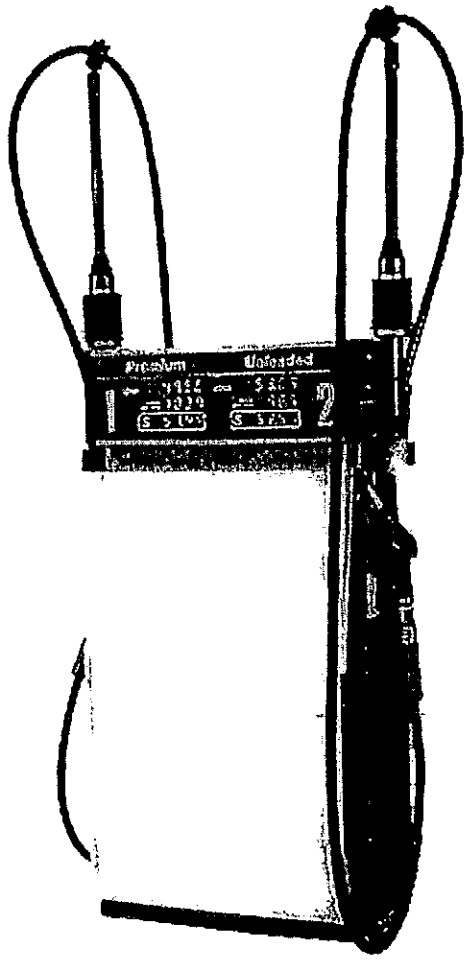
Gilbarco Australia Limited

ELECTROLINE Mk4 PUMPS & DISPENSERS

SERVICE MANUAL

DQ98001-106

Issue Y0



Gilbarco Australia Limited.

A.C.N. 000 020 799

ELECTROLINE MK4 Pumps & Dispensers
Service Manual

DQ98001-106
Issue Y0

This publication has been created for Gilbarco Australia Limited by Gilbarco Australia Limited - Engineering Standard Products Department.

Related Documentation –

Users' Manual	DQ98001-104
Installation Manual	DQ98001-105
Parts Manual	DQ98001-107

Gilbarco Australia Limited
A.C.N. 000 020 799
20 Highgate Street, Auburn

N.S.W. 2144

Release Information

Date	EAA	Description	Issue
July '03		First Draft issue for Services	Y0

TABLE OF CONTENTS

This page intentionally blank.

SECTION 1
COMMISSIONING PROCEDURES

The information provided in this section relates to the procedures necessary for commissioning the Electroline MK4 pumps and dispensers.

The information is intended for Gilbarco trained service personnel only, and those specifically trained by Gilbarco who will be involved in the planning and installation of the equipment.

The following procedures are necessary to ensure correct equipment and site operation.

HARDWARE CONFIGURATION – LINK SETTINGS

There are 4 links on the Processor PCB, adjacent to the Keypad as shown in Figure 1-. The correctly installed position of each link is shown in the following table.

JP1		Default Setting
JP2		Spare.
		Spare.
JP3		Spare.
		Spare.
JP4		Default Setting – removed and replaced as required during Commissioning and Servicing procedures.

PERSONALISATION

After the equipment has been installed, it is necessary for each side of the pump to be assigned a Fuelling Position number.

The Fuelling Position number relates to the pump number programmed on the Console (in Self-Serve mode)

ENTERING PERSONALISATION

1 Ensure all pump hoses are hung up correctly .

2. Switch on the mains power to the pump.

3. Unlock and open the top cover to gain access to the Manager Access panel of the pump.

   The Manager Access panel is situated under the pump's top cover.

4. Set the Manager Function switch to the TOTALS position. Refer to Figure 1-1.

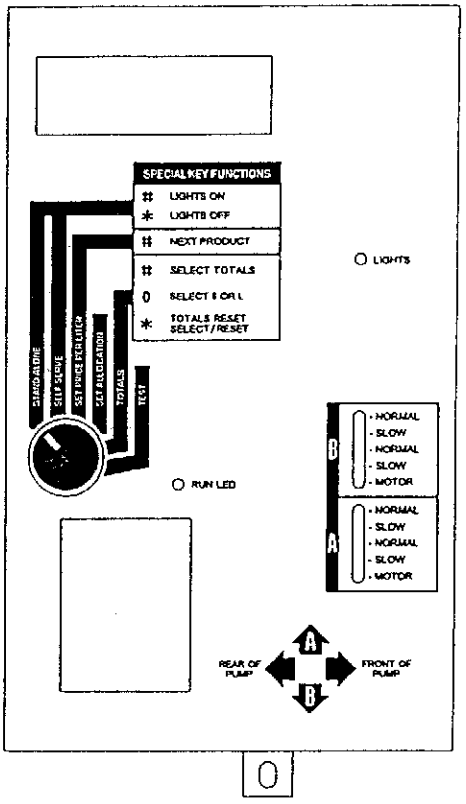
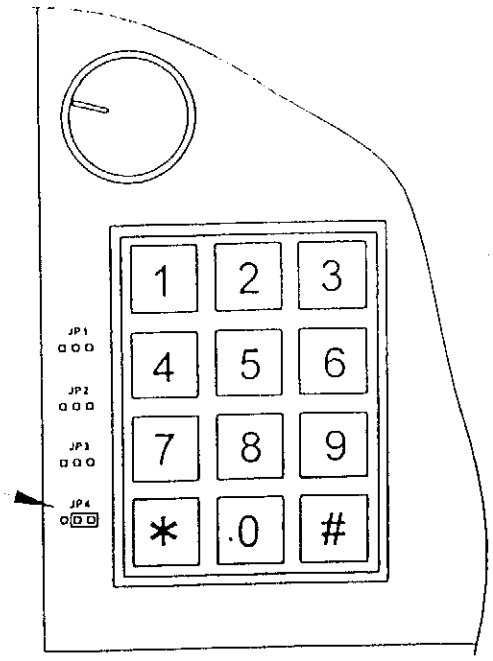


Figure 1-1 – Manager Function Panel

5. Remove the Processor PCB cover by unscrewing the kneeled knob and gently pulling at the bottom tab.

6. Remove, then replace, link **JP4** on the Processor PCB. Refer to Figure 1-2.



NOTE: Links are shown in their approximate position on PCB.

Figure 1-2 – Link positions on Processor PCB

FUELLING POSITION NUMBERS

NOTE:

1. For Island oriented models the front (F) and rear (r) numbers are associated with the right-hand and left-hand hoses respectively.
2. The rear (r) pumping position of a single hose pump *must* always be programmed to "00".

❑ SETTING PUMP NUMBERS

1. On the front Main Transaction Display, the display digit second from the right on the Litres display will flash a digit of the *current* Fuelling Position number for the ***front*** of the pump. Refer to Figure 1-3.

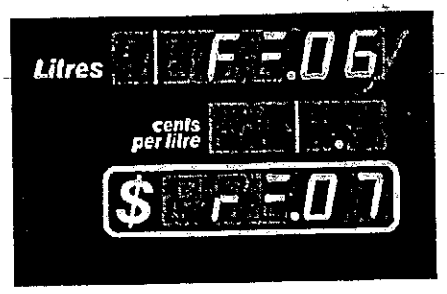


Figure 1-3 – Fuelling Position Number – FRONT

2. On the numeric keypad, enter the *required* Fuelling Position number (allowed range is 01 to 16) for the front of the pump. Always enter a zero as the first digit if the number is below 10, eg., for position 6, enter 06.

3. Press the asterisk (*) button on the numeric keypad. The display digit second from the right on the Money display will flash the *current* Fuelling Position number for the *rear* of the pump. Refer to Figure 1-4

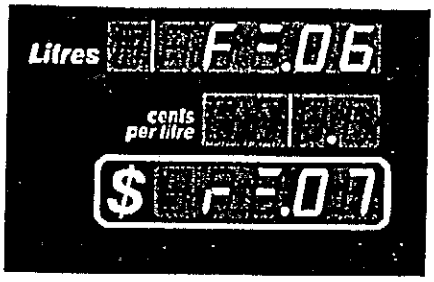


Figure 1-4 – Fuelling Position Number – REAR

4. On the numeric keypad, enter the *required* Fuelling Position number (allowed range is 01 to 16) for the rear of the pump. Always enter a zero as the first digit if the number is below 10, eg., for position 6, enter 06.

5. Leave the Manager Function switch set in the TOTALS position and proceed to setting the Grade numbers by pressing the hash (#) button.

GRADE NUMBERS

For all models of Electroline MK4 that provide only one grade per pumping position, the grade priority number is set automatically by the pump's firmware if and as required. These models will not prompt for data entry of GRADE NUMBER information.

For all MULTI grade models the GRADE NUMBER entry is selected after the Pump ID numbers by pressing the hash (#) button.

The current assigned grade numbers are displayed on the PPU display digits with the selected grade for change flashing. The two grades may be selected alternatively by pushing the "*" key.

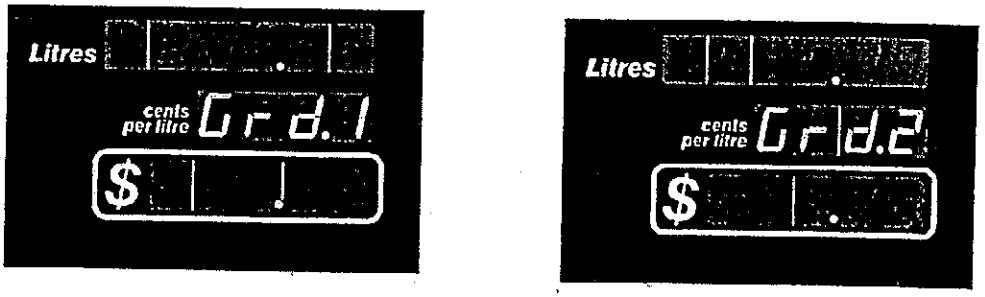


Figure 1-5 – Display of PPU digits with Grade Data – POSITION 'A' & 'B'
(position 'A' = Left Position 'B' = Right)

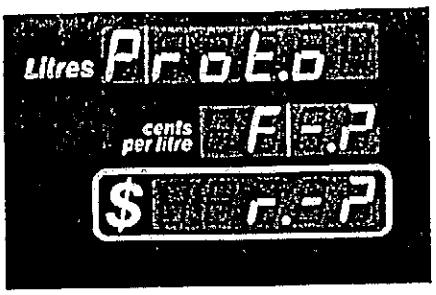
Of the two grades available at a Multi Electroline, the one which is lowest on the order of grades at the POS must be programmed with Grade Number 1 and the other must be set with Grade Number 2.

SETTING PUMP COMMUNICATION PROTOCOL TYPE

Single grade Electroline models, allow the manual setting of the communications protocol to be either Protocol 1 or Protocol 2. This feature will also be automatically confirmed by the communications Protocol

The ability to manually set the protocol is provided in order to facilitate some OEM POS systems that may operate newly connected pumps on-line incorrectly without first establishing the correct protocol for use

After the hash (#) button is pressed at the end of setting Pump Type, the front display will indicate as follows The Front and Rear settings will be alternatively selected by the (*) key



Where ? 1 = Protocol 1. Without Grade data, as for traditional Electroline models.

2 = Protocol 2. With Grade data, as for traditional Electrolines fitted with an ENVA

NOTE:
1. All MULTI model Electrolines only use Protocol 2 and will not allow manual setting of protocol 1.
2. The current Protocol setting for each Pumping position may be reviewed by Self Test 14 in order to confirm that the POS and Pump are both set to the same protocol.

SETTING PUMP TYPE

The full range of models available in the Electroline MK4 series include some models "Types" that require program configuration. The "Type" display may be indicated even if the setting cannot be altered. Refer to the list below to confirm which models allow setting by Serviceman actions.

After the hash (#) button is pressed at the end of setting Grade Numbers or Prototype (depending of program options available for different models), the front display will indicate as follows if Type setting is an option:

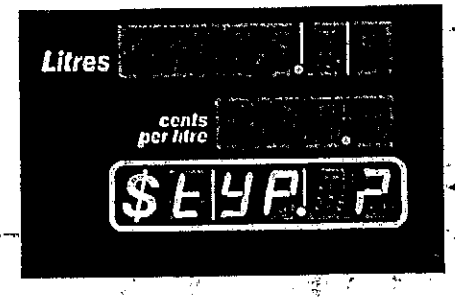


Figure 1-5 – Pump Type Numbers

To skip setting Pump Type, push the "#" key.

The configuration types of the Electroline MK4 series are - Where?: = Type is as listed below

TYPE 0 : One or two hose Normal or High flow Pump or Dispenser. (Separate pumping position and supply line per hose)

TYPE 1 Two hose, one pump unit (one grade) Normal flow only.

TYPE 2 Ultra High Flow Pump or dispenser

NOTE
1. Only these Models allow Serviceman Setting of the "Type"
2. Type 2 will be displayed if the Electroline is fitted with software for an Ultra High flow model however in this case the setting CANNOT be changed

INITIALISING TOTALS

NOTE: 1. These totals are **not** resettable by the Manager

2. This function is carried out at installation, and at any time the Pump ID or Grade is changed on a pump.

❑ INITIALISING TOTALS

1 After the hash (#) button is pressed (at the end of the previous step), the display shown in Figure 1-6 will appear on the front Transaction Display, indicating that the option to reset the totals is available. If this option is *not* required, press the hash (#) button now to bypass Totals Reset

NOTE: At this point, if the "?" is displayed, the totals have not yet been reset

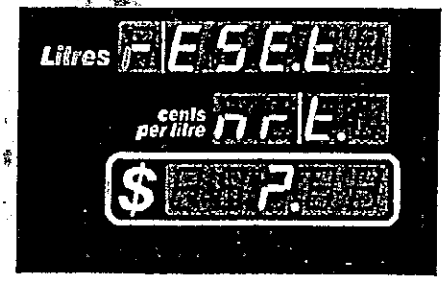


Figure 1-6 – Totals Reset – Full-Display pumps

where: **nrt** indicates "totals not resettable by manager" are selected.

2. a) If required to reset all totals to zero:

Press the asterisk (*) button. The "question mark" (?) showing in the "$" display will disappear. *THE TOTALS HAVE NOW BEEN RESET.*

b) If required to programme a new starting value for any hose total:

- Push digit keys "1" then "3". The display will indicate the current value for the first assigned hose total. The Most Significant Digit (MSD) will be flashing indicating that it may be changed.

  Multi product pumps will indicate the assigned hose position Total on the PPU displays, i.e. "F - A " for Front "A" MONEY and "F - A L" for Front "A" LITRES.

  Single grade pumps will indicate MONEY totals by the PPU display being blanked and LITRES totals as " L".

- To change the value of the assigned total; Enter all total digits from MSD to Least Significant Digit (LSD). As each digit is changed the next digit will flash indicating it is the next digit to be entered.

- When the assigned hose total is programmed with the new required data, push the "#" key to accept the data. This will also assign the next hose total for programming

  Hose totals that do not require programming may be skipped by pushing the "#" key without changing the displayed data.

- When all hose totals have been programmed as required, exit the programming mode by turning the managers rotary switch

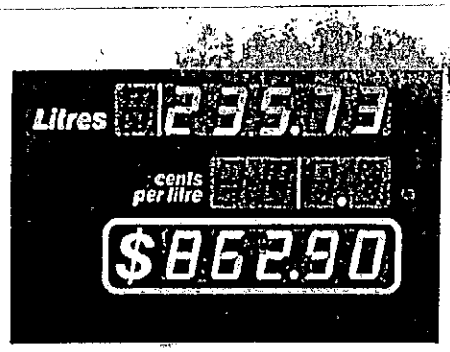


Figure 1-7 – Example of "$"Totals – i.e. $23,573,862 90

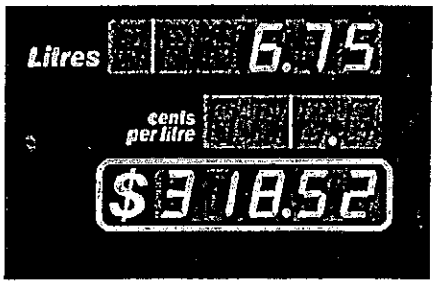


Figure 1-8 – Example of Volume Totals – i.e. 675,318.52 Litres

3 Refit the Processor PCB cover by clipping into place.

4. Reset the Manager Function switch to the required operating mode position (STAND-ALONE or SELF-SERVE).

5 Close and lock the Manager Access panel cover.

FUNCTIONAL CHECKS

For information on operating Electroline Mk4 pumps, refer to the relevant information in Chapter 2 (Operating Instructions) of the Users' Manual (DQ98001-104)

PUMP & DISPENSER CHECK

1 Check the following on all pumps.

a) All flameproof covers are fitted properly.

b) All components are properly located and secure.

c) All cables are connected properly and secure.

d) All panels are fitted properly and secure.

2. In the CDM, set each pump/dispenser to STAND-ALONE mode.

3. At the switchboard, power down the pump, wait 3 seconds, then power up again.

4. Check that the pump lighting is operating correctly, turn them on and off several times.

5. On each pump set a valid PPU for each hose pair.

6. On each pump, carry out the following procedures for each hose.

a) Lift the nozzle and, ***before*** maximum outward travel of the nozzle flap, check that all pump displays begin the reset cycle.

b) Ensure all pump displays complete the reset cycle, and that the pump motor starts running.

c) Run the pump motor for several minutes to prime the system. Check all hydraulic connections and rectify any leaks found.

d) Insert the nozzle into a container and dispense a small amount of fuel (about 1$). Check that the readings on the money and volume totes increase by the amount shown on the Transaction Display.

e) Return the nozzle to the nozzle boot and, ***before*** maximum inward travel of the nozzle flap, check that the pump motor has switched off.

DIAGNOSTICS CHECK

Carry out all diagnostics tests as described in Section 4, Field Servicing.

PRESET TRANSACTION CHECK

This is to test the functional operation of the pump preset (if fitted).

NOTE: The "Preset/Allocation" value set on a pump is in whole dollars.

1. Press each preset button and ensure the selected preset amount increases by the amount shown on the button pressed.

2. Press the CLEAR or FILL button and ensure the Preset amount goes to zero.

3. Set an *allocation limit* of 10$ and ensure the Preset Display shows 10 dollars.

Refer to Section 2 in the Users' Manual for instructions on setting allocation limits

Press CLEAR or FILL and ensure the Preset Display does *not* go to zero.

4 Reset the allocation limit to zero (unlimited)

5 With the Manager Function Switch in the "Stand Alone" position, select a preset value of 10$

7 Start fuel delivery. Ensure that at about 0 1 to 1 5 litres ***before*** the preset value, the flow rate is sharply reduced to about 2 5 to 3 litres per minute

8 Hold the nozzle trigger in until the pump motor stops Check the value of fuel dispensed is the same as the preset value

9 Return the nozzle to the nozzle boot

10 Push the "RECALL" button on the preset keypad and insure the 'LAST' delivery is shown as the preset amount just delivered.

SELF-SERVE SYSTEM CHECK

This check is to be carried out at the Operator Console

1 Ensure the Console is programmed correctly. Refer to the appropriate Console Users' Manual for programming details.

2 Ensure that all pumps are set for Self-Serve mode.

3 Place all pumps on the communications loop.

4 At the Console, check that each pump is communicating.

NOTE: If the Console fails to establish communications with the pump, try the next two fuelling positions in turn. If the Console still fails to communicate, check the communications connections.

5. At the pump, lift the nozzle and check that the Console reacts correctly.

6. At the Console, authorise the selected pump and ensure that all displays on the selected pump complete the reset cycle. Also check that the pump motor starts.

7. Ensure the PPU displayed on the Console is the same as that displayed on the pump's main display.

8. Dispense some fuel. If the Console displays data during delivery, ensure the value of fuel displayed on the Console is the same as that displayed on the pump.

9. Replace the nozzle in the nozzle boot and ensure that the end of the transaction is recorded by the Console.

10. Ensure the transaction values displayed on the Console, and Customer Display if fitted, are the same as those displayed on the pump.

11. Pay off the transaction at the Console. Ensure the status for the selected pump goes to OFF (IDLE).

12. If the pump is fitted with a Preset keypad option, push the "RECALL" button on the preset keypad and insure the 'LAST' delivery is shown as not a preset.

METER CALIBRATION

The meters installed in the Electroline MK4 series of Pumps and Dispensers are equipped with a sealed mechanical adjustment wheel for calibration.

ONE METER PER HOSE

For all models excluding the Ultra High flow Pump and Dispenser models there is only one meter per hose. For these models the calibration procedure does not require any special mode of operation. The pump or dispenser may be operated as for normal deliveries during calibration runs.

TWO METERS PER HOSE

The Ultra High flow models use two meters operated in parallel and therefore the combined accuracy of both meters will affect the actual delivery accuracy. The two meters must be calibrated separately.

In order to perform calibration adjustment of one meter at a time the Electroline must be put into Flow Rate Test mode and only one set of meter valves opened at a time.

When both meters have been separately calibrated a delivery using both meters simultaneously must be performed.

If the settable mechanical calibration steps for both meters cannot be adjusted to give precisely 100%, in separate meter operation. It may be necessary for one meter to be set slightly negative and the other slightly positive, in order that the required accuracy is obtained during deliveries.

SECTION 2
HYDRAULICS DESCRIPTION

The information contained in this section may assist in understanding some of the basic hydraulics used in the Electroline Mk 4 Pumps and Dispensers.

The hydraulics system is discussed as a system, along with some individual parts, to make you aware of the features and functions of each component.

SYSTEM OVERVIEW

In Suction type models (Pumps), the fuel is drawn from the storage tank by a pump located in the hydraulic cabinet. Fuel then passes through an air separation system that is integrated into the pump. Flow then passes to the meter, which is fitted with a check valve (with integrated thermal pressure relief) at the inlet.

In Pressure type models (Dispensers), the fuel is delivered under pressure from the storage tank by a pump at the tank. Fuel enters the dispenser via inlet manifold. Flow then passes to the meter, which is fitted with a check valve (with integrated thermal pressure relief) at the inlet.

Both types of systems (Pumps and Dispensers) may be fitted with an inline filter in the hydraulic line before the meter.

In the metering system, the liquid passes through a four-piston meter for measurement, then through a solenoid-controlled flow valve positioned after the meter, with a back-pressure valve installed in the outlet port of the flow control valve. Liquid then travels through the delivery pipe to the outside of the frame, through the hose and then to the nozzle.

FOUR-PISTON METER

DESCRIPTION

The meter is of the four piston positive displacement type, having the pistons arranged in cruciform pattern. Numeric references are made to Figure 2-1.

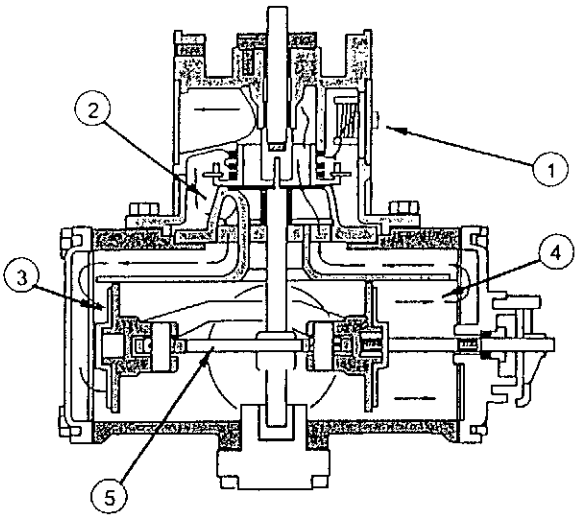
OPERATION

Liquid enters the meter under pressure from the pumping unit through the inlet (1), it travels down through the ported rotary valve (2) into the piston chamber (3), the pressure of the liquid forces the piston to travel its controlled stroke and hence displaces liquid from the opposite cylinder (4).

