# AS 2941-2013 DIGITAL FIRE PUMP CONTROLLER

## COMPLIANT WITH AS2941-2013

## CLAUSES 9.4.1 – 9.4.22

# OPERATION INSTRUCTIONS


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**FUNCTION:** Designed to automatically operate a diesel fire pump engine when the contacts of a remote water pressure switch close.

**POWER SUPPLY:** 240V A.C single phase supply and 12 or 24 V D.C.

**INDICATORS:**

Power On (green) - Mains power available.
Pump Standby (green) - Operational and without major faults.
Pump Running (red) - Pump is running.
Automatic Start Isolated (red) - Isolates controller auto starting (see Start Isolate switch below).
Failure of Engine to Start Automatically (red) - Diesel engine has failed to start when requested.
Power Fail (red) - Battery charger power supply failed.
Controller Fail (red) - Controller has failed.
Aural Alarm Silenced (red) - Audible alarm is muted.
Start Battery Charger Failure (red) - Start battery charger is faulty.
Control Battery Charger Fail (red) - Control battery charger is faulty
Start Battery Low Voltage (red) - Start battery volts is/was below the preset low level
Control Battery Low Voltage (red) - Control battery volts is/was below the preset low level.
Overspeed Shutdown (red) - Pump speed is/was in excess of preset limit.
High Engine Temperature (red) - Engine coolant temp is exceedingly high or low (if low temp, alarm optioned flash fast)
Low Oil Pressure (red) - Oil pressure is/was below preset.
Fuel Low Level (red) - Fuel level in tank is/was low.
Jacket Heater Failure (red) – Jacket heater has failed.

**BUTTONS:**

Display Scroll - Scrolls the displayed screen.
Start - Push to manually start the engine.
Stop / Reset - Push to stop the engine and clear alarm conditions.
Light Test - Illuminates all indicator lights
Alarm Test - Tests the alarm bell and light
Alarm Mute - Silences the audible alarm bell. Mute will be reset when the alarm condition stops, or alarm test is pressed.
Start Charger Boost - Push to boost the charge rate on the control battery. Charging turns off automatically.
Control Charger Boost - Push to boost the charge rate on the control battery. Charging turns off automatically.
Start Isolate - Isolates the pump preventing cranking from the controller. Engine can still be cranked from the manual start solenoid buttons located below the controller fascia.
Over Speed Test- simulates over speed test when engine is running.

**OPERATION:**

Starting - System is designed to automatically start the engine by closing a remote pressure switch. System may be test run by pressing the start button on the controller fascia.
Stopping - Push controller stop/reset button.

| | |
|---|---|
| **MANUAL STARTING:** | Manual start buttons - located below the controller fascia on the fire pump controller. Press either solenoid button to crank the engine from the start or control battery, external to the controller circuitry |

## INTRODUCTION

This controller is a dedicated microprocessor.

It has specific input, output and display capabilities that have been designed to meet all the requirements of AS 2941-2013 (The Australian Fire Pump Standard).

## AS 2941-2013 REQUIRES

An individual fire pump controller shall be provided for each fire pump, and shall have a degree of protection not inferior to IP54 in accordance with AS 60529.

The controller shall be certified by the manufacturer as complying with Clauses 9.4.1 to 9.4.22 including specific requirements for: General, Location, Controller cabinets, Isolating switch, low and extra-low voltage equipment, control functions, indicator lights, remote alarm contacts, aural alarm, alarm power supply, conductor terminations, wiring, controller driven interconnecting wiring, battery chargers, alternator isolation, locked switches, instructions, access for inspection and testing, pre-delivery testing, wiring diagram, marking, and test facility.

Controllers shall be compliant with compression-irrigation engine-driven fire pumps.

Controllers shall be assembled, wired and tested by the manufacturer prior to installation.

For more information regarding compliance to the Australian standard AS 2941-2013 please refer to the relevant section/s within the standard, or contact our offices on (0)3 9316 9700.

## CONTROLLER CABINETS

Where controllers are designed for wall mounting, 300mm clearance shall be maintained between the floor level and the live parts. (See Clause 9.4.20 AS 2941-2013)

## CONTROL SWITCHES

### START ISOLATE SWITCH

A two position rotary key lockable switch located to the left of the liquid crystal display.

