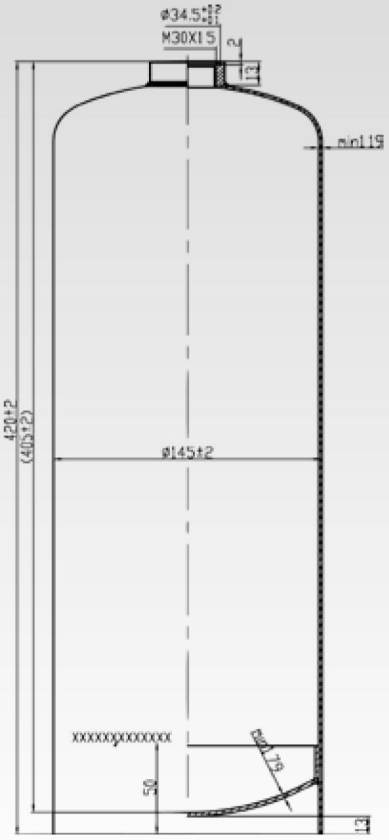
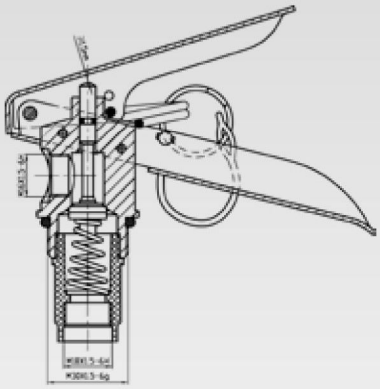
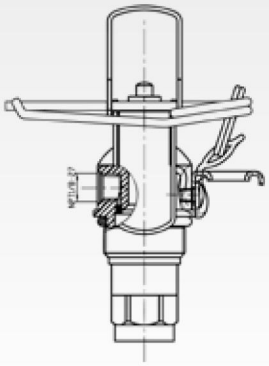
G4.5ABEHP

TECHNICAL DATA SHEET







Technical Details

Part Number	**G4.5ABEHP**
Model Number	FSZ4520HP
Agent Capacity	4.5kg
Agent Type	ABE Dry Chemical Powder
Agent Manufacturer	FlameStop Australia Pty Ltd
Total Mass	7.9kg
Fire Rating	**10A:80B:C:E**
Approvals	AS/NZS 1841.5
Nozzle Size	4.1mm
Pressure	1400kPa
Discharge Time	22 seconds
Dimensions	W145 x H500mm
Cylinder Pressure Test	5 Yearly
Periodic Test Pressure	2.5MPa
Cylinder Construction	Steel
Valve Construction	Stainless Steel
Cylinder Finish	Powder Coated Red
Handle Finish	Stainless Steel
Valve Finish	Nickel Plated Brass

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CSIRO Verification Services
Clayton, Victoria, Australia
+61 13 0036 3400
https://activfire.csiro.au

ACTIVE FIRE PROTECTION – PRODUCT CERTIFICATION

Certificate of Conformity

Certificate num.	Registration date	Version Number	Version Issue date	Valid until	Page 1 of 4
afp - 2399	10-Feb-2010	16	1-May-2022	30-Apr-2023	

Product designation

Flamestop, FSW/FSZ Series, powder type portable fire extinguishers

(Refer to the Schedule/enclosures for further specified details)

Agent/distributor

FlameStop Australia Pty. Ltd.
1/70 Gibbes St, CHATSWOOD, NSW, AUSTRALIA, 2067

Registrant

FlameStop Australia Pty. Ltd.
1/70 Gibbes St, CHATSWOOD, NSW, AUSTRALIA, 2067

Producer

FlameStop Australia Pty. Ltd.
1/70 Gibbes St, CHATSWOOD, NSW, AUSTRALIA, 2067

Conformance criteria and evaluation

The Flamestop, FSW/FSZ Series, powder type portable fire extinguishers have been evaluated and verified as conforming with the relevant requirements of the following criteria.

1. Australian/New Zealand Standard AS/NZS 1841.5:2007, 'Portable fire extinguishers - Specific requirements for powder type extinguishers'.

Limitations/conditions of conformance

Limitations/conditions of conformance, where identified on this certificate, are derived from qualifications from evaluation(s) for conformity and/or other related technical documentation. All details with respect to design, assembly and installation instructions and restrictions should be checked against the producer's current technical manual/data sheets and the requirements of the Authority having Jurisdiction.

Specified limitations/conditions, determined from the evaluation for conformity, include the following.

i. Powder type fire extinguishers are suitable for use on Classes A, B and E fires.

This certification is issued within the scope of CSIRO Verification Services – Rules governing ActivFire Scheme and is valid only for the product(s) as submitted for evaluation and verification of conformity, subject to the following conditions.

- Reference to details, limitations and requirements, where documented as a schedule/enclosure with this certificate.
- The Registrant is responsible for their attestation of conformity and ensuring that on-going production complies with the conformance criteria defined in this certificate.
- This certificate will not be valid if any changes or modifications are made to the product which have not been notified and validated by CSIRO Verification Services.
- This certificate is subject to periodical re-validation upon verification that all requirements, as determined by the conformity assessment body, continue to be satisfactorily met by the Registrant.
- This certificate may only be reproduced in its published form, without modification and inclusive of all schedules/enclosures.
- Any changes, errors or omissions, must be submitted in writing and if necessary or requested, substantiated with relevant evidence.
- Any representations, such as advertising or other marketing related activities or articles shall reflect the correct contents of this certificate and conform with all relevant trade practices .and consumer protection legislation and regulations.
- Any terms or conditions of use as applicable to content and documentation as published or accessed through web sites administered by the CSIRO Verification Services.

Issued by

David Whittaker
Executive Officer – ActivFire Scheme

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This certificate remains the property of CSIRO and may be subject to amendment, suspension or withdrawal at any time.
The validity and authenticity of this certificate can be verified by the certification register located at https://activfire.csiro.au

Schedule to
Certificate of Conformity

Certificate num.	Registration date	Version		Valid until	
		Number	Issue date		
afp - 2399	10-Feb-2010	16	1-May-2022	30-Apr-2023	

Producer's description

Suitable for all paper, textiles, wood, plastics, rubber, petrol, oil, paints, LPG, CNG, Acetylene and electrically charged equipment, ABE powder type extinguishers have a wide application. Consideration must be made in relation to the location and usage of this product as the fine powder which is discharged may cause specific concerns or damage.

Technical specification

The following details are a representative extract of the technical specification for the Flamestop, FSW/FSZ Series, powder type portable fire extinguishers and may be subject to change. Complete and current details should be determined from the designated producer's technical manual/data sheets.

Schedule of variant designations

The following is a schedule of validated variant designations of the certified/listed equipment.

Trade brand	Model num.	Agent capacity	Agent type	Reference num.	Fire rating
Flamestop	FSW100	1.0 kg	ABE Dry Chemical Powder	20621-DA-6301	2A:30B:E
	FSZ150	1.5 kg		20621-DA-6319	2A:20B:E
	FSZ200	2.0 kg		20621-DA-6305	3A:30B:E
	FSZ250	2.5 kg		20621-DA-6309	3A:40B:E
	FSZ250GO	2.5 kg		20621-DA-6324	3A:40B:E
	FSZ450	4.5 kg		20621-DA-6311	4A:60B:E
	FSZ450H	4.5 kg		20621-DA-6322	4A:80B:E
	FSZ450GO	4.5 kg		20621-DA-6325	4A:60B:E
	FSZ600	6.0 kg		20621-DA-6313	4A:80B:E
	FSZ900	9.0 kg		20621-DA-6315	6A:80B:E
	FSZ900H	9.0 kg		20621-DA-6323	6A:80B:E
	FSZ150	1.5kg		20621-BB-6319 20621-DA-6319 20621-DB-6319 20621-DC-6319 20621-DD-6319 20621-DE-6319	2A:30B:E
	FSZ01FK	1.0kg		20621-DC-6329 20621-BB-6329	2A:20B:E
	FSZ100N	1.0kg		20621-BB-6331 20621-DA-6331	2A:20B:E
	FSZ100H	1.0kg		20621-BB-6332 20621-DA-6332	2A:20B:E
	FSZ2520GO-SS	2.5kg		20621-BB-6341 20621-DA-6341	4A:40B:E
	FSZ2520GO	2.5kg		20621-BB-6334 20621-DA-6334	4A:40B:E
	FSZ4520GO	4.5kg		20621-BB-6324 20621-DA-6324 20621-DA-6334	6A:80B:C:E
	FSZ4520HP	4.5kg		20621-BB-6345 20621-DA-6345	10A:80B:C:E
	FSZ4520HP-SS	4.5kg		20621-BB-6342 20621-DA-6342	10A:80B:C:E
	FSZ920GO	9.0kg		20621-BB-6336 20621-DA-6336	10A:80B:C:E
	FSZ920HP	9.0kg		20621-BB-6337 20621-DA-6337	10A:80B:C:E
	FSZ920HP-SS	9.0kg		20621-BB-6343 20621-DA-6343	10A:80B:C:E
	FSZ2320GO	2.3kg		20621-BB-6339 20621-DA-6339	4A:40B:C:E
	FSZ220GO	2kg		20621-BB-6333	3A:30B:E

Schedule to
Certificate of Conformity

Certificate num.	Registration date	Version		Valid until	
		Number	Issue date		
afp - 2399	10-Feb-2010	16	1-May-2022	30-Apr-2023	

Schedule of properties/characteristics

The following schedule is an extract of physical and operational properties/characteristics of the certified/listed equipment.

Model num.:	FSW100	FSZ150	FSZ200	FSZ250	FSZ250GO	FSZ450	FSZ450H	FSZ450GO	FSZ600	FSZ900	FSZ900H
Part num.:	G1ABESVB	G1.5ABESVB	G2.0ABEVB	G2.5ABEW G2.5ABEVB	G2.5ABEVB	G4.5ABE	G4.5ABEHP	G4.5ABE	G6.0ABE	G9ABE	G9ABEHP
Agent type:	ABE dry chemical powder										
Total mass:	1.5 kg	3.2 kg	3.8 kg	4.5 kg	4.3 kg	7.9 kg	7.9 kg	7.2 kg	9.7 kg	13.9 kg	14.2 kg
Discharge time:	8 secs	9 secs	11.3 secs	14.3 secs	14.3 secs	19 secs	2 secs	19 secs	21 secs	22 secs	22 secs
Pressure:	1350 kPa	1400 kPa									
Periodic test pressure:	2.5 MPa										
Dimensions											
Height:	185 mm	370 mm	395 mm	430 mm	430 mm	450 mm	530 mm	530 mm	550mm	615 mm	615 mm
Width:	85 mm	100 mm	110 mm	110mm	110 mm	150mm	145 mm	145 mm	160mm	183 mm	183 mm
Construction											
Cylinder:	Steel										
Valve:	Brass										
Finish											
Cylinder:	Powder coated red										
Valve:	Nickel plated brass										
Handles:	Stainless steel										
Reference technical data sheet	FlameStop ABE 1.0kg Extinguisher, 26-Nov-2009	FlameStop ABE 1.5kg Extinguisher, 26-Nov-2009	FlameStop ABE 2.0kg Extinguisher, 26-Nov-2009	FlameStop ABE 2.5kg Extinguisher, 26-Nov-2009	FlameStop ABE 2.5kg Extinguisher, 5-Oct-2016	FlameStop ABE 4.5kg Extinguisher, 26-Nov-2009	FlameStop 4.5kg HP ABE powder type fire extinguisher, 8-Jul-2013	FlameStop 4.5kg HP ABE powder type fire extinguisher, 8-Jul-2013	FlameStop ABE 6.0kg Extinguisher, 26-Nov-2009	FlameStop 9kg ABE powder type - fire extinguisher, 8-Jul-2013	FlameStop 9kg HP ABE powder type - fire extinguisher, 8-Jul-2013

Model num.:	FSZ01FK	FSZ100N	FSZ100H	FSZ2520GO-SS	FSZ2520GO	FSZ4520GO	FSZ450H	FSZ4520HP	FSZ4520HP-SS	FSZ920GO
Part num.:	G1ABE-FF2	G1ABESVB	G1HABE	G2.5ABEVBSS	G2.5ABEVB	G4.5ABE	G4.5ABEHP	G4.5ABEHP	G4.5ABEHPSS	G9ABE
Agent type:	ABE dry chemical powder									
Total mass:	1.8 kg	1.98 kg	2.08 kg	4.3 kg	4.3 kg	7.3 kg	-	7.9 kg	4.5 kg	13.8 kg
Discharge time:	8 secs	8 secs	8 secs	14.3 secs	14.3 secs	22 secs	-	22 secs	22 secs	22 secs
Pressure:	1000 kPa	1000 kPa	1000 kPa	1400 kPa	1400 kPa	1400 kPa	-	1400 kPa	1400 kPa	1400 kPa
Periodic test pressure:	2.5 MPa									
Dimensions										
Height:	265 mm	351 mm	351 mm	365 mm	383 mm	480 mm	-	500 mm	525 mm	555 mm
Width:	90 mm	85 mm	85 mm	130mm	130 mm	145 mm	-	145 mm	145 mm	181 mm
Construction										
Cylinder:	Steel									
Valve:	Brass									
Finish										
Cylinder:	Powder coated red									
Valve:	Nickel plated brass									
Handles:	Stainless steel									
Reference technical data sheet	FlameStop, G1ABE-FF2, Nov-2020	FlameStop, G1ABESVB, Nov-2020	FlameStop, G1HABE, Nov-2020	FlameStop, G2.5ABEVBSS, Nov-2020	FlameStop, G2.5ABEVB, Nov-2020	FlameStop, G4.5ABE, Nov-2020	-	FlameStop, G4.5ABEHP, Nov-2020	FlameStop, G4.5ABEHPSS, Nov-2020	FlameStop G9ABE, Nov-2020

Model num.:	FSZ920HP	FSZ920HP-SS	FSZ2320GO
Part num.:	G9ABEHP	G9ABEHPSS	G2.3ABE
Agent type:	ABE dry chemical powder		
Total mass:	9.0 kg	12.5 kg	2.3 kg
Discharge time:	22 secs	22 secs	13 secs
Pressure:	1400 kPa	1400 kPa	1400 kPa
Periodic test pressure:	2.5 MPa		
Dimensions			
Height:	555 mm	555 mm	460 mm
Width:	180 mm	180 mm	105 mm
Construction			
Cylinder:	Steel		
Valve:	Brass		
Finish			
Cylinder:	Powder coated red		
Valve:	Nickel plated brass		
Handles:	Stainless steel		
Reference technical data sheet	FlameStop G9ABEHP, Nov-2020	FlameStop, G9ABEHPSS, Nov-2020	FlameStop, G2.3ABE, Nov-2020

Schedule to
Certificate of Conformity

Certificate num.	Registration date	Version		Valid until	
		Number	Issue date		
afp - 2399	10-Feb-2010	16	1-May-2022	30-Apr-2023	

Supplementary information

Schedule of relevant articles

The following schedule is an extract of articles significant and/or related as evidence of conformity.

Reference		Title / description	Date issued (or date validated)	Source
Ident. type	**Ident.**			
Certificate No.	SMKH20621	StandardsMark Licence Manufactured to AS/NZS 1841.5:2007, ''Portable fire extinguishers - Specific requirements for powder type extinguishers'	15-Sep- 2020	SAI Global, AU

STANDARDSMARK LICENCE

SAI Global hereby grants:

Flamestop Australia Pty Ltd

ABN 15 060 627 965

13 Chaplin Drive, Lane Cove West, NSW 2066, Australia

StandardsMark Licence

Manufactured to:

AS/NZS 1841.5:2007 - Portable fire extinguishers - Specific requirements for powder type extinguishers

"the StandardsMark Licensee" the right to use the STANDARDSMARK as shown below only in respect of the goods described and detailed in the Schedule which are produced by the Licensee or on behalf of the Licensee* and which comply with the appropriate Standard referred to above as from time to time amended. The Licence is granted subject to the rules governing the use of the STANDARDSMARK and the Terms and Conditions for certification and licence. The Licensee covenants to comply with all the Rules and Terms and Conditions.

Certificate No:SMKH20621

Issued: 10 September 2021
Expires: 30 November 2026

Originally Certified: 1 December 2006
Current Certification: 9 September 2021

Frank Camasta
Global Head of Technical Services
SAI Global Assurance

Certified Product™ Australian Standard

JAS-ANZ

WWW.JAS-ANZ.ORG/REGISTER

*** For details of manufacture, refer to the licensee**

The STANDARDSMARK is a registered certification trademark of SAI Global Pty Limited (A.C.N. 050 644 642) and is issued under licence by SAI Global Certification Services Pty Limited (ACN 108 716 669) ("SAI Global") 680 George Street, Sydney NSW 2000, GPO Box 5420 Sydney NSW 2001. This certificate remains the property of SAI Global and must be returned to SAI Global upon its request. Refer to www.saiglobal.com, for the list of product models.

SAI GLOBAL
INFORM. INSPIRE. IMPROVE.

SCHEDULE TO
STANDARDSMARK LICENCE

SAI Global hereby grants:

Flamestop Australia Pty Ltd

13 Chaplin Drive, Lane Cove West, NSW 2066, Australia

StandardsMark Licence

Manufactured to:

AS/NZS 1841.5:2007 - Portable fire extinguishers - Specific requirements for powder type extinguishers

Model identification of the goods on which the STANDARDSMARK may be used:

Size	Model Number	Classification and Rating	Reference Number	Date Endorsed
1	FSW100	1A:20B:E	20621-DD-6301	25 Aug 2009
1	FSW100	1A:20B:E	20621-DB-6301	25 Aug 2009
1	FSW100	1A:20B:E	20621-BB-6301	25 Aug 2009
1	FSW100	1A:20B:E	20621-DC-6301	25 Aug 2009
1	FSW100	1A:20B:E	20621-DE-6301	25 Aug 2009
1	FSW100	1A:20B:E	20621-DA-6301	25 Aug 2009
1.0	FSZ01B	1A:20B:E	20621-DC-6321	10 Sep 2014
1.0	FSZ01FK	2A:20B:E	20621-DC-6329	2 Sep 2020
1.0	FSZ01FK	2A:20B:E	20621-BB-6329	2 Sep 2020
1.0	FSZ100	1A:20B:E	20621-DF-6301	28 May 2012
1.0	FSZ100H	2A:20B:E	20621-BB-6332	2 Sep 2020
1.0	FSZ100H	2A:20B:E	20621-DA-6332	2 Sep 2020
1.0	FSZ100N	2A:20B:E	20621-DA-6331	2 Sep 2020
1.0	FSZ100N	2A:20B:E	20621-BB-6331	2 Sep 2020
1.5	FSZ150	2A:30B:E	20621-DB-6319	7 Feb 2014
1.5	FSZ150	2A:30B:E	20621-DA-6319	7 Feb 2014
1.5	FSZ150	2A:30B:E	20621-DD-6319	7 Feb 2014
1.5	FSZ150	2A:30B:E	20621-BB-6319	7 Feb 2014
1.5	FSZ150	2A:30B:E	20621-DC-6319	7 Feb 2014
1.5	FSZ150	2A:30B:E	20621-DE-6319	7 Feb 2014
2.0	FSZ200	3A:30B:E	20621-BB-6305	16 Apr 2015
2.0	FSZ200	3A:30B:E	20621-DA-6305	17 Aug 2009
2.0	FSZ200	3A:30B:E	20621-DF-6305	28 May 2012
2.0	FSZ220GO	3A:30B:C:E	20621-BB-6333	20 Jan 2021

Certificate No: SMKH20621 Issued Date: 10 September 2021

This schedule supersedes all previously issued schedules

*** For details of manufacture, refer to the licensee**

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Size	Model Number	Classification and Rating	Reference Number	Date Endorsed
2.0	FSZ220GO	3A:30B:C:E	20621-DA-6333	20 Jan 2021
2.3	FSZ2320GO	4A:40B:C:E	20621-BB-6339	8 Sep 2020
2.3	FSZ2320GO	4A:40B:C:E	20621-DA-6339	8 Sep 2020
2.5	FSZ250	3A:40B:E	20621-DA-6309	26 Jun 2009
2.5	FSZ250	3A:40B:E	20621-DF-6309	28 May 2012
2.5	FSZ250	3A:40B:E	20621-DB-6309	26 Jun 2009
2.5	FSZ250	3A:40B:E	20621-DC-6309	26 Jun 2009
2.5	FSZ250	3A:40B:E	20621-BB-6309	26 Jun 2009
2.5	FSZ250	3A:40B:E	20621-DE-6309	26 Jun 2009
2.5	FSZ250	3A:40B:E	20621-DD-6309	26 Jun 2009
2.5	FSZ250GO	3A:40B:E	20621-BB-6324	1 Oct 2014
2.5	FSZ250GO	3A:40B:E	20621-DA-6324	1 Oct 2014
2.5	FSZ2520GO	4A:40B:E	20621-BB-6334	2 Sep 2020
2.5	FSZ2520GO	4A:40B:E	20621-DA-6334	2 Sep 2020
2.5	FSZ2520GO-SS	4A:40B:C:E	20621-DA-6341	2 Sep 2020
2.5	FSZ2520GO-SS	4A:40B:C:E	20621-BB-6341	2 Sep 2020
4.5	FSZ450	4A:60B:E	20621-DC-6311	26 Jun 2009
4.5	FSZ450	4A:60B:E	20621-DD-6311	26 Jun 2009
4.5	FSZ450	4A:60B:E	20621-BB-6311	26 Jun 2009
4.5	FSZ450	4A:60B:E	20621-DE-6311	26 Jun 2009
4.5	FSZ450	4A:60B:E	20621-DF-6311	28 May 2012
4.5	FSZ450	4A:60B:E	20621-DB-6311	26 Jun 2009
4.5	FSZ450	4A:60B:E	20621-DA-6311	26 Jun 2009
4.5	FSZ450GO	4A:60B:E	20621-DA-6325	1 Oct 2014
4.5	FSZ450GO	4A:60B:E	20621-BB-6325	1 Oct 2014
4.5	FSZ450H	4A:80B:E	20621-DA-6322	5 Aug 2012
4.5	FSZ450H	4A:80B:E	20621-BB-6322	10 Sep 2014
4.5	FSZ4520GO	6A:80B:C:E	20621-BB-6344	2 Sep 2020
4.5	FSZ4520GO	6A:80B:C:E	20621-DA-6344	2 Sep 2020
4.5	FSZ4520HP	10A:80B:C:E	20621-DA-6345	2 Sep 2020
4.5	FSZ4520HP	10A:80B:C:E	20621-BB-6345	2 Sep 2020
4.5	FSZ4520HP-SS	10A:80B:C:E	20621-BB-6342	2 Sep 2020
4.5	FSZ4520HP-SS	10A:80B:C:E	20621-DA-6342	2 Sep 2020
4.5	WZ450H	4A:80B:E	20621-DF-6326	7 Feb 2014
6	FSZ600	4A:80B:E	20621-DE-6313	26 Jun 2009
6	FSZ600	4A:80B:E	20621-DB-6313	26 Jun 2009
6	FSZ600	4A:80B:E	20621-DA-6313	26 Jun 2009

Certificate No: SMKH20621 Issued Date: 10 September 2021

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Size	Model Number	Classification and Rating	Reference Number	Date Endorsed
6	FSZ600	4A:80B:E	20621-DD-6313	26 Jun 2009
6	FSZ600	4A:80B:E	20621-BB-6313	26 Jun 2009
6	FSZ600	4A:80B:E	20621-DC-6313	26 Jun 2009
9	FSZ900	6A:80B:E	20621-DA-6315	25 Aug 2009
9	FSZ900	6A:80B:E	20621-DC-6315	26 Jun 2009
9	FSZ900	6A:80B:E	20621-DD-6315	26 Jun 2009
9	FSZ900	6A:80B:E	20621-DE-6315	26 Jun 2009
9	FSZ900	6A:80B:E	20621-BB-6315	26 Jun 2009
9.0	FSZ900	6A:80B:E	20621-DF-6315	28 May 2012
9.0	FSZ900H	6A:80B:E	20621-DA-6323	5 Aug 2012
9.0	FSZ900H	6A:80B:E	20621-BB-6323	10 Sep 2014
9.0	FSZ920GO	10A:80B:C:E	20621-BB-6336	2 Sep 2020
9.0	FSZ920GO	10A:80B:C:E	20621-DA-6336	2 Sep 2020
9.0	FSZ920HP	10A:80B:C:E	20621-DA-6337	2 Sep 2020
9.0	FSZ920HP	10A:80B:C:E	20621-BB-6337	2 Sep 2020
9.0	FSZ920HP-SS	10A:80B:C:E	20621-BB-6343	2 Sep 2020
9.0	FSZ920HP-SS	10A:80B:C:E	20621-DA-6343	2 Sep 2020

End of Record

Certificate No: SMKH20621

Issued Date: 10 September 2021

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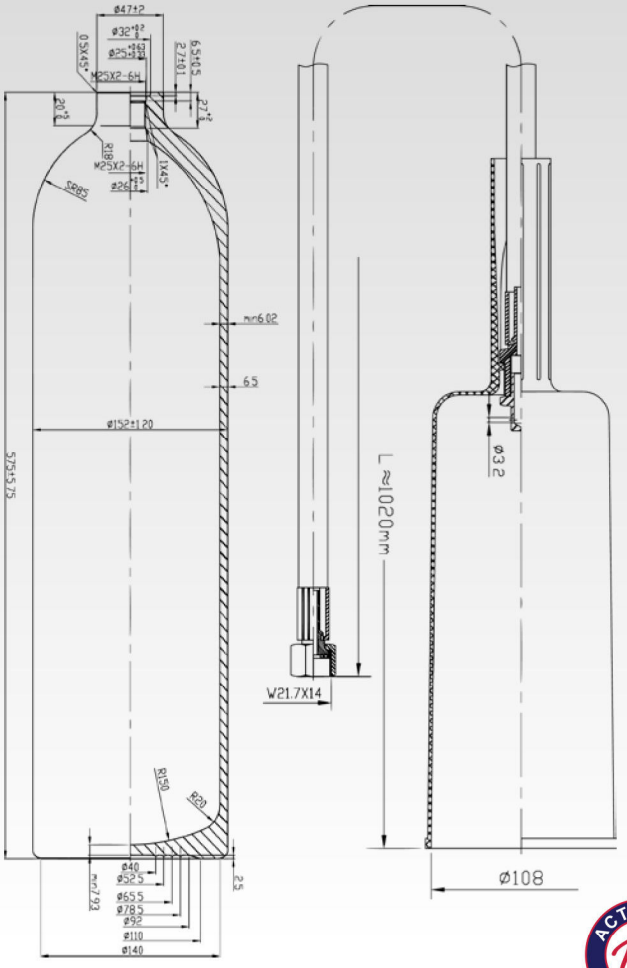
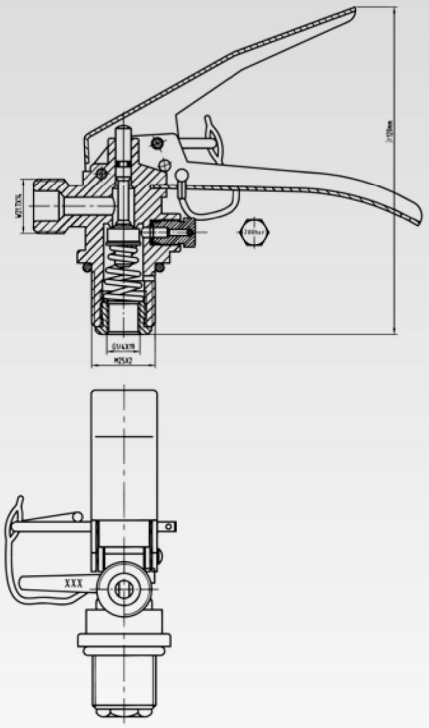
G5.0CO2

TECHNICAL DATA SHEET





Technical Details

Part Number	**G5.0CO2**
Model Number	CO5ALH6
Agent Capacity	5.0kg
Agent Type	Carbon Dioxide
Agent Manufacturer	FlameStop Australia Pty Ltd
Total Mass	11.7kg
Fire Rating	**10B:E**
Approvals	AS/NZS 1841.6
Discharge Time	13 - 16 Seconds
Dimensions	W153 x H680mm
Cylinder Pressure Test	5 Yearly
Periodic Test Pressure	21.5 MPa
Cylinder Construction	Aluminium
Valve Construction	Brass
Cylinder Finish	Powder Coated Red
Handle Finish	Stainless Steel
Valve Finish	Nickel Plated Brass
Handle Finish	Stainless Steel
Valve Finish	Nickel Plated Brass

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CSIRO Verification Services
Clayton, Victoria, Australia
+61 13 0036 3400
https://activfire.csiro.au

ACTIVE FIRE PROTECTION – PRODUCT CERTIFICATION

Certificate of Conformity

Certificate num.	Registration date	Version Number	Version Issue date	Valid until
afp - 2400	10-Feb-2010	15	1-May-2022	30-Apr-2023

Product designation

Flamestop, CO Series, carbon dioxide type portable fire extinguishers

(Refer to the Schedule/enclosures for further specified details)

Agent/distributor

FlameStop Australia Pty. Ltd.
1/70 Gibbes St, CHATSWOOD, NSW, AUSTRALIA, 2067

Registrant

FlameStop Australia Pty. Ltd.
1/70 Gibbes St, CHATSWOOD, NSW, AUSTRALIA, 2067

Producer

FlameStop Australia Pty. Ltd.
1/70 Gibbes St, CHATSWOOD, NSW, AUSTRALIA, 2067

Conformance criteria and evaluation

The Flamestop, CO Series, carbon dioxide type portable fire extinguishers has been evaluated and verified as conforming with the relevant requirements of the following criteria.

1. Australian/New Zealand Standard AS/NZS 1841.6:2007, 'Portable fire extinguishers - Specific requirements for carbon dioxide type extinguishers'.

Limitations/conditions of conformance

Limitations/conditions of conformance, where identified on this certificate, are derived from qualifications from evaluation(s) for conformity and/or other related technical documentation. All details with respect to design, assembly and installation instructions and restrictions should be checked against the producer's current technical manual/data sheets and the requirements of the Authority having Jurisdiction.

Specified limitations/conditions, determined from the evaluation for conformity, include the following.

i. Carbon Dioxide type fire extinguishers are suitable for use on Classes E fires.

This certification is issued within the scope of CSIRO Verification Services – Rules governing ActivFire Scheme and is valid only for the product(s) as submitted for evaluation and verification of conformity, subject to the following conditions.

- Reference to details, limitations and requirements, where documented as a schedule/enclosure with this certificate.
- The Registrant is responsible for their attestation of conformity and ensuring that on-going production complies with the conformance criteria defined in this certificate.
- This certificate will not be valid if any changes or modifications are made to the product which have not been notified and validated by CSIRO Verification Services.
- This certificate is subject to periodical re-validation upon verification that all requirements, as determined by the conformity assessment body, continue to be satisfactorily met by the Registrant.
- This certificate may only be reproduced in its published form, without modification and inclusive of all schedules/enclosures.
- Any changes, errors or omissions, must be submitted in writing and if necessary or requested, substantiated with relevant evidence.
- Any representations, such as advertising or other marketing related activities or articles shall reflect the correct contents of this certificate and conform with all relevant trade practices .and consumer protection legislation and regulations.
- Any terms or conditions of use as applicable to content and documentation as published or accessed through web sites administered by the CSIRO Verification Services.

Issued by

David Whittaker
Executive Officer – ActivFire Scheme

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This certificate remains the property of CSIRO and may be subject to amendment, suspension or withdrawal at any time.
The validity and authenticity of this certificate can be verified by the certification register located at https://activfire.csiro.au

Schedule to
Certificate of Conformity

Certificate num.	Registration date	Version Number	Version Issue date	Valid until	Page 2 of 2
afp - 2400	10-Feb-2010	15	1-May-2022	30-Apr-2023	

Producer's description

For use against electrically energised equipment and in electrical environments (Class E), this equipment has been manufactured to Australian Standards. Extracted from the atmosphere, CO2 is stored in a liquid state and at high pressure. The effect of a CO2 extinguisher can be limited where there is air movement and discharge within a confined space is definitely not recommended.

Technical specification

The following details are a representative extract of the technical specification for the Flamestop, CO Series, carbon dioxide type portable fire extinguishers and may be subject to change. Complete and current details should be determined from the designated producer's technical manual/data sheets.

Schedule of variant designations

The following is a schedule of validated variant designations of the certified/listed equipment.

Model num.	Nett mass	Agent	Brand	Reference num.	Rating
CO2ALH6	2.0 kg	Carbon Dioxide	Flamestop	22111-DG-7104	2B:E
				22111-DG-7107	5B:E
CO35ALH6	3.5 kg			22111-DG-7105	10B:E
CO5ALH6	5.0 kg			22111-DG-7106	10B:E

Schedule of properties/characteristics

The following schedule is an extract of physical and operational properties/characteristics of the certified/listed equipment.

Model num.:	CO2ALH6	CO35ALH5	CO5ALH5
Part ident.:	G2.0CO2	G3.5CO2	G5.0CO2
Total mass:	5.1 kg	9.0 kg	11.7 kg
Discharge time:	8 to 9.5 seconds	10.5 to 14 seconds	13 to 16 seconds
Periodic test pressure:	21.5 MPa		
Dimensions			
Height:	500 mm	535 mm	680 mm
Width:	111 mm	153 mm	153 mm
Construction			
Cylinder:	Aluminium		
Valve:	Brass		
Finish			
Cylinder:	Powder coated red		
Valve:	Nickel plated brass		
Handles:	Stainless steel		
Reference technical data sheet	FlameStop 2kg CO2 type – fire extinguisher, 2016	FlameStop 3.5kg CO2 type – fire extinguisher, 2016	FlameStop 5kg CO2 type – fire extinguisher, 2016

Supplementary information

Schedule of relevant articles

The following schedule is an extract of articles significant and/or related as evidence of conformity.

Reference		Title / description	Date issued (or date validated)	Source
Ident. type	Ident.			
Certificate No.	SMKH22111	StandardsMark Licence Manufactured to AS/NZS 1841.6:2007, 'Portable fire extinguishers - Specific requirements for carbon dioxide type extinguishers'	10-Jun-2016	SAI Global, AU

STANDARDSMARK LICENCE

SAI Global hereby grants:

Flamestop Australia Pty Ltd

ABN 15 060 627 965

13 Chaplin Drive, Lane Cove West, NSW 2066, Australia

StandardsMark Licence

Manufactured to:

AS/NZS 1841.6:2007 - Portable fire extinguishers - Specific requirements for carbon dioxide type extinguishers

"the StandardsMark Licensee" the right to use the STANDARDSMARK as shown below only in respect of the goods described and detailed in the Schedule which are produced by the Licensee or on behalf of the Licensee* and which comply with the appropriate Standard referred to above as from time to time amended. The Licence is granted subject to the rules governing the use of the STANDARDSMARK and the Terms and Conditions for certification and licence. The Licensee covenants to comply with all the Rules and Terms and Conditions.

Certificate No:SMKH22111

Issued: 26 August 2021
Expires: 19 May 2026

Originally Certified: 20 May 2011
Current Certification: 21 January 2021

Frank Camasta
Global Head of Technical Services
SAI Global Assurance

Certified Product™ Australian Standard

JAS-ANZ

WWW.JAS-ANZ.ORG/REGISTER

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SCHEDULE TO
STANDARDSMARK LICENCE

SAI Global hereby grants:

Flamestop Australia Pty Ltd

13 Chaplin Drive, Lane Cove West, NSW 2066, Australia

StandardsMark Licence

Manufactured to:

AS/NZS 1841.6:2007 - Portable fire extinguishers - Specific requirements for carbon dioxide type extinguishers

Model identification of the goods on which the STANDARDSMARK may be used:

Size (kg)	Model Number	Classification	Reference Number	Date Endorsed
2	CO2ALH6	5B:E	22111-BB-7107	7 Jun 2016
2	CO2ALH6	2B:E	22111-DG-7104	11 Oct 2012
2	CO2ALH6	2B:E	22111-BB-7104	14 Apr 2015
2	CO2ALH6	2B:E	22111-DG-7101	25 May 2012
2	CO2ALH6	2B:E	22111-LF-7101	20 May 2011
2	CO2ALH6	5B:E	22111-DG-7107	7 Jun 2016
2	FSZ20FN	2B:E	22111-LM-7107	27 Mar 2020
2	FSZ20FN	2B:E	22111-BB-7107	2 Sep 2020
3.5	CO35ALH6	10B:E	22111-BB-7105	9 Oct 2015
3.5	CO35ALH6	10B:E	22111-DG-7105	9 Oct 2015
3.5	CO35ALH6	5B:E	22111-LF-7102	20 May 2011
3.5	FSZ35FN	5B:E	22111-BB-7108	2 Sep 2020
3.5	FSZ35FN	5B:E	22111-LM-7108	27 Mar 2020
5	CO5ALH6	10B:E	22111-BB-7106	14 Apr 2015
5	CO5ALH6	10B:E	22111-DG-7106	11 Oct 2012
5	CO5ALH6	10B:E	22111-DG-7103	25 May 2012
5	CO5ALH6	10B:E	22111-LF-7103	20 May 2011
5	FSZ50FN	5B:E	22111-LM-7109	27 Mar 2020
5	FSZ50FN	5B:E	22111-BB-7109	2 Sep 2020

End of Record

Certificate No: SMKH22111

Issued Date: 26 August 2021

This schedule supersedes all previously issued schedules

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TECHNICAL DATA

8.7 LIST OF SUPPLIERS

Ampac
106 Blomfield Street
Salisbury QLD 4107
Australia

Reliable
550 Churchill Road
Kilburn, SA, 5084
Australia

FPS
495 Beaudesert Road
Moorooka QLD 4105
Australia

Aline Pumps
27 Container Street 4173
Tingalpa QLD
Australia

FlameStop Australia QLD (Gold Coast)
U6/24 Pailings Court
Nerang QLD 4211
Australia

SECTION 9

COMPLIANCE CERTIFICATE AND INSTALLER STATEMENT

Form 15 Compliance certificate for building design or specification

Queensland Government

This form is the approved form that must be used in accordance with section 10 of the *Building Act 1975* and sections 73 and 77 of the Building Regulation 2021 (Design-specification certificate) stating that an aspect of building work or specification will, if installed or carried out as stated in this form, comply with the building assessment provisions.

Additional explanatory information is included in the Appendix at the end of this form.

1. Property description

This section need only be completed if details of street address and property description are applicable.

E.g. in the case of (standard/generic) pool design/shell manufacture and/or patio and carport systems this section may not be applicable.

Where applicable, the description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address	18 Remembrance Drive		
		Suburb/locality	Surfers Paradise
State	QLD	Postcode	4217

Lot and plan details *(attach list if necessary)*
Lot 248 on SP129443
Local government area the land is situated in
Gold Coast City Council

2. Description of aspect/s certified

Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.

Fire Detection System
Building Occupant Warning System

3. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications were relied upon.

BCA 2016 – Amendment 1 Spec E2.2a
AS1670.1-2015 – Fire Detection Systems
Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-0

4. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Auscoast Fire Services drawing set 2854:
2854-FA-01[1] - Basement 2
2854-FA-02[1] - Basement 1
2854-FA-03[1] - Ground Level
2854-FA-04[1] - Level 2
2854-FA-05[1] - Levels 3 to 9
2854-FA-06[1] – Roof
Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-0

5. Building certifier reference number and building development approval number

Building certifier reference number	1446	Building development application number *(if available)*	MCU201800077

6. Appointed competent person details

Under Part 6 of the Building Regulation 2021 a person must be assessed as a competent for the type of work (design-specification) by the relevant building certifier.

Name *(in full)*	David Crosby		
Company name *(if applicable)*	Auscoast Fire Services Pty Ltd		
Contact person			
Business phone number	07 5596 1270	Mobile	
Email address	info@auscoastfire.com.au		
Postal address	Unit 1, 105 Spencer Road		
		Suburb/locality	Nerang
State	QLD	Postcode	4211
Licence class or registration type *(if applicable)*	QBCC		
Licence or registration number *(if applicable)*	744878		

7. Signature of appointed competent person

This certificate must be signed by the individual assessed and appointed by the building certifier as competent to give design-specification help.

Signature		Date	30/03/2023

LOCAL GOVERNMENT USE ONLY

Date received	Click or tap to enter a date.	Reference number/s	

Appendix – explanatory information

IMPORTANT NOTE: It is an offence for a competent person to give a building certifier a document, including this form, that the person knows or reasonably suspects, is false or misleading.

Who can complete this certificate? (section 10 of the *Building Act 1975* (Building Act) and 73 and 77 of the Building Regulation 2021 (BR 2021).

A building certifier can accept from a competent person (design-specification) a certificate stating that the competent person has assessed the building design or specification for the aspect of building work, and it will, if installed or carried out under the certificate, comply with the building assessment provisions, including any relevant standards and codes.

Schedule 10 of the BR 2021 defines *building design or specification* as any material, system, method of building or other thing related to the design of or specifications for building work.

When completing the certificate, a competent person is required under section 77 of the BR 2021 to include the basis for giving the certificate and state the extent to which the competent person has relied on tests, specifications, rules, standards, codes of practice or other publications.

What is the purpose of this form? (section 10 of the Building Act and sections 73 and 77 of the BR2 2021)

The information in this form informs the building certifier's decision making when they are assessing a building development application, issuing the building development approval for the building work the subject of the certificate (form) and when amending the building development approval due to the receipt of updated aspect information such as glazing or truss specifications or revised excavation drawings.

Can a manufacturer or supplier give this Form 15?

A building certifier can accept this form from a manufacturer or supplier who the certifier has decided is a competent person (design-specification).

A manufacturer or supplier of building materials can give this form if they have undertaken the design component for the product. For example a window manufacturer who designs, constructs and supplies the windows to industry could give this form.

Competent person (section 10 of the *Building Act 1975* and Part 6 of the BR 2021)

A building certifier must assess and decide to appoint an individual as a competent person before they can accept design-specification help.

When deciding whether a person can be a competent person, the building certifier must assess the person having regard to their experience, qualifications and skills and ensure the person holds a licence or registration if required.

The building certifier is required to keep detailed records about what was considered when appointing a competent person.

For further information about assessment of someone as a competent person refer to the **Guideline for the assessment of competent persons.**

What is required if a manufacturer or supplier did not do the design work for the product?

A manufacturer or supplier who is not part of the design process may give the construction contractor, builder, competent person or the building certifier evidence of suitability such as a product technical statement under Part A5 of the Building Code of Australia (BCA), for an aspect or material stating that it is compliant with the relevant reference documents in the BCA i.e. the applicable Australian Standard/s.

What if there is not enough space for all the supporting material/documents?

Items 2, 3 and 4 requires the competent person to clearly identify the extent of the assessment that was undertaken for aspect/s of work identified in this form.

For instance, there is provision for material such as specifications, standards, codes or other relevant publications to be referenced in the form. However, if the space in the form is not sufficient to accommodate all of this material, you can create and refer to additional material in an addendum or attachment to the form.

The form is the Microsoft Word version, that you can download and edited to include additional material in the relevant parts of the form. **Note**: that editing the form in the Microsoft Word version may cause the relevant boxes to expand and increase the length of the document. This is acceptable and does not change the approved form, provided the section text (description on the left-hand side of the page) is not altered.

Appointed competent person (design-specification) – (sections 34 and 36 of the BR 2021)

A building certifier must assess and decide to appoint an individual as a competent person before they can, as a competent person, give design-specification help. The building certifier is required to keep detailed records about what was considered when appointing a competent person.

A building certifier must be satisfied that an individual is competent to give the type of help having regard to the individual's experience, qualifications and skills and if required by law to hold a licence or registration, that the individual is appropriately registered or licensed.

An individual is appointed as competent to give design-specification help on or from a particular day.

For further information about assessment of someone as a competent person refer to the **Guideline for the assessment of competent persons.**

PRIVACY NOTICE

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Form 15 Compliance certificate for building design or specification

Queensland Government

This form is the approved form that must be used in accordance with section 10 of the *Building Act 1975* and sections 73 and 77 of the Building Regulation 2021 (Design-specification certificate) stating that an aspect of building work or specification will, if installed or carried out as stated in this form, comply with the building assessment provisions.

Additional explanatory information is included in the Appendix at the end of this form.

1. Property description

This section need only be completed if details of street address and property description are applicable.

E.g. in the case of (standard/generic) pool design/shell manufacture and/or patio and carport systems this section may not be applicable.

Where applicable, the description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address	18 Remembrance Drive		
		Suburb/locality	Surfers Paradise
State	QLD	Postcode	4217

Lot and plan details *(attach list if necessary)*
Lot 248 on SP129443
Local government area the land is situated in
Gold Coast City Council

2. Description of aspect/s certified

Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.

Installation of Dry Fire Hydrant and Fire Sprinkler systems, including
Fire Pump sets and Fire Hose Reels

3. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications were relied upon.

BCA 2016 – Amendment 1, Spec E1.5
AS2118.1-2017 – Installation of fire sprinkler systems
AS2419.1-2005 – Installation of fire hydrant systems
AS2941-2013 – Fixed fire protection systems – Pumpset systems
AS2441-2005 – Installation of fire hose reels
Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-0

4. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Auscoast Fire Services drawing set 2854:
2854-FS-01[3] - Stair Details
2854-FS-02[5] - Hyd.Spk Schematic
2854-FS-04[3] - Basement 2
2854-FS-05[3] - Basement 1
2854-FS-06[3] - Ground Level
2854-FS-07[3] - Level 2
2854-FS-08[3] - Levels 3 to 9
2854-FS-09[2] - Roof
Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-0

5. Building certifier reference number and building development approval number

Building certifier reference number	1446	Building development application number *(if available)*	MCU201800077

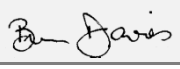
6. Appointed competent person details

Under Part 6 of the Building Regulation 2021 a person must be assessed as a competent for the type of work (design-specification) by the relevant building certifier.

Name *(in full)*	Brian Davies		
Company name *(if applicable)*	Auscoast Fire Services Pty Ltd		
Contact person			
Business phone number	07 5596 1270	Mobile	
Email address	info@auscoastfire.com.au		
Postal address	Unit 1, 105 Spencer Road		
		Suburb/locality	Nerang
State	QLD	Postcode	4211
Licence class or registration type *(if applicable)*	QBCC		
Licence or registration number *(if applicable)*	744881		

7. Signature of appointed competent person

This certificate must be signed by the individual assessed and appointed by the building certifier as competent to give design-specification help.

Signature		Date	30/03/2023

LOCAL GOVERNMENT USE ONLY

Date received	Click or tap to enter a date.	Reference number/s	

Appendix – explanatory information

IMPORTANT NOTE: It is an offence for a competent person to give a building certifier a document, including this form, that the person knows or reasonably suspects, is false or misleading.

Who can complete this certificate? (section 10 of the *Building Act 1975* (Building Act) and 73 and 77 of the Building Regulation 2021 (BR 2021).

A building certifier can accept from a competent person (design-specification) a certificate stating that the competent person has assessed the building design or specification for the aspect of building work, and it will, if installed or carried out under the certificate, comply with the building assessment provisions, including any relevant standards and codes.

Schedule 10 of the BR 2021 defines *building design or specification* as any material, system, method of building or other thing related to the design of or specifications for building work.

When completing the certificate, a competent person is required under section 77 of the BR 2021 to include the basis for giving the certificate and state the extent to which the competent person has relied on tests, specifications, rules, standards, codes of practice or other publications.

What is the purpose of this form? (section 10 of the Building Act and sections 73 and 77 of the BR2 2021)

The information in this form informs the building certifier's decision making when they are assessing a building development application, issuing the building development approval for the building work the subject of the certificate (form) and when amending the building development approval due to the receipt of updated aspect information such as glazing or truss specifications or revised excavation drawings.

Can a manufacturer or supplier give this Form 15?

A building certifier can accept this form from a manufacturer or supplier who the certifier has decided is a competent person (design-specification).

A manufacturer or supplier of building materials can give this form if they have undertaken the design component for the product. For example a window manufacturer who designs, constructs and supplies the windows to industry could give this form.

Competent person (section 10 of the *Building Act 1975* and Part 6 of the BR 2021)

A building certifier must assess and decide to appoint an individual as a competent person before they can accept design-specification help.

When deciding whether a person can be a competent person, the building certifier must assess the person having regard to their experience, qualifications and skills and ensure the person holds a licence or registration if required.

The building certifier is required to keep detailed records about what was considered when appointing a competent person.

For further information about assessment of someone as a competent person refer to the **Guideline for the assessment of competent persons.**

What is required if a manufacturer or supplier did not do the design work for the product?

A manufacturer or supplier who is not part of the design process may give the construction contractor, builder, competent person or the building certifier evidence of suitability such as a product technical statement under Part A5 of the Building Code of Australia (BCA), for an aspect or material stating that it is compliant with the relevant reference documents in the BCA i.e. the applicable Australian Standard/s.

What if there is not enough space for all the supporting material/documents?

Items 2, 3 and 4 requires the competent person to clearly identify the extent of the assessment that was undertaken for aspect/s of work identified in this form.

For instance, there is provision for material such as specifications, standards, codes or other relevant publications to be referenced in the form. However, if the space in the form is not sufficient to accommodate all of this material, you can create and refer to additional material in an addendum or attachment to the form.

The form is the Microsoft Word version, that you can download and edited to include additional material in the relevant parts of the form. **Note**: that editing the form in the Microsoft Word version may cause the relevant boxes to expand and increase the length of the document. This is acceptable and does not change the approved form, provided the section text (description on the left-hand side of the page) is not altered.

Appointed competent person (design-specification) – (sections 34 and 36 of the BR 2021)

A building certifier must assess and decide to appoint an individual as a competent person before they can, as a competent person, give design-specification help. The building certifier is required to keep detailed records about what was considered when appointing a competent person.

A building certifier must be satisfied that an individual is competent to give the type of help having regard to the individual's experience, qualifications and skills and if required by law to hold a licence or registration, that the individual is appropriately registered or licensed.

An individual is appointed as competent to give design-specification help on or from a particular day.

For further information about assessment of someone as a competent person refer to the **Guideline for the assessment of competent persons.**

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Form 12 Aspect Inspection Certificate (Appointed Competent Person)

Queensland Government

This form is the approved form that must be used in accordance with sections 74 and 77 of the Building Regulation 2021 (appointed competent person statement that an aspect of work has been completed and complies with the building development approval).

Information about how to complete this form is in the Appendix at the end of the form.

1. Indicate the aspect of the building work

Examples of aspects of the stage of building work (and not limited to the examples provided below):

waterproofing, tiling, glazing, energy efficiency, emergency lights, exit signs, smoke detection, air-conditioning.

Aspect of building work (indicate the aspect)
Fire Services including: Fire Detection System Building Occupant Warning System

2. Property description

The description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address	18 Remembrance Drive		
		Suburb/locality	Surfers Paradise
State	QLD	Postcode	4217

Lot and plan details *(attach list if necessary)*
Lot 248 on SP129443
Local government area the land is situated in
Gold Coast City Council

3. Building/structure description

Building/structure description
Residential Unit Development
Class of building/structure
2,7a,10b

4. Description of the extent of aspect/s certified

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Fire Services including: Fire Detection System – Including general fire alarm trips to security for Gate/Electric Strike/Sliding Door. Building Occupant Warning System

5. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications were relied upon.

BCA 2016 – Amendment 1 Spec E2.2a
AS1670.1-2015 – Fire Detection Systems
Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-5

6. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Auscoast Fire Services drawing set 2854:

2854-FA-01[AB1] - Basement 2

2854-FA-02[AB1] - Basement 1

2854-FA-03[AB1] - Ground Level

2854-FA-04[AB1] - Level 2

2854-FA-05[AB1] - Levels 3 to 9

2854-FA-06[AB1] – Roof

Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-5

7. Building certifier reference number and building development approval number

Building certifier's name *(in full)*	Mackie Construction Consultants Pty Ltd – Paul Mackie		
Building certifier reference number	1446	Building development approval number	MCU201800077

8. Details of appointed competent person

Name *(in full)*	David Crosby		
Company name *(if applicable)*	Auscoast Fire Service		
Contact person			
Business phone number	07 5596 1270	Mobile	
Email address	info@auscoastfire.com.au		
Postal address	Unit 1 / 105 Spencer Road		
		Suburb/locality	Nerang
State	QLD	Postcode	4211
Licence class or registration type *(if applicable)*	QBCC - Fire Services		
Licence class or registration number *(if applicable)*	QBCC 744878		
Date request to inspect received from building certifier	Click or tap to enter a date.		

9. Signature of appointed competent person

Signature			Date	30/05/2023

LOCAL GOVERNMENT USE ONLY

Date received	Click or tap to enter a date.	Reference number/s	

Appendix – explanatory information

IMPORTANT NOTE: a competent person who knowingly or reasonably suspects the information they are giving to the building certifier is false or misleading, including the information contained in this certificate (Form 12), commits an offence and is liable to a maximum penalty of 100 penalty units.

When is this certificate needed? (section 10 of the *Building Act 1975* (Building Act) and sections 74 and 75 of Building Regulation 2021 (BR 2021).

When performing a building certification function, a building certifier may accept and rely on an ***aspect inspection certificate*** from an appointed competent person to satisfy themselves that an aspect of work has been completed and complies with the building development approval.

For a single detached class 1a building a building certifier can only accept this form for an aspect of work that is for

- boundary clearance if the appointed competent person (inspection) is a cadastral surveyor, and,
- the reinforcement of footing systems or formwork and reinforcement for a slab if the appointed competent person (inspection) is a registered professional engineer.

For further information about inspections for detached class 1a and 10 buildings or structures, refer to **Guidelines for inspection of class 1a and 10 buildings and structures.**

Who can sign this certificate (Form 12)? (Part 9, Division 2, Section 74 of the BR 2021)

A person assessed and appointed as a competent person (inspection) must complete the approved form (Form 12) and give it to the building certifier after they (1) inspect the aspect of work; and (2) are satisfied the aspect of work has been completed and complies with the building development approval.

Competent person (section 10 of the Building Act and Part 6 of the BR 2021)

A building certifier must assess and decide to appoint an individual as a competent person before they can, as a competent person, give inspection help or design-specification help. The building certifier is required to keep detailed records about what was considered when appointing a competent person.

A competent person cannot give inspection help to a building certifier until they have been appointed by the building certifier. For further information about assessment of someone as a competent person refer to the **Guideline for the assessment of competent persons.**

Inspection help (section 34 of the BR 2021)

A building certifier must be satisfied that an individual is competent to give the type of inspection help having regard to the individual's experience, qualifications and skills and if required by law to hold a licence or registration, that the individual is appropriately registered or licensed.

For further information about conducting inspections for class 2 to 9 buildings, refer to the **Guideline for inspection of class 2 to 9 buildings.**

How to complete this form

Section 1 – Aspect of building work

An aspect of building work means a component of a stage of the building work, for example water proofing. A stage of assessable building work (requires a building development approval) is a stage of the work, prescribed by regulation, that may be inspected, or stated in a building development approval by the relevant building certifier.

Section 2 – Property description

The property description must identify all the land the subject of the application. The lot and plan details (e.g. SP/RP) can be found on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.

Section 3 – Building / structure description

Describe the type of building or structures and provide the classification determined under the National Construction Code (NCC). The NCC can be accessed at the Australian Building Codes Board's website.

Section 4 – Describe the extent or location of the aspect work inspected

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Sections 5 – Basis for the certification and section 6 Reference documentation (section 77 of BR 2021)

The appointed competent person (inspection) must state the basis for giving the certificate (Form 12) including the extent to which the competent person has relied on tests, specifications, rules, standards, codes of practice or other publications to make their decision that the aspect of work has been completed and complies with the building development approval.

Under the regulation (section 76) the appointed competent person (inspection) may accept and rely on a certificate (Form 12) from another appointed competent person (inspection) without inspecting the work. Although this can only be done if the inspection was carried out in accordance with best industry practice.

