



FirePro.

FPX-103C

Fire Control Panel

Issue April 2023
Version 4.0



Reinventing
Fire Suppression

FPX-103C

Dual Loop (Auto/Manual) Fire Control Panel

Operation and User Manual



Guideline	Version 4.0
Guideline issued on	April 2023
Necessary documents to read and use in conjunction with this guideline:	1. FirePro Information, Instruction & User Manual. 2. Annex 2 Marine Manual, of FirePro Information, Instruction & User Manual. 3. FirePro Aerosol Generators Installation Drawings (Appendix 1 (EN), Appendix D (UL) of FirePro Information, Instruction & User Manuals).

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1.0 Overview

This Manual provides information about the FPX-103C detection and activation panel, for use in marine and land applications.

2.0 Technical Characteristics Summary

- Dual detection loops with full fault monitoring.
- Automatic suppression operation after shutdown.
- “Double knock” automatic activation.
- Automatic Engine/fuel/fan shutoff capability.
- “Spin-down” of engine/ fan(s) delay ensures that the extinguishing agent is not vented.
- Extinguishing activation button with anti-tamper tag.
- Universal 12 or 24Vdc electrical power.
- Low power consumption in “PARKED” mode.
- Full fault monitoring on all detector and “firex” circuits.
- Supports up to 4 aerosol fire suppression generators.
- Very low false activation potential, tamper seal on “ManOp”
- The unit is reverse polarity, transient and EMC protected.
- Custom programming logic available on request.



Figure 1, FPX-103C Control Panel

Shutdown and delayed “firex” activation improve effectiveness and save cost of extra extinguishant. Most of the existing extinguishing systems release the agent into a high airflow environment which makes them almost completely ineffective.

The FPX103C Fire Control panel aims to effectively eliminate false activation which may be caused by the inherent characteristics of microprocessors, semiconductor power switches and inquisitive fingers. The tamper evident tag technology and strict electronic design rules have been proven highly effective in achieving this. To eliminate the inherent hazards of microprocessor control, the FPX103C uses a fully parallel path programmable logic device, which is coded using VHDL programming language, commissioned by US DOD and used for high reliability and safety critical applications.

3.0 Technical Features

- 2-wire Smoke, Thermal or Linear Heat Detector cables up to 50 meters are continuously monitored for alarms, open circuit, and chassis faults.
- LED flash codes indicate the location of an alarm or fault condition.
- An internal alarm sounder and relay to drive a loud external audible alarm unit up to 2Amps.
- Uncommitted relay change-over contacts are available for fuel shutoff, engine/fan shutdown.
- The delay option provides a selectable count down timer. “PARKED MODE” is entered when the panel senses that PW1 is turned off and provides automatic suppression operation should both loops alarm - switching off engine during a double alarm will also enter timed auto activation mode.

There is an electrical input for an override key-switch to circumvent shutdown circuits for restarting.

4.0 Functional Notes

Any loop alarm condition will operate audible and visual alarm indications as follows:

- Single loop alarm condition produces internal pulsed alarm (1 per sec) and fan shutdown.
- Dual loop alarm condition produces internal pulsed alarm (2 per sec) and automatic extinguishing and fuel solenoid operation after count down timer (user set on dip switches), audible alarm goes continuous.
- Alarm LED flash code indicates which loop is in alarm (1=1blink, 2=2blinks, 1&2=3blinks).

The count down timer allows time for fan and engine to stop before the FirePro condensed aerosol generators are activated. This is to avoid leakage through vents.

The timer tracks the spin-down of engine/fan(s) as a result of PW1 switch-off or shutdown by FPX103C as a result of an alarm (from either detectors or manual operate switch). With the PW1 off, the unit enters low power mode and the ON LED will flash to conserve power.

Single flash shows the count down timer is still counting (fans still turning), then adopts a double flash "heartbeat" indicating that "parked mode" is active and suppression operation will be immediate on double alarm or manual operate. In "parked mode" (PW1 off for longer than count down delay) then the fuel solenoid will operate on first alarm and suppressing immediately on second alarm.

Switching on the PW1 even for a short time will restart the count down timer which is also active on initial power-on.

Count down timer is selectable:

No, AUTO, IMMEDIATE, 5 to 30 seconds, 5 seconds increments. A fault in one detector loop will cause the auto mode to fail (because of the double knock logic). However, when operating in "PARKED" mode, after a single loop alarm, the controller can activate the generators.

When the controller is manually activated, the engine/ fan(s) must spin-down before the fire suppression activation. After 125ms filter time the unit will confirm activation request by flashing 2ALARM=AUTO LED and internal beeper, fan and fuel solenoid shutdown relays are activated immediately. After the count down period the suppression will operate, and the beeper will go off continuously.

5.0 Panel LED indications

The panel facade has two distinct areas, for extinguishing and detection status with separate LED flash pattern indications for each detection loop (1 and 2):

- Power On (Green LED)
- Detector Alarm (Red LED) - inverse flash pattern indicating affected loop
- Detector Loop Fault (Red AMBER) - inverse flash pattern indicating affected loop
- 2 Alarms=Auto Active (Red LED)
- Suppression output Fault (Red AMBER)

Internal sounder will operate on anything that requires user attention (alarm or fault).

6.0 Controls

- Extinguishing manual operation button (behind tamper evidence tag).
- Auto mode time delay selector DIP switch on panel rear (delay = binary value * 5 seconds):
SW1-3 off-off-off = immediate, on-on-on = Auto Disabled, on-off-off=5sec, off-on-off=10sec, etc (see Section 9 below).

SW4 on = vfc operates on single alarm, off = vfc operates on double alarm.

7.0 Connections

BLOCK 1 (6 way)	BLOCK 2 (6 way)	BLOCK 3 (6 way)
GND	Detector Loop1A	FirexA
External Alarm Output (Power via 2A N.O. relay contact)	Detector Loop1B	FirexB
GND	Detector Loop2A	GND
PW1 (11-32vdc via 4A fuse) input (sets auto PARKED mode when off)	Detector Loop2B	VFC (2Amps Max)
PW2 (11-32vdc via 4A fuse)	GND	NO VFC (2Amps Max) COM
GND	Aux input	VFC (2Amps Max) NC