In the isolate position the engine cranking circuits are disconnected from the controller. Automatic pressure switch starting and controller manual starting are disabled.

This switch position will allow routine maintenance to be undertaken without concern about the engine starting.

In the normal position the controller will crank the engine whenever an external start signal is present or when the controller start button is pressed.

Note: **Turning this switch to the isolate position will cause the controller to generate an alarm condition.**

When this switch is in the isolate position the engine can still be started using the manual start buttons located adjacent to the controller.

## CONTROL BUTTONS

### DISPLAY SCROLL BUTTONS

Two buttons located to the right of the liquid crystal display. Many sorts of information can be displayed on the liquid crystal; theses buttons allow an operator to 'scroll' through display items to get to specific required information. You may scroll 'up' or 'down' to get to the required information.

**Push the arrow to scroll**

AS2941 Diesel Fire Pump Controller
Serial # -------
Software REV:

↕

Engine Speed _____ RPM
Hours Run
------:--:--

↕

Engine Alternator
- Amps DC
Fuel Remaining
--- %

↕

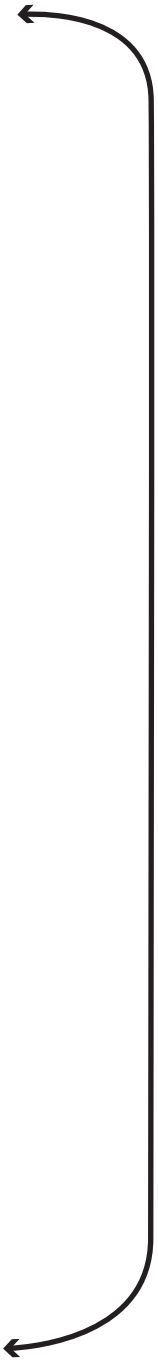
Coolant Temperature
-- C
--- KPA

↕

Control Battery
--.- Volts DC
Control Charge Rate
-.- Amps DC

↕

Start Battery
--.- Volts DC
Start Charge Rate
-.- Amps DC



**The position at which scrolling is stopped is not relevant to controller operation.**

## START BUTTON

Allows an operator to test start the fire pump engine in order to carry out routine maintenance. It can also be used to start the engine if external start signals have failed or are not present.

Note: **The Start isolate key switch must be in the normal position for the start button to operate.**

## STOP / RESET BUTTON

When pressed will send a stop signal to the engine fuel stop solenoid.

Note: **If an external start signal is present (pump on call) the engine will not stop. The stop button also functions as a reset on any 'latched' alarm information i.e. 'Power Fail' or 'Low Oil Pressure'.**

Note: **If alarm condition is still present then stop /reset button cannot clear the alarm indication.**

## LIGHTS TEST BUTTON

Will cause all 34 alarm and status light emitting diodes to illuminate. It is provided as a test for indicator failure.

## ALARM TEST BUTTON

When pressed will test the external alarm bell if connected to the controller bell circuit. It will also test the flashing alarm light or strobe if connected to the controller visible alarm circuit.

