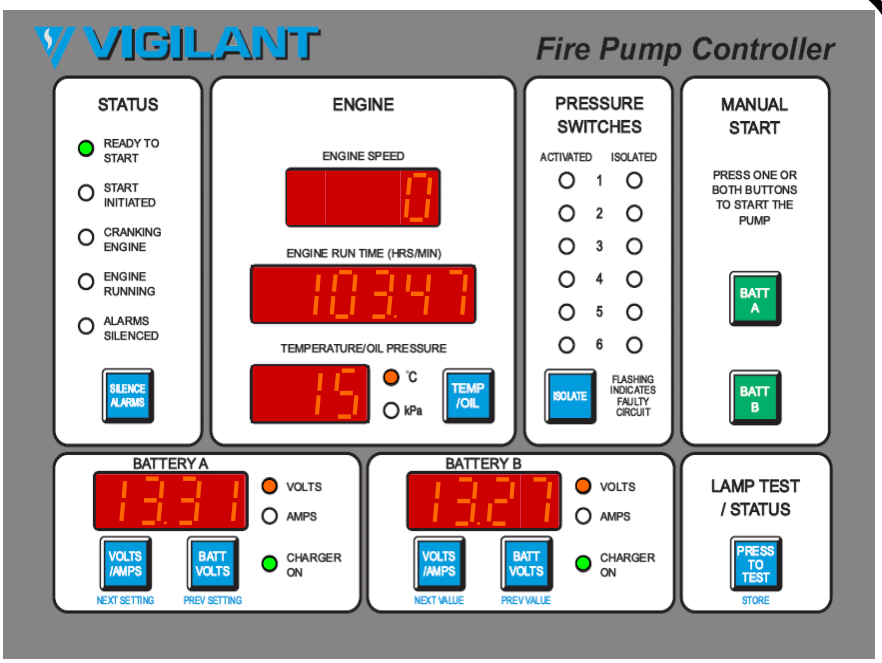
FPC-07

Fire Pump Controller

Installation/ Operation Manual



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Issue 1.1

tyco
Fire Protection Products

Manufacturer's Details

Standards Compliance	NZS 4541:2007, NZS 4541:2003, AS/NZS CISPR 22:2006 (EMC), AS/NZS 60950:2003 (Electrical Safety)
Manufacturer	The Vigilant FPC-07 Fire Pump Controller is manufactured by: Tyco Fire Protection Products 17 Mary Muller Drive Christchurch 8022 New Zealand
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Document	Document Number : LT0456 Issue: 1.1 9 August 2011
Firmware Revision	1.1
Amendments	1.0 Original. 1.1 New charger spare parts added.

Table of Contents

PROGRAMMED CONTROLLER SETTINGS FOR THIS INSTALLATION

The particular configuration values for this installation should be recorded here for reference in case of controller CIRCUIT BOARD replacement and the need to re-program a replacement.

Setting Name	Value	Units
Number of Pressure Switches		-
Recycling Delay		seconds
Crank Fail Time		seconds
Temperature sender type		-
Max. engine temperature		°C
Min. engine temperature		°C
Pressure sender type		-
Min. oil pressure		kPa
Max. battery voltage		volts
Min. battery voltage		volts
No of pulses per engine rev.		-
Engine crank speed threshold		rpm
Engine run speed threshold		rpm
Engine overspeed limit		rpm
Off normal battery voltage	Yes / No	-
Off normal engine readings	Yes / No	-
Off normal sensor connections	Yes / No	-
Off normal charger fail	Yes / No	-
Off normal start fail	Yes / No	-

Installation Name: .....

Date Installed: .....

Chapter 1
Introduction

Using this Manual

This manual contains information for personnel engaged in the installation, commissioning, and routine maintenance and testing of a diesel pump set containing the Vigilant FPC-07 Fire Pump Controller unit.

The manual has the following chapters:

1. Introduction - an introduction to this manual.
2. System Description - a brief description of the FPC-07.
3. Specifications - a summary of FPC-07 specifications.
4. Interpreting the Displays - how to read the display panel.
5. Using the Control Panel - what the controls on the panel do.
6. Alarm Displays - what the alarm displays mean.
7. Installation Information - Mounting and wiring the controller.

Associated Documentation

FPC-07 Technical Manual - provides complete details on planning, commissioning and configuring the FPC-07, as well as technical descriptions and schematics of the internal electronics.

The ordering code of the FPC-07 Technical Manual is LT0457.