Table 1, Control Panel Connections

8.0 Electrical Specification (at 24VDC supply unless otherwise stated)

Power Supply	Operating Voltage	11 to 32V DC
	Quiescent Current Ign Off	8.5mA Typ (excluding external load currents)
	Ign On	16mA Typ (excluding external load currents)
	Maximum Alarm Current Draw	100mA (excluding external load currents)
	Maximum Current draw	3A (including suppression output operating current)
	Parked current draw	8.5mA Typ
Suppressor Activation	Discharge Current	1A to 4A depending on voltage and number of suppression generators (1.6 – 3 Ohms nominal each unit) Up to 2 suppression generators on 12V Up to 4 suppression generators max on 24V Connect in series with bi-directional diodes across each suppression generator.
	Current/Time Limit	Output is Vin via switch with 6 Ohms in series. Constant I ² T limit = 9 Amp ² *Seconds
	Monitoring current	<4mA, Fault if loop R>300, 12Vmax o/c voltage
Aux In (Override key)	Monitoring current	1.2mA Nominal
	Sense Logic	Norm S/C, >1K active typ.
Sensor Loop Inputs 1+2	Max Output voltage	12VDC regulated, filtered and transient protected
	Output current limit	25mA per loop
	Alarm condition threshold	<700 Ohms Nominal
	Fault condition threshold	Approximately 20K Ohms
	End Of Line Resistor	10K Ohms
	Fault monitoring	Open circuit or ground fault = fault indication
Alarm Output	Relay Contacts	2A @ VinDC (Vin thru NO relay circuit)
VFC Output	Relay Contacts (voltage free)	2A @ 24VDC (relay changeover circuit)
Mechanical	Dimensions	H=82mm * W=83mm * D=25mm
	Mounting	75mm diameter round hole, retained by four #6*25 self-tapping screws
	Connections	Via 3 * 6 way terminal block accepting <1mm ² wires with ferrules

Table 2, Electrical Specifications

9.0 DIP Switch Settings (Black = switch tab)



DIP switches 1, 2, and 3 set a delay time between shutdown (VFC) and subsequent suppression automatic activation. Delay can be set at 0 to 30 seconds in 5 second steps. Manual only mode can be set with ON.ON.ON.OPT



DIP switch 4 defines critical alarm Option.

The default setting is OFF which requires 2 loops to be in alarm (OPT="double knock") before shutdown and time delayed suppression activation.

Moving to ON position requires only one loop to be in alarm (OPT="single knock") before shutdown and time delayed suppression activation.

Note that the panel commences activation delay following depowering of PW1 input. The instant mode is indicated by flashing green PWR LED which gives double flash whilst moving through the delay and single flash on reaching zero delay instant mode.

Fan/Engine "Count-down" delay time before automatic release.

Note: Count-down delay only when PW1 is ON.

DIP Switch setting			Time Delay
OFF.OFF.OFF.OPT	ON OFF		0 Sec = Immediate
ON.OFF.OFF.OPT	ON OFF		5 Sec
OFF.ON.OFF.OPT	ON OFF		10 Sec
ON.ON.OFF.OPT	ON OFF		15 Sec
OFF.OFF.ON.OPT	ON OFF		20 Sec
ON.OFF.ON.OPT	ON OFF		25 Sec
OFF.ON.ON.OPT	ON OFF		30 Sec
ON.ON.ON.OPT	ON OFF		No Automatic Operation / Manual Activation Only

Table 3, Control Panel -Programming – DIP Switches

More detailed information related to all the different combinations of dip switches can be found at Annex 4 "Detail Programming of DIP Switches".