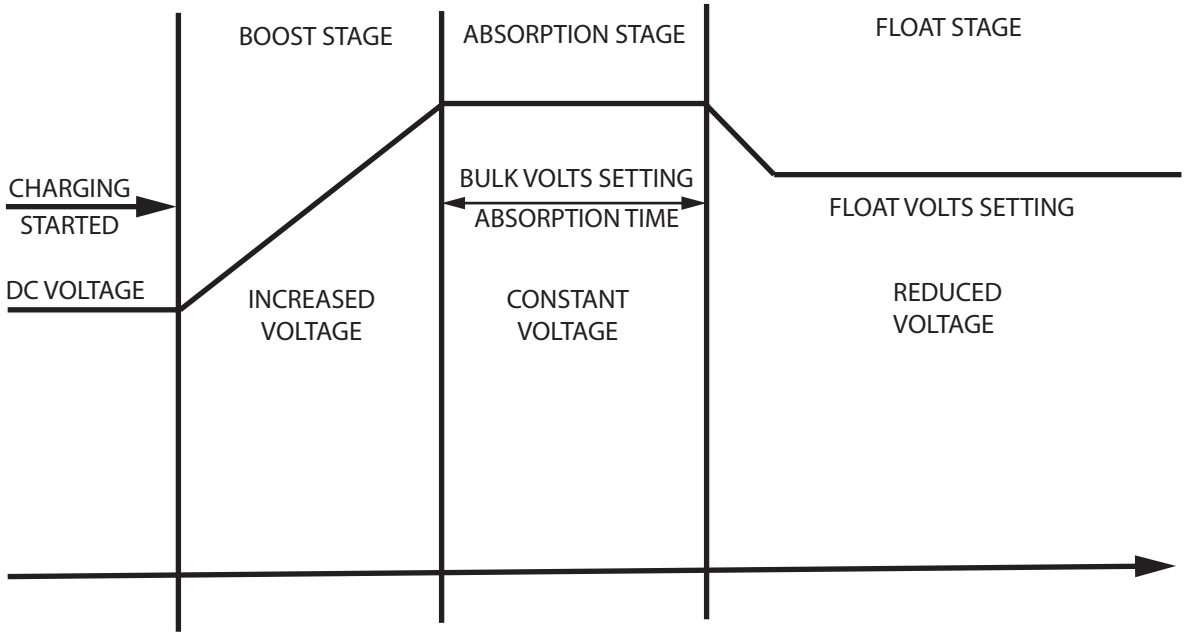
## ALARM MUTE BUTTON

When pressed will mute the alarm bell if it is currently operating. The alarm fault will continue to be indicated by status LED's. Alarm mute will automatically cancel when all alarm causes are cleared or reset.
When an alarm condition is muted a further alarm condition will not cause the bell to operate.

Note: **The flashing light or strobe is not turned off when alarm mute is pressed.**

## BATTERY CHARGERS

Battery chargers are three stage charging consisting of boost, absorption and float stages. See diagram overleaf.




ACTUAL BATTERY VOLTAGE DURING CHARGING CYCLE

The charging cycle uses three stages. During the initial boost charge stage, the battery charges at a maximum rate regulated by the chargers current limit settings. This causes the battery voltage to rise over time. After the battery voltage nears the absorption voltage setting, the charger starts the second or absorption stage. During this phase, the charge rate gradually reduces while the battery voltage is held near the boost voltage setting. This ensures that the battery is fully charged. The final float stage is initiated when the battery has been held at the boost charge setting for the adjustable absorption period, which is determined by the amp-hours capacity of the battery. After that period, the battery voltage is maintained at the lower float voltage setting, where it is maintained to provide current for the quiescent system load and to compensate for the battery's self-discharge.

For connections to batteries see diagram 140320B.

**Note: All associated control wiring for battery chargers must be connected correctly. Without correct connection battery charger will not operate.**

## START CHARGER BOOST BUTTON

When the boost button is pressed the charger will turn on at maximum charge rate, charging the battery up to the high charge turn off point.

### CONTROL CHARGER BOOST BUTTON

As for start charger boost button.

### OVER SPEED TEST BUTTON

When diesel engine is running press button to simulate an over speed. Engine will stop and indicate over speed. To reset press stop reset button.

## CONTROL INDICATORS

### POWER ON

These green LED's should be continuously lit and indicate the presence of the AC supply.

### PUMP STANDBY

These green LED's should be continuously lit and indicate a normal standby situation.

If they are not lit check

Is start isolate switch in normal position?
Fuel level?
Battery voltages?
Engine temperatures low?
Or any other fault indicators?

### PUMP RUNNING

Will indicate when the pump is running at rated speed.

### AUTOMATIC START ISOLATED

Will indicate that the start isolate key switch is not in the normal position.

**FAILURE OF ENGINE TO START AUTOMATICALLY**

Will indicate that the diesel engine has not started after completing 6 crank cycles.
This indicator will flash if alarm cause has occurred but is no longer present. Cancel flashing by pressing STOP/RESET.

**POWER FAIL**

Indicates failure of the AC to battery chargers. When supply fail LED's are lit the green power available LED's must be off.

**FUEL LOW LEVEL**

Indicates when fuel tank level is low. This level is adjustable with a factory setting of 75%. Flashing LED's indicate that fuel level was low and is now normal. Pressing the STOP/RESET button will cancel the flashing.

**AURAL ALARM SILENCE**

Indicates that an alarm condition exists and the alarm mute button has been pressed.
The LED's will turn off automatically when the alarm condition ceases.