Other relevant inspection / aspect forms

Aspect work – assessable building work: Form 43 – Aspect certificate (completed by a QBCC licensee) for aspect work for a single detached class 1a building and class 10 buildings and structures.

Aspect work not subject to a building development approval - accepted development (self-assessable): Form 30 – (completed by a QBCC licensee) given to either the builder or building owner of the building, stating the subject aspect work complies with the relevant provisions, standards and codes.

Stages of work: Form 16 – Inspection certificate (completed by a building certifier or competent person) for a stage of work.

Building design – specification: Form 15 – Compliance certificate for building design or specification (completed by the appointed competent person (design – specification)) - for an aspect of stating a building design – specification will, if installed or carried out to the detail under this Form will comply with the building assessment provisions.

For all other building forms and guidelines visit the Business Queensland website.

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Form 12 Aspect Inspection Certificate (Appointed Competent Person)

Queensland Government

This form is the approved form that must be used in accordance with sections 74 and 77 of the Building Regulation 2021 (appointed competent person statement that an aspect of work has been completed and complies with the building development approval).

Information about how to complete this form is in the Appendix at the end of the form.

1. Indicate the aspect of the building work

Examples of aspects of the stage of building work (and not limited to the examples provided below):

waterproofing, tiling, glazing, energy efficiency, emergency lights, exit signs, smoke detection, air-conditioning.

Aspect of building work (indicate the aspect)
Fire Services including: Fire Extinguishers

2. Property description

The description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address	18 Remembrance Drive		
		Suburb/locality	Surfers Paradise
State	QLD	Postcode	4217

Lot and plan details *(attach list if necessary)*
Lot 248 on SP129443
Local government area the land is situated in
Gold Coast City Council

3. Building/structure description

Building/structure description
Residential Unit Development
Class of building/structure
2,7a,10b

4. Description of the extent of aspect/s certified

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Fire Services including: Fire Extinguishers

5. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications were relied upon.

BCA 2016 – Amendment 1
AS2444-2001 – Fire Extinguishers
Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-5

6. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Auscoast Fire Services drawing set 2854:

2854-FA-01[AB1] - Basement 2

2854-FA-02[AB1] - Basement 1

2854-FA-03[AB1] - Ground Level

2854-FA-04[AB1] - Level 2

2854-FA-05[AB1] - Levels 3 to 9

2854-FA-06[AB1] – Roof

Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-5

7. Building certifier reference number and building development approval number

Building certifier's name *(in full)*	Mackie Construction Consultants Pty Ltd – Paul Mackie		
Building certifier reference number	1446	Building development approval number	MCU201800077

8. Details of appointed competent person

Name *(in full)*	Matthew Acworth		
Company name *(if applicable)*	Auscoast Fire Service		
Contact person			
Business phone number	07 5596 1270	Mobile	
Email address	info@auscoastfire.com.au		
Postal address	Unit 1 / 105 Spencer Road		
		Suburb/locality	Nerang
State	QLD	Postcode	4211
Licence class or registration type *(if applicable)*	QBCC - Fire Services		
Licence class or registration number *(if applicable)*	QBCC 15080819		
Date request to inspect received from building certifier	Click or tap to enter a date.		

9. Signature of appointed competent person

Signature			Date	23/05/2023

LOCAL GOVERNMENT USE ONLY

Date received	Click or tap to enter a date.	Reference number/s	

Appendix – explanatory information

IMPORTANT NOTE: a competent person who knowingly or reasonably suspects the information they are giving to the building certifier is false or misleading, including the information contained in this certificate (Form 12), commits an offence and is liable to a maximum penalty of 100 penalty units.

When is this certificate needed? (section 10 of the *Building Act 1975* (Building Act) and sections 74 and 75 of Building Regulation 2021 (BR 2021).

When performing a building certification function, a building certifier may accept and rely on an ***aspect inspection certificate*** from an appointed competent person to satisfy themselves that an aspect of work has been completed and complies with the building development approval.

For a single detached class 1a building a building certifier can only accept this form for an aspect of work that is for

- boundary clearance if the appointed competent person (inspection) is a cadastral surveyor, and,
- the reinforcement of footing systems or formwork and reinforcement for a slab if the appointed competent person (inspection) is a registered professional engineer.

For further information about inspections for detached class 1a and 10 buildings or structures, refer to **Guidelines for inspection of class 1a and 10 buildings and structures.**

Who can sign this certificate (Form 12)? (Part 9, Division 2, Section 74 of the BR 2021)

A person assessed and appointed as a competent person (inspection) must complete the approved form (Form 12) and give it to the building certifier after they (1) inspect the aspect of work; and (2) are satisfied the aspect of work has been completed and complies with the building development approval.

Competent person (section 10 of the Building Act and Part 6 of the BR 2021)

A building certifier must assess and decide to appoint an individual as a competent person before they can, as a competent person, give inspection help or design-specification help. The building certifier is required to keep detailed records about what was considered when appointing a competent person.

A competent person cannot give inspection help to a building certifier until they have been appointed by the building certifier. For further information about assessment of someone as a competent person refer to the **Guideline for the assessment of competent persons.**

Inspection help (section 34 of the BR 2021)

A building certifier must be satisfied that an individual is competent to give the type of inspection help having regard to the individual's experience, qualifications and skills and if required by law to hold a licence or registration, that the individual is appropriately registered or licensed.

For further information about conducting inspections for class 2 to 9 buildings, refer to the **Guideline for inspection of class 2 to 9 buildings.**

How to complete this form

Section 1 – Aspect of building work

An aspect of building work means a component of a stage of the building work, for example water proofing. A stage of assessable building work (requires a building development approval) is a stage of the work, prescribed by regulation, that may be inspected, or stated in a building development approval by the relevant building certifier.

Section 2 – Property description

The property description must identify all the land the subject of the application. The lot and plan details (e.g. SP/RP) can be found on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.

Section 3 – Building / structure description

Describe the type of building or structures and provide the classification determined under the National Construction Code (NCC). The NCC can be accessed at the Australian Building Codes Board's website.

Section 4 – Describe the extent or location of the aspect work inspected

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Sections 5 – Basis for the certification and section 6 Reference documentation (section 77 of BR 2021)

The appointed competent person (inspection) must state the basis for giving the certificate (Form 12) including the extent to which the competent person has relied on tests, specifications, rules, standards, codes of practice or other publications to make their decision that the aspect of work has been completed and complies with the building development approval.

Under the regulation (section 76) the appointed competent person (inspection) may accept and rely on a certificate (Form 12) from another appointed competent person (inspection) without inspecting the work. Although this can only be done if the inspection was carried out in accordance with best industry practice.

Other relevant inspection / aspect forms

Aspect work – assessable building work: Form 43 – Aspect certificate (completed by a QBCC licensee) for aspect work for a single detached class 1a building and class 10 buildings and structures.

Aspect work not subject to a building development approval - accepted development (self-assessable): Form 30 – (completed by a QBCC licensee) given to either the builder or building owner of the building, stating the subject aspect work complies with the relevant provisions, standards and codes.

Stages of work: Form 16 – Inspection certificate (completed by a building certifier or competent person) for a stage of work.

Building design – specification: Form 15 – Compliance certificate for building design or specification (completed by the appointed competent person (design – specification)) - for an aspect of stating a building design – specification will, if installed or carried out to the detail under this Form will comply with the building assessment provisions.

For all other building forms and guidelines visit the Business Queensland website.

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Form 12 Aspect Inspection Certificate (Appointed Competent Person)

Queensland Government

This form is the approved form that must be used in accordance with sections 74 and 77 of the Building Regulation 2021 (appointed competent person statement that an aspect of work has been completed and complies with the building development approval).

Information about how to complete this form is in the Appendix at the end of the form.

1. Indicate the aspect of the building work

Examples of aspects of the stage of building work (and not limited to the examples provided below):

waterproofing, tiling, glazing, energy efficiency, emergency lights, exit signs, smoke detection, air-conditioning.

Aspect of building work (indicate the aspect)
Fire Services including: Passive fire treatment to Wet and dry fire services

2. Property description

The description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address	18 Remembrance Drive		
		Suburb/locality	Surfers Paradise
State	QLD	Postcode	4217

Lot and plan details *(attach list if necessary)*
Lot 248 on SP129443
Local government area the land is situated in
Gold Coast City Council

3. Building/structure description

Building/structure description
Residential Unit Development
Class of building/structure
2,7a,10b

4. Description of the extent of aspect/s certified

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Fire Services including: Steel hydrants and sprinkler pipes treated using TBA penowrap and Intumastic CPVC sprinkler pipe treated using 3M 3000WT Dry fire alarm cables treated using promat bulkhead batt and wrap

5. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications were relied upon.

BCA 2016 – Amendment 1
AS1530.4-2014
AS4072.1-2005
Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-5

6. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Essence - Auscoast Passive register r1.pdf

Reports - FAS190236, FAS180485 R1.2, FAS190202 R4.4

Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-5

7. Building certifier reference number and building development approval number

Building certifier's name *(in full)*	Mackie Construction Consultants Pty Ltd – Paul Mackie		
Building certifier reference number	1446	Building development approval number	MCU201800077

8. Details of appointed competent person

Name *(in full)*	Matthew Acworth		
Company name *(if applicable)*	Auscoast Fire Service		
Contact person			
Business phone number	07 5596 1270	Mobile	
Email address	info@auscoastfire.com.au		
Postal address	Unit 1 / 105 Spencer Road		
		Suburb/locality	Nerang
State	QLD	Postcode	4211
Licence class or registration type *(if applicable)*	QBCC - Fire Services		
Licence class or registration number *(if applicable)*	QBCC 15080819		
Date request to inspect received from building certifier	Click or tap to enter a date.		

9. Signature of appointed competent person

Signature		Date	30/05/2023

LOCAL GOVERNMENT USE ONLY

Date received	Click or tap to enter a date.	Reference number/s	

Appendix – explanatory information

IMPORTANT NOTE: a competent person who knowingly or reasonably suspects the information they are giving to the building certifier is false or misleading, including the information contained in this certificate (Form 12), commits an offence and is liable to a maximum penalty of 100 penalty units.

When is this certificate needed? (section 10 of the *Building Act 1975* (Building Act) and sections 74 and 75 of Building Regulation 2021 (BR 2021).

When performing a building certification function, a building certifier may accept and rely on an ***aspect inspection certificate*** from an appointed competent person to satisfy themselves that an aspect of work has been completed and complies with the building development approval.

For a single detached class 1a building a building certifier can only accept this form for an aspect of work that is for

- boundary clearance if the appointed competent person (inspection) is a cadastral surveyor, and,
- the reinforcement of footing systems or formwork and reinforcement for a slab if the appointed competent person (inspection) is a registered professional engineer.

For further information about inspections for detached class 1a and 10 buildings or structures, refer to **Guidelines for inspection of class 1a and 10 buildings and structures.**

Who can sign this certificate (Form 12)? (Part 9, Division 2, Section 74 of the BR 2021)

A person assessed and appointed as a competent person (inspection) must complete the approved form (Form 12) and give it to the building certifier after they (1) inspect the aspect of work; and (2) are satisfied the aspect of work has been completed and complies with the building development approval.

Competent person (section 10 of the Building Act and Part 6 of the BR 2021)

A building certifier must assess and decide to appoint an individual as a competent person before they can, as a competent person, give inspection help or design-specification help. The building certifier is required to keep detailed records about what was considered when appointing a competent person.

A competent person cannot give inspection help to a building certifier until they have been appointed by the building certifier. For further information about assessment of someone as a competent person refer to the **Guideline for the assessment of competent persons.**

Inspection help (section 34 of the BR 2021)

A building certifier must be satisfied that an individual is competent to give the type of inspection help having regard to the individual's experience, qualifications and skills and if required by law to hold a licence or registration, that the individual is appropriately registered or licensed.

For further information about conducting inspections for class 2 to 9 buildings, refer to the **Guideline for inspection of class 2 to 9 buildings.**

How to complete this form

Section 1 – Aspect of building work

An aspect of building work means a component of a stage of the building work, for example water proofing. A stage of assessable building work (requires a building development approval) is a stage of the work, prescribed by regulation, that may be inspected, or stated in a building development approval by the relevant building certifier.

Section 2 – Property description

The property description must identify all the land the subject of the application. The lot and plan details (e.g. SP/RP) can be found on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.

Section 3 – Building / structure description

Describe the type of building or structures and provide the classification determined under the National Construction Code (NCC). The NCC can be accessed at the Australian Building Codes Board's website.

Section 4 – Describe the extent or location of the aspect work inspected

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Sections 5 – Basis for the certification and section 6 Reference documentation (section 77 of BR 2021)

The appointed competent person (inspection) must state the basis for giving the certificate (Form 12) including the extent to which the competent person has relied on tests, specifications, rules, standards, codes of practice or other publications to make their decision that the aspect of work has been completed and complies with the building development approval.

Under the regulation (section 76) the appointed competent person (inspection) may accept and rely on a certificate (Form 12) from another appointed competent person (inspection) without inspecting the work. Although this can only be done if the inspection was carried out in accordance with best industry practice.

Other relevant inspection / aspect forms

Aspect work – assessable building work: Form 43 – Aspect certificate (completed by a QBCC licensee) for aspect work for a single detached class 1a building and class 10 buildings and structures.

Aspect work not subject to a building development approval - accepted development (self-assessable): Form 30 – (completed by a QBCC licensee) given to either the builder or building owner of the building, stating the subject aspect work complies with the relevant provisions, standards and codes.

Stages of work: Form 16 – Inspection certificate (completed by a building certifier or competent person) for a stage of work.

Building design – specification: Form 15 – Compliance certificate for building design or specification (completed by the appointed competent person (design – specification)) - for an aspect of stating a building design – specification will, if installed or carried out to the detail under this Form will comply with the building assessment provisions.

For all other building forms and guidelines visit the Business Queensland website.

PRIVACY NOTICE

The Department of Energy and Public Works is collecting personal information as required under the *Building Act 1975*. This information may be stored by the Department, and will be used for administration, compliance, statistical research and evaluation of building laws. Your personal information will be disclosed to other government agencies, local government authorities and third parties for purposes relating to administering and monitoring compliance with the *Building Act 1975*. Personal information will otherwise only be disclosed to third parties with your consent or unless authorised or required by law.

Form 12 Aspect Inspection Certificate (Appointed Competent Person)

Queensland Government

This form is the approved form that must be used in accordance with sections 74 and 77 of the Building Regulation 2021 (appointed competent person statement that an aspect of work has been completed and complies with the building development approval).

Information about how to complete this form is in the Appendix at the end of the form.

1. Indicate the aspect of the building work

Examples of aspects of the stage of building work (and not limited to the examples provided below):

waterproofing, tiling, glazing, energy efficiency, emergency lights, exit signs, smoke detection, air-conditioning.

Aspect of building work (indicate the aspect)
Fire Services Including: Installation of Dry Fire Hydrant and Fire Sprinkler systems, including Fire Pump sets and Fire Hose Reels

2. Property description

The description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address	18 Remembrance Drive		
		Suburb/locality	Surfers Paradise
State	QLD	Postcode	4217

Lot and plan details *(attach list if necessary)*
Lot 248 on SP129443
Local government area the land is situated in
Gold Coast City Council

3. Building/structure description

Building/structure description
Residential Unit Development
Class of building/structure
2,7a,10b

4. Description of the extent of aspect/s certified

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Fire Services Including: Installation of Dry Fire Hydrant and Fire Sprinkler systems, including Fire Pump sets, Fire Hose Reels, Sprinkler Booster & Hydrant Booster

5. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications were relied upon.

BCA 2016 – Amendment 1, Spec E1.5 & BCA 2019 – Amendment 1
AS2118.1-2017 – Installation of fire sprinkler systems
AS2419.1-2005 – Installation of fire hydrant systems
AS2941-2013 – Fixed fire protection systems – Pumpset systems
AS2441-2005 – Installation of fire hose reels
Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-5

6. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Auscoast Fire Services drawing set 2854:

2854-FS-01[AB1] - Stair Details

2854-FS-02[AB1] - Hyd.Spk Schematic

2854-FS-04[AB1] - Basement 2

2854-FS-05[AB1] - Basement 1

2854-FS-06[AB1] - Ground Level

2854-FS-07[AB1] - Level 2

2854-FS-08[AB1] - Levels 3 to 9

2854-FS-09[AB1] - Roof

Sotera Fire Engineering Report - 30161019 002 – Essence, Remembrance Drive, Surfers Paradise FER rev 2-5

7. Building certifier reference number and building development approval number

Building certifier's name *(in full)*	Mackie Construction Consultants Pty Ltd – Paul Mackie		
Building certifier reference number	1446	Building development approval number	MCU201800077

8. Details of appointed competent person

Name *(in full)*	Juan Mackie		
Company name *(if applicable)*	Auscoast Fire Service		
Contact person			
Business phone number	07 5596 1270	Mobile	
Email address	info@auscoastfire.com.au		
Postal address	Unit 1 / 105 Spencer Road		
		Suburb/locality	Nerang
State	QLD	Postcode	4211
Licence class or registration type *(if applicable)*	Fire Services - QBCC		
Licence class or registration number *(if applicable)*	QBCC 1194983		

Date request to inspect received from building certifier	Click or tap to enter a date.

9. Signature of appointed competent person

Signature		Date	30/05/2023

LOCAL GOVERNMENT USE ONLY

Date received	Click or tap to enter a date.	Reference number/s	

Appendix – explanatory information

IMPORTANT NOTE: a competent person who knowingly or reasonably suspects the information they are giving to the building certifier is false or misleading, including the information contained in this certificate (Form 12), commits an offence and is liable to a maximum penalty of 100 penalty units.

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The property description must identify all the land the subject of the application. The lot and plan details (e.g. SP/RP) can be found on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.

Section 3 – Building / structure description

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Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Sections 5 – Basis for the certification and section 6 Reference documentation (section 77 of BR 2021)

The appointed competent person (inspection) must state the basis for giving the certificate (Form 12) including the extent to which the competent person has relied on tests, specifications, rules, standards, codes of practice or other publications to make their decision that the aspect of work has been completed and complies with the building development approval.

Under the regulation (section 76) the appointed competent person (inspection) may accept and rely on a certificate (Form 12) from another appointed competent person (inspection) without inspecting the work. Although this can only be done if the inspection was carried out in accordance with best industry practice.

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Version 1 – July 2014

Form 71—fire hydrant and sprinkler system commissioning

This form is to be used for the purposes of commissioning water based fire safety installations, as required by the Queensland Development Code – Mandatory Part (MP) 6.1, which is a building assessment provision under the *Building Act 1975*, section 30. This form is also to be used in accordance with the 'Fire hydrant and sprinkler system commissioning and periodic maintenance procedure', defined in MP 6.1 as the 'Relevant procedure'. Please note that this form does not comprise all testing requirements for commissioning—this form is only for collecting results of testing for some sections of the Australian Standards referred to and in each case, further testing is required.

Part A—Test details		
Site name	**ESSENTIA APARTMENTS**	
Site address	**18 Remembrance Drive**	
Contractor	**Auscoast Fire Services**	
Testing details	**Test date: 12/05/23**	Commissioning test: fire hydrant ☐ fire sprinkler ☐ combined ☒
	Time: 7:00am	

Part B—Hydrant hydrostatic test			**PASS** ☒		**FAIL** ☐
Refer to the required pressure specification for commissioning as per AS2419.1.					
Boost pressure	1700kPa	**Test pressure**	1700kPa		
Duration of test	120mins	**End of test pressure**	1700kPa	**Loss (if any):**	0 L/min
Comments:					

~~**Part C—Hydrant test equipment/pressure gauges**~~				
If using more devices, provide details in the Notes section below or complete another form. The correction factor must be kPa or a percentage.				
Flow measuring device	Orifice ☐ Part C not required for orifice testing	Mechanical ☐ Calibrated: / /	Electro magnetic ☐ Calibrated: / /	
	Device/gauge 1	Device/gauge 2	Device/gauge 3	Device/gauge 4
Serial number				
Date calibrated				
Correction certificate				
65/100/150 mm face				
Digital reader				
Increments (kPa)				

~~**Part D—Hydrant system flow test**~~			~~**PASS**~~ ☐	~~**FAIL**~~ ☐		
~~This part relates to section 10.3 of AS2419.1. If pressure/flow rates do not meet the fire system design criteria and there are no on-site problems, contact the relevant water service provider to ascertain if there are any problems with the water system network. In the table below, please record the pressure readings obtained during the hydrant system flow test.~~						
~~Hydrant 1 location~~	———		~~Hydrant 3 location~~	———		
~~Hydrant 2 location~~	———		~~Hydrant 4 location~~	———		
~~System requirements~~	——— L/s at ——— kPa		~~Static pressure~~	——— kPa		
~~On-site pump set installed~~ ———	~~**Yes**~~ ☐			~~**No**~~ ☐		

~~Pressure zone number:~~	~~**Size/flow rate**~~	~~**Device/gauge no. (Part C)**~~	~~**Hydrant 1 only**~~	~~**Hydrants 1 and 2**~~	~~**Hydrants 1, 2 and 3**~~	~~**Hydrants 1, 2, 3 and 4**~~
~~**Nozzles**~~	~~19 mm~~	———	——— kPa	——— kPa	——— kPa	——— kPa
	~~22 mm~~	———	——— kPa	——— kPa	——— kPa	——— kPa
	~~25 mm~~	———	——— kPa	——— kPa	——— kPa	——— kPa
~~**Other portable testing devices**~~	~~5 L/s~~	———	——— kPa	——— kPa	——— kPa	——— kPa
	~~10 L/s~~	———	——— kPa	——— kPa	——— kPa	——— kPa
	~~15 L/s~~	———	——— kPa	——— kPa	——— kPa	——— kPa
	~~20 L/s~~	———	——— kPa	——— kPa	——— kPa	——— kPa
	~~30 L/s~~	———	——— kPa	——— kPa	——— kPa	——— kPa
	~~System achieved: ——— L/s at ——— kPa~~					

~~Part E—Pump appliance booster test~~	~~PASS ☐~~	~~FAIL ☐~~	
~~This part relates to sections 10.4 and 10.5 of AS2419.1. If pressure/flow rates do not meet the fire system design criteria and there are no on-site problems, contact the relevant water service provider to ascertain if there are any problems with the water system network. In the table below, please record the pressure readings obtained during the pump appliance booster test.~~			
~~Hydrant locations~~	~~———~~	~~Height of highest hydrant above booster~~	~~——— m~~
~~System requirements~~	~~——— L/s at ——— kPa~~	~~Static pressure~~	~~——— kPa~~
~~Pump inlet pressure~~	~~——— kPa~~	~~Pump discharge pressure~~	~~——— kPa~~
~~Boost pressure~~	~~——— kPa~~	~~Calculated frictional loss~~	~~——— kPa~~
~~Comments:~~ ———			

Part F—Sprinkler hydrostatic test - per level	**PASS** ☒	**FAIL** ☐	
Relevant required pressure specification in AS2118.1			
Pressure	1400 kPa	Time held	120 mins
Comments: Window Drenchers fed off Hydrant System			

~~Part G—Sprinkler system flow test~~

This section is to be used for sections 4.14 of AS2118.1-1999, 4 of AS2118.6-2012 and 6.2 of AS2118.4-2012. Notes: (1) For AS2118.1 and AS2118.6 systems, multiple testing points may be required. (2) For AS2118.4, a simulated running test may be required for systems without a flow measuring device, in which the test involves opening a valve to discharge a volume of water that is accepted as being in excess of the design flow. System test points shall be noted for each different system and its location and descriptor.

	System specifications (block plan):		**Test results:**	
Test point 1	Location	**GROUND FLOOR – FIRE PUMP ROOM - OHII**		
	Required flow rate	**869 L/M**	Pass ☒ Fail ☐	**881.02 L/M**
	Required pressure	**392 kPa**	Pass ☒ Fail ☐	**1100 kPa**
Test point 2	Location	**GROUND FLOOR – FIRE PUMP ROOM - LH**		
	Required flow rate	**323 L/M**	Pass ☒ Fail ☐	**339.96 L/M**
	Required pressure	**610 kPa**	Pass ☒ Fail ☐	**1150 kPa**
Running test	Installation gauge pressure: 1200 kPa			

Part H—Compliance		
Critical defects identified	Yes ☐	Give owner/occupier a critical defect notice
	No ☒	No action required in relation to critical defects at this time
Repairs/corrective actions taken	Yes ☐	Attach details (including action and date taken) as part of Licensee's report
	No ☒	No action required in relation to repairs/corrective actions at this time
System	Pass ☒	
	Fail ☐	

Part I—Signature

By signing this Form 71, I confirm that the information contained herein is correct to the best of my knowledge given the information available and that this Form 71 has been completed in accordance with the relevant standards, codes and regulations.

Licensee name	Juan Mackie	**Licensee signature**	
Licence no. (QBCC/PIC)	1114544	**Licensee report no.**	

Note: Building owners/occupiers are responsible for ensuring their buildings continuously meet fire safety standards. Where a building owner/occupier becomes aware that their building does not meet the minimum requirements for water pressure required by any standard applicable under the Queensland Development Code Mandatory Part 6.1 (Maintenance of fire safety installations) the building owner/occupier should contact the Queensland Fire and Emergency Service.
Definitions *"Commissioning test"* is a test that is required upon completion of a new system or an extension to an existing system. *"Running test"* means a two inch waste test installed at the sprinkler control valve on older systems.
Privacy: The information on this form is collected for purposes related to monitoring compliance under the *Plumbing and Drainage Act 2002*, the *Building Act 1975* and the *Building Fire Safety Regulation 2008* ("legislation"). This information may be stored in the department's database and may be used for statistical research, information provision and evaluation of Plumbing Industry Council and state government services. Your personal information may be disclosed to other government agencies, local government authorities and third parties for purposes related to this application. Except for these circumstances, personal information will only be disclosed to third parties with your consent or in accordance with the *Information Privacy Act 2009*.
RTI: The information collected on this form will be retained as required by the *Public Records Act 2002* and other relevant Acts and regulations, and is subject to the Right to Information regime established by the *Right to Information Act 2009*. If you have any further questions regarding your privacy, please email Building Codes Queensland on buildingcodes@qld.gov.au © The State of Queensland (Department of Housing and Public Works) July 2014. Published by the Queensland Government July 2014, 41 George Street, Brisbane QLD 4000.

Form 71—Fire Hydrant and Sprinkler System Commissioning

This form is to be used for the purposes of commissioning water based fire safety installations, as required by the Queensland Development Code – Mandatory Part (MP) 6.1, which is a building assessment provision under the *Building Act 1975*, section 30. This form is also to be used in accordance with the 'Fire hydrant and sprinkler system commissioning and periodic maintenance procedure', defined in MP 6.1 as the 'Relevant procedure'. Please note that this form does not comprise all testing requirements for commissioning—this form is only for collecting results of testing for some sections of the Australian Standards referred to and in each case, further testing is required.

Part A—Test Details		
Site Name	18 Remembrance Dr, Surfers Paradise	
Site **Address**	18 Remembrance Dr, Surfers Paradise	
Contractor	**FYREPOWER FIRE PROTECTION**	
Test Details	**Test date:** 04/05/2023	**Commissioning test: x** **Fire hydrant: x**
	Time: 12.30pm	**Fire sprinkler:** **Combined:**

Part B—Hydrant Hydrostatic Test **PASS** **FAIL**

Refer to the required pressure specification for periodic testing (as applicable) as per AS2419.1 or AS1851.

Boost Pressure	kPa	Test Pressure	kPa		
Duration of Test	mins	End of Test Pressure	kPa	Loss (if any):	L/min

Comments:

Part C—Hydrant Test Equipment/Pressure Gauges

If using more devices, provide details in the Notes section below or complete another form. The correction factor must be kPa or a percentage.

Flow Measuring Device	Device/Gauge 1	Device/Gauge 2	Device/Gauge 3	Device/Gauge 4
Type of Flow Meter	FLOW TECH	FLOW TECH	FLOW TECH	FLOW TECH
Serial Number	FP-01	FP-02	FP-03	FP-04
Date Calibrated	07/05/2022	07/05/2022	07/05/2022	07/05/2022
Gauges	FYR-007	FYR-008	FYR-009	FYR-010
Correction Certificate	3183	3184	3185	3186
65/100/150mm Face	100MM	100MM	100MM	100MM
Digital Reader	N/A	N/A	N/A	N/A
Increments (kPa)	20kpa	20kpa	20kpa	20kpa

Part D—Hydrant System Flow Test **PASS** **FAIL**

This part relates to section 10.3 of AS2419.1. If pressure/flow rates do not meet the fire system design criteria and there are no on-site problems, contact the relevant water service provider to ascertain if there are any problems with the water system network. In the table below, please record the pressure readings obtained during the hydrant system flow test.

Hydrant 1 Location and Device		Hydrant 3 Location and Device	
Hydrant 2 Location and Device		Hydrant 4 Location and Device	
System Requirements	L/s at kPa	Static Pressure	kPa
On-Site Pump Set Installed	Yes		No

Pressure Zone Number:	Size/Flow Rate	Device/Gauge no. (Part C)	Hydrant 1 Only	Hydrants 1 and 2	Hydrants 1, 2 and 3	Hydrants 1, 2, 3 and 4
Nozzles	19 mm		kPa	kPa	kPa	kPa
	22 mm		kPa	kPa	kPa	kPa
	25 mm		kPa	kPa	kPa	kPa
Other Portable Testing Devices	5 L/s		kPa	kPa	kPa	kPa
	10 L/s		kPa	kPa	kPa	kPa
	15 L/s		kPa	kPa	kPa	kPa
	20 L/s		kPa	kPa	kPa	kPa
	30 L/s		kPa	kPa	kPa	kPa
	System Achieved: L/s at kPa					

Part E—Pump Appliance Booster Test		**PASS X**	**FAIL**
This part relates to sections 10.4 and 10.5 of AS2419.1 and for tests under Section 4 of AS1851. If pressure/flow rates do not meet the fire system design criteria and there are no on-site problems, contact the relevant water service provider to ascertain if there are any problems with the water system network. In the table below, please record the pressure readings obtained during the pump appliance booster test.			
Hydrant Locations	Dry Hydrant	Height of Highest Hydrant above Booster	24.1 m
System Requirements	20 L/s at 700 kPa	Static Pressure	1100 kPa
Pump Inlet Pressure	540 kPa	Pump Discharge Pressure	1230 kPa
Boost Pressure	1200 kPa	Calculated Frictional Loss	40 kPa
Comments:			

Part F—Sprinkler Hydrostatic Test		**PASS**	**FAIL**
Relevant required pressure specification in AS2118.1, AS2118.4 and AS2118.6.			
Pressure	kPa	Time held	mins
Comments:			

Part G—Sprinkler System Flow Test

This section is to be used for sections 4.14 of AS2118.1-1999, 4 of AS2118.6-2012 and 6.2 of AS2118.4-2012 and section 2 of AS1851. Notes: (1) For AS2118.1 and AS2118.6 systems, multiple testing points may be required. (2) For AS2118.4, a simulated running test may be required for systems without a flow measuring device, in which the test involves opening a valve to discharge a volume of water that is accepted as being in excess of the design flow. System test points shall be noted for each different system and its location and descriptor.

	System Specifications (block plan):		**Test Results:**		
Test Point 1	Location				
	Required Flow Rate	L/min	Pass	Fail	L/min
	Required Pressure	kPa	Pass	Fail	kPa
Test Point 2	Location				
	Required Flow Rate	L/min	Pass	Fail	L/min
	Required Pressure	kPa	Pass	Fail	kPa
Running Test	Installation Gauge Pressure: kPa				
Comments:					

Part H—Compliance

Critical Defects Identified	Yes		Give owner/occupier a critical defect notice
	No	X	No action required in relation to critical defects at this time
Repairs/Corrective Actions Taken	Yes		Attach details (including action and date taken) as part of Licensee's report
	No	X	No action required in relation to repairs/corrective actions at this time
System	Pass	X	
	Fail		

Part I—Signature

By signing this Form 72, I confirm that the information contained herein is correct to the best of my knowledge given the information available and that this Form 72 has been completed in accordance with the relevant standards, codes and regulations.

Licensee Name	SHAYNE KIRKLAND	**Licensee Signature**	
Licence No. (QBCC/PIC)	11972621	**Licensee report no.**	

Note: Building owners/occupiers are responsible for ensuring their buildings continuously meet fire safety standards. Where a building owner/occupier becomes aware that their building does not meet the minimum requirements for water pressure required by any standard applicable under the Queensland Development Code Mandatory Part 6.1 (Maintenance of fire safety installations) the building owner/occupier should contact the Queensland Fire and Emergency Service.

Definitions → *"Maintenance test"* means a test that is required under a maintenance standard such as AS1851. *"Running test"* means a two inch waste test installed at the sprinkler control valve on older systems.

Privacy: The information on this form is collected for purposes related to monitoring compliance under the *Plumbing and Drainage Act 2002*, the *Building Act 1975* and the *Building Fire Safety Regulation 2008* ("legislation"). This information may be stored in the department's database and may be used for statistical research, information provision and evaluation of Plumbing Industry Council and state government services. Your personal information may be disclosed to other government agencies, local government authorities and third parties for purposes related to this application. Except for these circumstances, personal information will only be disclosed to third parties with your consent or in accordance with the *Information Privacy Act 2009*.

RTI: The information collected on this form will be retained as required by the *Public Records Act 2002* and other relevant Acts and regulations, and is subject to the Right to Information regime established by the *Right to Information Act 2009*. If you have any further questions regarding your privacy, please email Building Codes Queensland on buildingcodes@qld.gov.au. © The State of Queensland (Department of Housing and Public Works) 2014. Published by the Queensland Government July 2014, 41 George Street, Brisbane QLD 4000.

Form 15 Compliance certificate for building design or specification

Queensland Government

This form is to be used by an appointed competent person for the purposes of section 10 of the *Building Act 1975* and sections 73 and 77 of the Building Regulation 2021 (Design-specification certificate) stating that an aspect of building work or specification will, if installed or carried out as stated in this form, comply with the building assessment provisions.

Additional explanatory information is included in the Appendix at the end of this form.

1. Property description

This section need only be completed if details of street address and property description are applicable.

E.g. in the case of (standard/generic) pool design/shell manufacture and/or patio and carport systems this section may not be applicable.

The description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address *(include number, street, suburb/locality and postcode)*

Lot 248/ 18 REMEMBRANCE DRIVE

SURFERS PARADISE State QLD Postcode 4217

Lot and plan details *(attach list if necessary)*

Lot 248/ SP 129443

Local government area the land is situated in

CITY OF GOLD COAST

2. Description of aspect/s certified

Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.

3. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications were relied upon.

AS/NZS 1170.0:2002; AS/NZS 1170.1:2002; AS 1170.4:2007, AS 4055:2012, NCC Vol. 2:2019

AS/NZS 4600:2018; AS 4100:1998

AS 2304:2019

Hydrostatic Loads: Specific gravity = 1.0

Wind Loading: Region B, TC1, IL2, Ultimate ARI 200 years, Md 0.95, Mt 1.0, Ms 0.8689

V design 52.10 m/s (ULS)

4. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Approved Documents:

STA Approved Altanks Dwgs

Shell Drawings: AT-RT-10.2-GA-01_R0, as approved by STA on 1/12/2022
Roof Drawings: AT-RT-10.2-ROOF SET_R0, as approved by STA on 1/12/2022

5. Building certifier reference number and building development application number

Building certifier reference number

Building development application number *(if available)*

6. Appointed competent person details

Under Part 6 of the Building Regulation a person must be assessed as a competent for the type of work (design-specification) by the relevant building certifier.

Name *(in full)*
Grant Rosbrook

Company name *(if applicable)*
STA Consulting Engineers

Contact person

Business phone number
07 3071 7444

Mobile number

Email address
CE@staconsulting.com.au

Postal address
Freeway Office Park, Building 3, 2728 Logan Road

Eight Mile Plains State QLD Postcode 4113

Licence class or registration type *(if applicable)*
RPEQ

Licence or registration number *(if applicable)*
MIEAust CPEng, RPEQ 10567, NER 2349759

7. Signature of appointed competent person

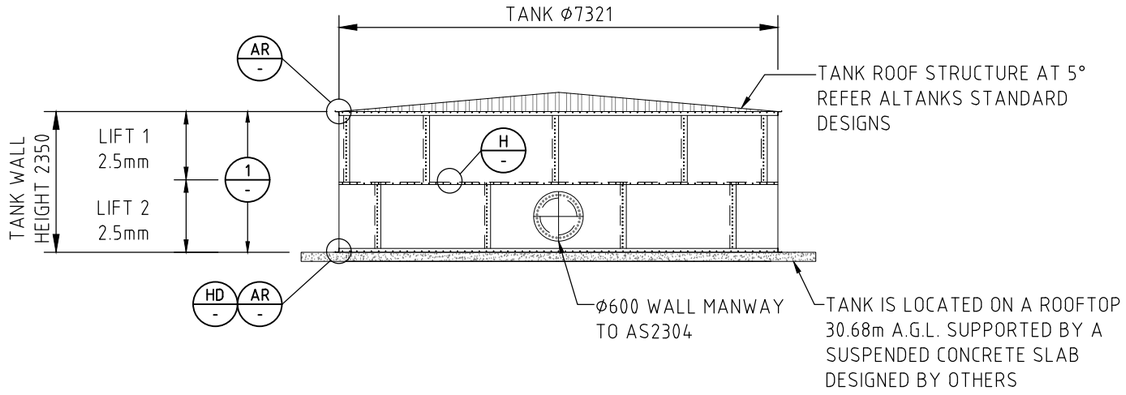
This certificate must be signed by the individual assessed and appointed by the building certifier as competent to give design-specification help.

Signature

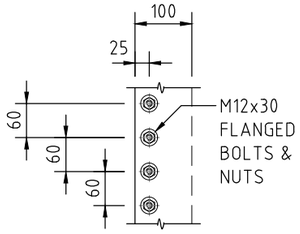
Date

LOCAL GOVERNMENT USE ONLY

Date received		**Reference number/s**	

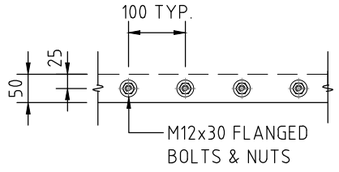


TANK ELEVATION
SCALE 1:100



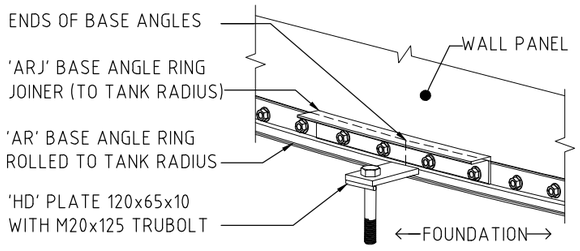
TYPICAL SINGLE VERTICAL ROW

DETAIL 1 / - SCALE 1:10



TYPICAL HORIZONTAL ROW

DETAIL H / - SCALE 1:10



HOLD DOWN NOTES:
1. HD PLATE POSITION IS INDICATIVE, CLAMPS ARE REQUIRED TO BE EVENLY SPACED AROUND TANK PERIMETER.
2. M20 TRUBOLT TO BE INSTALLED WITH A MAXIMUM 10mm GAP BETWEEN EDGE OF BOLT AND TOE OF BASE ANGLE. ENSURE ONCE TANK IS FULL THAT THE BASE ANGLE DOES NOT REST AGAINST BOLTS.

TYPICAL BASE CLAMPING

DETAIL HD / - N.T.S.

TANK DATA SHEET

SPECIFICATIONS	
TANK MODEL	AT-RT-10.2
DIMENSIONS	Ø7321mm x 2350mm HIGH
CAPACITY	100kL NOMINAL / 70kL EFFECTIVE
DESIGN & OPERATING PARAMETERS	
STORED FLUID	WATER
MAX PRODUCT DENSITY	SG1
DESIGN PRESSURE	STATIC
TEMPERATURE RANGE	-30°C to 65°C
OPERATING TEMPERATURE	AMBIENT
CONSTRUCTION	
TANK SHELL	GR250 GRADE MILD STEEL SHEETS
SHELL FINISH	GALVANISED
ROOF TYPE	LOW PROFILE PITCHED 5° CONE, VERMIN SEALED
ROOF STRUCTURE	ZINCALUME PURLINS & H.D.G. M.S. COMPONENTS
ROOF FINISH	TRIMDEK 0.42BMT
AR - ANGLE RING (ROOF/BASE)	H.D.G. M.S. 50EA5.0
HD - BASE HOLD DOWN	H.D.G. M.S. 120x65x10 CLAMP PLATES x 2 PER PANEL-20 TOTAL
WG - WIND GIRDERS	N/A
FASTENERS	SHELL: GALVANISED GR8.8 PANEL BOLTS & NUTS
	BASE: GALVANISED M20x125 TRUBOLTS
	ROOF: CYCLONE RATED H.D.G. TEK SCREWS
INTERNAL LINING	0.6mm PVC LINER REINFORCED, FIXED AT 200mm SPACING (BASE & WALL ONLY)
LINER UNDERLAY	200gsm GEOFABRIC
ACCESS LADDERS	INTERNAL: 316 S/S, EXTERNAL: H.D.G. M.S. TO AS1657
FOUNDATION RINGBEAM/SLAB	BY OTHERS AS PER ALTANKS STANDARD DRAWING
NOZZLES & MANWAYS	
EXTERNAL SPOOLS	H.D.G. M.S. BOLTED & 3mm INSERTION RUBBER GASKETS
PIPE FLANGES	TABLE D or FLANGED T.B.A.
ROOF MANWAY	H.D.G. M.S. 750x750 WITH HINGED LOCKABLE LID (ALL TANKS)
WALL MANWAY	H.D.G. M.S. Ø600 (FIRE TANKS ONLY AS PER AS2304)
DESIGN CODES	
AS2304	FIRE STORAGE TANKS
AS4100	SAA STEEL STRUCTURES
AS1554	WELDING OF STEEL STRUCTURES
AS1657	ACCESS LADDERS & PLATFORMS
AS1252	STRUCTURAL ASSEMBLIES
AS4860	GALVANISING
AS/NZS1170.1	LOADING CODE - DEAD & LIVE LOADS
AS/NZS1170.2	LOADING CODE - WIND LOADS
DR 04303	STRUCTURAL DESIGN ACTIONS PART 4: EARTHQUAKE
NOTES	
WARRANTY	20 YEARS
NOTE 1	DESIGN LIFE 50 YEARS
NOTE 2	CONSTRUCTOR TO INCORPORATE VENDOR DATA

STRUCTURAL ISSUE

ISSUE	ISSUE DESCRIPTION	DATE	DRAWN	APPROVED
0	STRUCTURAL ISSUE	30/11/22	TW	STA

DESIGNED: STA | APPROVED: STA
DRAWN: TW | DATE: 30/11/22
CHECKED: STA | SCALE: AS SHOWN

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ph: (07) 5618 8284
email: sales@altanks.com.au
web: www.altanks.com.au

CLIENT: **AUSCOAST**

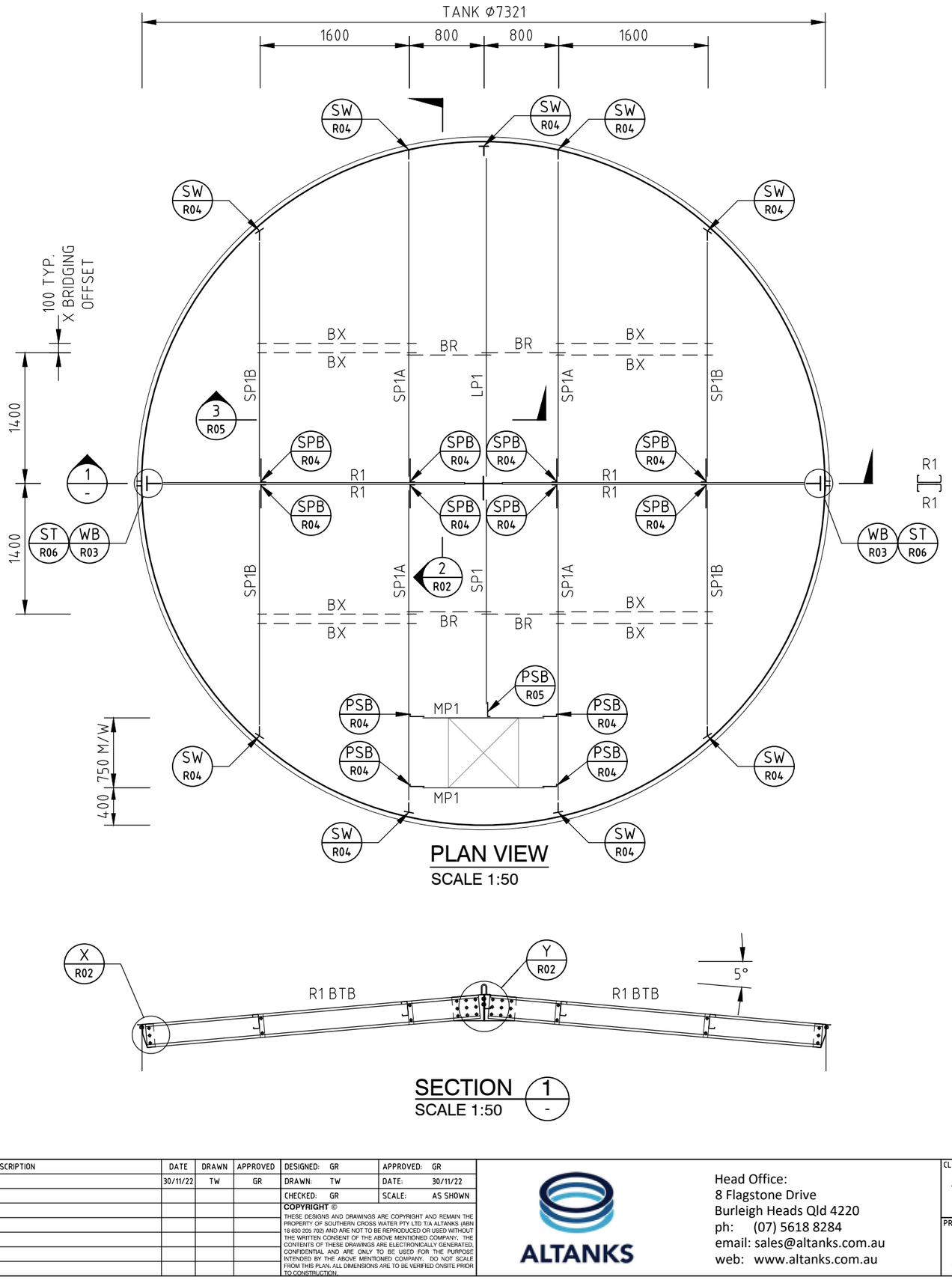
PROJECT: **18 REMEMBRANCE DRIVE SURFERS PARADISE, QLD 4217**

DRAWING TITLE: **AT-RT-10.2 (Ø7321 x 2350 HIGH) TANK G/A & DETAILS**

WIND REGION: B / TERRAIN CATEGORY: 1

DRAWING No.: **AT-RT-10.2-GA-01** | SHEET: 1 OF 1 | REV: 0

1:100 A3 SHEET SIZE



PLAN VIEW
SCALE 1:50

SECTION 1 -
SCALE 1:50

MEMBER SCHEDULE

MK No.	DESCRIPTION	SHEET	QT'Y.
R1	C25024 BTB RAFTER	R01	4
LP1	C15019 RADIAL PURLINS - LONG SIDE	R01	1
SP1, SP1A, SP1B	C15019 RADIAL PURLINS - SHORT SIDE	R01	9
MP1	C15019 MANHOLE PURLINS	R01	2

ITEM LIST

ITEM	DESCRIPTION	DRG.	QT'Y.
CB	RAFTER CENTRE BRACKET TYPE CB-2	R03	1
WB	RAFTER WALL BRACKET TYPE WB-2	R03	2
SPB	C250R-C150P PURLIN BRACKET-SHORT SIDE	R04	8
PSB	C150R-C150P PURLIN BRACKET-STRAIGHT	R04	5
SW	SWIVEL BRACKET ASSEMBLY FOR C150 PURLINS: TYPE SW-150 -C	R04	9
BX	PURLIN 'X' BRIDGING - M12 x 1700 LONG & CROSSED @ INSTALLATION, REFER DETAIL	R05	4
BR	PURLIN BRIDGING - M16 x 900 LONG	R05	4
ST	PANEL STIFFENERS	R06	4

STRUCTURAL ISSUE

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0	STRUCTURAL ISSUE	30/11/22	TW	GR

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CLIENT: AUSCOAST

PROJECT: 18 REMEMBRANCE DRIVE SURFERS PARADISE, QLD 4217

DRAWING TITLE: AT-RT-10.2 (Ø7321 x 2350 HIGH) ROOF STRUCTURE G/A & DETAILS

LOCATION: WIND REGION: B / TERRAIN CATEGORY: 1

DRAWING No.: AT-RT-10.2-B-R01 | SHEET: 1 OF 6 | REV: 0

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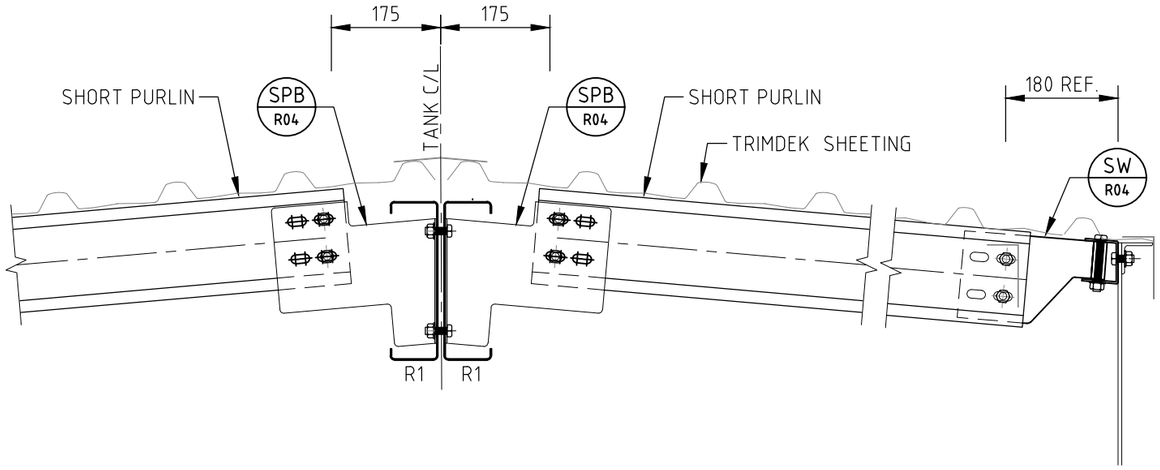
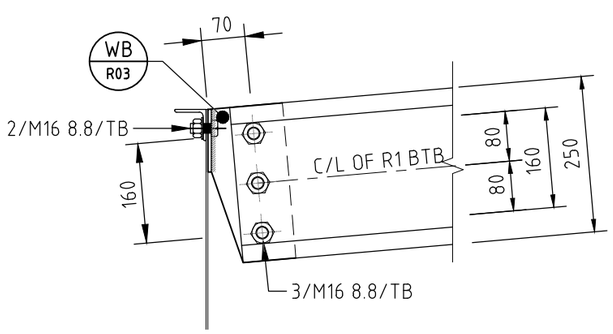
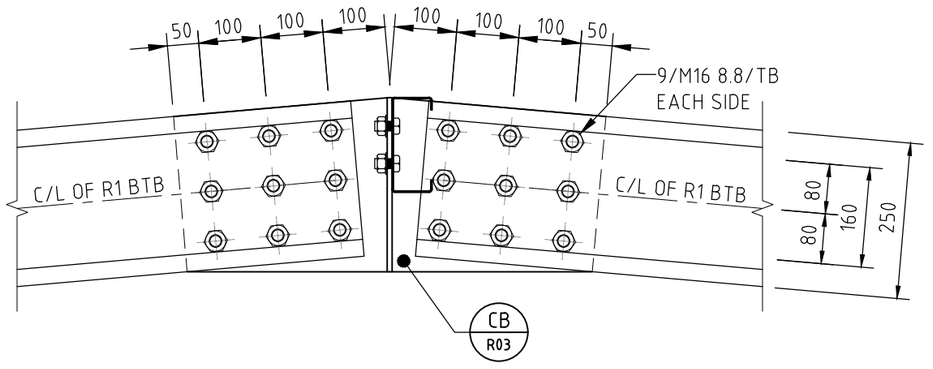


SECTION 2 / R01
SCALE 1:10



R1 WALL BRACKET CONNECTION

DETAIL X / -
SCALE 1:10



R1 CENTRE BRACKET CONNECTION

DETAIL Y / -
SCALE 1:10

STRUCTURAL ISSUE

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0	STRUCTURAL ISSUE	30/11/22	TW	GR

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CLIENT: **AUSCOAST**

PROJECT: **18 REMEMBRANCE DRIVE SURFERS PARADISE, QLD 4217**

DRAWING TITLE: **AT-RT-10.2 (Ø7321 x 2350 HIGH) ROOF STRUCTURE G/A & DETAILS**

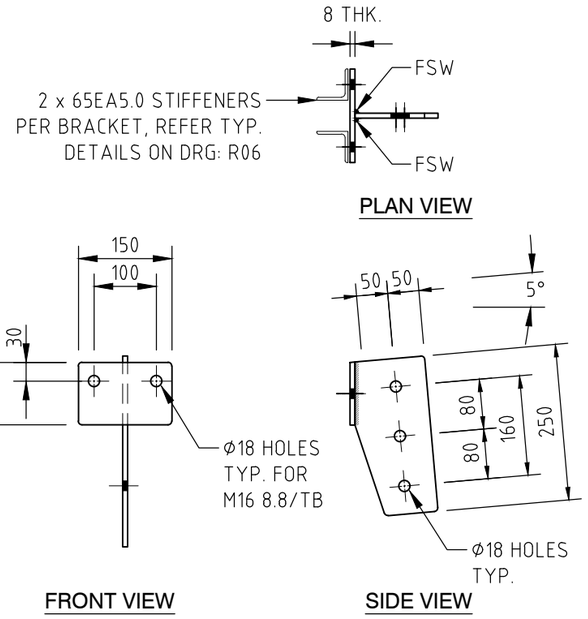
LOCATION: **WIND REGION: B / TERRAIN CATEGORY: 1**

DRAWING No.: **AT-RT-10.2-B-R02**

SHEET: 2 OF 6

REV: 0

1:100 0 1 2 3 4 5 A3 SHEET SIZE

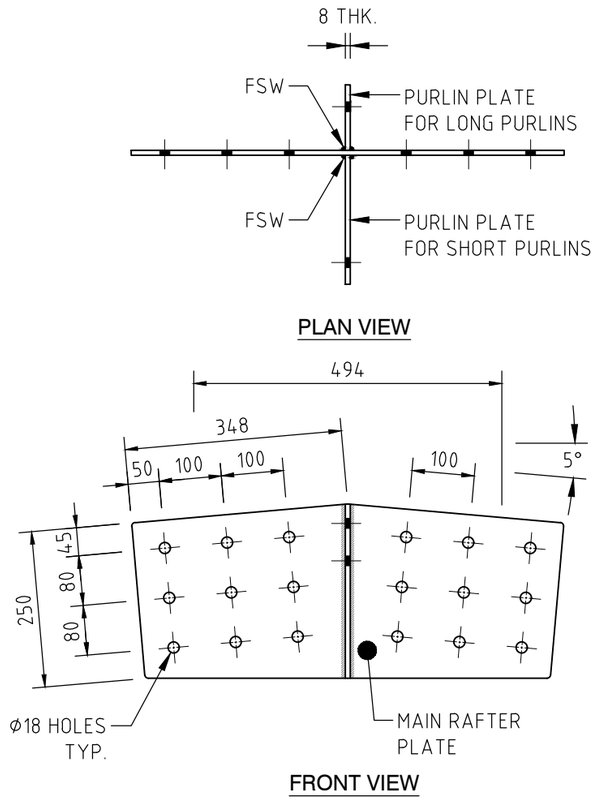


WB R01 RAFTER WALL BRACKET TYPE WB-2

SCALE 1:10

MAT'L: 8 THK. MIN. GRADE 250 PLATE H.D.G.