Chapter 2
System Description

Overview

The Vigilant FPC-07 Fire Pump Controller is an intelligent microcontroller-based battery charger and control unit intended for use with diesel engine pump sets. It provides displays of engine and battery condition, monitors up to six pressure switch circuits, and will attempt to automatically start the engine when any pressure switch operates. It will generate alarm signals in the event of abnormal engine or battery conditions.

Display Panel

The FPC-07 has five electronic digital displays, associated status indicators, and two mechanical gauges. The electronic displays show the state of the batteries, pump engine and pressure switches, while the mechanical gauges show the suction and delivery pressures from the pump.

Control Keys

Adjacent to the electronic displays are ten pushbutton controls, which allow the operator to test the displays, silence alarms, check battery condition, and manually start the pump set.

Each key is labelled in white according to its functions. Some keys have alternate functions in programming mode; these are the blue legends under the key. This manual does not deal with programming the controller; refer to the Technical Manual.

With the exception of the Manual Start buttons, all keys produce a brief "beep" from the internal buzzer when pressed. The use of the controls is detailed in Section 5.

Chapter 3
Specifications

Physical

Dimensions	800H x 500W x 200D (including gauge housing)
Weight	20kg
Cabinet Material	1.6mm Zintec
Finish	Red ripple powdercoat
Mounting Holes	Four points, up to M12 fasteners. See drawing 1941-42 for dimensions.

Power Supply

Single phase 230V 1A AC, permanently connected to internal switched outlets. Standby power taken from pump set engine batteries.

Environmental

Ambient Temperature:	-10°C to +55°C
Humidity:	0-95% RH (non-condensing)
Cabinet Rating	IP54 (nominal, not formally certified)

Battery Chargers

Dual constant-voltage type, either 12V or 24V. Independently capable of supplying at least 6A charge current (suitable for engine batteries up to 120Ah). Tolerant of short circuit and/or reverse battery connection.

Engine Sensor Types

Proximity detector: NPN type, 12V type (for both 12V and 24V systems).
Autonics PR12-2DN, PR18-5DN, or PR18-8DN
Compatible temperature senders: VDO type 320-002
Compatible oil pressure senders: VDO type 360-002

Engine Start Outputs

Two outputs, START A and START B, each switching the respective battery voltage. Each is one set of Normally-Open contacts rated at 5A, with suppression diodes across each contact set.

Other Outputs

Pump Running:	One set of voltage-free 1A changeover contacts plus plus one output of switched 12V/24VDC, up to 2A resistive load. These outputs are operated whenever the engine is running. Maskable for up to 1 hour by pressing the **SILENCE ALARMS** button.

Off Normal:	One set of voltage-free 1A changeover contacts plus one output of switched 12V/24VDC, up to 2A resistive load. These outputs are operated whenever there are fault or off-normal conditions with the pumpset. The conditions contributing to this output may be configured on site. Maskable for up to 1 hour by pressing the **SILENCE ALARMS** button.

Standards Compliance

NZS 4541:2007
NZS 4541:2003
AS/NZS 60950:2003
AS/NZS CISPR22:2006

Chapter 4
Interpreting the Displays

System Normal

Under normal circumstances (pump not running, AC mains on, no pressure switches operated), the display panel will be as follows:

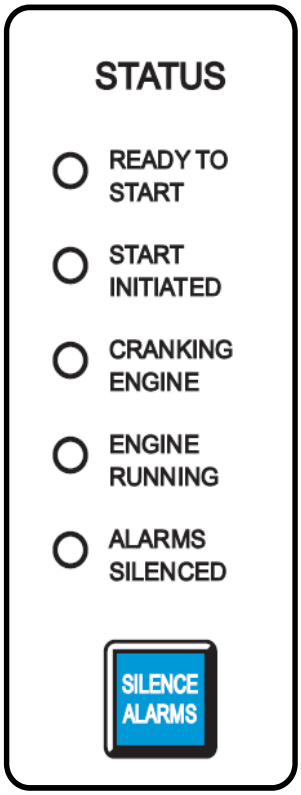
Status Area:	**Ready to Start** on.
Engine:	**Engine Speed** reading zero. **Engine Run Time** reading accumulated run time. **Temperature/Oil Pressure** reading a temperature, with **°C** on.
Pressure Switches:	All indicators off.
Battery A & B:	**Volts** indicators on, and display reading in the region of 13-14V (for a 12V system) or 26-28V (for a 24V system). Both **Charger On** indicators on.

