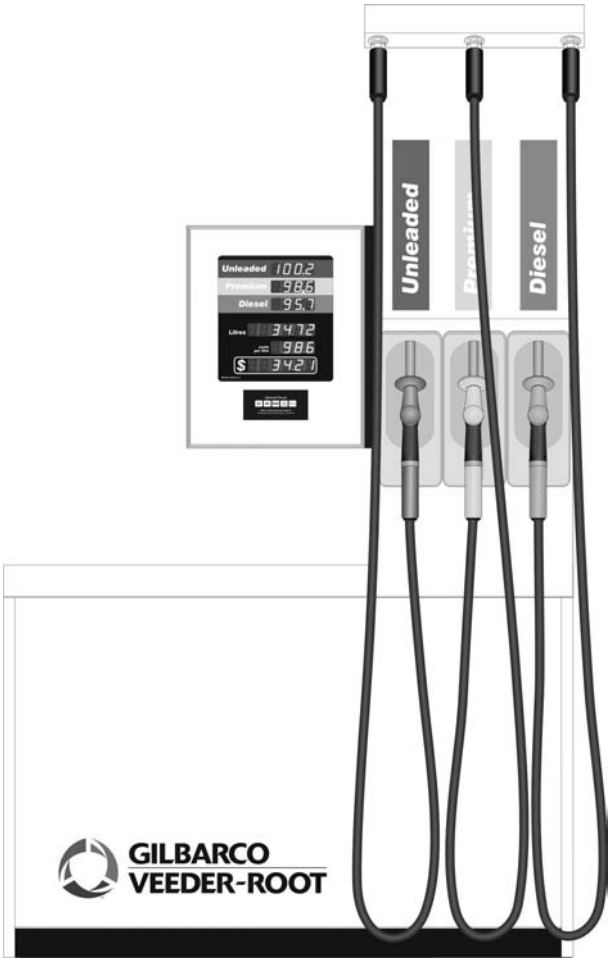
GILBARCO AUSTRALIA LIMITED

LOWLINE MK3 PUMPS & DISPENSERS

SERVICE MANUAL

DQ98001-114

Issue A



Gilbarco Australia Limited.

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

Related Documentation –

Users Manual DQ98001-112

Installers Manual DQ98001-113

Parts Manual DQ98001-115

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Release Information

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SECTION 1 INTRODUCTION

SCOPE OF MANUAL

This manual covers the **T910** series Lowline Mk3 Pumps and Dispensers. The following lists configuration variations that may be fitted. Some are model specific and will be designated as such.

- **Number of Hoses**

  2 hose

  4 hose

  6 hose

- **Preset**

  All models fitted with Preset.

- **Hose Flow Rates**

Gasoline	50 litres per minute
Diesel	50 litres per minute
Diesel	80 litres per minute

- **Orientation**

  Lane orientated column mounted hoses.

- **Panels**

  All outer panels are removable cladding and are powder coated painted mild steel.

- **Biodiesel**

  Biodiesel and Biodiesel Blended fuels, to Australian Government standard, may be used. However they require special outlet hoses. See local Gilbarco Branch office.

- **Ethanol**

  Ethanol blended fuels, to 10%, may be used.

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SECTION 2 INSTALLATION PROCEDURES

SITE REQUIREMENTS

The equipment is designed with the same “bolt-down” and hydraulic “Foot print” as Mk2 Lowline Pumps and Dispensers. They may be installed on any existing or new site, provided the site complies with the following guidelines.

1. The location, and electrical installation, of the equipment must conform with all relevant Government Authority regulations.

2. POS, Consoles, Controllers and Interconnect Boxes must be located inside the service station building. The POS/Console must be located in a position which allows the operator an unobstructed view of all pumps.

3. ***Do not*** install any equipment above hot water pipes or in close proximity to any form of heating or cooling.

4. Sufficient clearance must be provided around all equipment to provide easy access for service.

5. Connections to all equipment must be made through the entry points provided. A means of identification should be provided for all wiring entering the equipment. The equipment must not contain any wiring not associated with it.

6. All mounting dimensions are shown in Section 2 of this manual.

EMERGENCY POWER CUT-OFF / STOP BUTTON

If a site requires an Emergency Stop Button, Gilbarco (the Manufacturer) recommends the wiring diagram shown below. Note, the switch used must conform to the relevant Government Authority regulations.

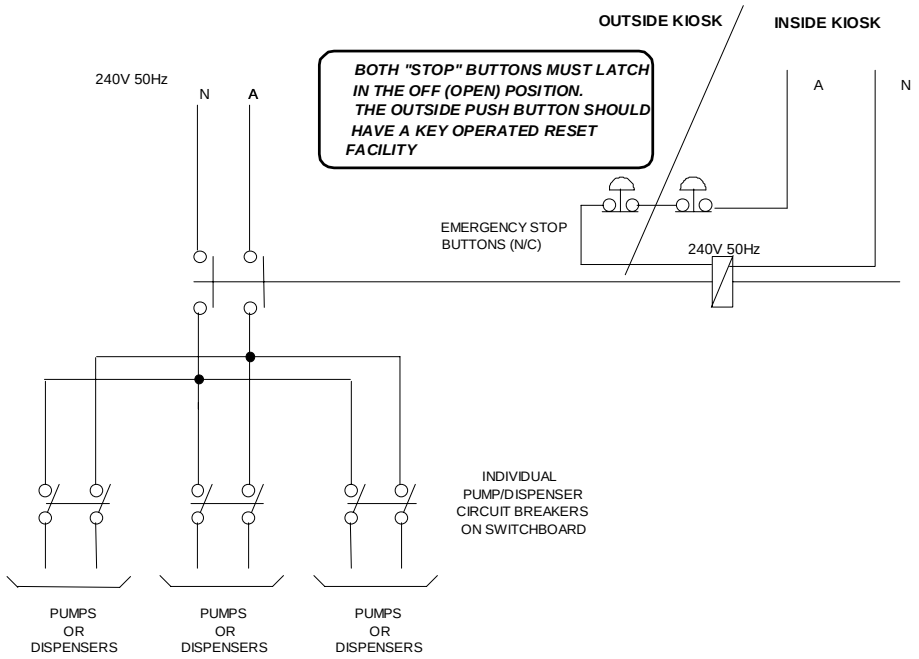


Figure 1 – Emergency Power Cut-off circuit

NOTE: Current ratings of circuit breaker contacts must be appropriate for the pump load.

WIRING & CONDUIT DATA

CABLE AND WIRING DATA

The cables used when installing the equipment should allow for future upgrading to any configuration of Gilbarco fuelling equipment, i.e., the installation of CRIP at some future time. This cable should be 6-core + Earth (7-core) for pumps, and 9-core + Earth (10-core) cables for dispensers.

1. All cables must conform to “Underground Wiring” and “Earthing Conductors” regulations as outlined in AS3000.

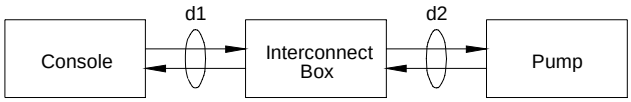
2. All electrical mains cables used in pump/dispenser installation must not be less than 1.5mm^2 in cross section, and must comply with AS3000 rules regarding voltage-drop.

3. Mains conductors must not run further than 400 metres in the same multi-core cable with the 2-wire loop. If the run is to be greater than 400 metres, the two cables must be run in separate conduits.

4. When using separate 2-core 2-wire loop cables, the total length of the 2-wire loop cable run should not exceed 500 metres (500m x 2-core = 1000m).