2 ASSEMBLIES REQ'D.



CB R01 RAFTER CENTRE BRACKET TYPE CB-2

SCALE 1:10

MAT'L: 8 THK. MIN. GRADE 250 PLATE H.D.G.

1 ASSEMBLY REQ'D.

STRUCTURAL ISSUE

ISSUE	ISSUE DESCRIPTION	DATE	DRAWN	APPROVED
0	STRUCTURAL ISSUE	30/11/22	TW	GR

DESIGNED:	GR	APPROVED:	GR
DRAWN:	TW	DATE:	30/11/22
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CLIENT: **AUSCOAST**

PROJECT: **18 REMEMBRANCE DRIVE SURFERS PARADISE, QLD 4217**

DRAWING TITLE: **AT-RT-10.2 (Ø7321 x 2350 HIGH) ROOF STRUCTURE G/A & DETAILS**

LOCATION: **WIND REGION: B / TERRAIN CATEGORY: 1**

DRAWING No.: **AT-RT-10.2-B-R03**

SHEET: 3 OF 6

REV: 0

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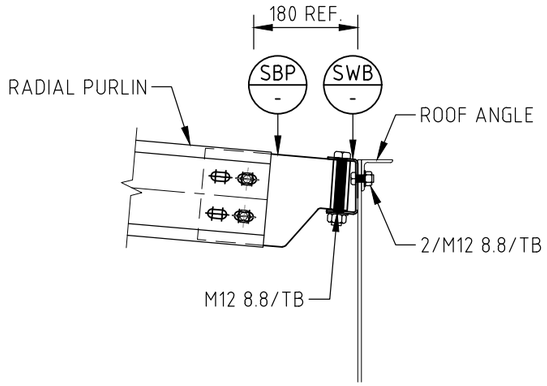
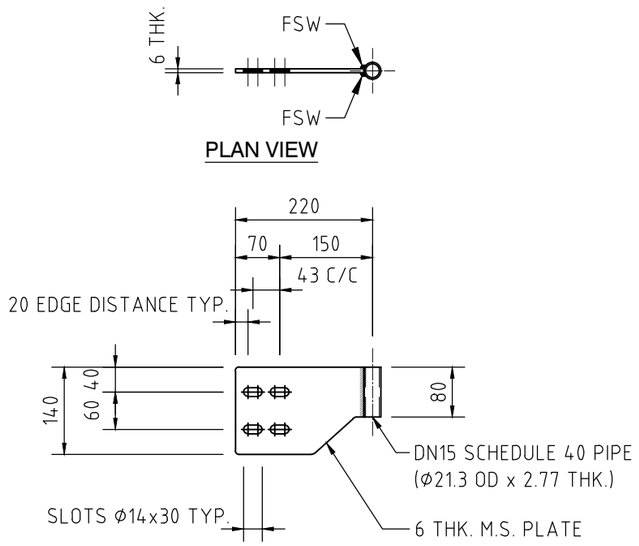


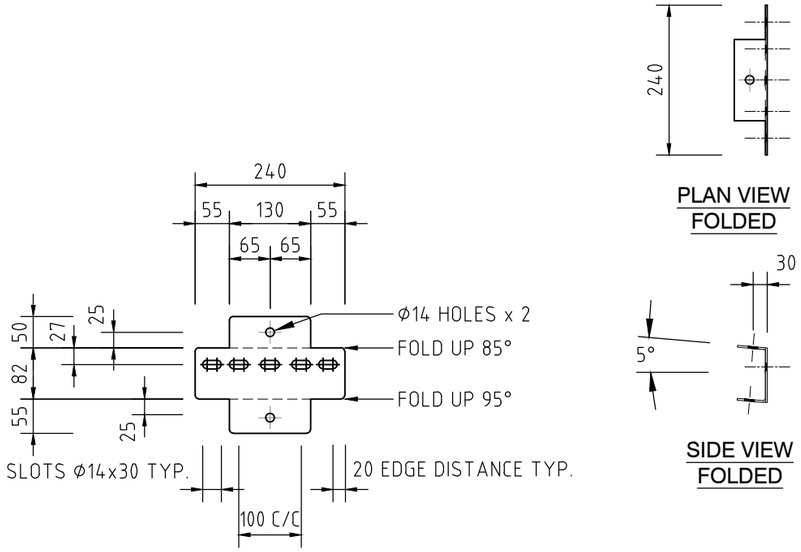
SW R01 SWIVEL BRACKET ASSEMBLY SW-150-C

SCALE 1:10
QUANTITIES AS PER
SCHEDULE ON DRG: R01



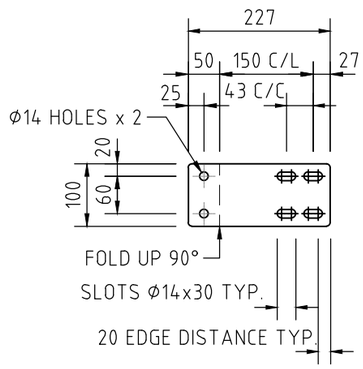
SBPB - C150P SWIVEL BRACKET PLATE

SCALE 1:10
MAT'L: 6 THK. M.S. H.D.G.
1 REQ'D. PER ASSEMBLY



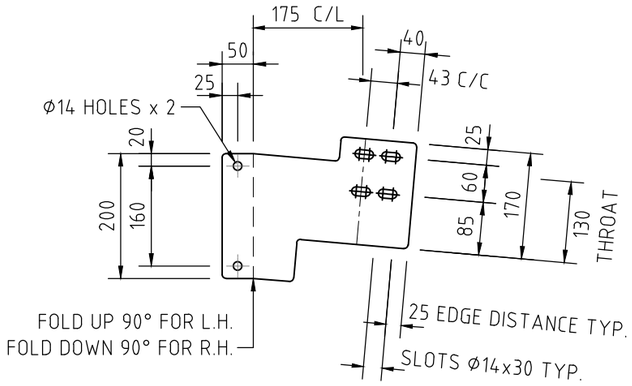
SWPB - SWIVEL WALL PLATE

SCALE 1:10
MAT'L: 4 THK. M.S. H.D.G.
1 REQ'D. PER ASSEMBLY



PSB R01 C150R-C150P PURLIN STRAIGHT BRACKET

SCALE 1:10
MAT'L: 3 THK. M.S. H.D.G.
QUANTITIES AS PER SCHEDULE
ON DRG: R01



SPB R01 C250R-C150P SHORT PURLIN BRACKET

SCALE 1:10
MAT'L: 3 THK. M.S. H.D.G.
QUANTITIES AS PER SCHEDULE
ON DRG: R01

STRUCTURAL ISSUE

ISSUE	ISSUE DESCRIPTION	DATE	DRAWN	APPROVED
0	STRUCTURAL ISSUE	30/11/22	TW	GR

DESIGNED: GR | APPROVED: GR
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email: sales@altanks.com.au
web: www.altanks.com.au

CLIENT: AUSCOAST

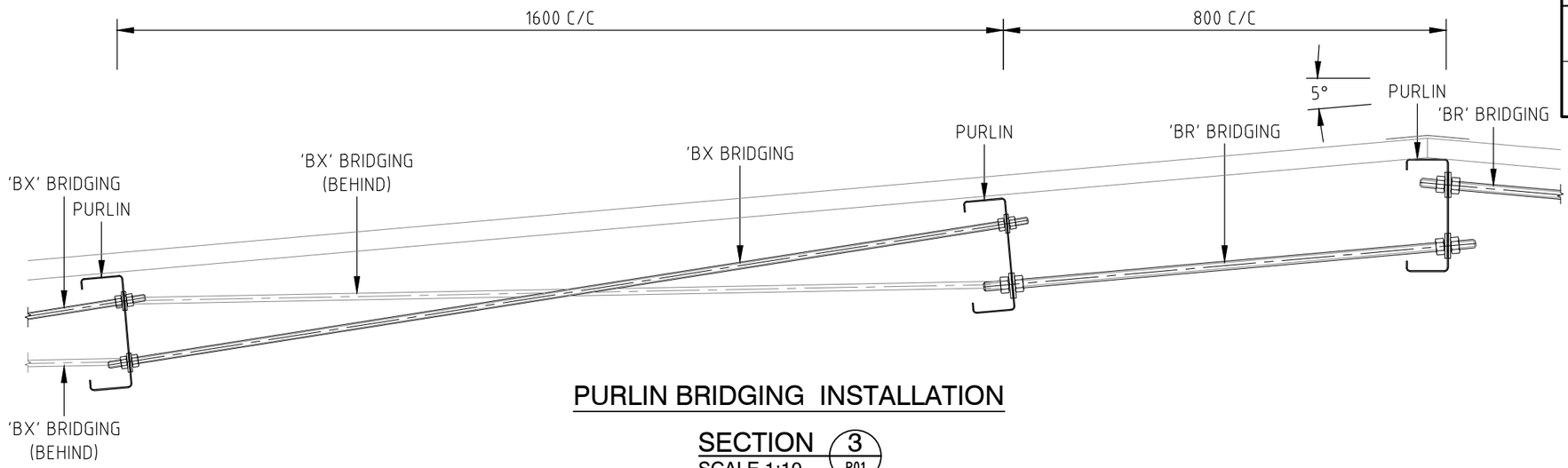
PROJECT: 18 REMEMBRANCE DRIVE
SURFERS PARADISE, QLD 4217

DRAWING TITLE: AT-RT-10.2 (Ø7321 x 2350 HIGH)
ROOF STRUCTURE G/A & DETAILS

LOCATION: WIND REGION: B / TERRAIN CATEGORY: 1

DRAWING No.: AT-RT-10.2-B-R04 | SHEET: 4 OF 6 | REV: 0

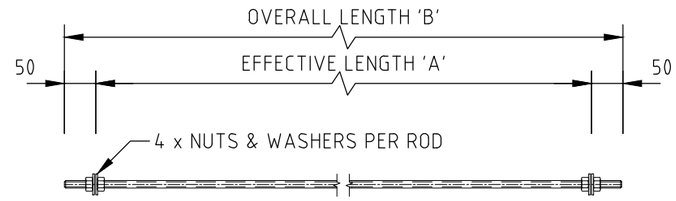
1:100 0 1 2 3 4 5 A3 SHEET SIZE



PURLIN BRIDGING INSTALLATION

SECTION 3 / R01
SCALE 1:10

BRIDGING SCHEDULE			
MK No.	DESCRIPTION	EFF. LENGTH 'A'	O'ALL. LENGTH 'B'
BX	PURLIN BRIDGING LONG M12 CROSSED	1600	1700
BR	PURLIN BRIDGING SHORT M16	800	900



BX/BR / R01

PURLIN BRIDGING

SCALE 1:10
MAT'L: GALV. THREADED ROD.
DIAMETER & QUANTITIES AS PER SCHEDULE ON DRG: R01

STRUCTURAL ISSUE

ISSUE	ISSUE DESCRIPTION	DATE	DRAWN	APPROVED
0	STRUCTURAL ISSUE	30/11/22	TW	GR

DESIGNED: GR | APPROVED: GR
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Head Office:
8 Flagstone Drive
Burleigh Heads Qld 4220
ph: (07) 5618 8284
email: sales@altanks.com.au
web: www.altanks.com.au

CLIENT: AUSCOAST

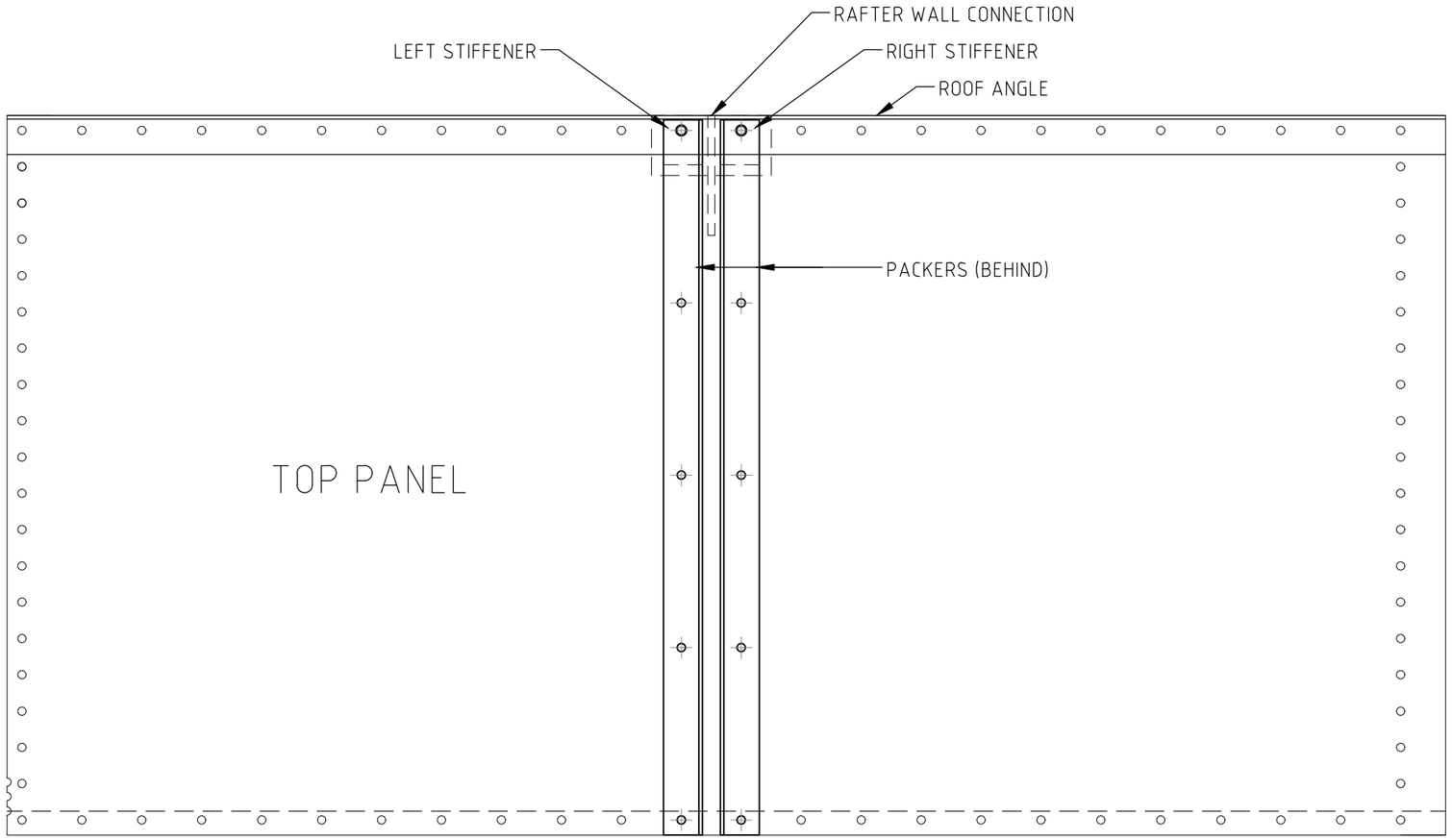
PROJECT: 18 REMEMBRANCE DRIVE
SURFERS PARADISE, QLD 4217

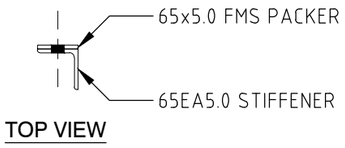
DRAWING TITLE: AT-RT-10.2 (Ø7321 x 2350 HIGH) ROOF STRUCTURE BRIDGING

LOCATION: WIND REGION: B / TERRAIN CATEGORY: 1

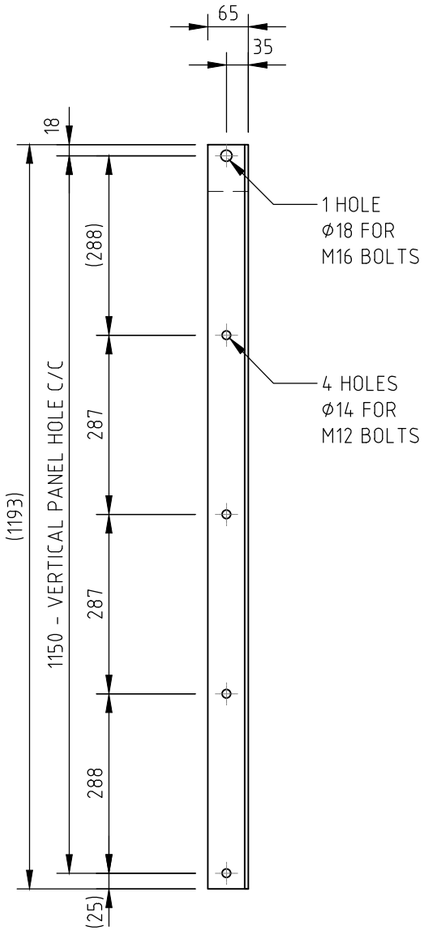
DRAWING No.: AT-RT-10.2-B-R05 | SHEET: 5 OF 6 | REV: 0

1:100 0 1 2 3 4 5 A3 SHEET SIZE

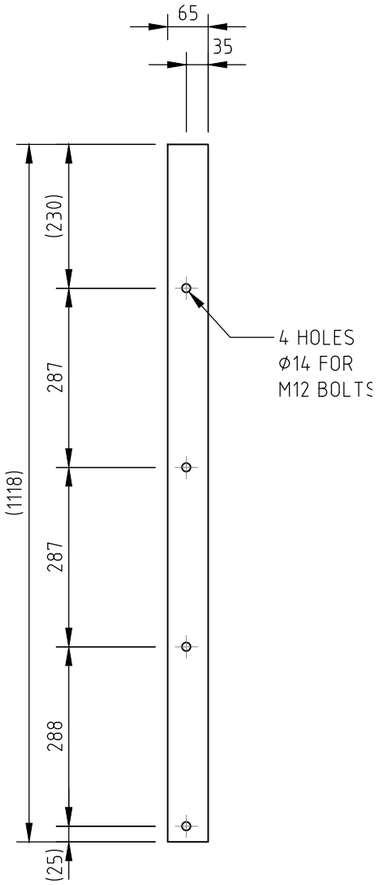




TOP VIEW



OUTSIDE VIEW



OUTSIDE VIEW

ST / R01 ASSEMBLED STIFFENERS OUTSIDE VIEW

SCALE 1:10
TYP. BOTH ENDS OF RAFTER

ST / R01 LEFT STIFFENERS

SCALE 1:10
MAT'L: 65EA5.0 H.D.G.
2 REQ'D. AS DRAWN
2 REQ'D. OPPOSITE HAND

- / - PACKERS

SCALE 1:10
MAT'L: 65x5.0 F.M.S. H.D.G.
4 REQ'D. AS DRAWN

STRUCTURAL ISSUE

ISSUE	ISSUE DESCRIPTION	DATE	DRAWN	APPROVED
0	STRUCTURAL ISSUE	30/11/22	TW	GR

DESIGNED:	GR	APPROVED:	GR
DRAWN:	TW	DATE:	30/11/22
CHECKED:	GR	SCALE:	AS SHOWN

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ALTANKS

Head Office:
8 Flagstone Drive
Burleigh Heads Qld 4220
ph: (07) 5618 8284
email: sales@altanks.com.au
web: www.altanks.com.au

CLIENT: **AUSCOAST**

PROJECT: **18 REMEMBRANCE DRIVE SURFERS PARADISE, QLD 4217**

DRAWING TITLE: **AT-RT-10.2 (Ø7321 x 2350 HIGH) ROOF STRUCTURE STIFFENERS**

LOCATION: **WIND REGION: B / TERRAIN CATEGORY: 1**

DRAWING No.:	SHEET:	OF	REV:
AT-RT-10.2-B-R06	6	6	0

1:100 A3 SHEET SIZE

Form 12 Aspect Inspection Certificate (Appointed Competent Person)

Queensland Government

This form is the approved form that must be used in accordance with sections 74 and 77 of the Building Regulation 2021 (appointed competent person statement that an aspect of work has been completed and complies with the building development approval).

Information about how to complete this form is in the Appendix at the end of the form.

1. Indicate the aspect of the building work

Examples of aspects of the stage of building work (and not limited to the examples provided below):

waterproofing, tiling, glazing, energy efficiency, emergency lights, exit signs, smoke detection, air-conditioning.

Aspect of building work (indicate the aspect)
BOLTED STEEL WATER TANK

2. Property description

The description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address	18 Remembrance Drive		
		Suburb/locality	Surfers Paradise
State	QLD	Postcode	4217

Lot and plan details *(attach list if necessary)*
Lot 248 on SP129443
Local government area the land is situated in
Gold Coast City Council

3. Building/structure description

Building/structure description
Residential Unit Development
Class of building/structure
2,7a,10b

4. Description of the extent of aspect/s certified

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Altanks Model: AT RT 10.2 Custom Steel Water Tank including: Tank shell including plate, connections, wind rings, hold downs, external ladder Roof structure including main rafters, purlins and brackets Excludes: Foundations; Ring beam / Slab, Nozzles, pipework, liner an other items not noted above.

5. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications were relied upon.

AS/NZS 1170.0:2002; AS/NZS 1170.1:2002; AS 1170.2:2011; AS 1170.4:2007; AS 4100:1998; AS 4600-2018; AS1657:2023;
AS 2304:2019

Hydrostatic Loads: Apecific Gravity = 1.0
Wind Loading: Region B, TC2.5, Importance level 2
Seismic Loads: Hazard Facgtor = 0.

6. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

STA Approved drawings:

General Arrangement: AT RT 10.2-GA-01

Roof Drawings: AT-RT-10.2-ROOF SET_RO

7. Building certifier reference number and building development approval number

Building certifier's name *(in full)*	Mackie Construction Consultants Pty Ltd – Paul Mackie		
Building certifier reference number	1446	Building development approval number	MCU201800077

8. Details of appointed competent person

Name *(in full)*	Scott SCHUBERT		
Company name *(if applicable)*	TANK TEK		
Contact person	Scott Schubert		
Business phone number		Mobile	0400844005
Email address	scott@tanklogix.com.au		
Postal address	59 Seafield Avenue		
KINGSWOOD			
State	SA	Postcode	5062
Licence class or registration type *(if applicable)*	QBCC Structural Metal Fabrication and Erection		
Licence class or registration number *(if applicable)*	15116055		
Date request to inspect received from building certifier	25/05/2023		

9. Signature of appointed competent person

Signature		Date	25/05/2023

LOCAL GOVERNMENT USE ONLY

Date received	Click or tap to enter a date.	Reference number/s	

Appendix – explanatory information

IMPORTANT NOTE: a competent person who knowingly or reasonably suspects the information they are giving to the building certifier is false or misleading, including the information contained in this certificate (Form 12), commits an offence and is liable to a maximum penalty of 100 penalty units.

When is this certificate needed? (section 10 of the *Building Act 1975* (Building Act) and sections 74 and 75 of Building Regulation 2021 (BR 2021).

When performing a building certification function, a building certifier may accept and rely on an ***aspect inspection certificate*** from an appointed competent person to satisfy themselves that an aspect of work has been completed and complies with the building development approval.

For a single detached class 1a building a building certifier can only accept this form for an aspect of work that is for

- boundary clearance if the appointed competent person (inspection) is a cadastral surveyor, and,
- the reinforcement of footing systems or formwork and reinforcement for a slab if the appointed competent person (inspection) is a registered professional engineer.

For further information about inspections for detached class 1a and 10 buildings or structures, refer to **Guidelines for inspection of class 1a and 10 buildings and structures.**

Who can sign this certificate (Form 12)? (Part 9, Division 2, Section 74 of the BR 2021)

A person assessed and appointed as a competent person (inspection) must complete the approved form (Form 12) and give it to the building certifier after they (1) inspect the aspect of work; and (2) are satisfied the aspect of work has been completed and complies with the building development approval.

Competent person (section 10 of the Building Act and Part 6 of the BR 2021)

A building certifier must assess and decide to appoint an individual as a competent person before they can, as a competent person, give inspection help or design-specification help. The building certifier is required to keep detailed records about what was considered when appointing a competent person.

A competent person cannot give inspection help to a building certifier until they have been appointed by the building certifier. For further information about assessment of someone as a competent person refer to the **Guideline for the assessment of competent persons.**

Inspection help (section 34 of the BR 2021)

A building certifier must be satisfied that an individual is competent to give the type of inspection help having regard to the individual's experience, qualifications and skills and if required by law to hold a licence or registration, that the individual is appropriately registered or licensed.

For further information about conducting inspections for class 2 to 9 buildings, refer to the **Guideline for inspection of class 2 to 9 buildings.**

How to complete this form

Section 1 – Aspect of building work

An aspect of building work means a component of a stage of the building work, for example water proofing. A stage of assessable building work (requires a building development approval) is a stage of the work, prescribed by regulation, that may be inspected, or stated in a building development approval by the relevant building certifier.

Section 2 – Property description

The property description must identify all the land the subject of the application. The lot and plan details (e.g. SP/RP) can be found on title documents or a rates notice. If the plan is not registered by title, provide previous lot and plan details.

Section 3 – Building / structure description

Describe the type of building or structures and provide the classification determined under the National Construction Code (NCC). The NCC can be accessed at the Australian Building Codes Board's website.

Section 4 – Describe the extent or location of the aspect work inspected

Clearly describe the extent of work covered by this certificate, i.e. all structural aspects of the steel roof beams and location i.e. what floors the work was on, the parts of a room.

Sections 5 – Basis for the certification and section 6 Reference documentation (section 77 of BR 2021)

The appointed competent person (inspection) must state the basis for giving the certificate (Form 12) including the extent to which the competent person has relied on tests, specifications, rules, standards, codes of practice or other publications to make their decision that the aspect of work has been completed and complies with the building development approval.

Under the regulation (section 76) the appointed competent person (inspection) may accept and rely on a certificate (Form 12) from another appointed competent person (inspection) without inspecting the work. Although this can only be done if the inspection was carried out in accordance with best industry practice.

Other relevant inspection / aspect forms

Aspect work – assessable building work: Form 43 – Aspect certificate (completed by a QBCC licensee) for aspect work for a single detached class 1a building and class 10 buildings and structures.

Aspect work not subject to a building development approval - accepted development (self-assessable): Form 30 – (completed by a QBCC licensee) given to either the builder or building owner of the building, stating the subject aspect work complies with the relevant provisions, standards and codes.

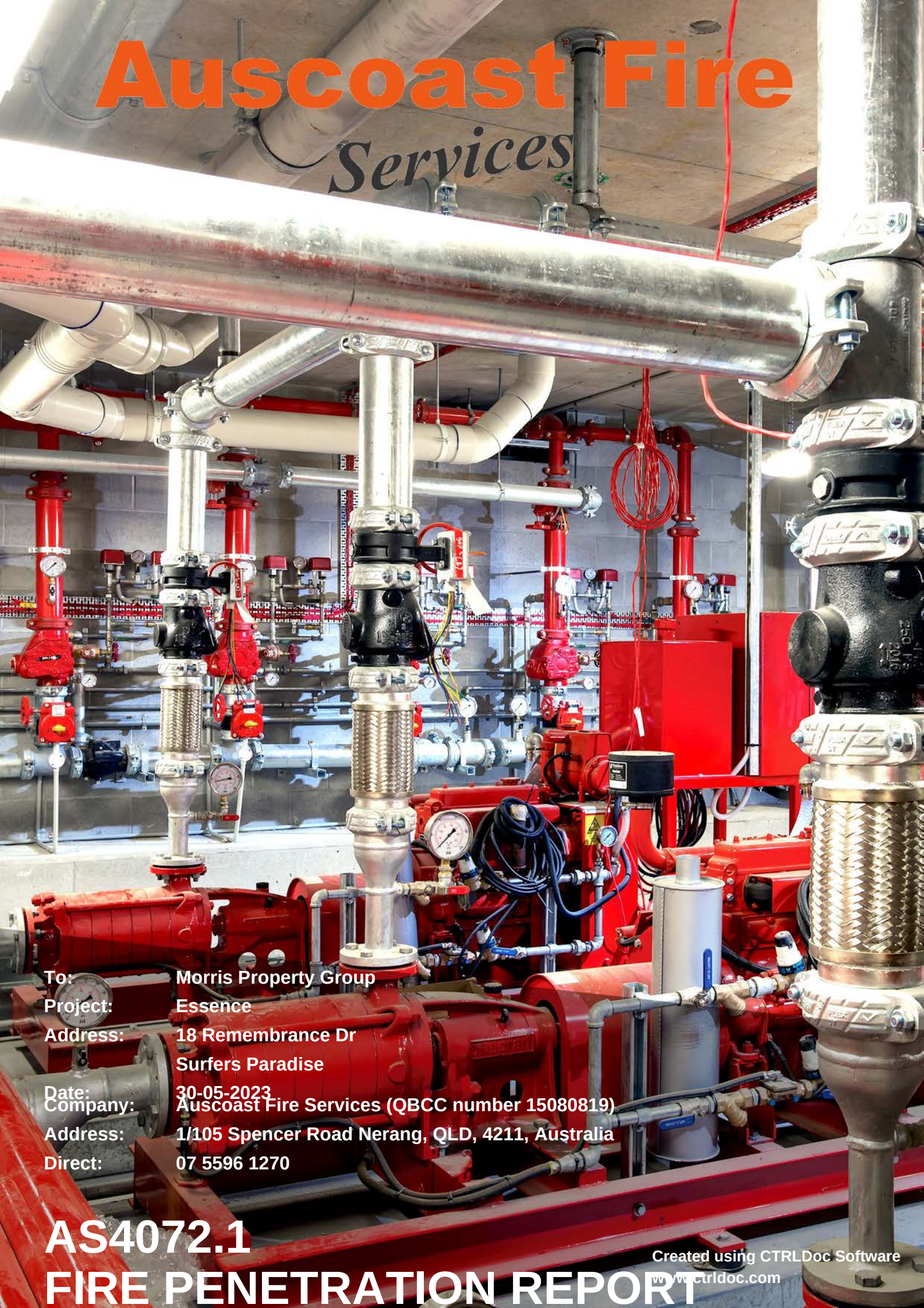
Stages of work: Form 16 – Inspection certificate (completed by a building certifier or competent person) for a stage of work.

Building design – specification: Form 15 – Compliance certificate for building design or specification (completed by the appointed competent person (design – specification)) - for an aspect of stating a building design – specification will, if installed or carried out to the detail under this Form will comply with the building assessment provisions.

For all other building forms and guidelines visit the Business Queensland website.

PRIVACY NOTICE

The Department of Energy and Public Works is collecting personal information as required under the *Building Act 1975*. This information may be stored by the Department, and will be used for administration, compliance, statistical research and evaluation of building laws. Your personal information will be disclosed to other government agencies, local government authorities and third parties for purposes relating to administering and monitoring compliance with the *Building Act 1975*. Personal information will otherwise only be disclosed to third parties with your consent or unless authorised or required by law.



To:	Morris Property Group
Project:	Essence
Address:	18 Remembrance Dr Surfers Paradise
Date:	30-05-2023

Company:	Auscoast Fire Services (QBCC number 15080819)
Address:	1/105 Spencer Road Nerang, QLD, 4211, Australia
Direct:	07 5596 1270

AS4072.1
FIRE PENETRATION REPORT

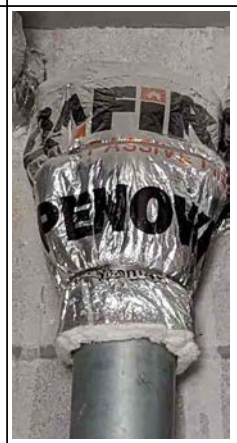
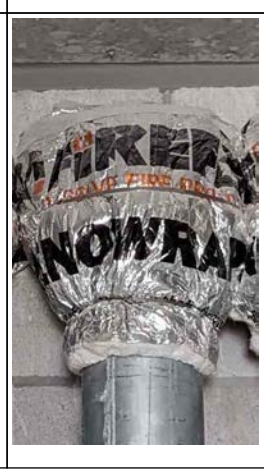
Created using CTRLDoc Software
www.ctrldoc.com

Auscoast Passive Fire Register

Project Name:Essence

Process:Done

Printed:Tuesday, May 30, 2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
STP-0105	Basement 2 Basement 2 Fire Stair	Steel Pipe	Intumastic and Penowrap FAS190236 RIR TBA Firefly Core Hole Report R1.13	Concrete Concrete ~/120/120	30-05-2023
STP-0106	Basement 1 Basement 1 Fire Stair	Steel Pipe	Intumastic and Penowrap FAS190236 RIR TBA Firefly Core Hole Report R1.13	Concrete Concrete ~/120/120	30-05-2023
STP-0115	Ground G Fire passage 1	Steel Pipe	Intumastic and Penowrap FAS190236 RIR TBA Firefly Core Hole Report R1.13	Concrete Concrete ~/120/120	30-05-2023
STP-0116	Ground G Fire passage 2	Steel Pipe	Intumastic and Penowrap FAS190236 RIR TBA Firefly Core Hole Report R1.13	Concrete Concrete ~/120/120	30-05-2023
STP-0117	Ground G Fire passage 3	Steel Pipe	Intumastic and Penowrap FAS190236 RIR TBA Firefly Core Hole Report R1.13	Concrete Concrete ~/120/120	 30-05-2023
STP-0118	Ground G Fire passage 4	Steel Pipe	Intumastic and Penowrap FAS190236 RIR TBA Firefly Core Hole Report R1.13	Concrete Concrete ~/120/120	 30-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
STP-0119	 Ground G Fire passage 5	Steel Pipe	Intumastic and Penowrap FAS190236 RIR TBA Firefly Core Hole Report R1.13	Concrete Concrete ~/120/120	 30-05-2023
STP-0102	 Ground Ground Floor Stair relief wall 2	Steel Pipe	Intumastic and Penowrap FAS190236 RIR TBA Firefly Core Hole Report R1.13	Concrete Concrete ~/120/120	 30-05-2023
C-0114	 Level 2 L2 DF riser	Cable	Batt FAS190202	Concrete Concrete ~/120/120	 30-05-2023
FP-0001	 Level 2 U1	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0011	 Level 2 U11	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0002	 Level 2 U2	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0003	 Level 2 U3	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0004	 Level 2 U4	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0005	 Level 2 U5	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0006	 Level 2 U6	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0007	 Level 2 U7	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0008	 Level 2 U8	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0009	 Level 2 U9	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
C-0113	 Level 3 L3 DF riser	Cable	Batt FAS190202	Concrete Concrete ~/120/120	 30-05-2023
FP-0024	 Level 3 Level 3 Fire Stair	CPVC Sprinkler	3000WT FAS180485.2	Concrete Concrete ~/120/120	 26-05-2023
FP-0013	 Level 3 U12	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0014	 Level 3 U13	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0015	 Level 3 U14	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

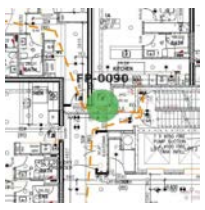
ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0016	Level 3 U15	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0017	Level 3 U16	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0018	Level 3 U17	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0019	Level 3 U18	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0020	Level 3 U19	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0021	Level 3 U20	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0022	 Level 3 U21	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0023	 Level 3 U22	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
C-0112	 Level 4 L4 DF riser	Cable	Batt FAS190202	Concrete Concrete ~/120/120	 30-05-2023
FP-0096	 Level 4 Level 4 Fire Stair	CPVC Sprinkler	3000WT FAS180485.2	Concrete Concrete ~/120/120	 26-05-2023
FP-0025	 Level 4 U23	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0033	 Level 4 U24	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0040	Level 4 U25	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0047	Level 4 U26	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0053	Level 4 U27	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0060	Level 4 U28	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0067	Level 4 U29	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0092	Level 4 U30	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0093	 Level 4 U31	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0094	 Level 4 U32	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0095	 Level 4 U33	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
C-0111	 Level 5 L5 DF riser	Cable	Batt FAS190202	Concrete Concrete ~/120/120	 30-05-2023
FP-0091	 Level 5 Level 5 Fire Stair	CPVC Sprinkler	3000WT FAS180485.2	Concrete Concrete ~/120/120	 26-05-2023
FP-0026	 Level 5 U34	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

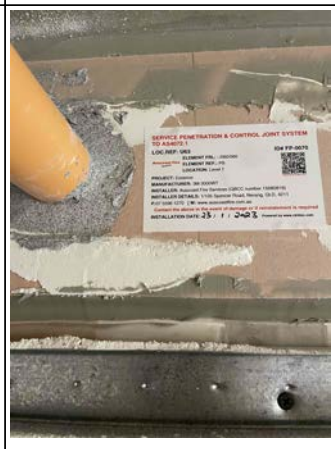
ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0031	Level 5 U35	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0037	Level 5 U36	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0043	Level 5 U37	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0049	Level 5 U38	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0054	Level 5 U39	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0059	Level 5 U40	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0065	 Level 5 U41	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0071	 Level 5 U42	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0076	 Level 5 U43	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0090	 Level 5 U44	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
C-0110	 Level 6 L6 DF riser	Cable	Batt FAS190202	Concrete Concrete ~/120/120	 30-05-2023
FP-0086	 Level 6 Level 6 Fire Stair	CPVC Sprinkler	3000WT FAS180485.2	Concrete Concrete ~/120/120	 26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0027	Level 6 U45	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0032	Level 6 U46	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0038	Level 6 U47	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0044	Level 6 U48	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0050	Level 6 U49	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0055	Level 6 U50	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0061	Level 6 U51	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0066	Level 6 U52	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0072	Level 6 U53	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0077	Level 6 U54	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0081	Level 6 U55	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
C-0109	Level 7 L7 DF riser	Cable	Batt FAS190202	Concrete Concrete ~/120/120	30-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0088	 Level 7 Level 7 Fire Stair	CPVC Sprinkler	3000WT FAS180485.2	Concrete Concrete ~/120/120	 26-05-2023
FP-0028	 Level 7 U56	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0035	 Level 7 U57	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0041	 Level 7 U58	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0046	 Level 7 U59	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0052	 Level 7 U60	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0058	Level 7 U61	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0064	Level 7 U62	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0070	Level 7 U63	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0075	Level 7 U64	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0080	Level 7 U65	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0084	Level 7 U66	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023

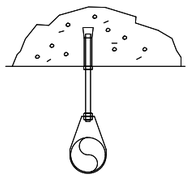
ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
C-0108	 Level 8 L8 DF riser	Cable	Batt FAS190202	Concrete Concrete ~/120/120	 30-05-2023
FP-0089	 Level 8 Level 8 Fire Stair	CPVC Sprinkler	3000WT FAS180485.2	Concrete Concrete ~/120/120	 26-05-2023
FP-0029	 Level 8 U67	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0036	 Level 8 U68	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0042	 Level 8 U69	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0048	 Level 8 U70	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0056	 Level 8 U71	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0063	 Level 8 U72	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0069	 Level 8 U73	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0074	 Level 8 U74	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0079	 Level 8 U75	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0083	 Level 8 U76	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
C-0107	 Level 9 L9 DF riser	Cable	Batt FAS190202	Concrete Concrete ~/120/120	 30-05-2023
FP-0085	 Level 9 Level 9 Fire Stair	CPVC Sprinkler	3000WT FAS180485.2	Concrete Concrete ~/120/120	 26-05-2023
FP-0030	 Level 9 U78	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0034	 Level 9 U79	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0039	 Level 9 U80	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023
FP-0045	 Level 9 U81	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023

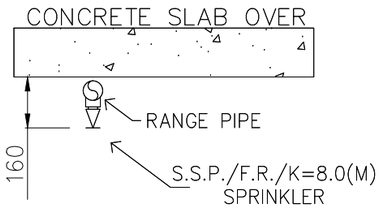
ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0051	Level 9 U82	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0057	Level 9 U83	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0062	Level 9 U84	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0068	Level 9 U85	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0073	Level 9 U86	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023
FP-0078	Level 9 U87	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	26-05-2023

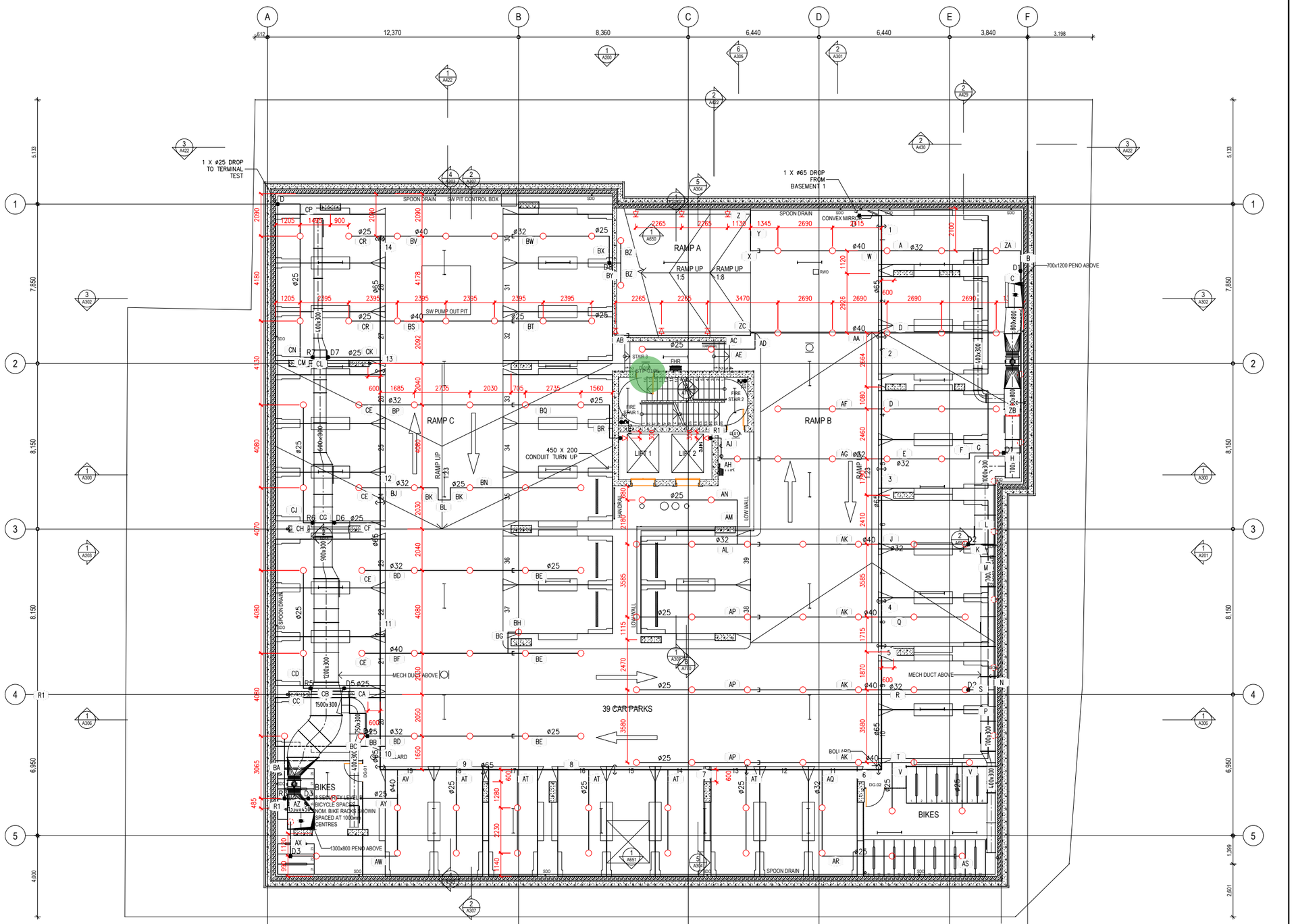
ID	Map - Location - Local Reference	Service Type	Product and Report	Description and FRL achieved	Photo*
FP-0082	 Level 9 U88	CPVC Sprinkler	3000WT FAS180485.2	Plasterboard ~/060/060	 26-05-2023



HANGER H1

SCALE - N.T.S.





FIRE SPRINKLER SYSTEM LEGEND

℄ OF PIPE AFL		SPRINKLER CONTROL VALVES	
SET	FS	FLOW SWITCH	
SOCKET		RANGE PIPE	
ROLL GROOVE		SPRINKLER MAIN	
RISE DROP	100ø	NOMINAL PIPE SIZE	
STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT	
HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL	
PIPE FAB ID	#255	STEP IN SLAB	
*3740 SOFFIT HEIGHT		SPRINKLER UNDER DUCT	

SPRINKLER HEADS

		THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.
	15mm		SEMI RECESSED SPRINKLER PENDANT WHITE	FR	8.0	68°C	–
	20mm		HSW SPRINKLER EXTENDED COVERAGE BRASS	FR	11.5	68°C	–
[41]	15mm		HSW SPRINKLER BRASS	FR	8.0	141°C	2
	15mm		HSW SPRINKLER BRASS	FR	8.0	68°C	6
	15mm		BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	9
	15mm		EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	120

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

FOR CONSTRUCTION

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ISSUE	DETAILS		DATE CHKD
5	PIPE MARKS ADDED	RDP	13/09/22

ISSUE	DETAILS	BY	DATE CHKD
4	ARCH UPDATED	LW	27/04/22
3	REV UPDATED	LW	17/12/21
2	BA ISSUE	JHN	15/12/21
1	BA ISSUE	AM	14/10/21

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
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info @ auscoastfire.com.au
QBCC: 1114543
ABN: 91 123 601 276

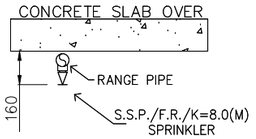
DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
BASEMENT 2

PROJECT
ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	11/10/21

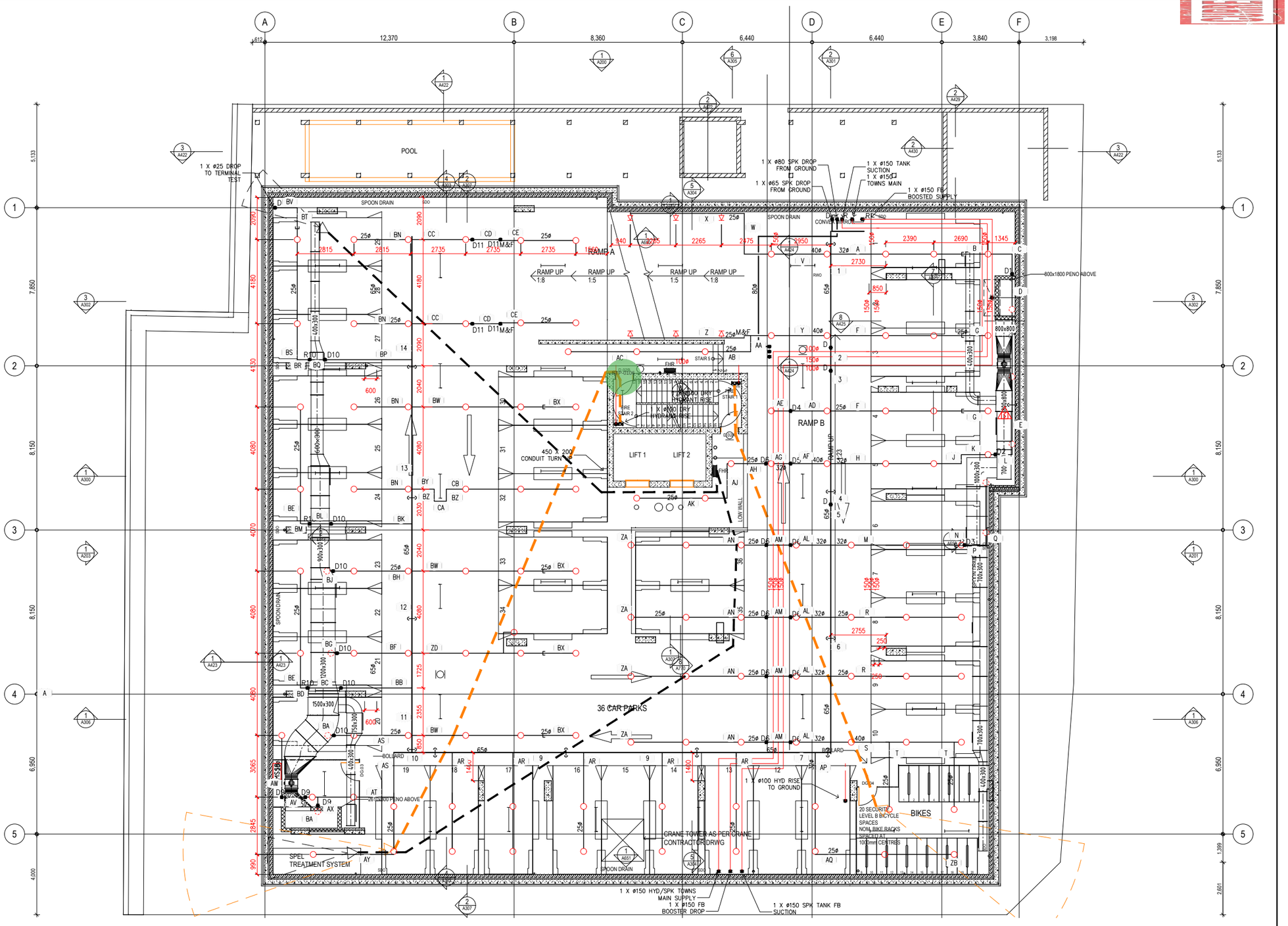
FILE NAME	PROJECT NO.	SCALE	
2854-FS-04	2854	1:100	A1

DRAWING No	ISSUE
FS-04	5



HANGER H1

SCALE - N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

XXX	℄ OF PIPE AFL		SPRINKLER CONTROL VALVES
)	SET	FS	FLOW SWITCH
C	SOCKET		RANGE PIPE
	ROLL GROOVE		SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
A	PIPE FAB ID	#255	STEP IN SLAB
*3740	SOFFIT HEIGHT		SPRINKLER UNDER DUCT

SPRINKLER HEADS

15mm	SEMI RECESSED SPRINKLER PENDANT WHITE	FR	8.0	68°C	–
20mm	HSW SPRINKLER EXTENDED COVERAGE BRASS	FR	11.5	68°C	–
15mm	HSW SPRINKLER BRASS	FR	8.0	141°C	–
15mm	HSW SPRINKLER BRASS	FR	8.0	68°C	6
15mm	BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	9
15mm	EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	118
THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

FOR CONSTRUCTION

NORTH

ISSUE	DETAILS	BY	DATE CHKD
5	PIPE MARKS ADDED	RDP	13/09/22

ISSUE	DETAILS	BY	DATE CHKD
4	ARCH UPDATED	LW	27/04/22
3	REV UPDATED	LW	17/12/21
2	UPDATED MAIN	JHN	15/12/21
1	BA ISSUE	AM	14/10/21

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au Tel: 07 5596 1370
QBCC: 1114544 ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
BASEMENT 1

PROJECT
ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	11/10/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-05	2854	1:100	A1

DRAWING No FS-05 ISSUE 5

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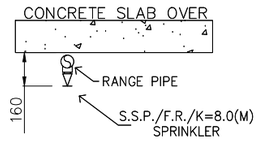
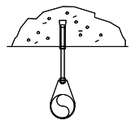
Essence > 18 Remembrance Dr, Surfers Paradise > Auscoast Fire Services (QBCC number 1508081)
Pages 20 - 30



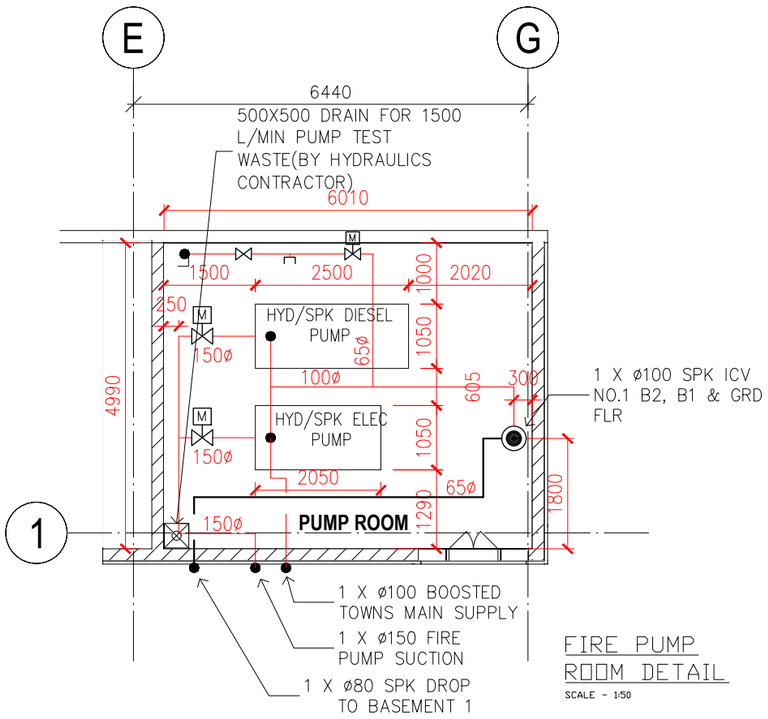


HANGER H1

SCALE - N.T.S.