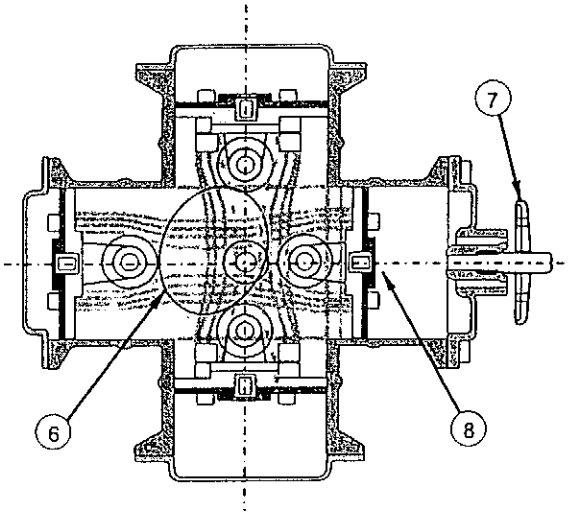
The liquid is then displaced through the exhaust port of the rotary valve whose timing is controlled by cam (5). Pressure applied to the first cylinder initiates the sequence of piston motion and inlet and discharge port operation which imparts rotation to the cam shaft and valve assembly. The rotation continues as long the meter inlet pressure is higher than the discharge pressure. The meter stops only when pressure on the opposing pistons is equalised by closing nozzle valve, switching off pumping unit drive motor or isolating a submerged pumping unit.

ADJUSTMENT

For calibration purposes crank (6) has an additional clearance allowed between the piston assembly followers and cam, thus permitting stroke adjustment by means of the calibration wheel (7) and cushioning/damping dash pot (8), either extending or restricting the stroke of the assembly, thereby changing the volume displaced.



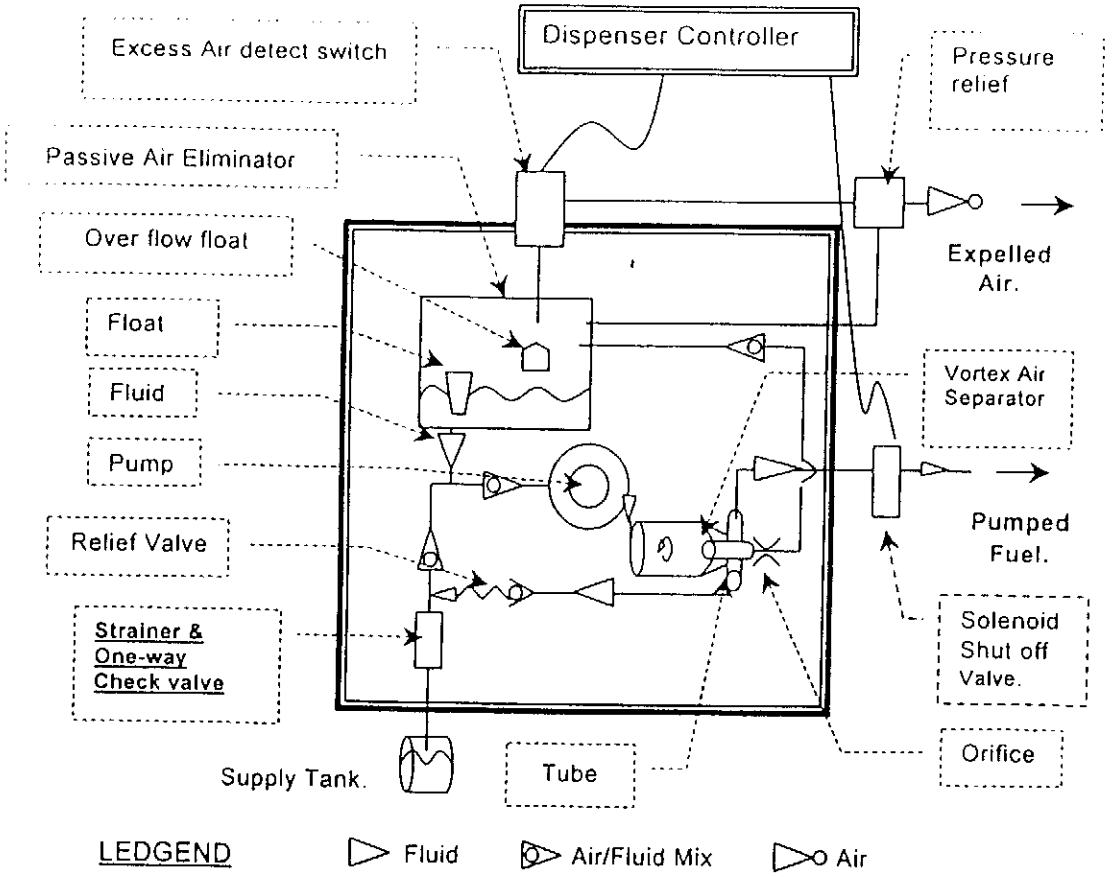
Side View of meter showing pulse generator drive.



Plan view of meter showing cam and follower.

Figure 2-1 – Four-Piston Meter

GDP PUMP & AIR DETECTION SYSTEM



1. Strainer / Check Valve

After the fluid enters the pump body but before it reaches the pumping element, it is passed through a strainer and a one-way check valve. The purpose of the one-way check valve is to prevent the column of fluid between the pump and the tank from dropping back to tank between customers. There is also a small pressure relief valve assembled within the one-way check valve. The purpose of this valve is to prevent the build-up of pressure within the pump due to thermal expansion, etc.

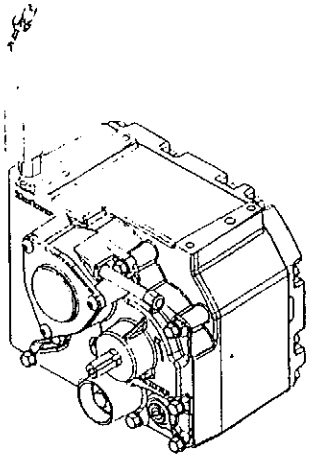
2. **Vortex air separator**. The vortex air separator consists of a cylindrical chamber with a concentric **tube**. The chamber is one piece with the casing casting. The purpose of this chamber is to actively separate the air from the fluid. The fluid/air mixture is introduced tangentially into the vortex creating a rotational flow This rotation creates a differential pressure within the vortex cylinder and concentrates the entrained air into the center of the vortex The air is removed through the concentric tube and routed into the passive air eliminator. This flow rate of separated air/fluid is controlled with an **orifice** located at the base of the tube The orifice is 3.0 mm in diameter

3 **Passive air eliminator** The passive air eliminator consists of a chamber and two floats The purpose of this is to let the air separate from the fluid The chamber is large enough to accommodate potential foaming of the product The **float** maintains a maximum level of fluid in the chamber When the fluid level gets high enough to lift the float, the pure fluid is routed back to the

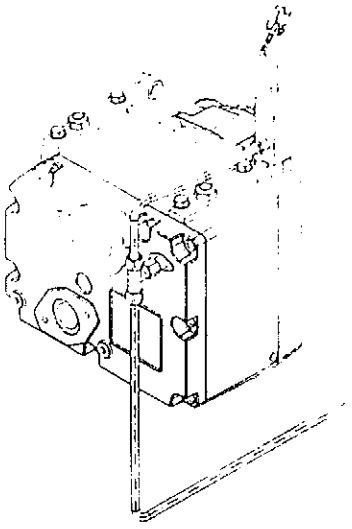
inlet of the pump. The **overflow float** keeps fluid from escaping the chamber under extraordinary circumstances (i.e. failure of the float system) The separated (pure) air is released from the top of the chamber into the Air Flow Switch

4. **Air Flow Switch.** The Air flow switch consists of a piston and magnetic reed switch assembly with an electrical connection. All separated air is routed through this flow switch When the air flow through the switch approaches the efficiency limit of the air elimination system, the piston moves into a position which activates the reed switch This signal is read by the computer and a **Solenoid Shut off valve** is activated thus stopping the flow of product through the meter and nozzle. In this way, the system is shut down before the Vortex air separator loses its efficiency. Once the solenoid shut off valve is activated the flow is routed through the **Relief Valve** and re-circulated through the pump and air elimination system. If the air flow through the Air Flow Switch is reduced to an acceptable level in the air elimination system, the piston moves back to its original position, the switch is de-activated. The computer then sends a signal to open the solenoid shut off valve thus dispensing product once again to the meter / nozzle.

GDP - 90 PETROL PUMPS



Front View - With W & M Air Test Arm
(Arm allows safe access with belt running.)



Rear View - With Vent Tube & Pressure Relief Valve
(Pressure relief valve between to rear port and "T".)

NORMAL FLOW OPERATION

The flow control valve is required to independently control the flow of each nozzle, and is positioned after the meter. A diaphragm valve is used, controlled by a three-position pilot (2-coil) solenoid valve (refer to Figure 2-2). The following explains the general operation of the valve

Position 1

When the valve is in the fully open position (both coils energised), the pressure drop behind the diaphragm due to flow through the diaphragm eyelets opens the valve, and full flow occurs

Position 2

In slow flow (preset) conditions, the pilot valve moves to an intermediate position (only coil "B" energised) where the flow through the inner eyelet is reduced to about 2 litres/min. In this case, the diaphragm is closed and fuel flow occurs only through the inner eyelet in the diaphragm.

Position 3

With the pilot valve in the fully closed position (no coils energised), no flow passes through the inner eyelet of the diaphragm. Therefore, the inlet pressure and pressure behind the diaphragm equalise via the outer eyelet hole, allowing inlet fuel pressure and the diaphragm spring to hold the diaphragm closed, which prevents fuel flow.

NOTE: A back-pressure valve is incorporated in the outlet of the flow control valve to reduce the effects of hose dilation, and fuel expansion on the meter.

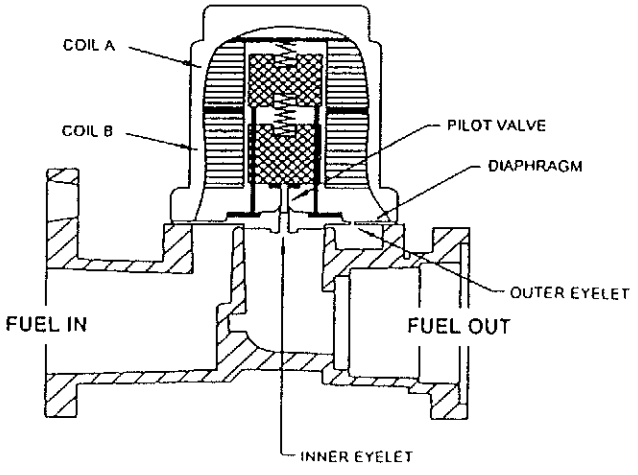


Figure 2-2 – Flow Control Valve

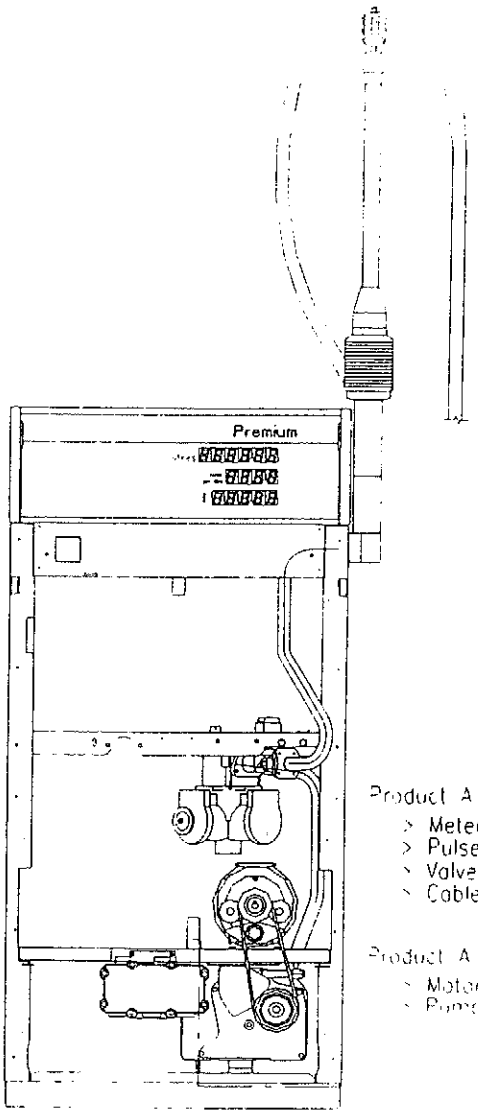
NOZZLES

The nozzles used are ZVA 'Model 19' nozzles, or as specified by customer requirements.

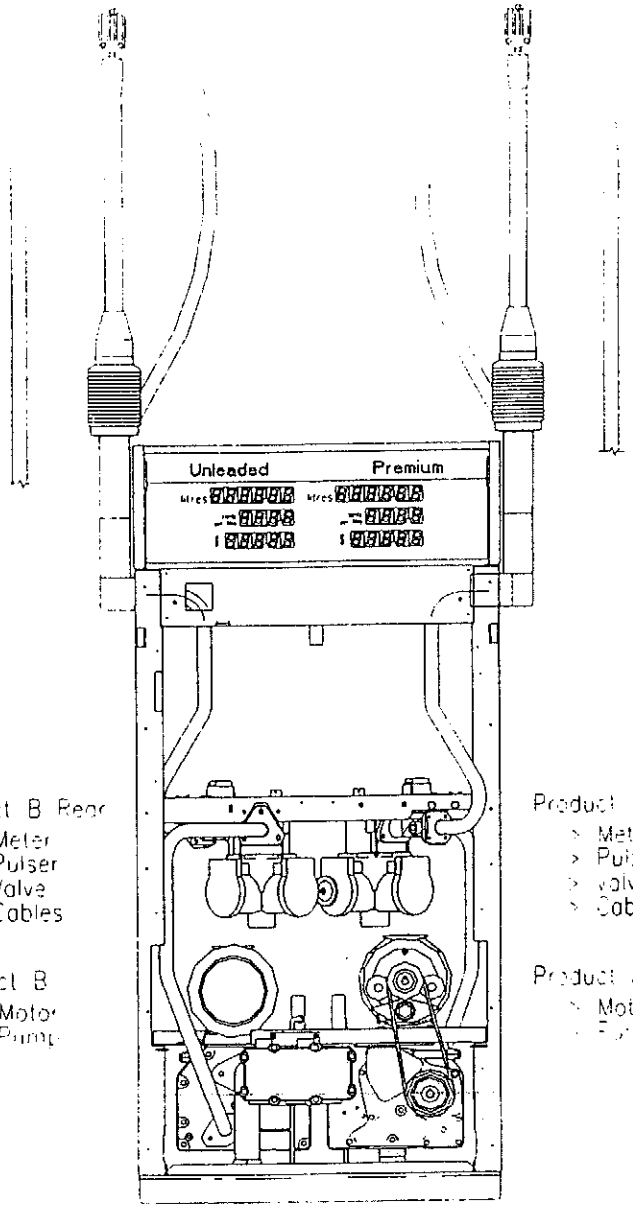
For High flow and Ultra High flow a minimum 25mm hose and nozzle is recommended

To obtain maximum capacity of Ultra High Flow models a 32mm nozzle will be required

ONE HOSE ISLAND ORIENTED HOSE



TWO HOSE ISLAND ORIENTED HOSE

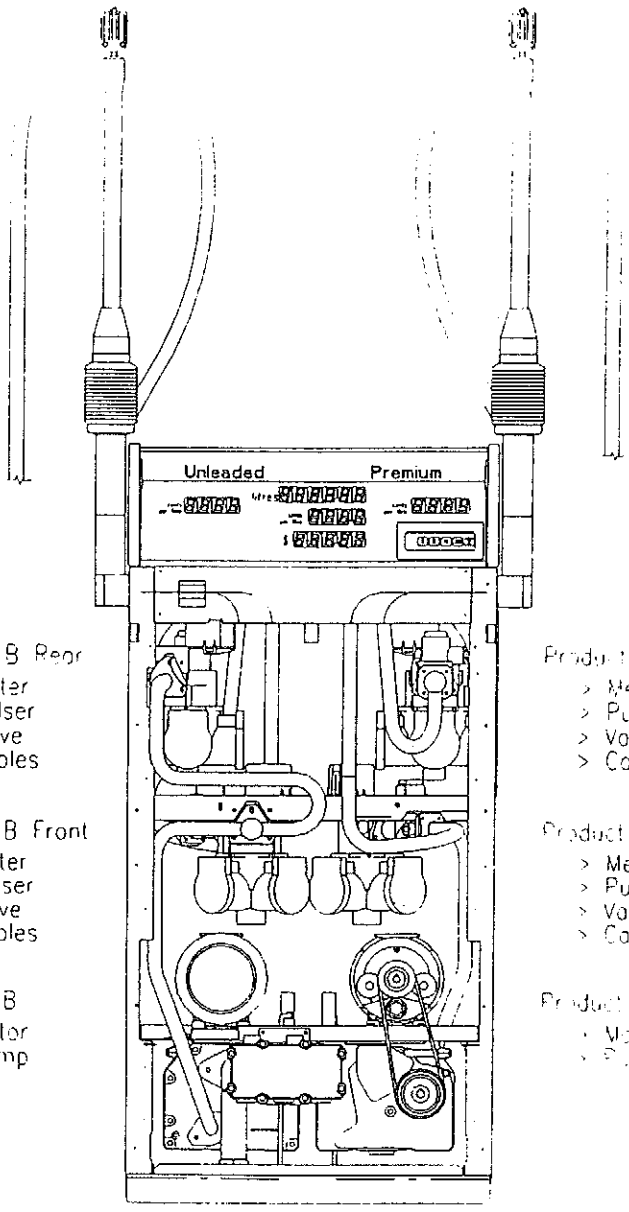


TWO HOSE - TWO PRODUCT

NORMAL FLOW HOSE - 16mm NB

HIGH FLOW HOSE - 25mm NB

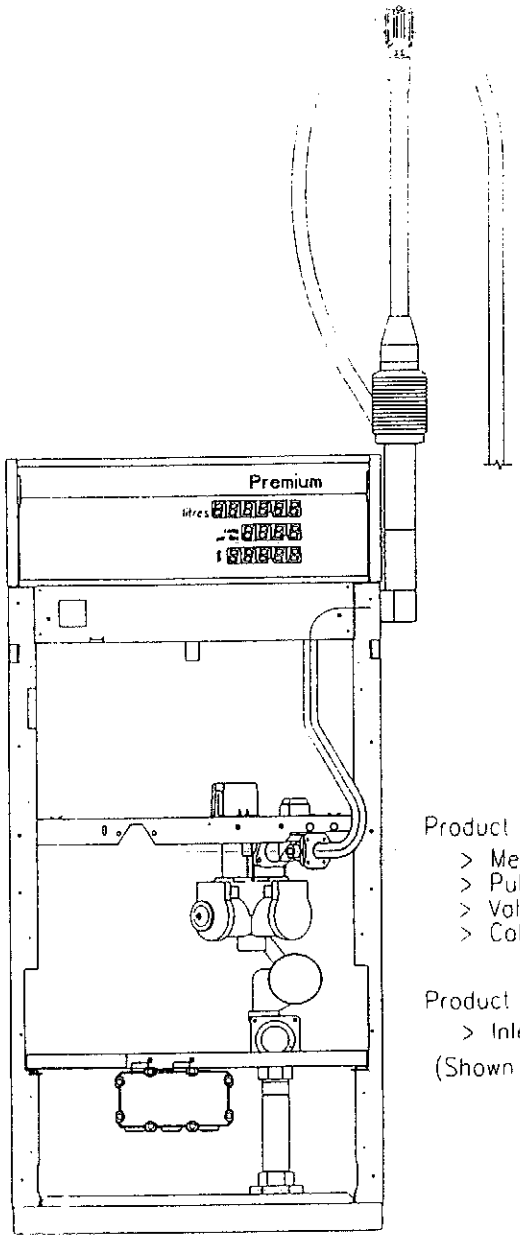
FOUR HOSE MULTI LANE ORIENTED



FOUR HOSE - TWO PRODUCT

NORMAL FLOW HOSE - 16mm ID

ONE HOSE ONE PRODUCT DISPENSER



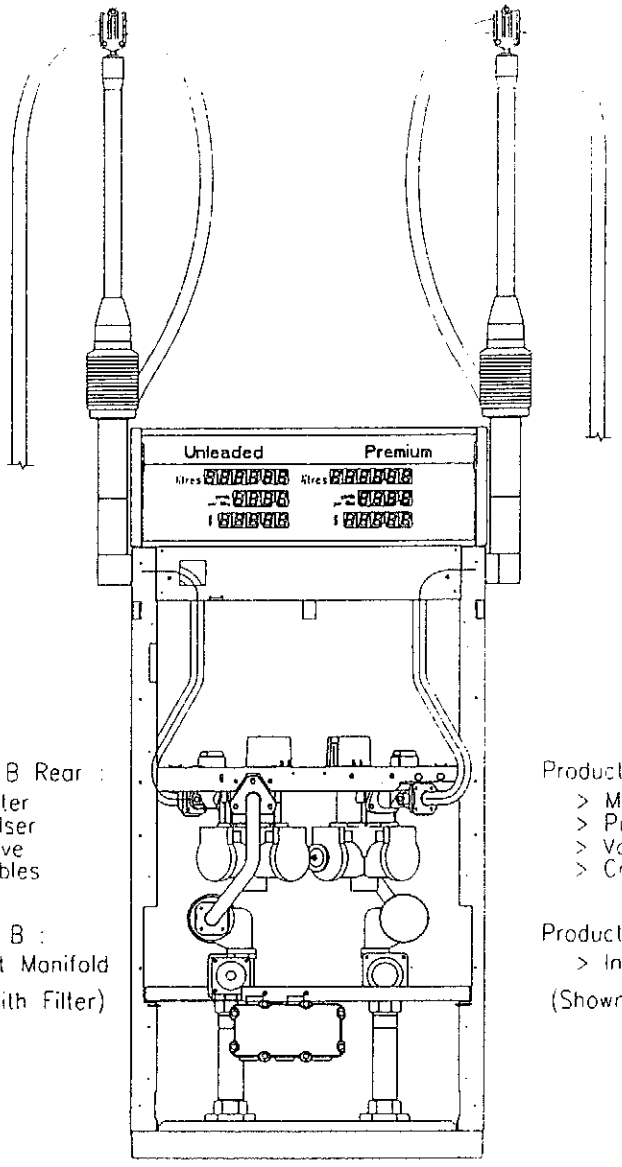
Product A Front
- > Meter
- > Pulser
- > Valve
- > Cables

Product A
- > Inlet Manifold

(Shown with Filter)