   NOTE: This distance refers to cable length and not physical separation.

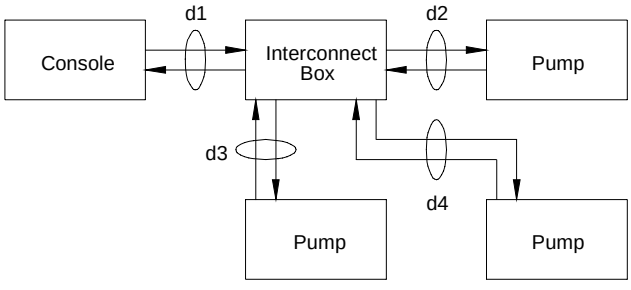
   a) In a single pump or dispenser system, the total cable length allowed is 1000m as shown in the following diagram.



d1 + d2 = 1000m (MAX)

   b) However, in a multiple pump/dispenser system, the maximum distance to each pump/dispenser will be proportionately less so that the total cable length does not exceed 1000m.

   If the location of the equipment is such that the sum of the distances is greater than 1000m, it may be possible to design the location of the Interconnect Box so that the distance is minimised. This may be achieved by locating the Interconnect Box closer to the pumps/dispensers rather than to the Console.



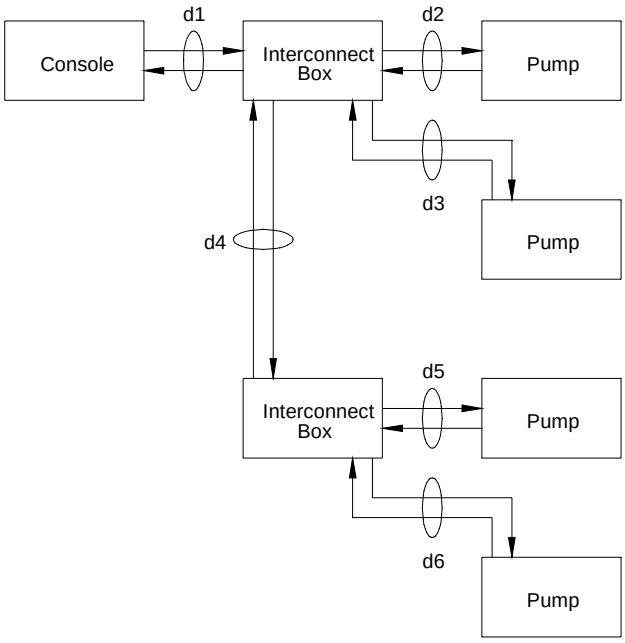
d1 + d2 + d3 + d4 = 1000m (MAX)

   c) In a situation where the pumps/dispensers are in two groups separated by a large distance, a second Interconnect Box can

be installed nearer the group of pumps/dispensers most remote from the Console.

NOTE: The Interconnect Box must be installed in a suitable location, i.e., out of the weather, out of the "hazardous zone", and out of reach of the general public.

NO MORE THAN TWO (2) INTERCONNECT BOXES CAN BE USED ON EACH LOOP.



d1 + d2 + d3 + d4 + d5 + d6 = 1000m (MAX)

5. Normally, only one conduit is required to each pump/dispenser. The conduit needs to be large enough to accommodate the size of cable being used.

   It is permissible to run the 2-wire loop in the same conduit as the mains power for pumps/dispensers using a multi-core cable, however, problems can arise if long 2-wire loop runs are installed in the same conduit with the mains cables, especially when using multi-core cables. Electrical interference can build up with long cables and disrupt the pump/dispenser communications.

PLANNING THE INSTALLATION OF PUMP/DISPENSER WIRING

1. The maximum distance allowed for a multi-core cable containing both power and loop wires is 150 metres for any one pump/dispenser on the system.

   On sites where the Console and mains switchboard are located in one area, while some or all of the pumps/dispensers are located a reasonable distance (more than 75 metres) away, care must be taken when planning the installation to minimise the distance where mains power runs with the loop.

2. Techniques to minimise this condition include:

   a) Running separate power and loop cables in the same conduit creates less of an interference problem. In this instance, the maximum distance allowed is 400 metres for any one pump/dispenser on the system. Using a shielded cable for the loop is better still.

      NOTE: The size of the cable cores for separate loop wiring should be 0·75mm^2 minimum. A “Figure 8” cable, or shielded-pair cable, is suitable.

   b) It is good installation practice to share the power load of the sites pumps and dispensers evenly across the 3 phases. This also applies to the length of loop wiring running in the same cable/conduit. Try to equalise the total distance that the loop runs, with each phase for the site.

      For example; if there are 5 pumps/dispensers on site, with two located at 50m, 2 located at 100m, and 1 located at 150m, a good installation would have:

      Phase A – 1x50m + 1x100m = 150m
      Phase B – 1x50m + 1x100m = 150m
      Phase C – 1x150m

   c) Running a separate conduit containing only the loop wires for the remote pumps/dispensers. Several loop pairs could be run in the same conduit, however, there would need to be an appropriate termination point in the vicinity of the remote pumps/dispensers.

      NOTE: The 1000 metre limit must still be adhered to.

   d) Installing a mains sub-board in the vicinity of the remote pumps/dispensers.

   e) Installing a remote Interconnect Box as described above.

   f) Any combination of the above.

Refer to the Technical Services Helpdesk if you require advice about a specific site. Please forward a drawing of the site layout first.

CONDUIT DATA

Only one conduit is required to each pump and dispenser. The conduit needs to be large enough to accommodate the size of cable being used.

PIPELINE, BOLT DOWN AND FOOTPRINT DATA

1. All pipeline work, above and below ground, must be in accordance with all relevant Government Authority regulations and codes.
2. The mounting base footprint, fuel and electrical connection entry points are shown in Figure 2.2 below.