10.0 Outline & Mounting drawings

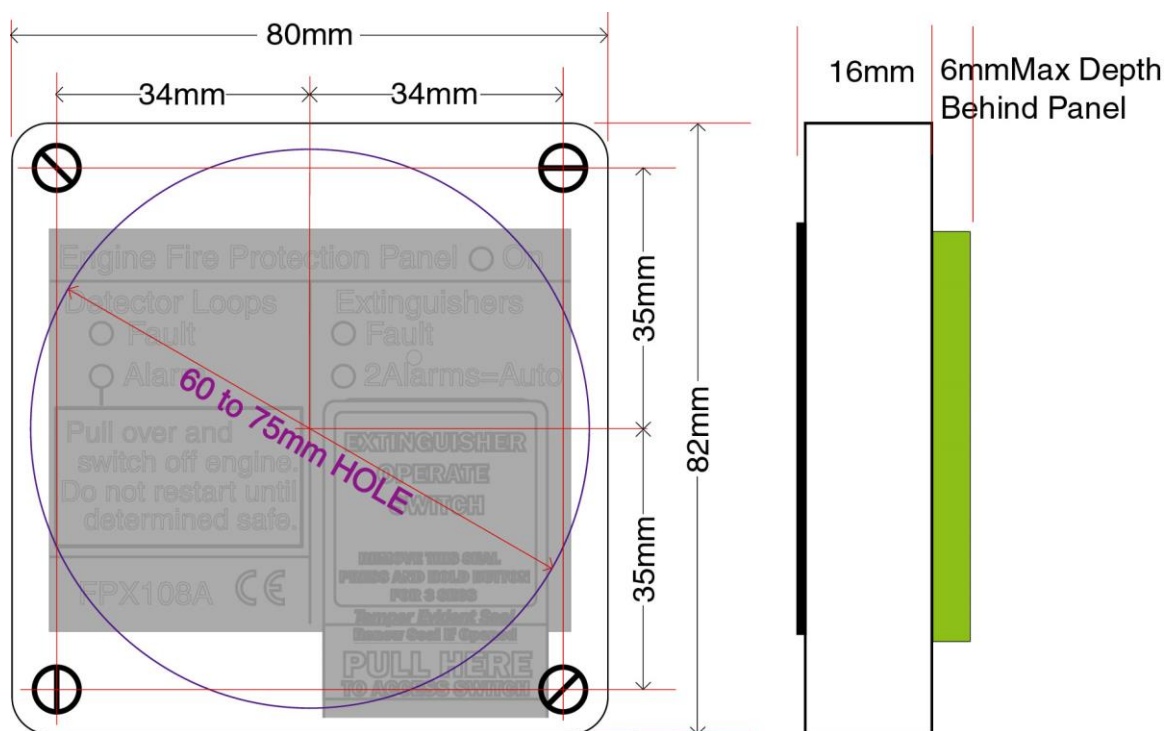


Figure 2, Panel dimensions

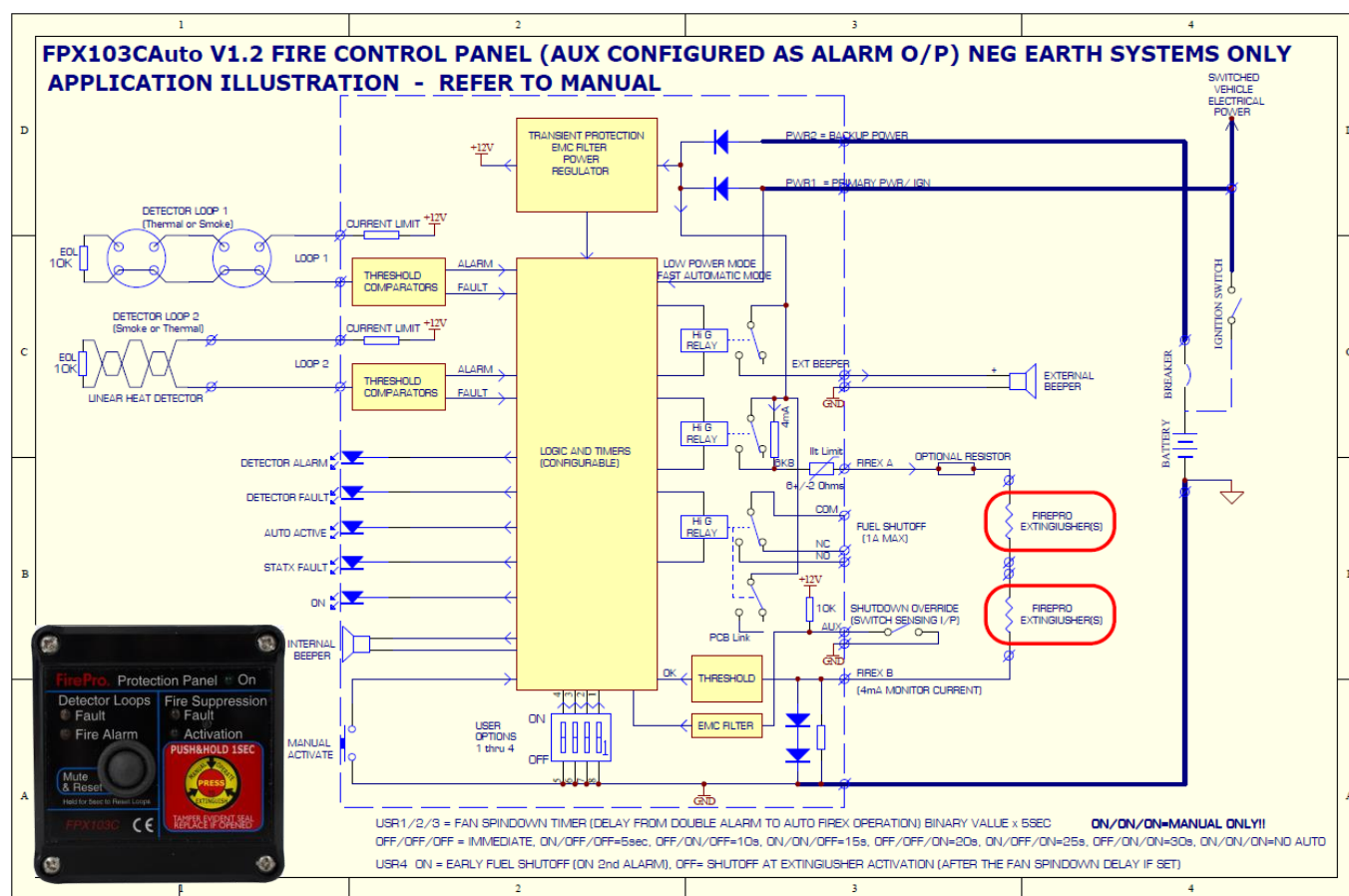


Figure 3, Panel internal logic

11.0 Installation Notes

Ensure that Linear Heat Detector cables or detectors are suitably mounted to withstand vibration levels. The control panel is IP65, but it must be located/installed in such a way as to prevent excessive moisture or water getting to the unit, especially through the rear connections.

Also install at locations where excessive direct solar exposure is avoided.

WARNING!

System installation must be verified by a competent technician familiar with regulations governing such installations. Do not install in Engine, bilge, fuel or gas storage compartments (see RCD and ISO9094).

In the event of an alarm, shutdown the engines and ventilation immediately. The cause of the activation must be found and corrected before restarting.

DO NOT PROCEED TO OVERRIDE UNLESS IT HAS BEEN DETERMINED SAFE TO DO SO.

12.0 Typical Application wiring

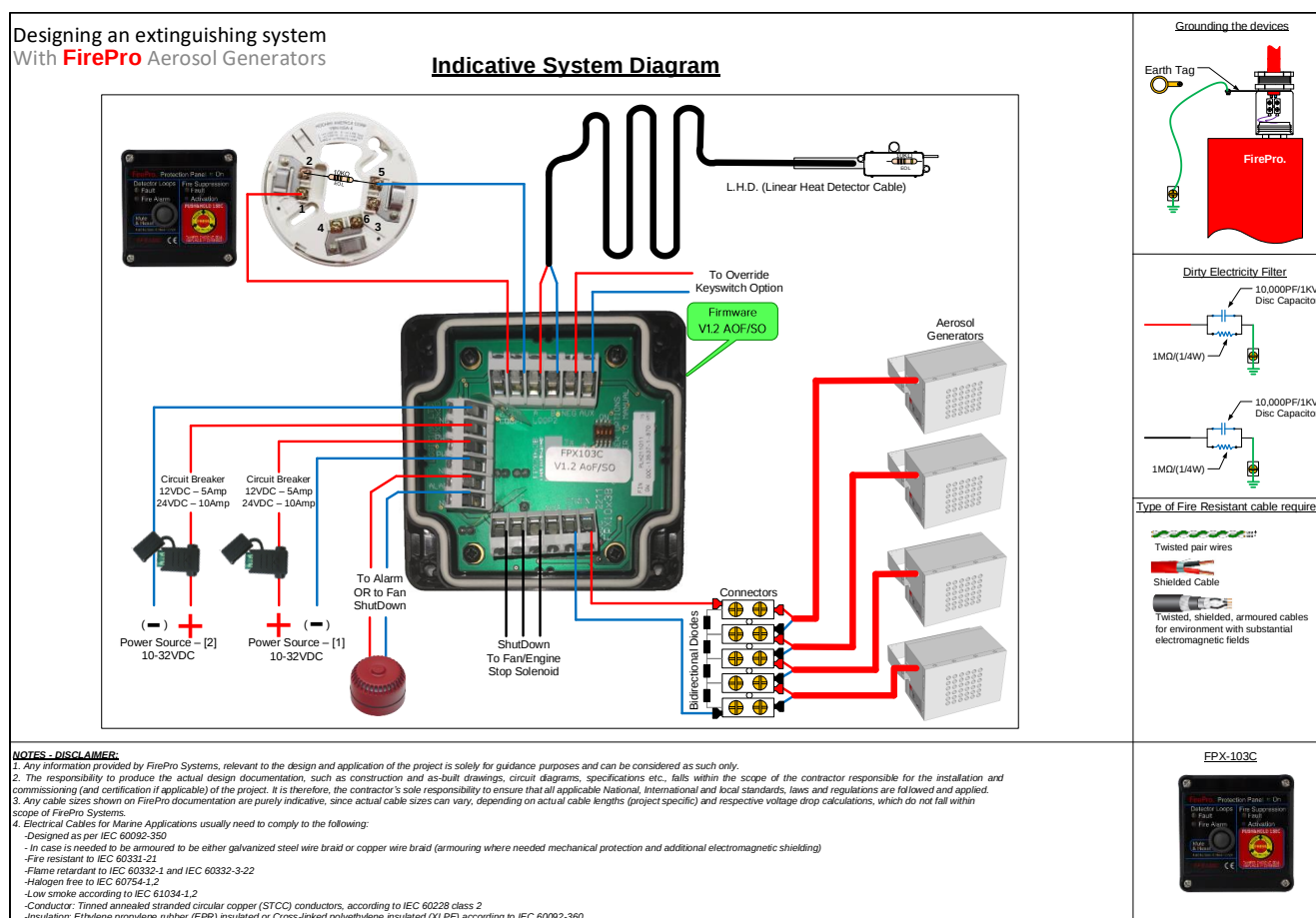


Figure 4, Typical application wiring

13.0 Typical Application wiring – Marine Applications

The FPX-103C Fire Control panel is a Maritime and Coastguard Agency (MCA) approved panel along with the FirePro Aerosol Generators for machinery spaces of small crafts, for vessels of less than 24 metres load line length, where the space to be protected does not exceed a deck height of 4 meters or an area of 63 square meters.