In the absence of any activity for the previous 15 minutes, the displays will dim to conserve power; if any key is pressed, or if the engine is active, the displays will brighten up again.

In general, the displays will be steadily lit. Any flashing display indicates an alarm or abnormal condition. See section 6 for details.

Status Display

The status indicators show the state of the engine starting process and alarm indicators. When lit the indicators have the following meaning:



Ready to Start: The controller is ready to start the pump motor. To confirm that the controller is operating, this indicator "blinks" off at about 8 second intervals.

Start Initiated: The controller is in the process of starting, or has started the motor.

When flashing, this indicates that the initial attempt to start the motor failed.

Cranking Engine: The starter motor relays are energised, either by the controller, or by pressing a Manual Start key.

Engine Running: The engine has reached a predefined minimum running speed.

Alarms Silenced: The external alarm contacts have been disabled by pressing **SILENCE ALARMS**.

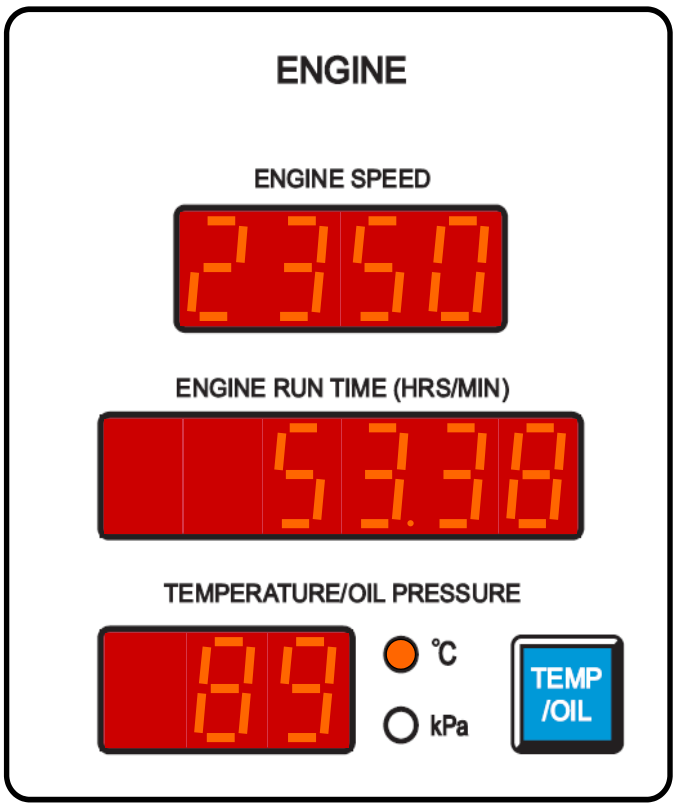
Engine Display

The engine readings displays show the following engine conditions:

Engine Speed: Shows the measured speed in rpm. Flashing indicated overspeed.

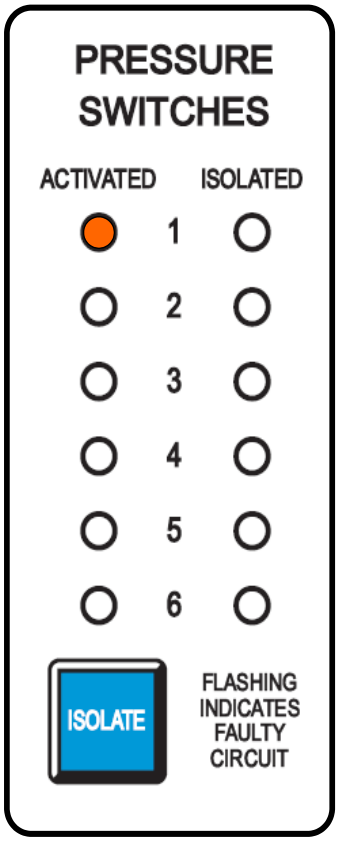
Engine Run Time: Displays the cumulative engine run time in hours and minutes.

Temperature/ Oil Pressure: This is a dual mode display. The **°C** or **kPa** indicators show which of engine temperature or engine oil pressure is being displayed.
Pressing the adjacent **TEMP/OIL** key toggles the display from one to the other. The display defaults to temperature after a period of time.
Flashing indications denote faults as described in more detail in Chapter 6.



Pressure Switches

The pressure switch indicators show the status of the pressure switches. When lit, the indicators have the following meanings:



Activated: These show which pressure switches are operated.