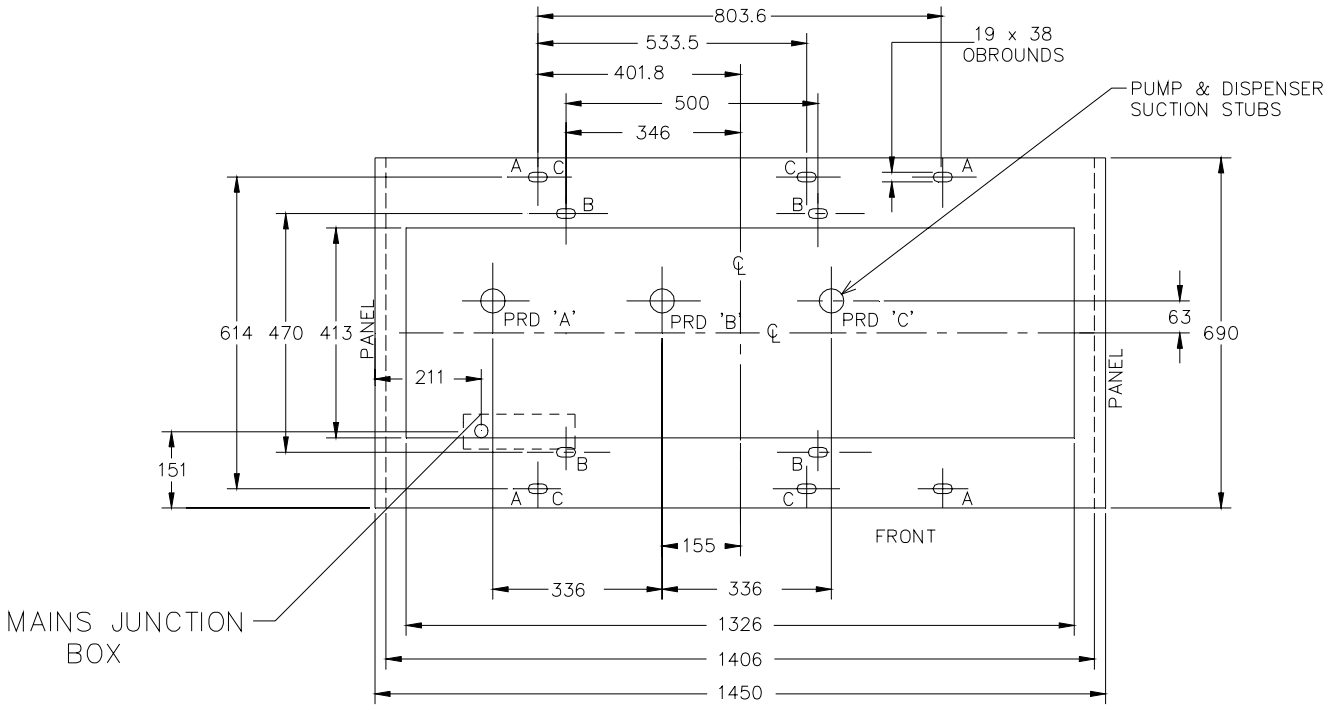


Figure 2 – Mounting footprint for Lowline MK3 Pumps and Dispensers

3. Recommended *minimum* hold down bolts are 16mm diameter in all positions marked “A” in the figure above – 4 bolts.

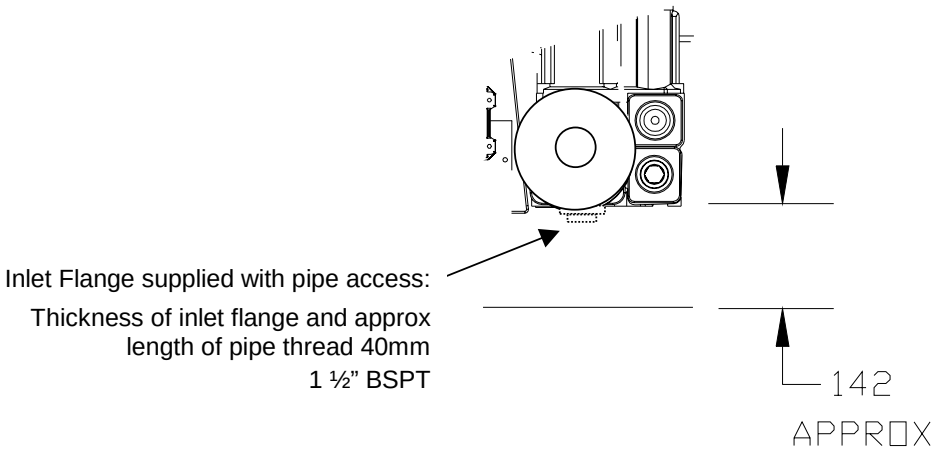


Figure 3 – Hydraulic coupling - Pumps

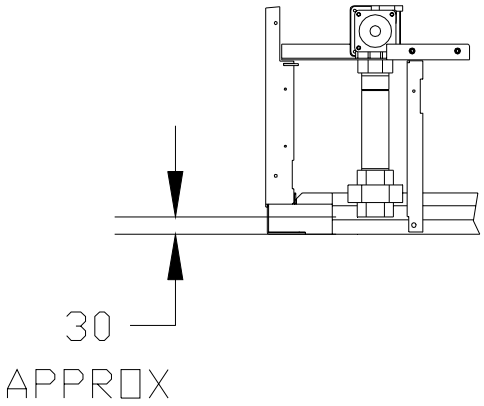


Figure 4 – Hydraulic coupling – Dispensers

4. If the bottom of the tank is greater than 3m below the centre of the pump unit (205mm above baseline), and the total length of the pipe run is greater than 20m, check the site installation against Gilbarco document DT00102-035 ("*Stability of Service Station Suction Pumping Systems*") .
5. Recommended *minimum* diameter of pipework is 50mm, with a 1 in 40 (1:40) rise from the tank to the inlet of the pump.
6. Pumps are supplied complete with integrated Check Valves/Strainers.

OPTIONAL FITTINGS

The pump modules are supplied with an attached inlet flange as standard. The flange provides approximately 20 mm of 1 ½" BSPT to facilitate attachment of a drop pipe.

If the inlet flange is removed the pump body base provides 3 X M10 threaded holes on a triangular flat surface with 78mm PCD (Pitch Centre Diameter).

WARNING: Pumps manufactured by Gilbarco should never be used to remove water or other non-fuel liquids from underground tanks.

PREPARATION FOR INSTALLATION

A thorough inspection of the equipment and site must be made prior to the installation of the equipment. This is to ensure that all materials for correct installation have accompanied the equipment, and that the site complies with all site requirements as previously outlined.

EQUIPMENT INSPECTION

When the pumps arrive on site, each pump should be closely examined for damage. If damage is evident, the damage must be immediately reported to the carrier for insurance purposes.

After the inspection is complete, if there are no equipment or component returns continue with 'Lifting the Pump'.

EQUIPMENT AND COMPONENT RETURNS

Equipment or components returned under warranty, or for repair, can be damaged in transit if not packaged correctly. If possible, return the goods in their original cartons.

If the original cartons are no longer available, or badly damaged, use a durable, reinforced corrugated box and suitable packing material such as polyurethane or polystyrene foam beads.

1. Fill the bottom of the box with approximately 50mm of packing.
2. Carefully wrap the goods and place them centrally in the box.
3. Fill the remainder of the box with packing material, then seal the box.

NOTE: Pump electronic PCBs must be enclosed in the special package used for the replacement PCB.

LIFTING THE PUMP

The recommended method of lifting the pumps into position from the back of delivery vehicles is as follows.

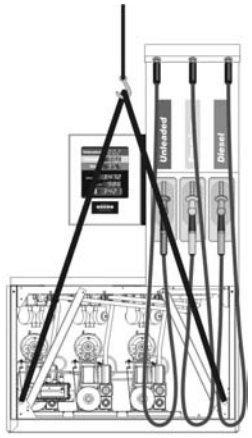


Figure 5 - Lifting Arrangement

1. The lifting hook must be located above the centre of the pump.
2. Attach two *long* lifting straps with 19mm. Dee Shackles – Grade M (4 required) to the pump frame front and rear where indicated at left. Connect each strap to the lifting hook at the centre of each strap.
3. Carefully lift the pump up off the tray of the truck before swinging the pump out.

   WARNING: Use extreme caution when lifting the pump. Ensure the lifting straps are positioned so that they cannot slip.
4. Lower the pump and place beside the final mounting position.

Note: Pumps are NOT to be lifted with straps positioned under the CDM and top of the frame.

INSTALLATION MATERIALS

The cables, conduits, pipework, underground valves and all other installation materials are not included in the cost of the equipment sale.

The materials required for the installation will depend on the particular equipment configuration and site layout. All such materials are the responsibility of the installer.

ELECTRICAL INSTALLATION

> ***CAUTION***
> Do not apply mains power to any equipment before carrying out all field wiring tests as specified later in this manual.

Read the following instructions carefully before starting. This will ensure correct installation with regard to economy, efficiency, and correct equipment operation.

NOTE: The installation must comply with the requirements of national and local electrical codes and regulations.

