PEC Fuel Pumps

9000 Servicing Manual R1

(MULTIPEC2)

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PEC MULTIPEC Pump Range

SUMMARY

The routine care and maintenance for PEC Fuel Pumps Ltd's MULTIPEC2 9000 Fuel Delivery System is described, along with details of the field diagnostic and fault finding procedures and a description of its serviceable component parts. The MULTIPEC2 H9000 LPG Dispenser is an option that can be fitted together with petrol and diesel pumps or dispensers into the 9000 series Fuel Delivery System. This manual should be read in conjunction with documentation for the H9000 LPG MULTIPEC2[2] [3] [6] [8].

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NOTATION & PICTOGRAMS

Comms	Communication
EEPROM	Electrically Erasable Programmable Read Only Memory
EPROM	Erasable Programmable Read Only Memory
ESD	Electro-Static Discharge
FC	Forecourt Controller
FRAM	Ferromagnetic RAM (permanent)
IS	Intrinsically Safe
LCD	Liquid Crystal Display
LED	Light Emitting Diode
Li	Lithium
LPG	Liquified Petroleum Gas
MPD	Multi-Product fuel Delivery system
PCB	Printed Circuit Board
PEC	PEC Fuel Pumps Ltd
POS	Point of Sale
RAM	Random Access Memory
SWA	Steel Wire Armoured
TBC	To Be Confirmed

pump

Three context sensitive meanings:

(a) device used to pressurise or transport a liquid;

(b) fuel delivery module based on a mechanical pump;

(c) Fuelling position/side of a FDS (Fuel Delivery System). In a forecourt controlled environment a number is allocated to the fuelling position/side to enable the retail system to identify and communicate with the FDS. Note that an FDS may have 2 different numbers allocated to it, which serve different purposes. A number will normally be indicated on the outside of the FDS, or one each side, which relates to the FDS's physical location on the forecourt in relation to other pumps, referred to in this document as the External ID number. Each side of the FDS may also have a number allocated to it by a connected Forecourt Controller, which may be different from the External ID number. These are referred to as Pump Comms numbers in this document.

dispenser

Fuel delivery module based on fuel supplied under pressure from a remote storage system and which does NOT contain a mechanical pump.

module

Pump or dispenser subsystem for a single fuel product with one or more hoses.

fuel delivery system

Self-contained system containing equipment for delivering fuel to a customer. May contain 1 or more modules based on mechanical pumps, dispensers or a combination of the two. Does not include any connected remote fuel storage and pumping facilities.

MPD/MPP

In this document the abbreviation "MPD" (Multiple Product Dispenser) is commonly used as shorthand for a fuel delivery system capable of delivering 1 or multiple products which may contain a mechanical pump, i.e. it may be a dispenser, or combination pump/dispenser system

The terms **'petrol pump'**, **'fuel pump'** and **'pump'** are commonly used within the fuel supply industry as shorthand for a fuel delivery system which may NOT contain a mechanical pump, i.e. it may be a dispenser, or combination pump/dispenser system. These terms are not used with this meaning in this manual.

DANGER : the associated text highlights a subject area that poses a threat of injury or death if procedures are not carried out correctly.

WARNING : the associated text highlights a subject area in which damage to equipment may result if procedures are not carried out correctly.

INFORMATION: highlights subject areas that should clarify understanding or provides tips or hints that should assist users and/or technicians.

References are listed and numbered at the end of this document. Where the text within this document relates to a listed reference, the reference number is shown as a superscript number within square brackets, e.g. [3].

1 INTRODUCTION

The MULTIPEC2 9000 Series fuel delivery system is an approved system[7]. These approvals and certifications apply to the fuel delivery system as a whole. Many parts and sub-systems are **not** serviceable. Modifying or tampering with some parts may invalidate the certification for the complete fuel delivery system.

Any servicing or repairs should only be carried out by suitably qualified technicians approved by PEC Fuel Pumps Ltd.

Routine servicing and maintenance of the MULTIPEC2 9000 series FDS is detailed herein. Failure to carry out servicing and maintenance in accordance with these instructions may result in invalidation of the product warranty.

Do not attempt to service or repair any parts not detailed in this servicing manual.

Any replaceable or serviceable parts must be replaced with **like-for-like** replacements, failure to do so will invalidate the product warranty and may result in dangerous faults. To ensure suitability and compliance with the terms of the product warranty, PEC require that only genuine PEC parts are used.

When requesting parts from PEC, the following information will help us determine the correct part required:

(a) part number or detailed description of part

(b) service company;

(c) FDS model number;

(d) FDS serial number;

(e) oil company;

(a) site name.

1.1 System Description

The fuel delivery system is described separately[9].

1.2 How to Contact PEC

PEC Fuel Pumps Ltd
2 Station Rd
PO Box 308
Marton
4741
New Zealand

Phone : +64 6 327 6730
Fax : +64 6 327 6724
Email : pecsupport@pec.co.nz
pecsom@pec.co.nz
Website : www.pec.co.nz

When contacting PEC always quote the serial number on the product's nameplate. See the 9000 series System Description[9] for the location of the product's nameplate.

2 GENERAL SAFETY WARNINGS AND PRECAUTIONS

2.1 Hazard Warnings

- No naked flames.
- Isolate all fuel supplies and empty pipes before working on them.
- Isolate electrical supply before opening dispenser cabinet for maintenance. Physically lock, restrict access to, or tag the circuit breakers you turn off when working on the Fuel Delivery System.
- The Fuel Delivery System must be supported at all times by a minimum of 4 anchor bolts. External support must be used until these 4 anchors are secured. In service, all 6 anchor bolts must be fitted.
- All personnel working with Fuel Delivery Systems must be made aware of how, in an emergency, to turn OFF power to the fuel delivery system and any remote fuel storage system. They must also be briefed on fire fighting and other relevant inflammable liquid safety procedures.
- There are exposed belt-drives between mechanical pumps and their motors in fuel pump equipped fuel delivery systems. Ensure that power to the motors is isolated and that the motors have stopped running before opening external panels.
- Ensure fuel pipes, flanges etc. are clear of debris before re/assembling.
- Have all leaks or defects repaired immediately.

Fuels present a toxic hazard and suitable precautions should be taken at all times to prevent ingestion, inhalation and contact with skin and eyes.

Only lift units using the correct lifting points as indicated in the MULTIPEC2 9000 Installation Manual[1]. Never lift by the nozzle boot, sheet metal, etc.. Incorrect lifting also risks damage to equipment which will not be covered under warranty.

Any repairs must not compromise the safety approval of the fuel delivery system.

The system must not be modified without consulting PEC Fuel Pumps.

Only use genuine spare parts. The Multipec2 9000 FDS is supplied by PEC Fuel Pumps Ltd as a fully approved system. Genuine parts as specified in the original design are integral to the correct function and safety of the system. PEC Fuel Pumps Ltd cannot be held responsible for any consequences of using non-genuine parts and will not support under warranty any Multipec2 9000 where substitution has occurred. Any replacement parts should be like for like. In addition the repairer may be legally liable for the consequences of any unauthorised modifications.

Never operate a non-intrinsically safe circuit without the flameproof enclosure cover fitted.

Do not short out isolation or intrinsic safety barriers.

2.2 *Damage Warnings*

Electronic equipment in the fuel delivery system is susceptible to damage by electro-static discharge (ESD). Suitable preventative measures should be taken at all times when working on the electronics system.

Do not clean using hoses or other pressurised systems. Pressurised water ingress damage invalidates the warranty.

The operating environment requirements (temperature, humidity, etc.) defined in the 9000 Series System Description[9] must not be exceeded.

Do not clean using abrasive materials such as steel wool or abrasive polishes unless specifically recommended.

Ensure air is bled from product lines of remote dispensers and mechanical pumps before dispensing product.

Flush all fuel supply lines and ensure flanges, etc. are clear of debris before connection.

Pressure must not be applied to the upper frame or panels by strops or other pieces of lifting equipment.

Hoses that have been used to deliver petrol should not be used to deliver deisel. Plasticisers in the hose lining are replaced by components of the petroleum during use, which are removed if the hose is subsequently used for deisel.

3 CARE AND MAINTENANCE

Caution! In a 9000 series FDS the relay terminals in the Mains Junction Box can be live whether the modules are pumps OR dispensers. Avoid contact with these terminals at all times.

PEC Fuel Delivery Systems are designed to give many years of reliable service. However, a regular maintenance and servicing regime will maximise the life expectancy and reliability of your PEC FDS. The following list is the minimum routine recommended by PEC for compliance with the terms of the product warranty

3.1 *Weekly Maintenance*

Clean all panels with a soft cloth, warm water and detergent. Wipe off with a soft cloth and clean water. Do not use a hose as this may cause water to enter the pump electronics and adversely affect operation.

3.2 *Monthly Maintenance*

(a) Weekly maintenance plus the following:

(b) Remove any product staining on the nozzle holsters by scrubbing with a stiff nylon brush, such as a nailbrush, using detergent and warm water.

(c) Stainless steel surfaces can rust if steel objects or other contaminants come in contact with the metal. Rusting can be removed by light rubbing with a 3M ScotchBrite pad. Start lightly and work from the centre of any marks to the outside, trying to blend the work area into the surrounding areas. Rinse with warm water and detergent.

(d) Only use a ScotchBrite pad — ***Never use steel wool***

(e) Panels that come into contact with fuel have an extra protective coating applied in the factory to prevent product staining. However, diesel fuel leaves a surface deposit. This can be removed by lightly rubbing the affected area with a 3M ScotchBrite pad. Wipe off with warm water and detergent. Carry out the weekly cleaning routine.

(f) Apply a light lubricating oil to hose swivels and other moving parts. Where fitted, the spring and spring pipe holding the delivery hose will also benefit from a light lubrication and a wipe with a cloth. Remove excess with a cloth. Aerosol type products such as CRC or WD40 are an excellent choice for this task.

(g) Apply a silicone based polish to all exterior panels. There are many suitable domestic and automotive polishes available — ***do not use products containing abrasives***.

(h) Note any damage to paintwork and have this repaired.

(i) Inspect nozzles for signs of damage and wear and tear. (see section 5.5)

(j) Check hoses for signs of wear and tear or damage (e.g. abrasions, bulges, distortion, etc.) and replace any exhibiting such signs. Hoses should not touch the ground when the nozzle is holstered correctly. Adjust the clamp of any which touch the ground, and replace any hoses which have stretched beyond the adjustment limit. (see section 5.8)

3.3 Yearly Maintenance

(a) Regular monthly maintenance plus the following:

(b) Hydraulic components of PEC Fuel Pumps should be checked for correct operation.

(c) Check the tension of any pump vee belts. Replace any that have excess play or are showing signs of wear or damage.

(d) Inspect the internal hoses and pipework joints/connections for evidence of leaks.

(e) Check and confirm the integrity of all fixings and mounting bolts.

3.4 Other Maintenance

Batteries

The electronic components of PEC Fuel Pumps are designed to provide reliable service, with the minimum of maintenance. There are however, two components that need replacement from time to time. These are:

(a) The Gel Cell Battery

This is located in the electronic head of the FDS. The battery provides power to the pump display and processor electronics should the mains power fail. This allows the pump to retain the value and volume of any delivery that may have been interrupted by the power failure.

The Gel Cell battery has an expected life of approximately 3 years. A qualified serviceman should be asked to check the battery condition annually and replace if necessary. Ensure any replacement is **like-for-like**.

(b) The Lithium Battery

This is located on the Main Processor PCB. The battery retains the pump set-up data when the pump is turned off. Lithium batteries have a very long life — the expected life of the battery fitted to the main processor board is a minimum of 5 years. Depending upon the operating temperature, the maximum life can be as long as 10 years.

Failure of the lithium battery will mean that the pump will need to be re-programmed if the power is turned off. PCBs must not be repaired and replacing the lithium battery will require a replacement PCB from PEC.

Nozzles

ZVA nozzles for petrol and deisel products are fitted with a safety break, which is covered by a protective sleeve to prevent damage in a drive-off. The sleeves should be checked weekly, ensuring that they are in good condition and that they are seated correctly, i.e. that they cover the break to avoid impact damage.

Inspect the nozzles every six to twelve months. Nozzles should be inspected for wear and tear.

(a) ensure that there is no obvious physical damage to nozzle components;

(b) ensure moving parts do not show damage or excessive wear;

(c) ensure that the latch mechanism is operating correctly;

(d) check for signs of leaks;

(e) the holster's nozzle anchor bracket shoud be checked for correct alignment from time to time.

(f) ensure that the autostop mechanism is operating correctly

4 DIAGNOSTICS, FAULT FINDING AND TROUBLESHOOTING

4.1 Normal Operation

To effectively diagnose faults in the MULTIPEC2 9000 FDS the following conditions and events, which occur during normal operation, should be considered:

(a) **LPG preset/prepay:** There is no preset or prepay option available on LPG. A preset/prepay amount **can** be entered - the display keypad is not disabled at this stage as the product has not been selected. The preset/prepay amount shows in the 'Preset' window until the LPG nozzle is lifted, when the figure clears. Delivery of LPG can then be made but the (invalid) preset amount has been 'lost' and will be ignored, i.e. the delivery will not stop at this figure and will continue as a normal post-pay delivery.

(b) **No flow timeout:** If a nozzle is lifted and no delivery is made for 60 seconds, the motor/relay is turned off and the FDS will start to beep repeatedly until the nozzle is hung back in the holster. This may also occur if the FDS receives no encoder pulses to initialise a delivery. It is therefore possible that in the event of a fault causing no encoder pulses to be received, the FDS may not display an error code[4] but may simply enter the no flow timeout sequence.

(c) **Pre-pressurisation:** At the first delivery after power-up or if the FDS has been idle for more than 4 hours, the hose will be repressurised to avoid short delivery due to possible loss of pressure within the hose. On lifting the nozzle the delivery will be 'delayed' for a few seconds while this occurs The display will go through a set sequence as illustrated in figure 1. The sequence is complete (and delivery can then continue) when the grade price is displayed for the active hose, shown as 123.4 in the illustration.

(d) **Grade price set to zero:** The FDS will not allow deliveries with the grade price set at zero. Forecourt Controllers generally will not allow prices to be set at zero, but in standalone mode the FDS could have a grade price of zero set for product. In these circumstances, if a delivery is attempted the display will go through three stages up to the point at which delivery would be made then come to a halt:

(i) the 'Litres' and 'Dollars' windows show 888.88;

(ii) the 'Litres' and 'Dollars' windows show ------;

(iii) the 'Litres' and 'Dollars' windows show 0.00 and the 'CENTS PER LITRE' window shows the grade price of 0.0;

(iv) the delivery will not be made. If the nozzle is not hung up for 60 seconds the FDS will enter the no flow timeout sequence described in **(b)** above.

(e) **Excess flow valve cut-off (LPG hoses only):** In circumstances where the FDS detects a sudden and excessive flow the excess flow valve will immediately cut the flow to the hose. This is a safety feature to avoid spillage in an otherwise dangerous event such as a hose being severed. The valve will automatically reset on the problem being rectified as the flow rate will return to within the normal parameters once pressure has equalised on both sides.

(f) **Activation of float switch:** If a 9000 series FDS has a float switch fitted[1] and the switch is activated (i.e. fluid is detected in the sump) the FDS will cease to deliver fuel. This may occur in the following circumstances:

(i) Fluid detected while the FDS is idle
- FLUId is displayed in the Dollars windows;

(ii) Fluid detected while one side of the FDS is
- idle side shows FLUId in the Dollars window;
- delivery ceases on the active side;
- delivery information for the active side is held in the display until nozzle is hung up;
- display on the active side starts to flash after a few seconds;
- display on active side shows FLUId when nozzle is next lifted;

(iii) Fluid detected when both sides of the FDS are in use
- delivery ceases on the both sides;
- delivery information for the each side is held in the display until nozzle is hung up;
- displays start to flash after a few seconds;
- displays show FLUId when nozzle is next lifted.