Isolated: These show that the corresponding pressure switch has been isolated.

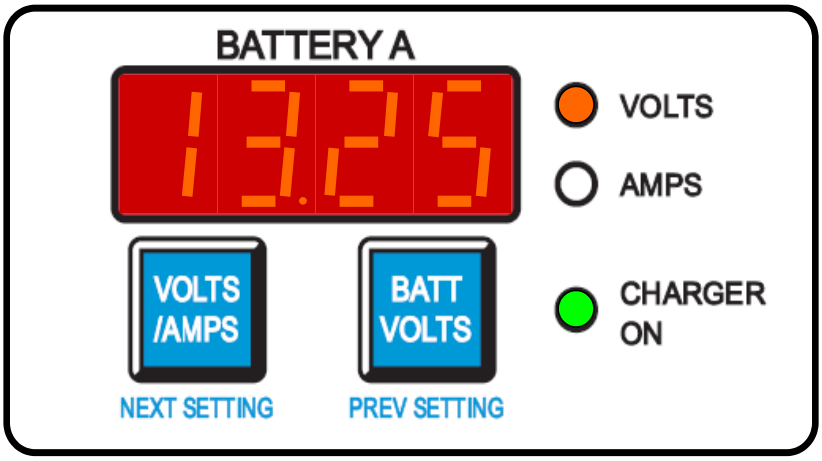
Pressing **ISOLATE** will isolate all the currently-operated pressure switches. When each pressure switch is released, it will be automatically de-isolated after a short delay.

If one of these indicators is flashing, it indicates a wiring fault for the corresponding pressure switch.

Battery A
Battery B

There are two identical battery displays, one for each of the separate battery/charger combinations. Each value displayed is either battery voltage or charge current. The **Volts** or **Amps** indicators show which is being displayed. Pressing the **VOLTS/AMPS** key toggles between the different readings. The display defaults to voltage after a period of time.

The **Charger On** indicator shows that there is input power to the respective battery charger, regardless of whether charge current is being delivered.



The voltage display normally shows battery voltage under charging conditions. Pressing and holding the **BATT VOLTS** key temporarily inhibits the charger and displays the off-charge battery voltage, which is a better indication of actual battery condition. The on-charge voltage or current is displayed again when the button is released.

Flashing indications denote faults as described in more detail in Chapter 6.

Chapter 5
Using the Control Panel

Testing the Display Panel

Press and hold the **LAMP TEST** key. All indicators will light up, all digits will read "8"s, and all but 8 decimal points will light. The normal display resumes when **LAMP TEST** is released.

The controller firmware version and error codes for any abnormal conditions will be displayed after 4 seconds while the **LAMP TEST** key is held – see Chapter 6 for more details.

Silencing Alarms

All external alarm contacts can be disabled for 60 minutes by pressing **SILENCE ALARMS**. The **Alarms Silenced** indicator will be lit.

During the last minute before re-enabling the alarms, the internal buzzer will beep at one second intervals as a warning.

Pressing **SILENCE ALARMS** again resets the disabled period to 60 minutes.

The alarms can be re-enabled by pressing and holding **SILENCE ALARMS** for two seconds. The **Alarms Silenced** indicator will go out.

Reading Battery Charge Current

If the **Amps** indicator is not on steadily, press the **VOLTS/AMPS** key once. The charge current in amps will be displayed.

Reading Battery Float Voltage

If the **Volts** indicator is not on steadily, press the **VOLTS/AMPS** key once. The battery float voltage while on charge will be displayed.

Reading Battery Voltage

Press and hold the **BATT VOLTS** key. The **Charger On** indicator will go out, and the **Volts** indicator will come on. The "off-charge" battery voltage will be displayed.

The previous display will be restored when **BATT VOLTS** is released.

Reading Engine Temperature

If the **°C** indicator is not on steadily, press the **TEMP/OIL** key once. The engine temperature will be displayed.