ONE HOSE DISPENSER
NORMAL FLOW HOSE - 16mm NB
HIGH FLOW HOSE - 25mm NB

TWO HOSE TWO PRODUCT DISPENSER



Product B Rear :
> Meter
> Pulser
> Valve
> Cables

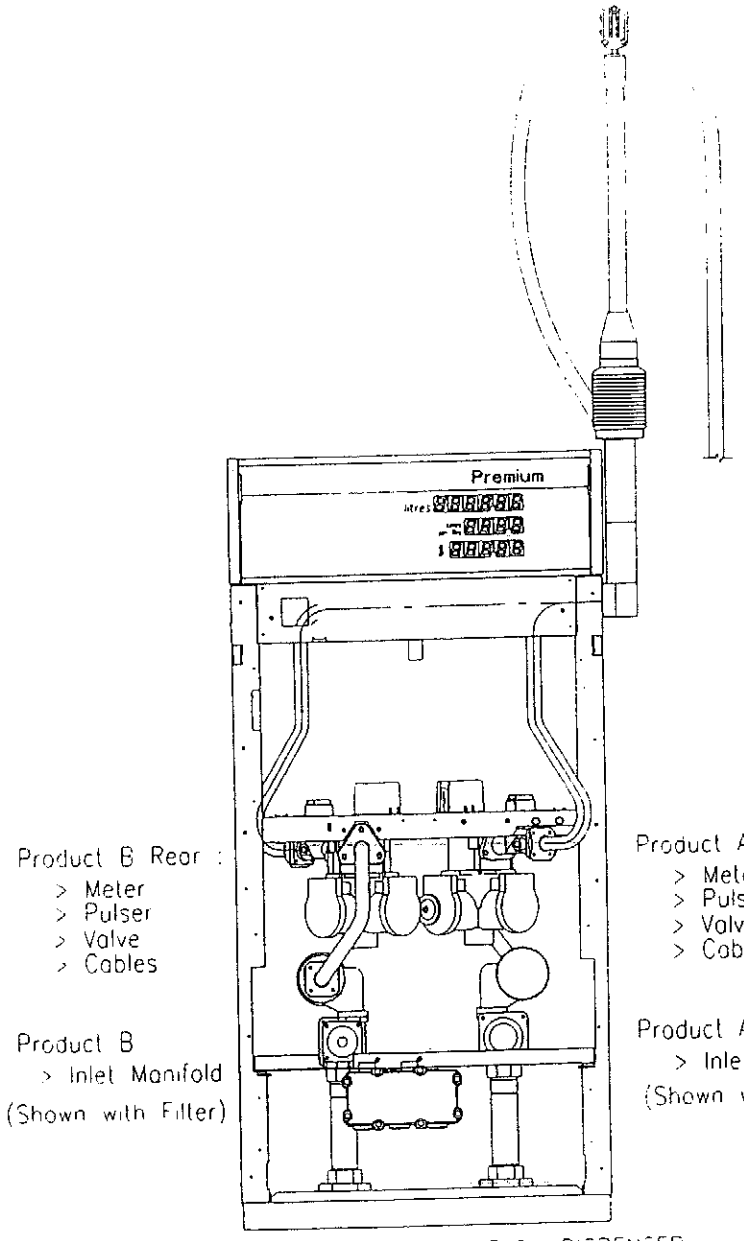
Product B :
> Inlet Manifold
(Shown with Filter)

Product A Front
> Meter
> Pulser
> Valve
> Cables

Product A
> Inlet Manifold
(Shown with Filter)

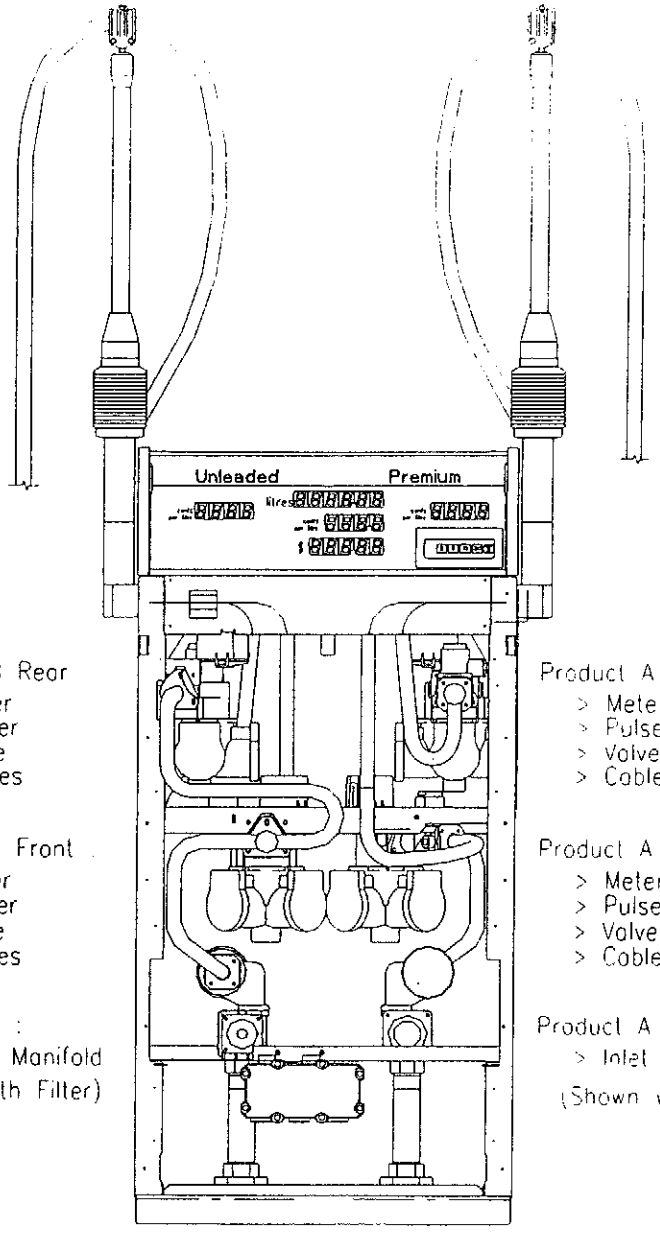
TWO HOSE DISPENSER
NORMAL FLOW HOSE - 16mm NB
HIGH FLOW HOSE - 25mm NB

ONE HOSE ONE PRODUCT ULTRA HIGH FLOW DISPENSER



ONE HOSE ULTRA HIGH FLOW DISPENSER
HOSE - 25mm NB
32mm NB NOZZLE

FOUR HOSE TWO PRODUCT (MULTI) DISPENSER



Product B Rear
- > Meter
- > Pulser
- > Valve
- > Cables

Product B Front
- > Meter
- > Pulser
- > Volve
- > Cables

Product B :
- > Inlet Manifold

(Shown with Filter)

Product A Front
- > Meter
- > Pulser
- > Volve
- > Cables

Product A Rear
- > Meter
- > Pulser
- > Volve
- > Cables

Product A
- > Inlet Manifold

(Shown with Filter)

FOUR HOSE - TWO PRODUCT

NORMAL FLOW HOSE - 16mm NB

SECTION 3
ELECTRONICS DESCRIPTION

The information contained in this section will assist in understanding the basic electronics used in the Electroline Mk 4 Pumps.

The electronics associated with this pump are contained in the sub-assemblies listed in the table below.

Together, these assemblies control *all* pump functions associated with (i) Self-Serve *and* Stand-Alone operation (providing an interface for either attendant or customer operation), and (ii) controlling the hydraulics operation of flow-control valves, motors, and pumps.

Communications with the pump is via a Gilbarco proprietary current loop interface. The communications Protocol used may be either Protocol 1 i.e. without Grade data or Protocol 2 i.e. with Grade data.

All of the components/equipment listed is either contained within flameproof enclosures, is part of an approved intrinsically-safe system (for pulsers, nozzle switches, air detection switches and earth quake sensors), or is housed above the vapour barrier.

The following notes are a brief description of each of the assemblies listed in the table below.

Pump type ⇒	**Multi**	**One/Two Hose**
Power Supply	1 per pump	1 per pump
Processor PCB ass'y	1 per pump	1 per pump
Preset Keypads (Optional)	1 per side	1 per hose
Main Display PCB ass'y	1 per side	2 per hose
Display interconnect PCB	1 per pump	1 per pump
PPU Display ass'y	2 per side	Nil
Pulser ass'y	2 per side	1 per hose
Motor and Valve Control PCB	1 per pump	1 per pump
Totes	2 Totes (Max.)	2 Totes (Max.)
Junction Box – Mains	1 per pump	1 per pump

POWER SUPPLY ASSEMBLY

CAUTION

Service of the PCBs contained within the Power Supply assembly must only be carried out at Gilbarco nominated locations by suitably trained personnel.

- This subassembly is mounted within the top Customer Display Module (CDM) housing of the Electroline Mk4 Pumps.

POWER SUPPLY PCB ASSEMBLY – *reference to schematic* DT???

This module contains the following hardware functional circuits:

- Mains Filter.
- Mains transformer.
- Lighting Ballast
- Low voltage Power circuits for:
  - Processor Logic (5V DC)
  - Displays (20V - 30V DC Constant Current)
  - Totes (12V)
- Communications interface.

The Power Supply module is mounted in the CDM housing.

MAINS SUPPLY

The power supply is designed to be powered from a nominal 240V AC 50 Hz supply.

DISPLAY SUPPLY

This supply provides a constant DC current, 300mA maximum, for operation of the seven segment display digits.

TOTE SUPPLY

This supply is 12V DC and supplies power to drive the 250mw coils of the 7 digit counters.

Under the control of the Processor software only one tote is driven at a time.

COMMUNICATIONS

The communications interface is the Gilbarco "2-Wire Like" two wire current loop type.

PROCESSOR PCB ASSEMBLY – *reference to schematic* DT07704? (3 sheets)

The Processor PCB assembly is capable of supporting up to 3 grades and 6 hoses in a two sided Multi Product pump. The main functions provided on the PCB consists of the following sections.

- Central Processing Unit (CPU)
- Memory
- I/O Address decoding
- Power Fail Detection and Watchdog Timer
- Pulser and Nozzle Switch input circuits
- Keyboard and Switch input circuits
- Product control output circuits
- Tote output circuits
- Display driving circuits
- Display protection circuit
- Display disconnection detection circuit

The following notes are a brief description of each of the above sections.

CENTRAL PROCESSING UNIT (CPU)

This section is the heart of the Zilog Z80180 CPU (U30). CPU timing is controlled by an external 12·288 MHz crystal (Y1). The CPU provides a 17-bit Address Bus (A0-A16), and an 8-bit Data Bus.

In addition, the CPU communicates directly with the Two-Wire communications interface on the PSU PCB.

The CPU IC is reset only from the Watchdog Timer IC (U1 - type MAX694).

The CPU also provides 4 output control lines as follows:

- RD
- WR
- MREQ
- IORQ

MEMORY

The memory sections consist of:

- 64K x 8 CMOS EPROM – 27C512 (U41)
- 8K x 8 Non-volatile SRAM – DS1225 (U40)

The EPROM contains the operating program for the system, while the RAM memory, which is battery backed, is used for data storage and a work area for the CPU.

I/O ADDRESS DECODING

Address decoding is provided by decoder ICs U23 and U28 (type 74HC138).

POWER FAIL DETECTION & WATCHDOG TIMER

Power fail detection of the +5V-P Supply is carried out within the supervisory circuit IC U1(type MAX694).

Power fail detection of the +5V-H Supply is via the ICs U44 (type 74HC14) and U35 (type 74HC373).

Power fail detection of the Display Supply is via the comparator IC U2-B (type LM293) and the supervisory circuit IC U1 (type MAX694)

The AC power fail detection (signal from the PSU PCB) is via the comparator IC U2-A (type LM293) and the supervisory circuit IC U1 (type MAX694).

Failure of the +5V-P Supply, or a Watchdog time-out, will result in a reset signal being asserted, which resets the CPU and inhibits the RAM section and resets the output port IC U26 (type 74HC273). Any other above supply failures are read as a port input (PFAILS) via the input port IC U12 (type 74HC373).

Supervisory IC U1 (type MAX694) contains a Watchdog Timer, such that if a chip-select output from IC U25 (type 74HC138) is not selected regularly, then a RESET signal is asserted.

PULSER & NOZZLE SWITCH INPUT CIRCUITS

Complementary pulse input signals from the active "front" and "rear" Pulsers, and individual signals from all the Nozzle Switches, are read in via Schmitt trigger circuit ICs U6 and U7 (type 74HC14) through input port ICs U12 and U14 (type 74HC373).

KEYBOARD & SWITCH INPUT CIRCUITS

Keyboard and rotary switch scan lines are output via the output port IC U26 (type 74HC273). The keyboard and rotary switch read lines are input via the input port IC U27 (type 74HC373).

The external Manager's Totals switch is also read via the input port IC U27 (type 74HC373).

The lights switch, the earthquake sensor, and jumper links JP1 through JP4 are read via the input port IC U35 (type 74HC373).

PRODUCT CONTROL OUTPUT CIRCUITS

Output signals for the control of motors and valves are written via the output port ICs U11, U10 and U15 (type 74HC273) followed by energy limiting resistors, then via individual transistors and indicator LEDs, thence to the corresponding product PCB channels via connectors P507 and P508.

TOTE OUTPUT CIRCUITS

The 9 Tote output driver circuits are driven from either of the output port ICs U9 or U26 (type 74HC273). Each port output drives an individual transistor via an energy limiting resistor.

Correct connection of the connector P503 to the Totes is assured by monitoring the "front" ¥ Tote and Litre Tote lines via input port IC U14 (type 74HC373).

DISPLAY DRIVING CIRCUITS

Display driving is performed one segment at a time. The driving current for each segment is obtained when both a 'digit select' (active high or active low) and a 'segment select' (write or erase) occur together.

The segment decoder ICs U23 and U43 (type 74HC4514) are driven from output port IC U33 (type 74HC273), via energy limiting resistors, with the relevant decoder being selected by decoder IC U24-B (type 74HC139).

The segment decoders then feed the display segment source and sink driver ICs U42 and U28 (type UDN2981) or ICs U38 and U21 (type ULN2003) which are rated to switch the 300mA display coil current.

The 'front' digit select decoder ICs U32 and U37 (type 74HC4514) are driven from output port IC U33 (type 74HC273), via energy limiting resistors, and are selected by decoder IC U24-A (type 74HC139).

The 'front' digit select decoders then feed the 'front' digit select source and sink driver ICs U31 and U36 (type UDN2981) or ICs U34, U39 and part of U8 (type ULN2003).

The 'rear' digit select decoder ICs U5 and U17 (type 74HC4514) are driven from output port IC U33 (type 74HC273), via energy limiting resistors, and are selected by decoder IC U24-A (type 74HC139).

The 'rear' digit select decoders then feed the 'rear' digit select source and sink driver ICs U3 and U13 (type UDN2981) or ICs U4, U22 and part of U8 (type ULN2003).

All the display decoder ICs are supplied from the +5V-D auxiliary supply (see below)

DISPLAY PROTECTION CIRCUIT

The components associated with IC U19 (type 74HC132) form a hardware protection timer, which limits the current pulse, to any display coil, to 10ms maximum.

DISPLAY DISCONNECTION DETECTION CIRCUIT

A separate static 5V DC sense line is provided from the Processor PCB to the display interconnect PCB for the "A" and "B" sides of the pump. The line is connected through all transaction display PCBs and returned to the Processor PCB where it is connected to ground and monitored. If any Display PCB, connector or cable required to insure the transaction displays are connected is NOT plugged in, then the sense line will NOT be detected as grounded.

PRESET KEYPAD

The Preset Keypad switches may be mounted at either the ends of the pump (above the nozzles) for Island orientated models or on the main display dials for multi hose models. The keypad is enabled before and after all deliveries and all preset display data is indicated on the main display.

MAIN DISPLAY PCB ASSEMBLY – *reference to schematic* DT0???

This PCB assembly contains the 15-digit 7-segment transaction displays and their associated steering/isolation diodes.

PULSER ASSEMBLY – *reference to schematic* DR06442

This PCB assembly contains the dual opto slot sensor which converts flow meter output-shaft rotations to electrical volume pulses (100 pulses per litre), and the associated circuit for obtaining the complementary volume outputs. It also provides mechanical backlash protection.

NOTE: The Nozzle Switch associated with each Pulser is also fed via this PCB assembly.

MOTOR / VALVE CONTROL PCB

This PCB contains the interface and drive circuits between 5VDC and 240v AC for each Motor and Valve coil. Different PCBs may be fitted for different configuration models and for Suction Pump and dispenser models:

- Motor Control circuit assembly.
- Valve Control circuit assembly.

MOTOR CONTROL CIRCUIT ASSEMBLY – *reference to schematic* DR0??

This control circuit contains an optical coupled switch that isolates and controls a triac for switching the 240VAC single-phase mains supply to the associated pump motor A single motor control signal turns on the triac.

NOTE: The triac type and rating and the associated snubber network components will vary for suction Pump and STP operation.

VALVE CONTROL CIRCUIT ASSEMBLY – *reference to schematic* DR0??

This control circuit contains solid state relays (type MOC2A60-5) for isolating the 5VDC control signal and switching 240VAC to the Goyen flow-control valves.

TOTE ASSEMBLY – *reference to schematic* DR0???

This assembly contains the required Money and Volume electro-mechanical totalisers, together with their associated back EMF suppression diodes.

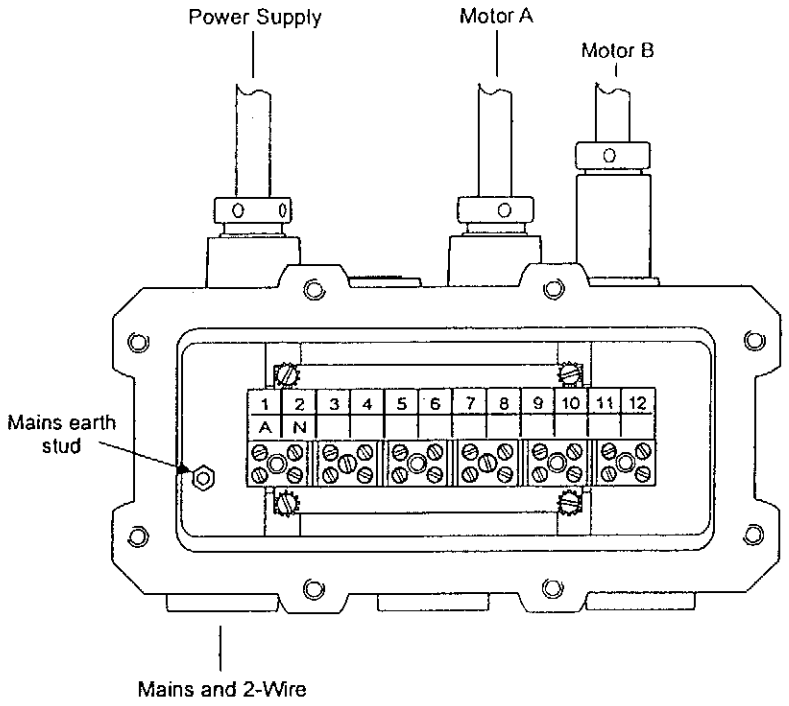
TOTE/SWITCH WIRING LOOM – *reference to schematic* DR0???

This assembly contains the two Volume electro-mechanical totalisers, together with their associated back EMF suppression diodes. The external Manager's Light Switch is also shown as part of this assembly.

The function of Resistor R1 is to provide a signal back to the Processor PCB to indicate that this cable assembly is connected.

JUNCTION BOX – MAINS

This junction box is used for the connection of the inlet mains power and communications and for the connection of switched power to the Motors for all models. In the case of Single Product, Single Hose models it is also used for connection of the switched power to the valve coils.



See following table for connection details.

MAINS JUNCTION BOX CONNECTIONS TABLE

Terminal	1	2	3	4	5	6	7	8	9	10	11	12	EARTH STUD
Des'tion	Active	Neutral	Filtered Neutral	Mot. A /STP A	Mot. A Neutral	Mot. B /STP B	Mot B Neutral				Loop +	Loop –	Earth
Power Supply Cable	RED	BLACK	BLUE	VIOLET		ORG		BRN			WHT	GR'Y	GRN/YL
Neutral link		BLACK			BLACK		BLACK						
2 Hose 2 Product Pump				Mot. A 1 & 4	Mot. A 2 & 3	Mot. B 1 & 4	Mot. B 2 & 3						Motor A & B earth
1 Hose 1 Product Pump				Mot. A 1 & 4	Mot. A 2 & 3								Motor A earth
4 Hose 2 Product Pump				Mot. A 1 & 4	Mot. A 2 & 3	Mot. B 1 & 4	Mot. B 2 & 3						Motor A & B earth
2 Hose 1 Product Pump				Mot. A 1 & 4	Mot. A 2 & 3								Motor A earth
1 Product UHF Pump				Mot. A 1 & 4	Mot. A 2 & 3	Mot. B 1 & 4	Mot. B 2 & 3						Motor A & B earth
FIELD WIRING :													
Mains INPUT	X	X											X
Comms INPUT											X	X	
DISP. WIRING :													
2 Hose 2 Prod Dispenser INPUT			X	X		X							
1 Hose 1 Prod Dispenser INPUT			X	X									
4 Hose 2 Prod Dispenser INPUT			X	X		X							
2 Hose 1 Prod Dispenser INPUT			X	X									
1 Prod UHF Dispenser INPUT			X	X									

MOTOR/VALVES PCB VALVE CONNECTIONS TABLE

	Front A Valve				Rear A Valve				Front B Valve				Rear B Valve			
Term'l	PT 1	PT 2	PT 3	PT 4	PT 5	PT 6	PT 7	PT 8	PT 9	PT 10	PT 11	PT 12	PT 13	PT 14	PT 15	PT 16
	F/A Nor	N	F/A Slo	E A R T H	R/A Nor	N	R/A Slo	E A R T H	F/B Nor	N	F/B Slo	E A R T H	R/B Nor	N	R/B Slo	E A R T H
2 Hose 2 Product.	F/A Brn	F/A Blue	F/A Wht	F/A G/Yl	—	—	—	—					R/ B Brn	R/ B Blue	R/ B Wht	R/ B G/Yl
1 Hose 1 Product.	F/A Brn	F/A Blue	F/A Wht	F/A G/Yl	—	—	—	—					—	—	—	—
4 Hose 2 Product	F/A Brn	F/A Blue	F/A Wht	F/A G/Yl	R/ A Brn	R/ A Blue	R/ A Wht	R/ A G/Yl	F/B Brn	F/B Blue	F/B Wht	F/B G/Yl	R/ B Brn	R/ B Blue	R/ B Wht	R/ B G/Yl
2 Hose 1 Product	F/A Brn	F/A Blue	F/A Wht	F/A G/Yl	R/ A Brn	R/ A Blue	R/ A Wht	R/ A G/Yl					—	—	—	—
1 Product UHF	F/A Brn	F/A Blue	F/A Wht	F/A G/Yl	—	—	—	—					R/ B Brn	R/ B Blue	R/ B Wht	R/ B G/Yl