(g) **Price changes:** A price cannot be changed unless the FDS is in the idle state, however a Forecourt Controller can request a price change while a delivery is in progress, in which case the price change will them be implemented immediately after the completion of that delivery:

(i) FDS idle - the displays on the FDS will go blank, except for 0.00 in the 'Preset' window and the red LED remaining on. They will remain blank and the FDS will not operate for a mandatory 60 second delay, after which the displays will revert to the ready state as shown in the final illustration in figure 1;

(ii) Delivery in progress - the current delivery will continue and, once the nozzle is hung up, the FDS will commence the sequence as shown at (i) above.

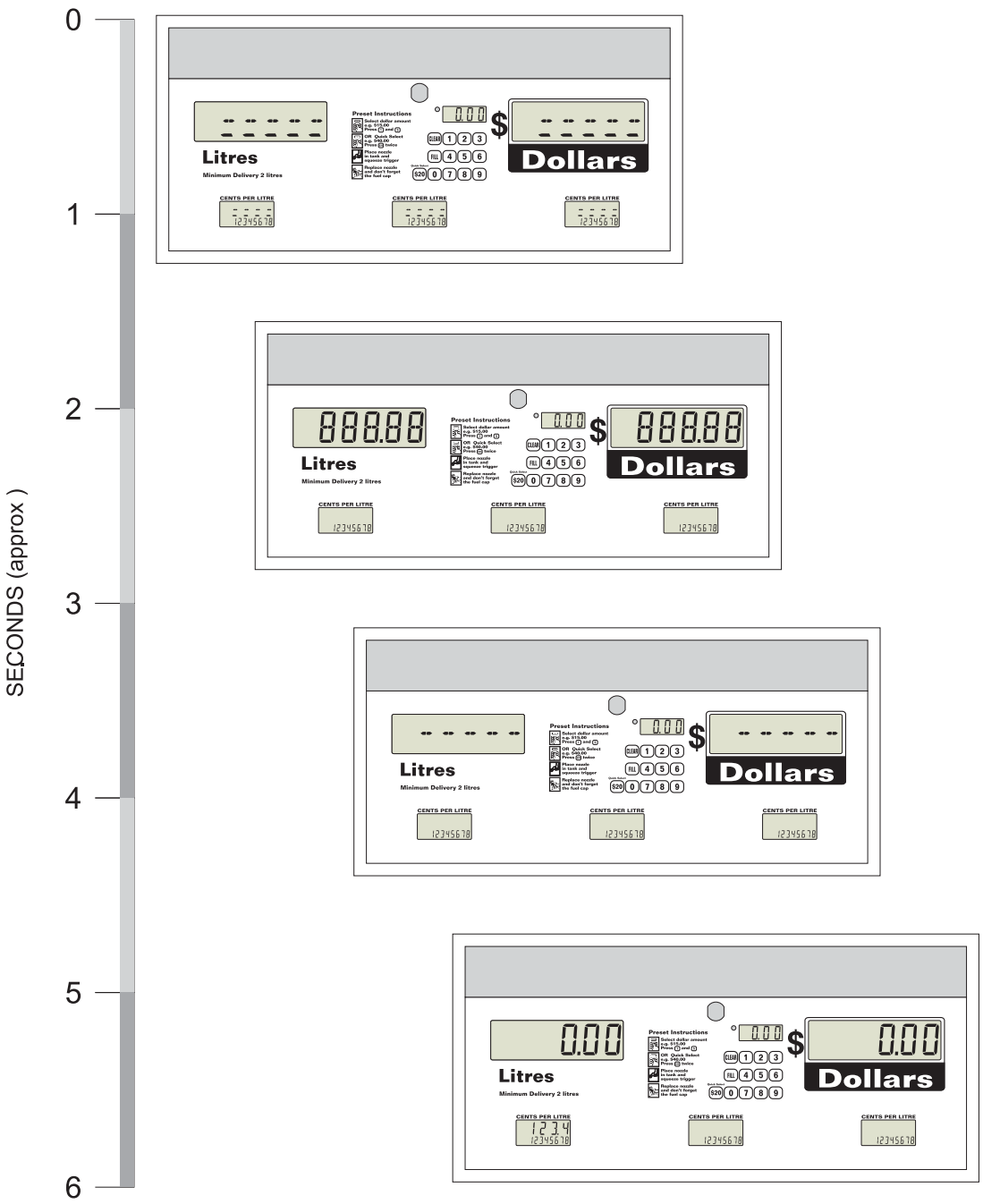


Figure 1. Pre-pressurisation Display Sequence

4.2 Startup Sequence

The MULTIPEC2 9000 FDS carries out a standard startup sequence which gives valuable diagnostic information.

When the FDS is powered up the system sounds a tone until a valid EPROM chip has been detected that can take control of the system. If a fault is detected at this point (i.e. if no valid EPROM is detected) this tone continues until power is disconnected. In non-fault conditions this tone sounds like a short beep, which will be followed by a noticeable pause before any other audible errors are reported. A sequence of internal checks (01 to 07) is then carried out. Any errors detected during these checks will be reported by a series of audible beeps. The number of beeps corresponds to the check position in the sequence (and to its relevant error code). Errors 01 to 05 are fatal, i.e. they cause the processor to stop at that point. Errors 06 and 07 are non-fatal so the sequence will continue. In the case of a fatal error, the number of beeps will indicate the error, but in the case of non-fatal errors 06 and 07 it is possible that both will be reported, resulting in a sequence of 13 beeps.

Table 1 shows this in tabular form.

Check and Error No.	Check Description	Fatal / Non-fatal	Beeps on Error
01	Check of processor's 4 banks of internal RAM (IRAM)	Fatal	1 + pause + 1
02	Check of all other IRAM	Fatal	1 + pause + 2
03	Check of EPROM checksum	Fatal	1 + pause + 3
04	Check of external RAM (XRAM)	Fatal	1 + pause + 4
05	Check of long-term RAM non-volatile system setup variables	Fatal	1 + pause + 5
06	Check current / most recent delivery variables have been retained	Non-fatal	1 + pause + 6
07	Check for valid LCD displays & keypads front and rear	Non-fatal	1 + pause + 7

Table 1. Startup Processor Checks

If there is only one beep and the displays remain inactive, check the LED at D4 on the Power Supply PCB. If the LED is anything other than fully lit and constant the required 230V/50Hz is not being supplied. (see section 4.5 (a))

The reporting of error 06 (i.e. 6 beeps) is not necessarily a ***fault*** condition. In instances where the 12V backup battery has been bypassed or disconnected, this is a normal condition.

The FDS will then check prices and, depending on the version of processor software installed, the displays will show one of two sequences:

(a) for processor software prior to vC2.60a the display will show 0.00 in both the 'Litres' and 'Dollars' windows;

(b) for processor software later than vC2.60a the software version number will be displayed in the 'Litres' window for approximately 5 to 10 seconds, or until valid Comms is detected.

The FDS will then check standalone prices or receive prices from the Forecourt Controller. FC prices always over-ride standalone prices. The displays will go blank (except for the totes, if displayed) during this check.

For price changes implemented while the FDS is powered-up, see section 4.1.

4.3 Install Note: H9000 LPG Single Hose (9161M)

Single hose 9000 series LPG pumps operate differently to other 9000 series pumps.

As LPG only 9000 pumps have no preset function, the graphics panel does not have the keypad printed on it. However, the keypads are fitted. Each pump is supplied with a keypad template which must be left inside the head for service personnel to use.

The 'Model' virtual DIP-switch setting must be set to '1MPS'. When set to this model the rear display functions only as a slave to the front display, i.e. it displays the same information as the front. Because it is a slave, the rear display keypad is disabled, so only the front side can be used for configuring the pump. When configured as a 1MPS the pump does not have a genuine 'rear' display and will therefore not detect the rear display. This will cause the pump to give 7 beeps on startup. In other pumps this would be an indication that the pump could not detect the rear 'side', but in the LPG 1MPS this is **standard** and indicates a **normal** startup.

4.4 Power Isolation Sequence

Due to its use of 2 batteries (see section 5.2) the MULTIPEC2 9000 FDS can be 'powered down' to 3 states:

(a) turning off the pump at the site switchboard removes mains power and renders displays & keypads inactive but the displays maintain the last transaction details while the 12V backup battery is connected. The 'Preset' window flashes between 0.00 and 0:00 three times. The display remains on 0:00 and the CENTS PER LITRE windows show OFF.

(b) the 12V backup battery can be bypassed by unplugging the power cable from the top left hand corner of the Power Regulator PCB. (Waiting for 5 seconds before proceeding following this disconnection is good practice - it ensures all residual current in capacitors and other components has dissipated.) This leaves the FDS setup information held in RAM maintained by the lithium battery on the Main

Processor PCB. With the backup battery disconnected, all display information is lost.

(c) the lithium battery can be bypassed by disconnecting the jumper (shunt) at J1 on the Main Processor PCB (found just to the side of the battery - it is good practice to keep the jumper pushed onto one of the pins while working to avoid misplacing it). With the lithium battery also disconnected the FDS is completely isolated and powered-down, all set-up and display information will be lost, but the tote data and Virtual Dip Switch settings are retained, tote data in the FRAM on the left hand PCB in the rear head compartment, Virtual Dip Switches in FRAM in both front and rear head compartments.

4.5 LED Indicators

The major PCBs in a MULTIPEC2 9000 FDS have LED indicators which give useful diagnostic information: (See figure 2 for the locations of the LEDs.)

(a) The Power Supply PCB has one red LED at D4 which, when on, indicates that power is connected to the board. At 230V/50Hz the LED is on and steady;

(b) The AC Control PCB has one red LED at LED1 which indicates the states of both power and AC data. When functioning correctly, the board's LED is on and steady. A flashing LED indicates that AC Comms connection has been lost, while an unlit LED indicates no power to the board. (At startup the LED will flash for approximately 5 seconds before remaining on);

(c) The Main Processor PCB has two LEDs, one red at D27 and one green at D26 to indicate data transmission and receipt respectively. The red LED (Tx) flickers to show transmission, the green LED (Rx) flashes to indicate receipt of data. Note that in normal operation the flashing of these LEDs is irregular;

(d) In an H9000 LPG FDS the Logic PCB has two LEDs for LPG operational status. Refer to the H9000 LPG Servicing Manual[8];

(e) The FDS displays have a red LED on each side to indicate that power is connected.

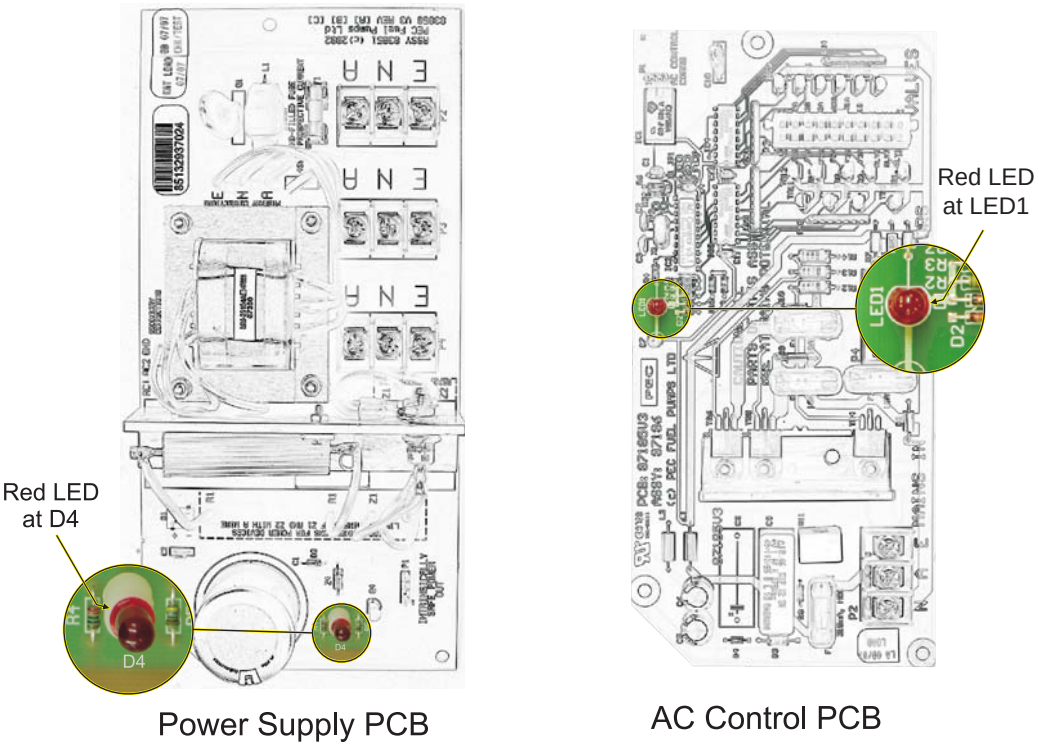


Figure 2. PCB LED locations

4.6 Voltage Checks

Power supply to the Main Processor PCB and peripherals is from two sources, the mains power supply and the battery module. Power from these sources is voltage and current limited by the Power Regulator PCB, before being fed to the Main Processor PCB together with the 50Hz “mains OK” signal.

Using a digital multimeter set to a suitable volts range, the system operating voltages can be checked as follows:

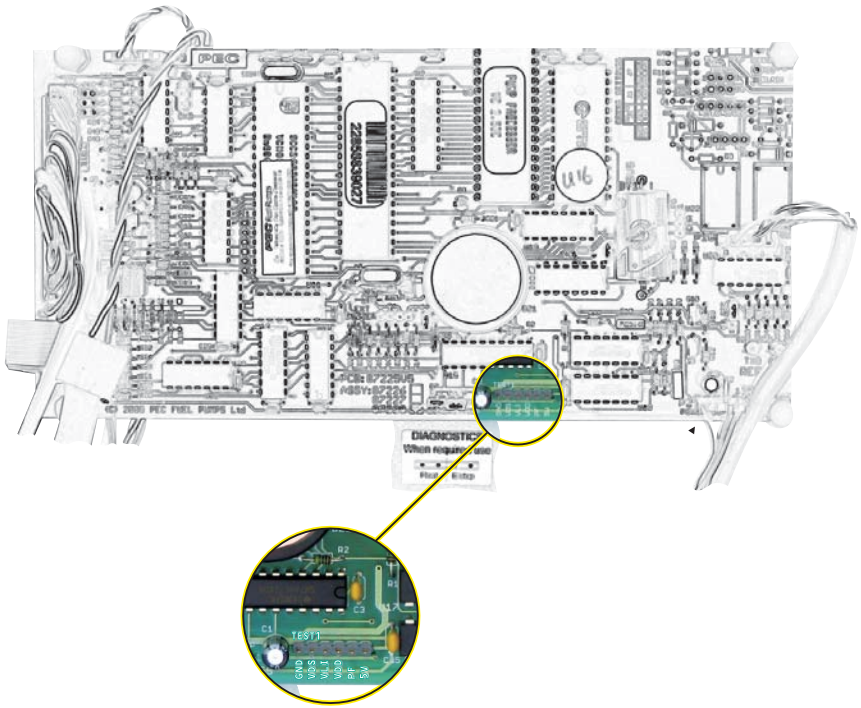


Figure 3. Main Processor PCB Test Pins

The Main Processor PCB has a 6 pin header close to the lower edge labelled TEST1 (see figure 3). **Measuring from the left hand pin labelled GND**, the following voltages can be checked:

(a) VDSP: This is a switched 5V power source for the display boards, controlled by the Main Processor PCB. 5V (±0.2V) should be present while mains power is on, and for a period of approximately 30 minutes after power down, provided the battery module is well charged;

(b) VLI: This is the voltage of the lithium battery memory back up source when mains power is off. A fresh battery will measure approximately 3.6V. Voltage below about 2.5V indicates a run-down battery, and the pump set-up data may be lost after power down;

(c) VDD: This is a switched 5V power source to the microprocessor and associated logic, controlled by the processor board. 5V (±0.2V) should be present while mains power is on, and for a period of approximately 30 seconds after power down, provided the battery module is well charged;

(d) PF: This is the “power fail” logic signal, and should measure a “high” level (5V) while mains power is on, in response to the 50Hz signal from the power supply. It will go “low” (0V) on mains power down;

(e) 5V: This is the 5V supply to the Main Processor PCB from the Power Regulator PCB, and should always measure 5V (±0.2V) as long as mains power is on, or after power down provided the battery module is well charged.