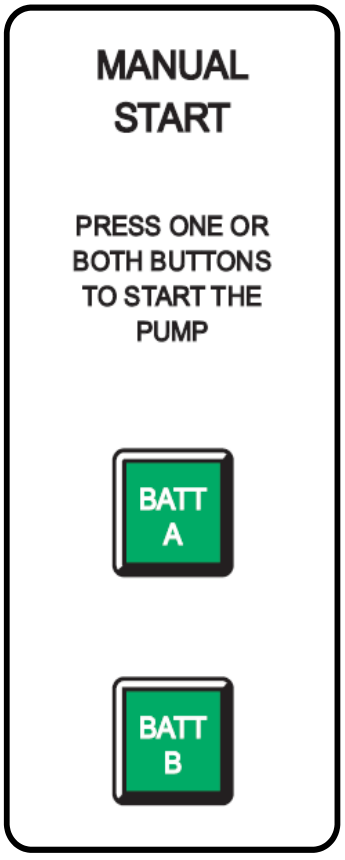
Reading Engine Oil Pressure

If the **kPa** indicator is not on steadily, press the **TEMP/OIL** key once. The engine oil pressure will be displayed.

Isolating Pressure Switches

The **Activated** indicators show which pressure switch(es) are operated. Pressing **ISOLATE** will isolate all the currently-operated pressure switches. When each pressure switch is released, it will be automatically de-isolated.

Manually Starting the Pump



Pressing either the green **BATT A** or **BATT B** keys will directly operate the start relays and crank the engine, bypassing the controller logic. If the controller is running, the status indicators and engine display will show the state of the engine.

These keys will still operate even if the controller has failed.

Chapter 6
Alarm Displays

Alarm Conditions

Alarm conditions may be signalled by devices connected to the external Off-Normal alarm relay contacts. More detail is provided by the flashing of the part of the display associated with the alarm condition.

The controller may have been configured so that some off-normal conditions will not cause an external alarm. Regardless of this, any abnormal condition will always cause some part of the display to flash.

To see more information about an abnormal condition, press and hold the **LAMP TEST/STATUS** key. After a lamp test period of 3 seconds, and a brief display of the controller firmware version, the Engine Run Time display will show an error code in the format "**Err**" plus a 2-digit code number. Locate this code number in the Table 6-2 for more detail about the error or fault. If there are several abnormal conditions, their respective codes will be displayed sequentially for as long as the **LAMP TEST/STATUS** key is held pressed.

Table 6-1 - Indicator Flashing Interpretation

WHAT IS FLASHING?	WHAT IT MEANS
Ready to Start (blinks off once every 8 seconds)	Controller is operating correctly - no action is required.
EITHER BATTERY DISPLAY (**Amps** indicator on steady)	The corresponding charger has failed. Check ac mains supply if both chargers have failed, or the corresponding charger if only one has failed. (**CHARGER ON** indicator will be off).
Amps INDICATOR	
FLASHING "oC" IN BATTERY DISPLAYS (**Volts** indicator on steady)	The lead to that battery is broken or incorrectly connected. Check the battery connection.
FLASHING "SC" IN BATTERY DISPLAYS (**Volts** indicator on steady)	The battery is faulty or reverse-connected. Check the battery polarity and condition.
EITHER BATTERY DISPLAY (**Volts** indicator on steady)	The battery voltage is out of range (too high or low). Check the battery condition.
Volts INDICATOR	The battery voltage is out of range range (too high or low). Press **VOLTS/AMPS** to read the voltage (this reading will be flashing). Check the battery condition.

WHAT IS FLASHING?	WHAT IT MEANS
Temperature/Oil Pressure (**°C** indicator on steady)	The engine temperature is out of range (too high or too low). Check the engine cooling/heating system.
°C INDICATOR	The engine temperature is out of range. Press **TEMP/OIL** to read the actual temperature (display will be flashing). Check the engine cooling/heating system.
Temperature/Oil Pressure (**kPa** indicator on steady)	The oil pressure is too low while the engine is running. Check the engine lubrication system.
kPa INDICATOR	The oil pressure is too low when engine is running. Press **TEMP/OIL** to read the actual pressure (display will be flashing). Check the engine lubrication system.
FLASHING "oC" IN **Temperature/Oil Pressure** (**°C** indicator on steady)	The lead to the temperature sender is broken, or a connector is not seated properly on the Controller circuit board.
FLASHING "SC" IN **Temperature/Oil Pressure** (**°C** indicator on steady)	The lead to the temperature sender is short circuited to earth.
FLASHING "oC" IN **Temperature/Oil Pressure** (**kPa** indicator on steady)	The lead to the oil pressure sender is broken, or a connector is not seated properly on the Controller circuit board.
Engine Speed	The engine speed is too high.
FLASHING "oC" IN **Engine Speed**	The leads to the engine speed sensor are broken, or a connector is not seated properly on the Controller circuit board.
ANY PRESSURE SWITCH **Isolated** INDICATOR	The associated pressure switch cable is faulty. Check for a broken wire at the circuit board end, or in the pressure switch case.
Start Initiated	The controller is attempting to start the engine, but without success. Isolate the pressure switches by pressing **ISOLATE**, and attempt a manual start.
Run Time	Internal controller fault. Other displays may be giving false readings. If the fault is not obvious, obtain expert assistance.