The following procedure will cover most situations the installer may encounter.

1. All conduits and wiring must comply with all relevant Government Authority regulations.
2. All cables in underground conduits must be sealed in accordance with all relevant Government Authority regulations.
3. Threaded connections of all conduits and fittings must be tight and secure.
4. Avoid damage to cable insulation when pulling cables through conduits.
5. When terminating cables, ensure all terminations are safe and secure.
6. Wiring and cable connection diagrams are provided at the rear of this manual. It may be necessary to refer to more than one diagram to cover all aspects of the installation.

NOTE: The installation diagrams are to be used as a guide only.

PRE-OPERATIONAL CHECKS

SITE WIRING TESTS

Electrical wiring tests must be carried out in accordance with all relevant Government Authority regulations and codes. If in any doubt, contact your local Gilbarco office.

> ***CAUTION***
> Do not use a Megger to check wiring if connected to the Pump's internal wiring.

EQUIPMENT CONNECTION

When the above procedures have been completed, make the necessary electrical connections shown in the wiring diagrams at the rear of this manual. It may be necessary to refer to more than one diagram to cover all aspects of the installation. Every installation is special and so cannot be covered in detail in this manual.

SECTION 3 COMMISSIONING PROCEDURES

The information provided in this section relates to the procedures necessary for commissioning the Mk3 pumps and dispensers.

The information is intended for Gilbarco trained service personnel, and those involved in the planning and installation of the equipment.

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

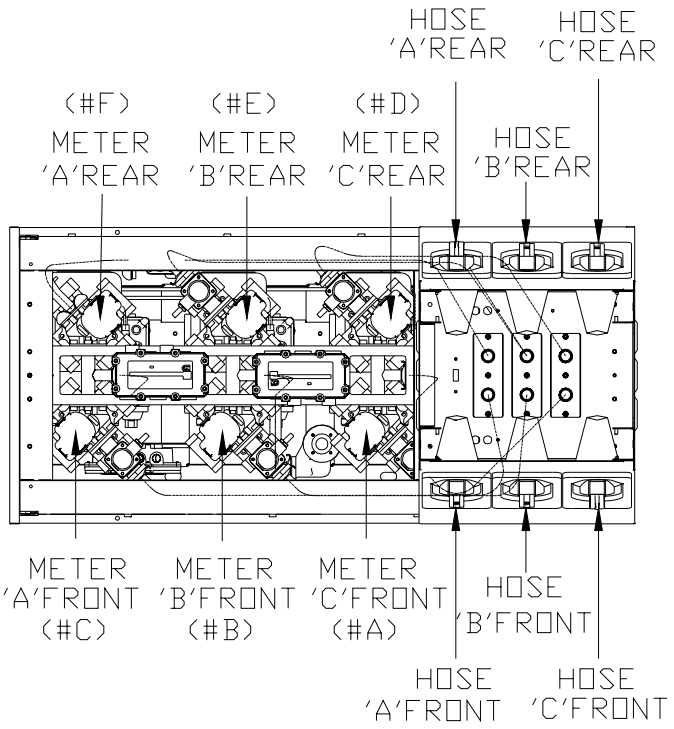
HARDWARE CONFIGURATION – LINK SETTINGS

There are 4 links on the Processor PCB, adjacent to the Keypad as shown in Figure 6. The correctly installed position of each link is shown in the following table.

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

Figure 6 - Link Default Positions, Processor PCB

HOSE TO METER ASSIGNMENTS



Plan View of 6 Hose – Hose to meter assignment

Meter and Hose Product	Pump/Dispenser Model			
	2 Hose Normal Flow	4 Hose Mixed Flow	4 Hose Normal Flow	6 Hose Normal Flow
Meter 'A' - Front	Fitted	Fitted	Fitted	Fitted
Meter 'A' - Rear'	Fitted	Fitted	Fitted	Fitted
Meter 'B' - Front	-	-	-	Fitted
Meter 'B' - Rear'	-	Fitted	-	Fitted
Meter 'C' - Front	-	Fitted	Fitted	Fitted
Meter 'C' - Rear'	-	-	Fitted	Fitted
Hose Product 'A' - Front	Fitted	Fitted	Fitted	Fitted
Hose Product 'A' - Rear	Fitted	Fitted	Fitted	Fitted
Hose Product 'B' - Front	-	-	-	Fitted
Hose Product 'B' - Rear	-	-	-	Fitted
Hose Product 'C' - Front	-	Fitted	Fitted	Fitted
Hose Product 'C' - Rear	-	Fitted [#]	Fitted	Fitted

[#] Hose nozzle switch is internally assigned to control rear “B” meter.

Note: Meters are assigned individual W&M Serial Numbers as follows -

"Dispenser Serial Number – W&M meter position"
i.e. Rear "B" meter serial number is "XXXXXXXXX - E"

Figure 7 – Meter to Hose Assignment Map – Lowline MK3 Pumps and Dispensers

PERSONALISATION

After the equipment has been installed, it is necessary for each side of the pump to be assigned a Fuelling Position number and other variable parameters and Price Per Unit data for fuel grades.

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 front door of the CDM to gain access to the Manager Function panel of the pump.
4. Set the Manager Function switch to the TOTALS position. Refer to Figure 8.

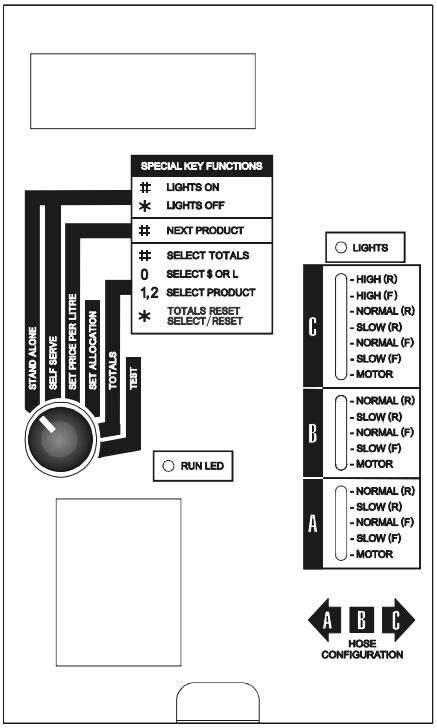
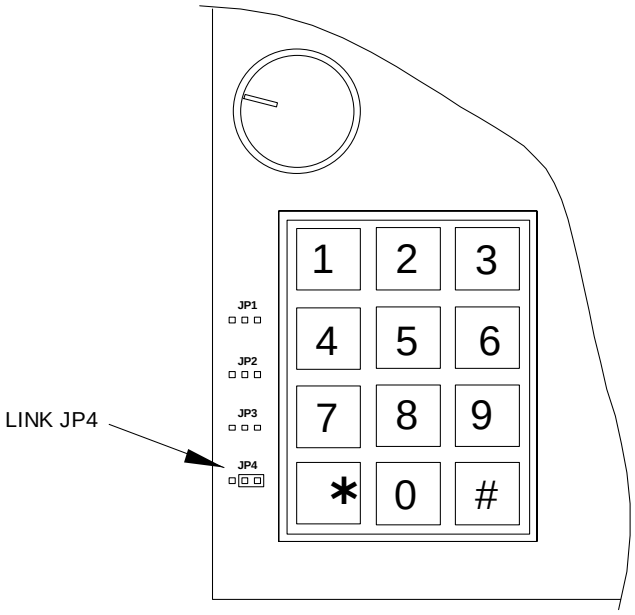


Figure 8 – Manager Function Panel

5. Remove the Processor PCB cover by gently pulling at the bottom tab.
6. Remove, then replace, link **JP4** on the Processor PCB. Refer to Figure 9.