**START BATTERY CHARGER FAILURE**

Indicates when the battery should be charging but is not.

**CONTROL BATTERY CHARGER FAILURE**

Refer to 'Start Battery Charger Failure'

**START BATTERY LOW VOLTAGE**

Indicates when start battery voltage has fallen to an unacceptable low level. This level is adjustable, with a factory setting of 12 / 24 volts.

Flashing LED's indicate that start battery voltage was unacceptably low and is now normal. Pressing the stop/reset button will cancel the flashing. Although the controller can deem a start battery as "failed" it may continue to attempt starting.

## CONTROL BATTERY LOW VOLTAGE

Refer to 'Start Battery Low Voltage'.

## OVERSPEED SHUTDOWN

Indicates when diesel engine speed exceeds programmed set point, this level is adjustable.

An over speed alarm status will display then the engine will stop.

If this condition occurs during routine testing, check program settings or call a service technician.

This indicator will flash if alarm cause has occurred but is no longer present. Cancel flashing by pressing STOP/RESET.

## HIGH ENGINE TEMPERATURE

Indicates when the diesel engine coolant temperature exceeds that's recommended by the engine manufacturer. This level is adjustable with a factory setting of 95°C.

Although a Coolant Temperature High alarm may be displayed the engine is not stopped.

If this condition occurs during routine testing the engine should be immediately stopped and attended to by a competent mechanic.

For engines fitted with a water jacket heater; failure of which could prevent engine starting; a low temperature alarm can be indicated. This condition will be indicated by the "High Engine Temperature" LED's flashing at a fast rate. The engine should be attended to immediately by a competent mechanic.

This indicator will flash if alarm cause has occurred but is no longer present. Cancel flashing by pressing STOP/RESET.

## LOW OIL PRESSURE

Indicates when the diesel engine lubricating oil pressure is less than that recommended by the engine manufacturer. This level is adjustable with a factory setting of 50KPA.

Although a Low Oil Pressure alarm status may be displayed, the engine is not stopped.

If this condition occurs during routine testing the engine should be immediately stopped and attended to by a competent mechanic.

This indicator will flash if alarm cause has occurred but is no longer present. Cancel flashing by pressing STOP/RESET.

### CONTROLLER FAIL

Indicates if the microprocessor stops operating. Detected by "Hard Wired" circuitry outside of the microprocessor. This alarm status may or may not indicate that the controller is unable to start the diesel engine in a fire situation. However competent technicians should attend to this situation at the earliest possibility.

### JACKET HEATER FAILURE

Indicates Engine Water Temperature is below 20°C and Jacket Heater has failed or AC supply is turned OFF.

## VOLT FREE CONTACTS

Are rated for a maximum current of 1A @ AC1 and a maximum voltage of 32VDC. If these ratings are exceeded, even for the shortest possible time, permanent damage may result, causing the controller to be unable to start the engine.

### CONTROLLER SERVICEABLE (NC-200; COM-201; NO-202)

Is normally 'energised' and changes to the state indicated on the drawings for microprocessor failure.
Competent technicians should attend to this situation at the earliest possible.
**Note: that both batteries are flat or disconnected will also cause this condition.**

### PUMP RUNNING (NC-203; COM-204; NO-205)

Will energise when diesel engine is at a speed higher than starter motor cut out speed.

### FAILURE OF ENGINE TO START AUTOMATICALLY (NC-206; COM-207; NO-208)

Will energise when the engine has failed to start on command or crank cycle has completed.

### POWER FAIL (NC-209; COM-210; NO-211)

Will energise when the battery charger AC supply has failed.
Power is continually being consumed by the controller and under normal conditions this power is being replaced by the battery chargers. If a power failure condition exists for 24 hours the power consumed by the controller will cause batteries to go flat.
Attention from competent personnel should happen at the earliest possible time. If competent repair people are not available, isolate AC supply and disconnect both batteries.
Notification to Local Fire Authorities and continual supervision should occur until all systems are back to normal.

### COMMON ALARM (NC-212; COM-213; NO-214)

Will energise when all systems are normal and controller / engine are ready to start in a fire situation.

### AUTOMATIC START ISOLATED (NC-215; COM-216; NO-217)

Energises when start isolating switch is in START ISOLATE position.