Error Codes

To see error codes, press and hold the **LAMP TEST/STATUS** key. After a lamp test period of 3 seconds, and a brief display of the controller firmware version, the Engine Run Time display will show an error code in the format "**Err**" plus a 2-digit code number. Locate this code number in the Table 6-2 for more detail about the error or fault. If there are several abnormal conditions, their respective codes will be displayed sequentially for as long as the **LAMP TEST/STATUS** key is held pressed.

Table 6-2 - Error Code Interpretation

Category	Code	Meaning
Battery	1	Battery A voltage is low
	2	Battery A voltage is high
	3	Battery A is disconnected
	4	Battery A is short circuit or reverse connected
	5	Battery B voltage is low
	6	Battery B voltage is high
	7	Battery B is disconnected
	8	Battery B is short circuit or reverse connected
Charger	10	Charger A is off
	11	Charger B is off
Pressure Switches	21	Pressure Switch 1 wiring is faulty
	22	Pressure Switch 2 wiring is faulty
	23	Pressure Switch 3 wiring is faulty
	24	Pressure Switch 4 wiring is faulty
	25	Pressure Switch 5 wiring is faulty
	26	Pressure Switch 6 wiring is faulty
Engine	30	Engine start sequence is taking too long
	31	Engine temperature too low
	32	Engine temperature too high
	33	Oil pressure too low
	34	Engine speed too high
Engine Wiring	40	Temperature sender wiring open circuit
	41	Temperature sender wiring short circuit
	42	Oil pressure sender wiring open circuit
	43	Remote Common wiring open circuit
	44	Speed sensor wiring open circuit
	45	Start contactor A wiring open circuit
	46	Start contactor B wiring open circuit
Controller Internal	50	Stored programmed configuration faulty/store operation was not successful – default or volatile memory values being used
	51	Internal start relay wiring fault
	52	Supervision wiring open circuit
	53	Current Sense wiring open circuit
	55	Manual start wiring open circuit
	60	Fuse fault on controller
	62	Controller link DPE is not fitted – may cause error 50
	63	Controller link FPE is fitted
	64	Display board wiring fault Bus 1
	65	Display board wiring fault Bus 2

Chapter 7
Installation Information

Cabinet Mounting on a Wall

The FPC-07 cabinet is designed to be wall-mounted, with four fastening points.

The upper mounting holes on the cabinet are slotted, allowing the cabinet to be hung on studs or bolts in the wall. The lower mounting holes are not slotted, to secure the cabinet in place. M10 or M12 mounting screws are recommended.

Refer to presentation drawing 1941-42, which shows the important dimensions for locating the mounting points.

Cabinet Mounting Free-standing

Where wall mounting of the FPC-07 is not convenient, the cabinet can be mounted on a free-standing frame.

Refer to drawing 1941-51 which shows two versions of a suitable mounting frame constructed from Unistrut channel and couplings.

Pressure Switch Wiring

The FPC-07 is supplied with one pressure switch and mounting bracket kit, which is partially assembled and tested but is not fitted to the cabinet, for ease of packaging and protection transport.

The bracket is mounted on the right hand side of the cabinet, using two M6 x 12 screws and washers supplied. There are positions for up to three brackets on the cabinet. The mounting holes for the unused positions should be left with screws fitted as was done during factory assembly, to prevent water leakage into the cabinet.

The pressure switch is fastened to the bracket with the conduit adaptor and nut supplied with the kit. Pass the pressure switch cable through the round hole in the bracket then through the conduit adaptor; the nut is already threaded on the cable. Remove the cover of the pressure switch and tighten the 20mm nut on the conduit adaptor to secure the switch onto the bracket.