The voltage from the mains power supply may be checked at the power Power Regulator PCB. This can be measured on the “left hand” end of diode D4, found at the lower left hand end of the PCB (see figure 4). This should read nominally 15V, ±1V.

Likewise, the battery module voltage can be measured on the “left hand” end of diode D1 (see figure 4). It should read 10.5V minimum, and up to about 13V.

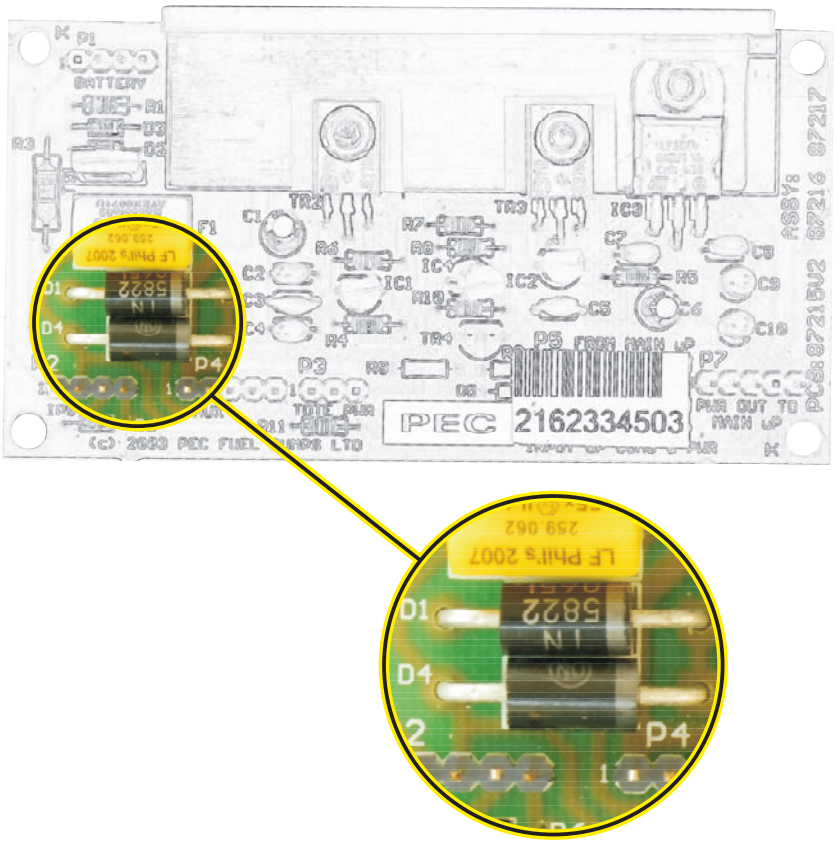


Figure 4. Power Regulator PCB Diodes D1 and D4

4.7 Electrical System Diagrams

The electrical systems of the MULTIPEC2 9000 FDS differ depending on display style and capabilities.

Figure 5 represents a pump or dispenser FDS with horizontal display, capable of up to 3 products. Figure 6 represents a dispenser only FDS with vertical display, capable of up to 4 products. Figure 7 represents a pump or dispenser FDS with vertical display capable of up to 3 products.

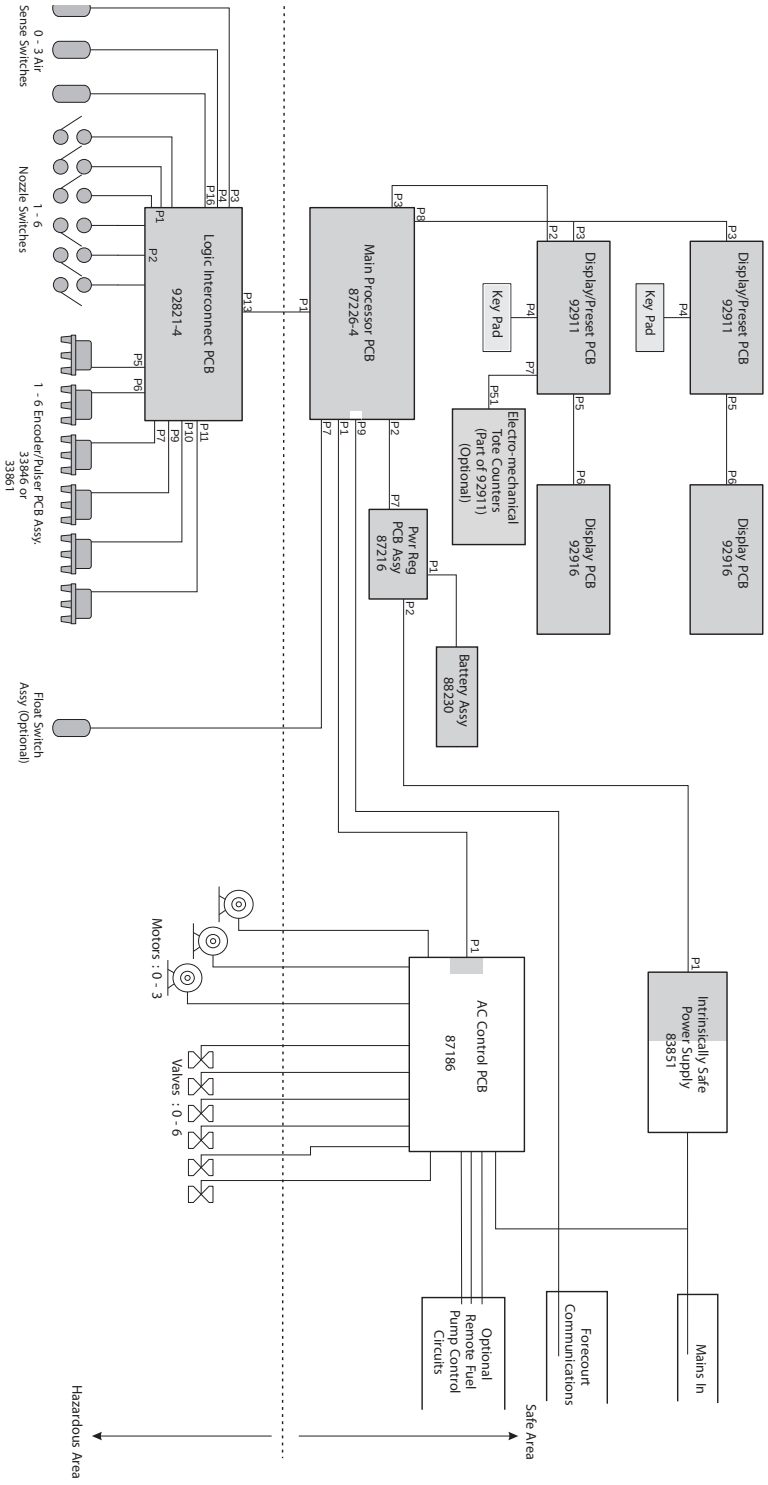


Figure 5. Electrical Diagram Multipec2 9000 Horizontal Display (Pump or Dispenser)

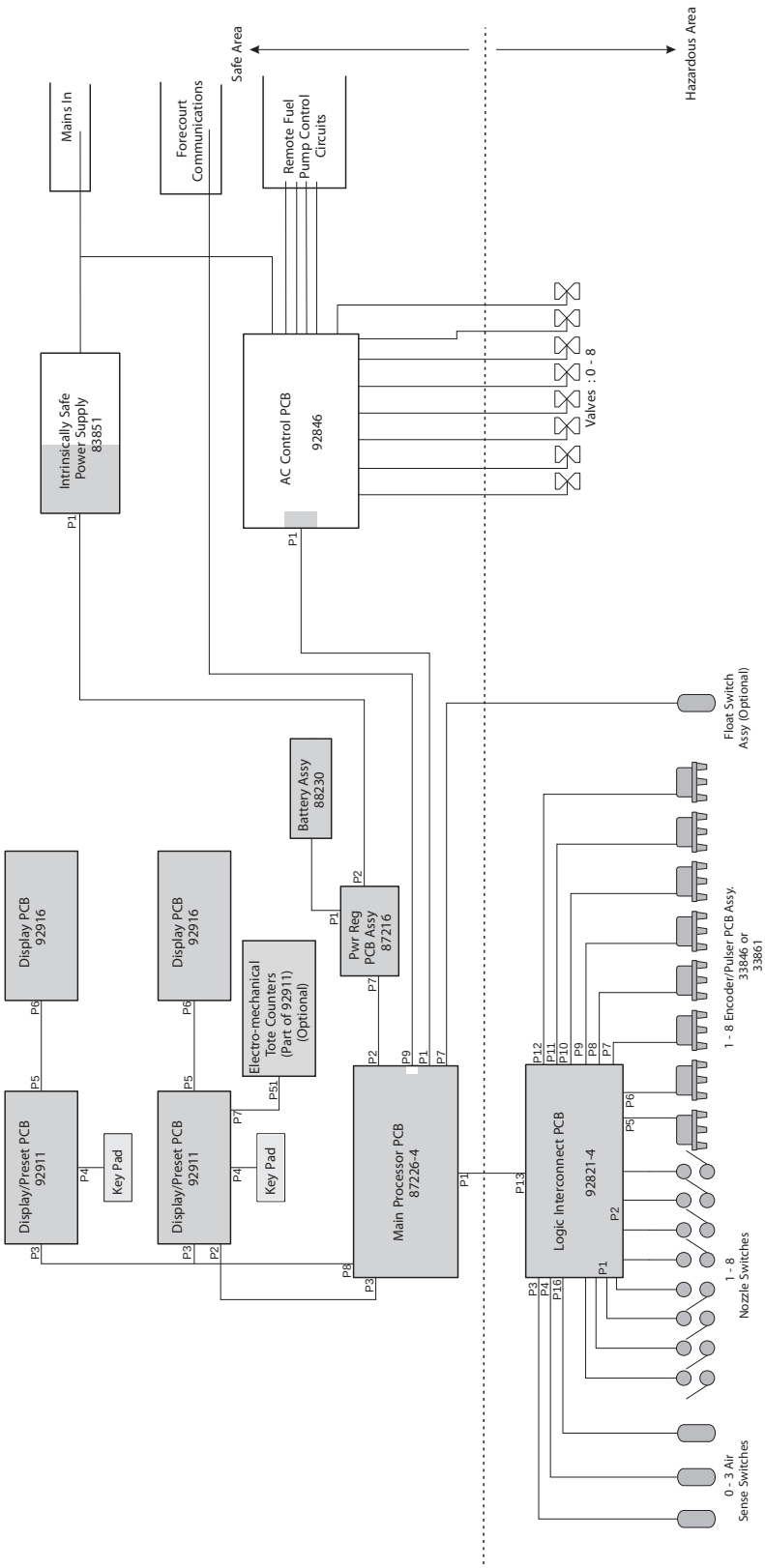


Figure 6. Electrical Diagram Multipec2 9000 Vertical Display 4-Product (Dispenser Only)

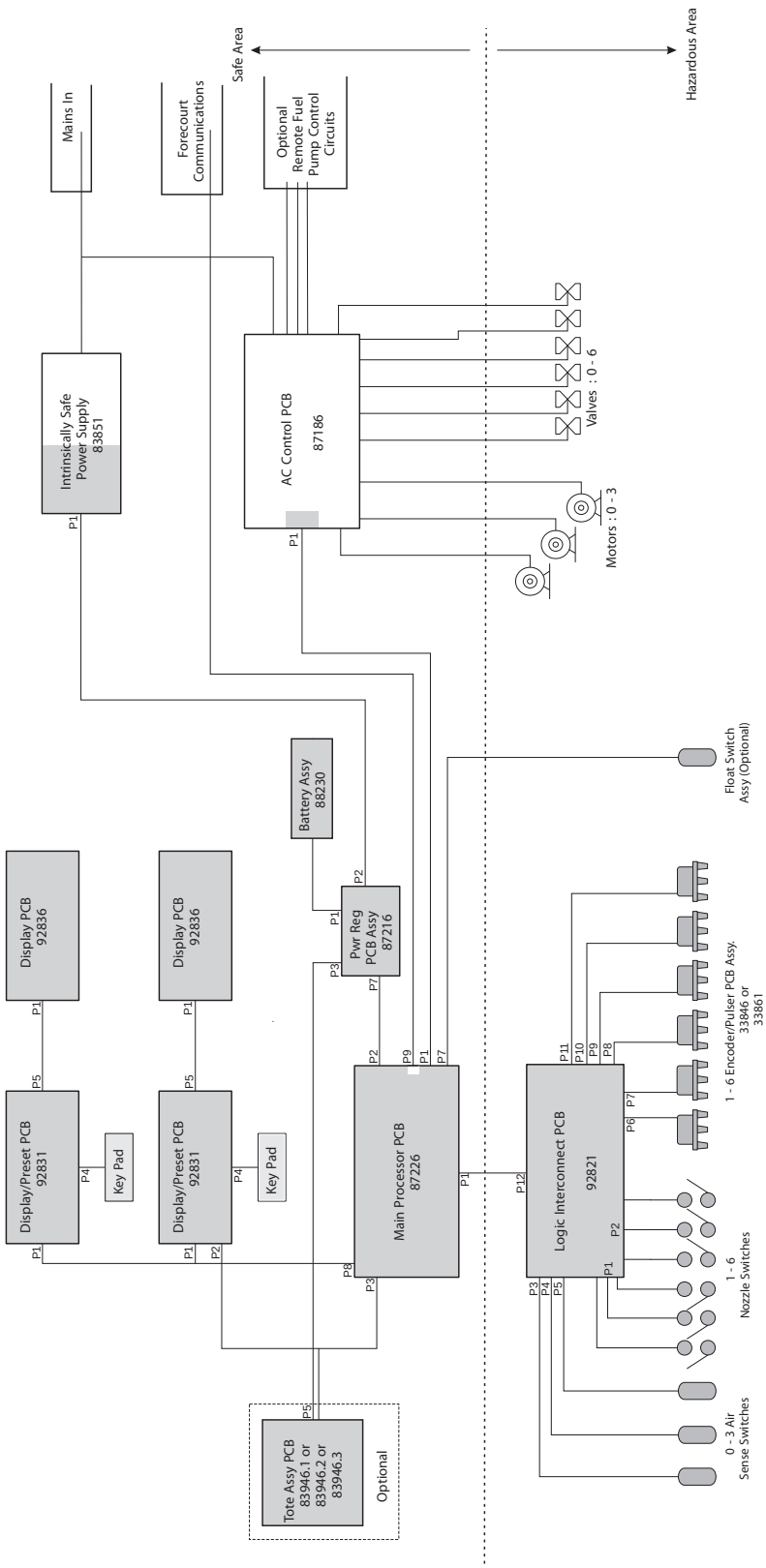


Figure 7. Electrical Diagram Multipec2 9000 Vertical Display 3-Product (Pump or Dispenser)