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

Figure 9 – Link positions on Processor PCB

FUELLING POSITION 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 10.

Figure 10 – Fuelling Position Numbers – Displayed on the 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.

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.

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

   Note:

   All fuelling positions connected to the same communications system must be assigned a unique number.

   If a pumping position is required to be set to NOT respond to Console communications, then the Fuelling Position number must be set to 00.

GRADE NUMBERS

Grade numbers are used to configure the pump's products and hoses, to set their positions to correspond with the grade data PPU etc, assigned at the POS.

GRADE NUMBER entry is selected after the Pump Fuelling Position 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 next grade may be selected by pushing the "*" key.

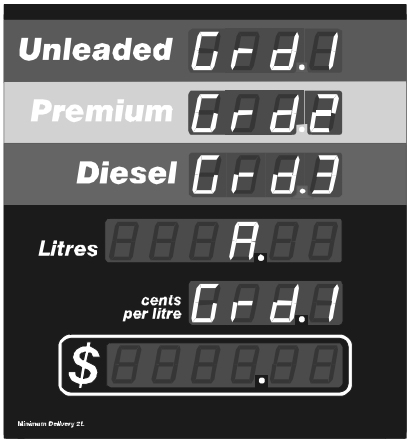


Figure 11 – Main and PPU Display digits with Grade Data

Of the grades available at the pump, the one which is assigned the highest order of grades at the POS must be programmed with Grade number 1, the next highest with Grade number 2 and the third with Grade number 3. (They may or may not be in the sequence as shown in the example in Figure 11).

SETTING PUMP TYPE

The full range of models available in the Lowline Mk3 series includes different model types that require program configuration of the “TYPE” variable. 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, the front display will indicate as follows with the current setting flashing if Type setting is an option:

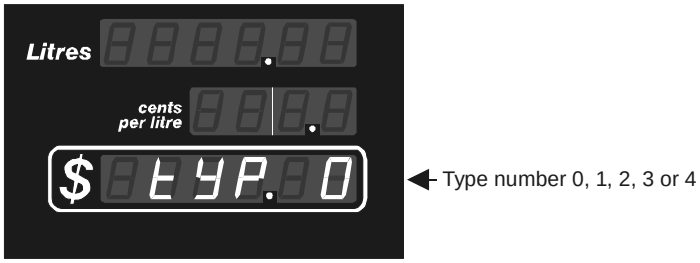


Figure 12 – Pump Type Numbers

To skip setting Pump Type, push the “#” button.

The configuration types of the Lowline Mk3 series are designed to be consistent and compatible with the range of Types available in the Electroline Mk4 products.

Where ?: = Type is as listed below;

TYPE	ELECTROLINE MK4 TYPE CONFIGURED (INCLUDED FOR REFERENCE ONLY)	LOWLINE MK3 TYPE CONFIGURED
0	* One or two hose Normal or High flow Pump or Dispenser and “Multi” grade models. (Separate pumping position and supply line per hose or hose pair).	* Three Product, six hose, normal flow rate on all hoses. Pumps; A, B, C. Hoses; A, B, C.
1	* Two hose, one “shared” pump unit (one grade) Normal flow only.	Not available
2	Ultra High Flow Pump or dispenser	Not available
3	Not available	* Two Product, four hose, normal flow rate on all hoses. Pumps; A, C. Hoses; A, C.
4	Not available	* Two Product, four hose, normal flow rate on “A” hoses and High flow rate on “C” hoses. Pumps; A, B, C. Hoses; A, C.

Table 1 - Software TYPE settings

NOTE:
1. * Only these Models allow Serviceman setting of the “Type”.
2. If Type 1 is displayed, check installed software is for Lowline MK3. If it is then RAM memory (Processor PCB) has previously been operated as an Electroline. Reset to required type is possible.
3. If Type 2 is displayed then installed software is for Electroline. Replace with Lowline Mk3 software.

INITIALISING TOTALS

Lowline Mk3 pumps and dispensers have two types of electronic totals, “Hose Throughput” and “Secure” totals for each hose. The Hose Throughput totals are resettable by the Manager at any time however the Secure totals may only be reset or initialised by Service staff action.

NOTE: This function should be carried out at Installation, and at any time the Pump Fuelling Position numbers or Grades are changed on a pump.

It may also be required if a Processor PCB or memory is replaced, and it is required to align the starting value of the electronic totals with the current value of the site POS totals.

1. After the hash (#) button is pressed (at the end of the previous step), the display shown in Figure 13 will appear on the front Transaction Display, indicating that the option to reset the totals to zero or initialise them to a specific value, 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 13 – “Secure” Totals reset prompt

where: **nrt** indicates “totals not resettable by manager” are selected. (See section on Resetting Totals.)

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.

     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.

   - 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 Manager Function rotary switch.

Figure 14 – Example of "$"Totals – i.e. $23,573,862.90

Figure 15 – Example of Front Hose "A" Volume Totals – i.e. 297,058.20 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 CDM door.

EXTRA CONFIGURATION FEATURES

The Lowline Mk3 provides extra programmable features to those normally provided to setup a pump for operation with a site's requirements. They are provided to allow features to be either activated or fine tuned to suit "non standard" on-site equipment.

The extra features are:

1. 5 or 6 Digit Display operation.

   This feature refers to the maximum size display format usable on the Money and Volume digits of the Pump's transaction display and the format of the money and litres data messages transmitted to the POS when in Self-Serve mode of operation.

   The standard traditional digit size is 5 with format XXX.XX $ or Litres.

   The 6 digit format is X,XXX.XX $ or Litres which is a new optional feature.

   The Lowline Mk3 automatically operates in 6 digit format in Standalone mode and may operate in 5 or 6 digit format in Self-Serve mode. Factory set pumps, and replacement Processor PCBs, are set to operate in 5 digit format in Self-Serve and if required may be configured for 6 digit format in Self-Serve in either of two ways.

   The normally expected way that a Lowline MK3 will be set to operate with 6 digit format in Self-Serve mode is via POS communications configuration. This allows the data format feature to be checked and controlled automatically when the POS software is able to use and support it. POS developers must refer to the "Australian Pump Two-Wire Protocol Specification Issue E" or later for details of how the 6 digit communications configuration mode operates.

   In order to allow pumps that may have been operated in the 6 digit format in Self-Serve to be moved to a different site or the POS to be replaced with a POS that does not support the feature – there is a manual method that allows the traditional 5 digit format to be set. The manual method also allows the 6 digit format to be forced to allow for the case where a POS may be capable of operating with 6 digit format data however does not support the communications feature that allow the POS to force the pump to change its configuration.

2. Remote Lights control.

   This feature allows the remote control of the Lowline Mk3 pump lights via POS communications to be either ENABLED or DISABLED. It is provided to prevent incorrect operation of the lights (to ON or OFF) via corrupted communication messages due to a variety of abnormal conditions that may occur from time to time.

   Without this feature lights on traditional pumps may appear to be turned ON or OFF for no apparent reason and may require them to be manually set to the required condition at the pumps.

   The feature should be set to DISABLED for all POSs that do not provide a Lights-ON and Lights-OFF control feature.