### FUEL LOW LEVEL (NC-218; COM-219; NO-220)

Will energise for low fuel level.

Note: **If both batteries fail or are disconnected the microprocessor will eventually stop and this alarm will disappear.**

### OVERSPEED SHUTDOWN (NC-221; COM-222; NO-223)

Will energise when engine is in overspeed or overspeed test button is pressed.

Note: **Engine fault does not necessarily mean the engine has stopped.**

## INSTALLATION

The controller should be mounted in a position away from vibration, heat and hot exhaust pipes and potential diesel fuel and water spills.

If located outdoors considerations must be given to a sun shade. Direct sunlight combined with high ambient temperatures will cause controller failure.

Note: **PVC insulated engine and control wiring will also fail if continually subjected to UV radiation (i.e. sunlight).**

The controller is certified to IP54 AS 1939 and has a "Lexan" membrane fascia. Continual UV radiation on fascia will cause permanent damage and possibly controller failure.

Controller should be wired to engine, external start signal and alarm circuits. Using the schematic drawings and termination diagrams supplied with the controller

Note: **Even though the controller has fuses and reverse polarity protection, various components of the controller can suffer permanent damage if incorrectly connected.**

Before connecting AC supply or batteries, double check all wiring and stated voltage rating (which will be viewed on White /Black ID Sticker located on inside of controller door).

**TESTING**

Turn start isolate switch to "start isolate" position.

Verify that engine is okay to run; fuel; lube oil; coolant etc.

Connect control battery and sensing leads, ensure correct polarity.

Controller will take a few seconds to initialize and will then display serial no. and software revision.

Controller may also be indicating error conditions.

Scroll up twice.

Display will show control battery voltage and charge rate.

Charge rate will be 0.0 Amps DC as AC supply not yet connected.

Scroll down once.

Connect start battery and all sensing leads- ensure correct polarity.

Display will show start battery voltage and charge rate. Charge rate will be 0.0 amps.

Display should show start battery voltage.

Leaving start isolate switch in "start isolate" position; scroll up & down, press a few buttons to get a "feel" for what's happening.

Apply AC supply to controller. Battery charge rate should begin 3 stage charging.

If display shows 0.0 AMPS check connections to batteries.

Connect battery temperature PCB to batteries.

## FUSES

Auto reset fuses are fitted to several of the cards fitted to the controller. They have been fitted to protect the controller components from abnormal load conditions and unusual transients.

### ENGINE CONTROLLER CARD (207206)

F1 12/24V Crank Fuse
30A Auto Reset Fuse
F2 12/24V Stop Solenoid Fuse
30A Auto Reset Fuse
F3 12/24V Regulator Fuse
30A Auto Reset Fuse
F4 12/24V NFPA 20 Crank Fuse
30A Auto Reset Fuse

### POWER SUPPLY CARD (207207)

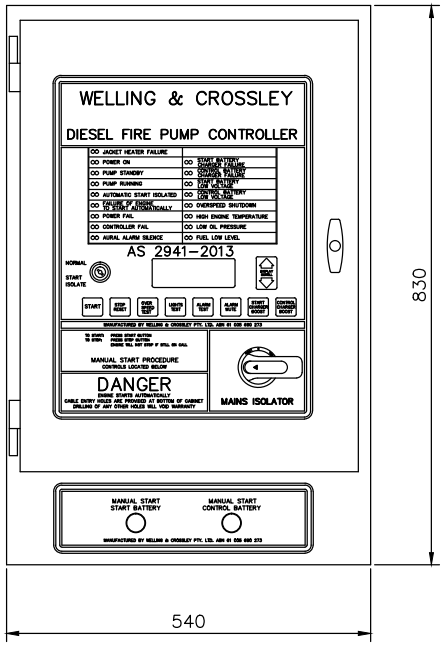
F1 Control Battery
5A Auto Reset Fuse
F2 Start Battery
5A Auto Reset Fuse
F3 AC Mains Supply
5A Automotive
F4 Control Transformer Secondary
5A Blade Automotive
F5 Auxiliary Supply
5A Auto Reset Fuse