In marine applications, the fire-fighting systems are manually operated. In cases where an automatic activation is required, the system design should include an Isolation Switch if there is a possibility of people entering the protected space. Below you can find two typical examples for manual and automatic activation systems.

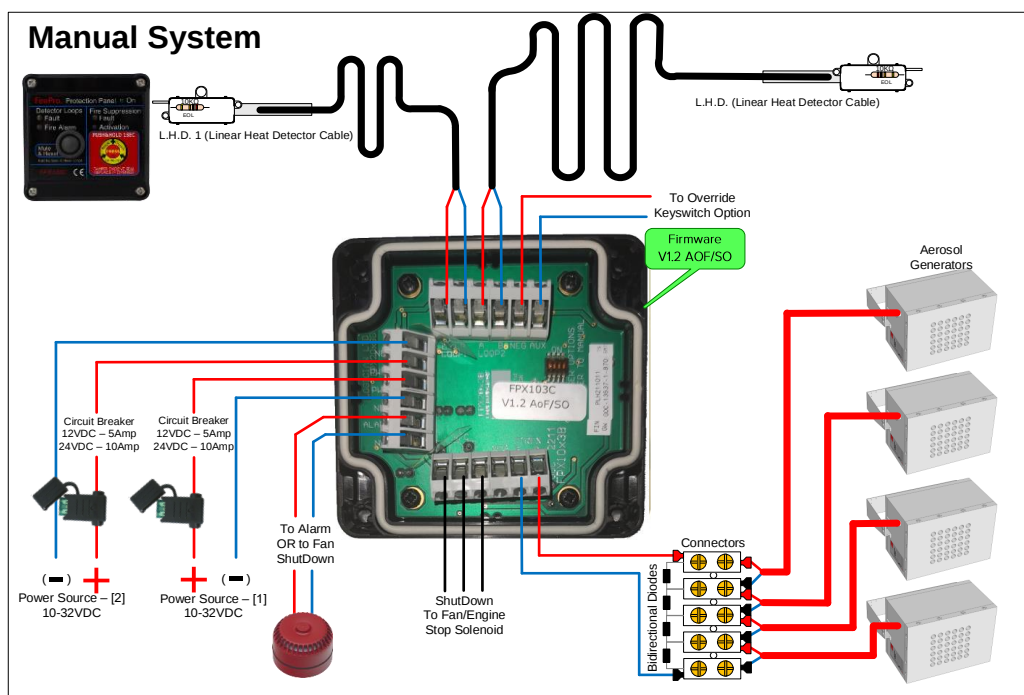


Figure 5, Typical application- Manual system

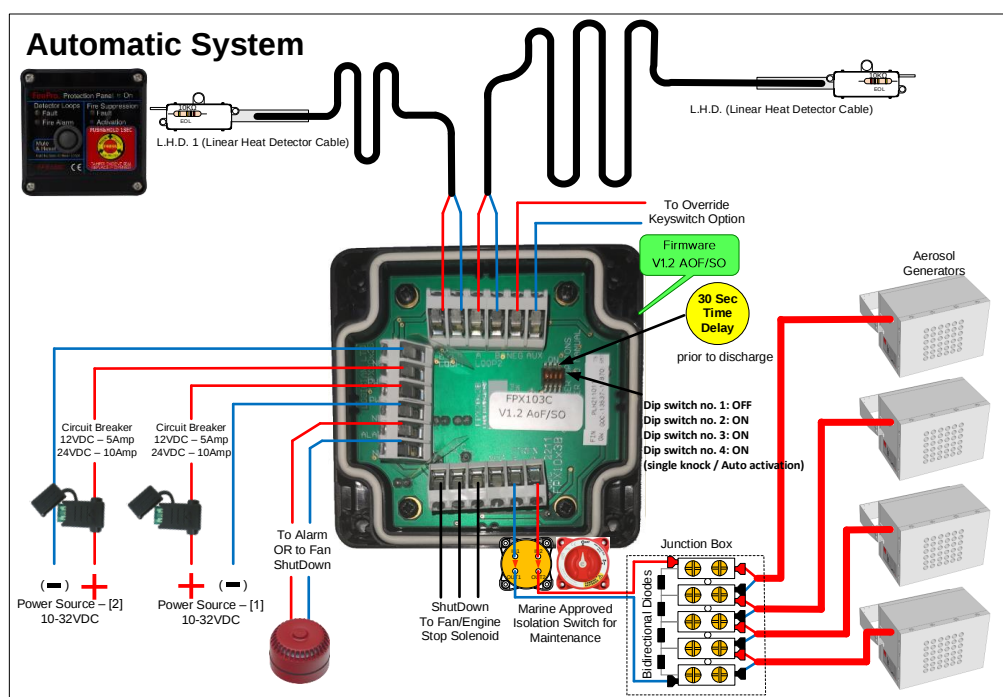


Figure 6, Typical application- Automatic system

14.0 Testing and Commissioning

After completing the installation and wiring of all equipment, the system should be commissioned to validate that it operates as designed with no faults.

14.1 Testing the Detection line

In a system where automatic detection is used:

1. Connect the End of Line (EOL) termination resistance (supplied with the FPX-103C panel) at the end of the Detection Zone/Loop 1 (the detection loop can be comprised of a Linear Heat Detection cable or conventional Smoke or Heat Detectors or other conventional detectors, suitable for use in the specific application, connected in a Zone/Loop).
2. Confirm that the panel detects the presence and the absence of the EOL resistance → the “**Detector Loop(s) Fault**” LED indicator will turn OFF and the buzzer will stop sounding if the detection loop identifies the presence of the EOL resistance. Similarly, the “**Detector Loop Fault**” LED indicator will turn ON (Red AMBER) and the buzzer will start sounding if the detection loop identifies the absence of the EOL resistance.
3. Upon completion of the above (i.e. testing of Detection Zone/Loop 1), repeat steps 1 and 2 to test Detection Zone/Loop 2, if used.

14.2 Testing Detection line Alarm conditions

In order to test whether the panel correctly identifies Fire Alarm conditions:

1. Short circuit the LHD cable (or other detectors) installed on Zone/Loop 1, at the End of Line (EOL) * → If the “**Detector Loop(s) Fire Alarm**” LED indicator turns ON (Red) and the buzzer sounds, then the Fire Alarm conditions have been correctly confirmed.
2. Repeat step 1 above to test Detection Zone/Loop 2, if used, for Fire Alarm conditions in the same way.
3. Ensure that the (post-)Alarm Outputs are activated upon verification of Fire Alarm conditions (as per steps 1 and/or 2) → Shut Down Relay output has latched, and the Alarm (Siren) output has been activated.