WIRING DIAGRAMS

ONE HOSE, ONE PRODUCT MODEL

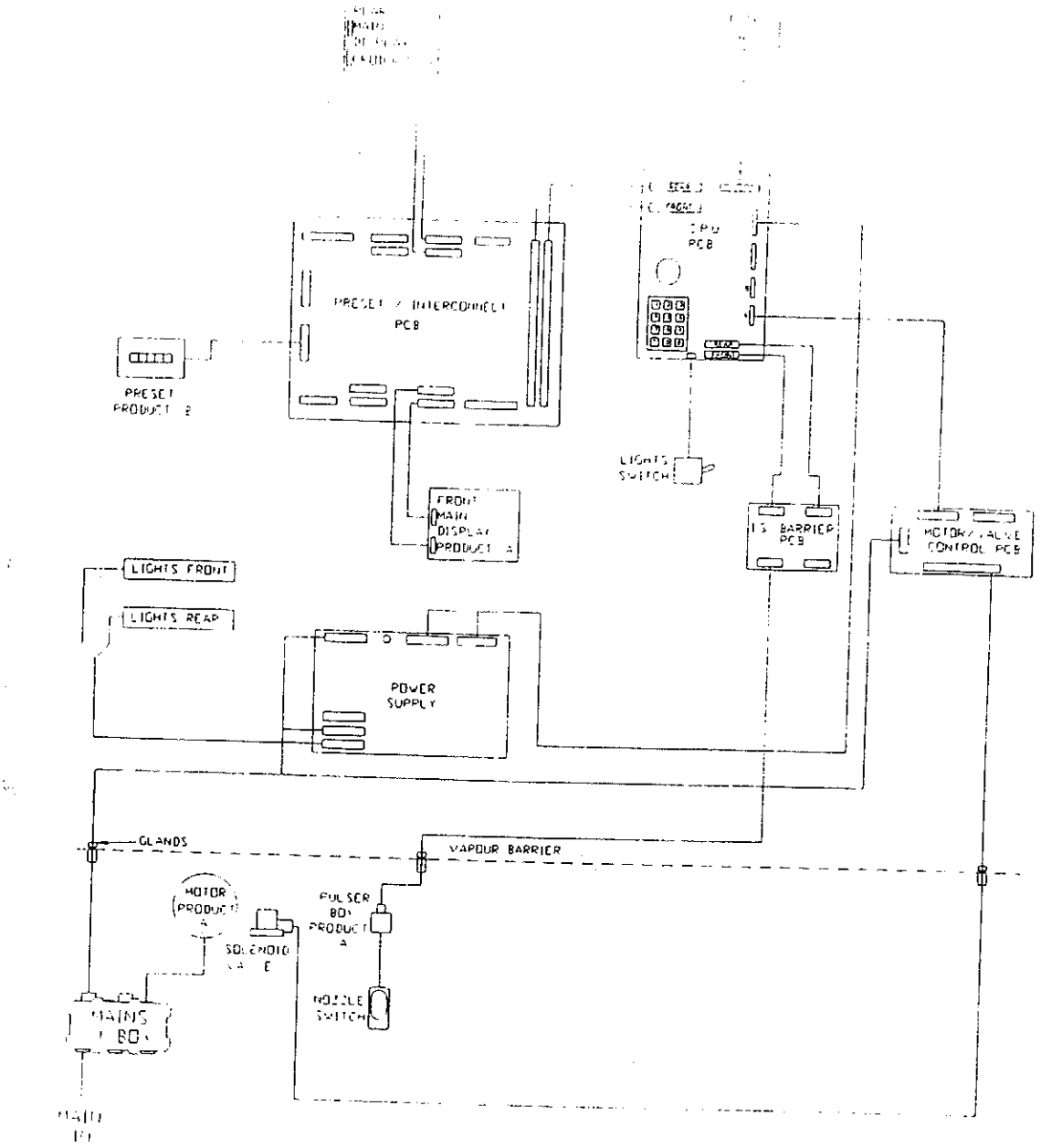


Figure 3-1 – System Overview Diagram for One Hose, One Product Electroline Mk 4 Pumps

ONE HOSE, ONE PRODUCT MODEL

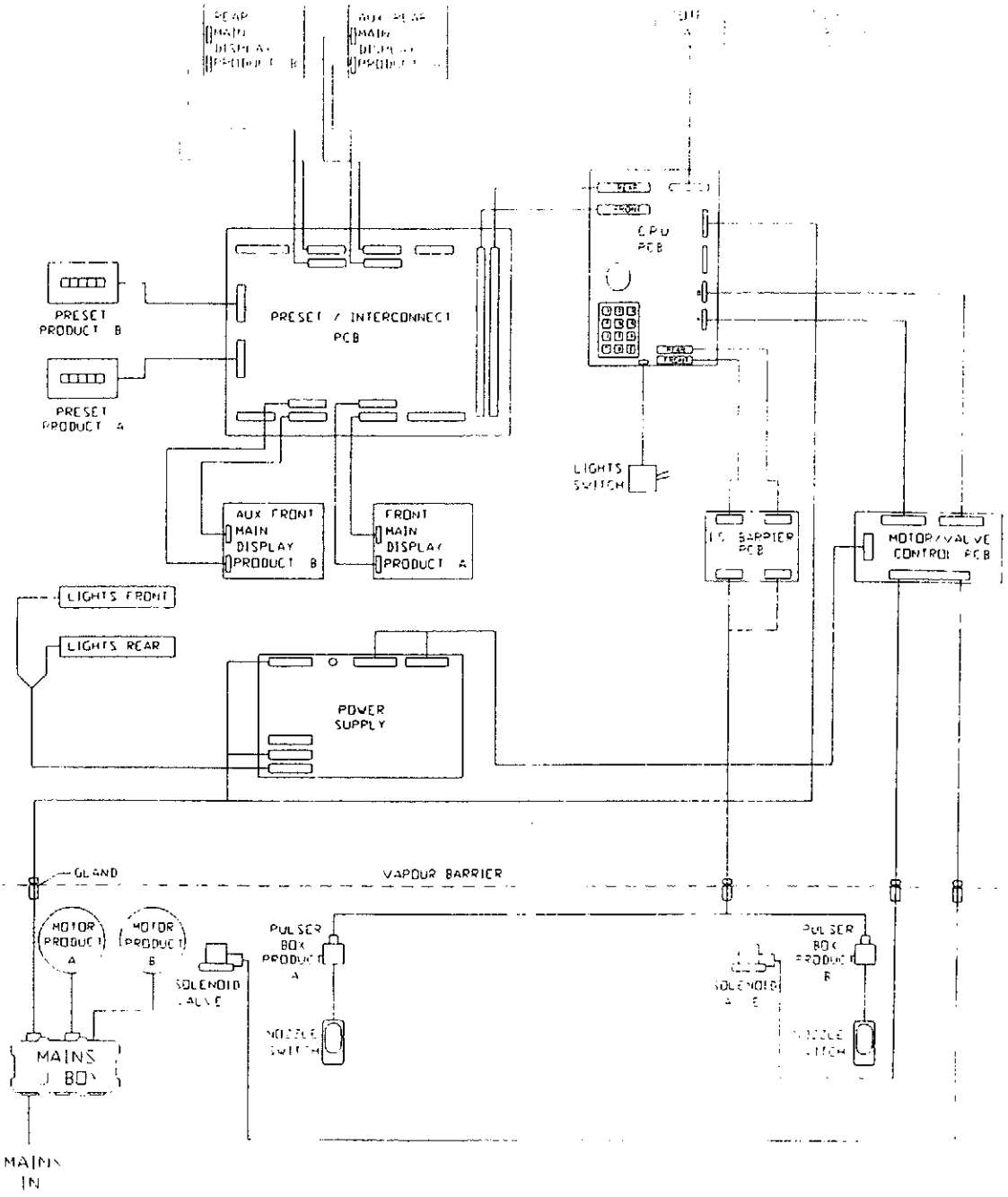


Figure 3-3 – System Overview Diagram for Two Hose, Two Product Electroline Mk 4 Pumps

TWO HOSE, ONE PRODUCT (SHARED) MODEL

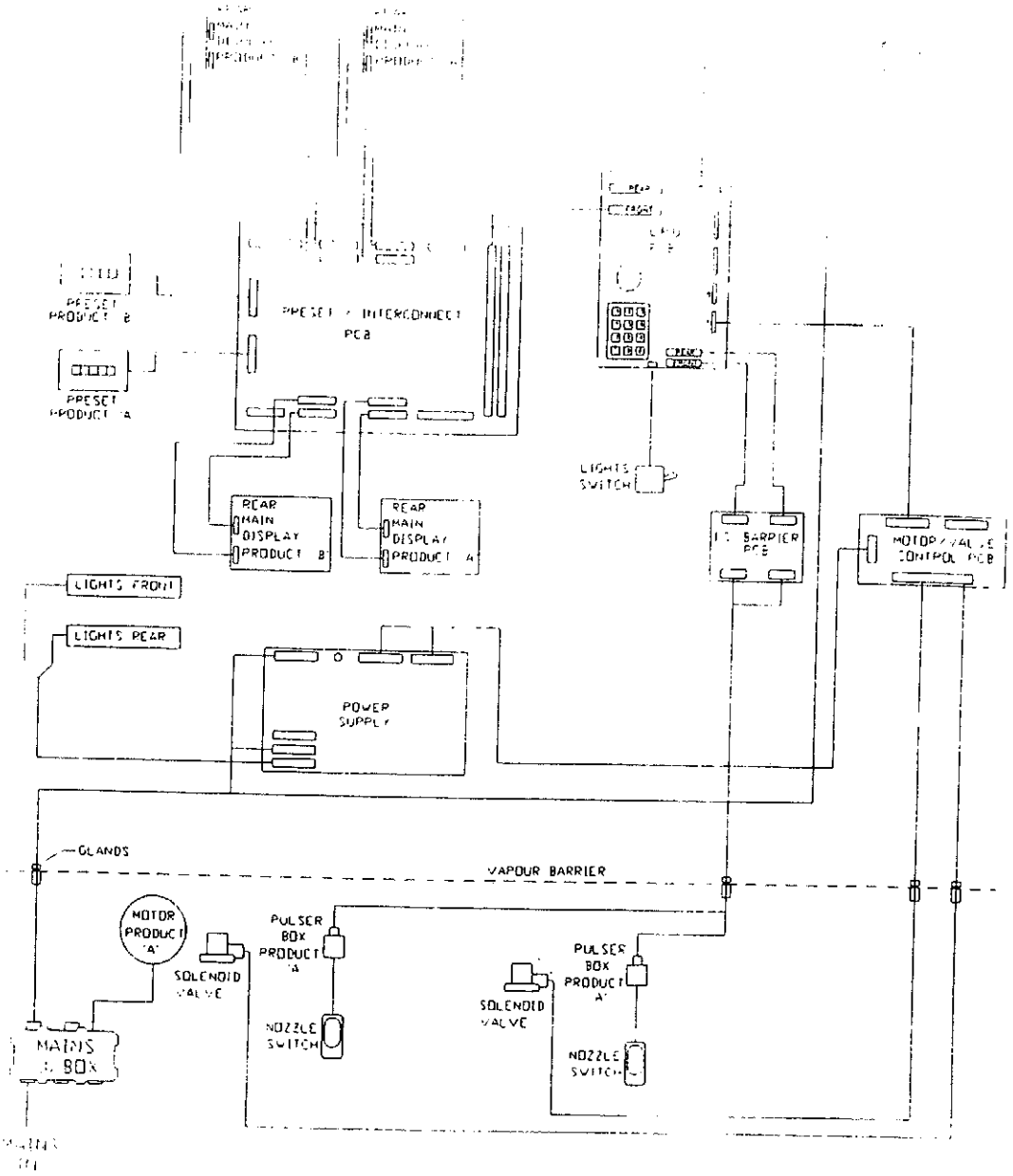


Figure 3-2 – System Overview Diagram for Two Hose, One Product Electroline Mk 4 Pumps

FOUR HOSE, TWO PRODUCT (MULTI) MODEL

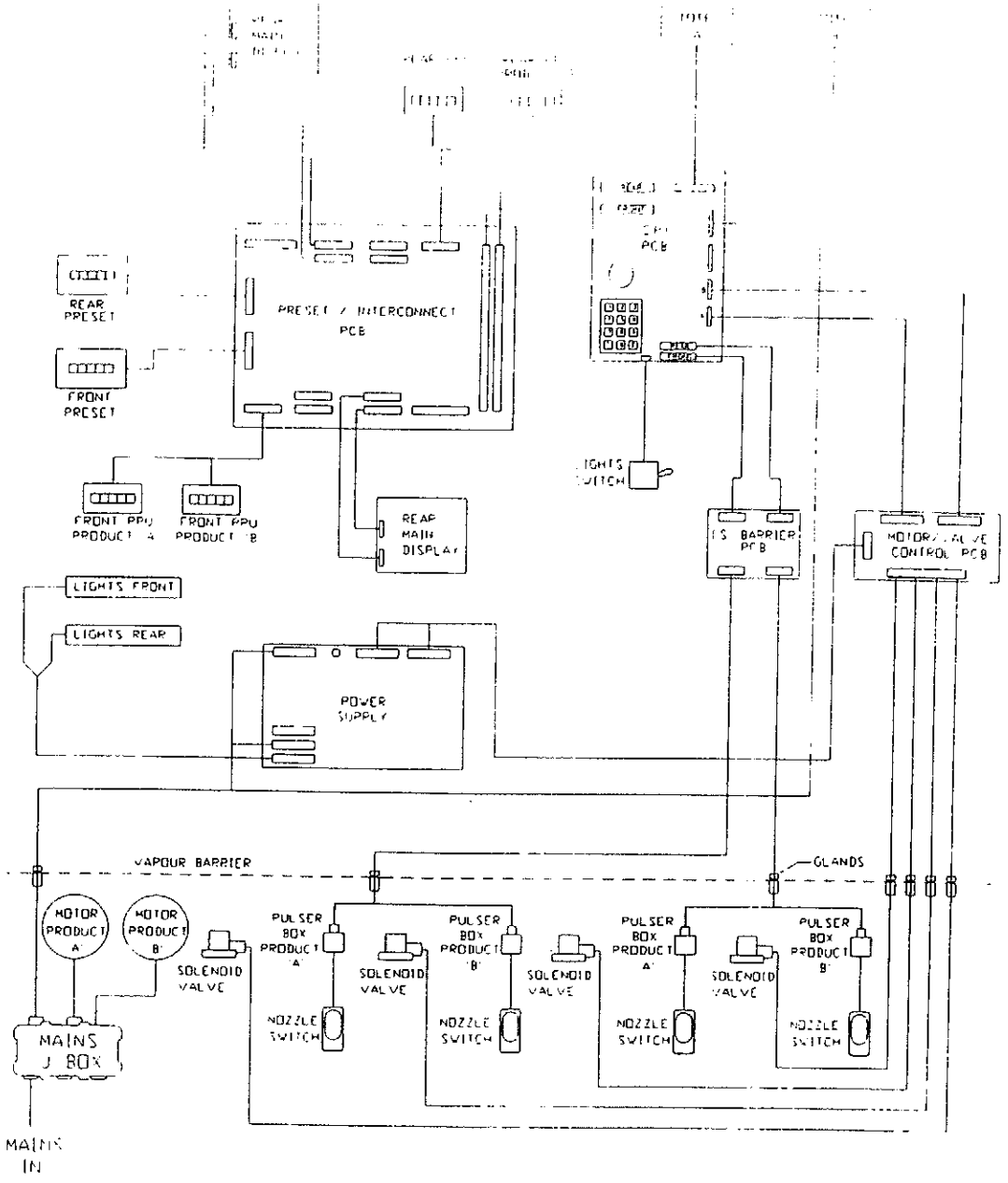


Figure 3-4 – System Overview Diagram for Four Hose, Two Product Electroline Mk 4 Pumps

SECTION 4
FIELD SERVICING

The information contained in this section is proprietary, and is intended only for Gilbarco trained service personnel and their official agents.

It is to be used as a guide for locating problems, to assist in carrying out repairs, and for ordering and maintaining an adequate supply of spare parts.

Some of the procedures may involve the removal and replacement of components (connectors, links, etc.), either for start up procedures or to isolate a service problem.

> ***CAUTION***
>
> For personal safety, as well as the protection of equipment, always remove mains power from the equipment ***before*** removing or replacing any components.

LUBRICATION & ADJUSTMENT

LUBRICATION

1. All brass and sinter bushes should be lubricated with a drop of oil at regular intervals to ensure they do not dry out.
2. Ensure all gear assemblies have adequate grease on them.

> ***CAUTION***
>
> ***Do not*** over grease the gear assemblies as this may cause the gears to bind.

ADJUSTMENT

There are no adjustments to be made on the Electroline MK4 pumps.

SPECIAL CONSIDERATIONS

1. Record ***all*** pump tote readings ***before*** carrying out any servicing.
2. Many problems are created by operator error. Ensure the error(s) are cleared, that Operator Reference Card(s) (if any) are available, and that operators and attendants are fully aware of how to interpret them.

PROBLEM LOCALIZATION

1. Ensure all components within the system are connected properly, using the required cables and methods of connection.
2. Ensure all components within the system which require mains power, are connected to the power, and that the power is turned ON.
3. Ensure all sections of the system are programmed correctly to operate in the required manner.
4. Attempt to duplicate the operation(s) which is reported to have produced the problem.
5. Carry out all diagnostics tests available for each section of the system, to further verify or analyse the problem. Refer to the following information in this section relating to diagnostics procedures.
6. Refer to the Fault Symptoms listing Section 5 of this manual. Select a symptom which most closely resembles the problem reported or observed in your tests.
7. Proceed to the repair Action sequences and follow closely the repair steps listed. The same symptoms may be caused by different faulty items.

   These steps are arranged to correct the most likely causes of the symptom first, followed by the least likely.

> ***CAUTION***
>
> Before removing any PCBs or assemblies, refer to the Removal and Replacement procedures outlined in Section 4 of this manual.

8. If any component is replaced and, when the system is rechecked, the repair action has *not* corrected the problem, re-install the original component as described.
9. If any component is replaced and, when the system is rechecked, the repair action *does* correct the problem, adopt the following procedure.
   a) Re-install the original component believed to be faulty, and verify the problem recurs.
   b) If the problem ***does*** recur, remove the original component and re-install the replacement component, then recheck the system again.
   c) If the problem does *not* recur, proceed through the troubleshooting sequence to trace any new symptoms.

      NOTE: The recheck of suspected faulty components is necessary to ensure good components are not returned to the factory as faulty. Replacement of the suspect component may have disturbed the system and corrected the problem.
10. If the problem is still present after all repair actions for that particular symptom have been carried out, select the next appropriate symptom from the Fault Symptoms list and proceed with the listed repair actions.
11. If all possible corrective action has been carried out, and the problem is still evident, contact the Gilbarco Service Help Desk at Auburn for further assistance.

AUTOMATIC SELF TESTS

There are two groups of automatic self tests built into the program of the pump to monitor the operation of both the hardware and software. The first group operates during the power up sequence while the second group operate during fuelling transactions.

POWER UP TESTS

Each time the pump is powered up, the items listed in the following table are automatically tested. Failures are indicated by the status of the RUNNING LED.

Normal operation is indicated by a regular flashing rate (equal time ON and OFF) of the RUNNING LED.

Indication	Failure
Steady ON or OFF	CPU
One double-blip – pause (repeated)	RAM
Two double-blips – pause (repeated)	ROM
Three double-blips – pause (repeated)	Watchdog Timer
Four double-blips – pause (repeated)	Rotary Switch
Five double-blips – pause (repeated)	Power Supply Error
Six double-blips – pause (repeated)	Totes Cable Unplugged
Extra fast flashing – > 4 flashes per sec.	Display(s) Unplugged

TRANSACTION TESTS

The items listed in the following table are automatically tested during every transaction. Failures are indicated by an error message flashing on the volume digits of the Transaction Display.

1. During delivery of fuel, the pulser and tote counters are monitored continuously. Refer to information on *ERRORS* for details on clearing error conditions.

2. If a display system is disconnected before a delivery is started i.e. before the display reset cycle then reconnection will clear the error condition. Otherwise the pump requires to be powered off and on to clear the error.

Error Message	Failure
Err 0	Tote Cable
Err 1	Pulser
Err 2	Air detected
Err 3	RAM
Err 4	Earth quake sensor (Only on export models.)
No Displays Fast Flashing of running LED	Display(s) unplugged.

DIAGNOSTICS TESTS

The following diagnostics tests are included in the pump programming to assist service personnel in diagnosing a failure within the system.

The available tests are as follows:

All models;

TEST 0	Flashing 8's test
TEST 1	System test
TEST 2	Settings
TEST 3	Valve Index Number display
TEST 4	Nozzles and Pulsers input
TEST 5	Keyboard, and Preset test
TEST 6	Jumpers
TEST 7	Walking Segments – all displays
TEST 8	Walking Segments – Transaction Display
TEST 9	Air detection signals
TEST 10	Earthquake Sensor Status (Optional fitting)
TEST 11	Communications analyser test. Poll counting monitoring.
TEST 12	Communications analyser test. Status monitoring.
TEST 13	External Manager's Switches Status
TEST 14	Communications Protocol setting – Display Type
TEST 15	Communications Data format – Display digit format

Multi Grade models only;

TEST 16	Walking Segments – PPU Display Hose A
TEST 17	Walking Segments – PPU Display Hose B

To use the diagnostics correctly, proceed as follows.

1. Ensure all transactions have been completed, and all nozzles are hung up.
2. Set the Manager Function switch to the TEST position.
3. The Gilbarco software product number and Version of the software currently installed are displayed on the bottom line ($).
4. On the numeric keypad, press the button corresponding to the number of the test required followed by the hash (#) button to start the test.
5. To exit from the test being carried out, select another test, or set the Manager Function switch to another position.

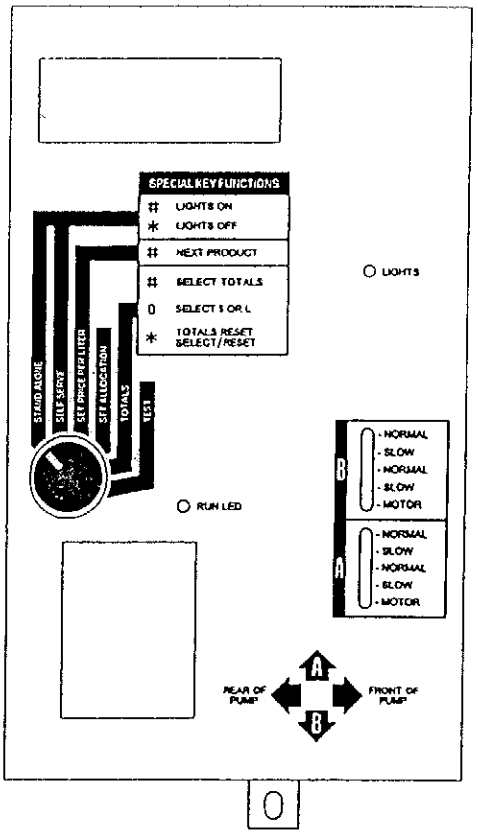


Figure 4-1 – Manager Function Panel – Electroline MK4 Pump

TEST 0 – FLASHING 8's

All display digits will continually alternate between the figure "8" and blank at approximately a one second rate. This is to check the operation of each display segment to ensure they are *written* to and *erased* properly.

TEST 1 – SYSTEM TEST

This test checks the following Processor PCB sub-systems.

1. CPU (micro processor chip)
2. RAM
3. ROM

If all tests pass, the word **PASS** will be displayed on the front "$" display.

If there is a failure, the message **Err** will be indicated on the front display, with an error code number displayed as below.

Error Message	Failure
0	CPU
1	RAM
2	ROM

TEST 2 – FUELLING POSITION ID & GRADE SETTINGS

The Fuelling Position numbers, "A" and "B', are indicated as follows.

1. The **"A"** Fuelling Position numbers are displayed on the top display digits. An "F" is displayed on the 3rd digit, with the position number displayed on the last two digits of the display.
2. The **"B"** Fuelling Position numbers are displayed on the bottom display. An "r" is displayed on the 2nd digit, with the position number displayed on the last two digits of the display.
3. If ***NO*** Fuelling Position number has been set, "**Er**" will be displayed in place of the position number.
4. For Multi Hose models "**Grd**" and the assigned grade number is shown on the PPU display for the related hose.

TEST 3 – VALVE INDEX NUMBERS DISPLAY

This test displays a number on the PPU display in the range of 1 to 15 for the hydraulic valve for each hose. The number is adjusted automatically as preset deliveries are done, and is an indication of the speed of operation of the valve.

The *lower* the number, the *faster* the valve is operating. Likewise, the *higher* the number, the *slower* the valve is operating. For example, a very fast operating valve will have a number around 3 or 4 while a slow valve will have a number around 9 or 10.

If the VIN (Valve Index Number) for a valve is 15, and does not change after a series of preset deliveries (say 6), then the valve is not operating correctly and should be serviced or replaced.

The VINs are displayed on the Price per Litre digits.

TEST 4 – NOZZLES AND PULSER INPUTS

This test displays the status of Nozzle and Pulser inputs.

1. Nozzle Inputs

The status of each nozzle switch is displayed on the PPU display.

in	=	nozzle *in* boot
out	=	nozzle out of boot

2. **Pulser Inputs**

The Pulser inputs status for nozzles on the "A" side of the pump is indicated as follows.

- displayed on the **4**th digit of the volume display and the **3**rd digit of the money display.

The Pulser inputs status for nozzles on the "B" of the pump is indicated as follows.

- Displayed on the **5**th digit of the volume display and the **4**th digit of the money display.