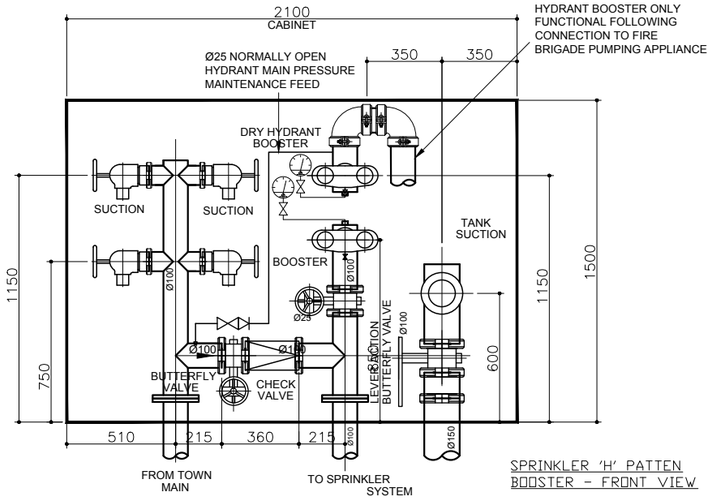
EXPOSED SPRINKLER DETAIL

SCALE - 1:10

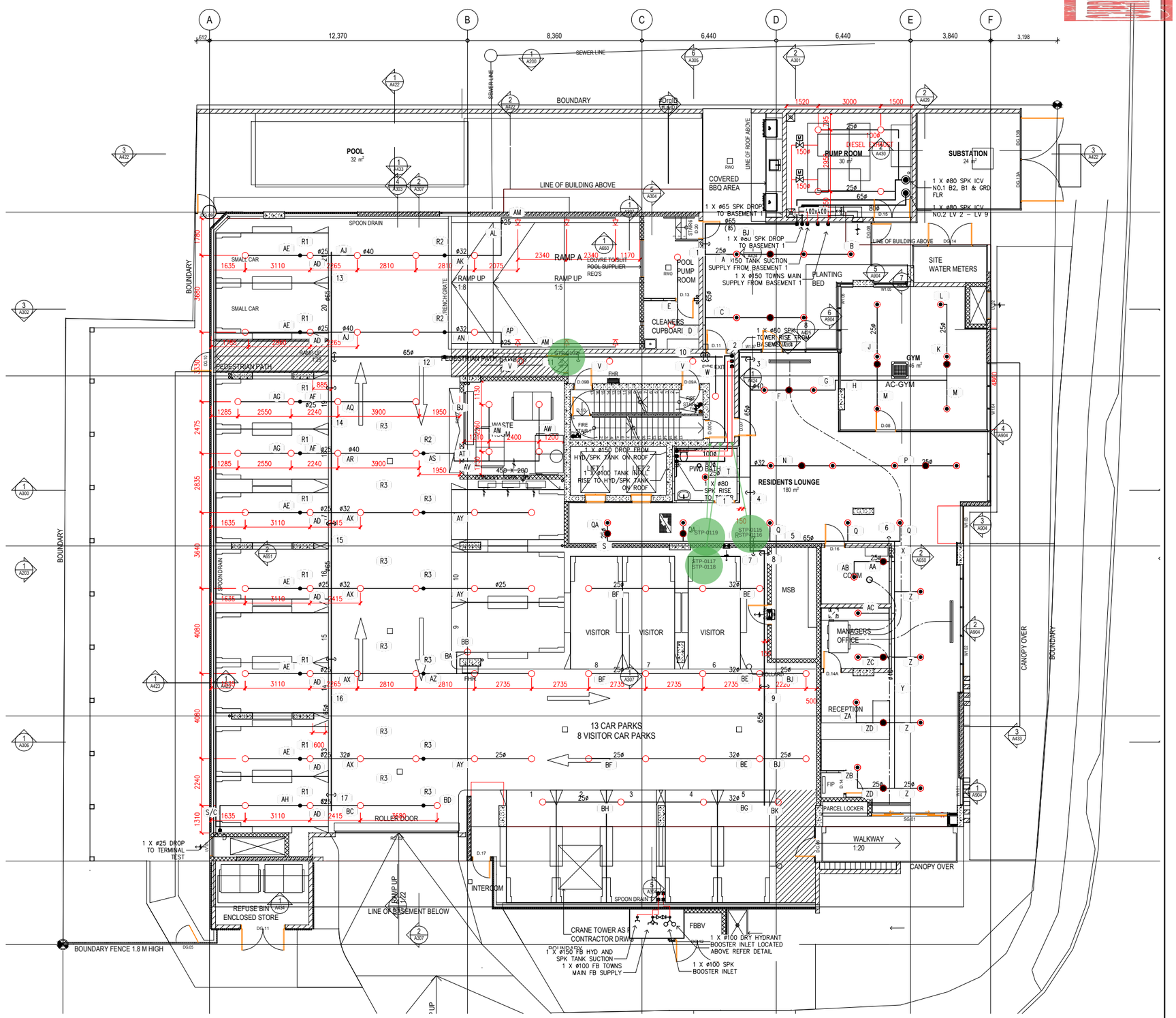


FIRE PUMP ROOM DETAIL

SCALE - 1:50



SPRINKLER 'H' PATTEN BOOSTER - FRONT VIEW



FIRE SPRINKLER SYSTEM LEGEND

℄ OF PIPE AFL		SPRINKLER CONTROL VALVES	
SET	FS	FLOW SWITCH	
SOCKET		RANGE PIPE	
ROLL GROOVE		SPRINKLER MAIN	
RISE DROP	100ø	NOMINAL PIPE SIZE	
STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT	
HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL	
PIPE FAB ID	#255	STEP IN SLAB	
*3740 SOFFIT HEIGHT		SPRINKLER UNDER DUCT	

SPRINKLER HEADS

15mm	SEMI RECESSED SPRINKLER PENDANT WHITE	FR	8.0	68°C	32
EC 20mm	HSW SPRINKLER EXTENDED COVERAGE BRASS	FR	11.5	68°C	–
15mm	C/S SPRINKLER PENDENT BRASS	FR	8.0	79°C	13
15mm	HSW SPRINKLER BRASS	FR	8.0	68°C	6
15mm	BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	–
15mm	EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	79
THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 - 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1- 2017 (OH2) & 30161019 FER REV 2-0 DATED 09/12/2021

NOTES:

FOR CONSTRUCTION

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ISSUE	DETAILS	BY	DATE CHKD
6	PIPE MARKS ADDED	RDP	10/09/22
5	BOOSTER PENETRATIONS	JHN	02/06/22

ISSUE	DETAILS	BY	DATE CHKD
4	ARCH UPDATED	LW	27/04/22
3	REV UPDATED	LW	17/12/21
2	RELOCATED MAIN	JHN	15/12/21
1	BA ISSUE	AM	14/10/21

CLIENT: MORRIS PROPERTY GROUP

Auscoast Fire Services
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Tel: 07 5596 0870
QBCC No. 1114544
ABN: 91 123 601 276

DRAWING TITLE: FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
GROUND FLOOR

PROJECT: ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

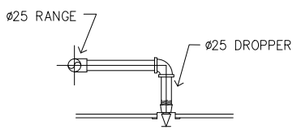
DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	11/10/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-06	2854	1:100	A1

DRAWING No	ISSUE
FS-06	6

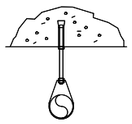
Essence > 18 Remembrance Dr, Surfers Paradise > Auscoast Fire Services (QBCC number 15008070)
Pages 20 - 30

CURRENT



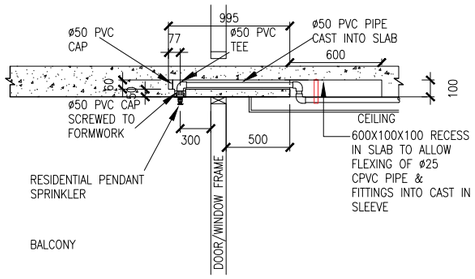
CEILING SPRINKLER DETAIL

SCALE – 1:10



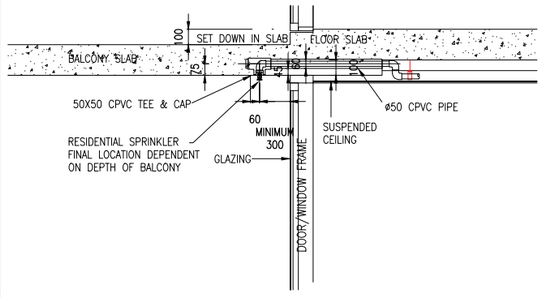
HANGER H1

SCALE – N.T.S.



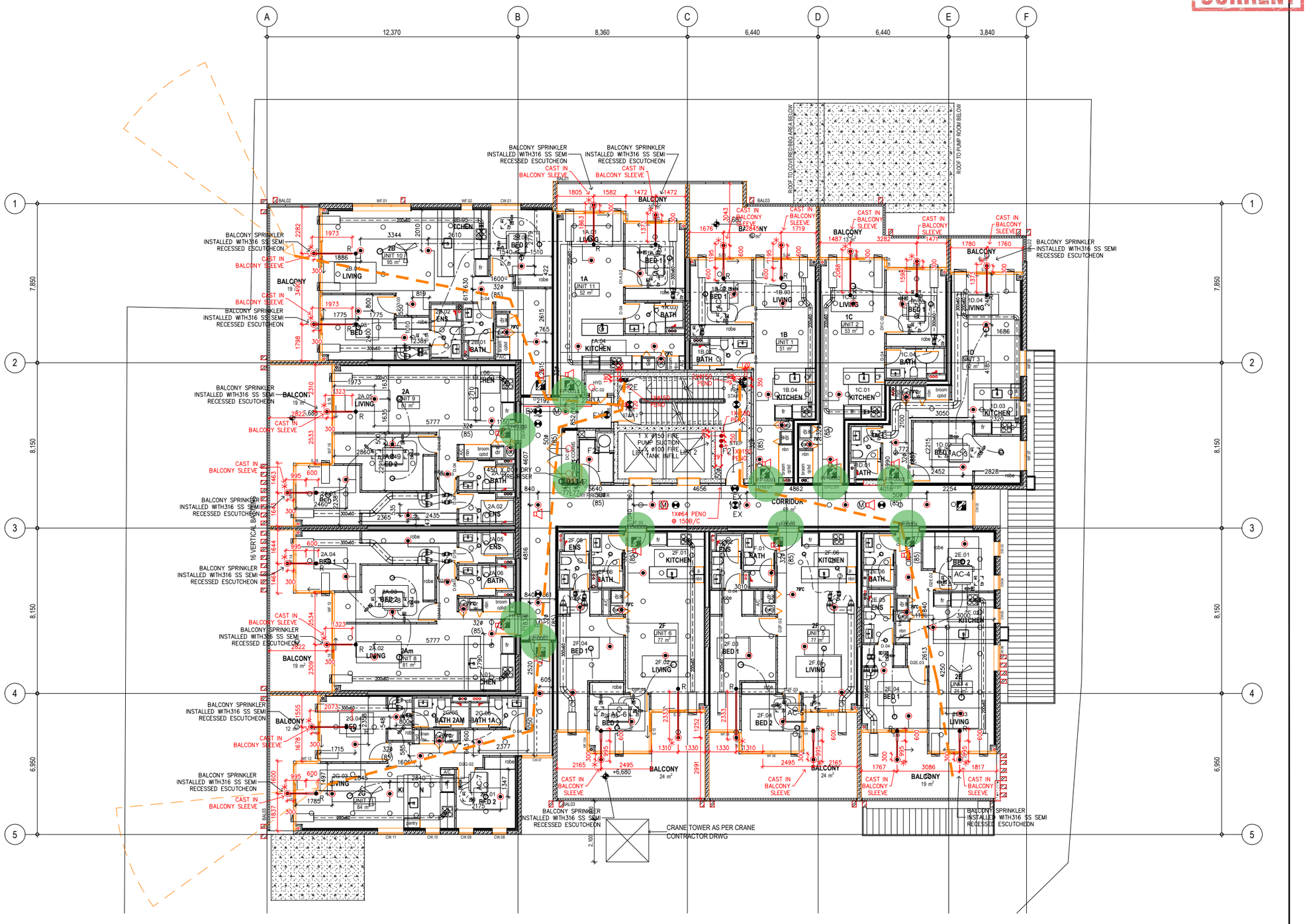
BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

SCALE – N.T.S.



TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE – N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	●	SPRINKLER CONTROL VALVES
⊃	SET	FS	FLOW SWITCH
⊏	SOCKET		RANGE PIPE
	ROLL GROOVE		SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
(A)	PIPE FAB ID	ø255	STEP IN SLAB
*3740	SOFFIT HEIGHT		SPRINKLER UNDER DUCT

SPRINKLER HEADS

		THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.
●	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	68°C	70
●	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	79°C	11
●	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL TEFLON COATED	FR	7.1	68°C	21
☆	15mm		HSW SPRINKLER BRASS	FR	8.0	68°C	–
◌	15mm		BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	–
○	15mm		EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	3

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

BA ISSUE

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ISSUE	DETAILS	BY	DATE CHKD
5	CLASH COORDINATION	LW	09/06/21
4	ARCH UPDATED	LW	27/04/22
3	REV UPDATED	LW	17/12/21
2	RELOCATED MAIN	JHN	21/10/21
1	BA ISSUE	AM	21/10/21

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
QBCC: 1114543
Tel: 07 5596 4370
ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
LEVEL 2

PROJECT
ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

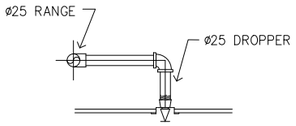
DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	21/10/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-07	2854	1:100	A1

DRAWING No	ISSUE
FS-07	4

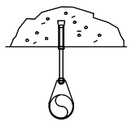
Essence > 18 Remembrance Dr, Surfers Paradise > Auscoast Fire Services (QBCC number 15080819)

CURRENT



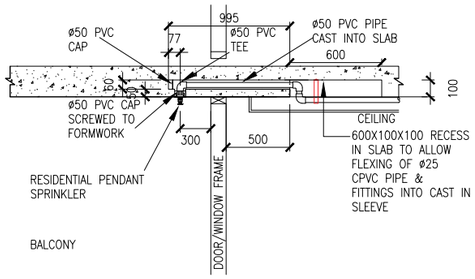
CEILING SPRINKLER DETAIL

SCALE - 1:10



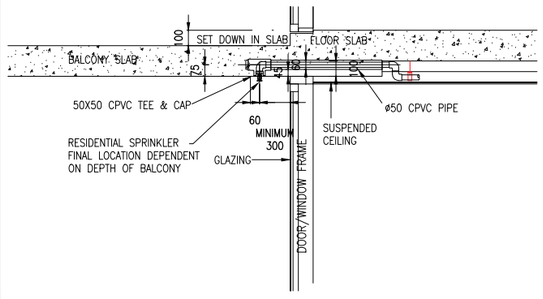
HANGER H1

SCALE - N.T.S.



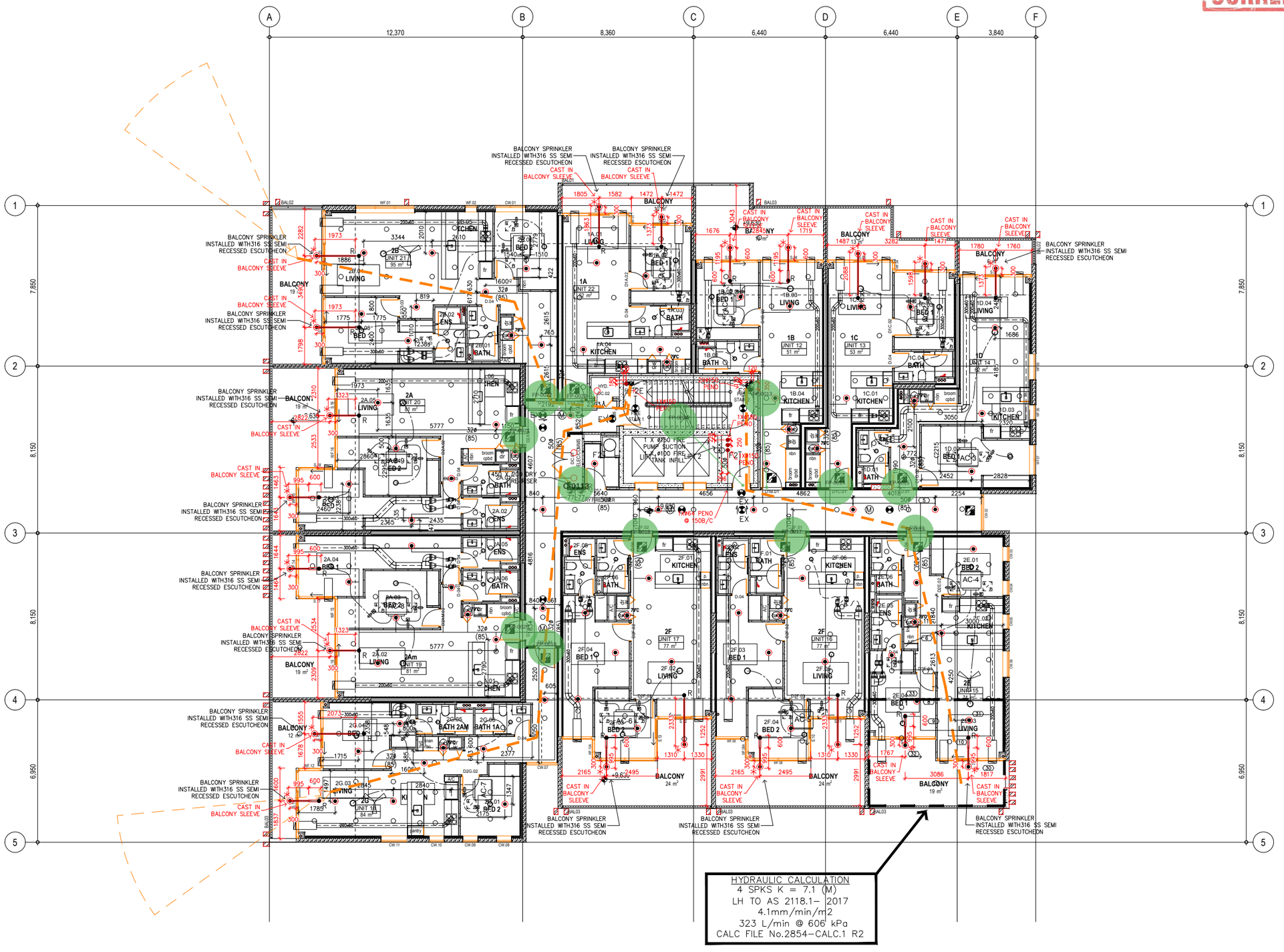
BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

SCALE - N.T.S.



TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE - N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	◉	SPRINKLER CONTROL VALVES
ↄ	SET	FS	FLOW SWITCH
⊏	SOCKET		RANGE PIPE
⊥	ROLL GROOVE		SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
A	PIPE FAB ID	#255	STEP IN SLAB
*3740	SOFFIT HEIGHT	◌	SPRINKLER UNDER DUCT

SPRINKLER HEADS

15mm	SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	68°C	70
15mm	SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	79°C	11
15mm	SEMI RECESSED SPRINKLER RESIDENTIAL TEFLON COATED	FR	7.1	68°C	21
15mm	HSW SPRINKLER BRASS	FR	8.0	68°C	–
15mm	BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	–
15mm	EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	3
THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

BA ISSUE

ISSUE	DETAILS	BY	DATE CHKD
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CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
Tel: 07 5596 1275
QBCC: 1114543
ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
LEVELS 3 TO 9

PROJECT
ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-08	2854	1:100	A1

DRAWING No	ISSUE
FS-08	4

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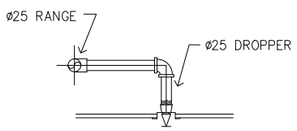
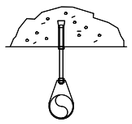
CURRENT



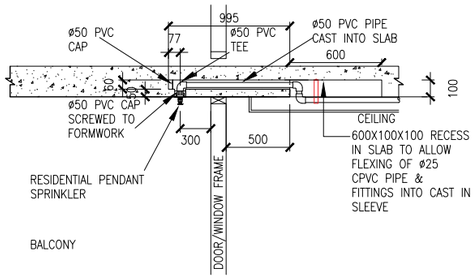
CEILING SPRINKLER DETAIL

SCALE - 1:10



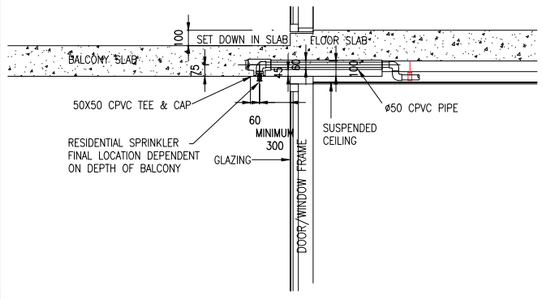
HANGER H1

SCALE - N.T.S.



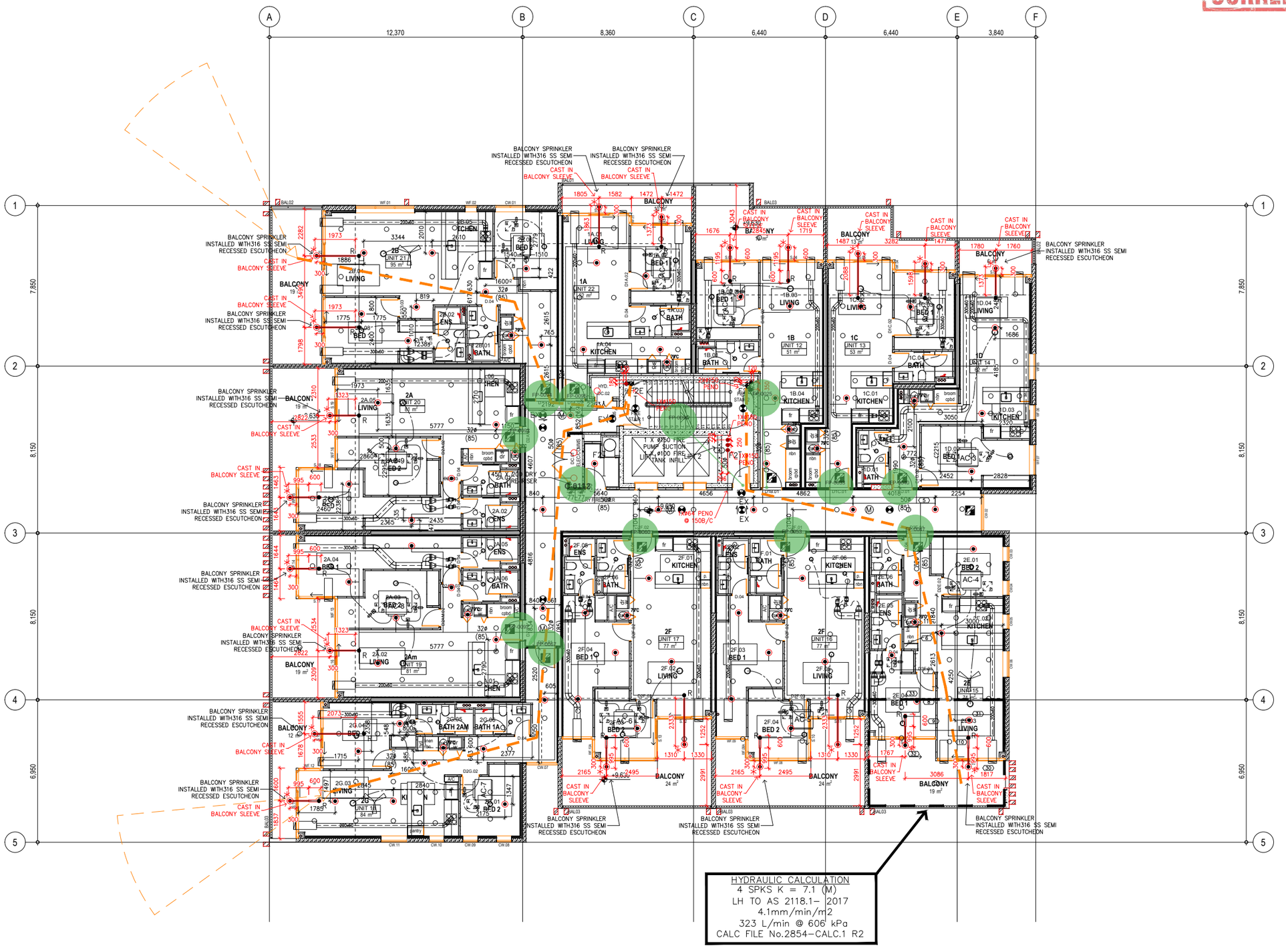
BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

SCALE - N.T.S.



TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE - N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	◉	SPRINKLER CONTROL VALVES
ↄ	SET	FS	FLOW SWITCH
⊏	SOCKET		RANGE PIPE
↕	ROLL GROOVE		SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
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SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

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DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
LEVELS 3 TO 9

PROJECT
ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-08	2854	1:100	A1

DRAWING No: FS-08 — ISSUE: 4

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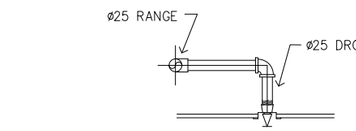
CURRENT

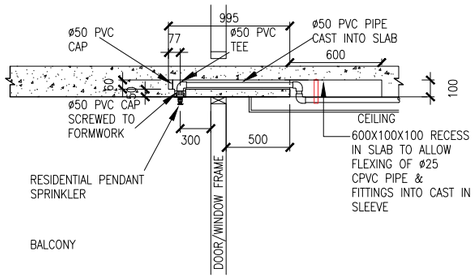


CEILING SPRINKLER DETAIL

SCALE - 1:10

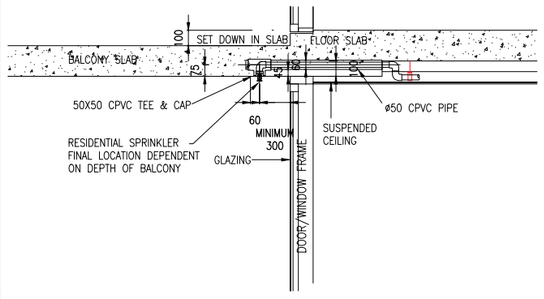
HANGER H1

SCALE - N.T.S.



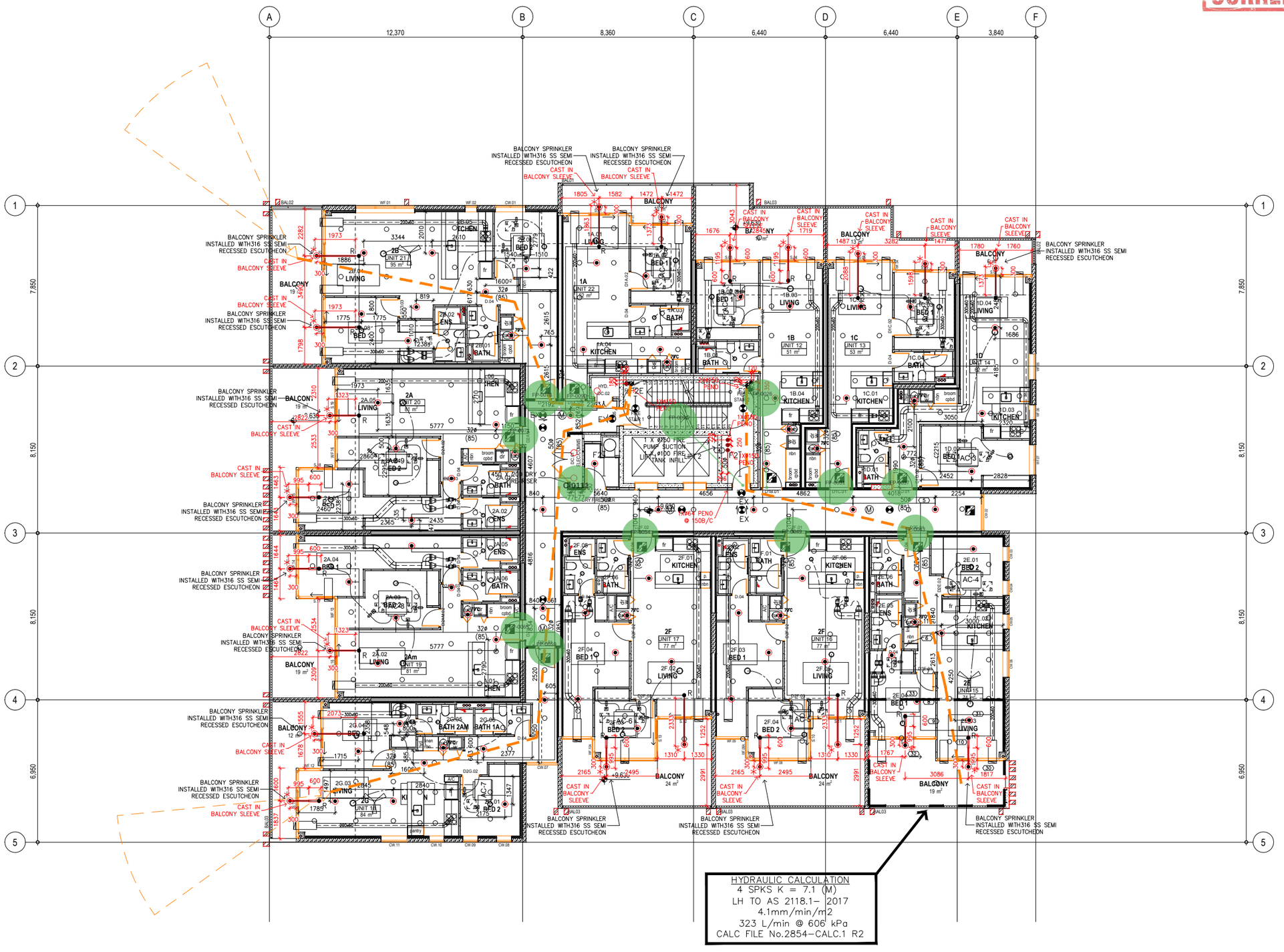
BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

SCALE - N.T.S.



TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE - N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

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ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

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DRAWING TITLE: FIRE PROTECTION SERVICES SPRINKLER SYSTEM LEVELS 3 TO 9

PROJECT: ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-08	2854	1:100	A1

DRAWING No: FS-08 ISSUE: 4

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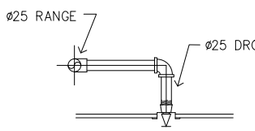
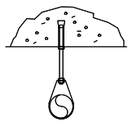
CURRENT



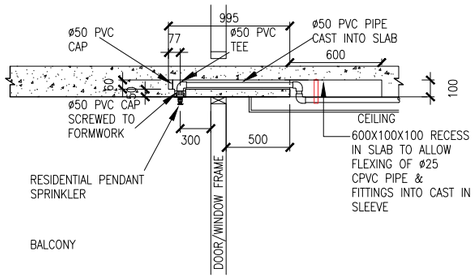
CEILING SPRINKLER DETAIL

SCALE - 1:10



HANGER H1

SCALE - N.T.S.



BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

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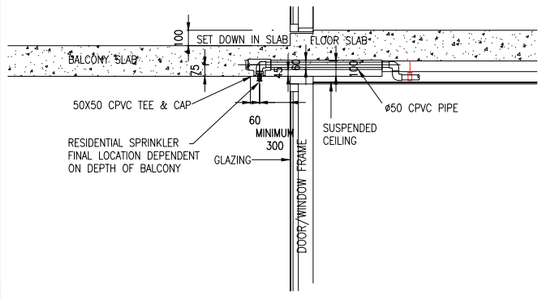
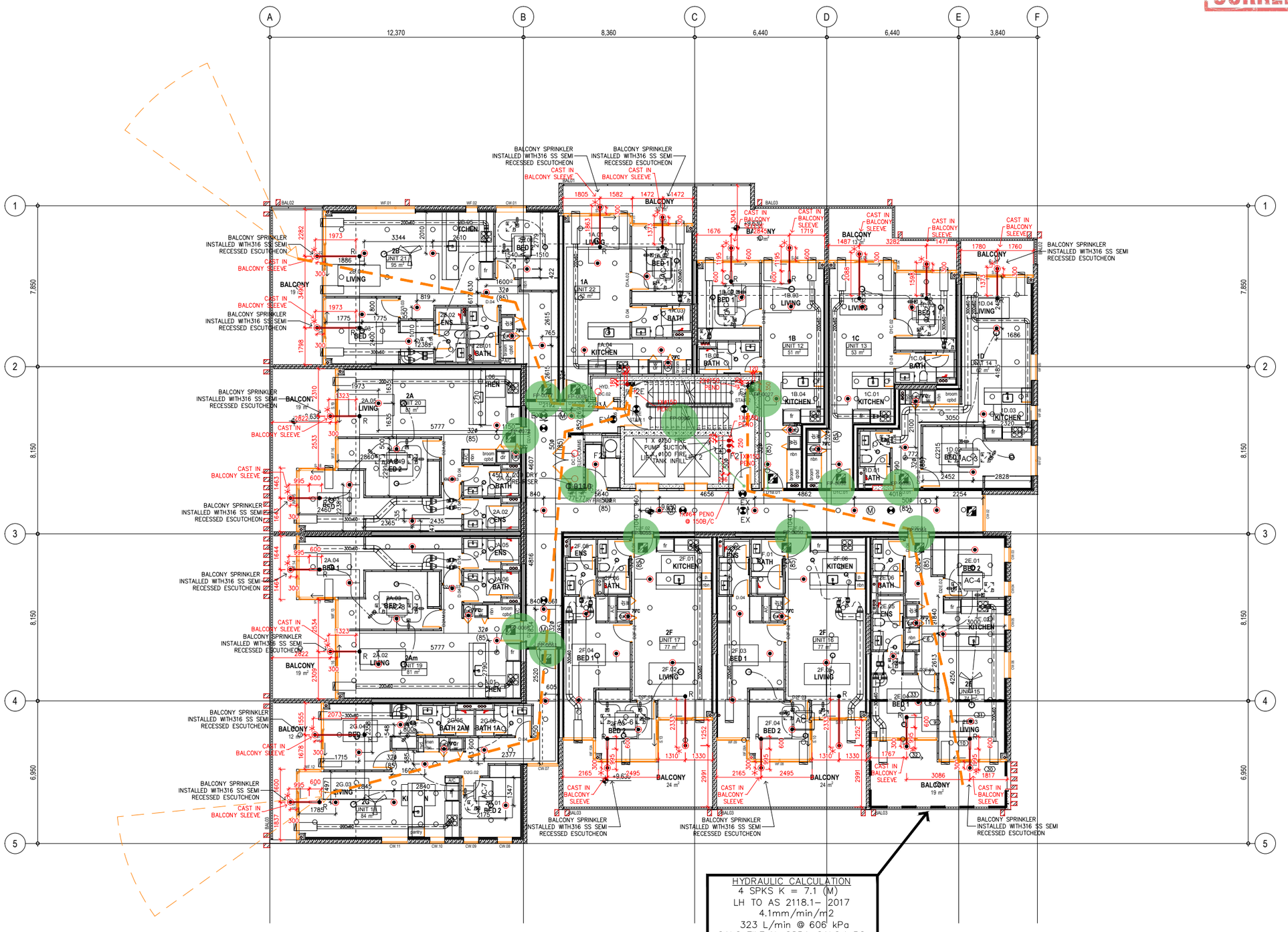


TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE - N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	◉	SPRINKLER CONTROL VALVES
ↄ	SET	FS	FLOW SWITCH
⊏	SOCKET		RANGE PIPE
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SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

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DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
LEVELS 3 TO 9

PROJECT
ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-08	2854	1:100	A1

DRAWING No: FS-08 — ISSUE: 4

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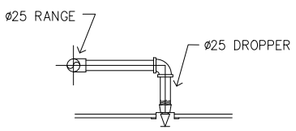
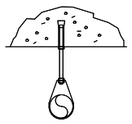


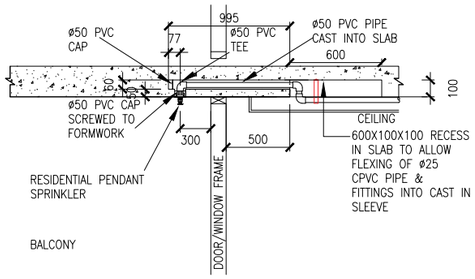
CEILING SPRINKLER DETAIL

SCALE - 1:10



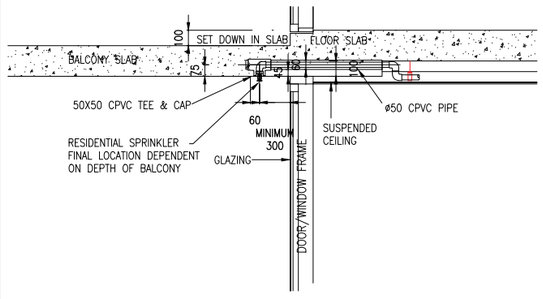
HANGER H1

SCALE - N.T.S.



BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

SCALE - N.T.S.



TYPICAL BALCONY SPRINKLER REBATE DETAIL

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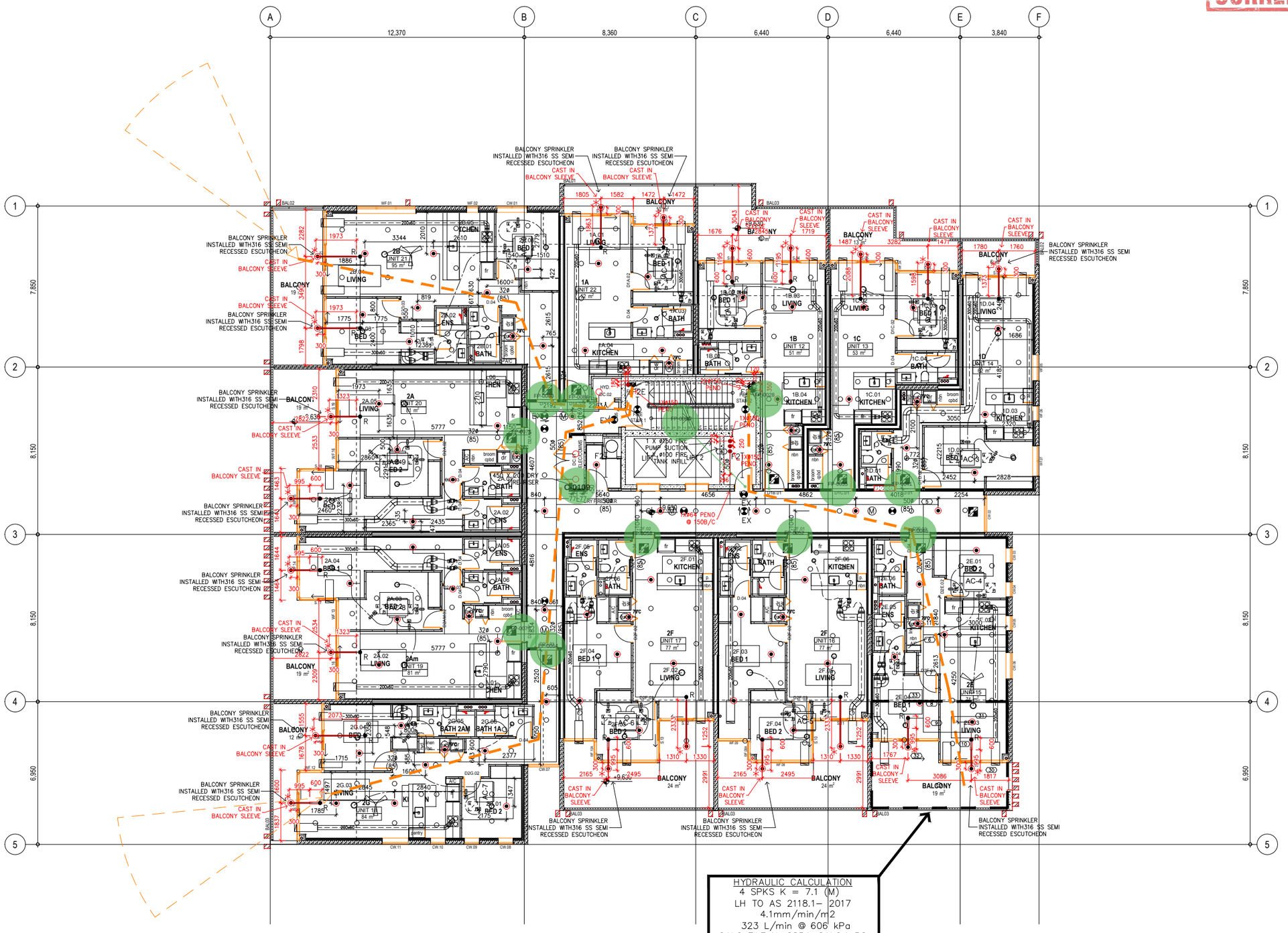

FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	◉	SPRINKLER CONTROL VALVES
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DRAWING TITLE: FIRE PROTECTION SERVICES SPRINKLER SYSTEM LEVELS 3 TO 9

PROJECT: ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-08	2854	1:100	A1

DRAWING No: FS-08 — ISSUE: 4

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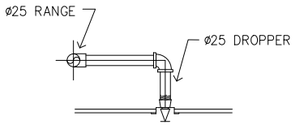
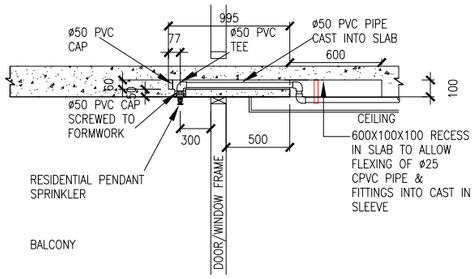


CEILING SPRINKLER DETAIL

SCALE - 1:10

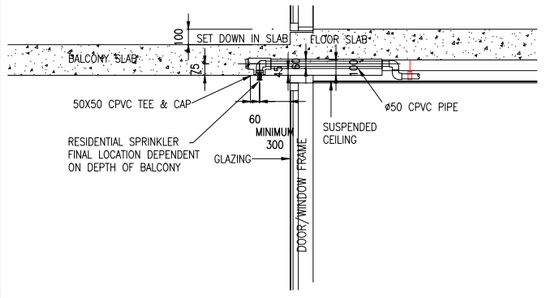
HANGER H1

SCALE - N.T.S.



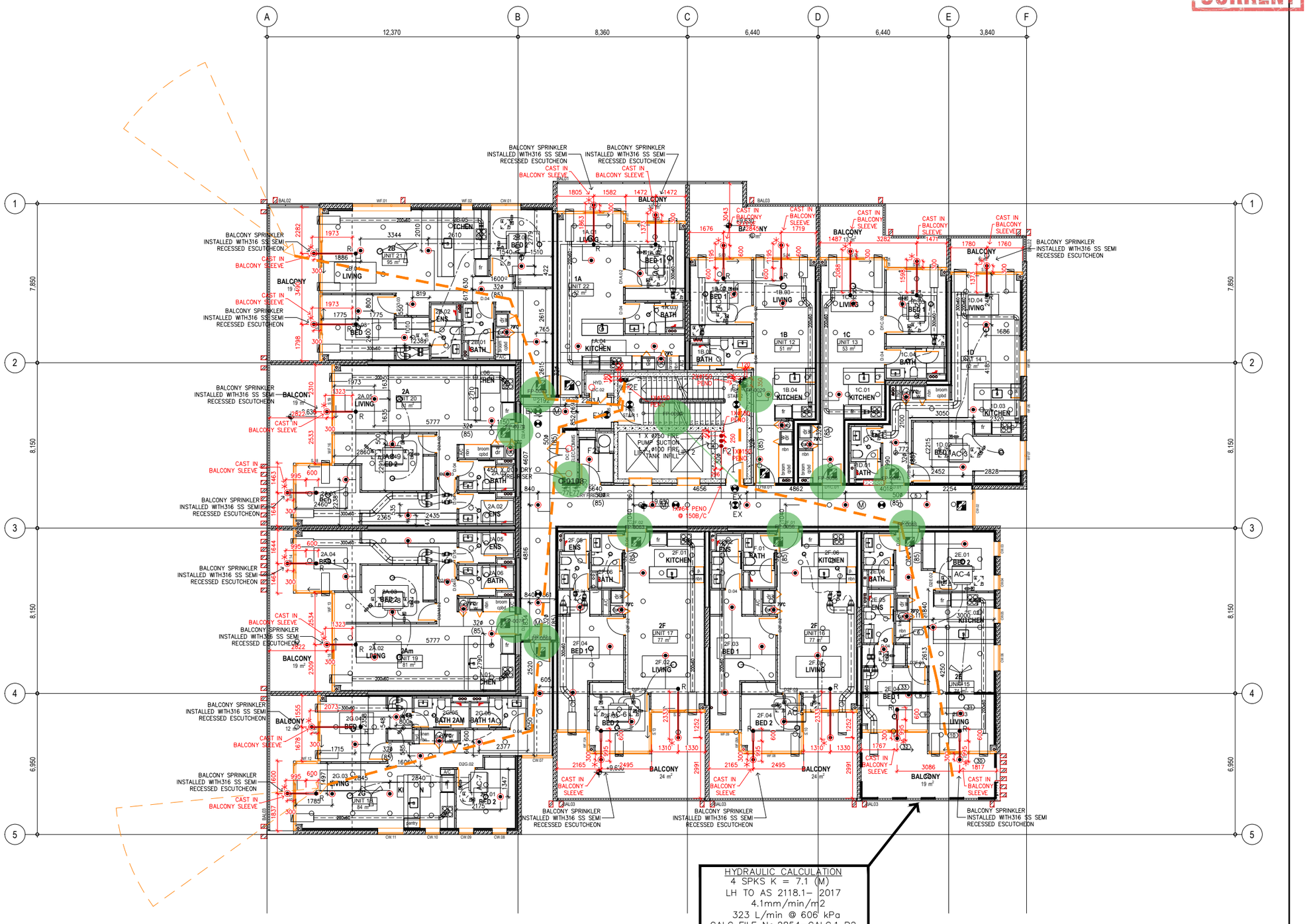
BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

SCALE - N.T.S.



TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE - N.T.S.



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		THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.
◉	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	68°C	70
◉	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	79°C	11
◉	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL TEFLON COATED	FR	7.1	68°C	21
☆	15mm		HSW SPRINKLER BRASS	FR	8.0	68°C	–
◌	15mm		BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	–
○	15mm		EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	3

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

BA ISSUE

ISSUE	DETAILS	BY	DATE CHKD
4	ARCH UPDATED	LW	27/04/22
3	REV UPDATED	LW	17/12/21
2	UPDATED CALC	JHN	15/12/21
1	BA ISSUE	AM	02/11/21

CLIENT
MORRIS PROPERTY GROUP

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Tel: 07 5596 1272
QBCC: 1114543
ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
LEVELS 3 TO 9

PROJECT
ESSENCE
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-08	2854	1:100	A1

DRAWING No: FS-08 — ISSUE: 4

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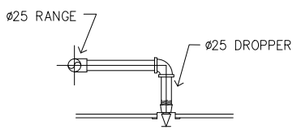
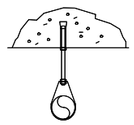
CURRENT



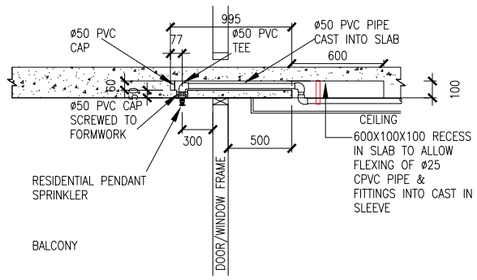
CEILING SPRINKLER DETAIL

SCALE - 1:10



HANGER H1

SCALE - N.T.S.



BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

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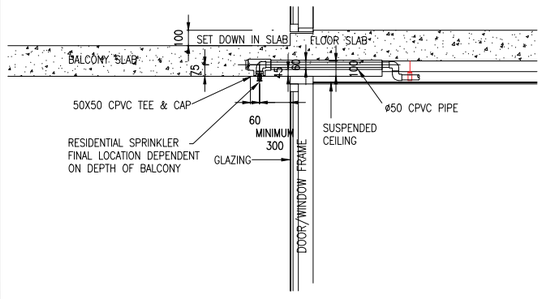
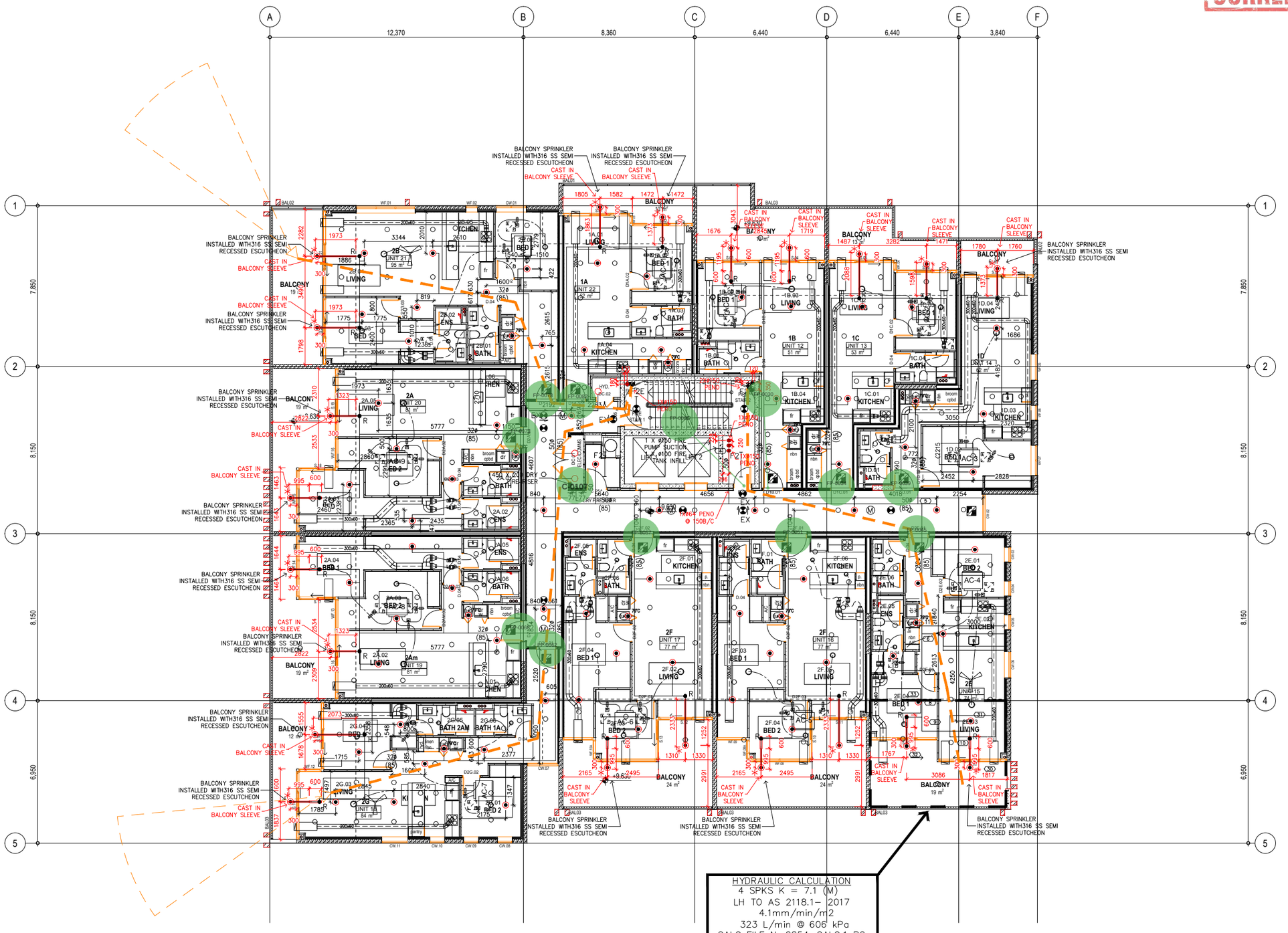


TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE - N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	◉	SPRINKLER CONTROL VALVES
ↄ	SET	FS	FLOW SWITCH
⊏	SOCKET		RANGE PIPE
↕	ROLL GROOVE		SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
A	PIPE FAB ID	#255	STEP IN SLAB
*3740	SOFFIT HEIGHT		SPRINKLER UNDER DUCT

SPRINKLER HEADS

		THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.
◉	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	68°C	70
◉	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	79°C	11
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☆	15mm		HSW SPRINKLER BRASS	FR	8.0	68°C	–
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DRAWING TITLE
FIRE PROTECTION SERVICES
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LEVELS 3 TO 9

PROJECT
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18 REMEMBRANCE DRIVE
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DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-08	2854	1:100	A1

DRAWING No	ISSUE
FS-08	4

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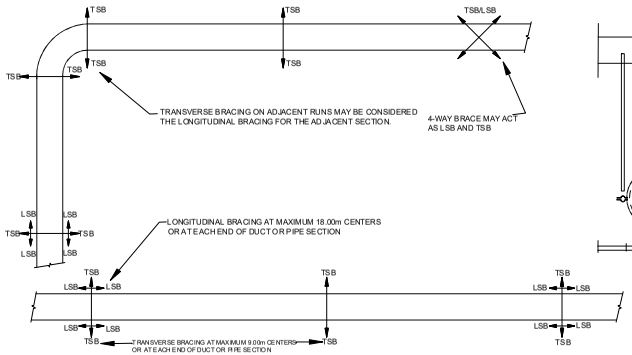
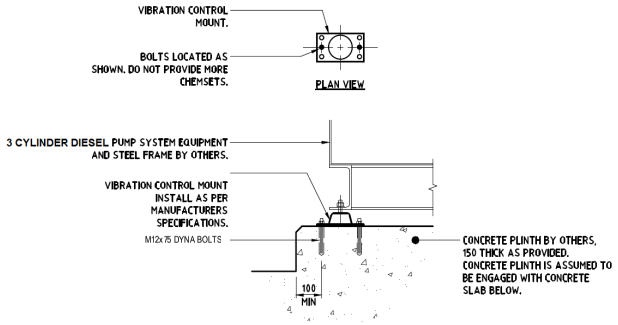
SECTION 10

SEISMIC / FIXINGS

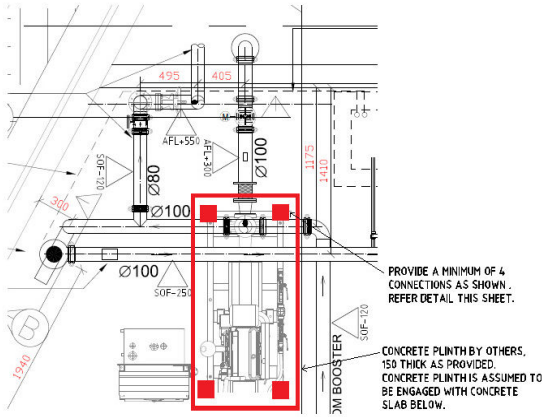


TYPICAL PIPE WORK PLAN SHOWING BRACING REQUIREMENT

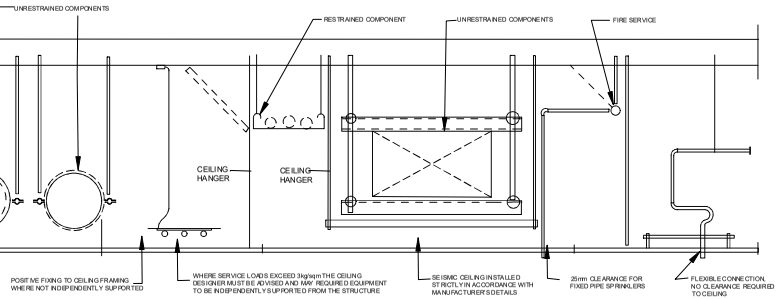
LSB - LONGITUDINAL SEISMIC BRACING DESIGNED AND INSTALLED TO RESIST MOVEMENT IN THE DIRECTION PARALLEL TO THE PIPING OR DUCT.
TSB - TRANSVERSE SEISMIC BRACING DESIGNED AND INSTALLED TO RESIST MOVEMENT PERPENDICULAR TO THE PIPING OR DUCT.
NOTE: 1. ALL RUNS HAVE A MINIMUM OF TWO TRANSVERSE AND ONE LONGITUDINAL BRACES.
2. A RUN IS A STRAIGHT SECTION OF DUCT, PIPING OR TRAY. ANY CHANGE OF DIRECTION IS CONSIDERED A NEW RUN.



3 CYLINDER DIESEL PUMP SKID CONNECTION DETAIL



3 CYLINDER DIESEL PUMP PLAN

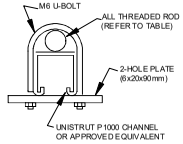


COMPONENT CLEARANCE FOR SERVICES IN ACCORDANCE WITH NZS 4219-2009

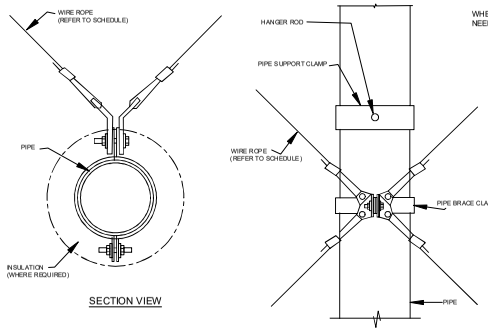
MINIMUM CLEARANCES (part extract from NZS 4219:2009 Table 15)		
CONDITION BEING CONSIDERED	MINIMUM CLEARANCES	
	Horizontal	Vertical
UNRESTRAINED COMPONENT TO UNRESTRAINED COMPONENTS (where allowed by AS 1170.4 - 2007)	250mm	50mm
UNRESTRAINED COMPONENT TO RESTRAINED COMPONENT	150mm	50mm
RESTRAINED COMPONENT TO RESTRAINED COMPONENT	50mm	50mm
PENETRATION THROUGH STRUCTURE SUCH AS WALL OR FLOOR	50mm	50mm
UNRESTRAINED SERVICES PASSING THROUGH THE CEILING	25mm	25mm
SPRINKLER HEADS WITH FLEXIBLE DROPPERS	NIL	NIL

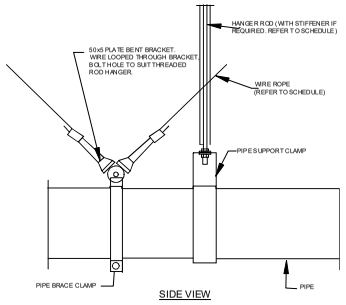
NOTE: CEILING HANGERS AND BRACES ARE CONSIDERED TO BE RESTRAINED COMPONENTS FOR THE PURPOSE OF THIS TABLE, HENCE 150mm HORIZONTAL CLEARANCE IS REQUIRED BETWEEN CEILING HANGERS AND UNRESTRAINED SERVICES.