3. STP to Flow Control valve delay timer.

   This feature allows the initial opening of the valve to be delayed, by a programmable time, after the motor or STP is turned on. It is designed to specifically assist on sites where dispensers are supplied from STPs that are a long distance from the dispensers or sites that are effected by thermal contraction of product in the delivery lines. It allows for the supply line to be fully pressurised before the valve is opened and thereby prevents false triggering of Leak Detectors.

SETTING EXTRA CONFIGURATION FEATURES

The entry point for setting the extra features is via the Personalisation “Initialisation of Totals” stage where the “secure” (“nrt” Totals) hose totals are prompted for resetting.

While the display prompts with "*rESET nrt ?*", as indicated in Figure 13, with or without the “?” visible, if the link JP4 is operated, then the pump will enter the mode for setting the extra configuration features.

The extra features available for setting are selected sequentially by repeated pushing of the “★” key.

The entry point starts with the front money display size for Stand Alone.

At entry the current setting will be flashed and the alternate option may be selected by pushing “5” or “6” digits as required followed by the “★” key.

Figure 16 – Money Display Digit Size setting. SA = Standalone, SS = Self Serve mode

After setting both front and rear digit sizes, the next extra feature is the Lights control Enable/Disable.

At entry the current setting will be flashed and the alternate option may be selected by pushing “0” for Disable or “1” for Enable as required followed by the “★” key.

Figure 17 - Remote Lights control setting. EN = Enabled, DIS = Disabled

After the Remote Lights Control has been set, the next extra feature is the STP to Flow Control valve delay time setting.

At entry the current setting in seconds will be flashed. A new time may be set by pushing the digits 0 to 9 as required followed by the “★” key..

Figure 18 – STP Delay time in Seconds. Enter from 0 to 9.

FUNCTIONAL CHECKS

For information on operating Lowline Mk3 pumps, refer to the relevant information in Chapter 2 (Operating Instructions) of the Users' Manual (DQ98001-112).

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, at the beginning of the reset cycle.
   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 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.

      NOTE: A minimum of 200L should be passed through each meter prior to calibration check and adjustment.

PRESET TRANSACTION CHECK

This is to test the functional operation of the pump preset.

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. Refer to Section 2 in the Users' Manual for instructions on setting allocation limits.
4. Start fuel delivery. Ensure that at about 0.1 to 1.5 litres before the allocation value, the flow rate is sharply reduced to about 2.5 to 3 litres per minute.
5. Hold the nozzle trigger in until the flow stops. Return the nozzle to the boot and check the value of fuel dispensed is the same as the allocation value.
6. Reset the allocation limit to zero (unlimited).
7. With the Manager Function Switch in the "Stand Alone" position, select a preset value of $10.
8. 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.
9. Hold the nozzle trigger in until the flow stops. Return the nozzle to the nozzle boot and check the value of fuel dispensed is the same as the preset value.
10. Check that the motor has stopped.
11. Push the "RECALL" button on the preset keypad and ensure 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. Check 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.
9. Pay off the transaction at the Console. Ensure the status for the selected pump goes to OFF (IDLE).
10. Push the "RECALL" button on the preset keypad and ensure the 'LAST' delivery is shown to be not a preset.

RESETTING TOTALS

It may be required by the station manager that the Transaction Count and/or Hose Throughput Totals be reset to zero. If so, carry out the following procedures.

There are a number of different types of totals that are maintained by the pump – they are:

- **Manager Resettable Transaction Count**
  1. A count of the number of transactions per Pumping position from 0000 to 9999.
  2. A count of the number of "Preset" type transactions per pump grade from 0000 to 9999.
- **Manager Resettable Hose Throughput Totals**

  A 7-digit accumulated total for volume (Litres) and money (Dollars) per hose throughput.
- **Secure Hose Throughput Totals – not resettable by Manager (nrt)**

  A 10-digit accumulated total for volume (Litres) and money (Dollars) per hose throughput.
  NOTE: These totals are resettable only by service personnel.

NOTE: ***For Manager resettable totals, please refer to the appropriate Users Manual.***

METER CALIBRATION

The meters installed in the Lowline MK3 series of Pumps and Dispensers are equipped with a sealed mechanical adjustment wheel for calibration. New meters should have a minimum 200 litres run through them prior to checking calibration.

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SECTION 4 HYDRAULICS DESCRIPTION

The information contained in this section may assist in understanding some of the basic hydraulics used in the Lowline Mk 3 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. The pump unit is a Gilbarco Global Pumping Unit – 90 Lt/min (GPU-90) which includes a check valve and strainer at the inlet, independent bypass and output pressure adjustments and an air-separation system.

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 the inlet manifold.

From the output of either the pump or the dispenser inlet manifold the flow passes to the meter.

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

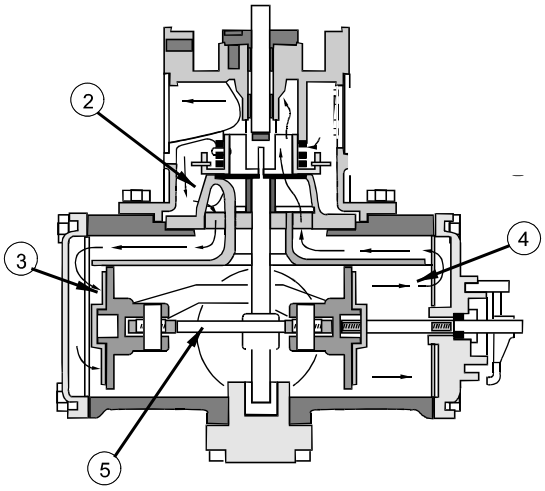
The meter is of the four piston positive displacement type, having the pistons arranged in cruciform pattern. Numeric references are made to Figure 19.

OPERATION

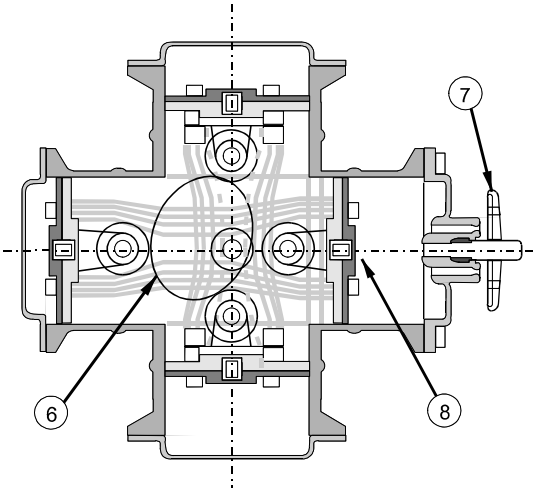
Liquid enters the meter under pressure from the pumping unit through the inlet (1). It travels down through the ported rotary valve (2) into the piston chamber (3). The pressure of the liquid forces the piston to travel its controlled stroke and hence displaces liquid from the opposite cylinder (4).
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 the nozzle valve, switching off the 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 19 – Four-Piston Meter