Carry out the following check procedure.

a) Lift the nozzle on "A" side of the pump/dispenser. Check that a **0** ***and*** **1** appear in the positions indicated above. Either position may be **0** or **1**. If both positions indicate the same, i.e. both **0** or both **1**, then a fault exists.

b) Hang up the nozzle and ensure that the display clears.

Repeat this procedure for "B" side nozzle.

TEST 5 – KEYBOARD & PRESETS TEST

Presets Test

Press each button on the preset keypad and ensure the value of the button pressed is displayed on the transaction money display.

NOTE:
1. The values of the buttons pressed ***do not*** accumulate. This test checks individual buttons only.
2. The "Recall" button will be displayed as "UU".
3. The "Clear/Fill" button will be displayed as "0".

Keyboard Test

Press each keyboard button (except the hash (#) which will start a new test) and ensure that the value of the button pressed is displayed on the LSD digit of the front "$" display.

NOTE:
1. A dash (–) is displayed before the first key press.
2. The letter "A" is displayed when the asterisk (*) button is pressed.

TEST 6 – JUMPERS

This test displays the current settings for the links on the Processor PCB. The status of each link is displayed on the front Main Transaction Display; "**1**" for link IN and "0" for link OUT. The link positions are indicated as follows.

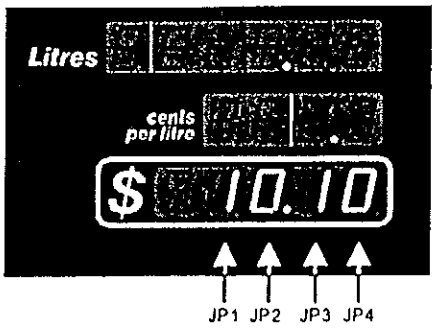


Figure 4-3 – Link indications

(*Figure 4-3* indicates that JP1 is in, JP2 is out, JP3 is in and JP4 is out)

TEST 7 – WALKING SEGMENTS – ALL DISPLAYS

This test further checks to ensure each individual segment is functioning properly. Each display digit consists of seven (7) segments.

In each digit, each segment is activated then de-activated in turn. As one segment is de-activated, the next is activated, making the segment appear to be moving around the digit. All digits, on all displays, are tested in turn, with the front and rear displays being tested simultaneously.

After the last digit has been checked, the test restarts again. To exit the test, enter the number of the next test required, then press the hash (#) button.

TEST 8 – WALKING SEGMENTS – TRANSACTION DISPLAY

This test checks only the Transaction Display to ensure each individual segment is functioning properly. Each display digit consists of seven (7) segments.

In each digit, each segment is activated then de-activated in turn. As one segment is de-activated, the next is activated, making the segment appear to be moving around the digit. All digits, on all displays, are tested in turn, with the front and rear displays being tested simultaneously.

After the last digit has been checked, the test starts again. To exit the test, enter the number of the next test required, then press the hash (#) button.

TEST 9 – AIR DETECTION SWITCH OPERATION

This test displays the status of the Pumping unit AIR detection switch.

The test maybe used to check a suspected 'stuck' switch or, by unscrewing the switch mechanism and holding it upside down, the free movement and operation of the switch plunger may be tested.

Figure 4-4 – indicates the status of the Air detection switch

where: Air Good = No Air detected. (Plunger is down when mounted upright.)
Air Bad = Air detected (Plunger is down when upside down.)

TEST 10 – EARTHQUAKE SENSOR STATUS

This test displays the current status of the optional Earthquake Sensor.

The status is displayed on the "A" side volume display as follows

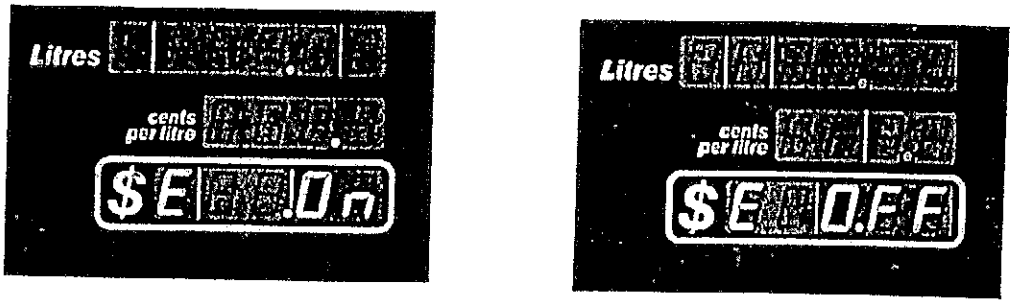


Figure 4-5 – indicates Earthquake Sensor status

where: E On = sensor is installed and currently closed.
E Off = sensor either not installed or currently open.

TEST 11 – COMMUNICATIONS TEST – 2-WIRE POLL COUNTING

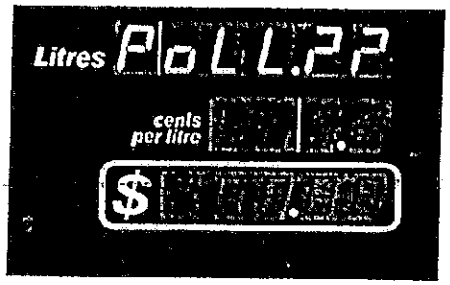
This test may be used to monitor the communications from the Console to this or another Pump connected on the same communications loop. It displays two count values, one is the number of times a selected pump is "Polled" by the console and the other is the number of times the pump responds with a 'normal' response.

The test has two parts to its operation;

a) The selecting of the pump ID to check.

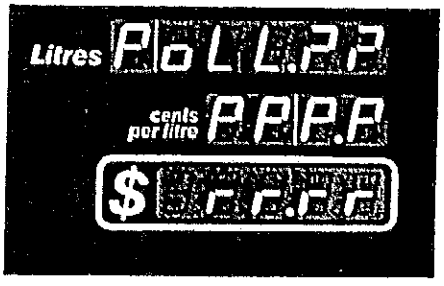
b) Viewing of the counts of polls and responses as the communications are monitored.

Upon entry to this test the display will prompt for an ID to be selected.



where: ?? = Selected ID

When the required ID is selected, push the "#" key. The display will change to show the counts of polls from the console (POS) to the selected pump ID and that pump's normal responses



where: ?? = Selected ID
pppp = Count of polls
r r r r = Count of responses

If the "#" key is pushed during the display of counts, both counts will be reset to zero and automatically restart.

If the "*" key is pushed at any time during this test the test will be exited and the system will revert to display Product and Software Version number, and allow selection of a new test.

If another pump is required to be checked its ID may be entered during monitoring of a priority selected ID.

This test may be used to assist in the analysis of the following type of information:

- That the Console is operating and the communications loop from the Kiosk is functioning.
- That the selected pump is actually being polled.
- That the selected pump is not experiencing errors on the communications loop. If errors exist the count will differ. (If the poll count is momentarily greater by one then it should be assumed that no errors exist. The counts can be simultaneously reset by pushing the "#" key.)
- That the 'speed' of the loop is satisfactory. This will vary from site to site depending on the type of console, the number of pumps installed and the number of pumps busy at the time of testing. (Experienced Service staff, once familiar with different POS / Consoles and site operations should be able to recognise abnormal monitoring patterns.)

TEST 12 – COMMUNICATIONS TEST – 2-WIRE STATUS MONITORING

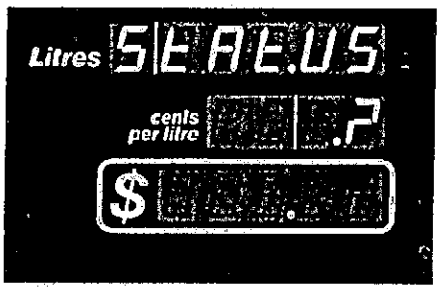
This test may be used to monitor the communications status between the Console and another Pump connected on the same communications loop. It displays the status response of the selected pump continuously and may be used to view changes as the selected pump performs a delivery.

The test has two parts to its operation;

a) The selecting of the pump ID for monitoring.

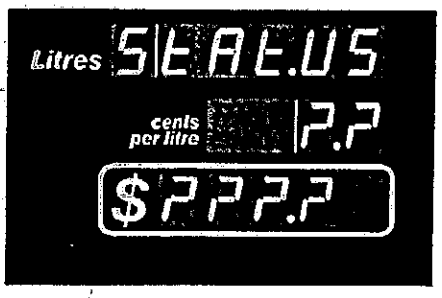
b) Viewing of the current status as the communications are monitored.

Upon entry to this test the display will prompt for an ID to be selected.



where: ? = Selected ID

When the required ID is selected, push the "#" key. The display will change to show the responses from the selected pump.



where: ?? = Selected ID (01 to 16)
???? = Last received status response from selected pump.

Possible response displays and their meanings are:

Display	Pump Response Status	Meaning
No_St	No status response received	Pump is not responding.
Off__	Off	Pump is off, not authorised & nozzle is in.
CAll_	Call	Pump is off, not authorised & nozzle is out.
AUth_	Authorised.	Pump is off, authorised & nozzle is in.
bUSY_	Busy.	Pump is on, authorised & nozzle is out.
PAY__	Paying.	Pump is waiting for Paid command or for End of delivery time to complete. This response should only last approximately 5 seconds.
STOP_	Stopped.	Pump is stopped during delivery, authorisation has been removed & nozzle is out.

If the "#" key is pushed during the monitoring display, the last status received response will be cleared and monitoring will be automatically restart.

If the "*" key is pushed at any time during this test the test will be exited and the system will revert to display Product and Software Version number, and allow selection of a new test.

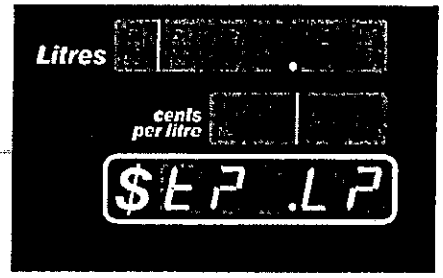
This test may be used to assist in the analysis of the following type of information:

- That the Console is operating and the communications loop from the Kiosk is functioning.
- That a selected pump is actually being polled and is responding.
- The selected pump is reacting to input commands and nozzle operations.
- That the 'speed' of the loop is satisfactory. This will vary from site to site depending on the type of console, the number of pumps installed and the number of pumps busy at the time of testing. (Experienced Service staff, once familiar with different POS / Consoles and site operations should be able to recognise abnormal monitoring patterns.)

TEST 13 – EXTERNAL MANAGER'S "LIGHTS" & "TOTALS" SWITCHES

This test indicates the status of the two external switches that are mounted on the ends of the CDM of the Electroline MK4 style pump.

The status of the two switches is indicated on the "A" money display as follows:



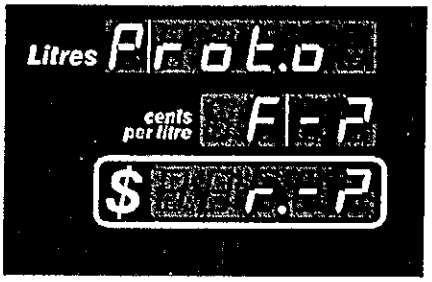
where: **Totals switch status-**
1 = switch pushed
0 = switch not pushed or not installed

Lights switch status-
1 = switch pushed
0 = switch not pushed or not installed

TEST 14 – ASSIGNED PROTOCOL

For non Multi grade type pumps the two pumping positions may be assigned with different protocols. Multi grade type pumps use only Protocol 2.

This test displays the current assigned Protocol type.



where: ? 1 = Protocol 1
2 = Protocol 2

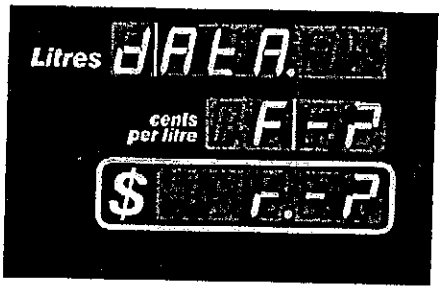
F = Position A
r = Position B

TEST 15 – SIX DIGIT FORMAT

This test displays the current selected format for transaction money and volume data digits that is used by the communications protocol with the POS. The test is provided to allow service staff to check and confirm the setting only, the actual setting is performed via the communications.

The default feature is the traditional 5 digit format and in order for the 6 digit format to be activated the Pump must be "SET" by the POS via the "Expanded" commands of the 2-Wire communications.

The display format of this test is:



where: F = Position A.
r = Position B.
? = "6", If 6 digit format is set. . "5", If 5 digit format is set.

NOTE: In Self Serve mode the use of the most significant digit of the volume display is only possible if the POS is capable of, and set to use, 6-digit formatted data.

NOTICE

All technical enquiries to Service staff regarding upgrading of POS equipment to use 6 digit data formats should be referred to the local Sales Branch.

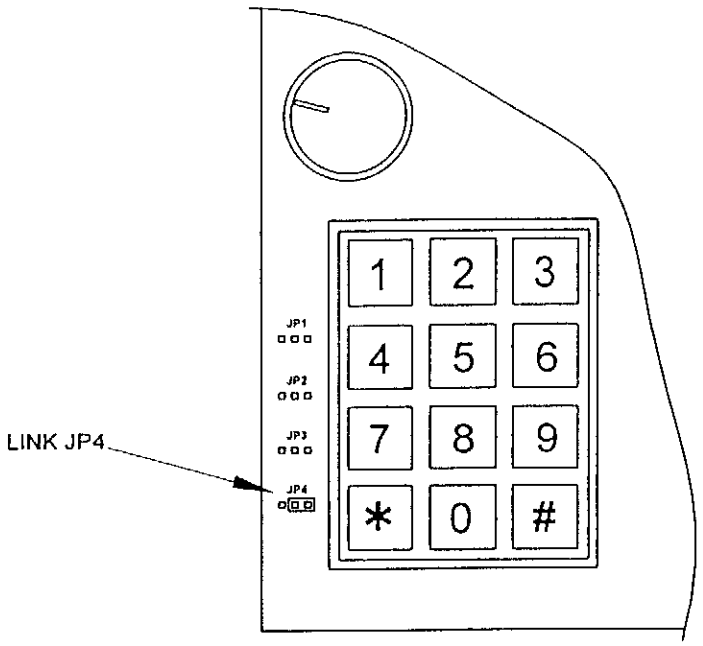
TEST 16 – WALKING SEGMENTS, "A" PPU (MULTI HOSE MODELS ONLY)

TEST 17 – WALKING SEGMENTS, "B" PPU (MULTI HOSE MODELS ONLY)

FLOW RATE TESTS

TO ENTER FLOW RATE TEST MODE

1. Ensure the pump is powered up with the Manager Function switch in the "Stand-Alone" position.
2. Set the Manager Function switch to the ALLOCATION position.
3. Remove, then replace link **JP4** on the Processor PCB. Refer to Figure 4-5



NOTE: Links are shown in their approximate position on PCB.

Figure 4-5 – Link positions on Processor PCB

4. The pump will enter the Flow Rate Test mode.

♦ FOR ONE AND TWO HOSE, NORMAL & HIGH FLOW PUMP OPERATION

❑ FOR PUMPING POSITION "A"

- Lift the nozzle. As the nozzle is lifted, the volume amount will be reset and the motor will start.
- Press the asterisk (*) button to turn the valve ON. Further pressing of the asterisk (*) button will alternate the valve setting between "n" (normal flow) and "d" (slow down). Delivery ***cannot*** start until a valve setting has been selected.
- Pressing the "1" button will reset the "Maximum Flow Rate".

NOTE: Delivery ***cannot*** start until a valve setting has been selected.

❑ FOR PUMPING POSITION "B"

- Lift the nozzle. As the nozzle is lifted, the volume amount will be reset and the motor will start.

- Press the hash (#) button to turn the valve ON. Further pressing of the hash (#) button will alternate the valve setting between "n" (normal flow) and "d" (slow down). Delivery ***cannot*** start until a valve setting has been selected
- Pressing the "3" button will reset the "Maximum Flow Rate".

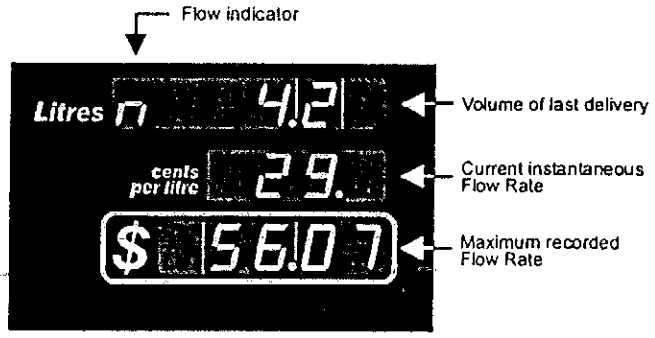
NOTE: Delivery ***cannot*** start until a valve setting has been selected.

♦ FOR ULTRA HIGH FLOW PUMP OPERATION

❑ FOR OPERATION

- Lift the nozzle. As the nozzle is lifted, the volume amount will be reset and the motors will start.
- Press the asterisk (*) button to turn the valve ON for the "A" meter. Further pressing of the asterisk (*) button will alternate the "A" meter valve setting between "n" (normal flow) and "d" (slow down). Delivery ***cannot*** start until a valve setting has been selected.
- Press the hash (#) button to turn the valve ON for the "B" meter. Further pressing of the hash (#) button will alternate the "B" meter valve setting between "n" (normal flow) and "d" (slow down) and "off". In the off position the motor will also turn off.
- The maximum flow will be obtained when both valves are on.
- Pressing the "1" button will reset the "Maximum Flow Rate".

FLOW RATE TEST DISPLAY DATA



Flow Rate test value indication character

where:
- *o* = off – all valves off.
- *n* = normal – meter Position A normal and slow valves.
- *n* = normal plus – meter Position A normal and slow valves plus meter position B slow valve.
- *d* = slow meter Position A slow valve only.
- *S* = slow plus – meter Position A slow valve plus meter position B slow valve.
- *U* = ultra hi – all valves on.
- *b* = slow – meter position B slow valve only.

TO EXIT FLOW RATE TEST MODE

1. Ensure all nozzles are hung up.
2. Set the Manager Function Switch to any position other than the ALLOCATION position. This will force an exit from the test.

NOTE: If a nozzle from either side of the pump/dispenser is *not* hung up, exiting from the test is *not* possible.

METER CALIBRATION PROCEDURES

See "METER CALIBRATION" in section on SITE COMMISSIONING.

ERROR CONDITIONS

The following error conditions are designed for, and may be caused by, transient conditions. These conditions, should they occur, may be reset as listed below.

ERROR	CAUSE	RESET ACTION
Err 0	Tote Cable	1. Check the Tote cable is plugged in properly. 2. Power the pump down, then power up again to clear the error indication.
Err 1	Faulty Pulser.	1. Power the pump down, then power up again. 2. Carry out another delivery on the same hose. 3. If the error condition recurs, replace the Pulser Box.
Err 2	Air detected in the supply line.	1. Power down and up to clear the error. 2. Check Air Detect switch plugged in. 3. Check for leaks in the incoming fuel line.
Err 3	Faulty RAM.	1. Record all totals if the site requires them. **NOTE:** The totals ***may not*** be correct. 2. Enter Personalisation mode and carry out a Totals Reset. 3. If the error condition recurs, change the RAM or Processor PCB.
Err 4	Earthquake Sensor	1. Press digit "5" on Managers Keypad.
Err ?	Display system has been unplugged and reconnected during a delivery.	1. Power down and up to clear the error.

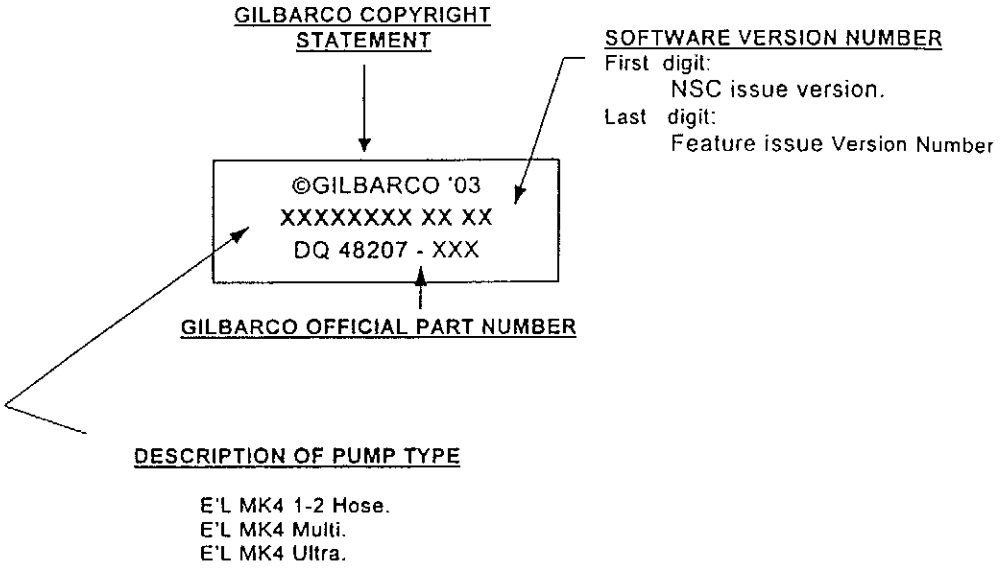
UPGRADING SOFTWARE

Software upgrading is done by replacing the "EPROM" device which is mounted in a 28-pin socket on the Processor PCB.

There are different EPROM version releases for different model series as follows:

- One and Two Hose Pumps and dispenser models – normal and High Flow.
- One hose Ultra High Flow model Pumps and Dispensers.
- Multi Hose model Pumps and dispensers.

The following describes the different areas of the EPROM software label:



SOFTWARE PRODUCT AND VERSION CODES

When the Managers switch is turned to the test position the software Product code and version numbers are displayed:

P P V V

Where:

P P = Software Product code

81 = 1 & 2 Hose Pumps and Dispensers
82 = Multi Pumps and Dispensers
83 = Ultra High flow Pumps and Dispensers

V V = Installed Software version

00 = Development version (dated on label)
99 = Demo version (dated on label)
01 to 98 = Released version number

SECTION 5
REPLACEMENT & SERVICE PROCEDURES

The information in this section outlines the correct procedures necessary for the removal and replacement of components and assemblies to ensure no damage results from the operation. This information is intended for Gilbarco trained service personnel only.

SAFETY WARNING

Equipment *must* be isolated from the mains power ***before*** any sub-assemblies are removed.

INTRODUCTION

The pump consists of the following basic assemblies.

1. Customer Display Module (CDM) assembly.
   Which includes a number of sub modules.
2. Processor PCB (Part of the CDM assembly).
3. Power Supply. (Part of the CDM assembly)
3. Display System. (Part of the CDM assembly)
3. Motor & Valve Control PCB. (Part of the CDM assembly)
4. Hydraulic cabinet.
5. Pump unit. (Part of the Hydraulic cabinet)
6. Pulser assembles. (Part of the Hydraulic cabinet)
7. Meter(s). (Part of the Hydraulic cabinet)
8. Flow Control Valves. (Part of the Hydraulic cabinet)
9. Motor(s). (Part of the Hydraulic cabinet
10. J-Box assembly.

The above assemblies may be further broken down into sub-assemblies. Removal and replacement of the major assemblies and sub-assemblies is described in the following information.

CAUTION

1. Static electricity can damage an EPROM and other similar devices. Ensure any static charge on your person is completely discharged by touching the metal framework of the pump/dispenser ***before*** handling electronic components.
2. When removing a PCB, lay it on top of the pump/dispenser, preferably resting on the anti-static wrapping supplied with the replacement PCB.

RECOMMENDED TOOL REQUIREMENTS

The following tools will be required by service personnel when working on Electroline MK4 pumps.