ROD DIA.	MAXM. COMPRESSION FORCE	U-BOLT SPACING
25mm	5.0 kN	300mm
25mm	8.0 kN	400mm
20mm	12.0 kN	500mm
24mm	17.0 kN	600mm

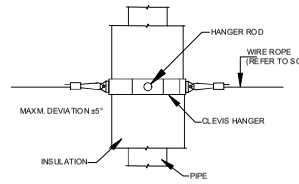


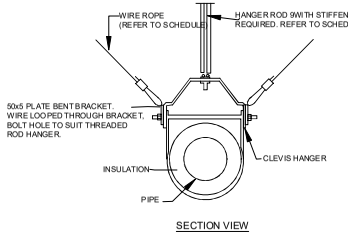
HANGER ROD STIFFENING DETAIL





PIPE & CONDUIT - 4 WAY BRACE





INSULATED PIPE & CONDUIT BRACE (TRANSVERSE BRACE WITH CLEVIS HANGER)

COMPONET CONNECTION SIZE SCHEDULE

ITEM BEING BRACED	MAXIMUM WEIGHT	WIRE ROPE (#)	STEEL ANGLE (#)	GRIPPLE BRACE	UNISTRUT BRACE (*)	ROD HANGER	ANCHOR TO SLAB (MIN 100mm EDGE DISTANCE, 150mm SPACING (#)
TRANSVERSE BRACING FOR RECTANGULAR DUCTS UP TO 1300 x 1300mm	80 kgs/m	6mm GALV. 7 x 19 WIRE	50 EA 5.0 up to 2400mm long	GS19	P1000 up to 2400mm long	16mm no stiffener required	POWERS GALVANISED H12 x 75mm BLUETIP SCREW BOLT OR EQUIVALENT APPROVED
CIRCULAR DUCTWORK UP TO 1900mm DIA.	80 kgs/m	6mm GALV. 7 x 19 WIRE	50 EA 5.0 up to 2400mm long	GS 19	P 1000 up to 2400mm long	16mm no stiffener required	
MULTIPLE PIPES ON A TRAPEZE	80 kgs/m	6mm GALV. 7 x 19 WIRE	50 EA 5.0 up to 2400mm long	GS 19	P1000 up to 2400mm long	16mm no stiffener required	
UNIT &EQUIPMENT (NOT ON A FLEXIBLE MOUNTING)	300 kgs	3mm GALV. 7 x 19 WIRE	50 EA 5.0 up to 4000mm long	GS 10 GS19	P1000 up to 2700mm long	12mm no stiffener required	

NOTE: * IF USING ANGLES OR UNISTRUT BRACING ENSURE VIBRATION IS NOT TRANSMITTED TO THE STRUCTURE.
COMPONENTS SHALL COMPLY WITH RECOGNISED STANDARD FOR USE IN SEISMIC BRACING APPLICATION

SEISMIC BRACING NOTES FOR SERVICES

H2. THE INFORMATION AND DETAILS ON THIS DRAWING APPLY ONLY TO IMPORTANCE LEVEL 2 & 3 BUILDINGS AS DEFINED IN THE NATIONAL CONSTRUCTION CODE

H3. BRACING OF ALL MECHANICAL AND ELECTRICAL PLANT TO BE IN ACCORDANCE WITH THE REQUIRED OF AS 1170.4-2007 SECTION 0.

H4. THE FOLLOWING COMPONENT MUST BE RESTRAINED IN ORDER TO COMPLY WITH AS1170.4-2007 SECTION 8:

(i) SMOKE CONTROL SYSTEMS.
(ii) EMERGENCY ELECTRICAL SYSTEMS (INCLUDING BATTERY PACKS.
(iii) FIRE AND SMOKE DETECTION SYSTEMS.
(iv) FIRE SUPPRESSION SYSTEMS (INCLUDING SPRINKLERS).
(v) LIFE SAFETY SYSTEM COMPONENTS.
(vi) BOILERS, FURNACES, INCINERATORS, WATER HEATERS AND OTHER EQUIPMENT USING COMBUSTIBLE ENERGY SOURCES OR HIGH-TEMPERATURE ENERGY SOURCES, CHIMNEYS, FLUES, SMOKESTACKS, VENTS AND PRESSURE VESSELS.
(vii) COMMUNICATION SYSTEMS (SUCH AS LABEL SYSTEMS MOTOR CONTROL DEVICES, SWITCHGEAR, TRANSFORMERS AND UNIT SUBSTATIONS).
(viii) RECIPROCATING OR ROTATING EQUIPMENT.
(ix) UTILITY AND SERVICE INTERFACES.
(x) ANCHORAGE OF LIFT MACHINERY AND CONTROLLERS.
(x) LIFT AND HOIST COMPONENTS INCLUDING STRUCTURAL FRAMES PROVIDING SUPPORT FOR GUILD RAILS BRACKETS, CAR AND COUNTERWEIGHT MEMBERS.
(xi) ESCALATORS.
(xii) MACHINERY (MANUFACTURING AND PROCESS).
(xv) LIGHTING FIXTURES.
(xv) ELECTRICAL PANEL BOARDS AND DIMMERS.
(xvi) CONVEYOR SYSTEMS (NON-PERSONNEL)
(xvii) DUCTS AND PIPING DISTRIBUTION SYSTEMS.
(xviii) SUPPORTS FOR DUCTS AND PIPING DISTRIBUTION SYSTEMS, EXCEPT FOR THE FOLLOWING, WHERE IT IS NOT REQUIRED:
(A) GAS PIPING LESS THEN 25mm INSIDE DIAMETER.
(B) PIPING IN BOILER AND MECHANICAL ROOMS LESS THEN 32mm INSIDE DIAMENETER.
(C) ALL OTHER PIPING LESS THEN 64mm INSIDE DIAMETER.
(D) ELECTRICAL CONDUIT LESS THEN 64mm INSIDE DIAMETER.
(E) RECTANGULAR AIR-HANDLING DUCTS LESS THEN 0.40 SQ METERS IN CROSS SECTIONAL AREA.
(F) ROUND AIR-HANDLING DUCTS LESS THEN 700mm IN DIAMETER.
(G) DUCTS AND PIPING SUSPENDED BY INDIVIDUAL HANGERS 300mm OR LESS IN LENGTH FROM THE TOP OF THE PIPE TO THE BOTTOM OF THE SUPPORT FOR THE HANGER.

WHERE PART OF A RUN EXCEEDS THESE LIMITATIONS THEN THE WHOLE RUN NEEDS TO BE SEISMICALLY BRACED.

H5. THE STRUCTURAL ENGINEER SHALL CHECK THE ADEQUACY OF THE STRUCTURE TO SUPPORT THE SERVICE LOADS, INCLUDING SEISMIC FORCES.

H6. ALL DUCTWORK TO BE SUPPORTED IN ACCORDANCE WITH AS 4254-2002.

H7. TRANSVERSE BRACING FOR DUCT SECTIONS TO BE AT 9.00m MAX CENTERS AND AT SECTION ENDS.

H8. LONGITUDINAL BRACING FOR DUCT SECTIONS TO BE AT 18.00m MAX CENTERS, TRANSVERSE BRACING ON ADJACENT RUNS MAY BE CONSIDERED AS THE LONGITUDINAL BRACING FOR THE ADJACENT SECTION.

H9. SPACING OF THE BRACING MAY NEED TO BE REDUCED FOR EXAMPLE:
- BRACE BOTH SIDES OF PIPING, CONDUIT OR DUCTWORK AT FLEXIBLE CONNECTIONS;
- BRACE TO AVOID COLLISION BETWEEN PIPING, CONDUIT OR DUCTWORK AND OTHER NON-STRUCTURAL COMPONENTS;
- BRACE WITHIN 600mm OF CHANGES IN DIRECTION, WHETHER IT BE HORIZONTAL OR VERTICAL CHANGES;
- BRACE WHERE COMPONENTS PENETRATE FLOORS OR CEILINGS;
- BRACE IN BOTH DIRECTIONS AT THE TOP OF ALL RISERS WHERE RISERS EXCEED 900mm;

THE SPACING OF BRACING ALONG A RUN OF PIPING, CONDUIT OR DUCTWORK SHOULD NOT VARY GREATLY IN ORDER TO ENSURE UNIFORM DEFLECTION AND LOADING.

H10. EACH UNIT OF EQUIPMENT CONNECTED TO A RUN OF PIPING, CONDUIT OR DUCTWORK SHALL BE INDIVIDUALLY AND INDEPENDENTLY BRACED WHEN >15kg.
THERMAL EXPANSION AND CONTRACTION FORCES, WHERE PRESENT, MUST BE CONSIDERED IN THE LAYOUT OF TRANSVERSE AND LONGITUDINAL BRACES.
FLEXIBILITY SHOULD BE PROVIDED WHERE PIPES PASS THROUGH SEISMIC OR EXPANSION JOINTS OR CONNECT TO EQUIPMENT WITH VIBRATION ISOLATORS.

H11. PROVIDE MINIMUM CLEARANCES AS SET OUT IN THE MINIMUM CLEARANCE TABLE.

H12. ALL WIRE, WIRE LOCKING MECHANISMS AND ANCHORS SHALL BE HOT-DIPPED GALVANISED.

H13. BRACING SYSTEMS, ANCHORS ETS, SHALL BE CERTIFIED FOR USE FOR SEISMIC BRACING TO A RECOGNISED STANDARD.

H14. DO NOT CORE THROUGH, CUT THROUGH OR OTHERWISE DAMAGE STEEL REINFORCEMENT IN CONCRETE SLABS, BEAMS OR COLUMNS WHEN INSTALLING SEISMIC BRACING.

H15. FOR FURTHER INFORMATION REFER TO:
- NZS 4219-2009 SEISMIC PERFORMANCE OF ENGINEERING SYSTEMS IN BUILDINGS.
- GRIPPLE SEISMIC INSTALLATION MANUAL.
- TYCO FLOW CONTROL, 2002. UNISTRUT SEISMIC BRACING SYSTEMS.
- FEMA E-74, JANUARY 2011. REDUCING THE RISKS OF NONSTRUCTURAL EARTHQUAKE DAMAGE - A PRACTICAL GUIDE.
- SMACNA SEISMIC RESTRAINT MANUAL, GUIDELINES FOR MECHANICAL SYSTEMS, 1998, SMACNA, SHEET METAL AND AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION.

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PROJECT:

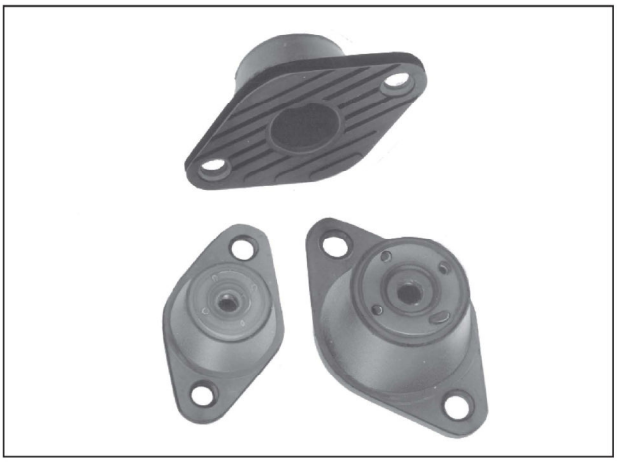
TITLE:
SEISMIC BRACING FOR SERVICES

DESIGNED :	VERIFIED RVJ
DRAWN :	APPROVED FOR TENDER
SCALE @ A1 : 1 : 100	APPROVED FOR CONSTRUCTION

PROJECT No.	DRAWING No.	REVISION
1200-G6-S	S01.00	B

POLYBOND
Moulding Innovation into Global Bonds

P MOUNTS

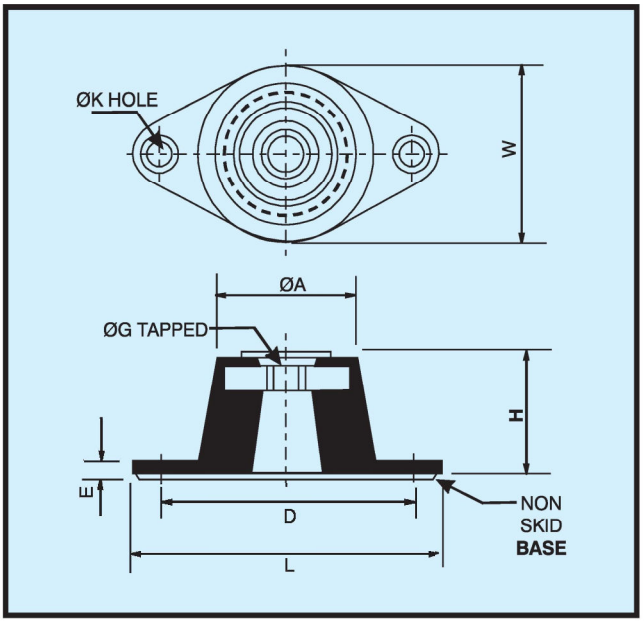


APPLICATION

- For effective isolation of noise and vibration from rotating equipment with speeds of 1000 RPM and above.
- Typically used to isolate fans, pumps, generators, air-conditioning units and general machinery.

FEATURES

- Static deflection ranges from 5 to 12 mm.
- Colour coded load range.
- Threaded top.
- Non-skid ribbed base.



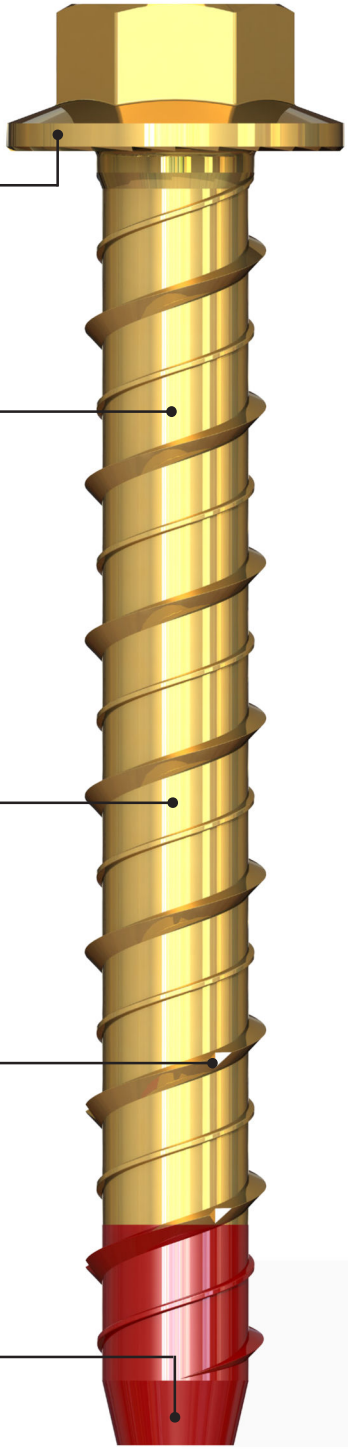
TYPE	DIMENSIONS (mm)							
	H	L	W	D	ØA	ØG	ØK	E
P-1	28	80	45	60	32	M10	8.5	5
P-2	32	98	60	76	45	M10	8.5	6
P-3	44	140	85	104	64	M12	14	6
P-4	45	165	110	127	100	M16	14	6
PD-1	35	80	45	60	32	M10	8.5	5
PD-2	44	98	60	76	45	M10	8.5	6
PD-3	72	140	85	104	64	M12	14	6
PD-4	75	165	110	127	100	M16	14	6

PART NO.	COLOUR CODE	MAX LOAD (kg)	STATIC DEFL. (mm)
P-1A	BLUE	15	5
P-1B	WHITE	25	
P-1C	GREEN	40	
P-1D	YELLOW	60	
P-1E	RED	80	
PD-1A	BLUE	15	8
PD-1B	WHITE	25	
PD-1C	GREEN	40	
PD-1D	YELLOW	60	
PD-1E	RED	80	
P-2A	BLUE	70	6
P-2B	WHITE	100	
P-2C	GREEN	175	
P-2D	YELLOW	250	
PD-2A	BLUE	70	10
PD-2B	WHITE	100	
PD-2C	GREEN	175	
PD-2D	YELLOW	250	
P-3B	WHITE	145	6
P-3C	GREEN	240	
P-3D	YELLOW	340	
P-3E	RED	500	
PD-3B	WHITE	145	12
PD-3C	GREEN	240	
PD-3D	YELLOW	340	
PD-3E	RED	500	
P-4B	WHITE	680	6
P-4C	GREEN	1020	
P-4D	YELLOW	1360	
P-4E	RED	1800	
PD-4B	WHITE	680	12
PD-4C	GREEN	1020	
PD-4D	YELLOW	1360	
PD-4E	RED	1800	

HobSpec DataSheet

XBolt® Screw Anchor

HOBSON TECHNICAL



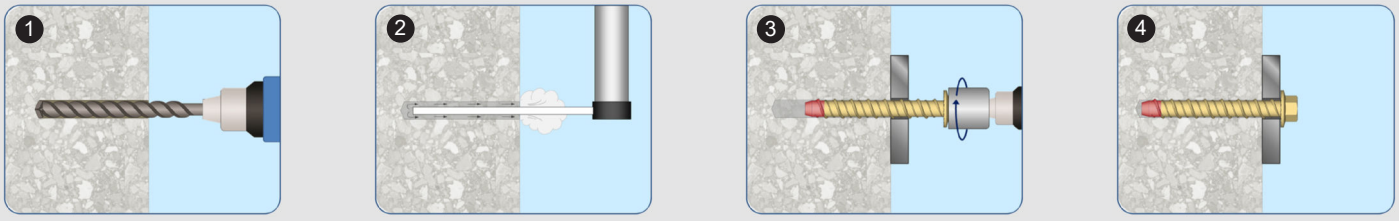
XBolts® are single unit screw type anchors that are used in solid concrete applications. Fixing is achieved by screwing the anchor into the hole. As it is screwed in, it creates its own undercut by tapping the concrete hole. The cutting and locking mechanism, enables the anchor to be used in close spacing and edge distance applications.

- ☑ Suitable for medium to heavy loads
- ☑ Suitable for small anchor spacing and edge distance applications
- ☑ Quick and easy to install
- ☑ Fully removable

Because of the XBolt's unique features, it can be used for many fastening applications, including but not limited to the following:

- Hand rail fastening
- Formwork support fastening
- Mechanical, electrical and pipe bracket fastening
- Bottom plates

XBolt . Quick . Easy . Reliable



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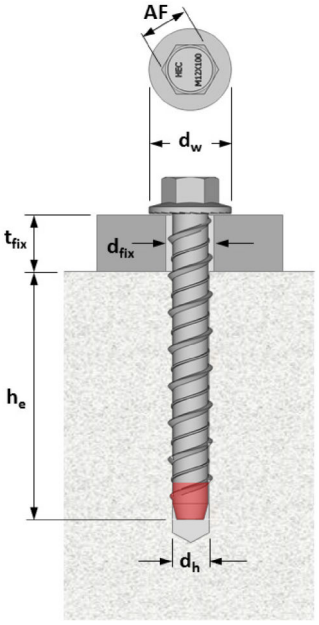
HobSpec DataSheet

XBolt® Screw Anchor

HOBSON TECHNICAL

Installation Specification

XBolt™ Size	Nominal hole diameter d_h (mm)	Minimum embedment depth $h_{e,min}$ (mm)	Min. hole diameter on fixture d_{fix} (mm)	Wrench size AF (mm)	Flange Head Diameter d_w (mm)	Minimum spacing S_{min} (mm)	Minimum edge distance c_{min} (mm)
Ø5	5	25	7	8	11.0	40	40
Ø6	6	25	8	10	13.7	40	40
Ø8	8	40	11	13	17.9	40	40
Ø10	10	50	13	15	22.5	50	50
Ø12	12	55	15	16	26.1	60	60
Ø16	16	65	20	21	31.9	70	70



Basic Load Performance in 32 MPa non-cracked concrete

[1] *Design Resistance* is the governing minimum load resistance obtained by comparing relevant concrete and steel resistances. Capacity reduction factors of $\phi = 0.60$ for concrete and $\phi = 0.80$ for steel are already included.

[2] *Working Load* is the governing minimum allowable load obtained by comparing relevant concrete and steel working loads. Factor of safety of FOS = 2.5 for steel and FOS = 3.0 for concrete are already included.

XBolt™ Size	Embedment Depth h_e (mm)	Design Tensile Resistance[1] $ØN_d$ (kN)	Working Load in Tension[2] N_{WLL} (kN)
Ø5	25	1.5	0.8
Ø6	25	2.4	1.3
	30	2.7	1.5
	45	6.1	3.3
	60	10.8	6.0
Ø8	35	4.1	2.3
	40	5.7	3.1
	60	12.2	6.8
	80	20.1	11.1
Ø10	45	6.6	3.6
	50	8.8	4.8
	75	18.2	10.1
	90	24.6	13.6
Ø12	55	7.8	4.3
	60	11.3	6.2
	90	24.6	13.6
	110	34.2	19.0
Ø16	65	13.3	7.3
	75	17.1	9.5
	100	28.0	15.5
	125	40.6	22.5

XBolt™ Size	Embedment Depth h_e (mm)	Edge Distance c_1 (mm)	Design Shear Resistance[1] $ØV_d$ (kN)	Working Load in Shear[2] V_{WLL} (kN)
Ø5	25	80	6.7	3.3
Ø6	40	40	3.1	1.7
		60	5.4	3.0
		80	8.1	4.5
		100	9.5	4.7
Ø8	50	40	3.3	1.8
		60	5.8	3.2
		80	8.6	4.8
		100	11.8	6.5
Ø10	60	50	4.9	2.7
		80	9.1	5.1
		100	12.4	6.9
		120	15.9	8.8
Ø12	70	60	6.6	3.6
		80	9.7	5.3
		120	16.7	9.3
		150	22.6	12.6
Ø16	80	70	8.7	4.8
		100	13.9	7.7
		150	23.9	13.3
		200	35.4	19.6

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HILTI HKD
FLUSH ANCHOR

Technical Datasheet

Update: Sep-18

HKD Flush anchor

Everyday standard manual set flush anchor for single anchor applications

Anchor version		Benefits
	HKD (M8-M20) HKD-S(R) (M6-M20) HKD-E(R) (M6-M20)	- Simple and well proven - Approved, tested and confirmed by everyday jobsite experience - Reliable setting thanks to simple visual check - Versatile - For medium-duty fastening with bolts or threaded rods - Available in various materials and sizes for maximized coverage of possible applications

Base material	Load conditions
Concrete (non-cracked)	Static/ quasi-static

Installation conditions	Other information			
Hammer drilled holes	European Technical Assessment	CE conformity	PROFIS Anchor design Software	Corrosion resistance

Approvals / certificates

Description	Authority / Laboratory	No. / date of issue
European Technical Assessment [a)]	CSTB, Marne-la-Vallèe	ETA-02/0032 / 2015-01-07

a) All data given in this section according to ETA-02/0032, issue 2015-01-07.

Static resistance

All data in this section applies to:
- Correct setting (See setting instruction)
- No edge distance and spacing influence
- Concrete as specified in the table
- Steel failure
- Minimum base material thickness
- Concrete C 20/25, $f_{ck,cube}$ = 25 N/mm²
- Screw or rod with steel grade 5.8 (carboon steel) and / or A4-70 (stainless steel)

Effective anchorage depth for static

Anchor size			M6	M8	M10	M12	M16	M8	M8	M10	M10	M12	M16	M20
Eff. anchorage depth range	h_{ef}	[mm]	25	25	25	25	30	30	40	30	40	50	65	80

Mean ultimate resistance

Anchor size			Hilti technical data				ETA-02/0032, issued 2015-01-07							
			M6x25	M8x25	M10x25	M12x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Tension $N_{Ru,m}$	HKD	[kN]	8,4	8,4	8,4	8,4	-	11,0	13,1	11,0	17,0	23,8	32,9	48,1
	HKD-S, HKD-E		8,2	-	-	-	10,6	10,8	16,6	10,8	16,6	23,3	34,5	47,1
	HKD-SR, HKD-ER		8,2	-	-	-	10,6	10,8	-	-	16,6	23,3	34,5	47,1
Shear $V_{Ru,m}$	HKD	[kN]	*5,5*	6,9	6,9	6,9	-	*9,4*	*10,1*	*11,0*	*12,2*	*20,1*	*37,1*	*53,9*
	HKD-S, HKD-E		*6,5*	-	-	-	*6,5*	*9,1*	*9,1*	*9,6*	*10,4*	*18,3*	*28,5*	*45,1*
	HKD-SR, HKD-ER		*8,3*	-	-	-	*7,0*	*10,9*	-	-	*13,7*	*24,3*	*41,7*	*66,3*

Characteristic resistance

Anchor size			Hilti technical data				ETA-02/0032, issued 2015-01-07							
			M6x25	M8x25	M10x25	M12x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Tension N_{Rk}	HKD	[kN]	6,3	6,3	6,3	6,3	-	8,3	9,0	8,3	12,8	17,8	26,4	36,1
	HKD-S, HKD-E		6,3	-	-	-	8,3	8,3	9,0	8,3	12,8	17,8	26,4	36,1
	HKD-SR, HKD-ER		6,3	-	-	-	8,3	8,3	-	-	12,8	17,8	26,4	36,1
Shear V_{Rk}	HKD	[kN]	*5,0*	6,3	6,3	6,3	-	*8,6*	*9,2*	*10,0*	*11,0*	*18,3*	*33,8*	*49,0*
	HKD-S, HKD-E		*5,0*	-	-	-	*5,0*	*7,0*	*7,0*	*7,4*	*8,0*	*14,1*	*21,9*	*34,7*
	HKD-SR, HKD-ER		*6,2*	-	-	-	*6,4*	*8,4*	-	-	*10,5*	*18,7*	*32,1*	*51,0*

Design resistance

Anchor size			Hilti technical data				ETA-02/0032, issued 2015-01-07							
			M6x25	M8x25	M10x25	M12x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Tension N_{Rd}	HKD	[kN]	4,2	4,2	4,2	4,2	-	5,5	6,0	5,5	8,5	11,9	17,6	24,0
	HKD-S, HKD-E		3,0	-	-	-	4,6	4,6	5,0	4,6	7,1	9,9	17,6	24,0
	HKD-SR, HKD-ER		3,0	-	-	-	4,6	4,6	-	-	7,1	9,9	17,6	24,0
Shear V_{Rd}	HKD	[kN]	*4,0*	4,2	4,2	4,2	-	*6,9*	*7,3*	*8,0*	*8,8*	*14,6*	*27,0*	*39,4*
	HKD-S, HKD-E		*3,9*	-	-	-	*3,9*	*5,5*	*5,5*	*5,9*	*6,4*	*11,3*	*17,5*	*27,8*
	HKD-SR, HKD-ER		*4,1*	-	-	-	*4,2*	*5,5*	-	-	*6,9*	*12,3*	*21,1*	*33,6*

Recommended loads [a)]

Anchor size				Hilti technical data				ETA-02/0032, issued 2015-01-07							
				M6x25	M8x25	M10x25	M12x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Tension N_{Rec}	HKD	[kN]		3,0	3,0	3,0	3,0	-	3,9	4,3	3,9	6,1	8,5	12,6	17,2
	HKD-S, HKD-E			2,1	-	-	-	3,3	3,3	3,6	3,3	5,1	7,1	12,6	17,2
	HKD-SR, HKD-ER			2,1	-	-	-	3,3	3,3	-	-	5,1	7,1	12,6	17,2
Shear V_{Rd}	HKD	[kN]		2,9	3,0	3,0	3,0	-	4,9	5,2	5,7	6,3	10,5	19,3	28,3
	HKD-S, HKD-E			2,8	-	-	-	2,8	3,9	4,2	3,9	4,6	8,1	12,5	19,8
	HKD-SR, HKD-ER			2,9	-	-	-	3,0	3,9	-	-	4,9	8,8	15,1	24,0

a) With overall partial safety factor for action γ = 1,4. The partial safety factors for action depend on the type of loading and shall be taken from national regulations.

Materials

Mechanical properties

Anchor size				M6	M8	M10	M12	M16	M20
Nominal tensile strength	f_{uk}	HKD	[N/mm²]	570	570	570	570	640	590
		HKD-S, HKD-E		560	560	510	510	-	460
		HKD-SR, HKD-ER		540	540	540	540	-	540
Yield strength	f_{yk}	HKD	[N/mm²]	460	460	460	480	510	470
		HKD-S, HKD-E		440	440	410	410	-	375
		HKD-SR, HKD-ER		355	355	355	355	-	355
Stressed cross-section	A_s	HKD	[mm²]	20,7	26,7	32,7	60,1	105	167
		HKD-S, HKD-E		20,9	26,1	28,8	58,7	-	163
		HKD-SR, HKD-ER							
Moment of resistance	W	HKD	[mm³]	32,3	54,6	82,9	184	431	850
		HKD-S, HKD-E		50	79	110	264	602	1191
		HKD-SR, HKD-ER							
Char. bending resistance for rod or bolt	$M^0_{Rk,s}$	With 5.8 Gr. Steel	[Nm]	7,6	18,7	37,4	65,5	167	325
		HKD-SR HKD-ER with A4-70		11	26	52	92	187	454

Material quality

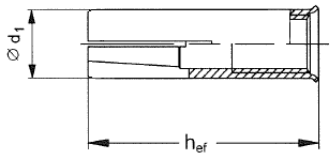
Part		Material
Anchor body	HKD	Cold formed steel / galvanised to min. 5 µm
	HKD-S, HKD-E	Steel Fe/Zn5 galvanised to min. 5 µm
	HKD-SR, HKD-ER	Stainless steel, 1.4401, 1.4404, 1.4571
Expansion plug	HKD	Cold formed steel
	HKD-S, HKD-E	Cold formed steel
	HKD-SR, HKD-ER	Stainless steel, 1.4401, 1.4404, 1.4571

Anchor dimensions of HKD, HKD-S, HKD-E, HKD-SR, HKD-ER

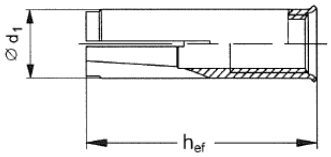
Anchor size			Hilti technical data				ETA-02/0032, issued 2015-01-07							
			M6x25	M8x25	M10x25	M12x25	M6x30	M8x30	M8x40	M10x30	M10x40	M12x50	M16x65	M20x80
Eff. anchorage depth	h_{ef}	[mm]	25	25	25	25	30	30	40	30	40	50	65	80
Anchor diameter	d_1	[mm]	7,9	9,95	11,9	14,9	8	9,95	9,95	11,8	11,95	14,9	19,75	24,75
Plug diameter	d_2	[mm]	5,1	6,35	8,1	9,7	5	6,5	6,35	8,2	8,2	10,3	13,8	16,4
Plug length	l_1	[mm]	10	7	7	7,2	15	12	16	12	16	20	29	30

Anchor body

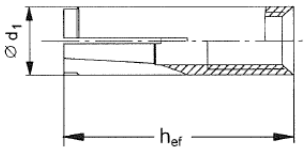
HKD



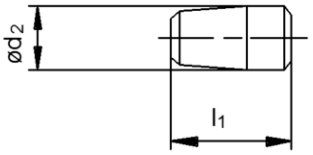
HKD-S and HKD-SR

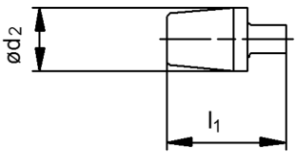


HKD-E and HKD ER



Expansion plugs



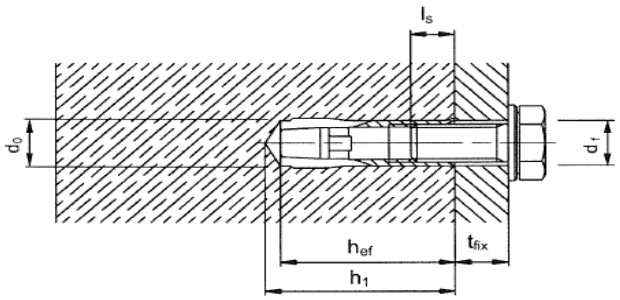


Setting information

Setting details

Anchor size			Hilti technical data				ETA-02/0032, issued 2015-01-07							
			M6x25	M8x25	M10x25	M12x25	M6x30	M8x30	M8x40	M10x30[a]	M10x40	M12x50	M16x65	M20x80
Effective embedment depth	h_{ef}	[mm]	25	25	25	25	30	30	40	30	40	50	65	80
Nominal diameter of drill bit	d_o	[mm]	8	10	12	15	8	10	10	12	12	15	20	25
Cutting diameter of drill bit	$d_{cut} \leq$	[mm]	8,45	10,5	12,5	15,5	8,45	10,5	10,5	12,5	12,5	15,5	20,5	25,5
Depth of drill hole	$h_1 \geq$	[mm]	27	27	27	27	32	33	43	33	43	54	70	85
Screwing depth	$l_{s,min}$	[mm]	6	8	10	12	6	8	8	10	10	12	16	20
Thread engagement depth	$l_{s,max}$	[mm]	12	11,5	12	12	12,5	14,5	17,5	12,7	18	23,5	30,5	42
Diameter of clearance hole in the fixture	$d_f \leq$	[mm]	7	9	12	14	7	9	9	12	12	14	18	22
Max. torque moment	T_{ins}	[Nm]	4	8	15	35	4	8	8	15	15	35	60	100

a) With anchor size M10x30 only threaded rod is to be used.



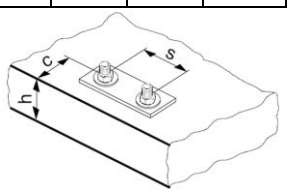
Installation equipment

Anchor size		M6	M8	M10	M10	M12	M16
Rotary hammer for setting		TE 1 – TE 3				TE 16 – TE 50	
Machine setting tool	HSD-M	6x25/30	8x25/30	10x25/30	10x40	12x50	16x65
Hand setting tool	HSD-G HSD-M	6x25/30	8x25/30	10x25/30	10x40	12x50	16x65
Other tools		hammer, torque wrench, blow up pump					

Setting paramaters

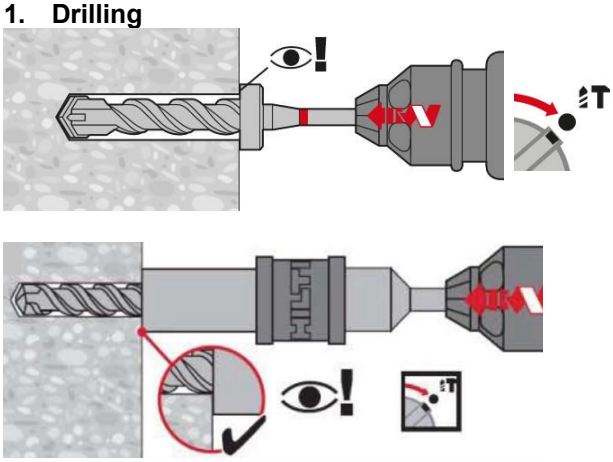
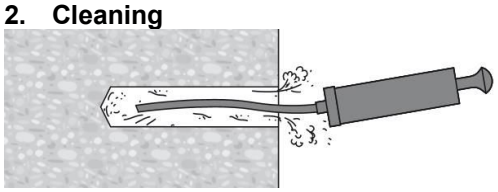
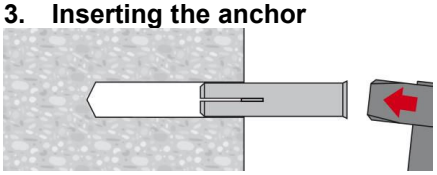
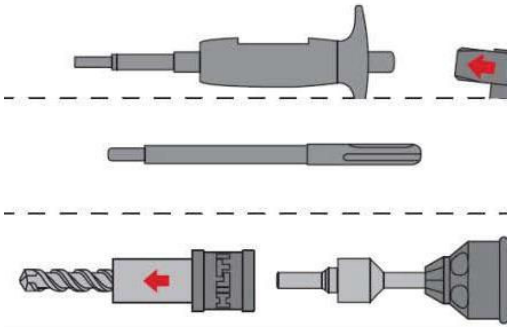
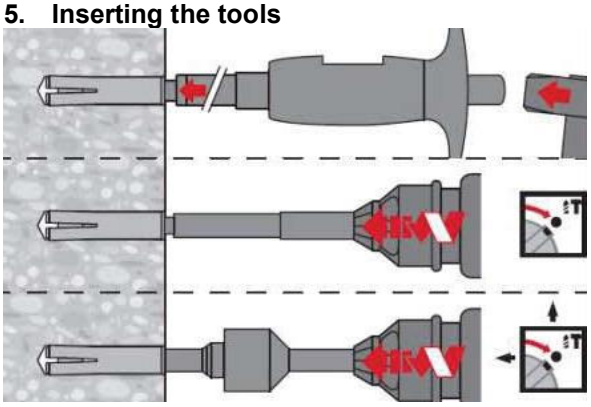
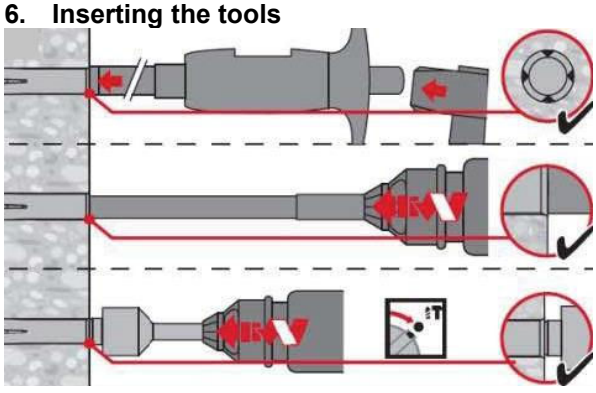
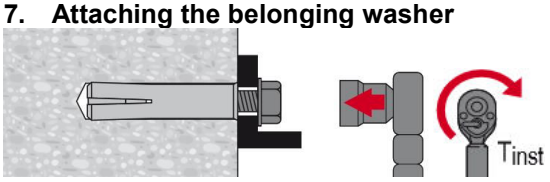
		Hilti technical data				ETA-02/0032, issued 2015-01-07							
Anchor size		**M6x25**	**M8x25**	**M10x25**	**M12x25**	**M6x30**	**M8x30**	**M8x40**	**M10x30**	**M10x40**	**M12x50**	**M16x65**	**M20x80**
Minimum base material thickness	h_{min} [mm]	100	100	100	100	100	100	100	100	100	100	130	160
Minimum spacing and minimum edge distance HKD-S (R) / HKD-E (R)	s_{min} [mm]	60	60	60	60	60	60	80	60	80	125	130	160
	c_{min} [mm]	88	88	88	88	105	105	140	105	140	175	230	280
Minimum spacing HKD	s_{min} [mm]	80	80	80	80	60	60	80	60	80	125	130	160
	c ≥ [mm]	140	140	140	140	105	105	140	105	140	175	230	280
Minimum edge distance HKD	c_{min} [mm]	100	100	100	100	80	80	140	80	140	175	230	280
	s ≥ [mm]	150	150	150	150	120	120	80	120	80	125	130	160
Critical spacing and edge distance for splitting failure HKD	$s_{cr,sp}$ [mm]	200	200	200	200	210	210	280	210	280	350	455	560
	$c_{cr,N}$ [mm]	100	100	100	100	105	105	140	105	140	175	227	280
Critical spacing and edge distance for concrete cone failure HKD / HKDS-(R) / HKD-E(R)	$s_{cr,N}$ [mm]	80	80	80	80	90	90	120	90	120	150	195	240
	$c_{cr,N}$ [mm]	40	40	40	40	45	45	60	45	60	75	97	120
Critical spacing and edge distance for splitting failure HKD-S(R) / HKD-E(R)	$s_{cr,sp}$ [mm]	176	176	176	176	210	210	280	210	280	350	455	560
	$c_{cr,N}$ [mm]	88	88	88	88	105	105	140	105	140	175	227	280

For spacing (edge distance) smaller than critical spacing (critical edge distance) the design loads have to be reduced.



Setting instruction

***For detailed information on installation see instruction for use given with the package of the product.**

Setting instruction	
1. Drilling  	**2. Cleaning** 
3. Inserting the anchor 	**4. Setting tools** 
5. Inserting the tools 	**6. Inserting the tools** 
7. Attaching the belonging washer  	

ANCHORING & FASTENING SYSTEMS

Technical Manual for the Design Professional

MECHANICAL ANCHORS

DROP-IN ANCHORS

DM-PRO
Carbon Steel Zinc Plated, Stainless Steel

DM-PRO
Part 6 Approval - Carbon Steel Zinc Plated, Stainless Steel

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ANCHOR DESIGN MANUAL

The Powers Anchoring Systems contained in this design manual have been developed by Powers Fasteners and its dedicated team of engineers. Powers Fasteners was established in New York, USA in the year 1921 and has grown to become a recognized global leader in the fastening industry. Powers has extensive development, engineering and manufacturing expertise in mechanical anchors, adhesive anchor systems, light-duty fastening, screw fastening and forced entry fastening systems. The Powers brand is recognized for leadership in fastening innovation and patented fastening systems.

As the global anchoring industry has evolved, the Powers engineering team kept pace with an unparalleled attention on customer and end-user needs, endless internal R&D focus as well as continuous involvement in external research groups, world-wide technical committees and building code development groups.

In 2012, Powers Fasteners was acquired by Stanley Black & Decker and is now a premium brand of the CDIY (Construction Do-It-Yourself) division of the Stanley Black & Decker Group together with DEWALT. The Stanley Black & Decker group has over 40,000 employees worldwide based in 160 locations, including 25 manufacturing sites. As the world leader with over 160 years experience in the market, Stanley Black & Decker today holds a complete portfolio of premium and middle-market tool and construction brands including Black & Decker, Stanley, Bostitch, Facom, Mac Tools, Proto and Stanley Vidmar.

The Powers Fasteners technical group have developed a world class Powers Anchoring range that is contained in this manual. The combined Powers – DEWALT team now has an even stronger commitment to continue the existing leadership in providing innovative building-code compliant fastening systems, user-friendly technical documentation and design software as well as global engineering support with in-market engineering teams. In addition, the organizational excellence of Stanley Black & Decker ensures that this product offering exceeds expectations: from the specifier to the installer and each step in between.

The Anchor Design Manual was developed for you as the design professional to select, design and specify our anchoring products. Our goal was to keep it as concise as possible to enable easy sound design according to the latest anchor design theories and standards. We suggest this manual to be used in combination with our free anchor design software available at: www.powers.com.au

Powers employs a national team of field engineers (Specification Managers) that work directly with design professionals to provide technical support and design assistance helping solve all your anchoring problems. To be placed in contact with one of our Specification Managers or for additional copies of this design manual please contact Powers on (03) 8669 5200.

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LOGOS USED IN THIS MANUAL

APPLICATION AND USE LOGOS	
	The anchor is installed in dry internal conditions, sufficient corrosion protection of carbon steel anchors is provided by a 5 µm minimum zinc coating.
	The anchor is subject to atmospheric external conditions including industrial and maritime environments, or permanently damp internal conditions, stainless steel or special corrosion resistant coatings are required.
	Particular aggressive conditions require anchors made of high corrosion resistance (HCR) steel. Such aggressive environments are e.g. splash zone of sea water, chloride atmosphere of indoor swimming pools, or atmosphere with extreme chemical pollution including road tunnels where de icing materials are employed.
	Certain post installed anchors are only approved for 'Multiple use for non-structural applications'. This means that this specific anchor product and size may only be used for redundant anchorage of non-structural components. The minimum number of anchors as well as the maximum design load is given in ETAG 001 Part 6.
The minimum and maximum ambient temperatures are limited to ensure proper performance over the service life of the anchorage. Currently adhesive anchor systems can be approved for various service temperature ranges. Short term temperatures: vary over short intervals, e.g. day/night cycles and freeze/thaw cycles. Long term temperatures: will be approximately constant over significant periods of time.	
	Temperature range: -40°C to +40°C for short term and +24°C for long term temperatures, labeled 40/24°C.
	Temperature range: -40°C to +80°C for short term and +50°C for long term temperatures, labeled 80/50°C.
	Temperature range: -40°C to +72°C for short term and +43°C for long term temperatures, labeled 72/43°C.
	Temperature range: -40°C to +120°C for short term and +72°C for long term temperatures, labeled 120/72°C.
Adhesive curing depends on the temperature at which this chemical reaction takes place. For this reason, the minimum installation temperature is defined for the adhesive and the base material. The adhesive anchor system can be approved for various installation temperatures.	
	Moderate base material temperature as low as +5°C.
	Low base material temperature as low as -5°C.
	Very low base material temperature as low as -10°C.
	Curing of adhesives may be inhibited if they get wet during installation, e.g. by moistened bore holes due to rain on the construction site. Approved adhesives are suitable for installation in dry and wet base material.
	Some adhesives can be installed in completely water filled holes without the curing process being affected negatively.
	Adhesives can also be used to install reinforcement bars connecting new concrete elements to existing concrete structures. Post-installed rebars are basically designed according to reinforced concrete design codes.

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Anchors may be used in three types of installation configurations:	
	For preset anchors, the anchor is installed first and then the fixture is attached. In this case, the clearance hole in the fixture can be smaller than the drilled hole in the base material.
	For through installations, the fixture is put in place first and the anchor is then inserted through the clearance hole. In this case, the fixture may be used as a template, but the hole diameter in the fixture must be at least as large as the drilled hole diameter.
	For a stand off installation, the element to be anchored is mounted in a distance from the surface of the base material. The lever arm of the applied loads creates a bending moment in the anchor bolt which needs to be taken care of in the design process.
	Anchoring in reinforced concrete may require core drills (diamond coring) where reinforcement is expendable. As adhesive anchors are generally sensitive to the hole roughness, they need to be explicitly approved for application in smooth core drilled holes.
APPROVAL AND LISTING LOGOS	
	Anchor products holding a European Technical Approval/Assessment (ETA) are qualified according to one of the following technical guidelines (ETAG): • ETAG 001 for metal anchors installed in concrete. (Option 1 for cracked concrete, Option 7 for uncracked concrete, Part 6 for multiple use for non-structural applications) • ETAG 029 for metal injection anchors installed in masonry. • EOTA TR 023 for post-installed reinforcement bars. Products complying with European standards or approvals are marked with the CE Marking.
	A fire resistance rating provides the duration of fire exposure for which the anchor is qualified based on ETA (EOTA TR020) or other relevant evaluation report. Ratings within the context of the European Organization of Technical Assessment (EOTA) are based on the following Technical Report (TR): • EOTA TR 020 "Evaluation of anchorages in concrete concerning resistance to fire". In general, the design strength is reduced if exposure to fire is taken into account. Maximum duration for fire resistance is given in the specific product section and generally ranges from 120 to 240 min, depending on whether the anchor product is qualified for concrete anchoring or post-installed rebar connections.
	The German Technical Approval of post installed reinforcement bars certifies that the product meets the requirements to be installed by trained personnel. The German Technical Approvals are next to the European Technical Approvals the most renowned qualifications of anchor products.
	The Evaluation Service of the International Code Council (ICC ES) provides test guidelines for anchor qualification in the US. The technical reports issued on the basis of these guidelines are internationally recognized and provide a high degree of safety.
	NSF International is an independent organization that provides standards for e.g. product certification for public health and the environment.
	Products tested for the emission of volatile substances in indoor air, with a risk of inhalation toxicity, on a scale ranging from class A + (very low emissions) to C (high emissions) level.
LOADING CONDITION LOGOS	
	Static loads are basically dead loads or other permanently or temporarily acting loads such as snow load.
	Live loads varying at low rates such as traffic or moving loads are considered as quasi static loads.
	Loads evolving from earthquakes are termed seismic loads and are characterized by cyclic loading.
	Load demands deriving from moderate wind are covered by the approval for quasi static loading.
	Anchors are considered fit for applications in areas prone to high wind such as typhoon or hurricanes if they are approved for seismic loading.

BASE MATERIAL LOGOS	
	The crack condition of the concrete is a critical factor in anchor selection. The concrete can either be uncracked or cracked. The concrete may only be assumed as uncracked if it can be shown that there is no tensile stress in the concrete.
	As a default, the concrete should be assumed as cracked. Anchors can generally be used for concrete strengths between 20 and 50 MPa (measured on cylindrical test specimens), corresponding to the European concrete strength classes C20/25 to C50/60.
	Material characteristics generally allow only certain anchor types to be used in masonry. Anchoring products qualified for masonry are generally adhesive type. The installation of adhesive anchors in solid bricks is basically identical to that in concrete.
	In case of hollow bricks, special sleeves inserted prior to the installation of the anchor prevents the adhesive to fully diminish into the brick voids. As masonry bricks available worldwide show a high diversity, the designer must check the specified brick carefully. On-site field testing in actual conditions is recommended.
OTHER LOGOS	
	Concrete anchor design is consistent but complex. The Powers Design Assistant (PDA) helps engineers to accelerate the design process. The design data of all Powers anchors holding a technical approval is readily available.
	The Powers Adhesive Volume Calculator is a tool designed to help you to determine the number of cartridges and to control the cost on the job site. It is available as a free download at www.powers.com.au or you can download the Powers AVC app for iPhone and Android platforms.
	We run a worldwide net of test laboratories for which experienced staff carry out tests for quality control and for research and development.
	Contact us if you need technical support in whatsoever, contact details are given at the end of this manual. Our field service experts will answer your questions.

General Safety Concept:

$S_d \leq R_d$

Where:

S_d = value of design action; $S_d = \gamma_F \cdot F_k$

R_d = value of design resistance (N_{Rd} for tension, V_{Rd} for shear, or $F_{Rd}{}^{45°}$ for loads acting at 45°); $R_d = R_k / \gamma_M$

NOTATIONS USED IN THIS MANUAL

F	N	V	M	T
Force in general	Normal force	Shear force	Moment in general	Torsion moment
F_k	R_k	c	c_{cr}	c_{min}
Characteristic resistance of an action	Characteristic resistance of anchor or anchor group	Concrete edge distance	Characteristic edge distance	Minimum allowable edge distance
d	d_f	d_{nom}	d_0	f_b
Diameter of anchor bolt	Diameter of clearance hole in the fixture	Outside diameter of an anchor	Nominal diameter of drilled hole	Normalized mean compression strength of masonry unit
f_c	f_y	f_u	h	h_{ef}
Concrete compressive strength of concrete	Steel yield strength or steel proof strength respectively	Steel ultimate tensile strength	Thickness of concrete member in which the anchor is installed	Effective embedment depth
h_{min}	s	s_{cr}	s_{min}	t_{fix}
Minimum allowed thickness of concrete member	Anchor spacing	Characteristic anchor spacing	Minimum allowable anchor spacing	Thickness of the fixture
ρ	τ_k	γ_F	γ_M	γ_2
Bulk density of masonry unit	Characteristic bond stress	Partial safety factor for actions	Partial safety factor for material	Partial safety factor for installation

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Applications and Uses

| Product | | |

				Listings and Approvals						Loading Condition					Base Material			
				European Technical Approval	Fire Rating	ICC-ES (ACI)	NSF / WQA	VOC	German Technical Approval	Static Load	Quasi-Static Loads	Seismic Loads	Moderate Wind Loads	High Wind Loads	Uncracked Concrete	Cracked Concrete	Solid Brick Masonry	Hollow Brick Masonry
Product				CE		ICC-ES	NSF											
EXPANSION ANCHORS	Throughbolt	PTB-ETA1-PRO		■	■					■	■	■	■	■	■	■		
		PTB-SS-ETA1 - PRO		■	■					■	■		■		■	■		
	Heavy Duty Anchor	PB-PRO-S		■	■					■	■	■	■	■	■	■		
	Drop-In Anchor	DM-PRO		■	■[1]					■	■		■		■			
		DM-PRO Part 6		■	■					■	■		■		■	■		
SCREW ANCHORS		BT (Blue-Tip)		■	■[1]					■	■		■		■	■		
		SNAKE-PRO		■	■[1]					■	■	■	■		■	■		
INJECTION ADHESIVE ANCHORS	Vinylester	AC100-PRO	Concrete	■	■	■	■	■		■	■	■	■	■	■	■		
			Masonry	■			■	■		■	■		■				■	■
			Rebar	■			■	■		■	■		■		■	■		
	Epoxy	PURE150-PRO	Concrete	■	■	■	■	■		■	■	■	■	■	■	■		
			Core-Drilled	■		■	■	■		■	■		■		■			
			Rebar	■	■			■	■	■	■		■		■	■		
		PURE110-PRO	Concrete	■	■	■	■	■		■	■	■	■	■	■	■		
	Polyester	PV45-PRO / AC100e	Concrete	■				■		■	■		■		■			
			Masonry	■				■		■	■		■				■	■
CAPSULE ADHESIVE ANCHOR		SC-PRO	Concrete	■						■	■		■		■			

Legend: ■ Suitable ◆ Suitable depending on the steel material used ● Mechanical anchors are suitable for all temperatures without further approval testing
▲ Performance of mechanical anchors is not affected by wet surfaces, however, corrosion effects need to be considered

1) Efectis Report

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TECHNICAL SUPPORT

This Anchor Design Technical Manual gives you valuable information on anchor technology and the powerful anchor products engineered by Powers. The specifications enable you to select the best anchor choice for every application. We strongly encourage you to use the Powers Design Assist for the efficient design of single and multiple anchor connections. This software contains design data of most Powers anchor products and allows you to design anchorages easily. To download this software for free, go to: www.powersdesignassist.com.

Innovation has always been a core strength of Powers. Since the foundation, Powers has been delivering innovative anchoring solutions for attachment to concrete, masonry, steel and wood. To do so, Powers employs a large team of senior anchor design and test engineers, many of them have master's and doctoral degrees in the fields of architectural engineering, civil engineering, mechanical engineering, metallurgy, chemical engineering, materials engineering, and manufacturing. The cooperation of Powers experts in these various disciplines in combination with the massive engineering resources of Stanley Black & Decker ensures Powers will continue to provide innovative, high-quality anchoring solutions. Powers research and development is carried out in several world-class testing laboratories with principal testing taking place in USA, Germany, China and Australia.

In-house QC inspection and testing is conducted to ensure continual supply of high quality products to our customers. Our experienced technical personnel check and inspect all Powers products to ensure only quality products enter the market place. The development of new, innovative anchoring solutions requires both know-how and equipment. Powers laboratories contain state-of-the art testing equipment, specialized for testing and evaluating anchors. Moreover, we have a worldwide network of regional branches. For technical support, just contact the closest branch which contact details you find on the at the end of this manual. Our engineers will be pleased to help you solving any of your anchoring problems. We also offer training seminars for your individual needs to back your confidence in Powers products!

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MECHANICAL ANCHOR OVERVIEW

Mechanical anchors are available in many variations and choices and can usually be loaded immediately after installation which is an advantage in many applications. Mechanical anchors may also have a greater resistance to the effects of elevated temperature when compared with adhesive anchors.

Mechanical anchors can be described by their functional principle and categorized by their load transfer mechanism which either bases on mechanical **friction** or on mechanical **interlock:**

Anchor types which load transfer mechanism bases on friction are in general **expansion anchors.** These anchor types are designed with expansion elements that compress against the wall of the drilled hole. When the anchor is loaded, frictional force between expansion elements and concrete allows the anchor to transfer the load to the base material. **Torque-controlled expansion anchors** are installed by applying a specified torque to the bolt head or nut with a torque wrench. Torque-controlled expansion anchors may be further classified as either sleeve type (also commonly named 'heavy duty anchor' or 'high load anchor') or bolt type (also commonly named 'wedge anchor' or 'throughbolt'). **Displacement-controlled expansion anchors** are set by the axial displacement of the expansion plug within the sleeve. They are commonly called 'drop-in anchors'.