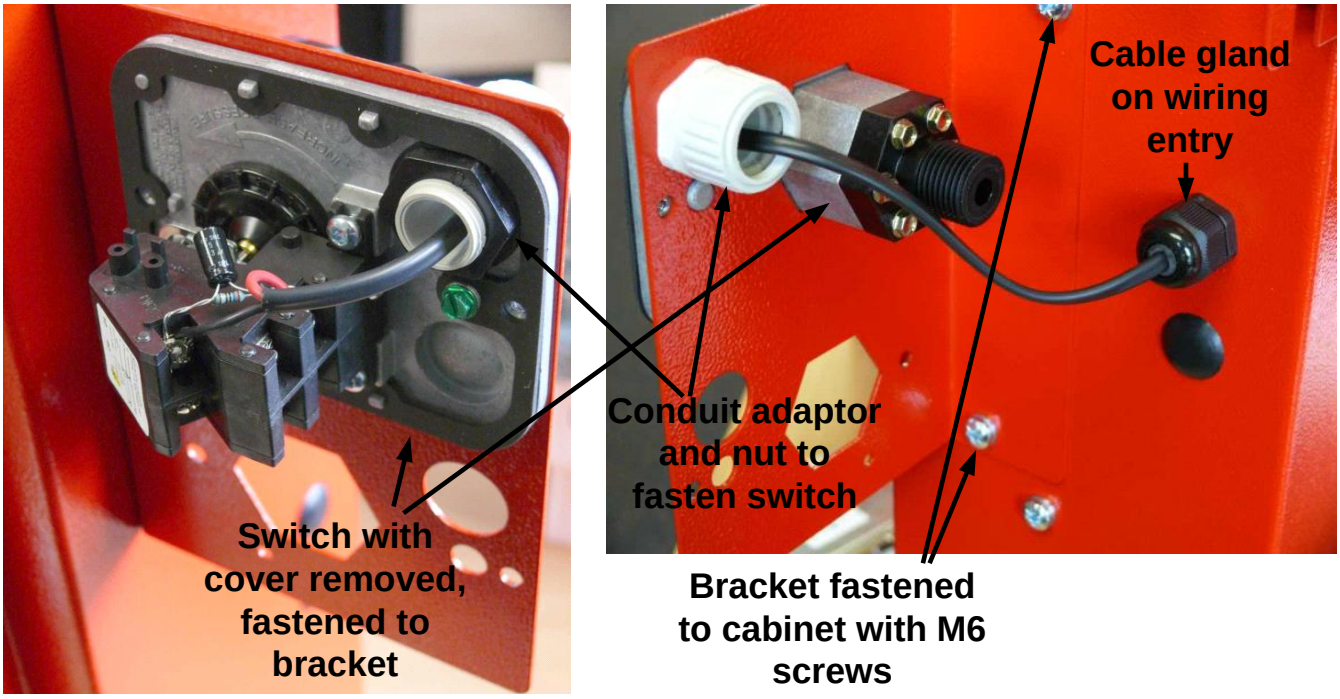


Figure 7-1 – Pressure Switch Mounting and External Wiring

Thread the 16mm nylon cable gland onto the pressure switch cable and pass the cable through the top-most round hole in the side of the cabinet, securing the gland with its nut on the inside of the cabinet to provide a waterproof seal.

Refer to drawing 1941-48 for more details.

Inside the cabinet, route the pressure switch cable across the lower edge of the gearplate, below the controller circuit board, to the terminals in the top left corner of this board. Connect the pressure switch to the next free Pressure Switch Input position (1-6). Wiring polarity is not important for the pressure switches.

Secure the pressure switch cable with the supplied nylon zip ties.