### BATTERY CHARGER CARD (207208)

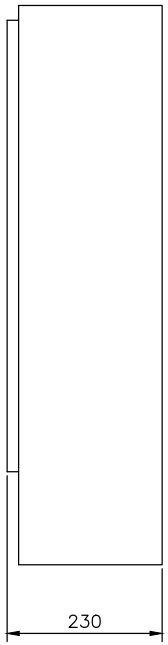
F1 Charger Protection
7.5A Auto Reset Fuse

**I/O TERMINAL CARD (207205)**

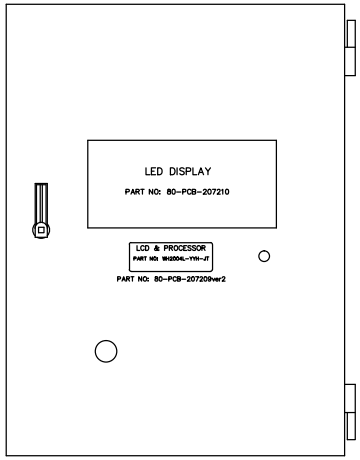
F1 Alarm Bell (1A)
F2 Flashing Light
1A
F3 12V Auxiliary Supply 1A



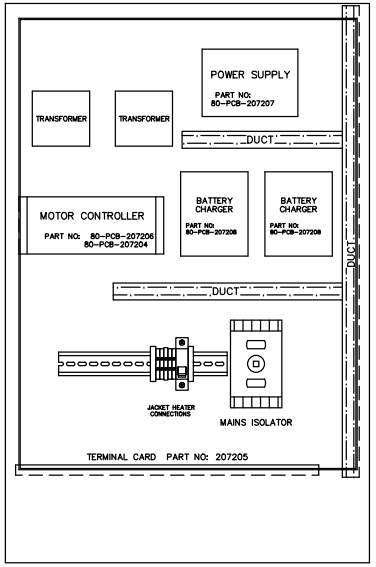

FRONT VIEW




SIDE VIEW




BACK VIEW OF DOOR




INSIDE VIEW

BOX SIZES ARE APPROXIMATE.

| REV. | DESCRIPTION | DRN | DATE | CHK. | DATE. |
|---|---|---|---|---|---|
| – | | – | – | – | – |
| – | | – | – | – | – |
| – | | – | – | – | – |
| B | WORDING CHANGE ON DOOR AND PANEL LABEL | SB | 30.01.17 | SB | 30.01.17 |
| A | ISSUED FOR APPROVAL | SB | 20.03.14 | SB | 20.03.14 |

TO BE MODIFIED ON CAD ONLY — DRN. R.M. 30.01.17
SCALE :1:10 — CHK. S.B. 30.01.17
PLOT SCALE :1:8 @ A3 — ENG. P.N.L. 30.01.17
TOLERANCES — APP. R.D. 30.01.17
FABRICATED DIMENSIONS ± 2 mm
MACHINING DIMENSIONS ± 0.125 mm
UNLESS OTHERWISE SPECIFIED

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TITLE : DIESEL FIREPUMP CONTROLLER LAYOUT AS2941–13

DRG No: 140320D | A3 | REV B

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# AS2941-2013 DIGITAL DIESEL FIRE PUMP CONTROLLER

## INSPECTION & TEST SHEET


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Email: bnicholas@wellcross.com.au

| | |
|---|---|
| **DESCRIPTION:** | AS2941 DIGITAL DIESEL PANEL |
| **DATE:** | _____ |
| **TYPE:** | _____ |
| **S/N:** | _____ |
| **CUSTOMER:** | _____ |
| **CUSTOMER O/N:** | _____ |
| **LOCATION: TESTED BY:** | _____ |
| **SOFTWARE REVISION:** | _____ |
| **12/24V DC:** | _____ |
| **PAINT:** | SIGNAL RED |
| **KEY NO:** | 003 |

**EQUIPMENT LIST:**

**PCB'S**

| | |
|---|---|
| START CHARGER | 80-PCB-207208 12v or 24v |
| CONTROL CHARGER | 80-PCB-207208 12v or 24v |
| POWER SUPPLY CARD | 80-PCB-207207 |
| MOTOR CONTROLLER | 80-PCB-207206 |
| I/O CARD | 80-PCB-207204 |
| LED CARD | 80-PCB-207210 |
| PROCESSOR | 80-PCB-207209 |
| I/O TERMINAL | 80-PCB-207205 |
| 2x TRANSFORMERS: 240/28 | 80-TRANS-1PH-028V |
| BATTERY TEMP PCB | 80-PCB-207213 |