Anchors which load transfer mechanism bases on interlock are either screw or undercut type. **Screw anchors** have a thread similar to that of a wood screw which allows the anchor to cut into the base material during installation in a drilled hole. The anchor develops its load capacity by the interlock of the thread and concrete. **Undercut anchors** provide a bearing area which undercuts into the wall of the drilled hole by a special installation procedure. The large bearing area allows transferring the load into the base material by mechanical interlock.

In Europe and many other countries, mechanical anchors are in general designed according the **ETAG 001 Annex C Method A.** Anchors qualified for **multiple use for non-structural applications** according to ETAG 001 Part 6 are designed according to simplified rules stipulated in **ETAG 001 Annex C.**

SECTION CONTENT

Expansion Anchors

Throughbolt:
PTB-ETA1-PRO
PTB-SS-ETA1-PRO

Heavy Duty Anchor
PB-PRO-S

Drop-In Anchor
DM-PRO

Screw Anchors
BT (BLUE-TIP)
SNAKE-PRO

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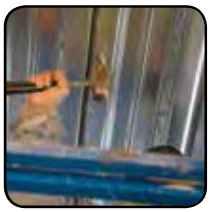
GENERAL INFORMATION

DM-PRO

Drop-In Anchor

PRODUCT DESCRIPTION

The DM-PRO is a drop-in anchor which shows good performance for competitive price for typical mass applications. It can be used in a wide range of concrete strengths and in all installation directions. The DM-PRO is available in carbon steel and stainless steel. The lipped version is furnished with a flange preventing the anchor to pertain too deep into the concrete.



GENERAL APPLICATIONS AND USES

* Stainless Steel only

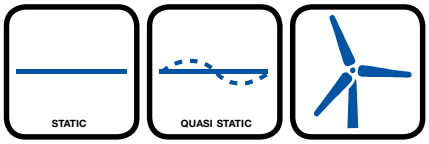
FEATURES AND BENEFITS

- Price competitive anchoring for all kinds of mechanical, electrical and plumbing installation
- Straightforward installation with hand driven hammer used in combination with the setting tool
- Suitable for threaded steel elements of various strength and grade
- Internally threaded anchor for easy bolt removability and service work

APPROVALS AND LISTINGS

* Please refer to Efectis Report for load capacities under fire

LOADING CONDITIONS



SUITABLE BASE MATERIALS

VERSIONS

Straight Collar
- Carbon Steel, Zinc Plated
- Stainless Steel

Lipped Collar
- Carbon Steel, Zinc Plated

APPROVALS

- ETA-10/0144

PDA®
Real-Time Anchor Design Software
www.powersdesignassist.com

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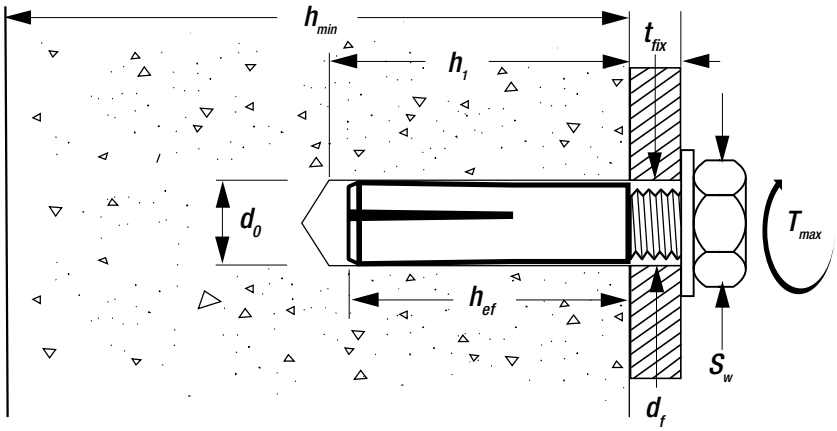
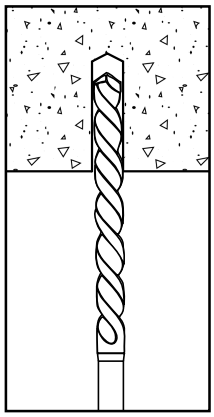
INSTALLATION INFORMATION

INSTALLATION DATA

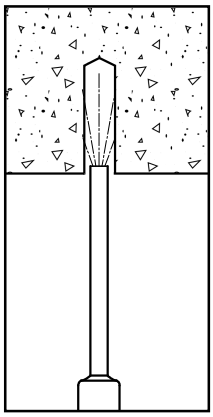
	Notation	Unit	DM-PRO			
			M8	M10	M12	M16
Anchor diameter	d	[mm]	10	12	16	20
Nominal drill bit diameter	d_0	[mm]	10	12	16	20
Diameter of hole clearance in fixture	d_f	[mm]	9	12	14	18
Effective embedment depth	h_{ef}	[mm]	30	40	50	65
Drill hole depth	h_1	[mm]	32	42	53	68
Minimum member thickness	h_{min}	[mm]	120	120	130	160
Minimum spacing	s_{min}	[mm]	70	100	120	160
Minimum edge distance	c_{min}	[mm]	100	130	170	200
Maximum torque threaded rod	T_{max}	[Nm]	8	15	35	60



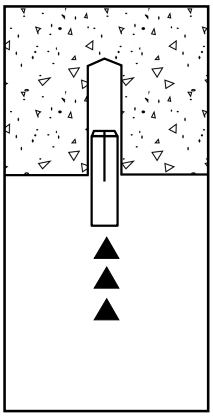
INSTALLATION INSTRUCTIONS



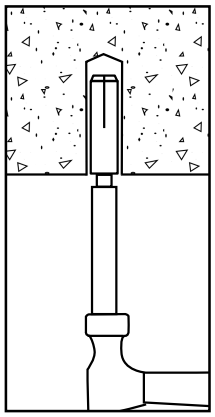
1.) *Using the proper drill bit size, drill a hole into the base material to the required depth.*



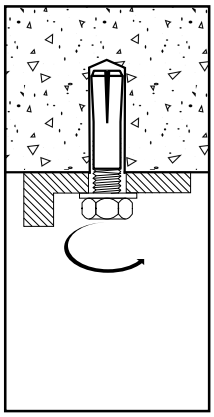
2.) *Remove dust and debris from the hole using a hand pump or compressed air.*



3.) *Insert drop in anchor in to drilled hole.*



4.) *Expand anchor by hammering on setting tool until the collar of the setting tool touches the anchor.*



5.) *Insert threaded rod and prestress with defined torque.*

For complete installation instructions, see technical approval.

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DESIGN INFORMATION

TENSION LOAD CAPACITIES - PARAMETERS FOR CALCULATION OF DESIGN STRENGTH

According to ETAG 001 Annex C Method A.

	Notation	Unit	DM-PRO			
			M8	M10	M12	M16
Steel failure						
Characteristic resistance, steel grade 4.6	$N_{Rk,s}$	[kN]	14.6	14.7	33.7	62.7
Partial safety factor	γ_{Ms}	[-]	2.0	1.5	2.0	
Characteristic resistance, steel grade 5.6	$N_{Rk,s}$	[kN]	11.6	14.7	42.1	47.3
Partial safety factor	γ_{Ms}	[-]	1.5		2.0	1.5
Characteristic resistance, steel grade 8.8	$N_{Rk,s}$	[kN]	11.6	14.7	36.0	47.3
Partial safety factor	γ_{Ms}	[-]	1.5			
Characteristic resistance, steel grade A4-70	$N_{Rk,s}$	[kN]	15.7	19.9	48.6	63.9
Partial safety factor	γ_{Ms}	[-]	1.89			
Pullout failure						
Uncracked concrete C20/25						
Characteristic resistance	$N_{Rk,p}$	[kN]	-[6]	9.0	12.0	12.0
Partial safety factor	γ_{Mp} [2]	[-]	1.5[3]	1.8[4]	2.1[5]	
Increasing factor for concrete strength						
C30/37	ψ_c	[-]	1.22			
C40/50	ψ_c	[-]	1.41			
C50/60	ψ_c	[-]	1.55			
Concrete failure						
Concrete cone failure						
Characteristic spacing	$s_{cr,N}$	[mm]	90	120	150	195
Characteristic edge distance	$c_{cr,N}$	[mm]	45	60	75	100
Partial safety factor for uncracked concrete	γ_{Mc} [2]	[-]	1.5[3]	1.8[4]	2.1[5]	
Splitting failure						
Characteristic spacing	$s_{cr,sp}$	[mm]	180	240	300	390
Characteristic edge distance	$c_{cr,sp}$	[mm]	90	120	150	195
Partial safety factor for uncracked concrete	γ_{Msp} [1]	[-]	1.5[3]	1.8[4]	2.1[5]	
Increasing factor for concrete strength						
C30/37	ψ_c	[-]	1.22			
C40/50	ψ_c	[-]	1.41			
C50/60	ψ_c	[-]	1.55			

1) For applications with statically indeterminate structural component only
2) In absence of other national regulations
3) Partial safety factor of $\gamma_2 = 1.0$ is included
4) Partial safety factor of $\gamma_2 = 1.2$ is included
5) Partial safety factor of $\gamma_2 = 1.4$ is included
6) Concrete cone failure is decisive

PDA The Powers Design Assist is a powerful anchor design software which helps you to design simple and complex anchorages.
The design data of all Powers anchor products is readily available. To download this software for free, go to www.powersdesignassist.com

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SHEAR LOAD CAPACITIES - PARAMETERS FOR CALCULATION OF DESIGN STRENGTH

According to ETAG 001 Annex C Method A.

	Notation	Unit	DM-PRO			
			M8	M10	M12	M16
Steel failure						
Steel failure without lever arm						
Characteristic resistance, steel grade 4.6	$V_{Rk,s}$	[kN]	7.3	7.4	16.9	31.3
Partial safety factor	γ_{Ms} 2)	[-]	1.67	1.25	1.67	
Characteristic resistance, steel grade 5.6	$V_{Rk,s}$	[kN]	5.8	7.4	21.1	23.6
Partial safety factor	γ_{Ms} 2)	[-]	1.25		1.67	1.25
Characteristic resistance, steel grade 8.8	$V_{Rk,s}$	[kN]	5.8	7.4	18.0	23.6
Partial safety factor	γ_{Ms} 2)	[-]	1.25			
Characteristic resistance, steel grade A4-70	$V_{Rk,s}$	[kN]	7.8	10.0	24.3	31.9
Partial safety factor	γ_{Ms} 2)	[-]	1.58			
Steel failure with lever arm (bending)						
Characteristic resistance, steel grade 4.6	$M^0_{Rk,s}$	[Nm]	14.9	29.9	52.4	132.2
Partial safety factor	γ_{Ms} 2)	[-]	1.67			
Characteristic resistance, steel grade 5.6	$M^0_{Rk,s}$	[Nm]	18.7	37.3	65.5	166.5
Partial safety factor	γ_{Ms} 2)	[-]	1.67			
Characteristic resistance, steel grade 8.8	$M^0_{Rk,s}$	[Nm]	27.3	43.0	104.8	224.9
Partial safety factor	γ_{Ms} 2)	[-]	1.25			
Characteristic resistance, steel grade A4-70	$M^0_{Rk,s}$	[Nm]	26.2	52.3	91.7	233.1
Partial safety factor	γ_{Ms} 2)	[-]	1.56			
Concrete failure						
Pry-out failure						
Factor in equation (5.6) of ETAG 001 Annex C.	k	[-]	1	1	1	2
Partial safety factor	γ_{Ms} 2)	[-]	1.5 3)			
Edge failure						
Effective length of anchor for h_{ef}	l_f	[mm]	30	40	50	65
Outside diameter of anchor	d_{nom}	[mm]	10	12	16	20
Partial safety factor	γ_{Mc} 2)	[-]	1.5 3)			

1) For applications with statically indeterminate structural component only
2) In absence of other national regulations
3) Partial safety factor of $\gamma_2 = 1.0$ is included

PDA The Powers Design Assist is a powerful anchor design software which helps you to design simple and complex anchorages.
The design data of all Powers anchor products is readily available. To download this software for free, go to www.powersdesignassist.com

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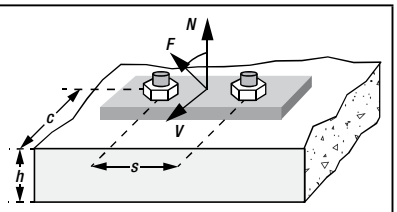
PRECALCULATED TENSION AND SHEAR CAPACITIES

According to ETAG 001 Annex C Method A.

- Every reasonable effort has been applied to ensure the accuracy of the tabulated data.
- The tables are intended to aid the user in the preliminary design process. It is the user's responsibility to interpret the data and to select, design and specify the correct product suitable for the application and its intended use.
- The given values are valid for normal concrete C20/25 and static/quasi-static loads with the exact dimensional information given. For any other conditions, the use of PDA is recommended.
- The values in the tables below are design level loads. This assumes a safety factor is included both on the loading
- For further details and background information please see the introduction of this manual.



M8	C20/25 8.8 steel	Anchoring located far from any edge					Anchoring located close to an edge				
Embedment depth	h_{ef} [mm]	30									
Member thickness	h [mm]	120									
Edge distance	c [mm]	-	-	-	-	-	100	100	100	100	100
Anchor spacing	s [mm]	-	70	90	70	90	-	70	90	70	90
	N_{Rd} [kN]	5.5	9.8	11.0	17.4	22.1	5.5	9.8	11.0	16.0	18.6
	$F_{Rd}^{45°}$ [kN]	4.3	8.1	8.6	14.8	17.1	4.3	8.1	8.6	11.9	13.0
	V_{Rd} [kN]	4.6	9.3	9.3	17.4	18.6	4.6	9.3	9.3	12.4	13.1

■ - Steel strengths controls ■ - Concrete strength controls ■ - Anchor pullout strength controls

M10	C20/25 8.8 steel	Anchoring located far from any edge					Anchoring located close to an edge				
Embedment depth	h_{ef} [mm]	40									
Member thickness	h [mm]	120									
Edge distance	c [mm]	-	-	-	-	-	130	130	130	130	130
Anchor spacing	s [mm]	-	100	120	100	120	-	100	120	100	120
	N_{Rd} [kN]	5.0	10.0	10.0	20.0	20.0	5.0	10.0	10.0	18.6	20.0
	$F_{Rd}^{45°}$ [kN]	4.6	9.2	9.2	18.4	18.4	4.6	9.2	9.2	15.0	15.9
	V_{Rd} [kN]	5.9	11.8	11.8	23.7	23.7	5.9	11.8	11.8	16.9	17.6

■ - Steel strengths controls ■ - Concrete strength controls ■ - Anchor pullout strength controls

M12	C20/25 8.8 steel	Anchoring located far from any edge					Anchoring located close to an edge				
Embedment depth	h_{ef} [mm]	50									
Member thickness	h [mm]	130									
Edge distance	c [mm]	-	-	-	-	-	170	170	170	170	170
Anchor spacing	s [mm]	-	120	150	120	150	-	120	150	120	150
	N_{Rd} [kN]	5.7	11.4	11.4	22.9	22.9	5.7	11.4	11.4	19.8	22.7
	$F_{Rd}^{45°}$ [kN]	6.5	12.6	13.1	24.3	26.2	6.5	12.6	13.1	18.1	19.9
	V_{Rd} [kN]	11.9	21.4	23.8	38.5	47.5	11.9	21.4	23.8	23.2	24.3

■ - Steel strengths controls ■ - Concrete strength controls ■ - Anchor pullout strength controls

PDA The Powers Design Assist is a powerful anchor design software which helps you to design simple and complex anchorages.
The design data of all Powers anchor products is readily available. To download this software for free, go to www.powersdesignassist.com

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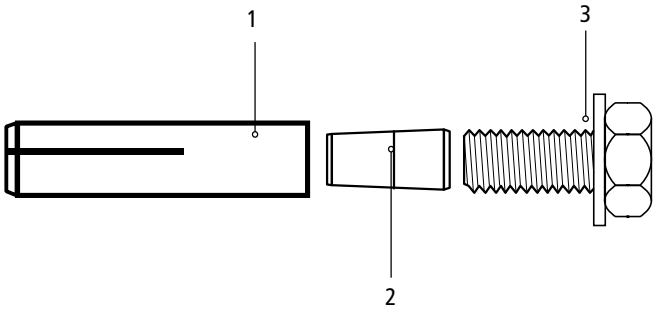
M16	C20/25 8.8 steel	Anchoring located far from any edge					Anchoring located close to an edge				
Embedment depth	h_{ef} [mm]	65									
Member thickness	h [mm]	160									
Edge distance	c [mm]	-	-	-	-	-	200	200	200	200	200
Anchor spacing	s [mm]	-	160	195	160	195	-	160	195	160	195
	N_{Rd} [kN]	5.7	11.4	11.4	22.9	22.9	5.7	11.4	11.4	22.9	22.9
	$F_{Rd}^{45°}$ [kN]	7.4	14.9	14.9	29.8	29.8	7.4	14.3	14.5	22.7	23.1
	V_{Rd} [kN]	18.9	37.8	37.8	75.5	75.5	18.9	32.3	33.8	32.3	33.8

■ - Steel strengths controls ■ - Concrete strength controls ■ - Anchor pullout strength controls

PDA The Powers Design Assist is a powerful anchor design software which helps you to design simple and complex anchorages. The design data of all Powers anchor products is readily available. To download this software for free, go to www.powersdesignassist.com

MATERIAL INFORMATION

MATERIAL SPECIFICATION



Part no.	Designation	Version	Material	Protection
1	Anchor sleeves	DM-PRO/ DM-Lip-Pro	Cold formed steel, grade SWRCH8A	Zinc plated 5 µm
		DM-SS-Pro	Machined steel, grade SS316[1)]	-
2	Expansion cones	DM-PRO/ DM-Lip-Pro	Cold formed steel, grade SWRCH8A	Zinc plated 5 µm
		DM-SS-Pro	Machined steel, grade SS316[1)]	-
3	Screw or threaded rod	DM-PRO/ DM-Lip-Pro	Steel strength class 4.6, 5.6, 5.8 or 8.8 according to ISO 898-1	Zinc plated 5 µm
		DM-SS-Pro	Steel strength class A4-70[1)]	-

1) Mat. No.: 1.4401, 1.4404, 1.4439, 1.4571

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GENERAL INFORMATION

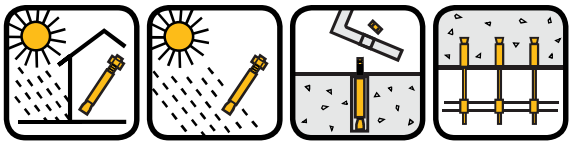
DM-PRO Part 6

Drop-In Anchor

PRODUCT DESCRIPTION

The DM-PRO is a drop-in anchor which shows good performance for competitive price for typical mass applications. It can be used in a wide range of concrete strengths and in all installation directions. The DM-PRO is available in carbon steel and stainless steel. The lipped version is furnished with a flange preventing the anchor to pertain too deep into the concrete. With an ETAG 001 Part 6 approval, the DM-PRO can also be used in cracked concrete, but only for multiple connection in non-structural applications.

GENERAL APPLICATIONS AND USES



Stainless Steel Only

FEATURES AND BENEFITS

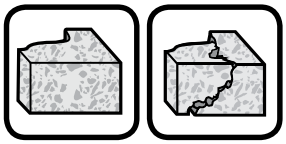
- Price competitive anchoring for all kinds of mechanical, electrical and plumbing installation
- Straightforward installation with hand driven hammer used in combination with the setting tool
- Suitable for threaded steel elements of various strength and grade
- Internally threaded anchor for easy bolt removability and service work

APPROVALS AND LISTINGS

* Please refer to Efectis Report for load capacities under fire

LOADING CONDITIONS

SUITABLE BASE MATERIALS



VERSIONS

Straight Collar:

Carbon Steel, Zinc Plated

Stainless Steel

Lipped Collar

Carbon Steel, Zinc Plated

APPROVALS

- ETA-10/0145

PDA®
Real-Time Anchor Design Software
www.powersdesignassist.com

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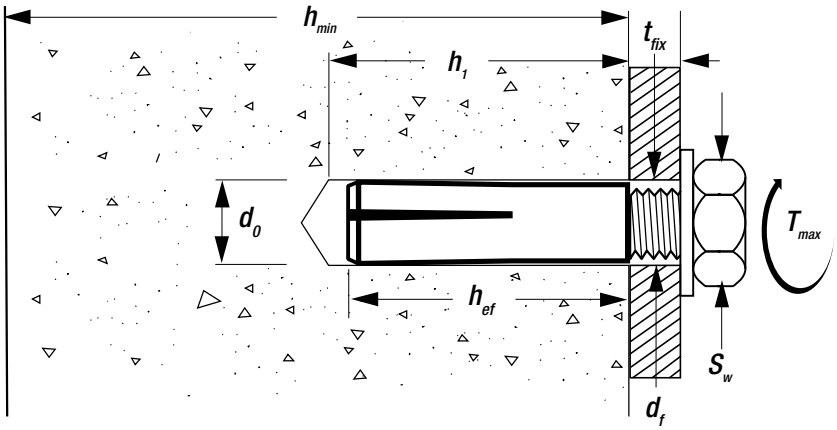
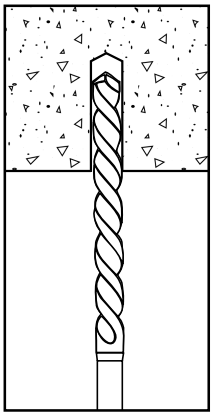
INSTALLATION INFORMATION

INSTALLATION DATA

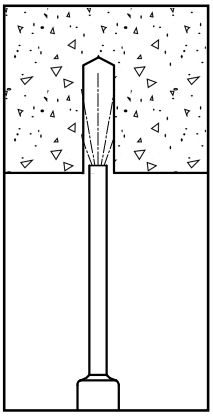
	Notation	Unit	DM-PRO Part 6			
			M6	M8	M10	M12
Anchor diameter	d	[mm]	8	10	12	16
Nominal drill bit diameter	d_0	[mm]	8	10	12	16
Diameter of hole clearance in fixture	d_f	[mm]	7	9	12	14
Effective embedment depth	h_{ef}	[mm]	25	30	40	50
Drill hole depth	h_1	[mm]	26	32	42	53
Minimum member thickness	h_{min}	[mm]	80	80	80	100
Minimum spacing for above h_{min}	s_{min}	[mm]	150	150	150	150
Minimum edge distance for above h_{min}	c_{min}	[mm]	200	200	200	200
Maximum torque threaded rod	T_{max}	[Nm]	4	8	15	35



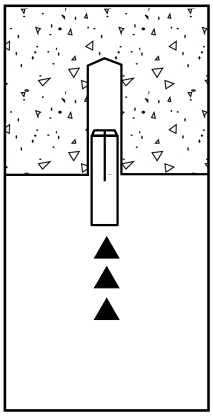
INSTALLATION INSTRUCTIONS



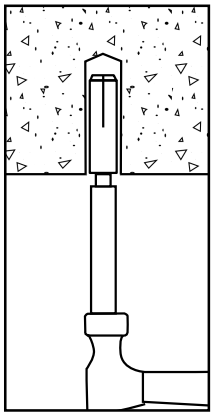
1.) *Using the proper drill bit size, drill a hole into the base material to the required depth.*



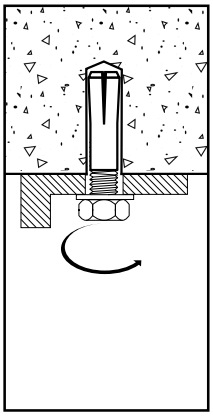
2.) *Remove dust and debris from the hole using a hand pump or compressed air.*



3.) *Insert drop in anchor in to drilled hole.*



4.) *Expand anchor by hammering on setting tool until the collar of the setting tool touches the anchor.*



5.) *Insert threaded rod and prestress with defined torque.*

For complete installation instructions, see technical approval.

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DESIGN INFORMATION

LOAD CAPACITIES - PARAMETERS FOR CALCULATION OF DESIGN STRENGTH

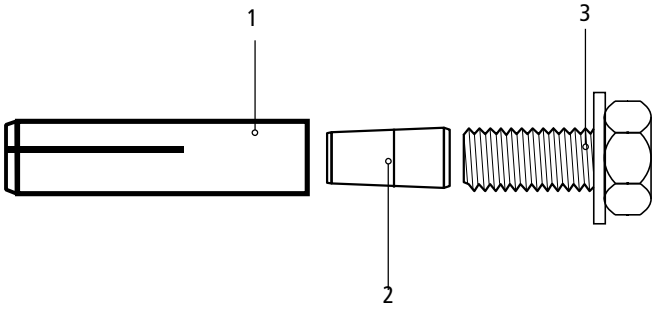
According to ETAG 001 Annex C Method C.

	Notation	Unit	DM-PRO			
			M6	M8	M10	M12
Capacity for all directions and failure modes						
Uncracked and cracked concrete						
Characteristic resistance C20/25 to C50/60	F^0_{Rk}	[kN]	2.0	2.0	4.0	5.0
Partial safety factor	γ_{Mp} 1)	[-]	2.4 2)	2.3 2)	2.1 2)	
Design resistance C20/25 to C50/60	F_{Rd}	[kN]	0.83	0.87	1.90	2.38
Characteristic spacing	s_{cr}	[mm]	200	200	200	200
Characteristic edge distance	c_{cr}	[mm]	150	150	150	150
Steel failure with lever arm						
Steel failure with lever arm (bending)						
Characteristic resistance, 8.8 steel	$M^0_{Rk,s}$	[Nm]	12.2	27.3	43.0	104.8
Partial safety factor	γ_{Ms} 1)	[-]	1.25			
Characteristic resistance, A4-70	$M^0_{Rk,s}$	[Nm]	10.7	26.2	52.3	91.7
Partial safety factor	γ_{Mp} 1)	[-]	1.56			

1) In absence of other national regulations
2) Partial safety factor of $\gamma_2 = 1.4$ is included

MATERIAL INFORMATION

MATERIAL SPECIFICATION



Part No.	Designation	Version	Material	Protection
1	Anchor sleeves	DM-PRO/ DM-Lip-Pro	Cold formed steel, grade SWRCH8A	Zinc plated 5 µm
		DM-SS-Pro	Machined steel, grade SS316 1)	-
2	Expansion cones	DM-PRO/ DM-Lip-Pro	Cold formed steel, grade SWRCH8A	Zinc plated 5 µm
		DM-SS-Pro	Machined steel, grade SS316 1)	-
3	Screw or threaded rod	DM-PRO/ DM-Lip-Pro	Steel strength class 4.6, 5.6, 5.8 or 8.8 according to ISO 898-1	Zinc plated 5 µm
		DM-SS-Pro	Steel strength class A4-70 1)	-

1) Mat. No.: 1.4401, 1.4404, 1.4439, 1.4571

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ORDERING INFORMATION

Anchor

Part no.	Description	Thread Size	Length [mm]	Box qty.	Carton qty.
DM-PRO - zinc plated					
24600-PWR	DM-PRO M6	M6	25	100	1600
24602-PWR	DM-PRO M8	M8	30	100	800
24604-PWR	DM-PRO M10	M10	40	100	800
24606-PWR	DM-PRO M12	M12	50	100	400
24608-PWR	DM-PRO M16	M16	65	25	100

DM-PRO

DM-LIP-PRO - zinc plated					
06304-POW	DM-LIP-PRO M6	M6	25	100	1600
06305-POW	DM-LIP-PRO M8	M8	30	100	800
06306-POW	DM-LIP-PRO M10	M10	40	100	800
06308-POW	DM-LIP-PRO M12	M12	50	100	400
06320-POW	DM-LIP-PRO M16	M16	65	25	100

DM-LIP-PRO

DM-SS-PRO - A4 stainless steel					
06224-POW	DM-SS-PRO M6	M6	25	100	1600
06225-PWR	DM-SS-PRO M8	M8	30	100	800
06226-POW	DM-SS-PRO M10	M10	40	100	800
06228-POW	DM-SS-PRO M12	M12	50	100	400
06230-POW	DM-SS-PRO M16	M16	65	25	100

DM-SS-PRO

Setting Tool for drop-in anchors

Part no.	Description	Box qty.
06330-POW	M6 ETA Drop-in Soft Grip Setting Tool	1
06332-POW	M8 ETA Drop-in Soft Grip Setting Tool	1
06334-PWR	M10 ETA Drop-in Soft Grip Setting Tool	1
06336-POW	M12 ETA Drop-in Soft Grip Setting Tool	1
06338-POW	M16 ETA Drop-in Soft Grip Setting Tool	1

SETTING TOOL

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TECHNICAL SUPPORT CONTACT INFORMATION

Australia

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T: (03) 8669 5200
F: 1800 080 898

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Stanley Black & Decker, Inc. ANZ
39 Business Parade North, East Tamaki, Auckland 2013
T: (09) 265 6714
F: (09) 273 3392

Disclaimer for Recommendations, Information and Use of Data

The recommendations, information and data contained in this manual are put together with the greatest care and accuracy possible. It is based on principles, equations and safety factors set out in the technical documentation of Stanley Black & Decker that are believed to be correct and current as of June 2017. The information and data is subject to change after such date as Stanley Black & Decker reserves the right to change the designs, materials and specifications of the products in this manual without notice.

It is the responsibility of the design professional to ensure that a suitable product is selected, properly designed and used in the intended application. This includes that the selected product and its use is compliant with the applicable building codes and other legal requirements and will satisfy durability and performance criteria and margins of safety which they determine are applicable. The products must be used, handled, applied and installed strictly in accordance with all current instructions for use published by Stanley Black & Decker.

The performance data given in this manual are the result of the evaluation of tests conducted under laboratory conditions. It is the responsibility of the designer and installer in charge to consider the conditions on site and to ensure the performance data given in the manual is applicable to the actual conditions. In particular the base material and environmental conditions have to be checked prior to installation. In case of doubt, contact the technical support of Stanley Black & Decker.

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Stanley Black & Decker offers a limited product warranty to customers or end users that the product meets its applicable specifications. Except for the express warranty in the immediately preceding sentence, Stanley Black & Decker grants no other warranties, express or implied, regarding the products, their fitness for any purpose, their quality, their merchantability or otherwise. Further, Stanley Black & Decker shall have no liability with respect to changes in the design, materials and specifications in the products presented in this manual, nor with respect to any product which has been modified or installed improperly, regardless of any specific instructions to the installer. The responsible designer and installer shall indemnify, defend, and hold harmless Stanley Black & Decker for any and all claimed loss or damage occasioned, in a whole or in part, by the modified products or deviation in product installation procedures.

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Stanley Black & Decker, Inc. ANZ
Level 2, 810 Whitehorse Road
Box Hill, VIC 3128
Australia

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Zamac Nailin™ *Nail Anchor*

PRODUCT DESCRIPTION

The Zamac Nailin is a nail drive anchor which has a body formed from Zamac alloy. Drive nails are available in carbon or stainless steel. The anchor can be used in concrete, block, brick or stone.

A corrosion resistant Zamac alloy is used to form the anchor body with either a mushroom or flat head. The anchor can be used for light duty, tamperproof applications. This anchor is not recommended for applications overhead. For overhead applications, please refer to the Zamac Hammer-Screw.

GENERAL APPLICATIONS AND USES

- Roof Flashing
- Brick Ties and Masonry Anchorage
- Electrical Fixtures
- Mechanical Attachments
- Furring Strips
- Maintenance

FEATURES AND BENEFITS

- General purpose anchoring
- Installs in a variety of base materials

APPROVALS AND LISTINGS

Southern Building Code Conference International (SBCCI) #9944A
Florida Building Code Approval – FL2209.11
Miami-Dade County Notice of Acceptance (NOA) 03-0311.08
Federal GSA Specification – Meets the proof load requirements of FF-S-325C, Group V, Type 2, Class 3, (superseded) and CID A-A 1925A, Type 1 (mushroom head) & Type 2 (flat head)

GUIDE SPECIFICATIONS

CSI Divisions: *03151-Concrete Anchoring, 04081-Masonry Anchorage* and *05090-Metal Fastenings.* Pin Anchors shall be Zamac Nailin anchors as supplied by Powers Fasteners, Inc., Brewster, NY.

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Installation and Material Specifications 171
Performance Data 172
Design Criteria 173
Ordering Information 174

Zamac Nailin

ANCHOR MATERIALS

Zamac Alloy with Carbon or Stainless Steel Drive Nail

ANCHOR SIZE RANGE (TYP.)

3/16" diameter x 7/8" length to 1/4" diameter x 2" length

SUITABLE BASE MATERIALS

Normal-Weight Concrete
Hollow Concrete Masonry
Brick Masonry
Stone

INSTALLATION AND MATERIAL SPECIFICATIONS

Installation Specifications

Dimension	Anchor Diameter, *d*		
	3/16" MH	1/4" MH	1/4" FH
ANSI Drill Bit Size, d_{bit} (in.)	3/16	1/4	1/4
Fixture Clearance Hole (in.)	1/4	5/16	5/16
Head Height (in.)	7/64	9/64	3/16
Head Width d_{hd} (in.)	13/32	35/64	35/64

MH = Mushroom Head FH = Flat Head

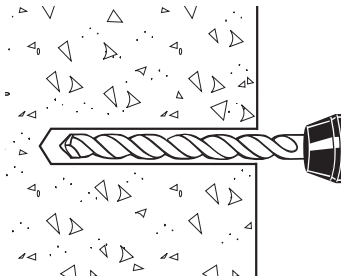
Material Specifications

Anchor Component	Component Material		
	Mushroom Head	Flat Head	Mushroom Head
	CS Nail	CS Nail	SS Nail
Drive Nail	AISI 1018	AISI 1018	Type 304 SS
Anchor Body	Zamac Alloy	Zamac Alloy	Zamac Alloy
Nail Plating	ASTM B 633, SC1, Type III (Fe/Zn 5)		N/A

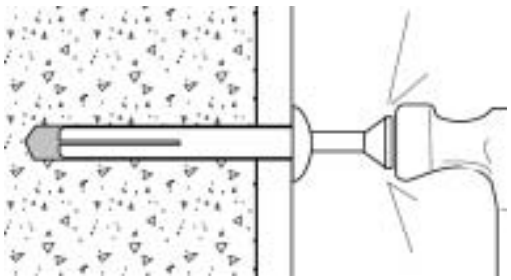
CS = Carbon Steel SS = Stainless Steel

Installation Guidelines

Using the proper diameter bit, drill a hole into the base material to a depth of at least 1/4" deeper than the required embedment. The tolerances of the drill bit used should meet the requirements of ANSI Standard B212.15. Blow the hole clean of dust and other material.



Insert the anchor through the fixture. Drive the nail into the anchor body to expand it. Be sure the head is seated firmly against the fixture and that the anchor is at the proper embedment. Take care not to overdrive. This anchor is not recommended for use overhead.



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800-474-7570 602-272-8128 www.BestMaterials.com
Email: Sales@BestMaterials.com

PERFORMANCE DATA

Ultimate Load Capacities for Zamac Nailin in Normal-Weight Concrete[1,2]

Anchor Diameter d in. (mm)	Minimum Embedment Depth h_v in. (mm)	Minimum Concrete Compressive Strength (f'_c)					
		2,000 psi (13.8 MPa)		**4,000 psi** (27.6 MPa)		**6,000 psi** (41.4 MPa)	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/16 (4.8)	3/4 (19.1)	460 (2.1)	520 (2.3)	500 (2.3)	700 (3.2)	580 (2.6)	700 (3.2)
1/4 (6.4)	5/8 (15.9)	480 (2.2)	550 (2.5)	600 (2.7)	820 (3.7)	640 (2.9)	820 (3.7)
	3/4 (19.1)	655 (2.9)	755 (3.4)	1,045 (4.7)	1,065 (4.8)	1,045 (4.7)	1,065 (4.8)
	7/8 (22.2)	780 (3.5)	800 (3.6)	1,070 (4.8)	1,115 (5.0)	1,070 (4.8)	1,115 (5.0)
	1 1/8 (28.6)	1,030 (4.6)	900 (4.1)	1,120 (5.0)	1,215 (5.5)	1,120 (5.0)	1,215 (5.5)
	1 3/8 (34.9)	1,085 (4.9)	1,105 (5.0)	1,150 (5.2)	1,460 (6.6)	1,230 (5.5)	1,460 (6.6)
	1 3/4 (44.5)	1,165 (5.2)	1,420 (6.4)	1,200 (5.4)	1,825 (8.2)	1,260 (5.7)	1,825 (8.2)
	1 7/8 (47.6)	1,165 (5.2)	1,420 (6.4)	1,300 (5.9)	1,825 (8.2)	1,365 (6.1)	1,825 (8.2)

1. The values listed above are ultimate load capacities which should be reduced by a minimum safety factor of 4.0 or greater to determine the allowable working load.
2. Linear interpolation may be used to determine ultimate loads for intermediate embedments and compressive strengths.

Allowable Load Capacities for Zamac Nailin in Normal-Weight Concrete[1,2,3]

Anchor Diameter d in. (mm)	Minimum Embedment Depth h_v in. (mm)	Minimum Concrete Compressive Strength (f'_c)					
		2,000 psi (13.8 MPa)		**4,000 psi** (27.6 MPa)		**6,000 psi** (41.4 MPa)	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/16 (4.8)	3/4 (19.1)	115 (0.5)	130 (0.6)	125 (0.6)	175 (0.8)	145 (0.7)	175 (0.8)
1/4 (6.4)	5/8 (15.9)	120 (0.5)	140 (0.6)	150 (0.7)	205 (0.9)	160 (0.7)	205 (0.9)
	3/4 (19.1)	165 (0.7)	190 (0.9)	260 (1.2)	265 (1.2)	260 (1.2)	265 (1.2)
	7/8 (22.2)	195 (0.9)	200 (0.9)	270 (1.2)	280 (1.3)	270 (1.2)	280 (1.3)
	1 1/8 (28.6)	260 (1.2)	225 (1.0)	280 (1.3)	305 (1.4)	280 (1.3)	305 (1.4)
	1 3/8 (34.9)	270 (1.2)	275 (1.2)	290 (1.3)	365 (1.6)	310 (1.4)	365 (1.6)
	1 3/4 (44.5)	290 (1.3)	355 (1.6)	300 (1.4)	455 (2.0)	315 (1.4)	455 (2.0)
	1 7/8 (47.6)	290 (1.3)	355 (1.6)	325 (1.5)	455 (2.0)	340 (1.5)	455 (2.0)

1. Allowable load capacities listed are calculated using an applied safety factor of 4.0.
2. Linear interpolation may be used to determine allowable loads for intermediate embedments and compressive strengths.
3. Critical and minimum spacing and edge distances as well as reduction factors for intermediate spacing and edge distances are listed in the Design Criteria section.

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PERFORMANCE DATA

Ultimate and Allowable Load Capacities for Zamac Nailin in Hollow Concrete Masonry[1,2,3]

Anchor Diameter d in. (mm)	Minimum Embedment Depth h_v in. (mm)	$f'_m \geq$ 1,500 psi (10.4 MPa)			
		Ultimate Load		Allowable Load	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/16 (4.8)	3/4 (19.1)	270 (1.2)	860 (3.9)	55 (0.2)	170 (0.8)
1/4 (6.4)	5/8 (15.9)	360 (1.6)	1,040 (4.7)	70 (0.3)	210 (0.9)
	3/4 (19.1)	735 (3.3)	1,075 (4.8)	145 (0.7)	215 (1.0)
	1 (25.4)	835 (3.8)	1,130 (5.1)	165 (0.7)	225 (1.0)
	1 1/8 (28.6)	1,040 (4.7)	1,250 (5.6)	210 (0.9)	250 (1.1)
	1 3/8 (34.9)	1,090 (4.9)	1,275 (5.7)	220 (1.0)	255 (1.1)
	1 1/2 (38.1)	1,090 (4.9)	1,275 (5.7)	220 (1.0)	255 (1.1)

1. Tabulated load values are for anchors installed in minimum 6-inch wide, Grade N, Type II, medium and normal-weight and lightweight concrete masonry units. Mortar must be minimum Type N. Masonry compressive strength must be 1,500 psi minimum at the time of installation.
2. Allowable loads are based on average ultimate values using a safety factor of 5.0.
3. Anchors installed flush with face shell surface.

Ultimate and Allowable Load Capacities for Zamac Nailin in Solid or Hollow Clay Brick Masonry[1,2]

Anchor Diameter d in. (mm)	Minimum Embedment Depth h_v in. (mm)	$f'_m \geq$ 1,500 psi (10.4 MPa)			
		Ultimate Load		Allowable Load	
		Tension lbs. (kN)	Shear lbs. (kN)	Tension lbs. (kN)	Shear lbs. (kN)
3/16 (4.8)	3/4 (19.1)	460 (2.1)	920 (4.1)	90 (0.4)	185 (0.8)
1/4 (6.4)	5/8 (15.9)	570 (2.6)	1,250 (5.6)	115 (0.5)	250 (1.1)
	3/4 (19.1)	790 (3.6)	1,400 (6.3)	160 (0.7)	280 (1.3)
	1 (25.4)	820 (3.7)	1,400 (6.3)	165 (0.7)	280 (1.3)
	1 1/8 (28.6)	865 (3.9)	1,400 (6.3)	175 (0.8)	280 (1.3)
	1 3/8 (34.9)	950 (4.3)	1,400 (6.3)	190 (0.9)	280 (1.3)
	1 1/2 (38.1)	1,015 (4.6)	1,400 (6.3)	205 (0.9)	280 (1.3)

1. Tabulated load values are for anchors installed in Grade SW multiple wythe, brick masonry conforming to ASTM C62.
2. Allowable loads are calculated using an applied safety factor of 5.0.

DESIGN CRITERIA

Combined Loading

For anchors loaded in both shear and tension, the combination of loads should be proportioned as follows:

$$\left(\frac{N_u}{N_n}\right) + \left(\frac{V_u}{V_n}\right) \leq 1$$

Where: N_u = Applied Service Tension Load
N_n = Allowable Tension Load
V_u = Applied Service Shear Load
V_n = Allowable Shear Load

Load Adjustment Factors for Spacing and Edge Distances

Anchor Installed in Normal-Weight Concrete					
Anchor Dimension	Load Type	Critical Distance (Full Anchor Capacity)	Critical Load Factor	Minimum Distance (Reduced Capacity)	Minimum Load Factor
Spacing (s)	Tension and Shear	$s_{cr} = 10d$	$F_N = F_V = 1.0$	$s_{min} = 5d$	$F_N = F_V = 0.50$
Edge Distance (c)	Tension	$c_{cr} = 12d$	$F_N = 1.0$	$c_{min} = 5d$	$F_N = 0.80$
	Shear	$c_{cr} = 12d$	$F_V = 1.0$	$c_{min} = 5d$	$F_V = 0.50$

DESIGN CRITERIA

Load Adjustment Factors for Normal-Weight Concrete

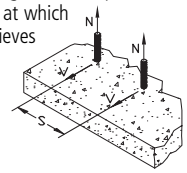
Spacing, Tension (F_N) & Shear (F_V)			
Dia. (in.)		3/16	1/4
s_{cr} (in.)		1 7/8	2 1/2
s_{min} (in.)		1	1 1/4
Spacing, s (in.)	1	0.50	
	1 1/4	0.67	0.50
	1 1/2	0.80	0.60
	1 7/8	1.00	0.75
	2		0.80
	2 1/2		1.00

Edge Distance, Tension (F_N)			
Dia. (in.)		3/16	1/4
c_{cr} (in.)		2 1/4	3
c_{min} (in.)		1	1 1/4
Edge Dist., c (in.)	1	0.80	
	1 1/4	0.85	0.80
	1 1/2	0.89	0.83
	2	0.96	0.89
	2 1/4	1.00	0.91
	2 1/2		0.94
	3		1.00

Edge Distance, Shear (F_V)			
Dia. (in.)		3/16	1/4
c_{cr} (in.)		2 1/4	3
c_{min} (in.)		1	1 1/4
Edge Dist., c (in.)	1	0.50	
	1 1/4	0.62	0.50
	1 1/2	0.71	0.57
	2	0.90	0.71
	2 1/4	1.00	0.79
	2 1/2		0.86
	3		1.00

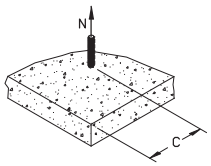
Notes: For anchors loaded in tension and shear, the critical spacing (s_{cr}) is equal to 10 anchor diameters (10d) at which the anchor achieves 100% of load.

Minimum spacing (s_{min}) is equal to 5 anchor diameters (5d) at which the anchor achieves 50% of load.



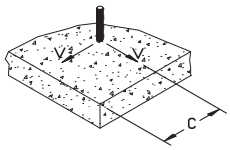
Notes: For anchors loaded in tension, the critical edge distance (c_{cr}) is equal to 12 anchor diameters (12d) at which the anchor achieves 100% of load.

Minimum edge distance (c_{min}) is equal to 5 anchor diameters (5d) at which the anchor achieves 80% of load.



Notes: For anchors loaded in shear, the critical edge distance (c_{cr}) is equal to 12 anchor diameters (12d) at which the anchor achieves 100% of load.

Minimum edge distance (c_{min}) is equal to 5 anchor diameters (5d) at which the anchor achieves 50% of load.



ORDERING INFORMATION

Mushroom Head Zamac Nailin with Carbon Steel Nail

Cat. No.	Anchor Size	Drill Diameter	Std. Box	Std. Carton	Wt./100
2802	3/16" x 7/8"	3/16"	100	500	3/4
2806	1/4" x 3/4"	1/4"	100	500	1 1/2
2808	1/4" x 1"	1/4"	100	500	1 3/4
2814	1/4" x 1 1/4"	1/4"	100	500	2 1/4
2820	1/4" x 1 1/2"	1/4"	100	500	2 1/2
2826	1/4" x 2"	1/4"	100	500	3
2804	1/4" x 3"	1/4"	100	500	4

Master Pack Mushroom Head Zamac Nailin with Carbon Steel Nail

Cat. No.	Anchor Size	Drill Diameter	Std. Box	Std. Carton	Wt./100
2803	3/16" x 7/8"	3/16"	–	1,000	3/4
2807	1/4" x 3/4"	1/4"	–	1,000	1 1/2
2809	1/4" x 1"	1/4"	–	1,000	1 3/4
2815	1/4" x 1 1/4"	1/4"	–	1,000	2 1/4
2821	1/4" x 1 1/2"	1/4"	–	1,000	2 1/2
2827	1/4" x 2"	1/4"	–	1,000	3
2805	1/4" x 3"	1/4"	–	1,000	4

Flat Head Zamac Nailin with Carbon Steel Nail

Cat. No.	Anchor Size	Drill Diameter	Std. Box	Std. Carton	Wt./100
2836	1/4" x 1 1/2"	1/4"	100	500	2 1/2
2838	1/4" x 2"	1/4"	100	500	3

Mushroom Head Zamac Nailin with Stainless Steel Nail

Cat. No.	Anchor Size	Drill Diameter	Std. Box	Std. Carton	Wt./100
2858	1/4" x 1"	1/4"	100	500	1 3/4
2864	1/4" x 1 1/4"	1/4"	100	500	2 1/4
2870	1/4' x 1 1/2"	1/4"	100	500	2 1/2
2876	1/4" x 2"	1/4"	100	500	3

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SECTION 11

FIRE PANEL PROGRAM

F220 Configuration Report
ESSENTIA

Main Configuration

Last Update Time: 5/12/2022 5:27:47 AM
Grayed Columns are restricted due to the Panel Version

Notes:

Panel Display Options

Target Panel Version	Last Connected Panel Version	Panel Name	User Text One	User Text Two	Time Format
v7.06 and higher			WELCOME TO ESSENTIA	AUSCOAST FIRE SERVICES PH 07 5596 1270	dddd, dd-MMM-yyyy HH:mm:ss

Peripheral Options

Number Of Physical Loops	Number Of Legacy LCD Mimics	Number Of Legacy LED Mimics	Number of High Speed LCD Mimics	Number of High Speed LED Mimics (Internal)	Number of High Speed LED Mimics (External)	Number of High Speed Amps (Internal)	Number of High Speed Amps (External)	Number of PSUs	Network Card Attached	Disable Local Keyboard Monitoring	Aux Fault Input Descriptor:
4	0	0	0	0	0	2	0	1	N	N	

Panel Flags

Day Night Mode	PreAlarm in Fault Queue	Buzzer On Fault	Buzzer On Pre Alarm	Warn Sys. Monitoring	Ext. Strobe Monitoring	Output 1 Monitoring	Output 2 Monitoring	ACF Monitoring	Log Automatic Test	Detector Blink	Warning Stage 1	SPR Evac Disable	Enable Loop Emulation	Emulated Loop Count
N	Y	Y	Y	Y	Y	Y	Y	Y	N	Y	N	N	N	0

Other Options

Fan Control Block Freeze Timer	Deluge Control Block Freeze Timer	Automatic Test	Fault Filter Delay Period	Fault Filter Count	Report Maintenance At Automatic Test	Report Maintenance as Fault	Log Door Holder Activations	Log Fan Relay Activations	Log Hidden Switch	Zone Offset	Latch Brigade Relay	Latch System Faults	Map Fire to Monitored Output 1	Map Fault to Monitored Output 2	No De-activation Fault Delay	ACF Disable Inhibits Fan Relays
0s	0s	Start Time 08:00 AM Day(s) Tu	0s	0 Faults/H	Y	Y		Y	Y	0	Y	Y	Y	Y	All Monitored O/P Modules	Y

Time Zone Region: Australia **Time Zone Location:** Brisbane

Local MCP

Warning System	Ext. Strobe	Brigade	ACF	Door	Alarm Queue Or Buzzer	Latching	Description	Zone
Y	Y	Y	Y	Y	Y	Y	FIP MCP	3

Devices

Loop: Loop Number. '*' indicates an emulated loop	**AVF:** AVF	**WS:** Warn Sys.	**ES:** Ext. Strobe	**BR:** Brigade	**AC:** ACF	**SU:** Super	**HI:** History
	AQ/Bz: Alarm Queue / Buzzer	**LA:** Latching	**BL:** Brigade Latch	**ZT:** Zone Trip	**DO:** Door	**SC:** Screen	**EX:** Export

Loop	Loop Name	Addr.	Zone	AAF /ADF Block	Description	Type	Sens (Day)	AVF	WS	ES	BR	AC	DO	AQ / BZ	LA	BL	ZT	SU	SC	HI	EX	Out1	Out2	Out3	Out4
1	*Loop 1*	D-1	1		BASEMENT 2 NORTH	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-2	1		BASEMENT 2 WEST	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-3	1		BASEMENT 2 SOUTH	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-4	1		BASEMENT 2 EAST	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-5	1		BASEMENT 2 RAMP	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-6	1		BASEMENT 2 LIFT LOBBY	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							

1	*Loop 1*	D-7	1		BASEMENT 2 LIFT LOBBY ADJ STAIR	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-8	1		BASEMENT 2 FIRE STAIR	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-9	2		BASEMENT 1 NORTH	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-10	2		BASEMENT 1 WEST	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-11	2		BASEMENT 1 SOUTH	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-12	2		BASEMENT 1 EAST	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-13	2		BASEMENT 1 RAMP	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-14	2		BASEMENT 1 CORRIDOR TO STAIR 5	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-15	2		BASEMENT 1 O/S STAIR 1 ADJ LIFT	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-16	2		BASEMENT 1 LIFT FOYER	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-17	3		GRND CARPARK RAMP	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-18	3		GRND CARPARK ADJ WASTE RM	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-19	3		GRND CARPARK ENTRY	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-20	3		GRND CARPARK EAST	OPT	-2	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-21	3		GRND LVL MSB RM	OPT	0	Y	Y	Y	Y	Y	Y	Y	Y	N	N	N							
		D-22	3		GRND LVL MANAGERS OFFICE	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-23	3		GRND LVL LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-24	3		GRND LVL FIRE EXIT	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-25	3		GRND LVL FIRE EXIT	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-26	3		GRND LVL COMMS RM	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-30	4		LVL 2 LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-31	5		LVL 3 LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-32	6		LVL 4 LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-33	7		LVL 5 LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-34	8		LVL 6 LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-35	9		LVL 7 LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-36	10		LVL 8 LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-37	11		LVL 9 LIFT LOBBY	OPT	0	Y	Y	Y	N	Y	Y	Y	Y	N	N	N							
		D-100	12		TOP OF LIFT SHAFT	OPT	0	N	Y	Y	Y	Y	Y	Y	Y	N	N	N							
		M-1	1		BASEMENT 2 NORTH VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-2	1		BASEMENT 2 WEST VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-3	1		BASEMENT 2 SOUTH VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-4	1		BASEMENT 2 EAST VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-5	1		BASEMENT 2 RAMP VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-6	0		COMMS ROOM SEC RELAY SPARE	FSW	0	N	N	N	N	N	N	N	N	N	N	N	N						
		M-7	0		COMMS ROOM SEC RELAY SPARE	VMD	0	N	N	N	N	N	N	N	N	N	N	N	N						
		M-8	0		COMMS ROOM SECURITY TRIP	RLY	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-9	2		BASEMENT 1 NORTH VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-10	2		BASEMENT 1 WEST VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-11	2		BASEMENT 1 SOUTH VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-12	2		BASEMENT 1 EAST VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-13	2		BASEMENT 1 RAMP VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-17	3		GRND CARPARK RAMP VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-18	3		GRND CARPARK ADJ WASTE RM VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-19	3		GRND CARPARK ENTRY VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-20	3		GRND CARPARK EAST VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-21	3		GRND PWD VAD	WRN	0	N	N	N	N	N	N	N	N	N	N	N	N	N	Y	N			
		M-30	0		ROOF TANK SUCTION GATE V/M	VMD	0	N	Y	Y	Y	Y	Y	Y	Y	N	N	N							
2	*Loop 2*	D-1	0		CPSF-B1 DUCT PROBE	OPT	0	N	N	N	N	N	N	N	N	N	N	N							
		D-2	0		CPSF-B2 DUCT PROBE	OPT	0	N	N	N	N	N	N	Y	N	N	N	N							