4.8 Cable and Plug Diagrams

CABLE NAME	END A	END B	SERVICE FITTING? (Y/N)	DIAGRAM
Comms Cable	White and Green wires put into molex receptacle; Red and blue wires (2-way berg): Processor PCB (P9)	Mains Motor PCB on P9 and P10	Y (End A)	Figure 8
Float Switch Cable	4-way berg: Processor PCB (P7)	Molex plug: float switch (if fitted)	Y (End A)	Figure 9
Display Cable	Processor PCB (P8)	Display PCB (P3) (Front and Rear)	N	
Valve Link	AC Control PCB (P3)	20 way molex plug: Valve Junction Box (P1)	Y (End A or B)	Figure 10
Mains and Motor Control Cable	AC Control PCB (P2 and P4)	Mains Motor PCB: terminal blocks E, 1,2,3,4,5	N	
Power Link	Power Supply PCB (P4)	AC Control PCB (P2)	N	
Lighting Cable	Fitted to light bracket	Power Supply PCB (P3)	N	
AC Comms Cable	40-way Logic Processor Cable (red wire no.5 and black no. 6	AC Control PCB (P1)	N	
Cable Assembly Regulator to Processor PCB	6-way berg (yellow/orange/black): Processor PCB (P3); (green/red) : Power Regulator PCB (P3)	6-way berg (5 wires): Mechanical Tote PCB (P5) When present.	N	
Cable Assembly-Mains-4-Product (only on 4-Product)	AC Control PCB (P2)	Mains Valve Junction Box (P6)	N	
Valve Link(only on 4-Product)	AC Control PCB (P3)	Mains Valve Junction Box (P1)	Y (End B)	Figure 10
Electronic Tote Cable	Processor PCB (P3)	Display PCB (P2)	N	
Regulator to Processor Cable	Power Regulator PCB (P7)	Processor PCB (P2)	N	

Power to Regulator Cable	Power Regulator PCB (P2)	Power Supply PCB (P1)	N	
Cable Assembly Nozzle Switch 4 product	Plugs into Holster Cable	Logic PCB:(P1) (P2)	N	
Logic Cable	40-way berg: Processor PCB (P1)	24-way Receptacle:Logic PCB (P13)	Y (End B)	Figure 11 & Figure 12

4.8.1 Service Fitting

Some cables are supplied with one end left without a connector so that they can be passed through the gland and the connector fitted afterwards.

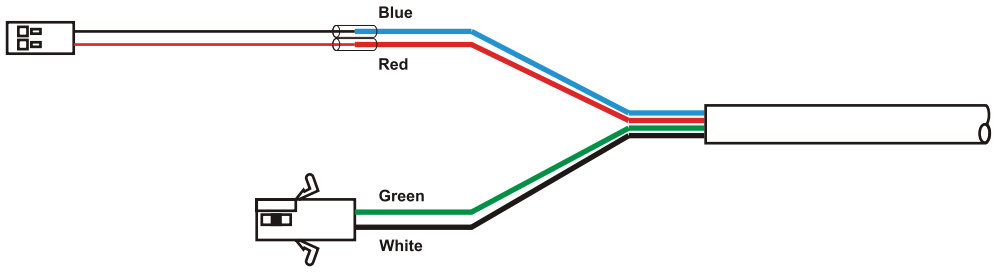


Figure 8. Comms Cable

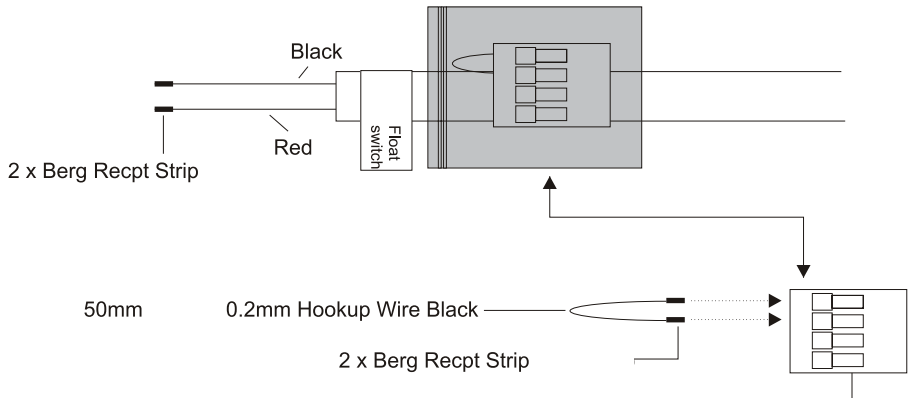


Figure 9. Float Switch Cable

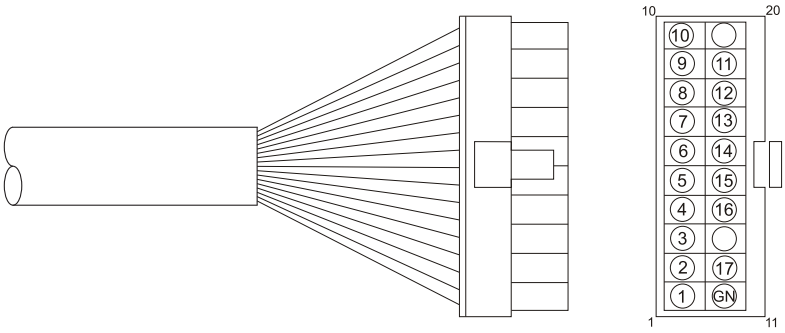


Figure 10. Valve Link

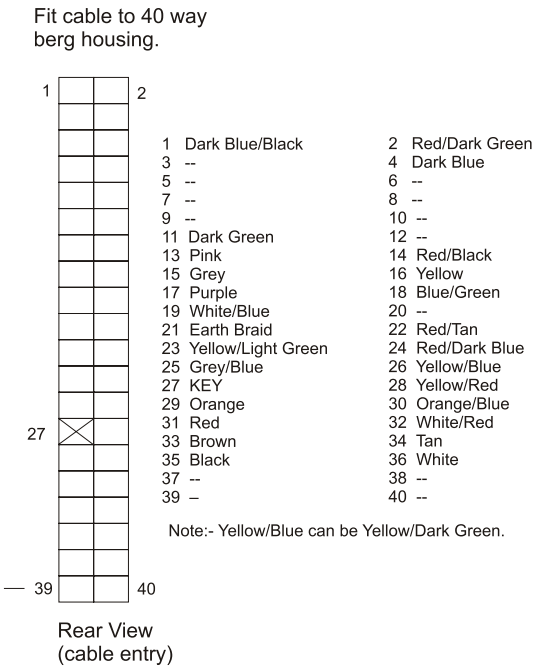


Figure 11. Logic Cable 40-Way Berg Housing

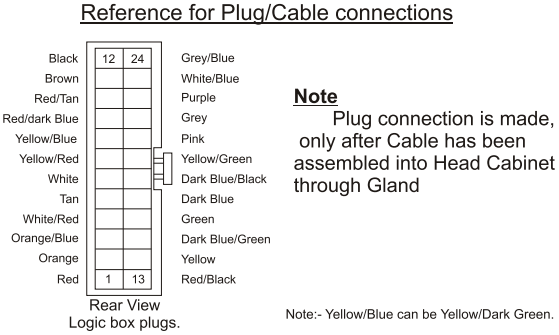


Figure 12. Logic Cable 24-Way Receptacle

4.9 Pump Stack Test

Perform a Pump Stack Test (function 30*) to ensure that fuel is flowing correctly. This will also flush the pipes and hoses and prime the system.

Set the 'Diags' switch on the Display PCB to 'Set' and press the 'Agent' button. A long beep will confirm entry.

When the holster panel is connected, if the nozzle switch cable is plugged into the Logic PCB and any nozzles are NOT in their holsters (i.e. if any of the holster switches are open), the motor of that module will start running.

Switches on the Logic PCB are left in the off (closed) position when shipped. (OFF = towards the centre of the PCB)

If testing an LPG dispenser, affix the LPG nozzle(s) to an approved container for collection of pumped fluid/gas, or to the vapour return nozzle test port (acme thread) to return fluid to storage. Refer to the MULTIPEC2 9000 Parts Manual[5] for the location and description of the vapour return nozzle test port.

Press 3 , 0 , FILL. The display should appear as shown in Figure 13.

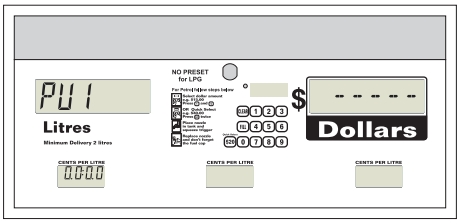


Figure 13. Function 30 Display Readout

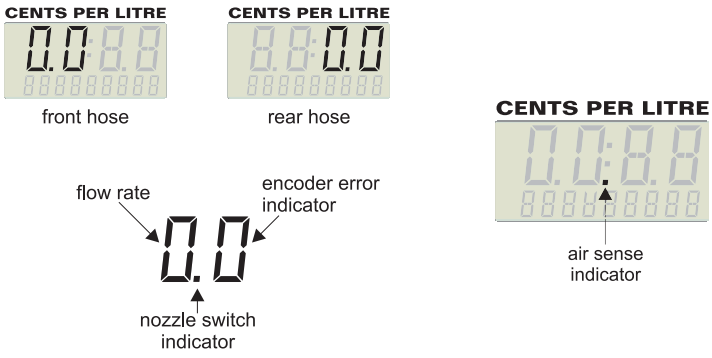


Figure 14. Function 30 CENTS PER LITRE Display Readout

The CENTS PER LITRE readout shows two pairs of digits, separated by 2 (or 3) dots. The first (left) pair relates to the front hose, while the second (right) pair relates to the rear hose.

Flow Rate
The first digit of each pair shows the flow rate of the hose. A figure of between 2 and 5 is normal, indicating approximately 20 to 50 litres per minute.

Encoder Errors
The second digit of each pair indicates whether the encoder is generating errors. This digit can display any figure, but must remain constant. A changing figure shows that errors are being detected.

Nozzle Switch Indicator
In the middle of each pair of digits, a point indicates the status of the hose's nozzle switch. If a point is present, the nozzle switch circuit is open, i.e. the nozzle is in the lifted state. Absence of a point in the display indicates that the nozzle is in the down (holstered) state, or closed-circuit.

Float Switch Indicator
If a float switch is fitted and activated, the lowest centre point indicates its status. If a point is displayed, the switch is open (i.e. it is raised, indicating fluid in the sump) or the circuit jumper is disconnected.

Air Sense Indicator (Not LPG modules)
Petrol and diesel modules incorporate air sense circuitry. The indicator for this is the bottom point in the middle of the four digits in the CENTS PER LITRE window (see above). When air is sensed in the module, flow is automatically reduced to allow the air/vapour to be eliminated. Note that, for pump or dispenser modules, if the air sense jumpers (at J1, J2, J3 on the Logic PCB) have been accidentally disconnected, the module will only deliver fuel at the slow rate as the data indicates that air/vapour is present.

Pressing 7 will change the display to show an approximate litres-per-minute reading (the colon will disappear). The figure may vary slightly, the lowest indicated flow rate will be the most accurate measure. Pressing 8 returns the display to its original view.

During these operations the 'Dollars' window will display information regarding the hoses in use and the motor status.

Pressing 1 will turn on the motor, and a 1 will show in the first digit of the 'Dollars' window. Press 1 again to turn it off.

Pressing 2 will open the front hose's valve, and a 2 will show in the second digit of the 'Dollars' window. Press 2 again to close the valve.

Pressing 4 will open the rear hose's valve, and a 4 will show in the fourth digit of the 'Dollars' window. Press 4 again to close the valve.

PEC recommends that at least 50 litres are delivered for each hose during these tests. Any air should be expelled from the system and any debris or contaminants should be thoroughly removed. All valves should be opened and closed, and switches turned on and off. Close attention should be given to all valves and joints, checking thoroughly for any leaks.

Pressing CLEAR will stop the motor and exit the stack test.

Functions 50 and 70 will enable stack tests of the second and third modules, if fitted.

The full list of motor operations and flow-rate functions controlled from the keypad is as follows.

Key	Operation (1 to 6 toggle on/off by repeating key-press)
1	Motor
2	Pump A restricted flow (not on LPG dispensers)
3	Pump A full flow
4	Pump B restricted flow (not on LPG dispensers)
5	Pump B full flow
6	Second motor (Ceepec Dual only)
7	Displays approx. litres per minute
8	Standard display mode

4.10 Troubleshooting

4.10.1 General Notes On Intrinsically Safe Systems

Intrinsically safe systems are highly susceptible to poor connections.

They are particularly sensitive to even minimal contamination and corrosion which may not be visible.

When fault-finding or investigating circuits with IS components, ensure that any contacts and connections are clean and tight:

(a) closely inspect all connections, checking for signs of corrosion or contamination;

(b) thoroughly clean any suspect connections using contact cleaner or toluene based thinners;

(c) unplug/re-plug connections several times to ensure contact surfaces give maximum conductivity.

Ensuring that the IS connections are effective can save time and simplify the location and diagnosis of faults in the field.

The following sections describe the analytical process for fault-finding. They are broken down logically into 2 separate tables, depending on whether the fault results in the FDS failing to deliver fuel or not.

Where the FDS ***appears*** to be ready to deliver fuel (i.e. the displays change to the ready-to-deliver state on nozzle-lift) but a delivery cannot be made, there are several further steps to consider or check. These are described in the chart in figure 15 following the table in section 4.10.2.

4.10.2 FDS Will Not Deliver Fuel

If the FDS displays FLUId in the 'Dollars' window, isolate the FDS at the switchboard.

This message indicates that fluid has been detected in the sump by activation of the float switch:

(a) remove any fluid from the sump and reset the FDS;

(b) if no fluid is present check the float switch circuit and the float switch cable to Logic PCB connection.