** The detection loop resistance drops below the 700 Ohm Alarm condition threshold when short circuited*

14.3 Commissioning and Testing of correct Aerosol Generator(s) connection

In order to test whether the Condensed Aerosol Generators have been correctly connected at the Fire Extinguishing loop make sure you have installed the Bidirectional Diodes of type 1.5KE15CA (1500W) in parallel to each Aerosol Generator as per the below schematic diagram:

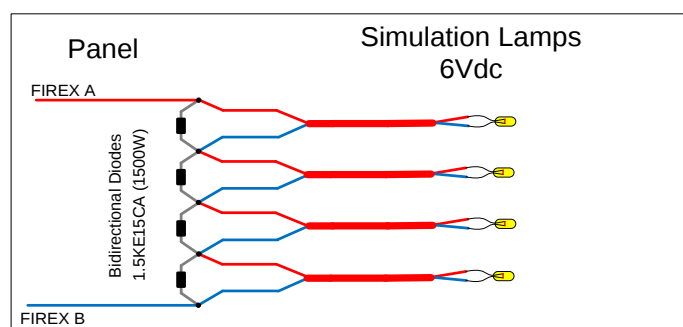


Figure 7, Typical connection of bidirectional diodes and aerosol generators

For Testing and Simulation purposes, each Aerosol Generator is disconnected and replaced by a simulation lamp as per the following guidelines, **after switching** the panel and the whole system **OFF**:

- If 4 Aerosol Generators are connected – replace with 4 lamps rated 6 Volts each

- If 2 Aerosol Generators are connected – replace with 2 lamps rated 12 Volts each
- If 1 Aerosol Generators are connected – replace with 1 lamp rated 24 Volts

NOTE: If 3 Aerosol Generators are connected, you can use either 6 Volt or 12V simulation lamps, which will illuminate either slightly brighter or dimmer respectively, when connected.

The above used simulation lamps should have a Resistance rating between 40 and 70 Ohms.

14.4 Testing Fault conditions

In order to test whether the panel correctly identifies Fault conditions on the Extinguishing line/loop, follow the steps below:

1. Upon correctly commissioning and testing the system by using lamps to simulate the Aerosol Generators, as per section 14.3 above, disconnect one simulation lamp at a time. This should initiate Fault conditions.
2. The “**Fire Suppression Fault**” LED indicator should turn ON (Red AMBER) and the buzzer should sound → This means that the panel has correctly identified the Fault.
3. Upon completion of thorough testing as per steps 1 and 2 above, reconnect the simulation lamps.

14.5 Testing of Fire Suppression procedure

In order to test whether the panel correctly simulates the fire suppression procedure:

Depending on the configuration of the panel – i.e. if it is set on Manual or Automatic mode – initiate Fire Alarm and Suppression conditions as follows:

Manual mode: Press the Manual Release button (“Push & Hold for 1 sec”) and observe whether the panel “**Fire Suppression Activation**” LED illuminates and the simulation lamps also turn on.

Automatic mode: Initiate Fire Alarm conditions according to the detection used (see section 14.2) and observe whether the panel “**Fire Suppression Activation**” LED illuminates and the simulation lamps turn on (after the pre-programmed time delay, if any, as set by the dip switches – see section 9 above).

14.6 Return to operating conditions

After performing the above testing/commissioning procedures and verifying that the panel/system is operating as intended:

1. Reset the panel to normal operating conditions.
2. Power OFF the panel/system completely and remove the simulation lamps.
3. Before re-connecting the Aerosol Generators, ensure that the resistance at the electrical actuator terminals lies within the acceptable limits – i.e. between 1.6 and 3.6 Ohms – as demonstrated by the schematic below:

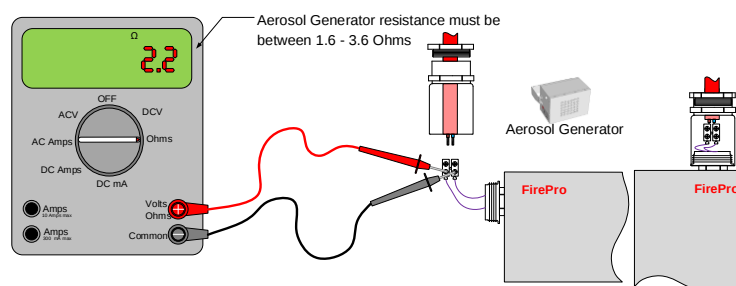


Figure 8, Measuring the Aerosol Generator resistance

4. Re-connect the Aerosol Generators.
5. Power ON the panel/system.

15.0 Additional Technical information

15.1 FPX-103C Panel operating temperature range:

Operation temperature range -20 to +71C.

15.2 FPX-103C IP rating:

IP65 with back box, cable glands and tamper tag correctly fitted. IP rating with direct panel mount depends primarily on seal achieved with panel surface (use a gasket to seal if required).

15.3 FPX-103C EMI/EMC standards met:

The susceptibility to electromagnetic interference is largely dependent on the specific installation – wire harness lengths and structure materials involved.

Any meaningful EMC qualification must be performed on an installed system. There are no specific level requirements in the CE root documents Recreational Craft Directive.

There is extensive EMC protection on all inputs, outputs and power connections for 20V/m radiated emissions 500KHz – 5GHz.

Upset tests for specific threat frequencies have been performed on first article product - mobile phones/3G also VHF (160MHz marine band) and UHF (446MHz PMR and 462MHz FRS/GMRS).

15.4 Automatic changeover power sources

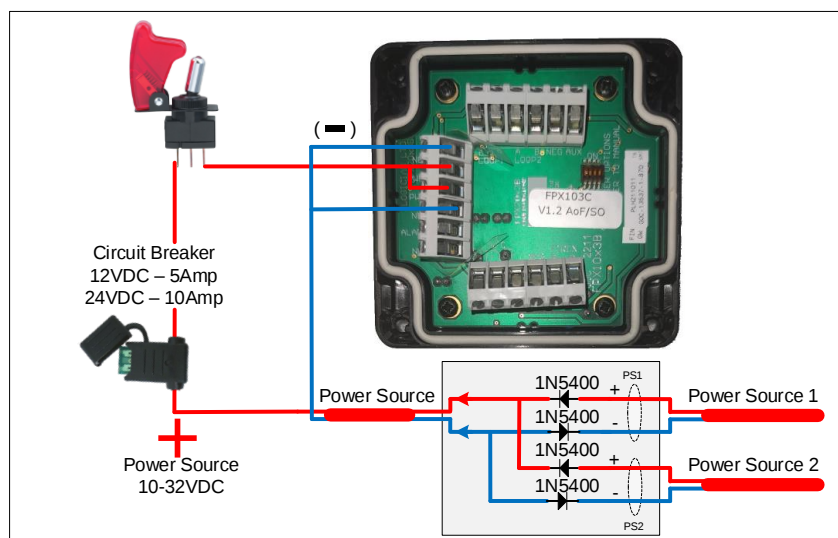


Figure 9, Automatic changeover power sources with diodes

16.0 System Design Recommendations

Below are our marine system design recommendations:

16.1 Electrical Cables for Marine Applications usually need to comply to the following:

- Designed as per IEC 60092-350, or IEC 60092-376.
- Fire resistant to IEC 60331-2, or IEC 60331-2.
- Flame retardant to IEC 60332-1-2 and IEC 60332-3-22.
- Halogen free to IEC 60754-1, and -2.