**DESCRIPTION / MODIFIED:**

_____
_____
_____
_____
_____

| DIESL PANEL MANUFACTURE | TASK COMPLETED (DATE & SIGN) | INDEPENDENT INSPECTION CHECK |
|---|---|---|
| Inspect Components | | |
| Assembly | | |
| Programming | | |
| Bench Test | | |
| Field Test | | |

# INSTALLATION INSTRUCTIONS FOR FUEL SENDER

## FLOAT ARM INSTALLATION

1. To install the float arm loosen screw "h", remove the short piece of rod and discard it. (Refer to Fig. 1)

This is the screw "h"

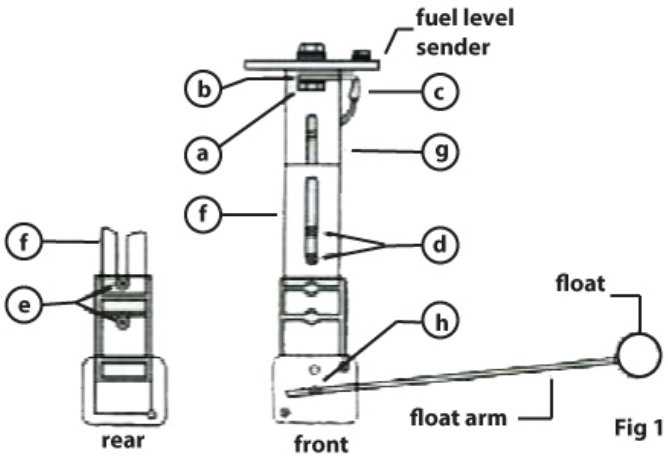


Fig 1

2. Insert the float arm/rod to the proper length. (Length located in table 1R on following page)

3. Allow 25mm to protrude out from the "h" point. (Refer to Fig. 2)

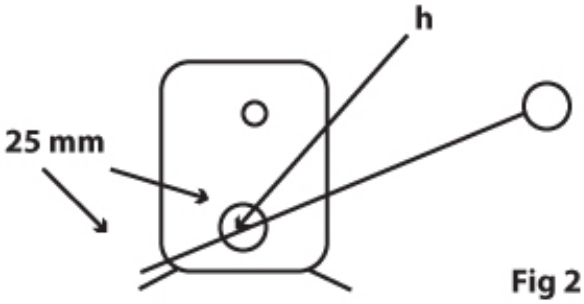


Fig 2

4. Carefully cut off any excess arm/rod with a bolt cutter or a similar tool, taking care not to damage the assembly.

H = Tank Unit Height (Refer to Fig. 1)
L = Body Length "g & f" (Refer to Fig.1)
R = Arm Length from "b" point to float centre (Refer to Fig. 1)

| H | L | R |
|---|---|---|
| 160 | 80 | 94 |
| 165 | 82.5 | 97 |
| 170 | 85 | 100 |
| 175 | 87.5 | 103 |
| 180 | 90 | 106 |
| 185 | 92.5 | 109 |
| 190 | 95 | 112 |
| 195 | 97.5 | 115 |
| 200 | 100 | 118 |
| 205 | 102.5 | 121 |
| 210 | 105 | 124 |
| 215 | 107.5 | 127 |
| 220 | 110 | 130 |
| 225 | 112.5 | 133 |
| 230 | 115 | 136 |
| 235 | 117.5 | 139 |
| 240 | 120 | 142 |
| 245 | 122.5 | 145 |
| 250 | 125 | 148 |
| 255 | 127.5 | 151 |
| 260 | 130 | 154 |
| 265 | 132 | 157 |

| H | L | R |
|---|---|---|
| 270 | 135 | 160 |
| 275 | 137.5 | 163 |
| 280 | 140 | 166 |
| 285 | 142.5 | 169 |
| 290 | 145 | 172 |
| 295 | 147.5 | 175 |
| 300 | 150 | 178 |
| 305 | 152.5 | 181 |
| 310 | 255 | 184 |
| 315 | 257.5 | 187 |
| 320 | 160 | 190 |
| 325 | 162.5 | 193 |
| 330 | 165 | 196 |
| 335 | 167.5 | 199 |
| 340 | 170 | 202 |
| 345 | 172.5 | 205 |
| 350 | 175 | 208 |
| 355 | 177.5 | 211 |
| 360 | 180 | 214 |
| 365 | 182.5 | 217 |
| 370 | 185 | 220 |
| 375 | 187.5 | 248 |