- WAGO terminal connector tool or small flat screw driver.
- Allen Key 6mm (J-Box)
- Allen Key 5mm (J-Boxes)
- Flat-Blade Screwdriver - 6mm (Mains J-Boxes)
- Flat-Blade Screwdriver - 3.5mm (Mains J-Boxes)
- Phillips Head Screwdriver - No. 2 (misc.)
- Spin-Tite (Nutdriver) M4 (Mains J-Boxes)
- Long Nose Pliers
- Small Cutters
- IC Extraction Tool (Processor PCB)
- IC Insertion Tool (Processor PCB)
- Spin-Tite (Nutdriver) - 10mm (to remove light to replace blown tube)
- Relief Valve and Strainer/Foot Valve Cap Spanner (P/No. 84-0024S)
- Long Allen Key - 6mm (for Air Separator)
- Gland Spanner ("C" Spanner P/No. 80-0169)

CDM ASSEMBLY

The CDM assembly consists of the following main sub-assemblies.

1. Power supply assembly.
2. Transaction Display PCBs.
3. Preset Keypad. (Optional)
4. Processor PCB.
5. Display interconnection PCB.
6. Intrinsically Safe Barrier PCB.
7. Motor & Valve control interface PCB.
8. Tote Loom assembly, external light switch and Managers totals switch.
9. Light tubes

POWER SUPPLY

1. **Removal**

   a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

   b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

   c) Unscrew the processor arm retaining screw and swing and lock the arm in the up position.

   d) Unplug the Mains and Lights cables.

   e) Unscrew the securing post for the Processor arm

   f) unscrew the three cover screws of the Motor / Valve control PCB and remove the cover

   g) Lift the Power Supply module out of the CDM.

2. Replacement

The replacement procedure is the reverse of the removal procedure. Ensure *all* cables are connected properly.

MAIN TRANSACTION DISPLAYS

1. **Removal**

   a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

   b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

   c) Unscrew the outer retaining clip of the display to be removed from the display dial. (The fluro tube may be removed first to give direct access to the screw head, the inner clip may be left in place.)

   d) Lift out the Display PCB and unplug the ribbon cables.

2. **Replacement**

   The replacement procedure is the reverse of the removal procedure. Ensure both cables are connected properly.

PRESET KEYPAD

1. **Removal**

   a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

   b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

   c) For non Multi models, the Preset Display/Keypad assemblies are mounted on 2 threaded bolts and retained by 2 nylon thumb nuts. Unscrew the thumb nuts and slip the PCB off the bolts.

      i. If fitted, remove the Preset Display PCB as outlined above.

      ii. Using an Allen Key, remove the 4 screws holding the Preset Panel to the CDM.

      iii. Remove the Preset Panel from the outside end of the CDM.

   d) For Multi models, The Preset Keypad assemblies are mounted on the display dial and window.

      i. First remove the Power supply module, then the main display PCB and the PPU display PCB above the Preset keypad.

      ii. Unscrew the nuts ?

2. **Replacement**

   The replacement procedure is the reverse of the removal procedure. Ensure *all* cables are connected properly.

PROCESSOR PCB

1. **Removal**

   a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

   b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

   c) Pivot the Processor PCB arm and allow to slide into the locked position.

   d) Remove the screw in the tab of the Processor PCB cover and remove the cover

e) Unplug *all* cables from the Processor PCB.

f) Unclip the Processor PCB from the 7 stand-offs and remove.

2. Replacement

The replacement procedure is the reverse of the removal procedure. Ensure *all* cables are connected properly.

DISPLAY INTERCONNECT PCB

1. Removal

a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

c) Pivot the Processor PCB arm and allow to slide into the locked position.

d) On the under side of the arm, remove the screws retaining the interconnection PCB to the arm.

e) Unplug *all* cables from the interconnection PCB.

f) Remove the PCB.

2. Replacement

The replacement procedure is the reverse of the removal procedure. Ensure *all* cables are connected properly.

INTRINSICALLY SAFE BARRIER PCB

1. Removal

a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

c) Pivot the Processor PCB arm and allow to slide into the locked position.

d) On the IS Barrier PCB mounted on the support bracket the Processor arm unplug all cables.

e) Remove the PCB.

2. Replacement

The replacement procedure is the reverse of the removal procedure. Ensure *all* cables are connected properly.

MOTOR & VALVE CONTROL PCB

1. Removal

a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

c) Pivot the Processor PCB arm and allow to slide into the locked position.

d) Loosen the two cover screws in between the Power Supply and the Motor/Valve PCB.

e) Unscrew the cover screw under the IS Barrier PCB

f) Slide and remove the cover.

g) Unplug *all* cables from the Motor & Valve PCB

h) Unscrew the holding down screws and remove the PCB and attached heat sink base. (The PCB and Heat Sink must be kept together.)

2. **Replacement**

The replacement procedure is the reverse of the removal procedure. Ensure *all* cables are connected properly.

TOTE LOOM ASSEMBLY/EXTERNAL LIGHTS/MANAGERS TOTALS SWITCH

1. **Removal**

a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

c) Undo the 2 screws on each Tote assembly bracket. Unplug the cable loom from the Processor PCB and remove the complete loom assembly.

2. **Replacement**

When looking at the front of the pump (with the Nameplate located on the right-hand side of the pump), place the cable loom so that the Manager Switch/Tote assembly is on the right-hand side, and the Light Switch/Tote assembly is on the left. Replace the screws.

LIGHT TUBES

1. **Removal**

a) Remove the mains power from the pump.

b) Using the keys provided, remove the top cover of the CDM (CDM cover locks at both ends).

c) Rotate tubes in holders and remove.

2. **Replacement**

The replacement procedure is the reverse of the removal procedure.

HYDRAULICS MODULE – PUMPS & DISPENSERS

The Hydraulics Module consists of the following main sub-assemblies.

1. Pulser assemblies
2. Flow Control Valves
3. Motors
4. GDP-90 Pump

The following topics outline the removal and replacement procedures recommended by the manufacturer to ensure safety to both equipment and service personnel.

PULSER ASSEMBLY

1. Removal

a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

b) Unlock the front and/or rear hydraulic cabinet panels and remove them. (Depending on the location of the required Pulser, only the front or rear panel may need to be removed.)

c) Locate the faulty Pulser and release the cover of the Pulser assembly.

d) Remove the 2-core Nozzle Switch cable from the connector, and unplug the Pulser cable.

f) Remove the 2 retaining spring-clips and lift the Pulser assembly off the flow-meter.

2. Replacement

The replacement procedure is the reverse of the removal procedure. Ensure *all* cables are connected properly.

FLOW CONTROL VALVE (SOLENOID ONLY)

1. Removal

a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

b) Unbolt the front and/or rear hydraulic cabinet panels and remove them. (Depending on the location of the required Pulser, only the front or rear panel may need to be removed.)

c) Unlock and remove the top cover of the CDM (CDM cover locks at both ends).

e) Remove the Motor / Valve PCB cover. Refer to separate instructions on removal of this cover.

f) Locate the faulty Valve assembly and trace the Valve cable back to the associated cable gland to the CDM.

g) Disconnect the relevant cable cores from the 'Clamp' type connectors on the PCB.

h) By reaching under the CDM base, inside the hydraulic cabinet area, loosen the cable gland nut and slide it down the cable in order to free the grip on the cable

i) Pull the valve cable through the cable gland.

j) Unbolt the valve solenoid assembly from the valve body and remove the solenoid and cable from the pump.

2. Replacement

The replacement procedure is the reverse of the removal procedure
Ensure *all* cables are connected properly

MOTOR REPLACEMENT

1. Removal

   a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

   b) Unlock/unscrew the front and rear hydraulic cabinet panels and remove them

   c) Locate the faulty Motor and detach Earth braid from the motor.

   d) Locate the Mains Junction box and remove it's cover.

   e) Trace the motor cable to the Mains Junction box gland and loosen the Gland nut.

   f) Unscrew the motor cables from the mains junction box terminal strip.

   g) Remove the cable from the Mains junction box through the cable gland.

   h) Loosen the motor hold down bolts (4 off) and move the motor to loosen the drive belt.

   i) Remove the drive belt.

   j) Remove the Motor from the mounting shelf.

2. Replacement

   The replacement procedure is the reverse of the removal procedure. Ensure *all* cables are connected properly.

PUMP UNIT REPLACEMENT

1. Removal

   a) Isolate the pump communications and remove the mains power from the pump at the switchboard.

   b) Remove the front and rear panel covers from the hydraulic section of the pump.

   c) Undo the inlet and outlet pipe flange bolts and remove the pipes.

   d) To remove the section of the vent pipe from the pump to the frame base at the bottom of the side panel – undo the vent pipe at the rear of the pump and at the side panel base.

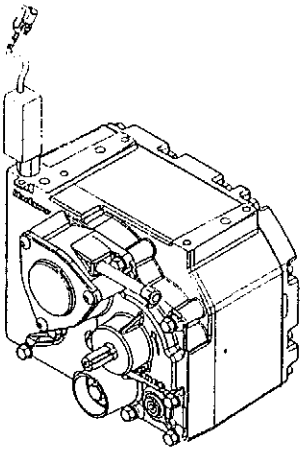
   e) Unplug the Air detect switch lead from the connector bracket, then unscrew the Air detect switch brass body from the top of the pump unit.

   f) Loosen the four bolts that secure the motor to the motor shelf and the pump unit, then move the motor and remove the drive belt. Then undo the motor bolts completely and lift the motor out of the way. If necessary to remove the motor completely refer to the section on motor replacement.

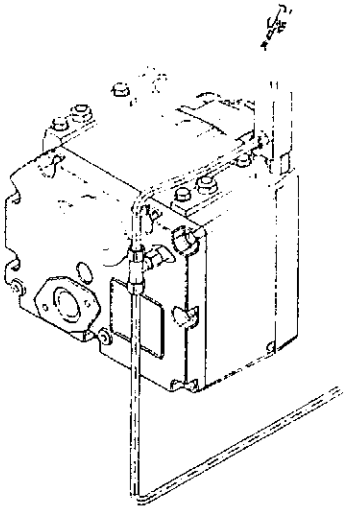
   g) Undo the bolts retaining the pump body to the motor shelf and remove it from the frame.

2. Replacement

   The replacement procedure is the reverse of the removal procedure. Ensure *all* pipe flanges are fitted and tightened correctly and, if necessary, any worn gaskets are replaced. Any cables that were unplugged or disconnected must be reconnected properly.



Front View – With W & M Air Test Arm
(Arm allows safe access with belt running.)



Rear View – With Vent Tube & Pressure Relief Valve
(Pressure relief valve between to rear port and "T".)

DRAINING PUMP.

The following procedure will drain the bulk of the fluid from the pump. Residual may remain in the pump.

Tools Required: ¼" Allen Key

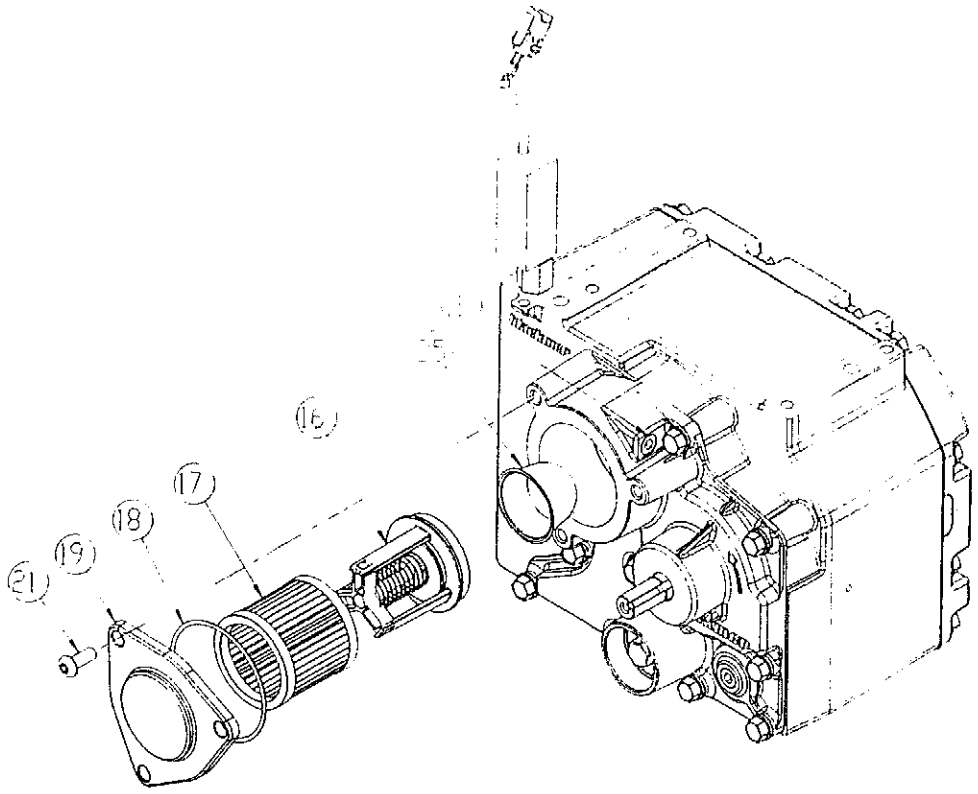
1. Remove plug (11) directly to the right of the strainer cover (19). (This port may be used to monitor vacuum).
2. Remove the plug (11, W & M Test arm) on the lower right face of the head (9). Fluid will be emptied by removing this plug. Fluid must be properly contained during draining procedure.

   NOTE: Pump contains up to 0.5 litre of fluid.

   DO NOT use this port to monitor pressure.

3. If sump drainage is desired, plug (11) near the mounting hole on the left side of pump casing (1) may be removed.
4. Manually turn the pump pulley COUNTER CLOCKWISE to aid in fluid removal.
5. Properly dispose of fluid drained from the pump.
6. After pump is drained, replace ALL plugs (11) using a non-hardening pipe sealant DO NOT use Teflon tape.

GDP - STRAINER AND CHECK VALVE



STRAINER / CHECK VALVE REMOVAL.

Check valves should be replaced only if pump is experiencing frequent prime loss, indicating the check valve is not functioning. Check valve should be installed when tank check valve is not available.

Always use strainers with or without check valves. Strainers must be kept clean to ensure proper operation and to extend pump life.

Tools Required: 5mm Allen Key

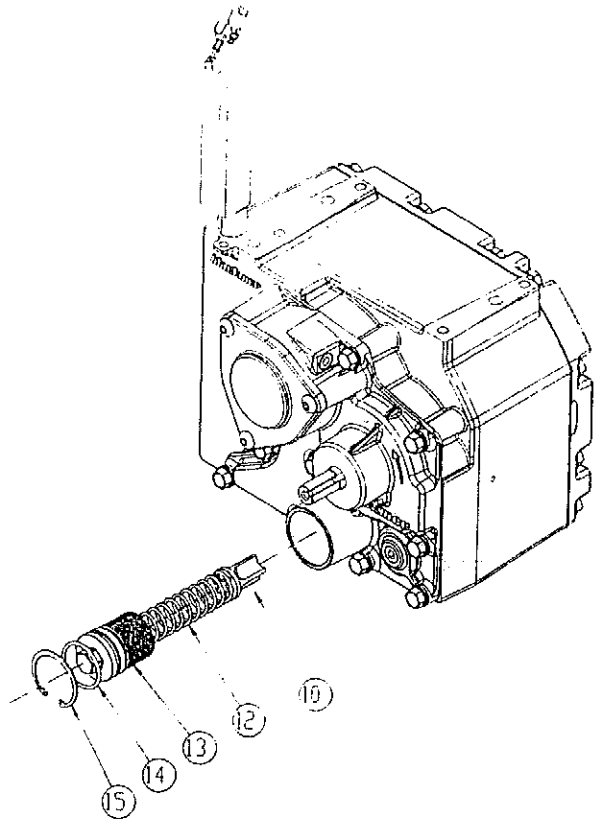
1. Lower pump fluid level by removing the plug (11, at end of W & M air test arm) located at the right of the strainer cover and rotation the pump shaft COUNTER CLOCKWISE approximately ten (10) turns.
   NOTE: Removing the plug allows air to enter.
2. Remove the three (3) strainer cover screws (21).
3. Remove the strainer cover (19). Replace cover O-ring (18) if necessary.
4. Carefully pull out strainer (17). Keep strainer in a horizontal position to avoid contaminating pump with strainer debris. It may be necessary to use a small tool to gently hook the inside of the metal strainer end cap.
5. Remove the inlet check valve assembly (16). Inspect for cracked or otherwise damaged O-rings. Replace if necessary.
6. Lift dome strainer (25) out from the bore (behind the check valve assembly).

STRAINER / CHECK VALVE INSTALLATION.

1 Insert dome strainer (25) into bore.
2 Ensure all debris is removed from check valve, especially at the O-ring seats.
3 Lubricate O-ring before installing in check valve assembly
4 Insert check valve assembly (16) or check cap (30) into corresponding pump bore Press assembly squarely over receiving cylindrical surface until O-ring seats firmly over the surface and holds assembly in position

5. Insert new or cleaned strainer (17) into bore, over check valve assembly.
6. Clean debris from strainer cover O-ring groove and install O-ring (18). If O-ring does not stay in place, use a small amount of all purpose grease to hold the O-ring in groove.
7 Install strainer cover (19) with screws (21). Hand tighten, alternating between each screw to keep the cover parallel to the casing face. Torque the screws to 150 lbs-in (17 Nm).
   DO NOT OVERTIGHTEN.
8. Replace the plug (11) in the hole located to the right of the strainer cover.

GDP - PRESSURE CONTROL VALVE



PRESSURE CONTROL VALVE REMOVAL.

Excessive wear on the pressure control valve (PCV) can cause improper pump performance, including flow loss or excessive or low discharge pressure.

Tools Required: **Large Snap Ring Pliers.**
16mm Socket wrench

1. Drain the pump following the procedure outlined under "Drain Pump" section.
2. Remove the snap C-ring (15). If C-ring is not free to move due to the valve cover (13) being wound back against it, use a 16mm socket wrench to slightly tighten the valve cover inwards (clockwise) to free the C-ring.
3. With a 16mm socket wrench, turn the valve cover (13) outwards (counter clockwise) until completely removed.
4. Remove the spring (12) and valve (10).
5. If valve does not come out with the spring, use a needle nose pliers to remove it from the bore.

PRESSURE CONTROL VALVE INSTALLATION.

1. Inspect valve for damage or excessive wear. Replace if necessary.
2. Install pressure control valve in reverse order of removal. Apply a light application of grease on the O-ring (14) to help keep the O-ring from being damaged during installation
3. When pump is operating at full speed, discharge pressure must NOT exceed 50 psi (3.5 bar) with any discharge restriction (fully open to fully close discharge)

NOTICE

Modification of the pressure control valve or failure to correctly install all components ot the pressure control valve will void any regulating agency recognition application to the pump.

PRESSURE CONTROL VALVE OPERATION & ADJUSTMENT.

The pump pressure must not exceed 50 psi (3.5 bar, 350 kPa).

Pressure Control Valve (PCV) must be set to the desired single hose operating pressure.

(Pressure for Petrol and LF Diesel normally between 120 and 180 kPa.)

WARNING

RETAINER (15) MUST BE IN PLACE AT ALL TIMES DURING PRESSURE CONTROL ADJUSTMENT. PERSONAL INJURY OR PROPERTY DAMAGE MAY OCCUR IF RETAINING RING IS NOT INSTALLED CORRECTLY.

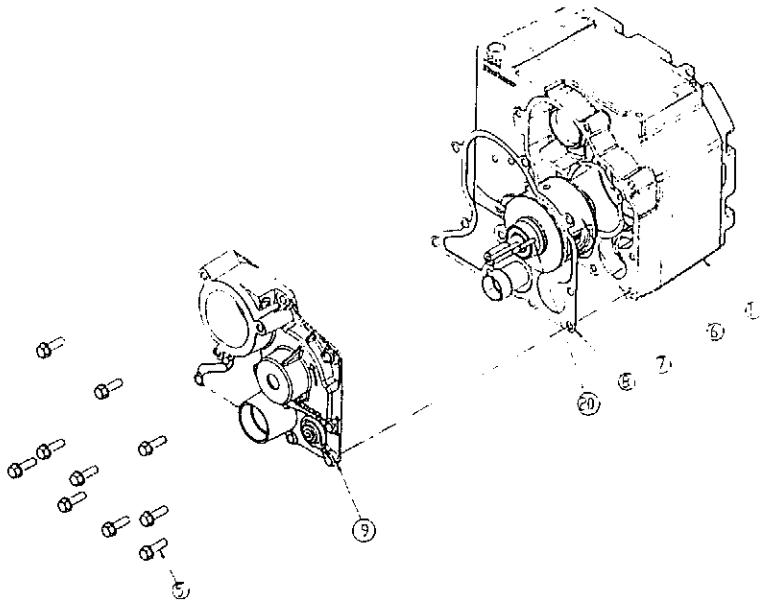
Tools Required: **16mm Socket wrench**.

1. To **INCREASE** the pressure setting, turn the PCV cover (13) ***inwards*** (clockwise) using a 16mm socket wrench.
2. To **DECREASE** the pressure setting, turn the PCV cover (13) ***outwards*** (counter clockwise) using a 16mm socket wrench.

NOTE:

1. Optimum factory setting of PCV is approximately ½ turn clockwise IN from fully OUT position.
2. Excessive By-Pass pressure will increase load on motor.
3. Flow restrictor washers are fitted in the pipe at outlet of flow control valves of all Normal flow hoses. Do not increase By-Pass pressure to increase flow rate without first fitting a larger ID washer.

GDP - PUMP CARTRIDGE



PUMP CARTRIDGE REMOVAL.

Damage or excessive wear to the pump cartridge can cause low suction, low flow, lock-up (seizing) or excessive noise.

Tools Required: **Large Snap Ring Pliers.**
16mm Socket wrench
5mm Allen wrench
13mm Socket wrench (or ½" Socket wrench)
Rubber mallet (or equivalent if needed)

1. Drain the pump following the procedure outlined under the "Draining Pump" section.
2. Remove belt and pulley. This will require loosening the four (4) motor mounting bolts and reducing the belt tension.
3. Remove strainer, check valve, and pressure control valve. Refer to "Strainer / Check Valve Removal" and 'Pressure Control Valve Removal" for disassembly instructions.
4. Remove the ten (10) head cap screws (5).
5. Slightly rotate the head (9) counter clockwise around the pump cartridge enough to provide exposed edges to grip.
6. Remove head (9) from pump case.
7. If pump cartridge comes off with head, remove by rotating and pulling the cartridge from the head bore.
8. If the cartridge remains in the pump casting, grip the shaft and/or liner and pull while slightly turning back and forth. If necessary, GENTLY tap around the circumference with a rubber mallet to loosen the cartridge assembly. Be sure to keep it concentric with the bore.

WARNING

DO NOT LEVER THE CARTRIDGE OUT AGAINST THE SIDE WALLS, AS THE GASKET SEALING SURFACE WILL BE DAMAGED.

OIML AIR DETECT SWITCH - INSTALLATION.

1. Apply very thin film of thread sealing compound onto the thread beginning about 3mm from the end. (Thread sealing tape is not advised as may cause contamination.)
2. Rotate (clockwise) OIML switch assembly (22) into sump vent port by hand and tighten firmly with wrench. Again take care that no debris or loose thread compound falls into the sump vent port.

   Ensure rotational alignment is correct to allow connection of tube line to Pressure relief device.

3. Attach tube from pressure relief device.

GDP TROUBLE SHOOTING GUIDE

NOTICE

Maintenance must be performed by qualified technicians only.
Refer to separate GDP subassembly sections for corrective action steps.