- Low smoke according to IEC 61034-1,2.
- Conductor: Tinned annealed stranded circular copper (STCC) conductors, according to IEC 60228 class 2.
- Insulation: Ethylene propylene rubber (EPR) insulated or Cross-linked polyethylene insulated (XLPE) according to IEC 60092-360.
- Sheath according to IEC 60092-360.
- In cases where armoured cable is used, select either galvanized steel wire braid or copper wire braid (Cable Armouring is not compulsory, consider only for cases where additional mechanical protection and additional electromagnetic shielding is deemed necessary).



Figure 10, Cables

Electrical Cable selection to reduce EMI by Shielded Twisted Pair Cable (STP).

- The STP cabling¹, works by attracting electromagnetic interference (EMI) and neutralizing it through proper grounding. Issues can arise if the cable is improperly grounded. If not grounded properly, STP may lose its ability to cancel EMI, RFI emissions.

[1] STP Cabling is twisted-pair cabling with additional shielding to reduce crosstalk and other forms of electromagnetic interference (EMI).

- The Aerosol Generators housing must be insulated from any metallic structures from the vessel's keel by using sleeves and connected to the shield of the extinguisher line cable.

The Annex 4 "Wiring Diagram" of this manual illustrate how the cables of a Fire Suppression System on the vessel should be properly grounded, as well as the proper use of sleeves.

16.2 Sleeves for Aerosol Generator Bracket.

The housing of the Aerosol Generators must be insulated from the keel of the vessel using sleeves.

- Four sleeves are required to be attached to the four screws that secure the aerosol generator to its bracket.
- Ensure that the appropriate sleeves and brackets are used.

The Annex 4 "Wiring Diagram" of this manual illustrates how to properly install the sleeves.

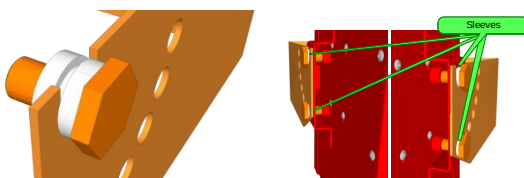


Figure 11, Sleeves

16.3 Isolation/Disconnect Switch

- An Isolation/Disconnect switch should be fitted between the manually operated fire control panel and the Aerosol Generators' electrical network.

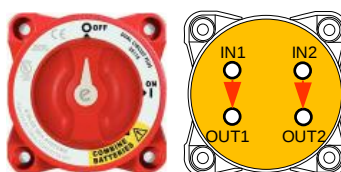


Figure 12, Isolation Switch

17.0 Post-discharge

After release, before substituting the activated aerosol generators, the fire suppression system should be thoroughly inspected to confirm that it is operational as per manufacturer's guidelines.

17.1 Post-discharge Steps

- Step 1. Record the status of the system for future reference of an investigation report.
- Step 2. Power Off the system.
- Step 3. Ensure that the extinguishing output is disconnected by activating the Manual Extinguishant Disablement Switch.
- Step 4. Follow the cleaning procedures as indicated in the FirePro Information, Instruction & User Manual, "Residue, Removal, Dismantling of generators, Waste, and Environment" section, with section number 13 for the EN manual and section number 14 for the UL manual.
- Step 5. Replace the aerosol generators with simulation lamps.
- Step 6. Follow the instructions as mentioned in section "14.0 Testing and Commissioning" of this guideline.



18. Annexes



Annex 1 - Easy Plug Connectors.

It is strongly recommended that Easy Plug connectors or similar connectors are employed with every FirePro System, as indicated in the technical guideline “Installing Cable Connector (Plugs) On Condensed Aerosol Fire Suppression Systems”.

The use of connector plugs is essential for commissioning and maintenance purposes since it will:

- Disconnect all power supplies from the marine control panel of the fire extinguishing system.
- Disconnect the Aerosol Generators from the rest of the system especially when the vessel is at the shipyard or in the drydock, for prevention or periodic maintenance.