FAULT	ACTION
Displays not active, display LEDs off.	Check Power Supply PCB LED is on and steady (see section 4.5). Check power supply to FDS.
Displays not active, display LEDs on.	Power reset at pump (disconnect/reconnect power cable to Processor PCB). (see figure 37) Listen to startup beeps (see section 4.2)
7 or 13 beeps reported at startup (indicating error 7 or errors 6 & 7)	Check dipswitches set correctly for model of pump (see section 5.9.2) Check keypads connected correctly.
Pump not responding at POS (displays active but not responding when nozzle lifted).	Power reset at pump (disconnect/reconnect power cable to Processor PCB). (see figure 37) Check Rx & Tx LEDs on Processor PCB for correct response (see section 4.5). Check POS / FC operating correctly.
Pump not responding at POS (displaying software version in the 'Litres' window e.g. P260) (Indicates that the FDS has Comms numbers set up but is unable to communicate with the FC)	Power reset at pump (disconnect/reconnect power cable to Processor PCB). (see figure 37) Check Rx & Tx LEDs on Processor PCB for correct response (see section 4.5). Check POS / FC operating correctly.
Nozzle lift 'ignored' by FDS, i.e. display does not change.	Check nozzle switch is activating and is not faulty. (N.B. circuit is closed when nozzle is hung up) Check Logic PCB for shorting/moisture/ corrosion/faults. Check Logic PCB to Processor PCB cable connected correctly.
On lifting nozzle, displays show all 8s then go blank - 'Litres' & 'Dollars' windows show 0.00 (ready to deliver but will not dispense fuel)	See following chart, (figure 15).
FDS displays FUEL OFF	FDS needs setting up. See Commissioning Manual[10] and 9000 Functions and Errors documentation[4]. Check condition and connection of Lithium Battery on Processor PCB. (see section 4.6)

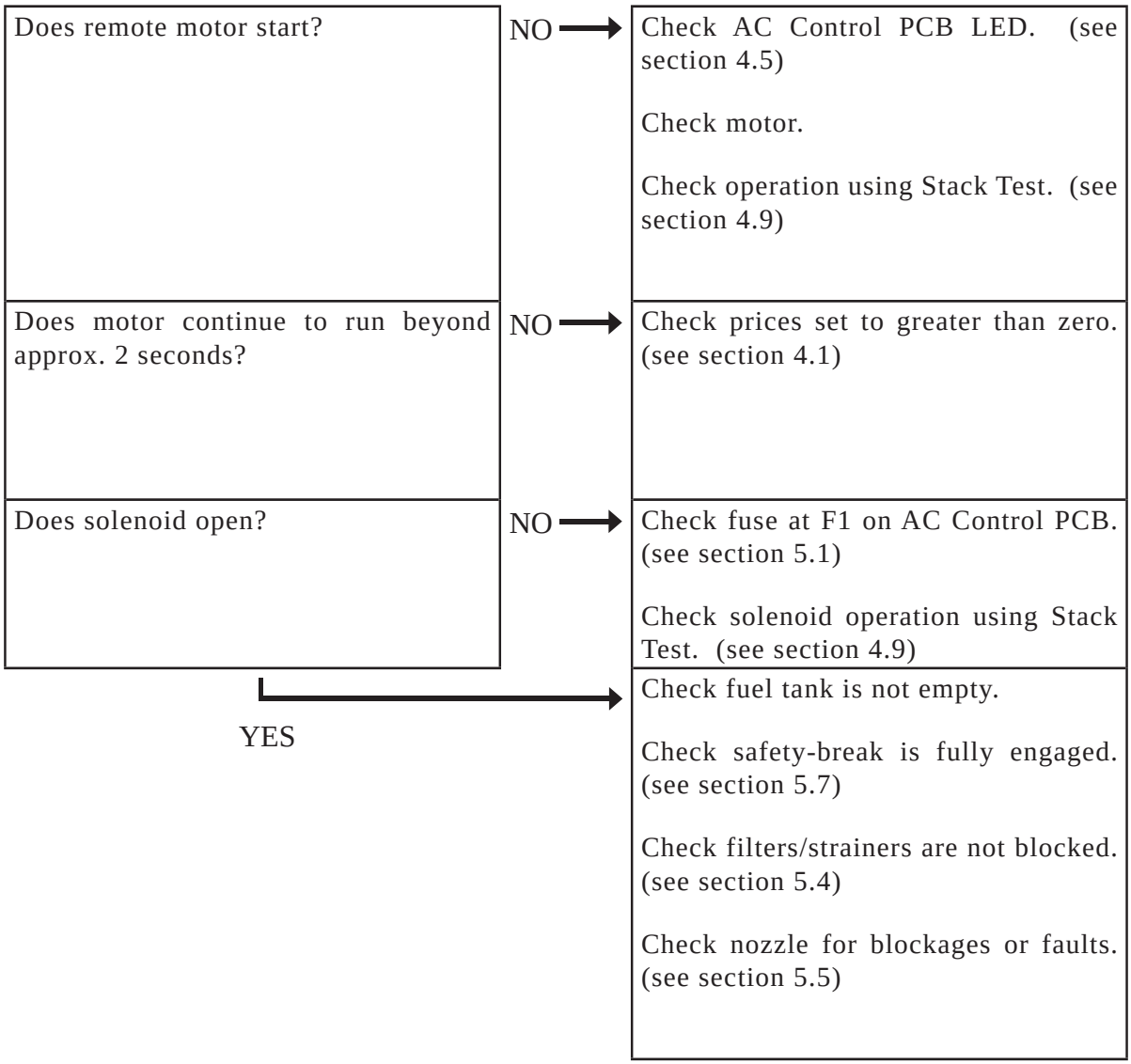


Figure 15. Checks - FDS Ready-to-Deliver but Will Not Dispense Fuel

4.10.3 FDS Will Deliver Fuel

<table>
<tr><th>FAULT</th><th>ACTION</th></tr>
<tr><td>FDS beeps and centre CENTS PER LITRE window shows flashing padlock icon.</td><td>Check connection between left and right hand PCBs in display.

Press ‘reset’ switch on left-hand display PCB.

Power down and restart FDS.</td></tr>
<tr><td>FDS beeps and centre CENTS PER LITRE window shows flashing pump icon.</td><td>Check FRAM is seated and connected correctly. (see figures 38 & 39)

Press ‘reset’ switch on left-hand display PCB.

Power down and restart FDS.</td></tr>
<tr><td>One or more of the electronic tote displays shows EEEEEEEE</td><td>Check FRAM is seated and connected correctly. (see figures 38 & 39)

Press ‘reset’ switch on left-hand display PCB.

Power down and restart FDS.</td></tr>
<tr><td>‘Dollars’ and ‘Litres’ windows are not incrementing during delivery.</td><td>Check encoder is turning.

Check encoder cable to Logic PCB is correctly connected.

Check Logic PCB for shorting/moisture. corrosion/faults.

Check Logic PCB to Processor PCB cable is correctly connected.</td></tr>
<tr><td>Totes not incrementing during delivery.</td><td>Check tote cable connected correctly at both ends (P3 on Main Processor PCB to either the mechanical totes or the LH Display PCB for electronic totes).

<table><tr><th>Electronic Tote</th><th>Mechanical Tote</th></tr><tr><td>If displays are working correctly EXCEPT totes, suspect Processor PCB fault.</td><td>Check for individual tote, tote assembly or Processor PCB fault.</td></tr></table></td></tr>
<tr><td>Prepay or preset delivery over-run.</td><td>Check solenoid diagram.

Check solenoid for debris.

If only 1 or 2 cents over-run, use function 17 (see section 5.9.4)</td></tr>
<tr><td>Slow flow rate.</td><td>Check solenoid. (see section 5.3)

Check filter. (see section 5.4)

Check safety break is fully engaged. (see section 5.7)

Check nozzle. (see section 5.5)

Check FDS fuel feed pressure.</td></tr>
</table>

5 SERVICEABLE PARTS

5.1 *Fuses*

To avoid invalidating the Approval Certificate for the entire FDS, all fuses MUST be replaced with genuine PEC-supplied replacements.

There are 5 replaceable fuses on the PCBs in the front head compartment of the MULTIPEC2 9000 FDS.

(a) On the Power Supply PCB: one 250mA at F1. This is a high breaking capacity type, with 4000A interrupt rating.

(b) On the AC Control PCB:

(i) one 315mA at F1 for supply to the board. This is a fast acting type with ceramic body and a 1500A interrupt rating;

(ii) three 10A at F2, F3 and F4 for power to each pump motor. These are of a time lag type with ceramic body and a 1500A interrupt rating. When there is no motor (e.g. a dispenser module or the unused third product on a 2 product FDS) the fuses are still fitted but the circuit is redundant.

Note that the PCB designators DO NOT directly correspond to the FDS product numbers, so designators F2, F3 and F4 supply motors 1, 2 and 3 respectively.

Disconnect the power supply to the FDS before replacing any of the fuses.

PCB	Designator(s)	Common Cause
AC Control	F1	Solenoid fault
AC Control	F2, F3, F4	Motor fault (or more rarely triac fault)
Power Supply	F1	Mains supply fault

Table 2. Common Causes for Blown Fuses

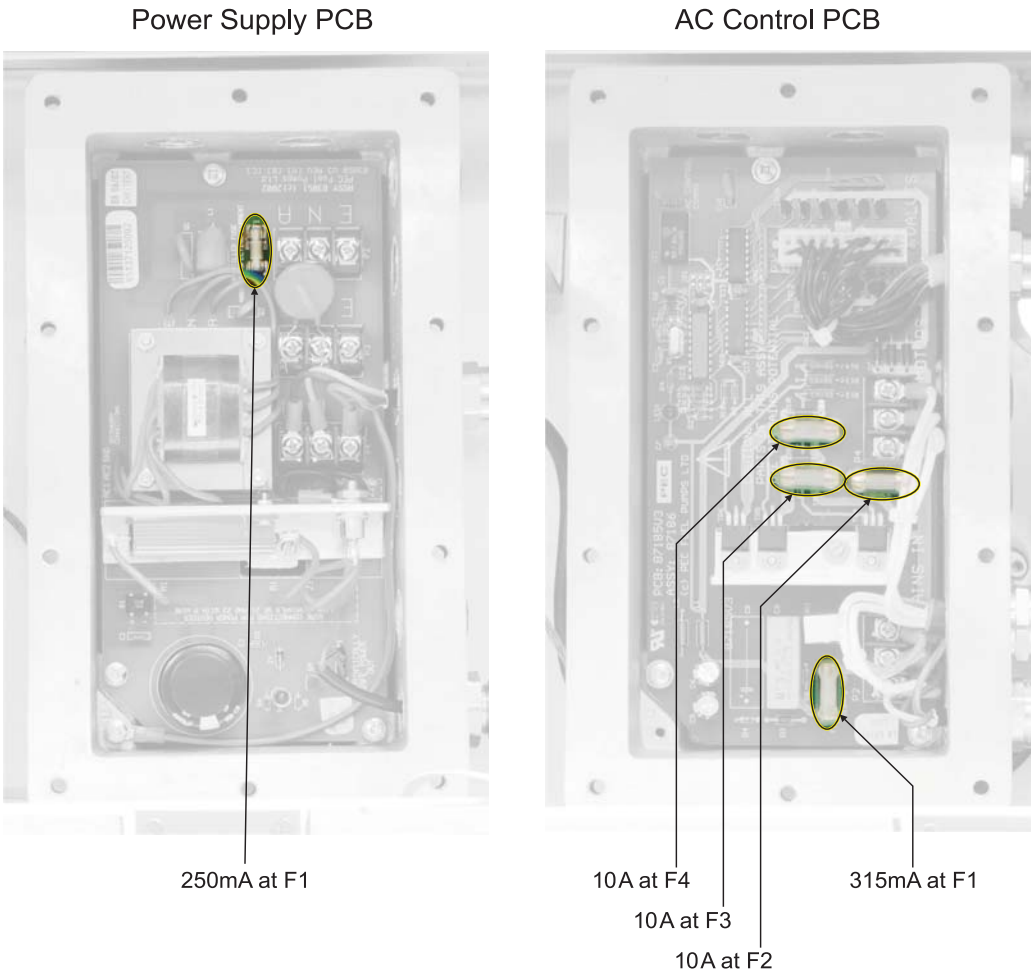


Figure 16. Replaceable Fuses

5.2 Batteries

There are 2 batteries used on the 9000 MULTIPEC2 FDS:

(a) A 3.6V lithium battery, to maintain the Main Processor's static RAM. This battery is soldered in place and is NOT a serviceable part;

(b) A 12V backup battery, to maintain power to the pump displays for a short time in the event of mains power supply failure. This battery is a serviceable part and can be replaced with a like-for-like PEC spare part:

(i) The backup battery is located inside the rear head compartment. It is fixed in place using 2 'Velcro' pads and is secured by a steel bracket;

(ii) Unplug the backup battery cable from the Power Regulator PCB;

(iii) Loosen the screw holding the bracket (accessed from the front of the head compartment - see figure 17) to allow the battery to be manoeuvred;

(iv) Pull the battery forward to separate the ‘Velcro’ pads and lift it out and clear of the bracket;

(v) Cut the cable ties that secure the battery cable and remove the old battery/ cable;

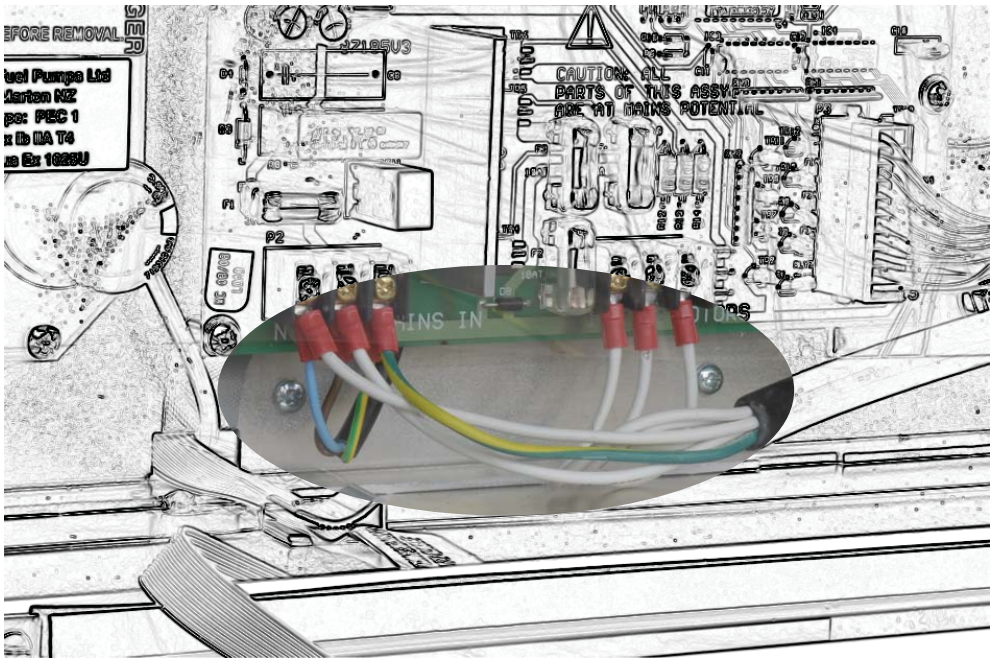


Figure 17. Backup Battery Bracket Screw - Front Head Compartment

(vi) Remove the backing film from the ‘Velcro’ pads on the replacement battery and press firmly into position;

(vii) Tighten the support bracket around the battery;

(viii) Plug the battery cable into the Power Regulator PCB;

(ix) Secure the cable with cable ties.

5.3 Valves

The 9000 FDS uses 2 types of solenoid valves to control fluid flow.

The H9000 LPG variants also use a third, LPG specific solenoid valve. Refer to the H9000 LPG Servicing Manual[8] for details of this valve and its maintenance.

Although replacement valves are available as spare parts, incorrectly operating valves can often be corrected by simple cleaning of the valve seals and O-rings (see figures 18 & 19 for exploded views of the different valve types).

Check the seals and O-ring for debris and obstruction and clean as necessary.

Check for signs of damage, e.g. cuts, tears, distortion, etc. which may cause leaks or bad seals.