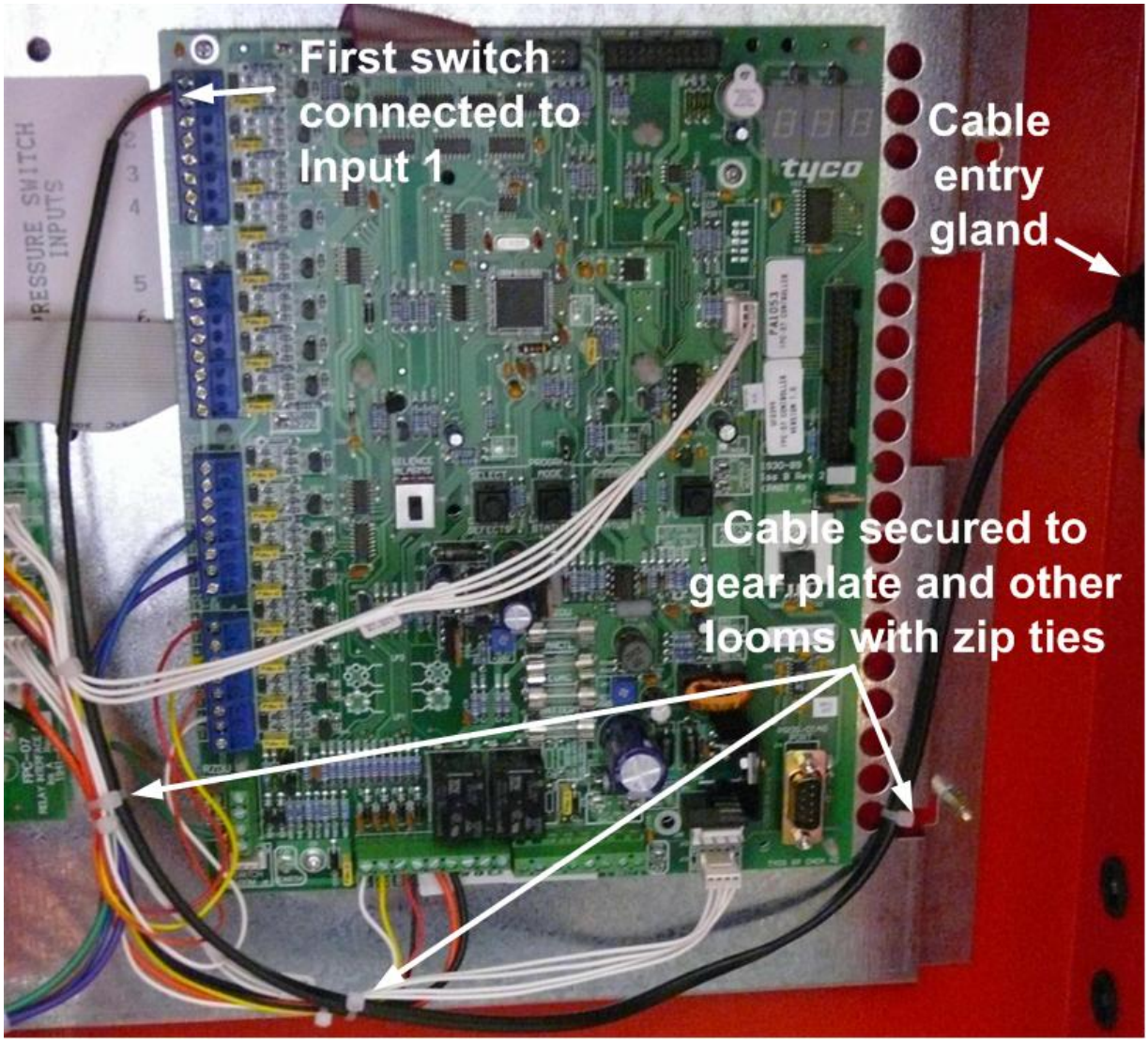


Figure 7-2 – Internal Pressure Switch Wiring

Unused pressure switch inputs should be left unterminated. The controller will be programmed to ignore them.

Pressure Switch Adjustment

The pressure switch has two sets of contacts, connected in parallel, as required by NZS 4541 and as shown in drawing 1941-48. The screw setting on the switch arm should first be adjusted so that both the contacts operate at about the same pressure (check this by moving the switch arm up carefully by hand and listening for the two clicks at the same position).

The actual operating pressure for the contacts can then be set or readjusted using the black adjusting wheel on the pressure switch's base plate.

Pump Set Wiring

The FPC-07 is supplied with a pre-assembled and tested umbilical cable, approximately 3 metres long. Drawing 1941-41 shows how this umbilical cable should be wired to the electrical components on the pump set.

Note that the wires for different electrical signals are individually coloured as shown on this drawing. Colours are not interchangeable. Damage to the FPC-07 controller may result from incorrect wiring.

Spare Parts and Drawings

The following spare parts are available for the FPC-07 controller:

Item	Part Number
Additional Pressure Switch Kit	FP0946
Charger Module 12V 6A	ME0479
Charger Module 24V 6A	ME0480
Operator's Manual (supplied with each FPC-07)	LT0456
Technical Manual	LT0457
Controller circuit board fuses (20x5mm 3A)	FU0017
FPC-07 Controller circuit board 1941-38	PA1053
Relay Interface circuit board 1941-40	PA1055
Display circuit board 1941-39	PA1054
Controller Firmware (technician download only)	SF0399
Display Panel Keyboard Overlay	FA2490

The following drawings relate to the FPC-07

1941-42 Presentation and physical dimensions drawing
1941-51 Alternative mounting arrangements
1941-41 Pump Set wiring details
1941-48 Extra pressure switch installation details