GPU PUMP & AIR ELIMINATION SYSTEM

Front View **Rear View**

Figure 20 – GPU-90 Pump, General View – Front & Rear

GPU PUMP & AIR SEPERATION OPERATION

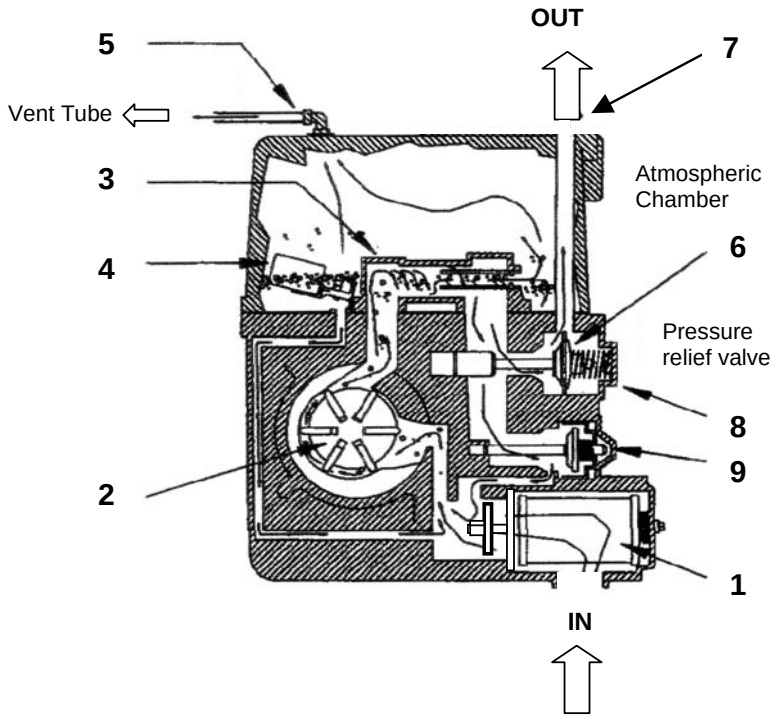


Figure 21 – GPU-90 Pump, Operation Diagram

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Typical Operation

The Pumping Unit lifts product from the storage tank to the dispenser meter and vehicle tank in the following manner: See Figure 21.

1. The fuel is drawn from the storage tank through an inlet strainer (1) and anti-drain-back check valve.

2. The rotary vane-pumping unit (2) pressurises the fluid.

3. Fuel enters the centrifugal air separator assembly (3). Any air or gas that is present is forced out the air tube along with a small amount of liquid into the atmospheric chamber.

4. When the liquid level in the chamber lifts the float and valve assembly (4), the liquid collected in the atmospheric chamber is returned to the pump inlet.

   Air/Gas is vented to the atmosphere through the vent tube and the overflow check valve assy. (5).

5. Gas-free fuel leaving the air separator opens the control valve (6) and is pumped into the meter (out) (7). The control valve includes a built-in relief valve (8), which relieves excess pressure caused by hot weather expansion.

6. Whenever the nozzle is not fully opened, some liquid is relieved into the pump intake through the bypass valve (9).

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 deliveries.

VORTEX AIR SEPARATOR.

The vortex air separator consists of a cylindrical chamber with a concentric tube. The vortex air separator is a separate assembly mounted within the atmospheric chamber on top of the pump body. The purpose of the vortex air separator 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 centre of the vortex. The air is removed and routed into the passive air eliminator. The flow rate of separated air/fluid is controlled with an orifice located at the end of the tube. The size of the orifice is automatically adjusted as the amount of air required to be separated varies.

PASSIVE AIR ELIMINATOR.

The passive air eliminator consists of a chamber and two floats. The purpose of which 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 check valve keeps fluid from escaping the chamber under extraordinary circumstances (i.e. failure of the float system). The separated air/vapour is released from the top of the chamber into the vent line.

INTEGRATED FLOW CONTROL VALVE

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 22). 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.

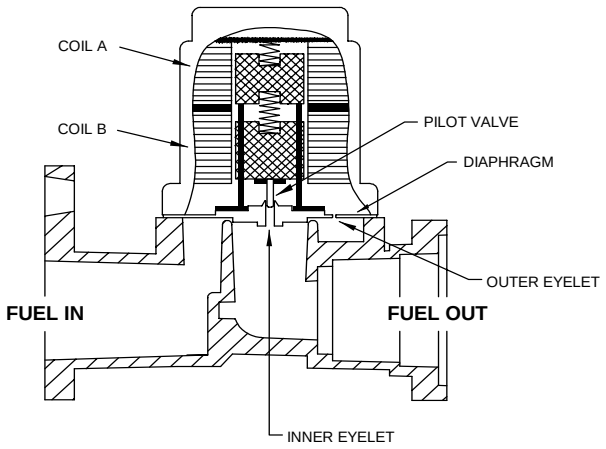

Figure 22 – Flow Control Valve

NOZZLES

The nozzles used are ZVA ‘Model 19’ nozzles, or as specified by customer requirements.
For High flow a minimum 25mm hose and nozzle is recommended.