2	*Loop 2*	M-1	300		SPRINKLER PUMP 1 GATE V/M	VMD	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-2	300		SPRINKLER PUMP 2 GATE V/M	VMD	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-3	300		SPRINKLER PUMP 1 V/M	VMD	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-4	300		SPRINKLER PUMP 2 V/M	VMD	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-5	300		SPRINKLER PUMP 1 FAULT	MON	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-6	300		SPRINKLER PUMP 2 FAULT	MON	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-7	300		SPRINKLER PUMP 1 RUNNING	MON	0	N	N	N	N	N	N	Y	N	N	N	N				Alarm> L02M40 [RLY]:PUMP RUNNING STROBE			
		M-8	300		SPRINKLER PUMP 2 RUNNING	MON	0	N	N	N	N	N	N	Y	N	N	N	N				Alarm> L02M40 [RLY]:PUMP RUNNING STROBE			
		M-9	103		SPRINKLER DBA	PSW	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-10	102		SPRINKLER MAIN PRESSURE/SW	PSW	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N				Alarm> Group 4			
		M-11	100		SPRINKLER SYSTEM 1 MAIN V/M	VMD	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-12	101		SPRINKLER SYSTEM 2 MAIN V/M	VMD	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-13	100		SPRINKLER SYSTEM 1 PRESSURE/SW	PSW	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-14	101		SPRINKLER SYSTEM 2 PRESSURE/SW	PSW	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-15	300		PUMP RM SPARE	MON	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-16	300		PUMP RM SPARE	MON	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-17	300		PUMP RM SPARE	MON	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-18	300		PUMP RM SPARE	MON	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-19	300		PUMP RM SPARE	MON	0	N	Y	Y	N	Y	Y	Y	Y	N	N	N							
		M-20	300		PUMP RM SPARE	MON	0	N	Y	Y	Y	Y	Y	Y	Y	N	N	N							
		M-21	301		BOOSTER CABINET V/M	VMD	0	N	Y	Y	Y	Y	Y	Y	Y	N	N	N							
		M-22	0		CPEF-B1 START	ACF	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
		M-23	0		CPEF-B1 STATUS	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-24	0		CPEF-B1 STOP	ACF	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
		M-25	0		CPEF-B1 SPARE	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-26	0		CPEF-B2 START	ACF	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
		M-27	0		CPEF-B2 STATUS	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-28	0		CPEF-B2 STOP	ACF	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
		M-29	0		CPEF-B2 SPARE	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-30	0		CPSF-B1 START	ACF	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
		M-31	0		CPSF-B1 STATUS	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-32	0		CPSF-B1 STOP	ACF	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
		M-33	0		CPSF-B1 SPARE	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-34	0		CPSF-B2 START	ACF	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
		M-35	0		CPSF-B2 STATUS	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-36	0		CPSF-B2 STOP	ACF	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
		M-37	0		CPSF-B2 SPARE	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-40	0		PUMP RUNNING STROBE	RLY	0	N	N	N	N	N	N	N	N	N	N	N	N	Y	N				
4	*Loop 4*	M-1	0		FAN RESET	SW3	0	N	N	N	N	N	N	N	N	N	N	N				Manual Off> Fan Reset			
		M-2	0		FIRE MODE LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-3	0			SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-4	0		CPEF-B1 SWITCH	SW3	0	N	N	N	N	N	N	N	N	N	N	N							
		M-5	0		CPEF-B1 RUN LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-6	0		CPEF-B1 FAULT LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-7	0		CPEF-B2 SWITCH	SW3	0	N	N	N	N	N	N	N	N	N	N	N							
		M-8	0		CPEF-B2 RUN LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							

4	*Loop 4*	M-9	0		CPEF-B2 FAULT LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-10	0		CPSF B1 SWITCH	SW3	0	N	N	N	N	N	N	N	N	N	N	N							
		M-11	0		CPSF-B1 RUN LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-12	0		CPSF-B1 FAULT LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-13	0		CPSF-B2 SWITCH	SW3	0	N	N	N	N	N	N	N	N	N	N	N							
		M-14	0		CPSF-B2 RUN LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							
		M-15	0		CPSF-B2 FAULT LED	SW_H	0	N	N	N	N	N	N	N	N	N	N	N							

Zones

WS: Warn Sys.	**ES:** Ext. Strobe	**BR:** Brigade	**AC:** ACF
LA: Latching	**AQ/Bz:** Alarm Queue / Buzzer	**DO:** Door	

Zone	Description	Out1	Out2	Out3	Out4	Out5	Out6	Out7	Out8	NBT	WS	ES	BR	AC	DO	AQ/BZ	LA	Run1	Run2	End1	End2
1	BASEMENT 2	Group 3								00:00	N	N	N	N	N	N	N				
2	BASEMENT 1	Group 3								00:00	N	N	N	N	N	N	N				
3	GROUND LEVEL	Group 3								00:00	N	N	N	N	N	N	N				
4	LEVEL 2	Group 3								00:00	N	N	N	N	N	N	N				
5	LEVEL 3	Group 3								00:00	N	N	N	N	N	N	N				
6	LEVEL 4	Group 3								00:00	N	N	N	N	N	N	N				
7	LEVEL 5	Group 3								00:00	N	N	N	N	N	N	N				
8	LEVEL 6	Group 3								00:00	N	N	N	N	N	N	N				
9	LEVEL 7	Group 3								00:00	N	N	N	N	N	N	N				
10	LEVEL 8	Group 3								00:00	N	N	N	N	N	N	N				
11	LEVEL 9	Group 3								00:00	N	N	N	N	N	N	N				
12	LIFT SHAFT	Group 3								00:00	N	N	N	N	N	N	N				
100	SPRINKLER SYSTEM B2,B1,GRND									00:00	N	N	N	N	N	N	N				
101	SPRINKLER SYSTEM TOWER									00:00	N	N	N	N	N	N	N				
102	SPRINKLER MAIN PRESSURE/SW	Group 4								00:00	N	N	N	N	N	N	N				
103	SPRINKLER DBA									00:00	N	N	N	N	N	N	N				
300	SPRINKLER PUMP ROOM									00:00	N	N	N	N	N	N	N				
301	BOOSTER CABINET									00:00	N	N	N	N	N	N	N				

Groups

Group	Description	Out1	Out2	Out3	Out4	Out5	Out6	Out7	Out8	Out9	Out10	Out11	Out12	Out13	Out14	Out15
6		L01M01 [WRN]:BASEMENT 2 NORTH VAD	L01M02 [WRN]:BASEMENT 2 WEST VAD	L01M03 [WRN]:BASEMENT 2 SOUTH VAD	L01M04 [WRN]:BASEMENT 2 EAST VAD	L01M05 [WRN]:BASEMENT 2 RAMP VAD	L01M09 [WRN]:BASEMENT 1 NORTH VAD	L01M10 [WRN]:BASEMENT 1 WEST VAD	L01M11 [WRN]:BASEMENT 1 SOUTH VAD	L01M12 [WRN]:BASEMENT 1 EAST VAD	L01M13 [WRN]:BASEMENT 1 RAMP VAD	L01M17 [WRN]:GRND CARPARK RAMP VAD	L01M18 [WRN]:GRND CARPARK ADJ WASTE RM VAD	L01M19 [WRN]:GRND CARPARK ENTRY VAD	L01M20 [WRN]:GRND CARPARK EAST VAD	L01M21 [WRN]:GRND PWD VAD

Logic Blocks

WS: Warn Sys.	**ES:** Ext. Strobe	**SC:** Screen	**BR:** Brigade	**AC:** ACF
LA: Latching	**AQ/Bz:** Alarm Queue / Buzzer	**HI:** History	**DO:** Door	

Block	Description	Mode	Inputs	Outputs	WS	ES	BR	AC	DO	AQor BZ	LA	SC	HI
1	GFA	OR	1:Group 3 2:Group 4	1:Group 1	N	N	N	N	N	N	N	N	N
2	SPRINKLER ASE	OR	1:L02M09 State:I/P Active	1:G.P. ASE Output	N	N	N	N	N	N	N	N	N
3	OWS	OR	1:Group 1	1:LED 101 2:Group 6	N	N	N	N	N	N	N	N	N
5	SECURITY TRIP	OR	1:Group 3 2:Group 4		N	N	N	N	N	N	N	N	N
6	SECURITY TRIP CONT.	AND	1:Logic Block 5 2:Not ACF Disable Event	1:L01M08 [RLY]:COMMS ROOM SECURITY TRIP	N	N	N	N	N	N	N	N	N

System Events

Event Index	System Event	Out1	Out2	Out3	Out4	Out5	Out6
1	Fan Control Latch	L04M02 [SW_H]:FIRE MODE LED					

Fan Control Blocks

IP: Invert Priority	**NC:** Non Casacading	**LA:** Latching

No.	Mode	LA	IP	NC	Description	Status Timeout	Stabilisation Period	Fire Start	Fire Stop	Manual Start	Manual Stop	Status Feedback	Duct Probe	Start Output	Stop Output	Stopped Indication	Running Indication	Fault Indication	Duct Probe Active	Master Start	Master Stop
1	On	Y	N	N	CPEF-B1	35	0	[In] Group 1		[In] L04M04 State:Manual On	[In] L04M04 State:Manual Off	L02M23 State:I/P Active		[1] L02M22 [ACF]:CPEF-B1 START	[1] L02M24 [ACF]:CPEF-B1 STOP		[1] L04M05 [SW_H]:CPEF-B1 RUN LED	[1] L04M06 [SW_H]:CPEF-B1 FAULT LED			
2	On	Y	N	N	CPEF-B2	35	0	[In] Group 1		[In] L04M07 State:Manual On	[In] L04M07 State:Manual Off	L02M27 State:I/P Active		[1] L02M26 [ACF]:CPEF-B2 START	[1] L02M28 [ACF]:CPEF-B2 STOP		[1] L04M08 [SW_H]:CPEF-B2 RUN LED	[1] L04M09 [SW_H]:CPEF-B2 FAULT LED			
3	On	Y	N	N	CPSF-B1	35	0	[In] Group 1		[In] L04M10 State:Manual On	[In] L04M10 State:Manual Off	L02M31 State:I/P Active	L02D001 State:I/P Active	[1] L02M30 [ACF]:CPSF-B1 START	[1] L02M32 [ACF]:CPSF-B1 STOP		[1] L04M11 [SW_H]:CPSF-B1 RUN LED	[1] L04M12 [SW_H]:CPSF-B1 FAULT LED	L04M11 [SW_H]:CPSF-B1 RUN LED		
4	On	Y	N	N	CPSF-B2	35	0	[In] Group 1		[In] L04M13 State:Manual On	[In] L04M13 State:Manual Off	L02M35 State:I/P Active	L02D002 State:I/P Active	[1] L02M34 [ACF]:CPSF-B2 START	[1] L02M36 [ACF]:CPSF-B2 STOP		[1] L04M14 [SW_H]:CPSF-B2 RUN LED	[1] L04M15 [SW_H]:CPSF-B2 FAULT LED	L04M14 [SW_H]:CPSF-B2 RUN LED		

SECTION 12

WARRANTIES

Essentia
18 Remembrance Drive
Surfers Paradise QLD 4217

Warranty Information

The Warrantor: MORRIS PROPERTY GROUP

This serves to confirm Auscoast Fire Services Pty Ltd Warranty for the products supplied for Essentia – 18 Remembrance Drive, Surfers Paradise QLD 4217 detailed below shall be limited to the repair or replacement of the products supplied for a period of 1 year on all components and workmanship from the date of PC.

Auscoast Fire Services Pty Ltd shall not be obligated to repair or replace products which are found to be defective because of unreasonable use, modifications, and incorrect application.

- Fire sprinkler system
- Fire hydrants & hose reel
- Diesel Fire Pumpset
- Fire Detection System
- Evacuation and Warning Intercom System
- Fire Extinguishers

Terms and conditions:

If any maintenance or modifications Occur(ed) to the system by another contractor during the 12-month period, this will render the warranty and all insurances null and void.

With warranties that extend more than 12 months, our terms are that the maintenance contract is matched for the same period. (pricing for continued maintenance can be provided to the client)

This will ensure that, there is no cross invoicing, and discrepancies, from when another contractor comes in to do maintenance, that have been seen to happen on these type of warranty projects.

Regards

Haydn Mackie

SECTION 13

TITLE	DRAWING NUMBER	REVISION
FIRE ALARM LOCATION DIAGRAM (ENTRY LOBBY)	BP-01	1
SPRINKLER / HYDRANT BLOCK PLAN (FIRE PUMP ROOM)	BP-02	1
SPRINKLER / HYDRANT BLOCK PLAN (BOOSTER)	BP-03	1
FIRE ALARM SYSTEM (SCHEMATIC)	FA-00	AB
FIRE ALARM SYSTEM (BASEMENT 2)	FA-01	AB
FIRE ALARM SYSTEM (BASEMENT 1)	FA-02	AB
FIRE ALARM SYSTEM (GROUND FLOOR)	FA-03	AB
FIRE ALARM SYSTEM (LEVEL 2)	FA-04	AB
FIRE ALARM SYSTEM (LEVEL 3-9)	FA-05	AB
FIRE ALARM SYSTEM (ROOF LEVEL)	FA-06	AB
HYDRANT / SPRINKLER SYSTEM (SCHEMATIC)	FS-02	AB
HYDRANT / SPRINKLER SYSTEM (BASEMENT 2)	FS-04	AB2

TITLE	DRAWING NUMBER	REVISION
HYDRANT / SPRINKLER SYSTEM (BASEMENT 1)	FS-05	AB2
HYDRANT / SPRINKLER SYSTEM (GROUND FLOOR)	FS-06	AB3
HYDRANT / SPRINKLER SYSTEM (LEVEL 2)	FS-07	AB
HYDRANT / SPRINKLER SYSTEM (LEVEL 3 TO LEVEL 9)	FS-08	AB2
HYDRANT / SPRINKLER SYSTEM (ROOF LEVEL)	FS-09	AB

DRY FIRE HYDRANT & FIRE SPRINKLER PUMP ROOM BLOCK PLAN

ESSENTIA APARTMENTS
18 REMEMBRANCE DRIVE, SURFERS PARADISE QLD 4217

DESIGN REFERENCE DOCUMENTATION

NCC (BCA) - BCA 2016.1
BASEMENT 2, 1 - CLASS 7A
RESIDENTIAL APARTMENTS - CLASS 2
FIRE ENGINEERING REPORT - SOTERA - 30161019 002 – FER REV 2-4

SPRINKLER SYSTEM INFORMATION

SPARES ARE LOCATED IN SPRINKLER CABINET

DESIGN STANDARD
AUSTRALIAN STANDARD - AS 2118.1-1999

HIGHEST HEAD ABOVE BOOSTER
30 METRES

SYSTEM INFORMATION
TOTAL NO. OF LEVELS = 11

WATER SUPPLY
SEQ WATER

HAZARD CLASSIFICATION
BASEMENT LEVELS - CAR PARK - OH II
GROUND FLOOR - CARPARK - OH II
GROUND FLOOR - RESIDENTIAL LOBBY - LH
SOLE OCCUPANCY UNITS - RESIDENTIAL SPRINKLERS

DESIGN REQUIREMENTS
LH - 323 L/M @ 610 kPa
OH II - 869 L/M @ 392 kPa

HYDRANT SYSTEM INFORMATION

DESIGN STANDARD
AUSTRALIAN STANDARD - AS 2419.1 - 2005

HIGHEST HYDRANT ABOVE BOOSTER
28 METRES

DESIGN REQUIREMENTS
2 X 10LS @ 700 kPa ASSISTED

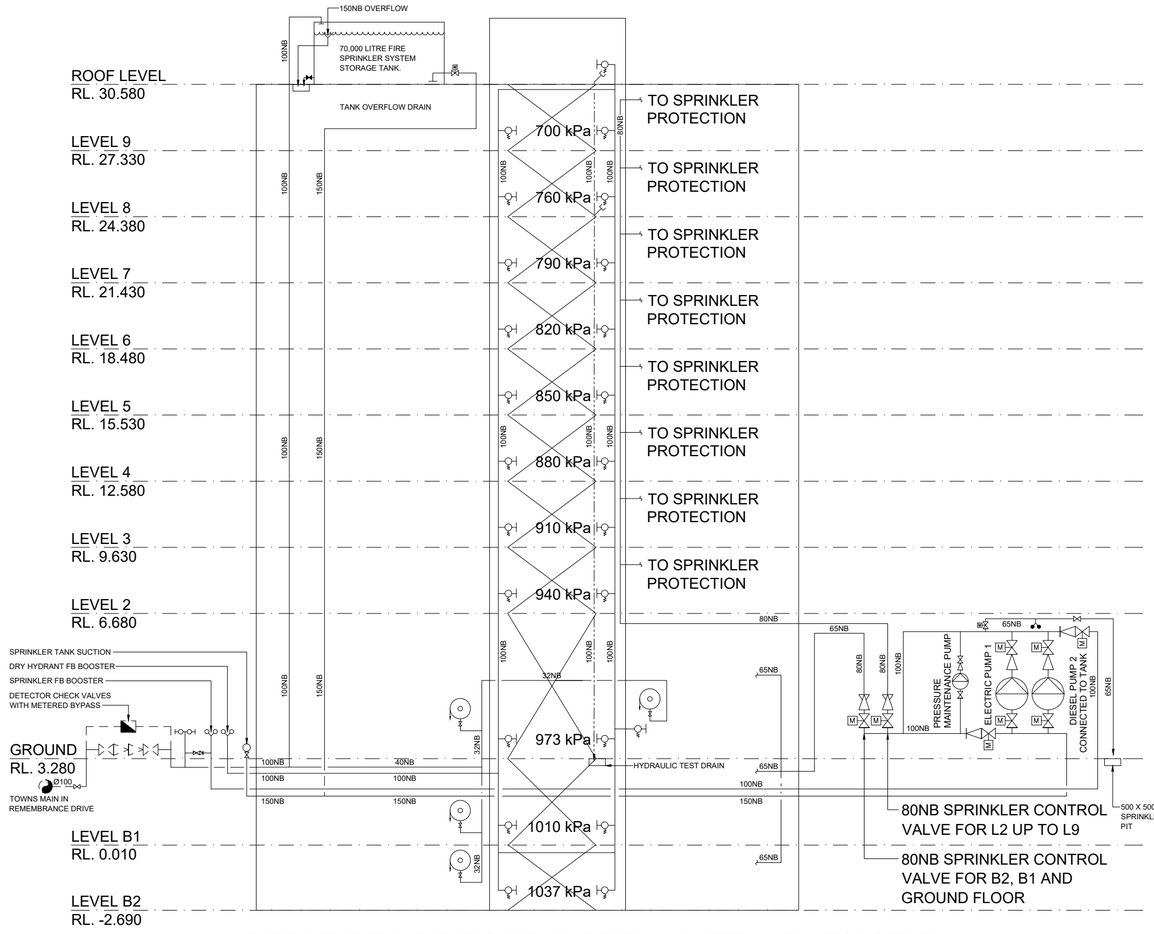
WATER SUPPLY
SEQ WATER

FIRE HOSE REEL SYSTEM INFOMATION

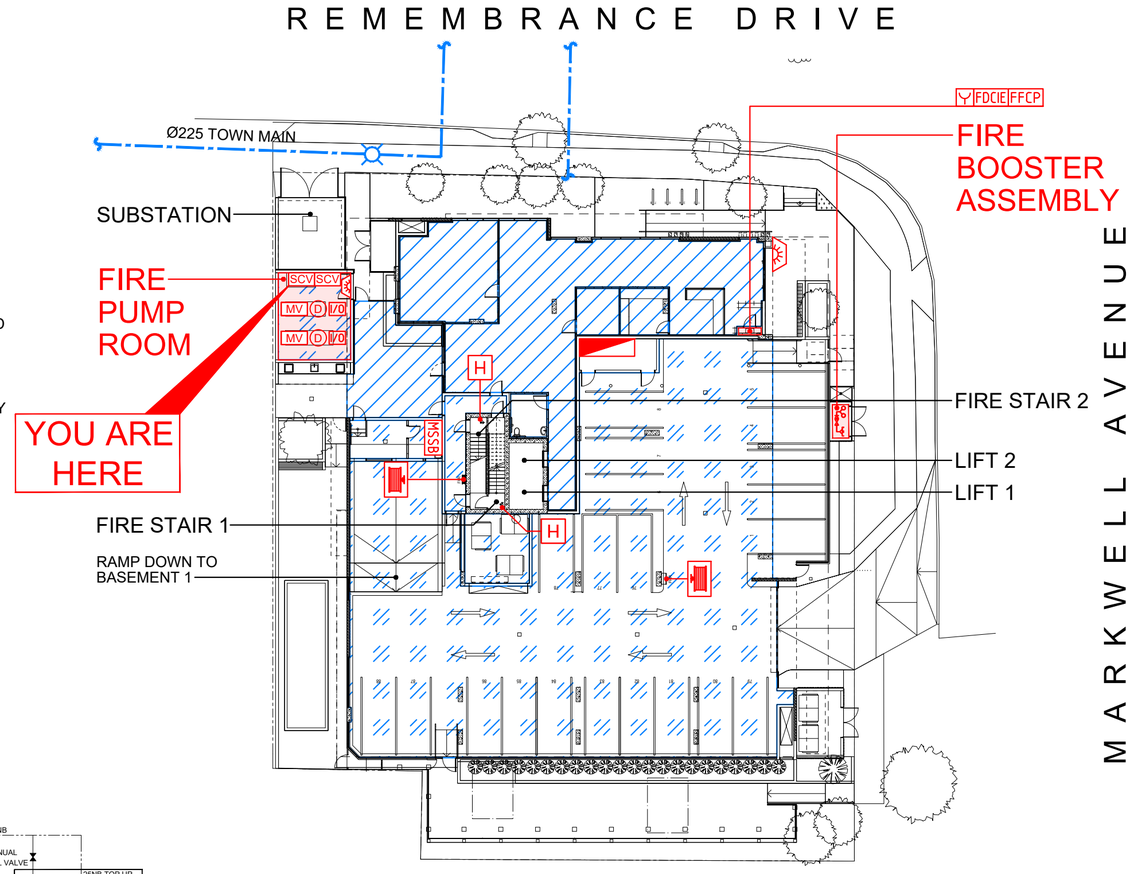
DESIGN STANDARD
AUSTRALIAN STANDARD - AS 2419.1 - 2005

PLAN LEGEND

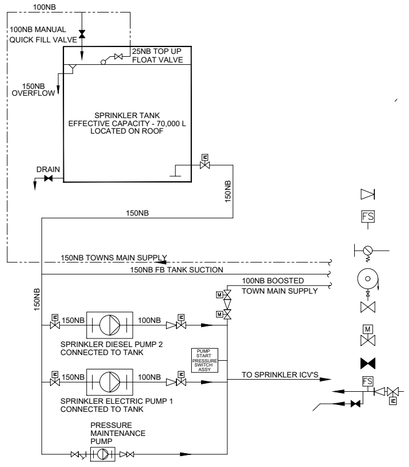
- D — DIESEL PUMP
- FDCIE — FIRE DETECTION CONTROL & INDICATING EQUIPMENT
- FFCP — FIRE FAN CONTROL PANEL
- FIRE HOSE REEL
- H — FIRE HYDRANT
- FIRE SYSTEM BOOSTER ASSEMBLY
- MAIN SWITCH BOARD
- MANUAL CALL POINT
- MSSB — MECHANICAL SERVICES SWITCH BOARD
- MV — MONITOR VALVE
- SPRING STREET HYDRANT
- SCV — SPRINKLER CONTROL VALVE ASSEMBLY
- STROBE
- TOWNS MAINS



DRY FIRE HYDRANT & SPRINKLER SCHEMATIC



HYDRANT BOOSTER, ONLY FUNCTIONAL FOLLOWING CONNECTION TO FIRE BRIGADE PUMPING APPLIANCE



FIRE SPRINKLER SYSTEM TANK PUMP & TANK SCHEMATIC

SCHEMATIC LEGEND

- CHECK VALVE
- FS — FLOW SWITCH
- HYDRANT VALVE
- HOSE REEL
- ISOLATION VALVE
- M — ISOLATION VALVE (MONITORED)
- ISOLATION VALVE (NORMALLY CLOSED)
- SPRINKLER CONTROL VALVE ASSEMBLY

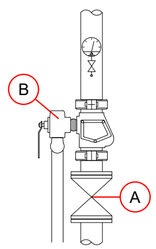
EXTENT OF SPRINKLER PROTECTION

- LIGHT HAZARD SPRINKLER INSTALLATION TO AS2118.1-1999
- OHII SPRINKLER INSTALLATION TO AS2118.1-1999

EMERGENCY INSTRUCTIONS

IN CASE OF FIRE -

1. MAKE SURE THAT FIRE IS OUT.
2. CLOSE MAIN STOP VALVE "A".
3. OPEN DRAIN VALVE "B".
4. PHONE - MAINTENANCE CONTRACTOR
5. REMAIN AT VALVES & IF FIRE RE-OCCURS CLOSE DRAIN VALVE "B" & OPEN MAIN STOP VALVE "A".



IN THE EVENT OF A FIRE RING 000 TO ENSURE FIRE SERVICE RESPONSE
FOR MAINTENANCE CALL: 1800 AFS QLD (237 759)

FCA : 63180-01

YEAR OF INSTALLATION
2023

Contractor:
Auscoast Fire Services
1/105 Spencer Road, Nerang QLD 4211 Tel: 07 5596 1270
info @ auscoastfire.com.au ABN: 91 123 601 276
QBCC: 1114544 AFS : 2854 - 15/05/2023 - REV 1

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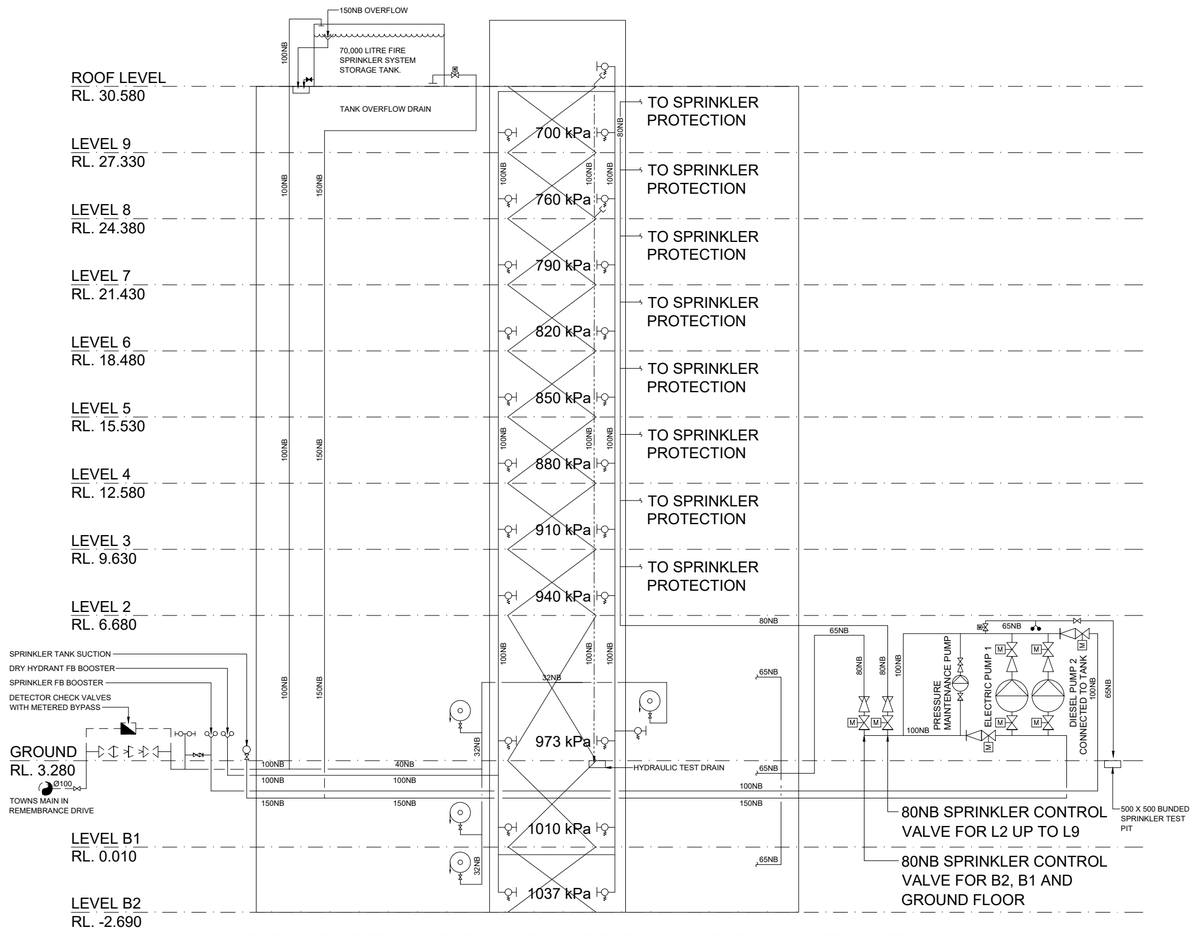

DRY FIRE HYDRANT & SPRINKLER SCHEMATIC

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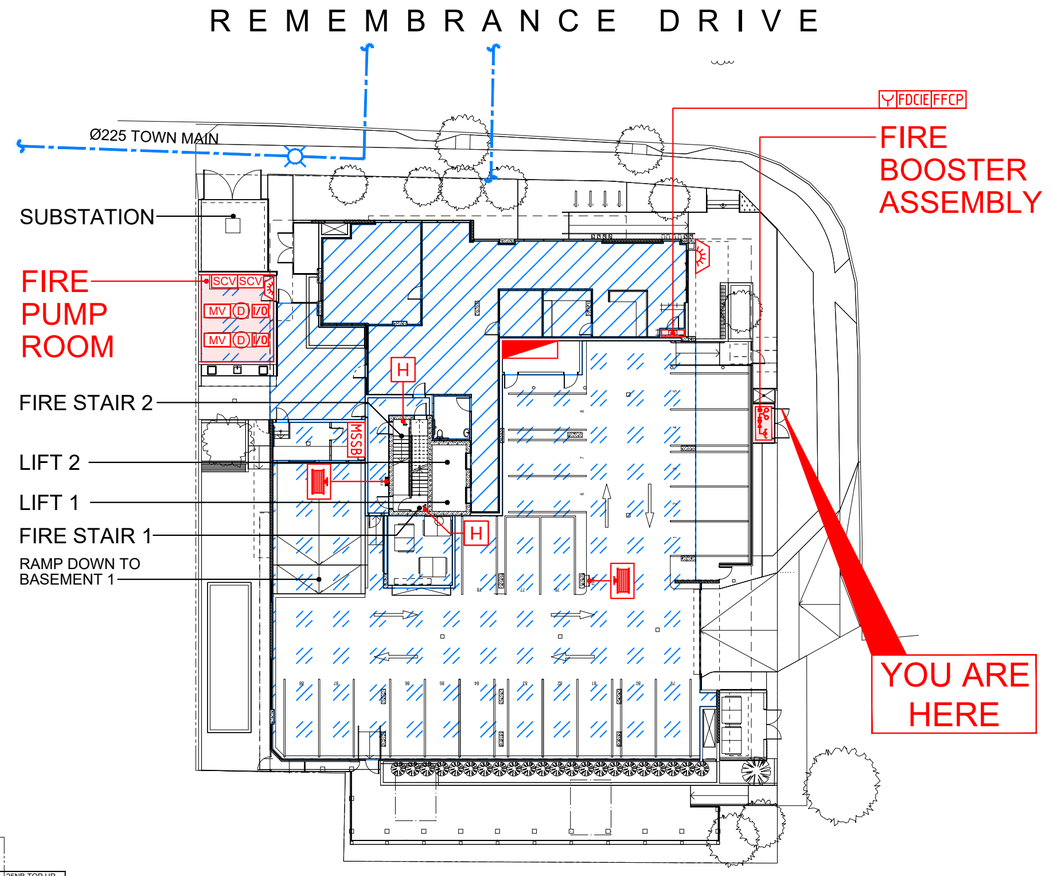
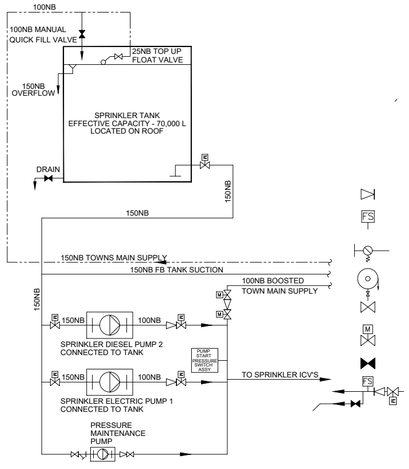
FOR MAINTENANCE CALL: 1800 AFS QLD (237 759)



HYDRANT BOOSTER, ONLY FUNCTIONAL FOLLOWING CONNECTION TO FIRE BRIGADE PUMPING APPLIANCE



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- HYDRANT VALVE
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FIRE SPRINKLER SYSTEM TANK PUMP & TANK SCHEMATIC

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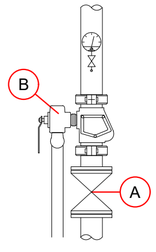
4. PHONE - MAINTENANCE CONTRACTOR
5. REMAIN AT VALVES & IF FIRE RE-OCCURS CLOSE DRAIN VALVE "B" & OPEN MAIN STOP VALVE "A".



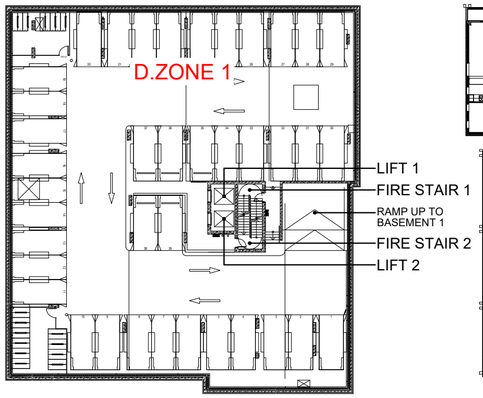
FCA : 63180-01

YEAR OF INSTALLATION
2023

Contractor:
Auscoast Fire Services
1/105 Spencer Road, Nerang QLD 4211 Tel: 07 5596 1270
info @ auscoastfire.com.au ABN: 91 123 601 276
QBCC: 1114544 AFS : 2854 - 15/05/2023 - REV 1

FIRE ALARM LOCATION DIAGRAM FIRE CONTROL ROOM

ESSENTIA APARTMENTS
18 REMEMBRANCE DRIVE, SURFERS PARADISE QLD 4217



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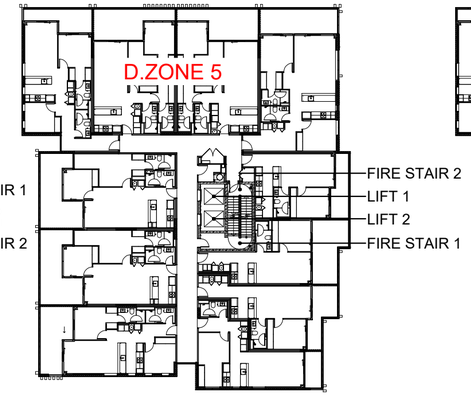

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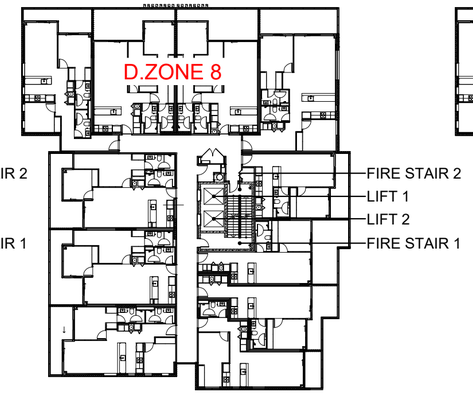

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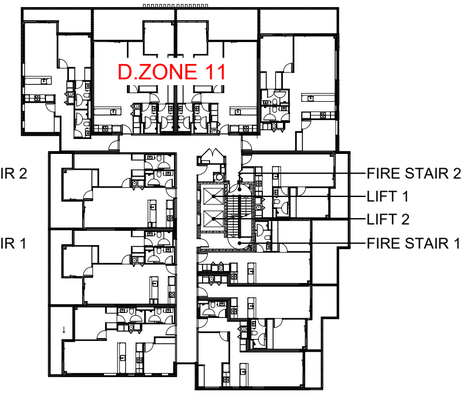

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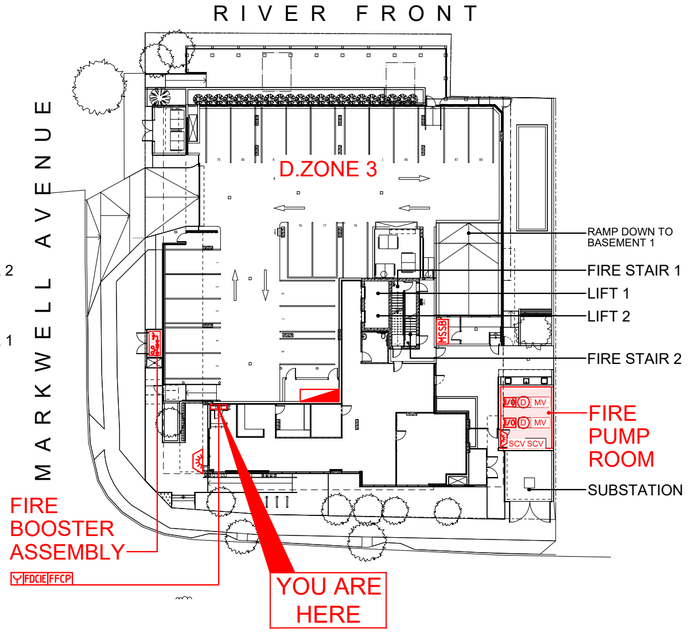
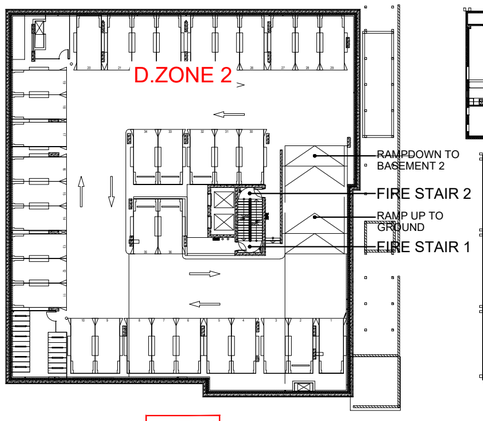
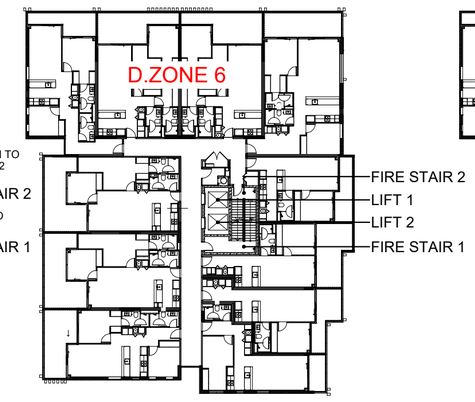


GROUND FLOOR



BASEMENT 1



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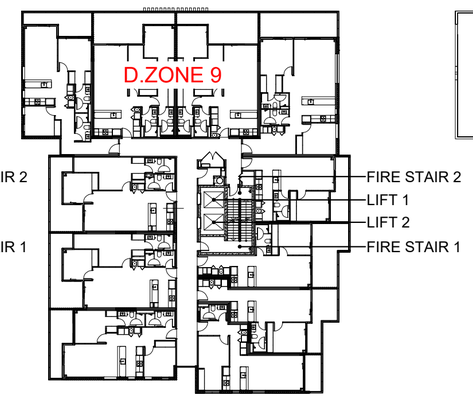

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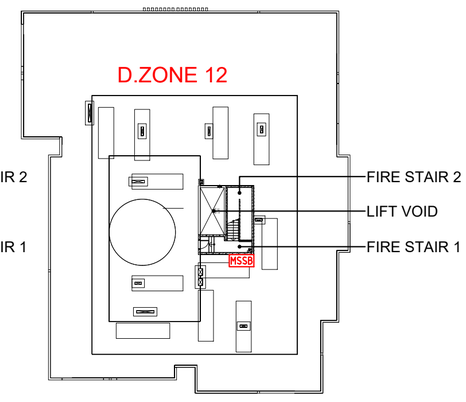
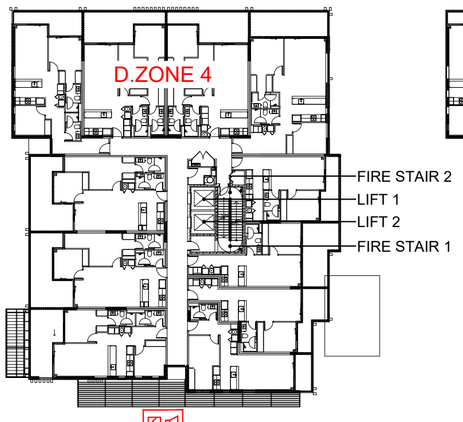
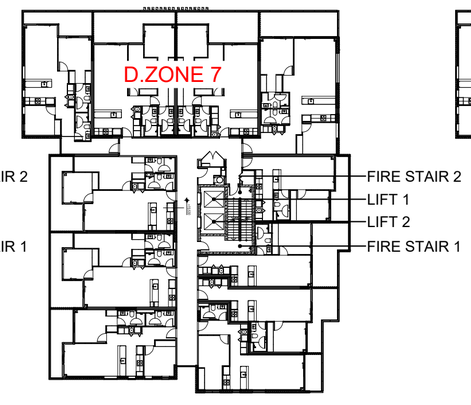


ROOF



LEVEL 2



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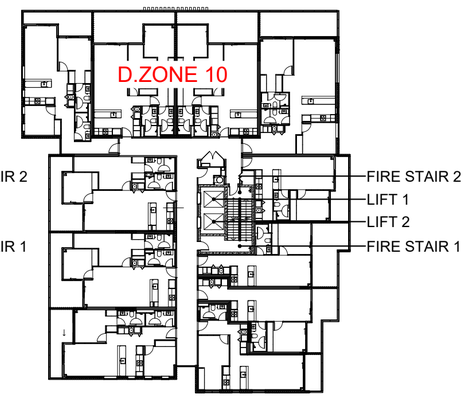
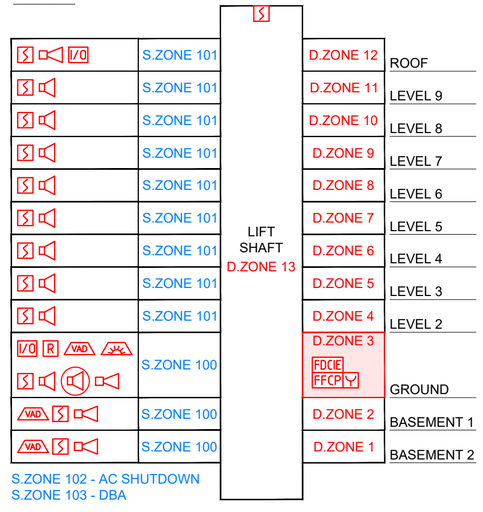


LEVEL 8

IN THE EVENT OF A FIRE RING 000 TO ENSURE FIRE SERVICE RESPONSE
FOR MAINTENANCE CALL: 1800 AFS QLD (237 759)



S.ZONE 102 - AC SHUTDOWN
S.ZONE 103 - DBA

SPRINKLER PROTECTION AND DETECTION ZONES - SCHEMATIC

LEGEND

D	DIESEL PUMP
FDCIE	FIRE DETECTION CONTROL & INDICATING EQUIPMENT
FFCP	FIRE FAN CONTROL PANEL
	FIRE SYSTEM BOOSTER ASSEMBLY
	HORN SPEAKER
I/O	INPUT / OUTPUT MODULE
	MAIN SWITCH BOARD
	MANUAL CALL POINT
MSSB	MECHANICAL SERVICES SWITCH BOARD
MV	MONITOR VALVE
	SMOKE DETECTOR
	SPEAKER (CEILING MOUNTED)
	SPEAKER (SURFACE MOUNTED)
SCV	SPRINKLER CONTROL VALVE ASSEMBLY
	STROBE
VAD	VISUAL ALARM DEVICE
D.ZONE	DETECTION ZONE
S.ZONE	SPRINKLER ZONE

FCA : 63180-01

YEAR OF INSTALLATION
2023

NORTH

Contractor:
Auscoast Fire Services
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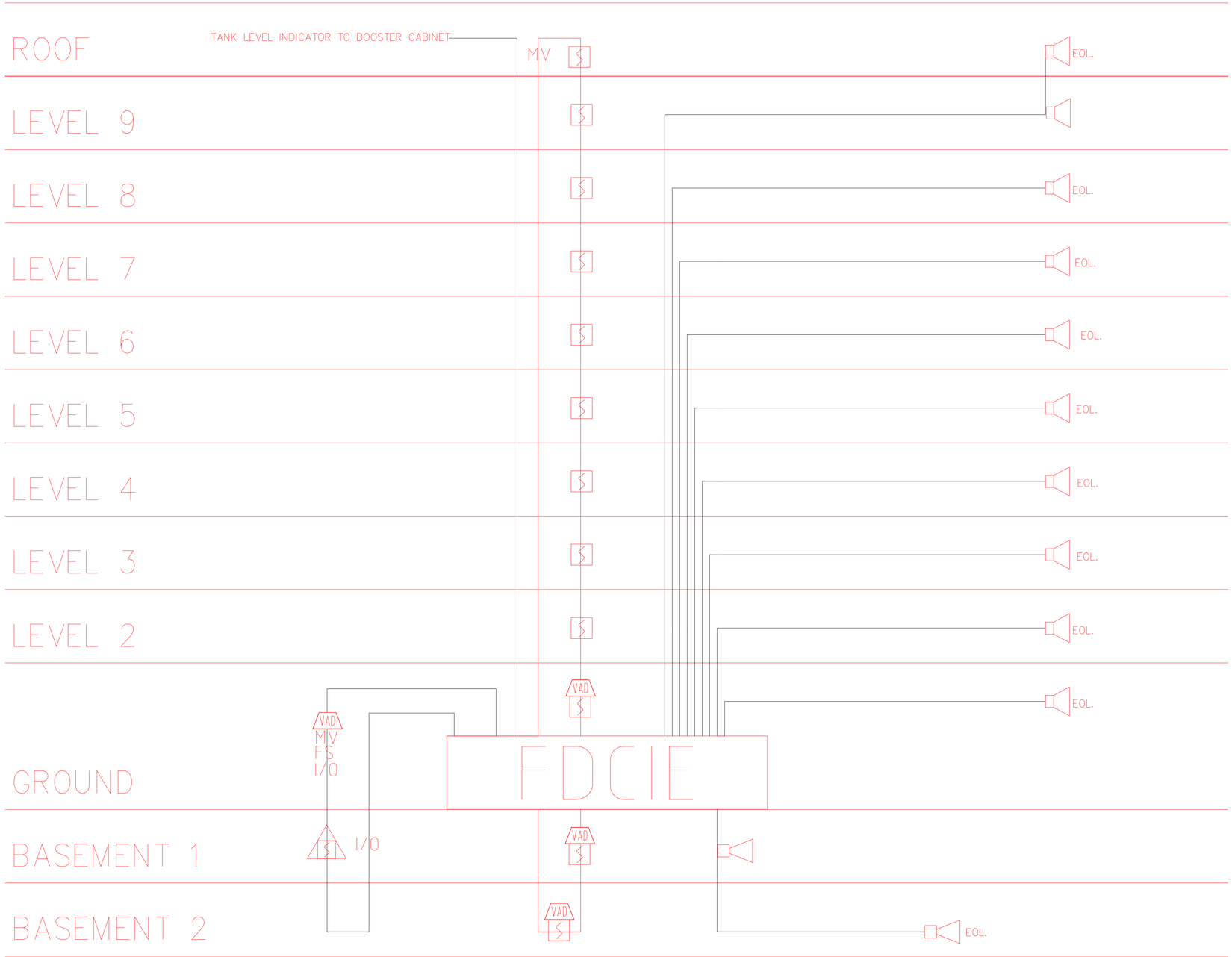
info @ auscoastfire.com.au ABN: 91 123 601 276
QBCC: 1114544 AFS : 2854 - 15/05/2023 - REV 1



NOTES:

AS BUILT

ISSUE	DETAILS	BY	DATE CHKD
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au Tel: 07 5596 1270
QBCC: 1114544 ABN: 91 123 601 276

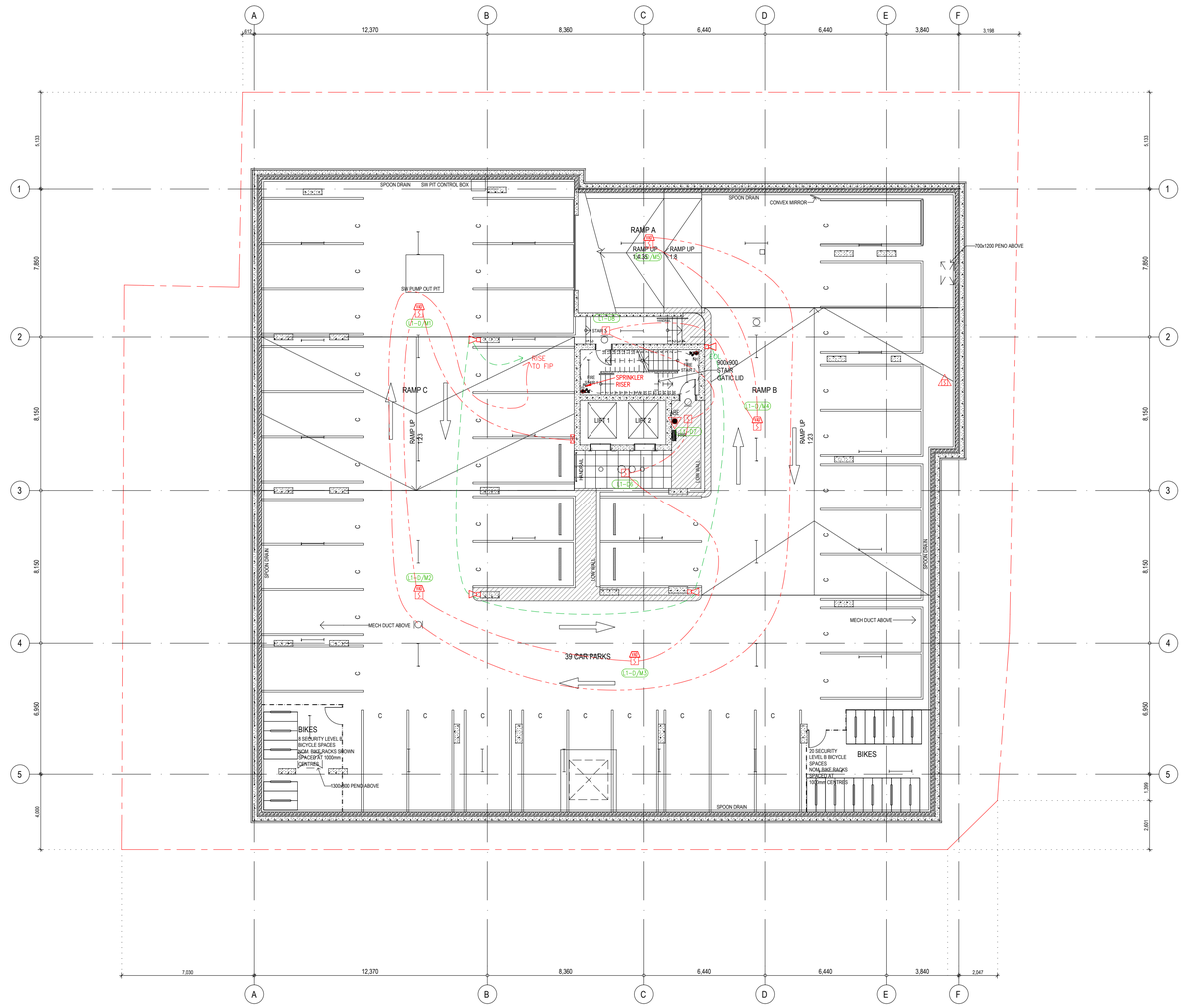
DRAWING TITLE
FIRE PROTECTION SERVICES
FIRE ALARM SYSTEM
SCHEMATIC

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
L.W	D.M	H.M	17/12/21

FILE NAME	PROJECT NO.	SCALE	
2854-FA-01	2854	1:100	A1

DRAWING No	ISSUE
FA-00	AB



FIRE ALARM SYSTEM LEGEND

- SMOKE DETECTOR (CEILING MOUNTED)
- SPEAKER SURFACE MOUNTED
- BREAK GLASS ALARM
- SPEAKER RECESSED CEILING MOUNTED
- HORN SPEAKER
- STROBE
- WARDEN INTERCOMMUNICATION POINT
- SCV — SPRINKLER CONTROL VALVE
- MV — MONITOR VALVE
- FS — FLOW SWITCH
- I/O — INPUT/OUTPUT MODULE
- FDCIE — FIRE DETECTION CIE
- FFCP — FIRE FAN CONTROL PANEL
- EWISCIE — EMERGENCY WARNING, INTERCOM SYSTEM
- SMOKE DETECTOR INSIDE DUCT
- R — RELAY CONTACT
- VAD — VISUAL ALARM DEVICE (WHITE LIGHT STROBE)
- ELECTROMAGNETIC DOOR HOLDER

FIRE ALARM SYSTEM DESIGN INFORMATION

1. REFERENCE DOCUMENTATION
   a. FIRE ENGINEERING REPORT 30161019 REV 02 DATED 09/12/21
2. SMOKE DETECTION TO BE INSTALLED TO AS1670.1 – 2015
2. EMERGENCY WARNING AND INTERCOM SYSTEM TO BE INSTALLED THROUGHOUT THE BUILDING TO AS1670 – 2018
3. SERVICES PROVIDED BY OTHERS
   a. POWER SUPPLY FOR FIP BY ELECTRICAL CONTRACTOR
   b. EMERGENCY LIGHTING BY ELECTRICAL CONTRACTOR

NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB	AS BUILT	LW	10/05/23

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MORRIS PROPERTY GROUP

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Tel: 07 5596 1270
QBCC: 1114544
ABN: 91 123 601 276

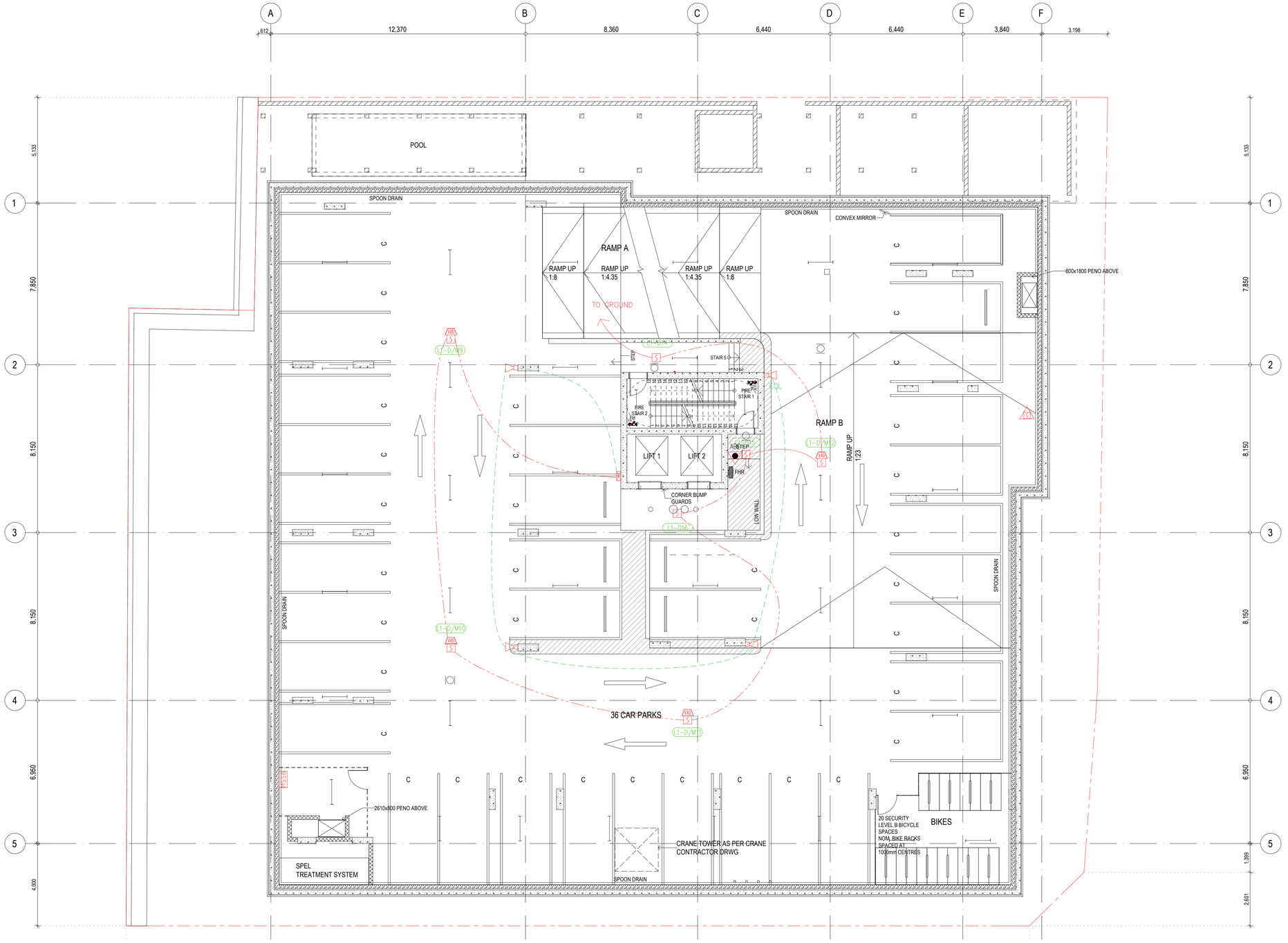
DRAWING TITLE
FIRE PROTECTION SERVICES
FIRE ALARM SYSTEM
BASEMENT 2

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
L.W	D.M	H.M	17/12/21

FILE NAME	PROJECT NO.	SCALE	
2854-FA-01	2854	1:100	A1

DRAWING No	ISSUE
FA-01	AB



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NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au Tel: 07 5596 1270
QBCC: 1114544 ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
FIRE ALARM SYSTEM
BASEMENT 1