| H | L | R |
|---|---|---|
| 490 | 245 | 340 |
| 495 | 247.5 | 344 |
| 500 | 250 | 348 |
| 505 | 252.5 | 352 |
| 510 | 255 | 356 |
| 515 | 257.5 | 360 |
| 520 | 260 | 364 |
| 525 | 262.5 | 368 |
| 530 | 265 | 372 |
| 535 | 267.5 | 376 |
| 540 | 270 | 380 |
| 545 | 272.5 | 384 |
| 550 | 275 | 388 |
| 555 | 277.5 | 392 |
| 560 | 280 | 296 |
| 565 | 282.5 | 400 |
| 570 | 285 | 404 |
| 575 | 287.5 | 408 |
| 580 | 290 | 412 |
| 585 | 292.5 | 416 |
| 590 | 295 | 420 |
| 595 | 297.5 | 424 |

## INSTALLATION OF THE TANK UNIT SENDER INTO THE FUEL TANK USINE A FLANGE TANK

**1.** Cut a 59 mm hole in the top of the tank.

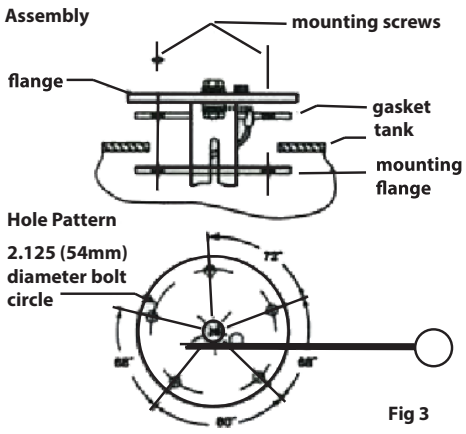


Fig 3

**CAUTION: Make sure certain float arm has a clear field of motion before tightening screws in flange assembly**

2. Slide the rubber gasket up to the bottom of the fuel sender flange. Than slide the second flange over fuel sender to bottom of rubber gasket. Align the pre-threaded holes in mounting flange and rubber gasket with those in fuel sender flange. Use 25 mm screw to loosely attach mounting flange. Do not tighten completely. (Refer to Fig. 3)

**CAUTION: Make certain float arm has a clear field of motion before tightening screws in flange assembly.**

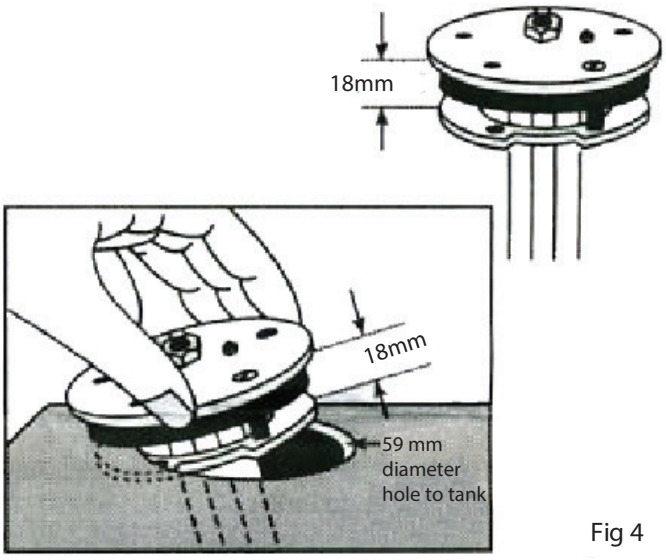


Fig 4

3. Slip the fuel sender assembly into the 59mm hole in the tank and turn until it goes into the tank. (Refer to Fig. 4)

4. Tighten all screws until flange is fully seated onto gasket.

5. Hook up gauge sensor wire to centre stud terminal.

6. Hook up ground wire to small terminal.

**NOTE: Make sure the float is installed as shown in Fig. 1, if installed backwards, the fuel gauge will indicate "full" when the tank is actually empty and vice versa.**

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