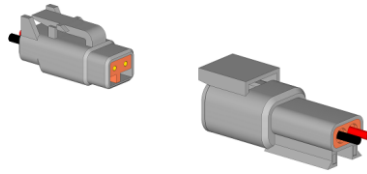


Figure 13, Plug Connectors

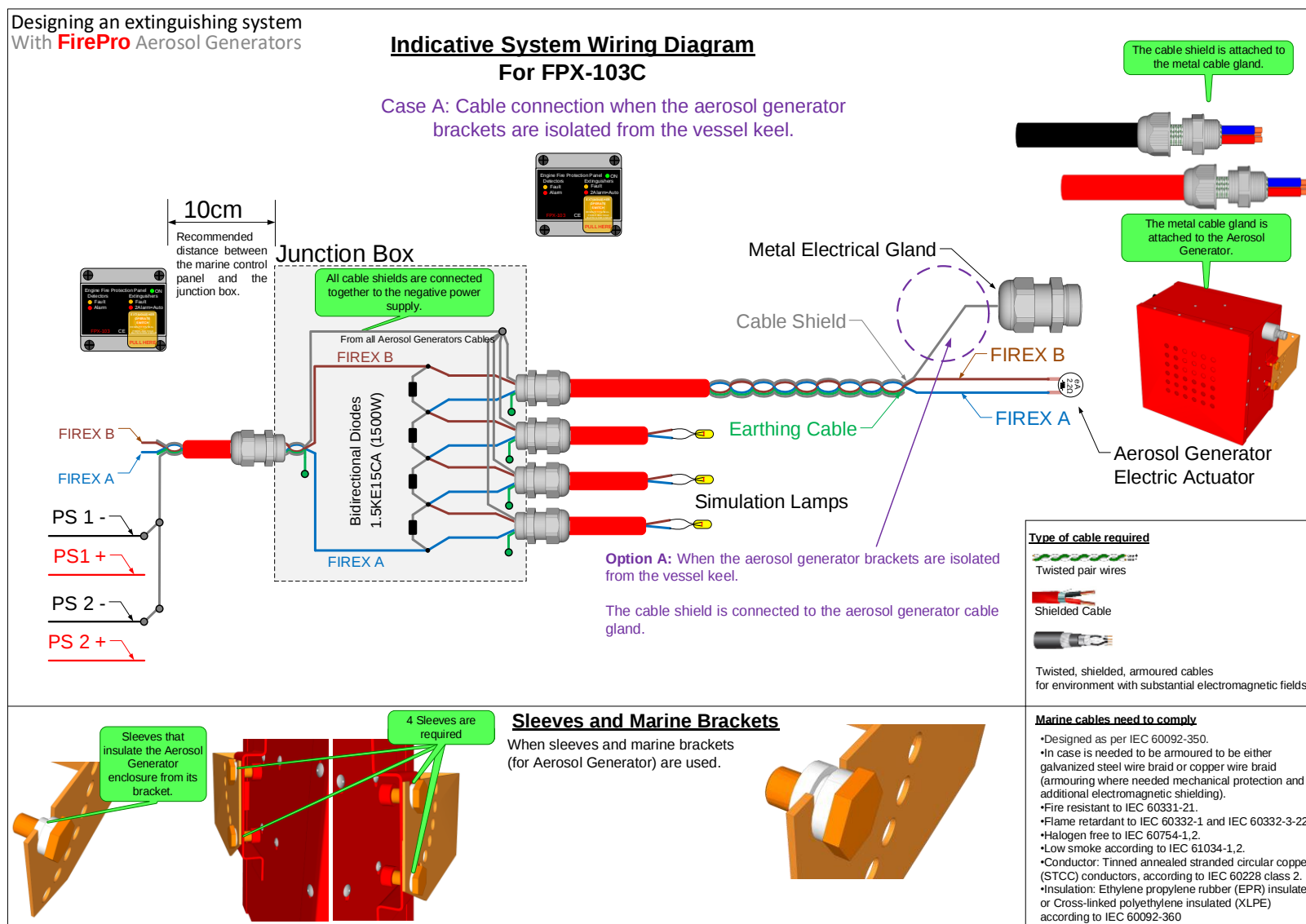


Figure 14

Annex 3 - Wiring Diagram – Case B

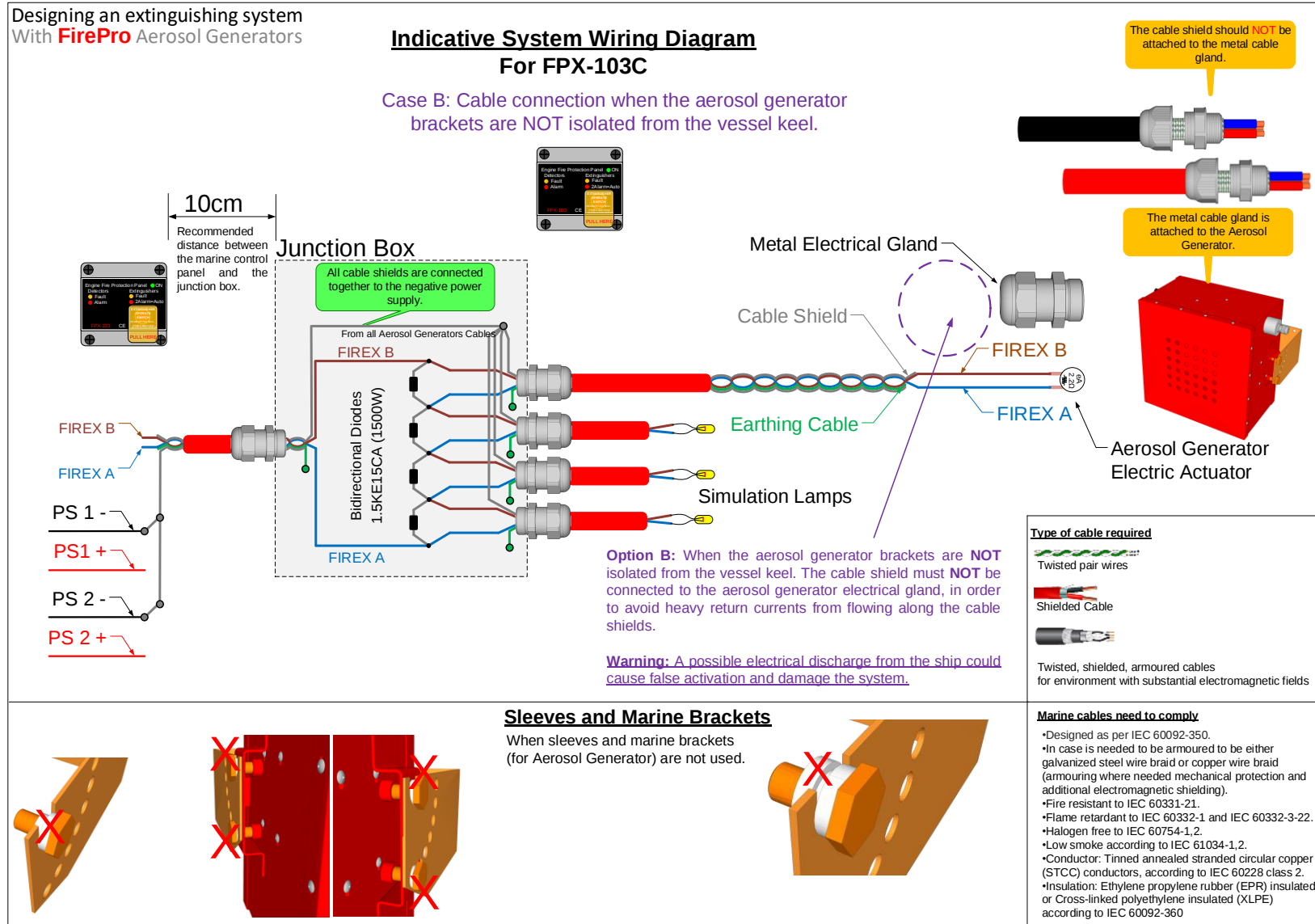


Figure 15

Annex 4 - With External Filters

Designing an extinguishing system
With **FirePro** Aerosol Generators

Indicative System Wiring Diagram FPX-103C with external filters

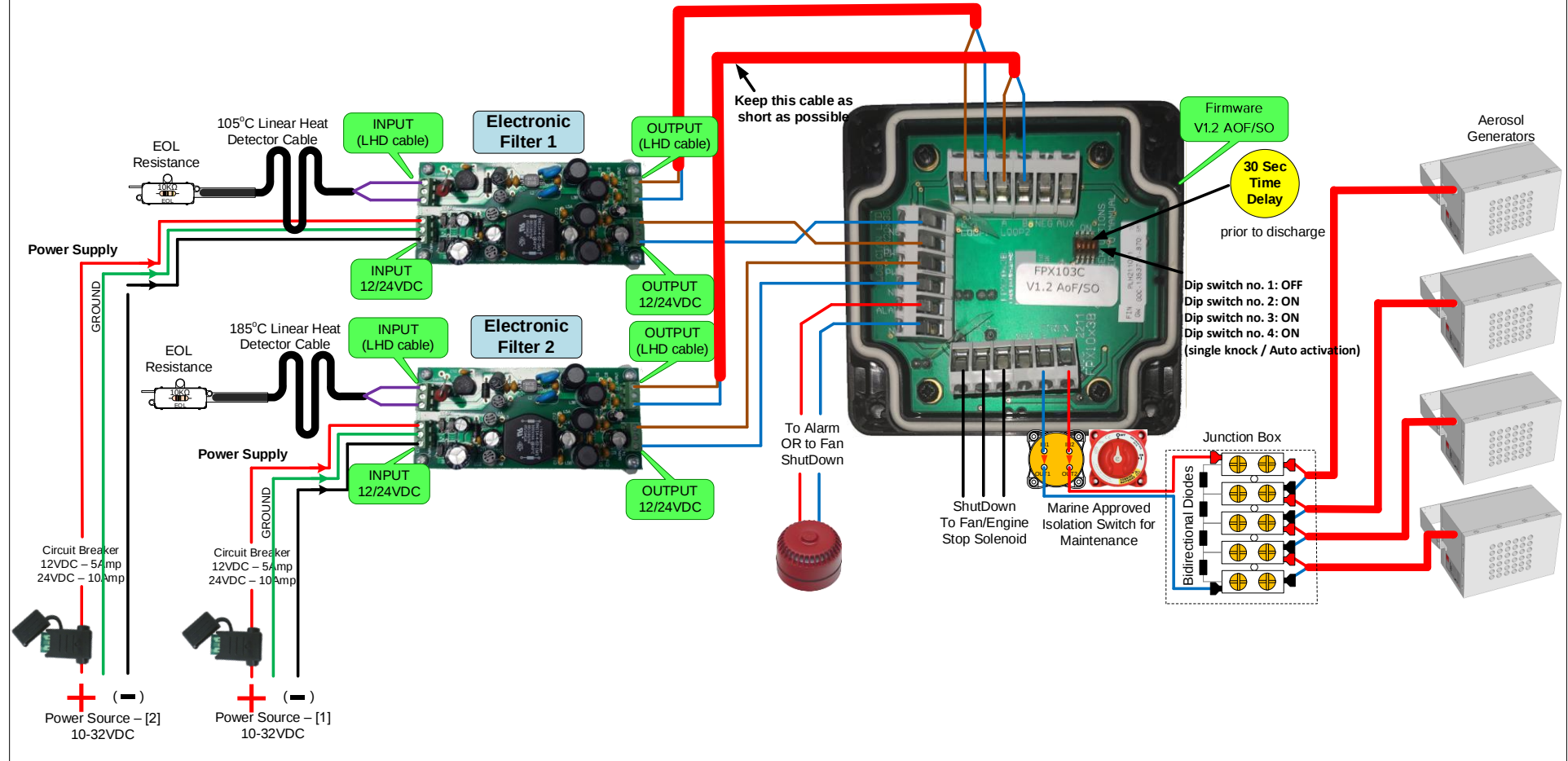


Figure 16

Annex 5 – Indicative Fire Suppression System with FPX-103C

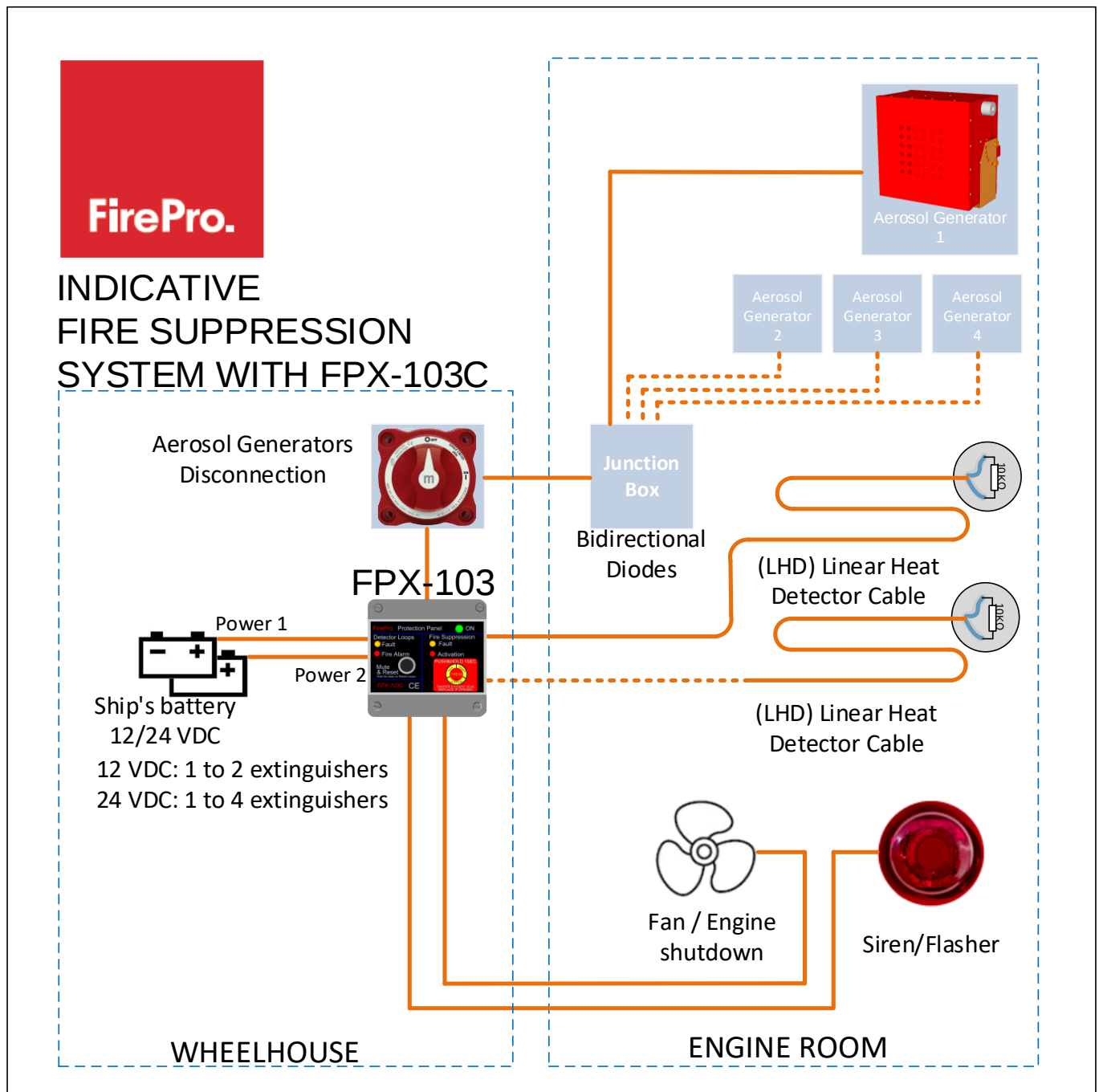


Figure 17

Annex 6 – User Instructions with FPX-103C

FirePro. FPX-103 Marine Control Panel



USER INSTRUCTIONS

Before initiating the release of the FirePro Condensed Aerosol Fire Suppression System:

1. Make sure that fire dampers and doors are closed
2. Turn off all electrical equipment
3. Engines must be stopped in case the engine room is under fire
4. Evacuate the protected area

Initiating the release of the FirePro Condensed Aerosol Fire Suppression System:

1. Check the Power ON (Green LED)
2. Remove the tamper evident seal
3. Press the **“Manual Operate Extinguishing Switch”** for 3 sec
4. Alarm will start
5. Automatic engine/fuel/fan shutoff will be activated
6. FirePro Condensed Aerosol Fire Suppression System will be activated after the time delay period is expired

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