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
L.W	D.M	H.M	17/12/21

FILE NAME	PROJECT NO.	SCALE	
2854-FA-02	2854	1:100	A1

DRAWING No	ISSUE
FA-02	AB

FIRE ALARM SYSTEM LEGEND

- SMOKE DETECTOR (CEILING MOUNTED)
- SPEAKER SURFACE MOUNTED
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1. REFERENCE DOCUMENTATION
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NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
Tel: 07 5596 1270
QBCC: 1114544
ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
FIRE ALARM SYSTEM
GROUND FLOOR

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
L.W	D.M	H.M	17/12/21

FILE NAME	PROJECT NO.	SCALE	
2854-FA-03	2854	1:100	A1

DRAWING No: FA-03 — ISSUE: AB

FIRE ALARM SYSTEM LEGEND

- SMOKE DETECTOR (CEILING MOUNTED)
- SPEAKER SURFACE MOUNTED
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- ELECTROMAGNETIC DOOR HOLDER

FIRE ALARM SYSTEM DESIGN INFORMATION

1. REFERENCE DOCUMENTATION
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NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
Tel: 07 5596 1270
QBCC: 1114544
ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
FIRE ALARM SYSTEM
LEVEL 2

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
L.W	D.M	H.M	17/12/21

FILE NAME	PROJECT NO.	SCALE	
2854-FA-04	2854	1:100	A1

DRAWING No: FA-04
ISSUE: AB

FIRE ALARM SYSTEM LEGEND

- SMOKE DETECTOR (CEILING MOUNTED)
- SPEAKER SURFACE MOUNTED
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NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
Tel: 07 5596 1270
QBCC: 1114544
ABN: 91 123 601 276

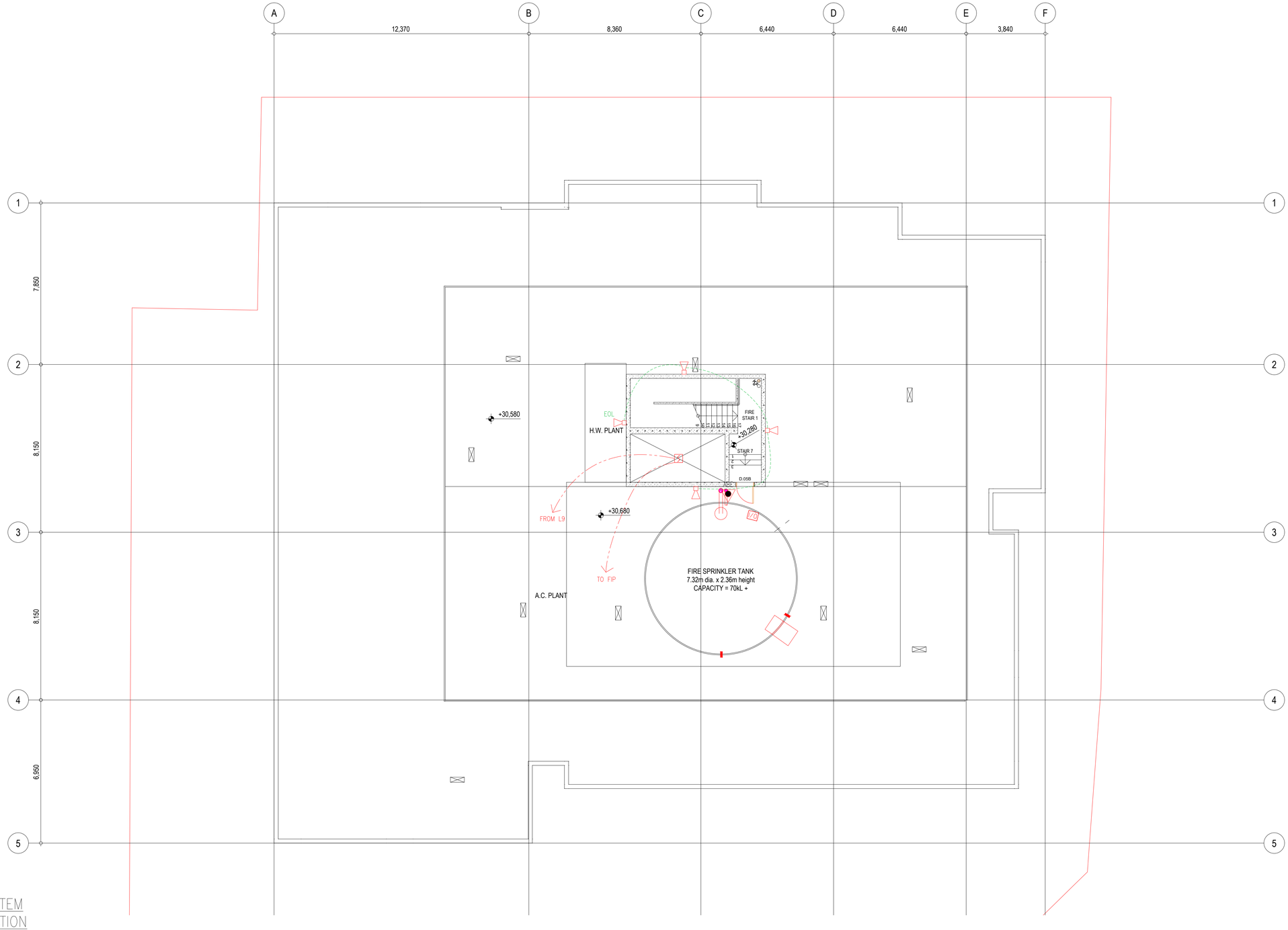
DRAWING TITLE
FIRE PROTECTION SERVICES
FIRE ALARM SYSTEM
LEVELS 3 TO 9

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
L.W	D.M	H.M	17/12/21

FILE NAME	PROJECT NO.	SCALE	
2854-FA-05	2854	1:100	A1

DRAWING No: FA-05
ISSUE: AB



FIRE ALARM SYSTEM LEGEND

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NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
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Tel: 07 5596 1270
QBCC: 1114544
ABN: 91 123 601 276

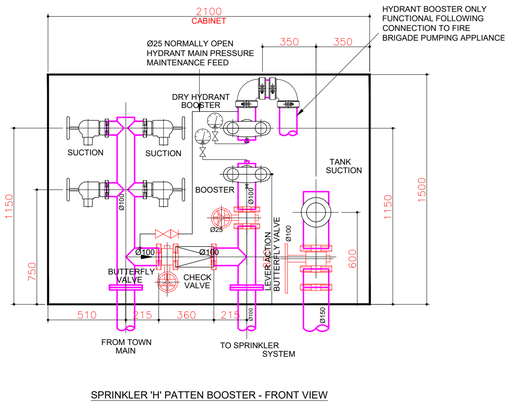
DRAWING TITLE
FIRE PROTECTION SERVICES
FIRE ALARM SYSTEM
ROOF LEVEL

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
L.W	D.M	H.M	17/12/21

FILE NAME	PROJECT NO.	SCALE	
2854-FA-06	2854	1:100	A1

DRAWING No	ISSUE
FA-06	AB



SPRINKLER 'H' PATTEN BOOSTER - FRONT VIEW

LEGEND

- ISOLATION VALVE (MONITORED)
- ISOLATION VALVE
- CHECK VALVE
- FLOW SWITCH
- SPRINKLER CONTROL VALVE ASSEMBLY
- HV — HYDRANT VALVE
- HOSE REEL

NOTES:

DESIGN CRITERIA - NCC - 2019 AMENDMENT 1
SPRINKLER IN ACCORDANCE WITH AS 2118.1-2017
DRY HYDRANT IN ACCORDANCE WITH AS 2149.1-2005

SPRINKLERS
BASEMENT PARKING LEVEL & GROUND - AS 2118.1-2017 - OH II
WITH 12 SPRINKLERS OPERATING SIMULTANEOUSLY
NOMINAL FLOW - 12 L/sec

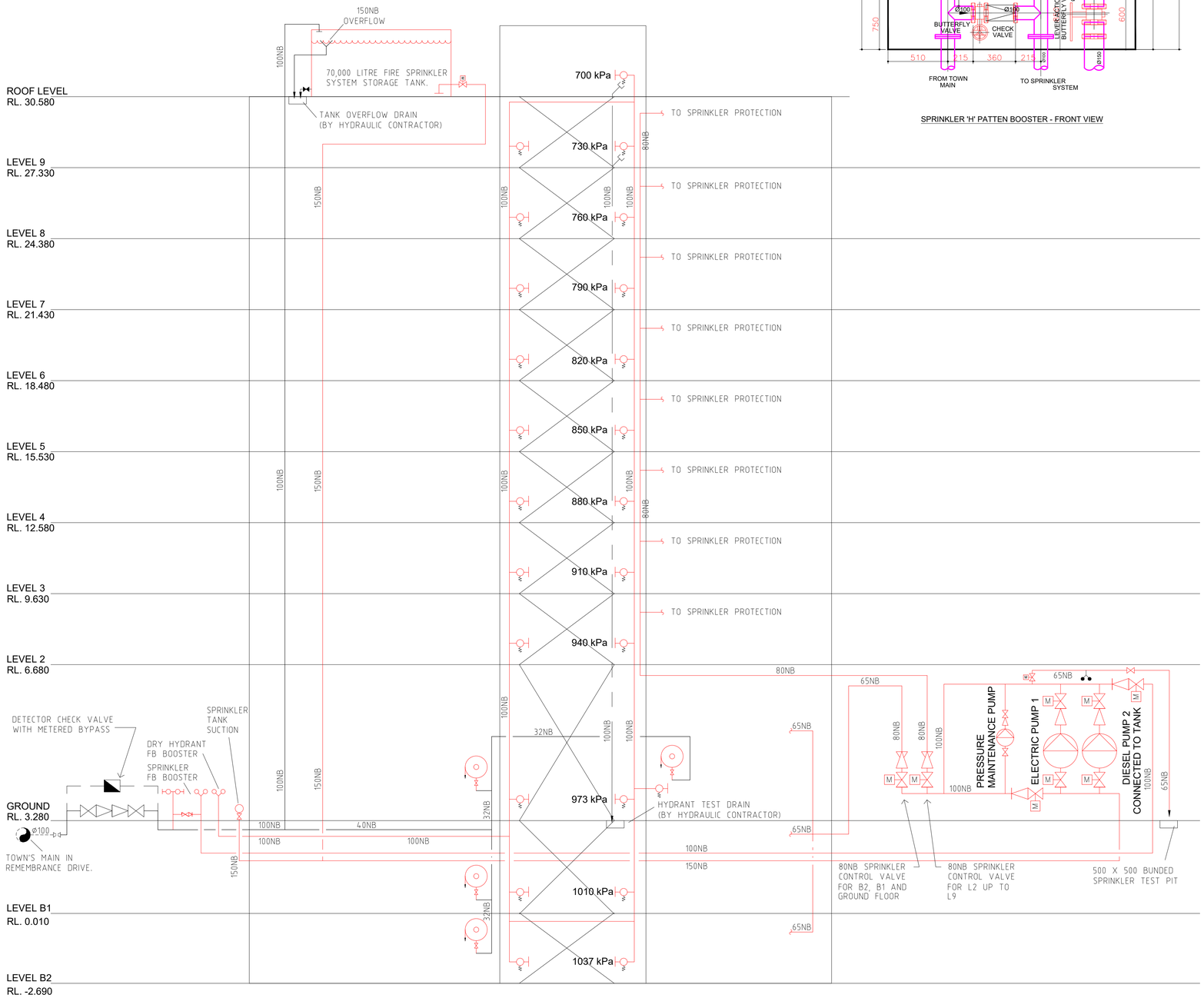
APARTMENT LEVELS - SPECIAL
SYSTEMS INCORPORATING
RESIDENTIAL SPRINKLERS
NOMINAL FLOW - 7 L/sec

SPRINKLER SYSTEM REQUIREMENTS

ON SITE PUMPS - 12 L/sec @ 1000 kPa

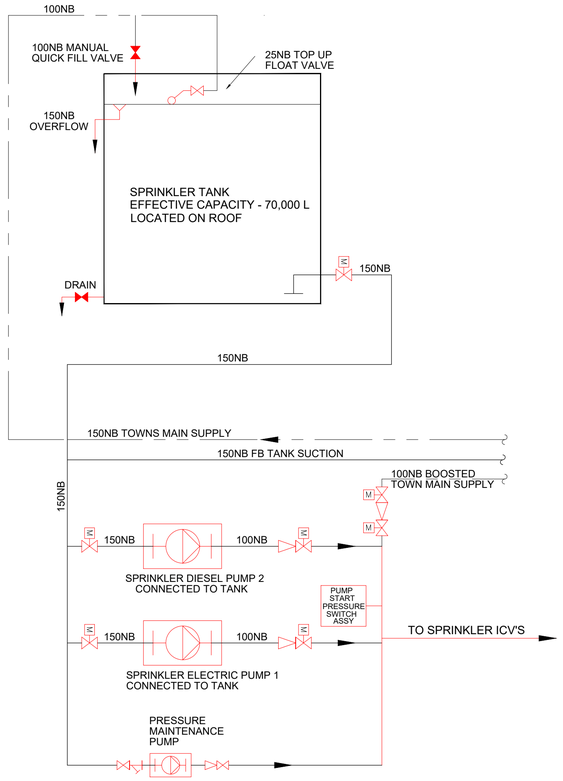
WATER SUPPLIES (GRADE 1)
FULL CAPACITY TANK - 70,000 L
IN ACCORDANCE WITH AS 2118.1 - 2017
1 x Ø100 TOWN MAIN

MINIMUM TANK SIZE
12 SPRINKLERS x 60 L/min = 720 L/min
720 L/min x 60min + 20% = 51,840 L



DRY FIRE HYDRANT/SPRINKLER SCHEMATIC

SCALE - NTS



SYSTEM DESIGNED IN ACCORDANCE WITH
AS 2419.1 2005, AS 2118.1– 2017 (OH2),
30161019 FER 2–0 DATED 09/12/2021

NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD	ISSUE	DETAILS	BY	DATE CHKD
				AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
QBCC: 1114544
Tel: 07 5596 1270
ABN: 91 123 601 276

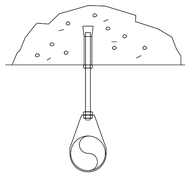
DRAWING TITLE
FIRE PROTECTION SERVICES
HYDRANT/SPRINKLER SYSTEM
SCHEMATIC LAYOUT

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	19/10/21

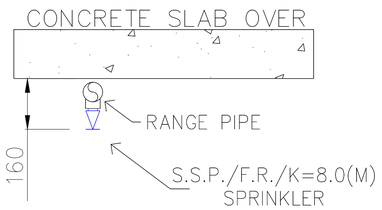
FILE NAME	PROJECT NO.	SCALE	
2854-FS-02	2854	NTS	A1

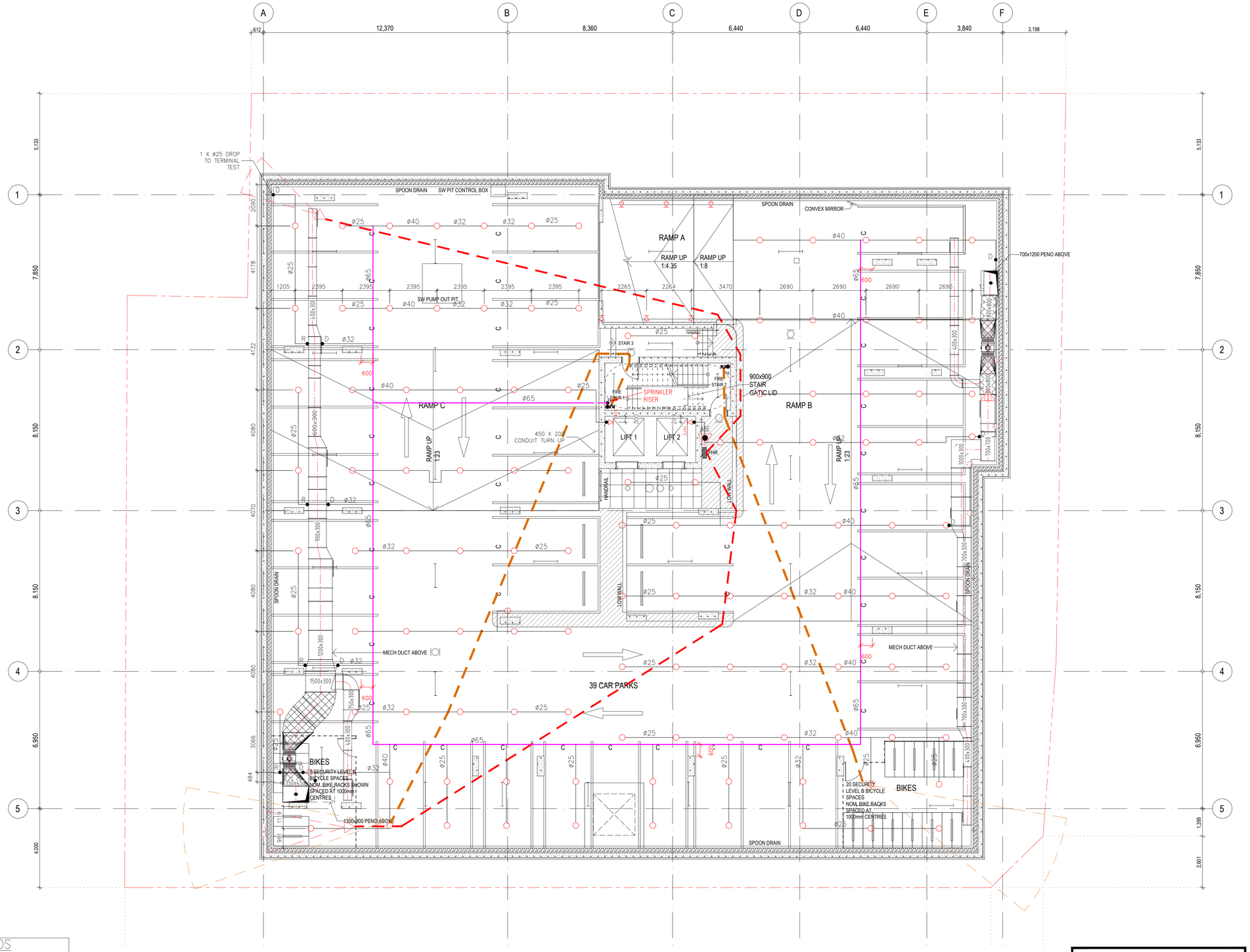
DRAWING No: FS-02
ISSUE: AB



HANGER H1

SCALE - N.T.S.





FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL		SPRINKLER CONTROL VALVES
	SET	FS	FLOW SWITCH
	SOCKET		RANGE PIPE
	ROLL GROOVE		SPRINKLER MAIN
	RISE DROP	100ϕ	NOMINAL PIPE SIZE
	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
A	PIPE FAB ID	#255	STEP IN SLAB
*3740	SOFFIT HEIGHT		SPRINKLER UNDER DUCT

SPRINKLER HEADS

15mm	SEMI RECESSED SPRINKLER PENDANT WHITE	FR	8.0	68°C	–	
20mm	HSW SPRINKLER EXTENDED COVERAGE BRASS	FR	11.5	68°C	–	
15mm	HSW SPRINKLER BRASS	FR	8.0	141°C	2	
15mm	HSW SPRINKLER BRASS	FR	8.0	68°C	11	
15mm	BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	7	
15mm	EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	117	
THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.	

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB2	AS BUILT ISSUE	LW	17/05/23
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
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info @ auscoastfire.com.au
Tel: 07 5596 1270
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ABN: 91 123 601 276

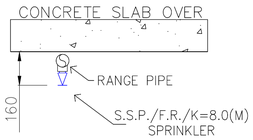
DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
BASEMENT 2

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	11/10/21

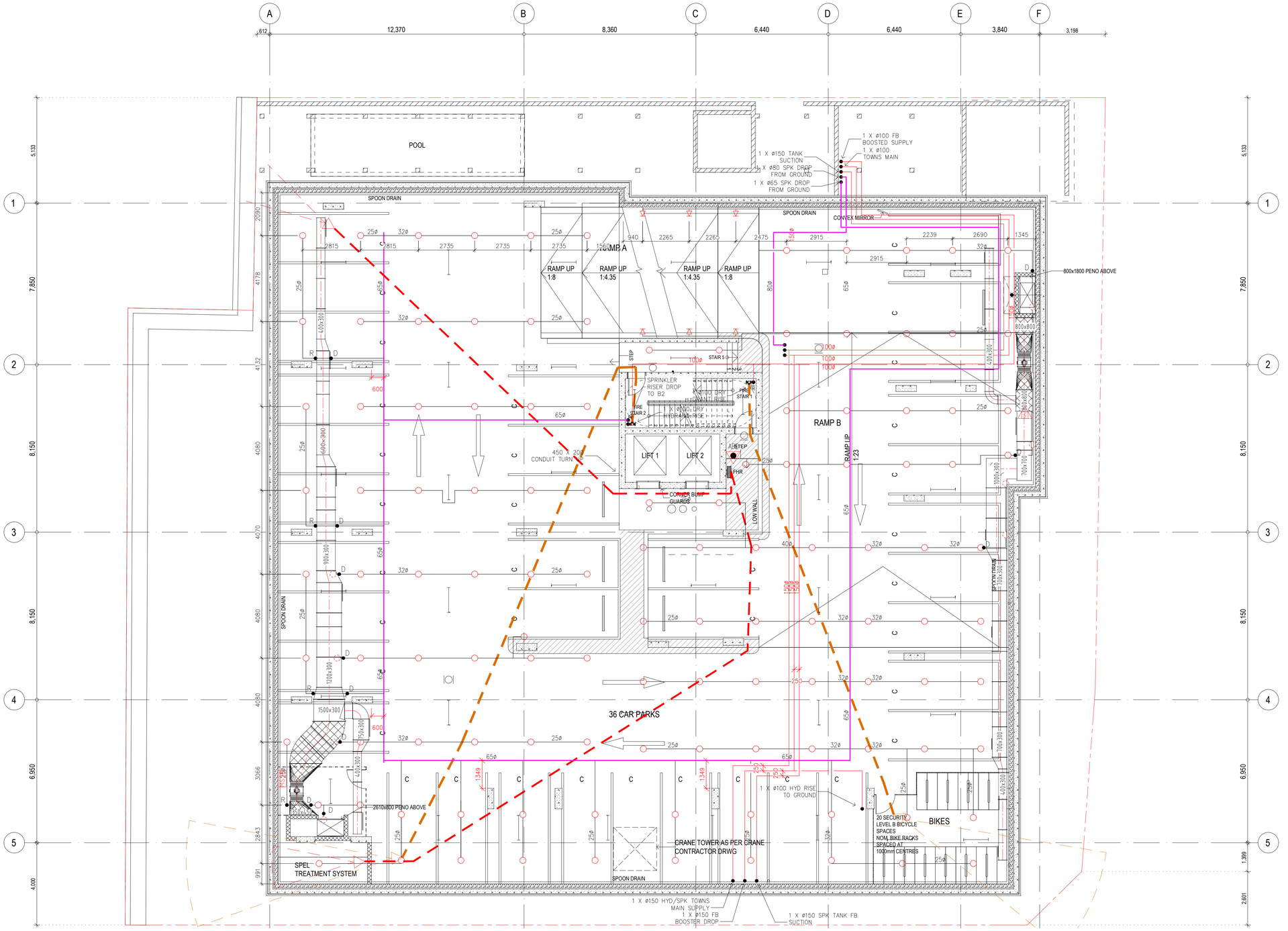
FILE NAME	PROJECT NO.	SCALE	
2854-FS-04	2854	1:100	A1

DRAWING No	ISSUE
FS-04	AB2



HANGER H1

SCALE - N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	●	SPRINKLER CONTROL VALVES
⊃	SET	FS	FLOW SWITCH
⊏	SOCKET		RANGE PIPE
⊤	ROLL GROOVE		SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	{3430}	℄ OF PIPE ABOVE FLOOR LEVEL
A	PIPE FAB ID	#255	STEP IN SLAB
*3740	SOFFIT HEIGHT		SPRINKLER UNDER DUCT

SPRINKLER HEADS

15mm	SEMI RECESSED SPRINKLER PENDANT WHITE	FR	8.0	68°C	–
20mm	HSW SPRINKLER EXTENDED COVERAGE BRASS	FR	11.5	68°C	–
15mm	HSW SPRINKLER BRASS	FR	8.0	141°C	–
15mm	HSW SPRINKLER BRASS	FR	8.0	68°C	6
15mm	BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	9
15mm	EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	117
THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB2	AS BUILT ISSUE	LW	17/05/23
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
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info @ auscoastfire.com.au
Tel: 07 5596 1270
QBCC: 1114544
ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
BASEMENT 1

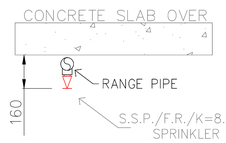
PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	11/10/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-05	2854	1:100	A1

DRAWING No: FS-05

ISSUE: AB2

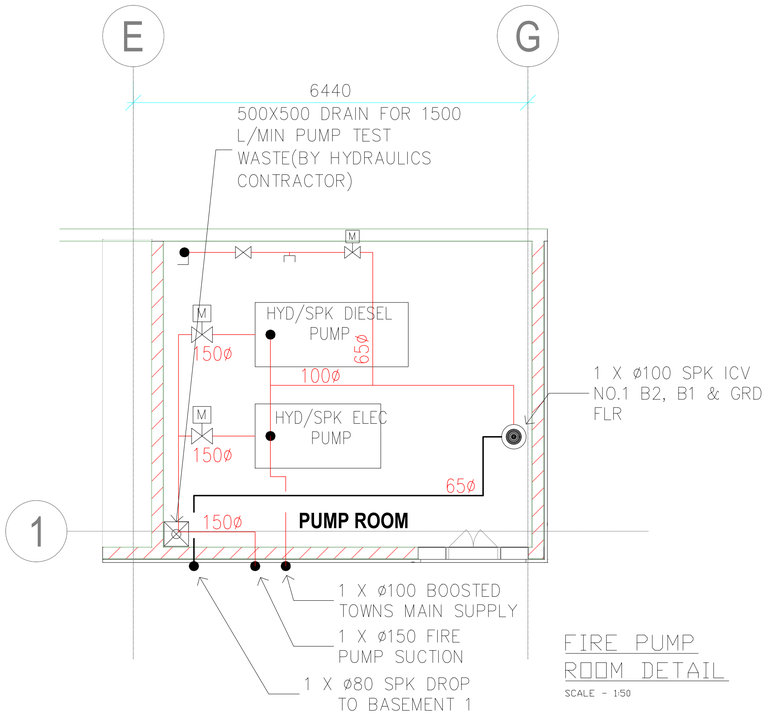


HANGER H1

SCALE - N.T.S.

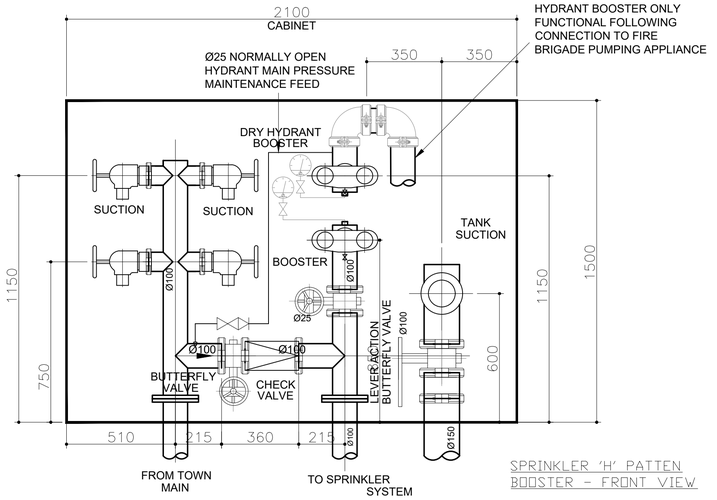
EXPOSED SPRINKLER DETAIL

SCALE - 1:10

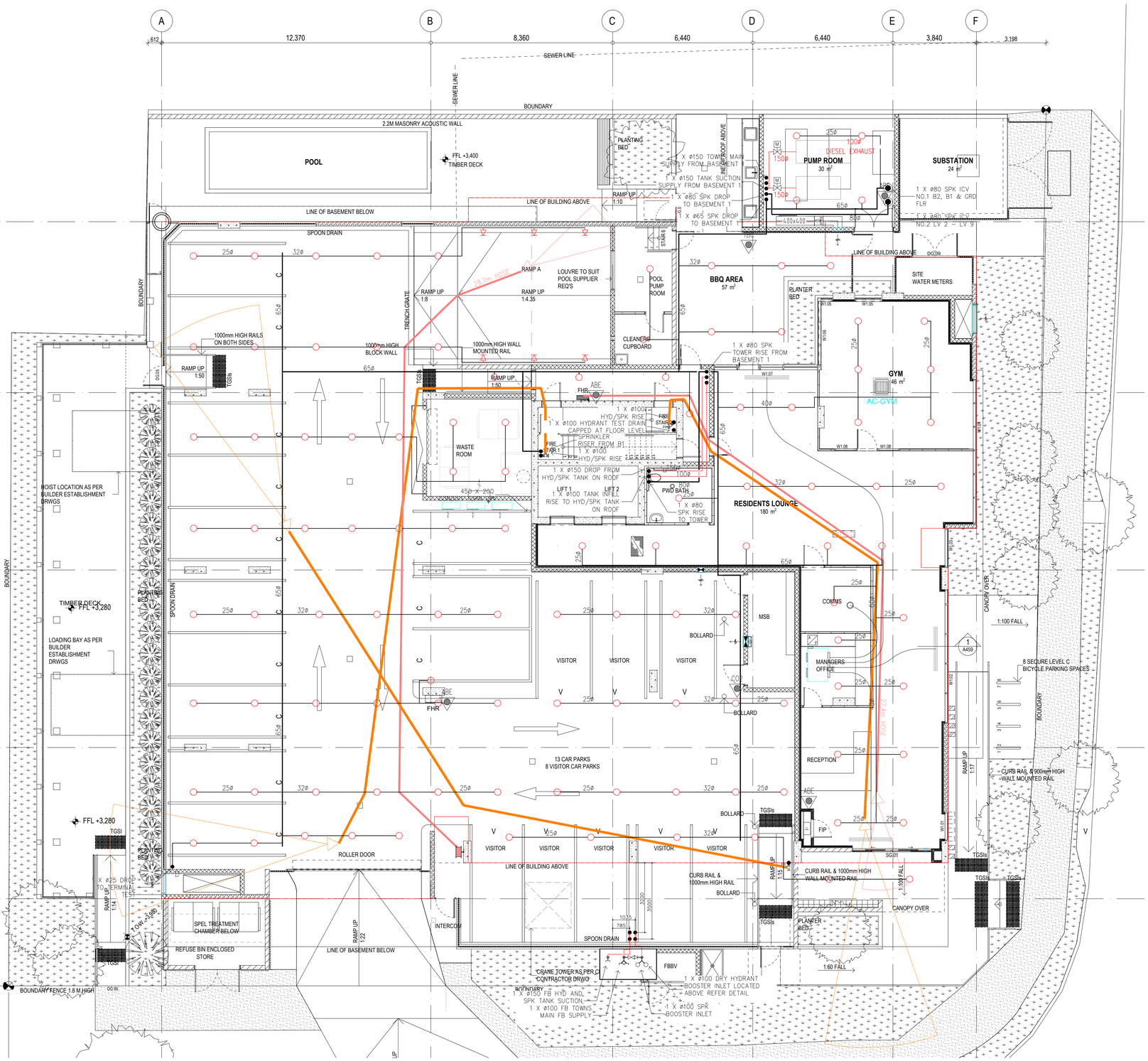


FIRE PUMP ROOM DETAIL

SCALE - 1:50



SPRINKLER 'H' PATTEN BOOSTER - FRONT VIEW



FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	●	SPRINKLER CONTROL VALVES
⟩	SET	FS	FLOW SWITCH
⊏	SOCKET	——	RANGE PIPE
⟊	ROLL GROOVE	——	SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
(A)	PIPE FAB ID	#255	STEP IN SLAB
+3740	SOFFIT HEIGHT	◌	SPRINKLER UNDER DUCT

SPRINKLER HEADS

◉	15mm	SEMI RECESSED SPRINKLER PENDANT WHITE	FR	8.0	68°C	–
ISO ▽	20mm	HSW SPRINKLER EXTENDED COVERAGE BRASS	FR	11.5	68°C	–
141 ▽	15mm	HSW SPRINKLER BRASS	FR	8.0	141°C	–
▽	15mm	HSW SPRINKLER BRASS	FR	8.0	68°C	6
◌	15mm	BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	–
○	15mm	EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	109
	THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD	ISSUE	DETAILS	BY	DATE CHKD
				AB3	AS BUILT ISSUE	JHN	31/05/23
				AB2	AS BUILT ISSUE	LW	17/05/23
				AB	AS BUILT ISSUE	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
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info @ auscoastfire.com.au Tel: 07 5596 1270
QBCC: 1114544 ABN: 91 123 601 276

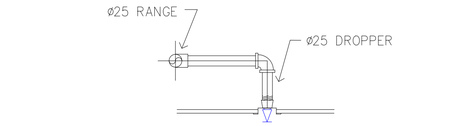
DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
GROUND FLOOR

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	11/10/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-06	2854	1:100	A1

DRAWING No	ISSUE
FS-06	AB3

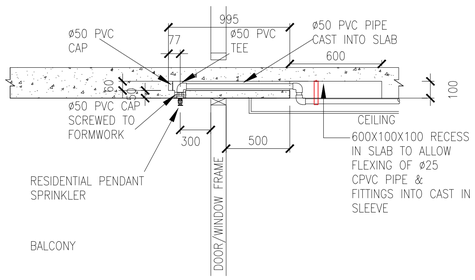


CEILING SPRINKLER DETAIL

SCALE - 1:10

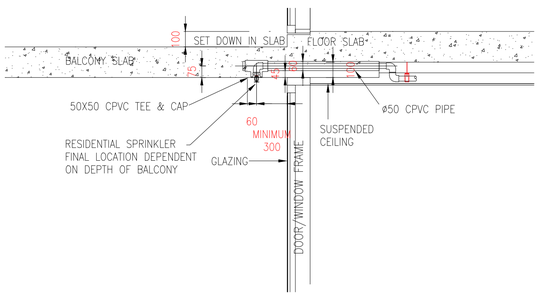
HANGER H1

SCALE - N.T.S.



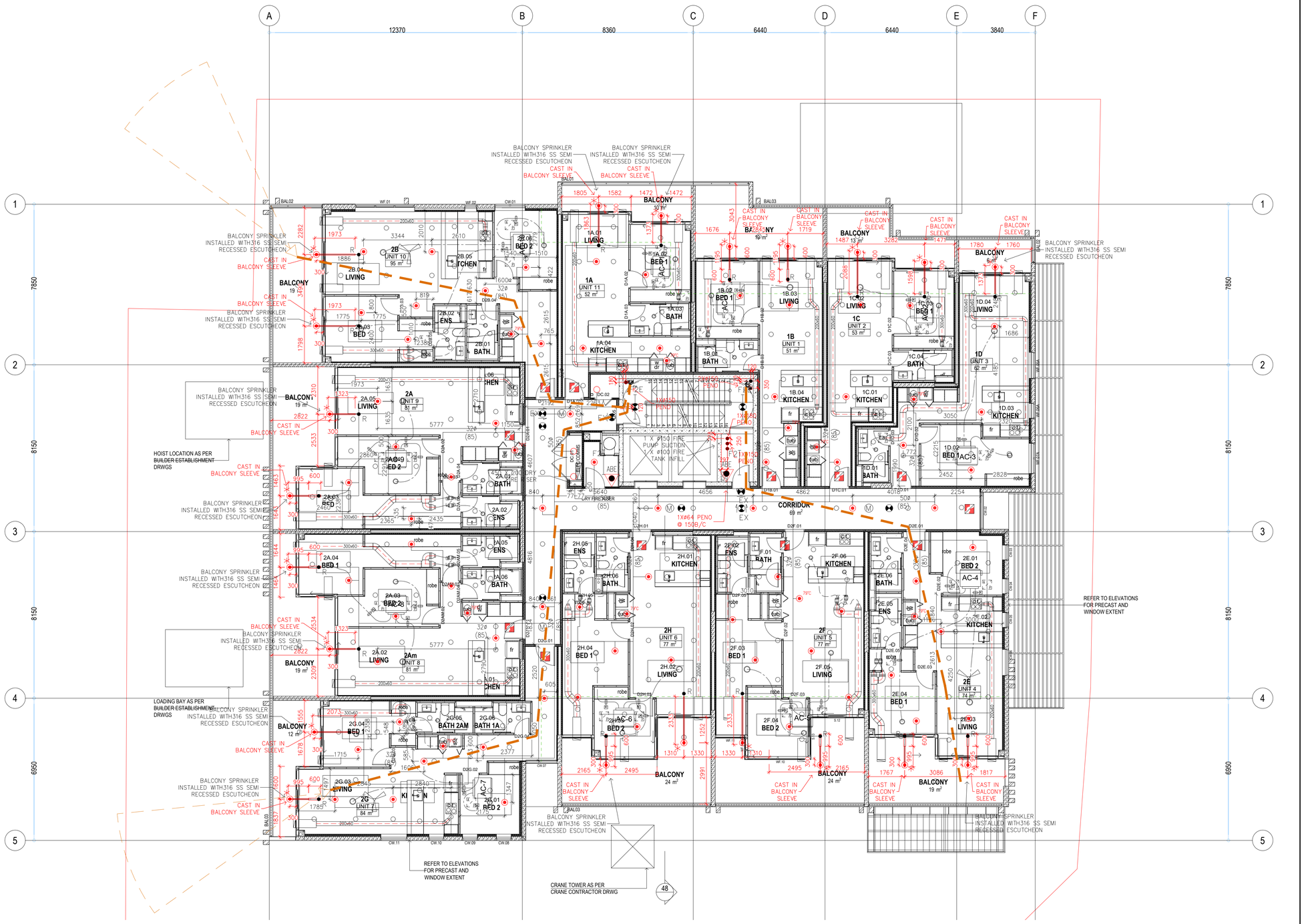
BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

SCALE - N.T.S.



TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE - N.T.S.



FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	●	SPRINKLER CONTROL VALVES
⟩	SET	FS	FLOW SWITCH
C	SOCKET		RANGE PIPE
⟩⟨	ROLL GROOVE		SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
A	PIPE FAB ID	#255	STEP IN SLAB
*3740	SOFFIT HEIGHT	◌	SPRINKLER UNDER DUCT

SPRINKLER HEADS

		THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.
◉	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	68°C	70
◉ 79	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	79°C	11
◉	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL TEFLON COATED	FR	7.1	68°C	21
▽	15mm		HSW SPRINKLER BRASS	FR	8.0	68°C	–
◌	15mm		BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	–
○	15mm		EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	3

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2-0 DATED 09/12/2021

NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD	ISSUE	DETAILS	BY	DATE CHKD
				AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
Tel: 07 5596 1270
QBCC: 1114544
ABN: 91 123 601 276

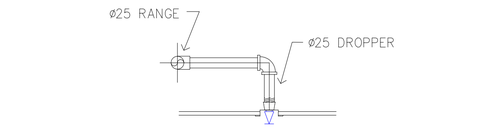
DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
LEVEL 2

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	21/10/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-07	2854	1:100	A1

DRAWING No: FS-07
ISSUE: AB

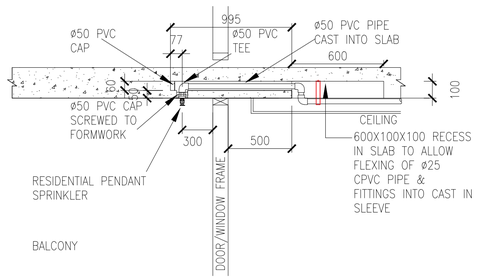


CEILING SPRINKLER DETAIL

SCALE - 1:10

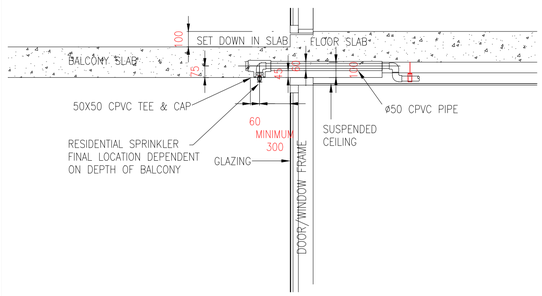
HANGER H1

SCALE - N.T.S.



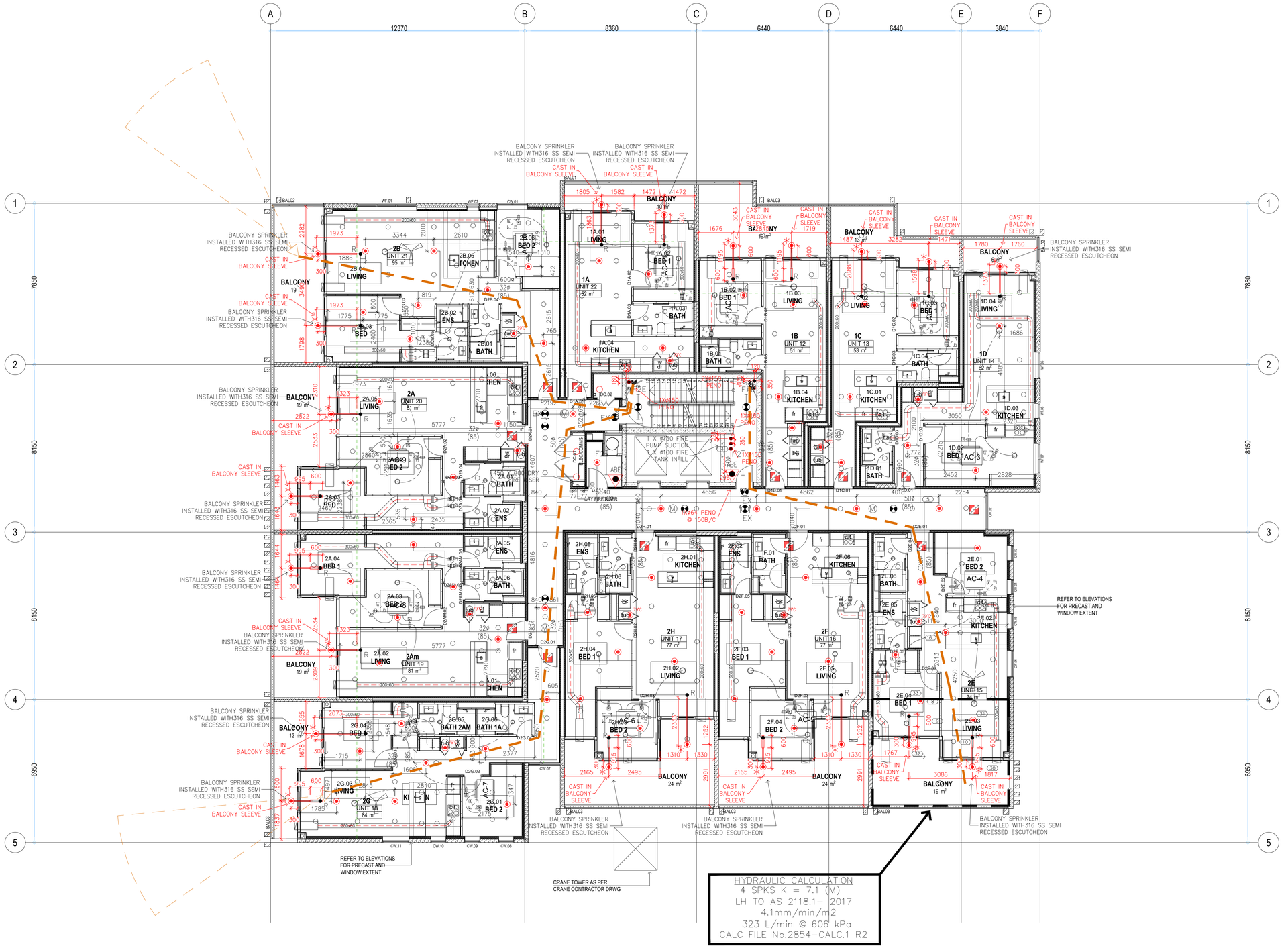
BALCONY SPRINKLER REBATE DETAIL(WITH SLAB RECESS)

SCALE - N.T.S.



TYPICAL BALCONY SPRINKLER REBATE DETAIL

SCALE - N.T.S.



HYDRAULIC CALCULATION

4 SPKS K = 7.1 (M)
LH TO AS 2118.1- 2017
4.1mm/min/m2
323 L/min @ 606 kPa
CALC FILE No.2854-CALC.1 R2

FIRE SPRINKLER SYSTEM LEGEND

3000	℄ OF PIPE AFL	●	SPRINKLER CONTROL VALVES
⟩	SET	FS	FLOW SWITCH
C	SOCKET		RANGE PIPE
	ROLL GROOVE		SPRINKLER MAIN
●	RISE DROP	100ø	NOMINAL PIPE SIZE
⋈	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
A	PIPE FAB ID	#255	STEP IN SLAB
*3740	SOFFIT HEIGHT		SPRINKLER UNDER DUCT

SPRINKLER HEADS

		THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.
	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	68°C	70
79	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	79°C	11
	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL TEFLON COATED	FR	7.1	68°C	21
	15mm		HSW SPRINKLER BRASS	FR	8.0	68°C	–
	15mm		BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	–
	15mm		EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	3

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 - 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1- 2017 (OH2) & 30161019 FER REV 2-0 DATED 09/12/2021

NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
			27/04/22
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
QBCC: 1114544
Tel: 07 5596 1270
ABN: 91 123 601 276

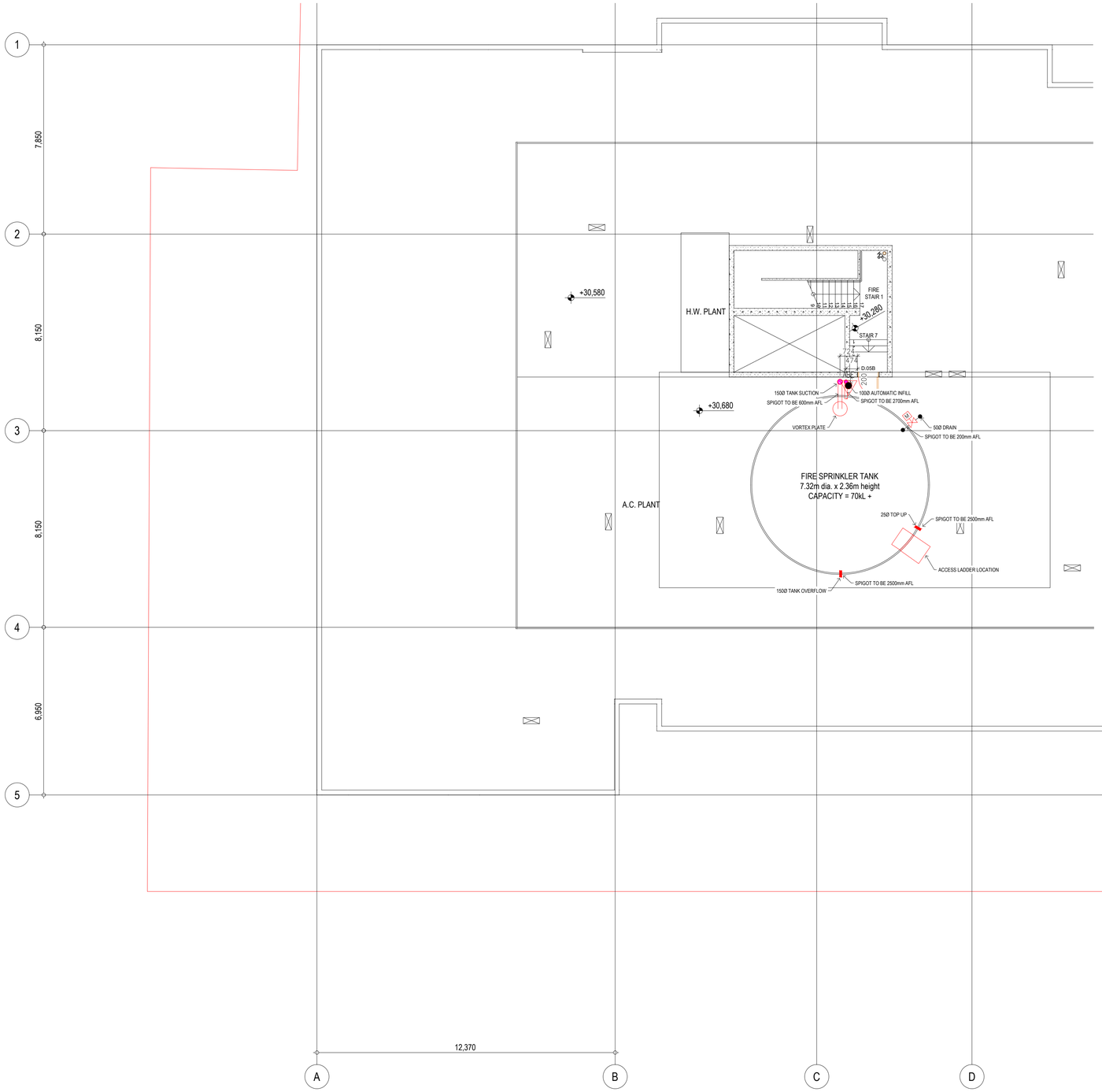
DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
LEVELS 3 TO 9

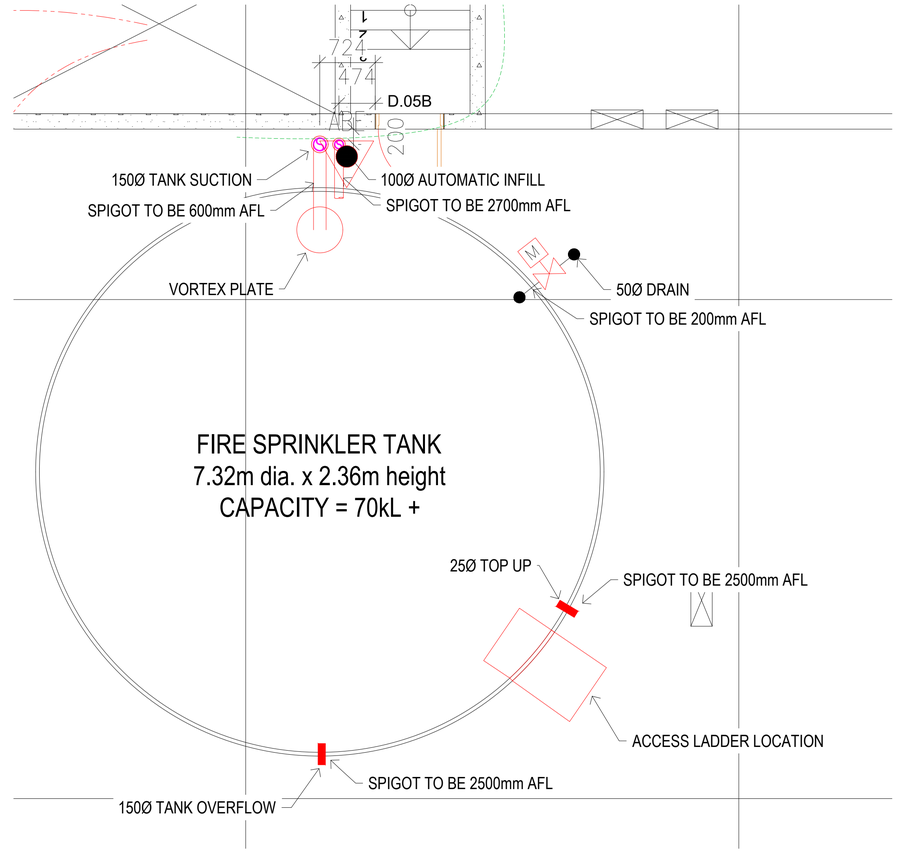
PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
A.M	A.M	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-08	2854	1:100	A1

DRAWING No FS-08 — ISSUE AB





TANK DETAIL
scale: 1:40

FIRE SPRINKLER SYSTEM LEGEND

	℄ OF PIPE AFL		SPRINKLER CONTROL VALVES
	SET	FS	FLOW SWITCH
	SOCKET		RANGE PIPE
	ROLL GROOVE		SPRINKLER MAIN
	RISE DROP	100ø	NOMINAL PIPE SIZE
	STOP VALVE	(85)	℄ OF PIPE U/S SOFFIT
	HYENA NODE	[3430]	℄ OF PIPE ABOVE FLOOR LEVEL
A	PIPE FAB ID	#255	STEP IN SLAB
*3740	SOFFIT HEIGHT		SPRINKLER UNDER DUCT

SPRINKLER HEADS

		THREAD	DESCRIPTION	RESPNCE	K(M)	TMP.	QTY.
	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	68°C	–
	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL PENDANT WHITE	FR	7.1	79°C	–
	15mm		SEMI RECESSED SPRINKLER RESIDENTIAL TEFLON COATED	FR	7.1	68°C	–
	15mm		HSW SPRINKLER BRASS	FR	8.0	68°C	–
	15mm		BELOW DUCT SPRINKLER PENDANT BRASS	FR	8.0	68°C	–
	15mm		EXPOSED SPRINKLER PENDANT BRASS	FR	8.0	68°C	–

ALL PIPE SUPPORT LOCATIONS ARE TO COMPLY WITH TABLE 7.8.6 OF AS 2118.1 – 2017

SYSTEM DESIGNED IN ACCORDANCE WITH AS 2118.1– 2017 (OH2) & 30161019 FER REV 2–0 DATED 09/12/2021

NOTES:

AS BUILT

NORTH

ISSUE	DETAILS	BY	DATE CHKD
AB	AS BUILT	LW	10/05/23

CLIENT
MORRIS PROPERTY GROUP

Auscoast Fire Services
1/105 Spencer Road Nerang, QLD 4211
info @ auscoastfire.com.au
Tel: 07 5596 1270
QBCC: 1114544
ABN: 91 123 601 276

DRAWING TITLE
FIRE PROTECTION SERVICES
SPRINKLER SYSTEM
ROOF LEVEL

PROJECT
ESSENTIA
18 REMEMBRANCE DRIVE
SURFERS PARADISE
QLD

DRAWN BY	DESIGNED BY	APPROVED BY	DATE APPROVED
L.W	L.W	H.M	02/11/21

FILE NAME	PROJECT NO.	SCALE	
2854-FS-09	2854	1:100	A1

DRAWING No	ISSUE
FS-09	AB