SYMPTOM		PROBABLE CAUSE
Pump not priming or excessive time to prime.		1. Suction line obstructed. 2. Air leak in suction line. 3. Clogged strainer. 4. Pump Speed too low. 5. Damaged or missing strainer cover O-ring. 6. Pressure Control valve open, worn or not seated correctly. 7. Damaged O-ring on Check Valve or improperly seated Check Valve assembly.
Reduced Capacity (Flow).		1. Pump speed too low. 2. Air leak in suction line. 3. Restriction in suction line. 4. Excessive system pressure. 5. Pressure Control valve open, worn or not seated correctly. 6. Worn or damaged pump cartridge.
Noise.		1. Inlet restriction of: a) Inlet pipe, b) Clogged strainer. 2. Excessive pump speed. 3. Pump not tightened to mounting plate. 4. Misaligned pulleys. 5. Improperly secured pipes. 6. Pressure Control Valve set to too high a pressure. 7. Excessive time with closed discharge line. 8. Excessive system pressure.
Leakage	**Port**	1. Loose pipes. 2. Improperly applied pipe thread sealant.
	Weep hole.	1. Damaged shaft seal O-ring. 2. Damaged shaft seal.
	Gasket.	1. Damaged gasket. 2. Improperly tightened mounting screws.
	Sump Overflow.	1. Excessively foamy fuel. 2. Failure of sump floats mechanism. 3. Failure of sump overflow check valve.
Motor / Belt Overheating.		1. Pump cartridge locked up. 2. Pressure Control valve stuck closed. 3. Excessive speed. 4. Improper belt tightening or alignment. 5. Defective or damaged motor.

SECTION 6
TROUBLESHOOTING

If and when failures occur, they should be reported to Gilbarco Engineering as soon as possible. The following troubleshooting chart will be continually updated as more information becomes available.

TROUBLESHOOTING HINTS

The following hints may make troubleshooting easier when diagnosing problems with Electroline MK4 pumps.

1. Voltages may be checked with a voltmeter at the Processor PCB as follows:
   - 20V - 35V – test between GND and Pin 18 on P502 (power cable connector)
   - Tote Supply – test between GND and 12V Test point (near Tote cable connector)
   - 5V – test between GND and 5V Test point (top of large diode near power cable connector)

   The most convenient position to 'clip' a meter to ground (GND) is at the bottom end of the large diode near P502 (power cable connector).

2. Processor running LED will power up and flash correctly with all cables unplugged *except* for the Power cable.

3. A fault on the display system may prevent the Display Supply voltage from powering up and therefore prevent the Processor PCB from powering up.

4. If the Processor running LED is permanently ON, or flashing a code to indicate a failed supply, unplugging the display cables at the Processor PCB (both front and rear, or one at a time) may help in powering up the Processor and finding the fault.

5. The motor and valve LEDs on the Processor PCB are in series with the control circuits on the Motor / Valve control PCB, therefore:
   - if the LED(s) operate the control circuit *must* be complete, and
   - if a particular LED does *not* operate, then it *may* be due to a fault in the Motor/Valve PCB.

6. The flat ribbon connectors for controlling the Product 'A', 'B' Motor and Valves are all 'pinned' the same *except* for the key. Therefore, by removing the key (temporarily for diagnostics purposes), they may be interchanged in order to test the operation of the cable(s) and/or PCB circuits.

7. The connectors for the Front and Rear pulsers are 'pinned' the same *except* for the key. Therefore, by removing the key (temporarily for diagnostics purposes), they may be interchanged in order to test the operation of the pulsers.

8 The two 50-way display cables are 'pinned' the same *except* for the key Therefore, by removing the key (temporarily for diagnostics purposes), they may be interchanged in order to test the operation of the displays.

10 Powering up with the Manager Function switch in a different position to when the pump was last powered down will force the pump to change the Power-up Position mode

11 Any short circuits on the "Display" or "Tote" supplies will cause the Processor RUN LED to flash the Power-up Fail code of 5 double blips

12. An unplugged display cable will cause the Processor RUN LED to flash extra fast if a nozzle is lifted. Reconnecting the display cables will correct the problem.

13. If a display cable becomes unplugged during a delivery the flow control valves will be closed and the running LED will be flashed extra fast. If the displays are reconnected, Err ?, will be flashed and the pump must be powered down and up to correct the system.

SYMPTOMS & CORRECTIVE ACTIONS

SYMPTOMS	ACTIONS
Processor	
Processor running LED off.	1. Check mains power is being supplied to the pump. 2. Check cable between Power Supply and Processor PCB. 3. Open Power Supply and check fuses.
Processor running LED on but *not* flashing.	1. Check cable between Power Supply and Processor PCB. 2. Change Processor PCB.
Processor running LED on and flashing a code in a series of double blinks.	1. Note the number of blinks and investigate as per the list in the "Automatic Self Test" section of this manual. 2. Check Tote cable plugged in properly. 3. If code is for Display Supply, unplug displays selectively to find the faulty assembly. 4. Change Processor PCB.
Pump operates in Stand Alone mode but does not respond to Console.	1. Check Manager Function Switch is in Self-Serve position. 2. Check pump is programmed with ID number. 3. Check communications wires are connected correctly and switched on. 4. Check Console is programmed correctly for that pump.
Pump will not operate in Stand Alone mode.	1. Check that the pump was powered up with the Manager Function Switch in the Stand Alone position. 2. Check that hoses have a Price per Unit entered.
Manager Function Switch does not appear to function correctly.	1. Power down the pump, turn the Manager Function Switch to a different position, then power up and re-check. 2. Use diagnostics Test 4 and check that all nozzles are operating correctly.
Displays	
Err 4 appears on the main display.	1. Push Managers Keypad button 5 to clear. If the problem persists, check that the Earthquake Sensor is mounted firmly and with the correct alignment.
Err 1 appears on the main display.	1 Power down and up again to clear. If the problem persists – • Check Pulser cables are plugged in correctly. • Replace Pulser Box for the hose that was in use when the error occurred.

Err 2 appears on the main display.	1. Check that the Air detection switch of the pump unit is operational (Refer Self Tests) and is plugged in. 2. Check for leaks in the incoming pipes and fittings. 3. Check all pipe flanges are tight. 4. Power pump down, wait 20 seconds, then power up again to clear the error indication.
Err 0 appears on the main display.	1. Check that the Tote to CPU PCB cable is plugged in properly. 2. Power down the pump, wait 20 seconds, then power up again to clear the error indication. 3. If the problem continues, replace the Tote Assembly.
Some displays do not appear as valid digits.	1. Perform all display diagnostics tests. If the problem persists – • Check display cables are plugged in correctly. • Replace suspect Display PCB
Displays do not operate and no pumping functions are possible.	1. Check if running LED is flashing very fast. If this is the case them one or more display cables are not plugged in correctly or the display I/C PCB is missing on or more LINK(s).
Hydraulics	
Motor and/or Valve LEDs on the Processor PCB for a particular Grade of fuel do not come on as expected.	1. Check cable(s) between the Motor / Valve control PCB and Processor PCB is plugged in correctly. 2. Replace related Motor or Valve PCB. 3. Replace Processor PCB.
Motor and/or Valve LEDs on Processor PCB comes on but Motor and/or Valve does not operate.	1. If the Motor is the problem, check that the 200VAC is OK. Are *all* phases present. 2. Replace the Motor and/or Valve PCB. 3. Replace Motor and/or Valves.
No response when a nozzle is lifted.	1. Check that the Manager Function Switch is in the correct position. 2. Use diagnostics to check nozzle operation. 3. Check that the nozzle switches are plugged into the Pulser boxes. 4. Check that the Pulser ribbon cable is plugged into all Pulser boxes and into the Processor PCB.
Flow rate is very slow, even when the "Norm" Valve LED is on.	1. Check motor drive belt tension. 2. Replace Motor / Valve PCB. 3. Replace relevant Valve assembly
Motor runs and Valve(s) operate but no fuel is delivered	1. Check motor drive belt tension. 2 Check direction of motor rotation (If needed change two of the three mains phase connections only). 3 Check fuel storage tank level 4. Check fuel line manifold valves are open

SECTION 7
SPECIFICATIONS

REQUIREMENTS	**Voltage**	240VAC -15% +10% 50Hz single phase +
	Current	240VAC ..... 12 amps. **Maximum**
		NOTE *This current does not include any other wiring requirements such as canopy lighting etc.*
RESOLUTION	**Volume Display**	To nearest 1/100th litre
	Money Display	To nearest cent
FLOW RATE	**Normal Flow**	*Less than* 50 litres per minute – for one nozzle
	High Flow	*Less than 90* litres per minute – for one nozzle
	Ultra High Flow	*Less than 160* litres per minute – for one nozzle
OPERATING TEMPERATURE RANGE		-25°C to +45°C – plus sun loading
OPERATING HUMIDITY RANGE		5% to 95% relative humidity – non-condensing
TOTALS	**(Electro-Mechanical)**	
	Volume	To nearest whole litre up to 9,999,999 litres
	Money	To nearest dollar up to 9,999,999 dollars
	(Electronic)	
	Volume	To nearest 1/100th litre up to 9,999,999.99 litres
	Money	To nearest Dollar up to 999,999,999 dollars
	Number of Transactions	For each hose, up to 9,999 transactions
OPERATING NOISE LEVEL		Less than 75 dB at a distance of 1 meter
NOZZLES		Normally fitted with a manual Elaflex ZV19 (19mm) nozzle. (High and Ultra Hi flow models require different nozzles.)
APPROVALS	**Statutory Requirements**	To NSC & OIML Requirements
	Safety	To Aus Ex standards.
	EMC	To Australian Communications Authority requirements

This page intentionally blank.

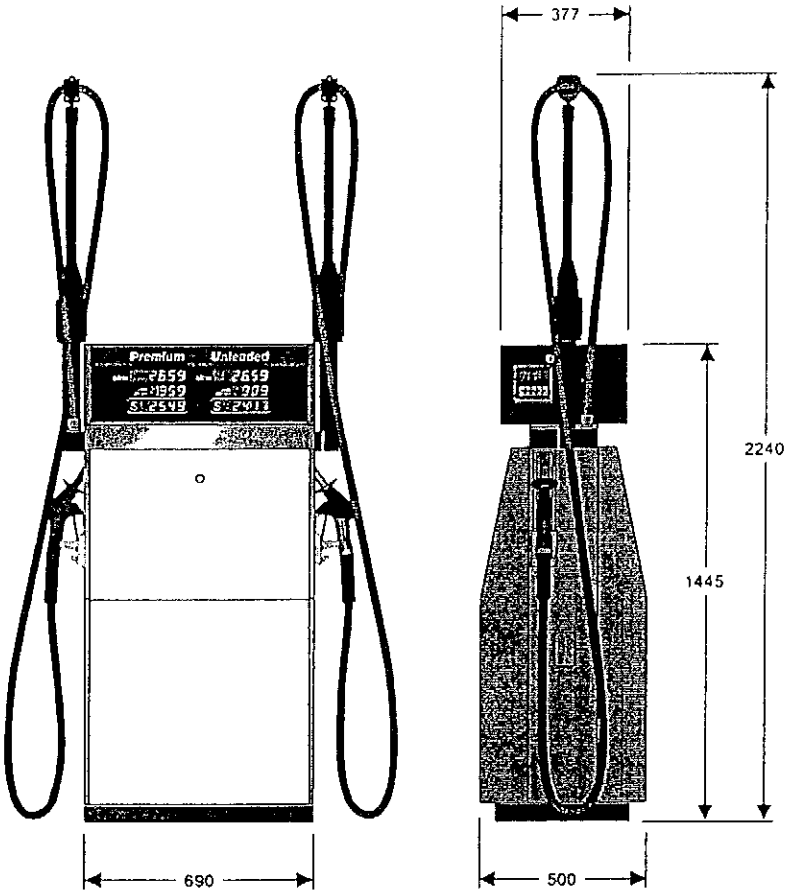
SECTION 8
DIAGRAMS & SCHEMATICS

The diagrams and schematics shown on the following pages are correct at the time of publication. However, changes to equipment and/or procedures may be made without prior notice. Check with your local Branch Office to ensure that you are using the latest issue of this manual.

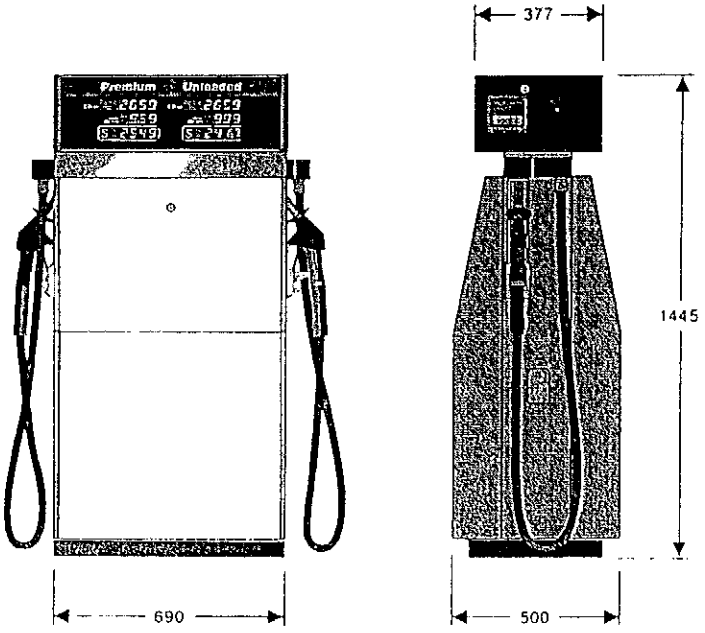
For diagrams pertaining to the installation of "other manufacturer's" pumps and/or Consoles, refer to the appropriate Installation Manual for that manufacturer's equipment.