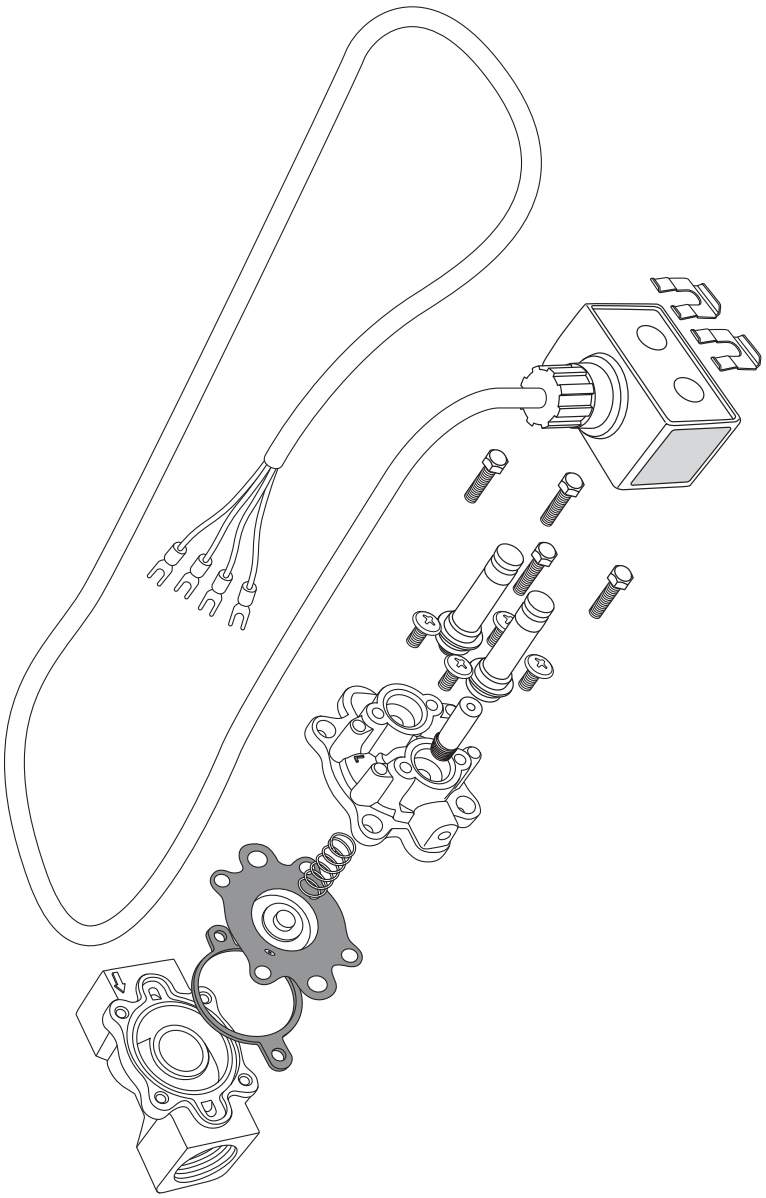


Figure 18. 2 Stage ¾" Solenoid Valve - Exploded View

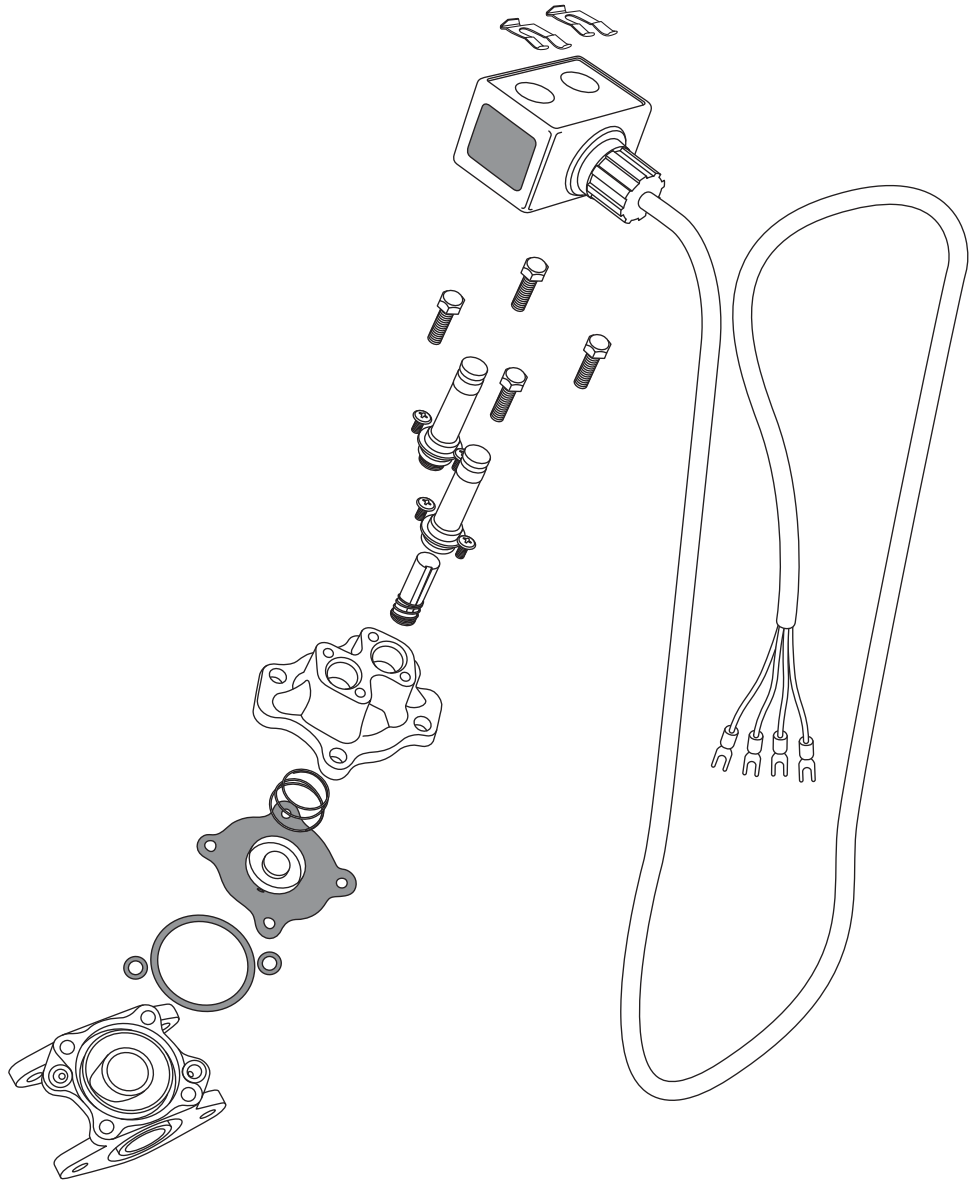


Figure 19. 2 Stage 4MPD Solenoid Valve - Exploded View

The solenoids cannot be checked with a multimeter

The solenoid switch is a sealed electrical system and MUST NOT be disassembled.

The valve contains fluids under pressure. To avoid risk of injury ensure that all motors are switched off and isolate all fluid supply lines.

Replacement diaphragm kits are available for each of these solenoid valves.

5.4 Strainers/Filters

All nozzles are pre-fitted with a filter. Note the orientation of the filter when replacing.

Figure 20. Nozzle Filter

The Multipec2 9000 FDS range uses different filters for dispensers (pressure) and pumps (suction).

Dispensing (pressure) systems use a simple spin-on filter as shown in figure 21.

Pumping (suction) systems use two strainers within the pump unit as shown in figure 22.

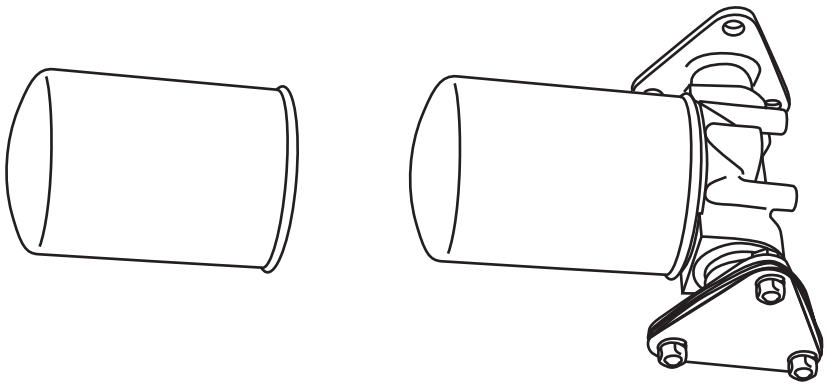


Figure 21. Dispenser Filter

The spin-on filter is located at the bottom end of the manifold below the meter on a dispensing (pressure) system.

Regular scheduling for maintenance and cleaning is not necessary for the dispenser filter. However, an indication that it is clogged and needs replacing is a slower than usual delivery flow of fuel.

To replace a dispenser filter:

(a) using a strap spanner, rotate the filter counter-clockwise and pull out. Ensure that machine oil is applied to lubricate the O-ring before you install the new dispenser filter;

(b) rotate clockwise until hand tight. Ensure that there are no leakages.

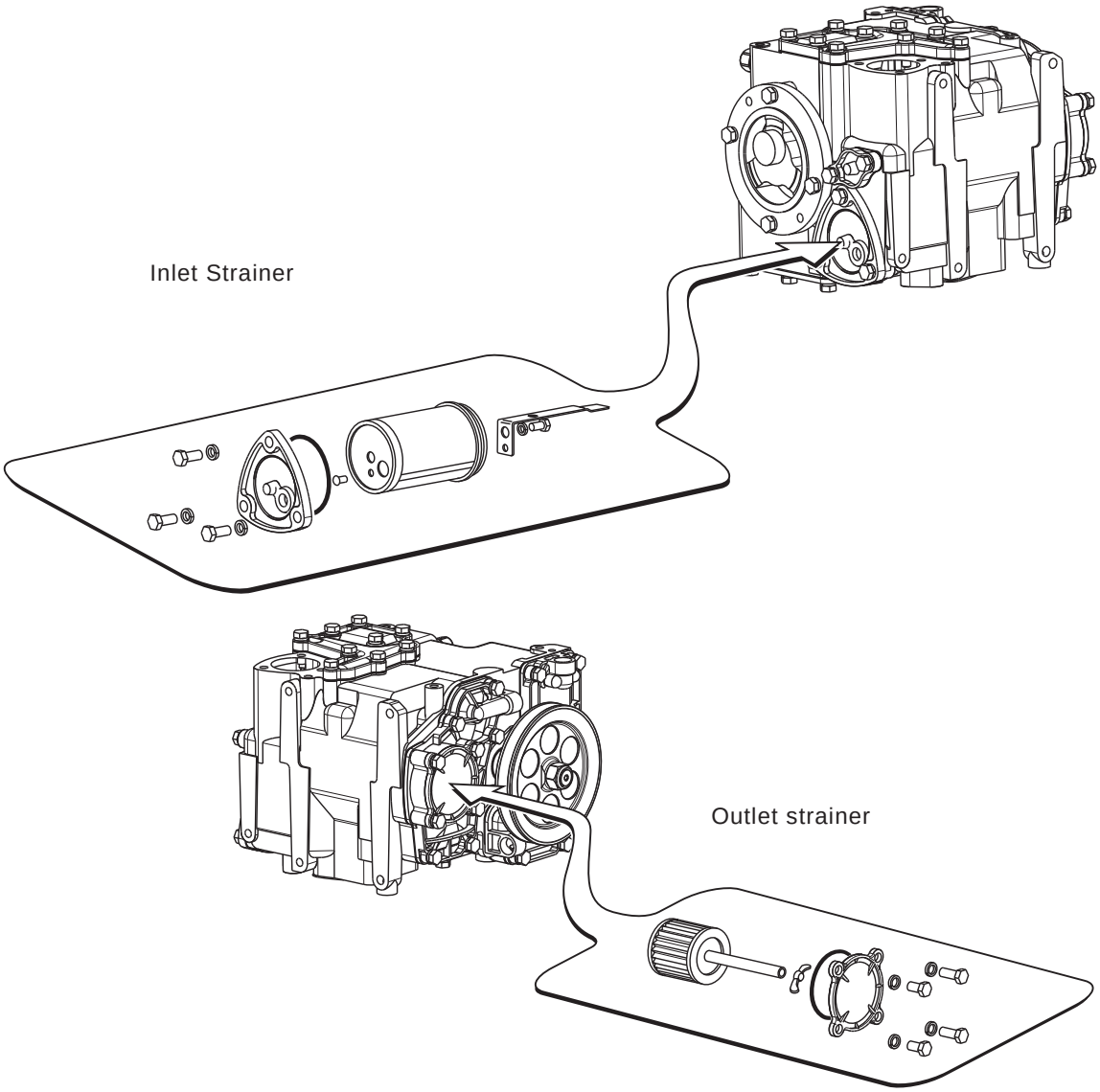


Figure 22. Tatsuno Pump Unit/Air Separator - Exploded View Showing Strainers

The Pump Unit/Air Separator contains two separate strainers - Inlet and Outlet.

To replace the Inlet Strainer:

(a) locate the strainer at the back of the pump unit. Unscrew the bolts from the strainer cover;

(b) pull out the inlet strainer;

(c) unscrew the bolt from the stopper that holds the strainer to the strainer cover;

(d) pull out the stopper;

(e) ensure that the replacement strainer has three pre-punched holes;

(f) ensure that the strainer cover is put back in the correct orientation as shown and screw back the bolt to the stopper that holds it to the strainer cover;

(g) screw in the elbow;

(h) fit the test valve assembly into the elbow.

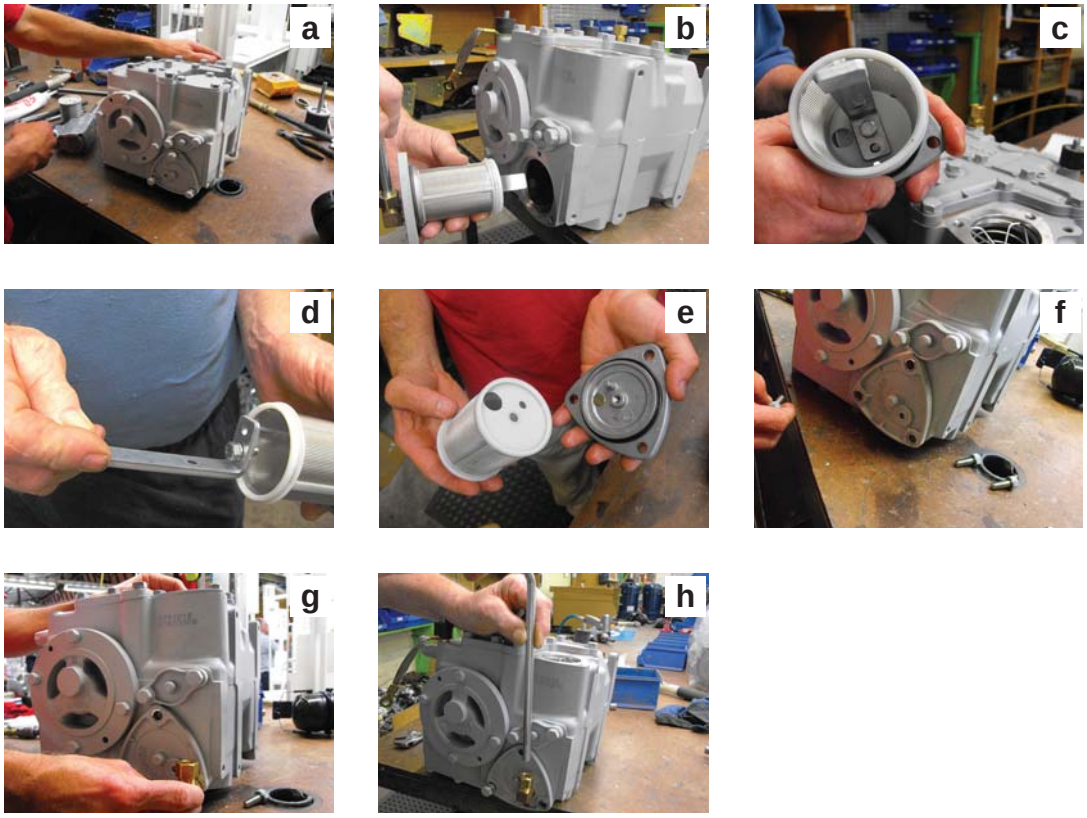


Figure 23. Replacing The Inlet Strainer

To replace the Outlet Strainer:

(a) locate the outlet strainer at the front of the pump unit;

(b) unscrew the bolts from the strainer cover;

(c) pulling out the strainer will release the float which will obstruct the replacement strainer when inserted;

(d) with a thin piece of wire hold back the float to allow the replacement strainer to enter the chamber;

(e) replace the strainer cover.

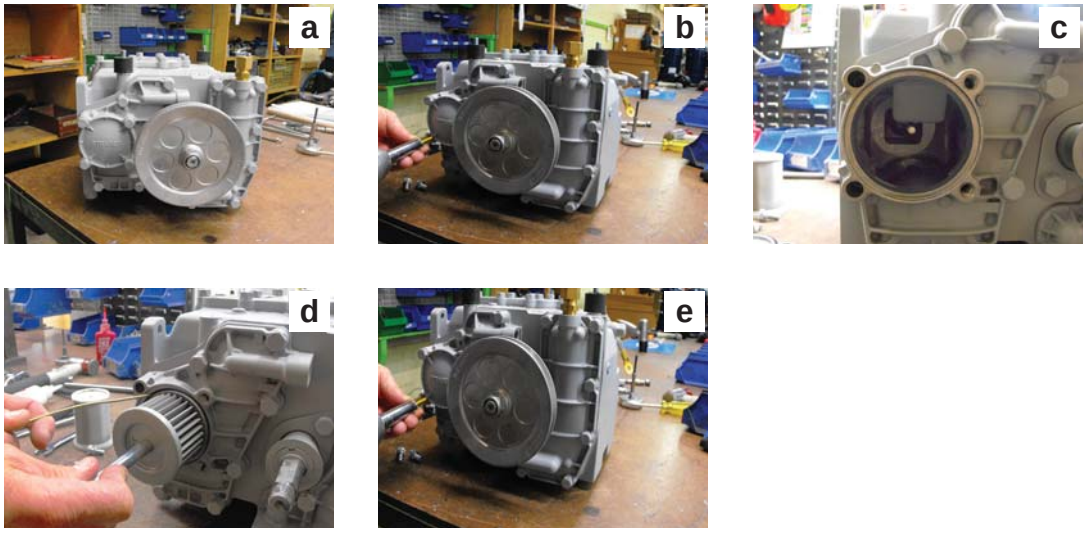


Figure 24. Replacing The Outlet Strainer

Cleaning and Maintenance

Regular scheduling for maintenance and cleaning is not necessary for the inlet and outlet strainer. However, a slow delivery flow of fuel is a good sign that cleaning is necessary.

The inlet strainer may be cleaned by blowing compressed air through the strainer element or by using proprietary brake dust cleaner or degreasant.

The outlet strainer is not suitable for cleaning with compressed air which only tends to move the dirt around. If degreasants or other solutions do not clean the strainer element effectively, fit a replacement strainer.

5.5 Nozzles

The MULTIPEC2 9000 FDS are supplied with various essentially similar nozzle types. LPG nozzles are different and are specific to LPG[8]. . A typical nozzle is detailed in figure 25.

Nozzles should be inspected regularly for damage and wear and tear:

(a) check that the Autostop Sensing Port (see figure 25) is not burred over. If it is, file the burred portion away to clear the port from any obstruction;

(b) check the freeness of the nozzle poppet by removing the swivel assembly from the nozzle body, compressing the nozzle trigger whilst at the same time pushing the poppet spindle to ensure it moves freely (see figure 25);

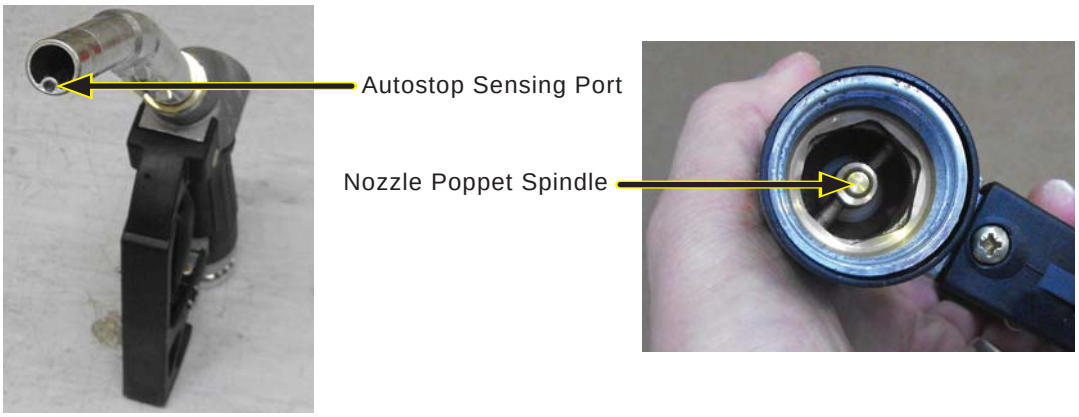


Figure 25. Autostop Sensing Port and Nozzle Poppet Spindle

(c) check that the filter is not clogged. If it is, clear the filter with compressed air. Re-insert the filter as shown in figure 26 so that the concave side faces towards the hose;

(d) ensure that the plastic boot is positioned correctly so that it protects the nozzle break;

(e) ensure that the plastic boot is positioned correctly so that it protects the nozzle break (see figure 26).

Figure 26. Refitting of Filter and Sleeving Safety Break Boot

5.6 Holsters

Petrol/Diesel Holsters for the 9000 series come in two shapes. The lip of the standard MULTIPEC2 9000 Holster is angled at the top of the holster to fit the shape of the door panel (see figure 27).

For the Federation variant, the column-position holster is of the same style as those on the front and rear panels, and is most likely to be for diesel on this model. (figure 28, right). The non-Federation 4 Product Dispenser uses a different style holster on the column (figure 28, left) to fit onto the flat vertical surface of the panel.

Figure 27. Standard 9000 Holster

Figure 28. 9000 Column Holster with Diesel Flap

The servicing requirements and methods are the same for both holster shapes.

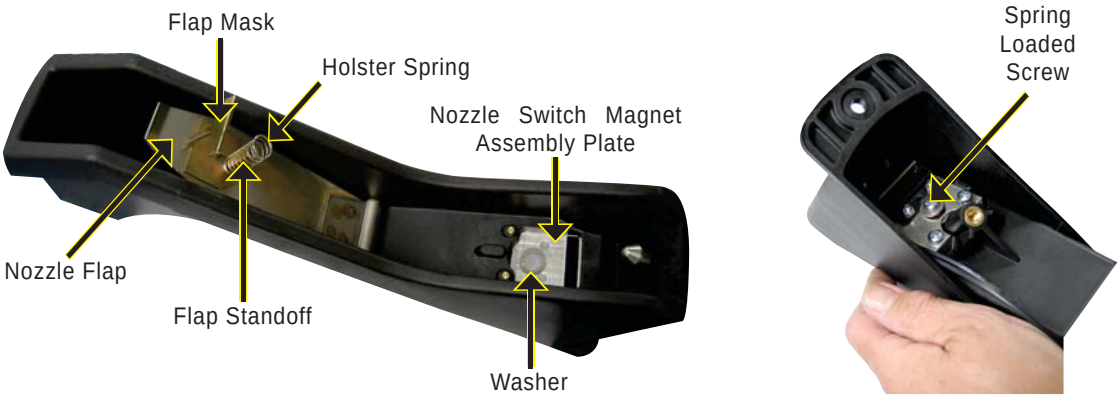


Figure 29. Holster Nozzle Flap Parts

The Holsters should be inspected regularly for damage and wear and tear:

(a) ensure the diesel latch pin is correctly in place;

(b) check that the switch magnet assembly is functioning correctly. This check can be performed by running a stack test and lifting the nozzle from the holster (refer to Section 4.9). If the switch magnet assembly is not functioning correctly check that the cable from the switch magnet assembly to the Logic PCB is connected. If the switch magnet fails (i.e. the circuit is permanently open or closed) replacements are available to order. Refer to the MULTIPEC2 9000 Parts Manual[5];

(c) check that the spring loaded screw holding the nozzle flap in position is securely fixed (see figure 29);

If the screw works its way out of the thread and the screw, washers, and spring come loose they will need to be re-fitted. The following steps and diagrams detail how to re-fit them:

(i) remove the holster from the panel;

(ii) center the washer with the larger diameter over the hole on the backside plate of the nozzle switch magnet assembly as displayed in figure 30;

(iii) sleeve the spring over the flap standoff as displayed in figure 30;

Figure 30. Place Washer and Sleeve Spring

(iv) close the nozzle flap so that the spring is compressed and the flap standoff and switch mask protrude out the rear of the holster. Ensure that the spring remains compressed. Screw the washer into the flap standoff so that it is firm;

(v) ensure that the flap mask is centered and that its sides do not catch on the plate of the nozzle switch magnet assembly whilst the nozzle flap is opened and closed;

(vi) re-fit holster to panel.

Figure 31. Nozzle Flap Spring

(d) formerly the flap masks were made without beveled edges. This may cause the flap mask to catch on the plate of the nozzle switch magnet assembly. To correct this, file the edges to match the new version of the flap mask as displayed in figure 32.

Figure 32. Flap Mask

5.7 Safety Breaks

The PEC 9000 Series (MULTIPEC2) FDS range uses Elaflex Straight (SSB) and Elbow (ESB) Safety Breaks to protect the FDS, the hose and the vehicle in the event of a drive-off.

An SSB may be used on 5/8" (16mm) and 1" (25mm) hoses, ESBs are only fitted on 5/8" hoses .

Reassembly of safety breaks must only be carried out by an authorised service engineer.

To reassemble a safety break:

(a) switch off FDS;

(b) push break sleeve up the hose from over the safety break;

(c) clean all parts and check them for damage caused by the drive-off (e.g. deformations or broken/cut plastic components) which could cause leaks (DO NOT use any couplings which show evidence of such damage);

(d) lightly lubricate parts shown in figure 33;

Figure 33. Safety Break Grease Points

5.8 Hoses

Hoses should be checked regularly for signs of wear and tear or damage (e.g. abrasions, bulges, distortion, etc.) and any exhibiting such signs should be replaced. Also replace any which can no longer be adjusted so as to not touch the ground when the nozzle is holstered correctly.

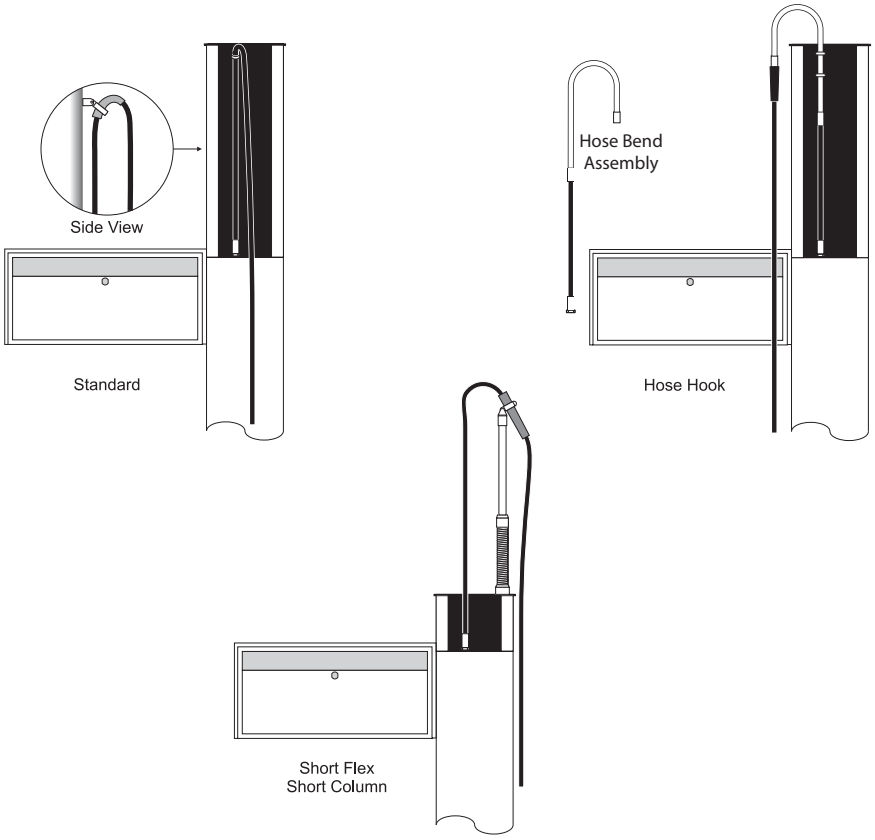


Figure 34. Hose Attachment Methods

Hoses are attached to the FDS by three different methods as shown in figure 34. The replacement procedure for each of the methods is as follows:

(a) Standard Attachment:

(i) unscrew the swivel body from the upper column so that the hose is no longer suspended;

(ii) disconnect the hose from where the delivery pipe exits the lower column;

(iii) remove the nozzle boot, nozzle and safety break assembly from the hose to be replaced;

(iv) sleeve the nozzle boot and anti-kink sleeve onto the replacement hose;

(v) attach the nozzle and saftey break assembly to the replacement hose, ensuring the nylon washer is in place;

(vi) suspend the replacement hose by screwing the swivel body into the upper column;

(vii) slide the anti-kink sleeve into place at the nozzle end;

(viii) slide the nozzle boot into place.

(b) Hose Hooks:

(i) disconnect the hose from the hose hook;

(ii) remove the nozzle boot, nozzle and safety break assembly from the hose to be replaced;

(iii) sleeve the nozzle boot and anti-kink sleeves onto the replacement hose;

(iv) attach the nozzle and saftey break assembly to the replacement hose, ensuring the nylon washer is in place;

(v) attach the replacement hose to the hose hook, ensuring the nylon washer is in place;

(vi) slide the anti-kink sleeves into place at both ends;

(vii) slide the nozzle boot into place.

(c) Short Flex:

(i) remove the pin that joins the hose clamps to the swivel body to remove the hose from the short flex spring assembly;

(ii) disconnect the hose from where the delivery pipe exits the lower column;

(iii) remove the nozzle boot, nozzle and safety break assembly from the hose to be replaced;

(iv) sleeve the nozzle boot and anti-kink sleeve onto the replacement hose;

(v) attach the nozzle and saftey break assembly to the replacement hose, ensuring the nylon washer is in place;

(vi) suspend the replacement hose assembly to the short flex spring assembly by inserting the pin through the swivel body (attached to the spring assembly) and hose clamps (attached to the hose assembly);

(vii) slide the anti-kink sleeve into place at the nozzle end;

(viii) slide the nozzle boot into place.

5.9 Software

Take suitable preventative measures when handling EPROMs or other ESD sensitive components. See Appendix A for more information.

The Multipec2 9000 FDS uses 4 types of software:

(a) The Processor Software EPROM is plugged into the Main Processor PCB using a socket (see figure 54), allowing easy replacement. Its purpose includes instructing the nozzle switches to start or stop fuel delivery and intructing the AC board to open or shut the valves. The Main Processor PCB also contains the jumpers which provide Comms Interface Settings for PEC and Gilbarco (see figure 37).