EXTERNAL DIMENSION

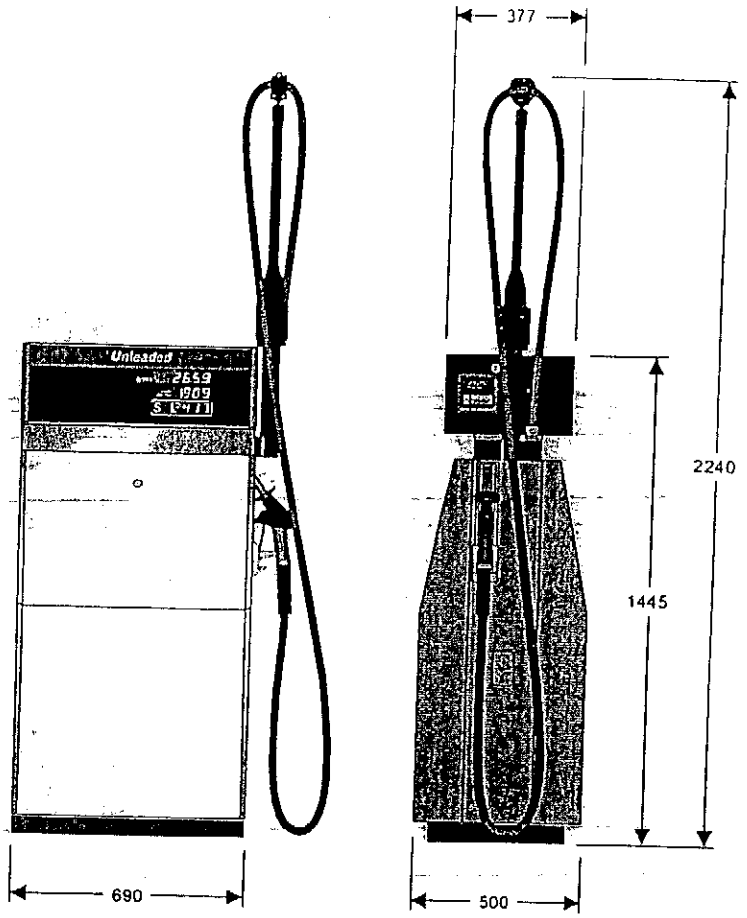
TWO HOSE ISLAND ORIENTED – WITH FLEXMAST



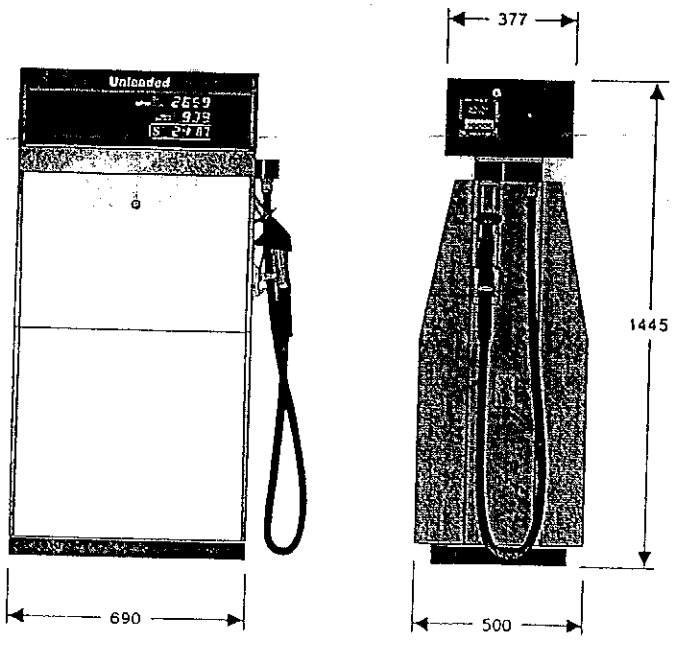
TWO HOSE ISLAND OREINTED – WITHOUT FLEXMAST



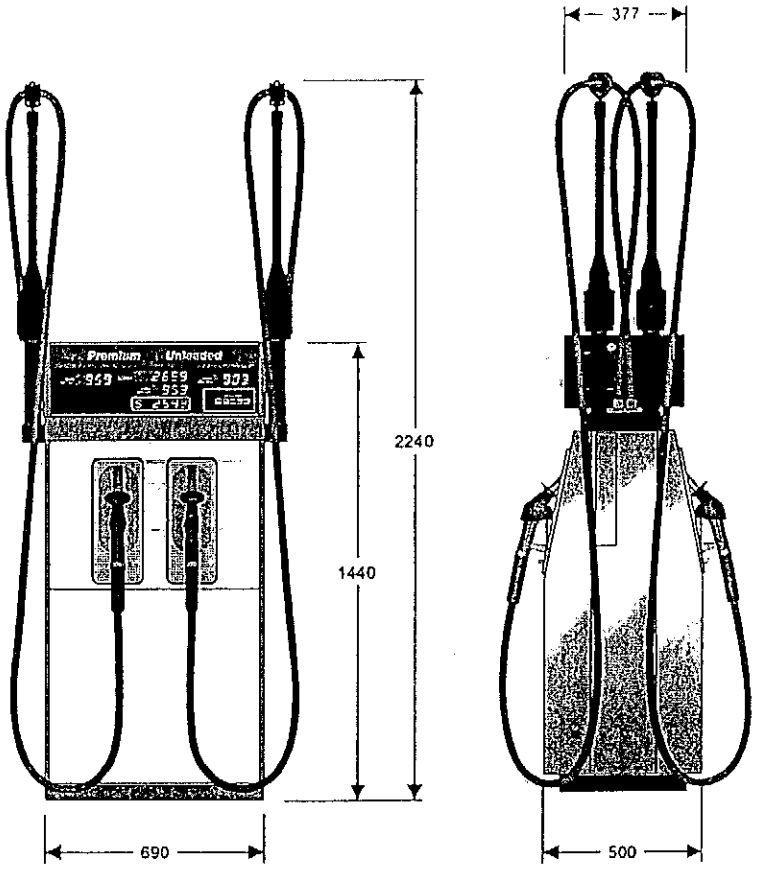
ONE HOSE ISPLAND ORIENTED – WITH FLEXMAST



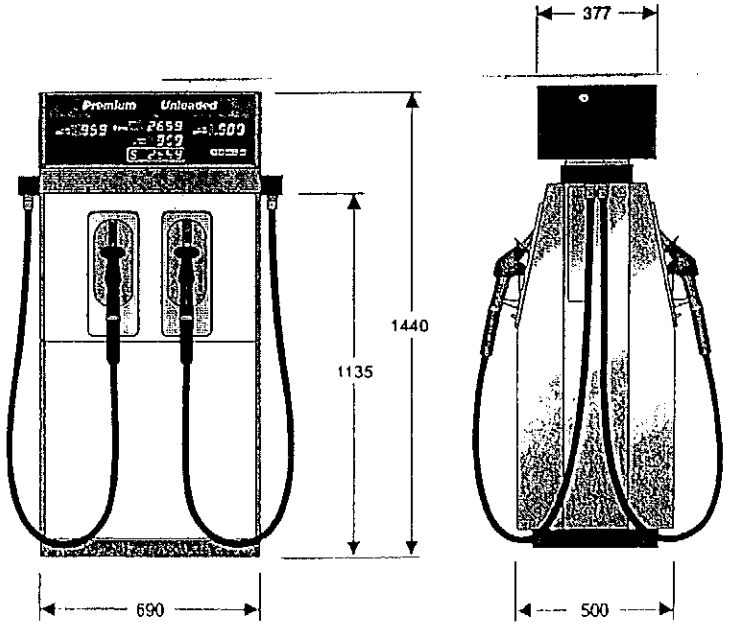
ONE HOSE ISLAND ORIENTED – WITHOUT FLEXMAST



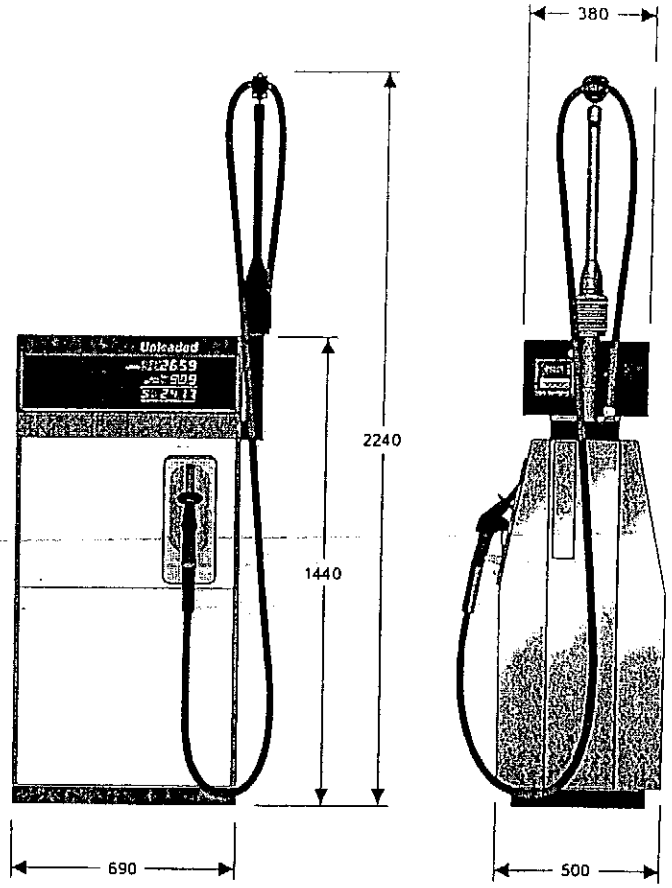
FOUR HOSE LANE ORIENTED – WITH FLEXMAST



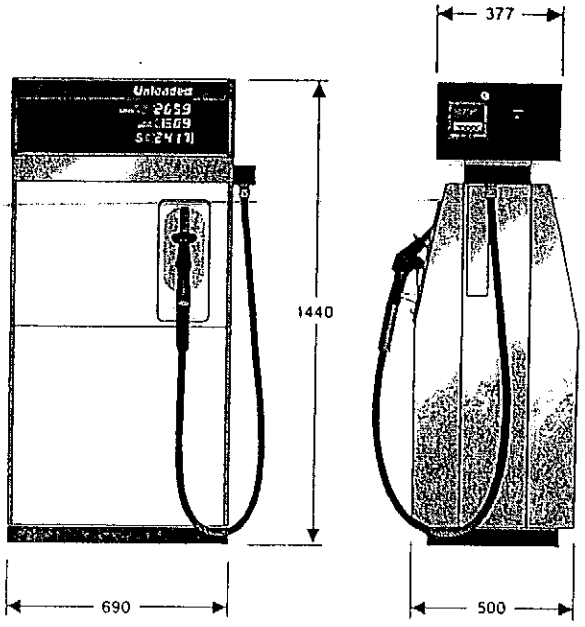
FORR HOSE LANE ORIENTED – WITHOUT FLEXMAST



ONE HOSE LANE ORIENTED – WITH FLEXMAST



ONE HOSE LANE ORIENTED – WITHOUT FLEXMAST



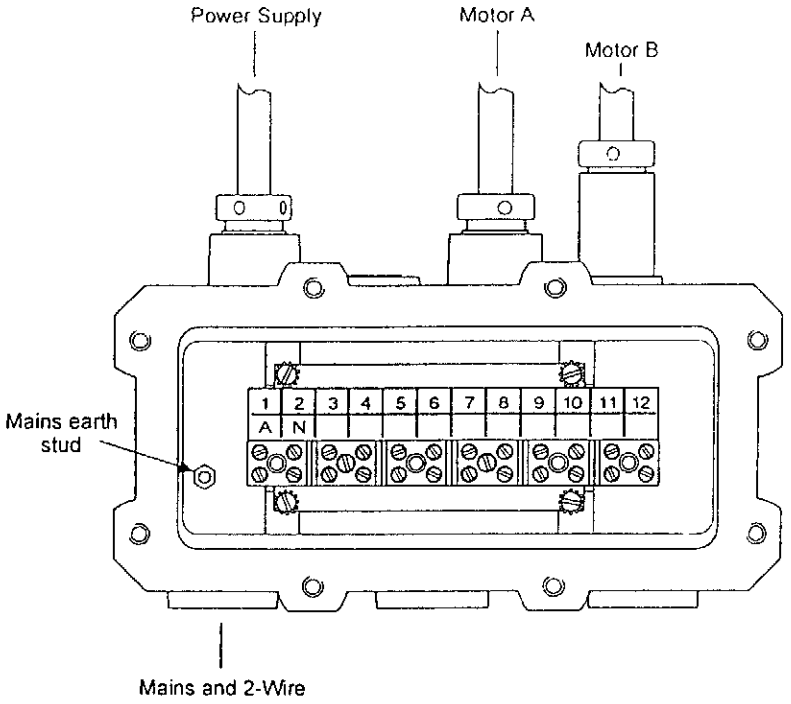


Figure 8-12 – Mains J-Box for Electroline MK4 Pumps

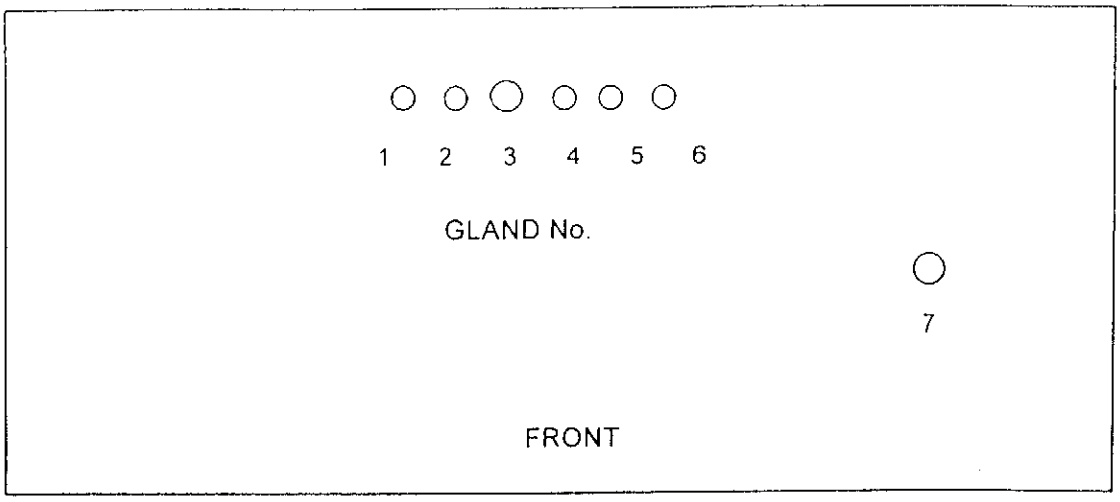
See following table for connection details.

Terminal	1	2	3	4	5	6	7	8	9	10	11	12	EARTH STUD
Des'tion	Active	Neutral	Filtered Neutral	Mot. A /STP A	Mot. A Neutral	Mot. B /STP B	Mot. B Neutral				Loop +	Loop –	Earth
Power Supply Cable	RED	BLACK	BLUE	VIOLET		ORG		BRN			WHT	GR'Y	GRN/YL
Neutral link		BLACK			BLACK		BLACK						
2 Hose 2 Product Pump				Mot. A 1 & 2	Mot. A 3 & 4	Mot. B 1 & 2	Mot. B 3 & 4						Motor A & B earth
1 Hose 1 Product Pump				Mot. A 1 & 2	Mot. A 3 & 4								Motor A earth
4 Hose 2 Product Pump				Mot. A 1 & 2	Mot. A 3 & 4	Mot. B 1 & 2	Mot. B 3 & 4						Motor A & B earth
2 Hose 1 Product Pump				Mot. A 1 & 2	Mot. A 3 & 4								Motor A earth
1 Product UHF Pump				Mot. A 1 & 2	Mot. A 3 & 4	Mot. B 1 & 2	Mot. B 3 & 4						Motor A & B earth
FIELD WIRING :													
Mains INPUT	X	X											X
Comms INPUT											X	X	
DISP. WIRING :													
2 Hose 2 Prod Dispenser INPUT			X	X		X							
1 Hose 1 Prod Dispenser INPUT			X	X									
4 Hose 2 Prod Dispenser INPUT			X	X		X							
2 Hose 1 Prod Dispenser INPUT			X	X									
1 Prod UHF Dispenser INPUT			X	X									

MOTOR AND VALVE PCB WIRING CONNECTIONS

Term'l	PT1	PT2	PT3	PT4	PT5	PT6	PT7	PT8	PT9	PT10	PT11	PT12	PT13	PT14	PT15	PT16
	F/A Nor.	N	F/A Slo	Earth	R/A Nor	N	R/A Slo	Earth	F/B Nor	N	F/B Slo	Earth	R/B Nor	N	R/B Slo	Earth
2 Hose 2 Prod.	F/ A Brn	F/ A Blue	F/ A Wht	F/ A Gn/Yl	—	—	—	—	—	—	—	—	R/ B Brn	R/ B Blue	R/ B Wht	R/ B Gn/Yl
1 Hose 1 Prod.	F/ A Brn	F/ A Blue	F/ A Wht	F/ A Gn/Yl	—	—	—	—	—	—	—	—	—	—	—	—
4 Hose 2 Prod.	F/ A Brn	F/ A Blue	F/ A Wht	F/ A Gn/Yl	R/ A Brn	R/ A Blue	R/ A Wht	R/ A Gn/Yl	F/ B Brn	F/ B Blue	F/ B Wht	F/ B Gn/Yl	R/ B Brn	R/ B Blue	R/ B Wht	R/ B Gn/Yl
2 Hose 1 Prod.	F/ A Brn	F/ A Blue	F/ A Wht	F/ A Gn/Yl	R/ A Brn	R/ A Blue	R/ A Wht	R/ A Gn/Yl	—	—	—	—	—	—	—	—
1 Prod. UHF	F/ A Brn	F/ A Blue	F/ A Wht	F/ A Gn/Yl	—	—	—	—	—	—	—	—	R/ B Brn	R/ B Blue	R/ B Wht	R/ B Gn/Yl

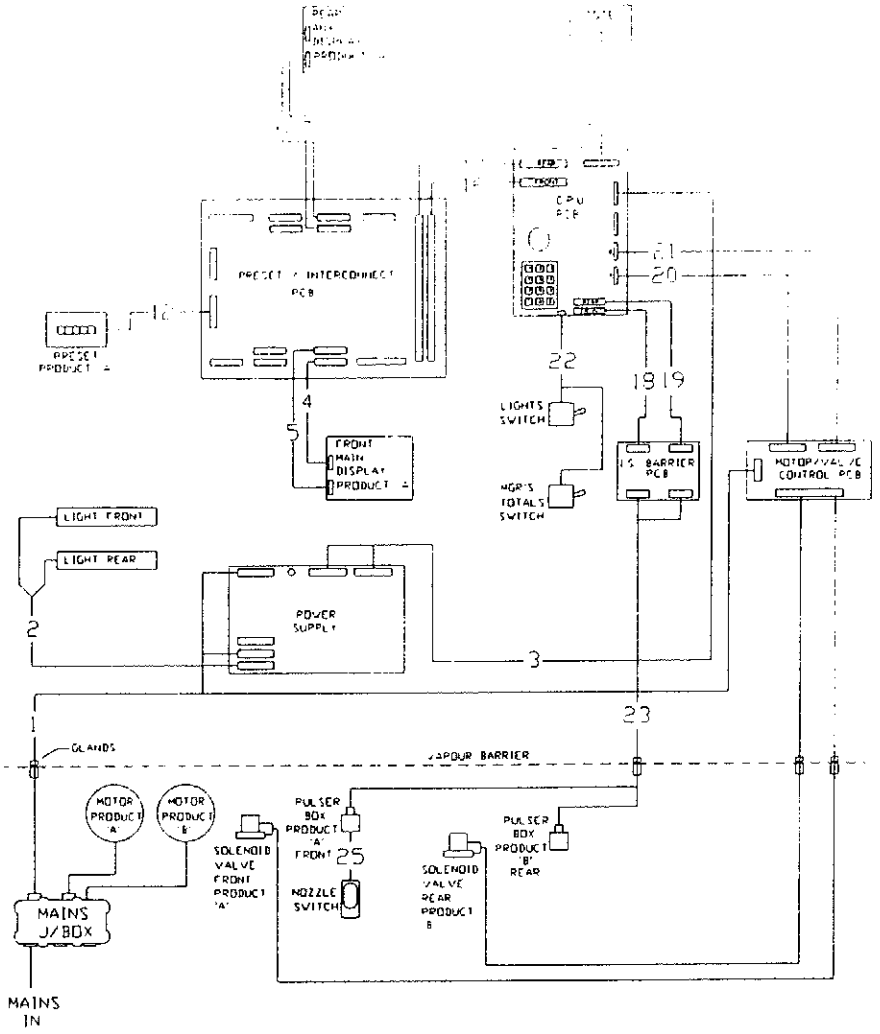
VAPOUR BARRIER CABLE AND GLAND POSITIONS



CDM / TOP OF FRAME

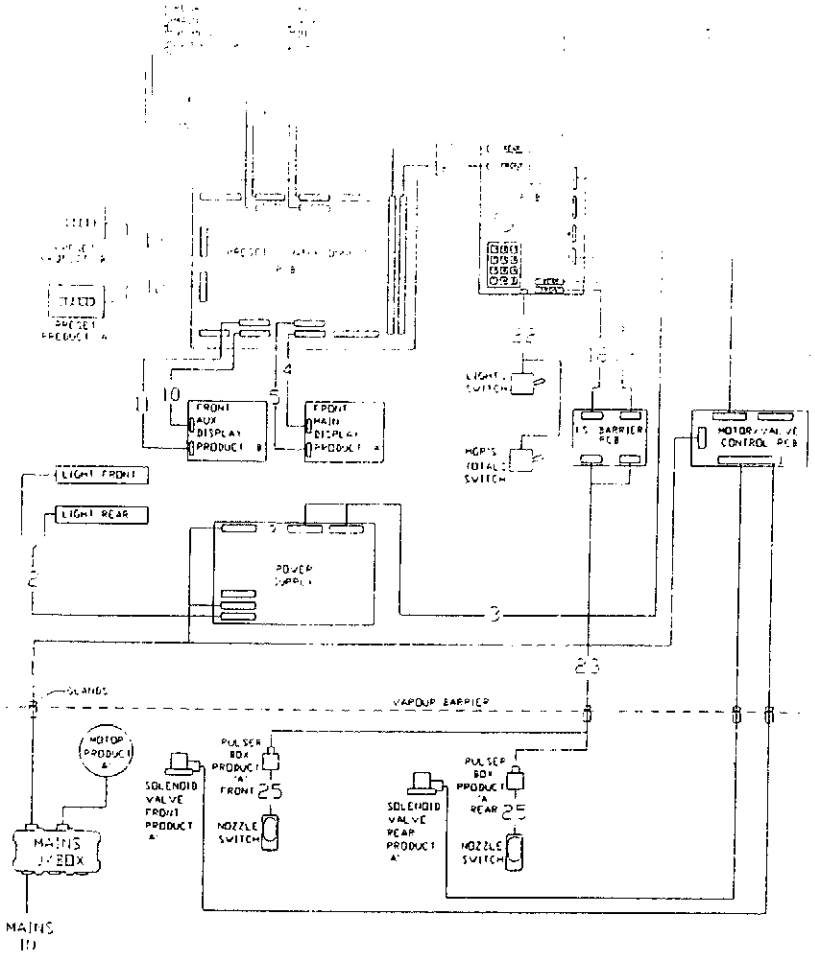
Gland #	1 20mm	2 20mm	3 25mm	4 20mm	5 20mm	6 20mm	7 25mm
2 Hose 2 Prod.	Pulser DN09208-001	Plug DQ38041-001	Plug DQ38041-002	R/B Valve	F/A Valve	Plug DQ38041-001	Mains DR09250-001
1 Hose 1 Prod.	Pulser DN09208-002	Plug DQ38041-001	Plug DQ38041-002	F/A Valve	Plug DQ38041-001	Plug DQ38041-001	Mains DR09250-001
4 Hose 2 Prod.	F/ Pulser DN09208-003	R/ Pulser DN09208-004	R/B Valve	F/B Valve	R/A Valve	F/A Valve	Mains DR09250-001
2 Hose 1 Prod.	Pulser DN09208-005	Plug DQ38041-001	Plug DQ38041-002	R/A Valve	F/A Valve	Plug DQ38041-001	Mains DR09250-001

ONE PRODUCT ULTRA HIGH FLOW PUMP



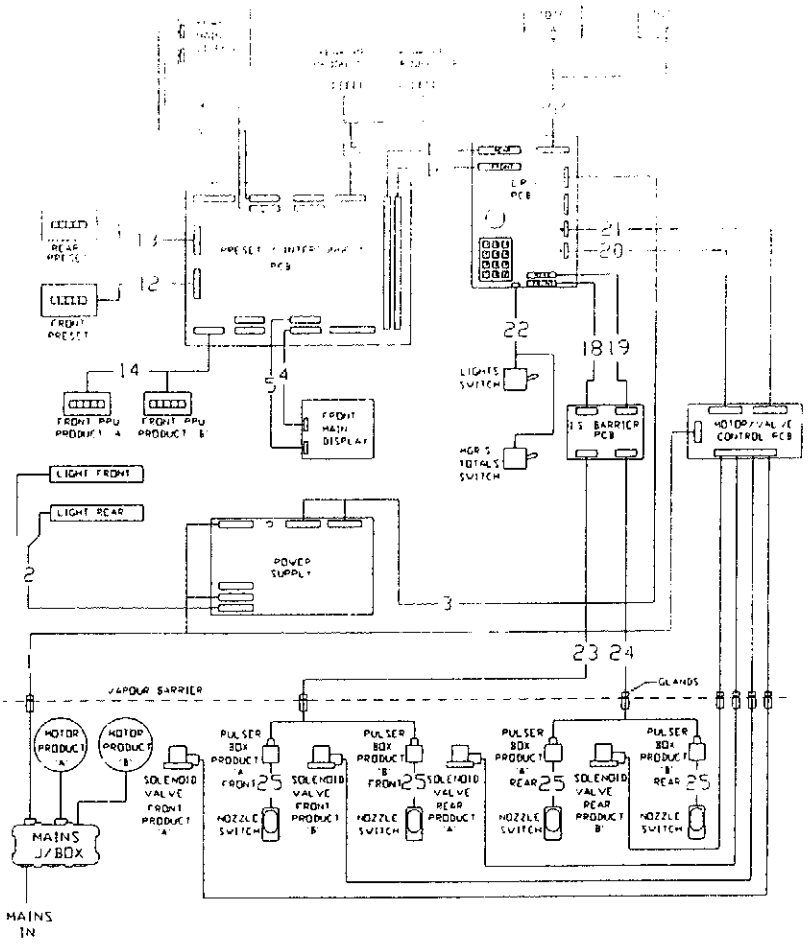
Ref.	Part Number	CABLE DESCRIPTION
1	DR09250-001	Mains Junction box to CDM
2	DR07257	Lights
3	DN09203	Power Supply to Processor PCB
4	DN09234-001	Main Display Front, Product "A" Segments select
5	DN09234-002	Main Display Front, Product "A" Digits select
6	DN09234-003	Aux. Display Rear, Product "A" Segments select
7	DN09234-004	Aux. Display Rear, Product "A" Digits select
8 - 11	-	Not used on this model
12	DN09242-001	Front Preset keypad
13 - 15	-	Not used on this model
16	DN09242-015	Front Processor PCB to Display Interconnect PCB
17	-	Not used on this model
18	DN09242-007	Front Pulser
19	DN09242-008	Rear Pulser
20	DN09242-009	Product "A". Processor to Motor/Valve Control PCB
21	DN09242-010	Product "B". Processor to Motor/Valve Control PCB
22	DR07959-003	Tote and Light Switch
23	DR09208-001	Pulser Boxes to IS Barrier (Product "A" & "B" Boxes)
24	-	Not used on this model
25	?	Nozzle Switch

TWO HOSE ONE PRODUCT (SHARED) PUMP



Ref.	Part Number	CABLE DESCRIPTION
1	DR09250-001	Mains Junction box to CDM
2	DR07257	Lights
3	DN09203	Power Supply to Processor PCB
4	DN09234-001	Main Display Front, Product "A" Segments select
5	DN09234-002	Main Display Front, Product "A" Digits select
6	DN09234-003	Aux. Display Rear, Product "A" Segments select
7	DN09234-004	Aux. Display Rear, Product "A" Digits select
8	DN09234-001	Main Display Rear, Product "B" Segments select
9	DN09234-002	Main Display Rear, Product "B" Digits select
10	DN09234-005	Aux. Display Front, Product "B" Segments select
11	DN09234-006	Aux. Display Front, Product "B" Digits select
12	DN09242-001	Front Preset keypad
13	DN09242-002	Rear Preset keypad
14 - 15	-	Not used on this model
16	DN09242-015	Front Processor PCB to Display Interconnect PCB
17	-	Not used on this model
18	DN09242-007	Front Pulser
19	-	Not used on this model
20	DN09242-009	Product "A". Processor to Motor/Valve Control PCB
21	DN09242-010	Product "B". Processor to Motor/Valve Control PCB
22	DR07959-006	Tote and Light Switch
23	DR09208-005	Pulser Boxes to IS Barrier (Product "A" & "B" Boxes)
24	-	Not used on this model
25	?	Nozzle Switch

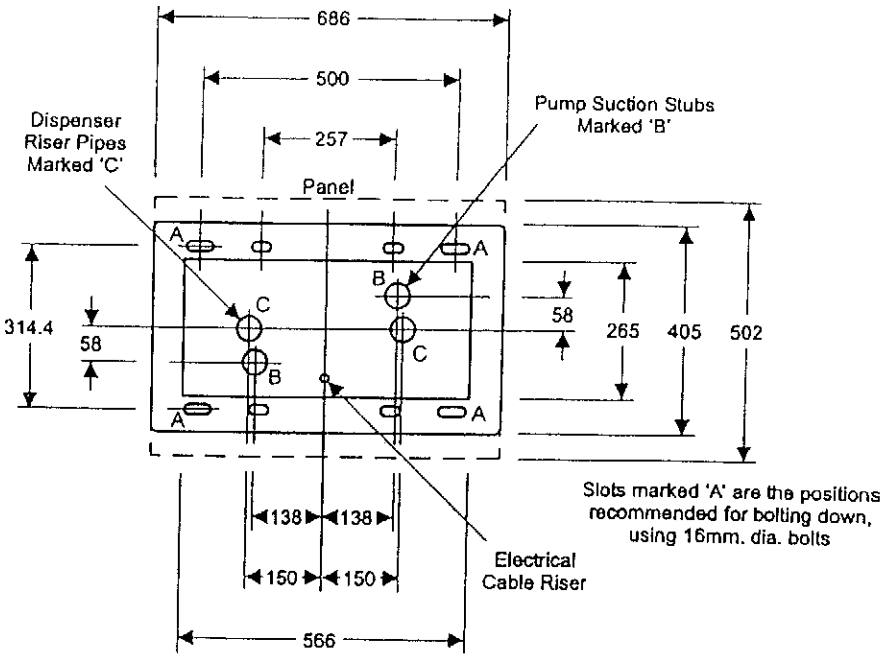
FOUR HOSE TWO PRODUCT (MULTI) PUMP



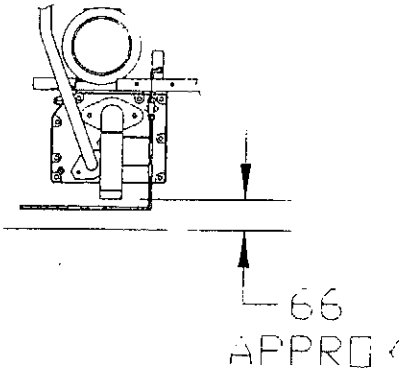
Ref.	Part Number	CABLE DESCRIPTION
1	DR09250-001	Mains Junction box to CDM
2	DR07257	Lights
3	DN09203	Power Supply to Processor PCB
4	DN09234-011	Main Display Front, "Centre" Segments select
5	DN09234-012	Main Display Front, "Centre" Digits select
6 -7	-	Not used on this model
8	DN09234-013	Main Display Rear "Centre" Segments select
9	DN09234-014	Main Display Rear, "Centre" Digits select
10 - 11	-	Not used on this model
12	DN09242-001	Front Preset keypad
13	DN09242-002	Rear Preset keypad
14	DN09242-017	Front PPU
15	DN09242-018	Rear PPU
16	DN09242-015	Front Processor PCB to Display Interconnect PCB
17	DN09242-016	Rear Processor PCB to Display Interconnect PCB
18	DN09242-007	Front Pulser
19	DN09242-008	Rear Pulser
20	DN09242-009	Product "A". Processor to Motor/Valve Control PCB
21	DN09242-010	Product "B". Processor to Motor/Valve Control PCB
22	DR07959-004	Tote and Light Switch
23	DR09298-003	Front Pulser Box to IS Barrier
24	DR09298-004	Rear Pulser Box to IS Barrier
25	?	Nozzle Switch

HYDRAULIC CONNECTION DIAGRAMS

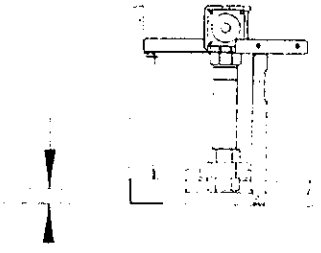
BOLT DOWN AND INLET PIPE FOOTPRINT – PUMPS AND DISPENSERS



INLET PIPE ARRANGEMENT – PUMPS

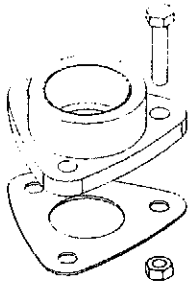


INLET PIPE ARRANGEMENT – DISPENSERS



OPTIONAL INLET FLANGE ADAPTOR KIT

Kit Order No. DN07630 – 141



Kit Parts

FLANGE, 1 off: 106-T-TF38

SCREW, M8x35, 3 off: DQ23102-583

NUT, M8, 3 off: DQ38050-017

INDEX

This page intentionally blank