(b) The Display Software is held in flash memory. The FRAM is soldered to the Display PCB and is not replaceable (see figures 38 & 39). The display software can only be changed by replacing the Display PCB. The FRAM holds the totes data and dip switch settings (pump configuration).

(c) Density probe interface in flash memory on the Logic PCB. This is only used on LPG dispensing units

(d) AC Control Software located on the AC Control PCB in a soldered chip. It is not a servicable part. Replacing this sotfware requires a replacement AC Control PCB.

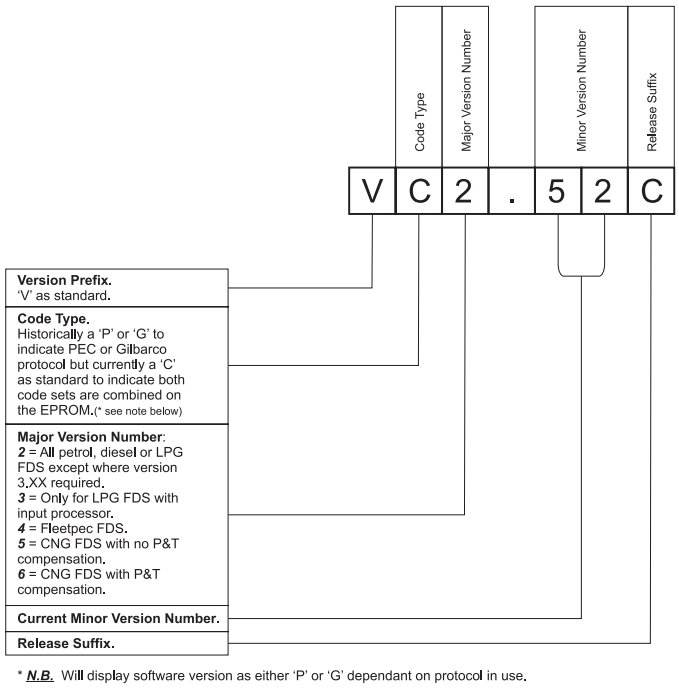
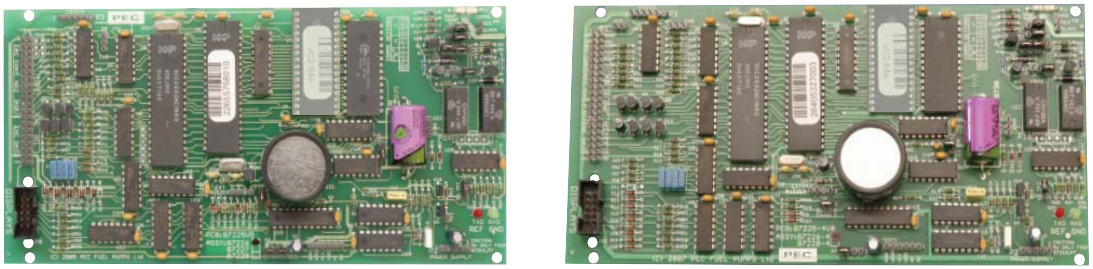


Figure 35. 9000 Series FDS Processor Software Version Numbering

5.9.1 Processor Software

Figure 36 shows the two types of Main Processor PCB used in the 9000 series (non LPG variants). These two processors are not interchangeable.



Processor PCB Type 1 Processor PCB 4PD

Figure 36. 9000 Series Processor PCBs

Figure 37 shows the Comms Jumpers and Power Cable connections common to both types of Processor PCB.

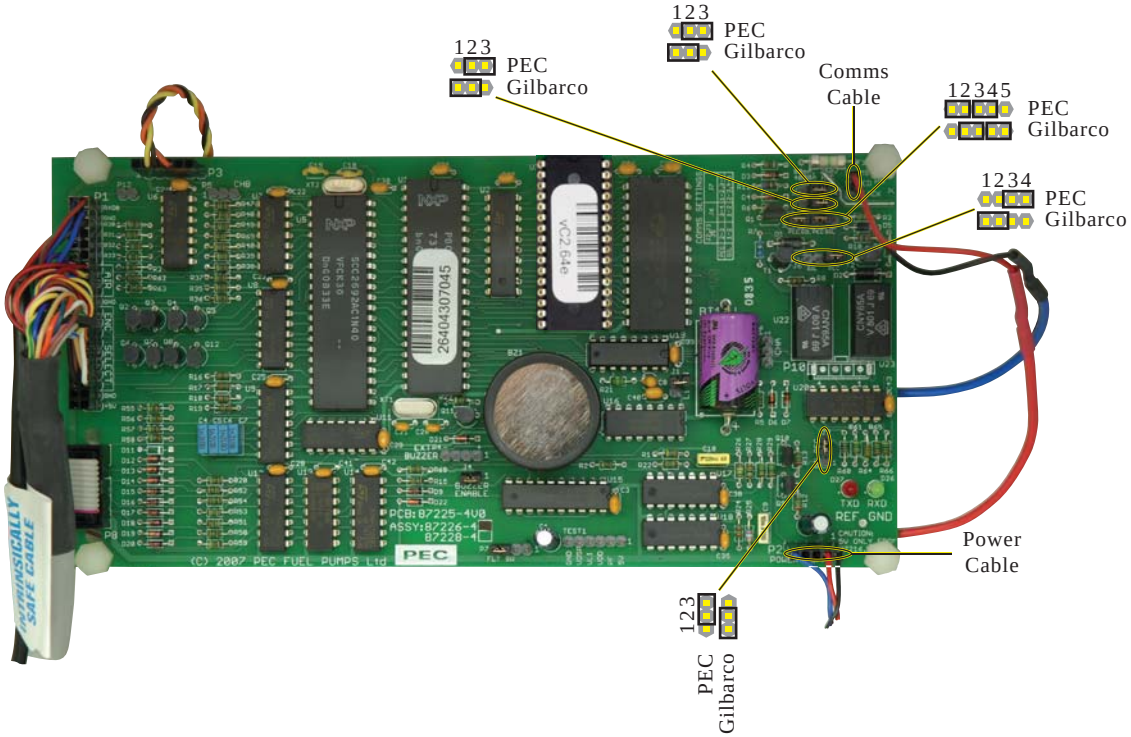


Figure 37. Processor PCB Comms Jumpers and Power Cable Connection

5.9.2 Display Software

The MULTIPEC2 9000 FDS holds its configuration settings in FRAM (see figure 38 and 39). Historically these settings were selected using on-board Dip Switches, but these have been replaced with software-based virtual dip switches.

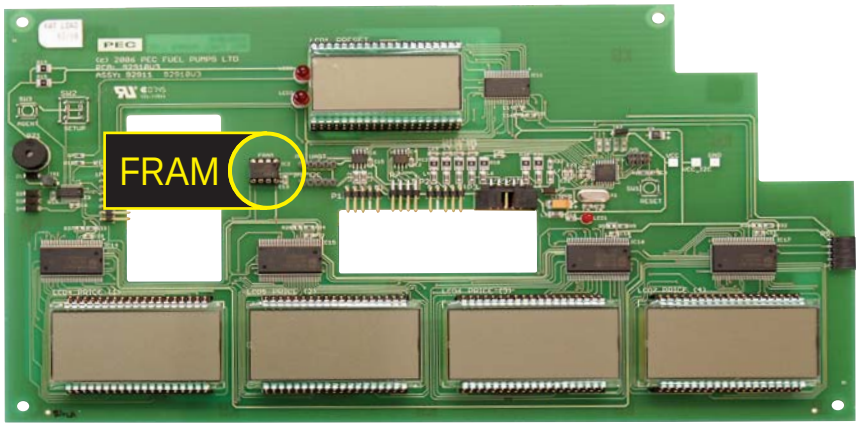


Figure 38. Virtual Dip Switch and Tote FRAM Location - Vertical Display Board

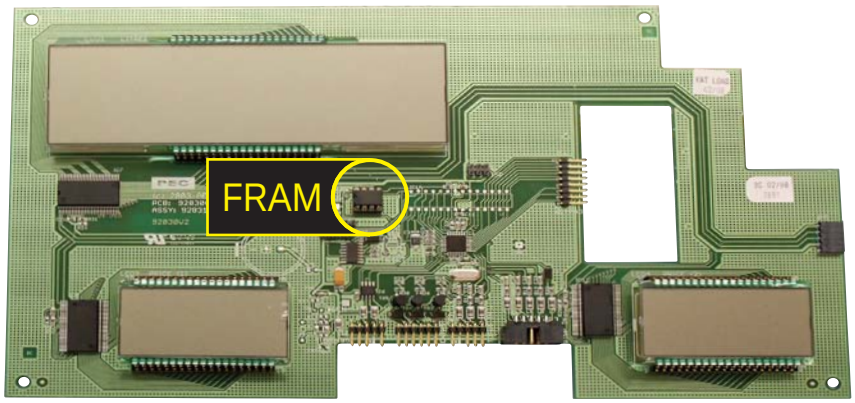


Figure 39. Virtual Dip Switch and Tote FRAM Location - Horizontal Display Board

If the virtual dip switches are not set correctly for the configuration of the FDS it will not function correctly.

Virtual dip switches are set at the factory prior to despatch but they may need to be reset in the field for various reasons, e.g. if the FRAM chip has been replaced.

△ It is possible that on replacing a display PCB, the FDS will appear to display prices/ totes in the wrong windows. This is likely to be because the FDS has a non-standard configuratioin which needs to be set in the virtual dip switches to match the physical configuration. Check to see if any hoses have been crossed over on the upper column or if any of the holster switch inputs have been swapped on the Logic PCB. See Hose mapping, (section 5.9.3).

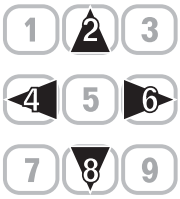
Tables 3 & 4 show the 9000 series virtual dip switch options along with the default settings for software versions prior to r2.30. To access the virtual dip switch settings:

(a) hold down the FILL key for 3 seconds until PIN? is displayed in the 'Litres' window;

(b) enter 1 , 2 , 3 , 9;

(c) the 'Litres' window will show SIDE, which is the first virtual dip switch option;

(d) to display the display software version in the 'Litres' window, press 5. Press 5 again to clear this display.



When changing or viewing the virtual dip switch settings, the 2 , 4 , 6 & 8 keys function as cursor keys. Use the 2 & 8 to scroll through the next/previous virtual dip switchesand the 4 & 6 to scroll through the setting options.

Changes made to the virtual dip switch settings are 'memorised' until saved. To save the changes and exit the virtual dip switch setting routine, press FILL. To exit without saving changes, press CLEAR.

Any changes made to virtual dip switch settings will not take effect until these settings are read at startup (see section 4.2). To apply settings the FDS must therefore be powered-down and restarted.

Switch	Options	Default
SIDE	FRONT (power supply side) REAR (processor side)	FRONT
MODEL	1MPD 2MPD 3MPD DUAL TRIO 1MPDS (available only in r1.5b)	3MPD
TOTES	SHOW HIDE	SHOW
DMODE	5DIGL 6DIG	5DIGL
IP BD	NO YES	NO
PRICE	CENTS DLLRS	CENTS
LPG	NO YES	NO

NOTE - The last three options are only available on FRONT side

Table 3. Virtual Dip Switch Options (Display Software up to r1.5b)

Switch	Options	Default
SIDE	FRONT (power supply side) REAR (processor side)	FRONT
LPG	NO YES	NO
PRICE	CENTS DLLRS	CENTS
DMODE	NATIVE RETRO	NATIVE
6 DIG	NO YES	NO
TOTES	SHOW HIDE	SHOW
MODEL	1MPD 2MPD 3MPD DUAL TRIO 1MPDS (available only in r1.5b)	3MPD
CONFIG	AUTO USER	AUTO

NOTE - The LPG and PRICE options are only available on FRONT side

Table 4. Virtual Dip Switch Options (Display Software up to r2.31)

5.9.3 Hose Mapping

Hose mapping (the defining of which nozzle/hose relates to which grade price window on the display of one side of an FDS) must always be set on BOTH sides of an FDS.

Hose mapping is accessed through the virtual dip switch option as follows:

Press the [5] key to access hose configuration.

Hose numbers will be displayed in the price per litre window as H01, H02, H03.

The - before the hose number indicates which window is active. Use the [2] or [8] key to change the hose number in the active window. Use the [4] or [6] key to move to the next window.

Grade prices not in use will show OFF.

5.9.4 Function 17 (Preset Shutoff Tolerance)

Function 17 is used to change the Preset Shutoff Tolerance to overcome small delivery overruns of one or two cents on preset or prepay deliveries.

To stop the overrun, change the Shutoff Tolerance in v.2.31 or newer of Main Processor software.

Steps to change preset shutoff tolerance:

(a) go to Function mode by pressing [1] [2] [3] [7]

(b) press [1] [7] [FILL] . The Litres window will read: o-Run and the CENTS PER LITRE window will read 10 indicating that the shutoff tolerance has been set to 10 mls

(c) to set the shutoff tolerance to 20, press [2] [0] [FILL]

(d) exit Function Mode by holding down the [CLEAR] key for 3 seconds.

5.9.5 PreKey Software Version Numbers

PEC is committed to the ongoing development and improvement of its products in accordance with the demands of its customers. The 9000 series FDS has been subject to this process and the following notable milestones have been reached in the development of the software:

(a) 6 digit capable - 2.60 or above

(b) 4 product capable - 2.64 or above

6 REFERENCES

1. **2A91093:** *"9000 Installation Manual -(MULTIPEC2)"*, B Meacheam/I Hollins, PEC Fuel Pumps Ltd, Issue 1, 20 April, 2009

2. **2A91002:** *"H9000 System Description (MULTIPEC2)"*, LSF Brown/I Hollins, PEC Fuel Pumps Ltd, Issue 2, 20 April, 2009

3. **2A91004:** *"H9000 Commissioning Manual (MULTIPEC2)"*, LSF Brown/I Hollins, PEC Fuel Pumps Ltd, Issue 2, 20 April, 2009

4. **2A82349:** *"9000 Software Functions & Errors"*, LSF Brown, PEC Fuel Pumps Ltd, Issue 1, 20 April, 2009

5. **2A91096:** *"9000 Parts Manual (MULTIPEC2)"*, I Hollins, PEC Fuel Pumps Ltd, Issue 2, 20 April, 2009

6. **2A91003:** *"H9000 Installation Manual (MULTIPEC2)"*, LSF Brown/I Hollins, PEC Fuel Pumps Ltd, Issue 2, 20 April, 2009

7. **5/6M/2:** *"Certificate of Approval No 5/6M/2 - PEC Model H9672P Fuel Dispenser for Motor Vehicles"*, Chief Metrologist, Australian Government National Measurement Institute, 13 April 06

8. **2A91005:** *"H9000 LPG Servicing Manual (MULTIPLEC2)"*, I Hollins, PEC Fuel Pumps Ltd, Issue 2, 20 April, 2009

9. **2A91092:** *"9000 System Description - (MULTIPLEC2)"*, B May, PEC Fuel Pumps Ltd, Issue 1, 26 February 2009

10. **2A91094:** *"9000 Commissioning Manual (MULTIPEC2)"*, B Meacheam/I Hollins, PEC Fuel Pumps Ltd, Issue 1, 20 April, 2009

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APPENDIX A - ELECTRO-STATIC DISCHARGE (ESD) PRECAUTIONS

It is vital to take anti-static precautions when working on the Fuel Delivery System's electronic components. These include:

(a) carrying and transporting all printed circuit boards in static-shielded bags;

(b) wearing an anti-static wristband, and connecting it correctly when working on electronic equipment.