OVERVIEW DIAGRAMS – HYDRAULIC CONFIGURATIONS

SIX HOSE PUMP

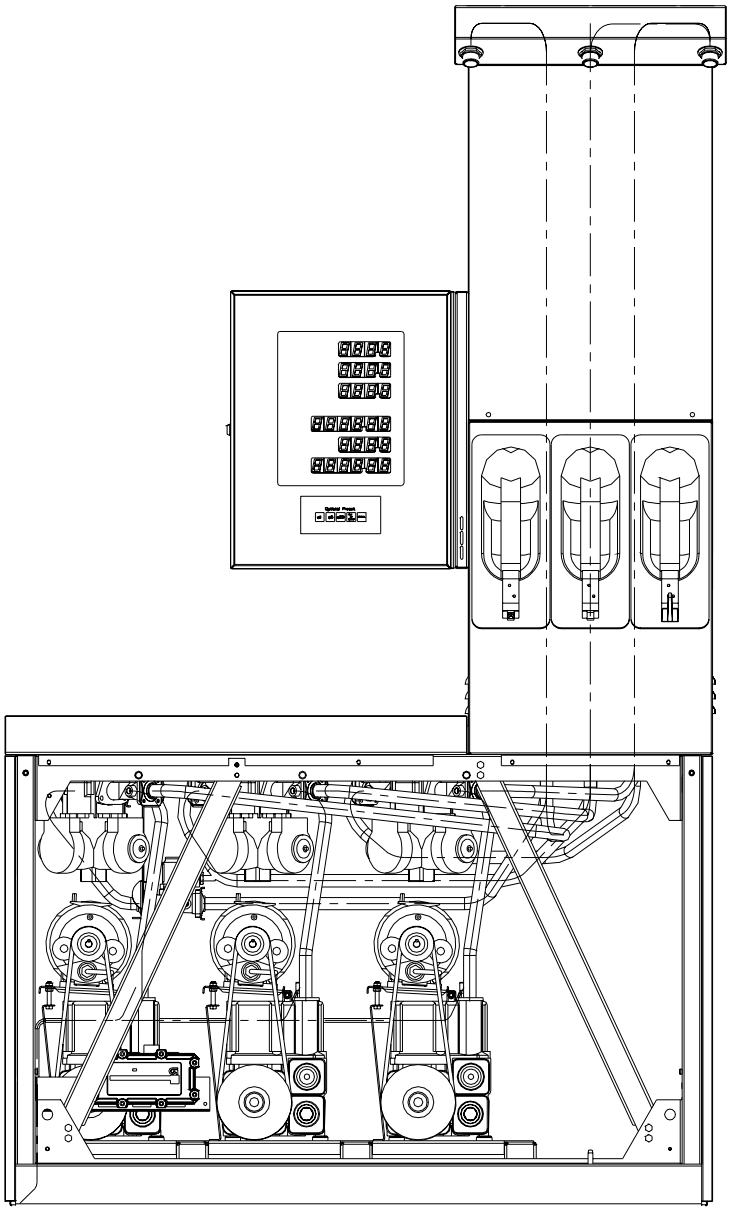

Figure 23 – Hydraulic Configuration – Six Hose Three Product Pump

SIX HOSE DISPENSER

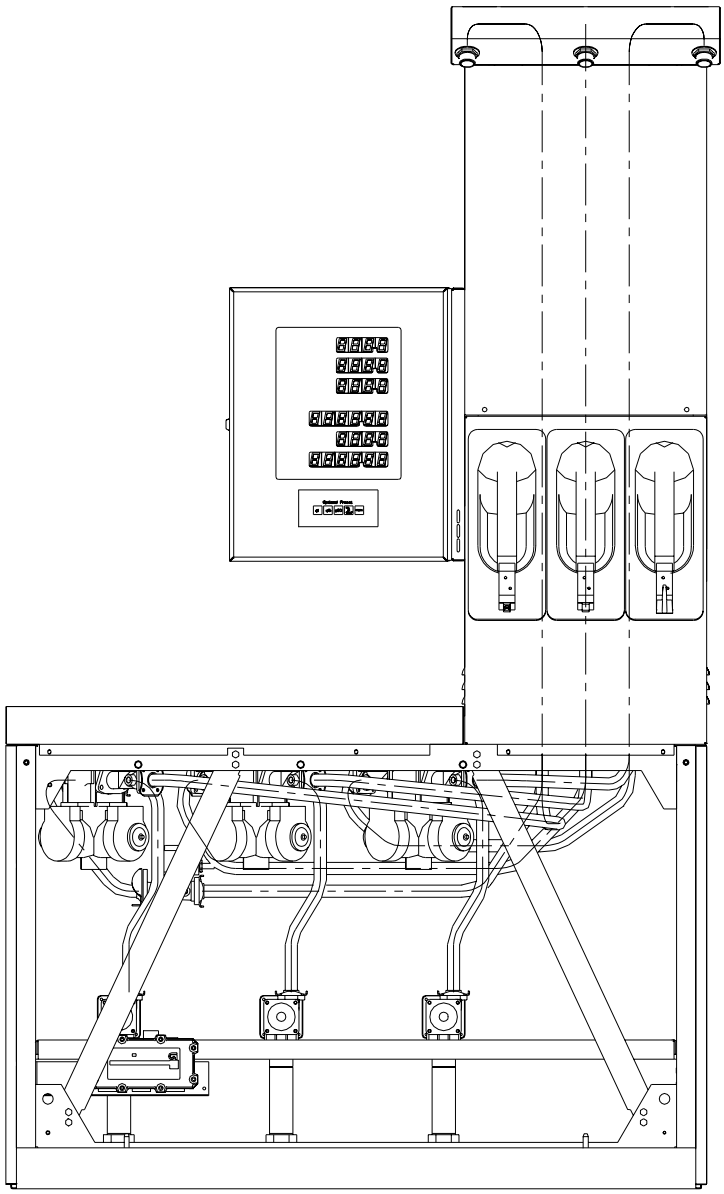

Figure 24 – Hydraulic Configuration – Six Hose Three Product Dispenser

SECTION 5 ELECTRONICS DESCRIPTION

The information contained in this section will assist in understanding the basic electronics used in the Lowline Mk3 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. Only Australian 2-Wire Protocol 2 i.e. with Grade data is available.

All of the components/equipment listed are either contained within flameproof enclosures, are part of an approved intrinsically-safe system (for pulsers, nozzle interconnect PCB and switches), or are housed outside the hazardous zones of the pump which are segregated via vapour barriers.

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

Component	Quantity
Power Supply	1 per pump
Processor PCB assy	1 per pump
Preset Keypads	1 per side
Main Display PCB assy	1 per side
Display Interconnect PCB	1 per pump
PPU Display assy	1 per hose
Pulser assy	1 per hose
Motor and Valve Control PCB	1 per pump
Totes	1 per grade
Junction Box – Mains connections	1 per pump
Junction Box – Valves connections	2 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.

There is only one Power Supply assembly that is supplied with the Lowline Mk3 - DT09359-001.

CAUTION

DT09359-001 Power Supply assemblies are the same size and have the same general appearance as LPG dispensers Power Supplies however they CANNOT be used in LPG dispensers.

Thie Power Supply assembly is mounted within the Customer Display Module (CDM) housing of the Lowline Mk3 Pumps.

This module contains the following hardware functional circuits:

- Mains Filter.
- Mains transformer.
- Lighting Ballast (used in Electroline Mk4 applications only). Lowline Mk3 has a separate ballast mounted in the CDM.
- Low voltage Power circuits for:
  - Processor Logic (5V DC)
  - Displays (18V DC Constant Current)
  - Totes (12V)
- Communications interface.

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

The main functions provided on the Processor PCB consist 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 – up to 3 motors and 8 valve coils.
- 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)

The microprocessor is the heart of the Zilog Z80180 (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 Supply is carried out within the supervisory circuit IC U1(type MAX694).

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 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 (not fitted with Lowline MK3), 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” money 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 Front and Rear 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 ensure 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 are mounted on the front and rear doors of the CDM housing. The keypads are enabled before and after all deliveries and all preset display data is indicated on the main display.

MAIN DISPLAY PCB ASSEMBLY

This PCB assembly contains the 16-digit 7-segment transaction displays and their associated steering/isolation diodes.

PULSER ASSEMBLY

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 Switches associated with each Pulser are mounted on the rear of the nozzle boots which are mounted on the lower sections of the front and rear columns. They are connected to the nozzle interconnect PCB mounted inside the column area.

MOTOR / VALVE CONTROL PCB

This PCB contains the interface and drive circuits between 5VDC and 240v AC for each Motor and Valve coil. It is mounted in the CDM and 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

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

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

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

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.

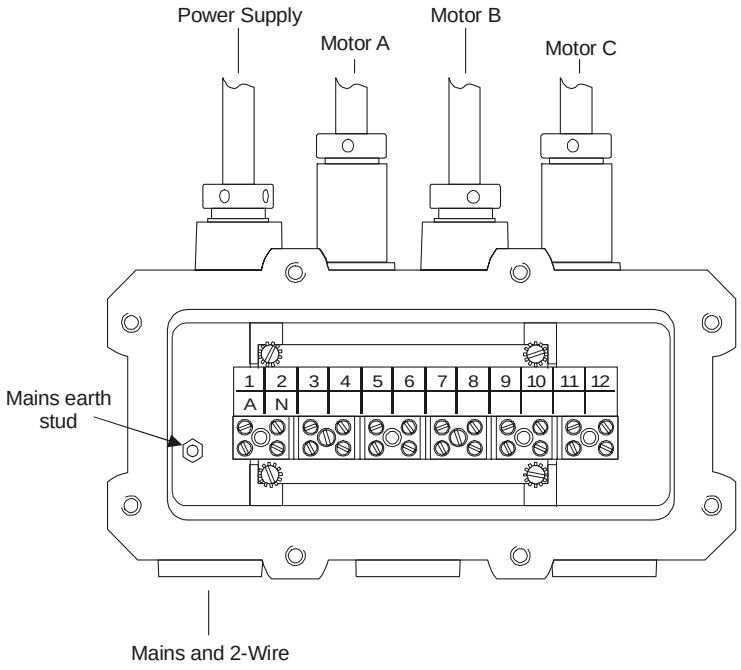

Figure 25 – Mains Junction Box

Refer Section 10 for tables and Wiring Diagrams.

JUNCTION BOX – VALVES

This junction box is used for the connection of the different product flow control valves. Each valve cable is terminated in a J-Box, one for the front and one for the rear, and a separate multi core cable connects the boxes to the motor/valve control PCB in the CDM.

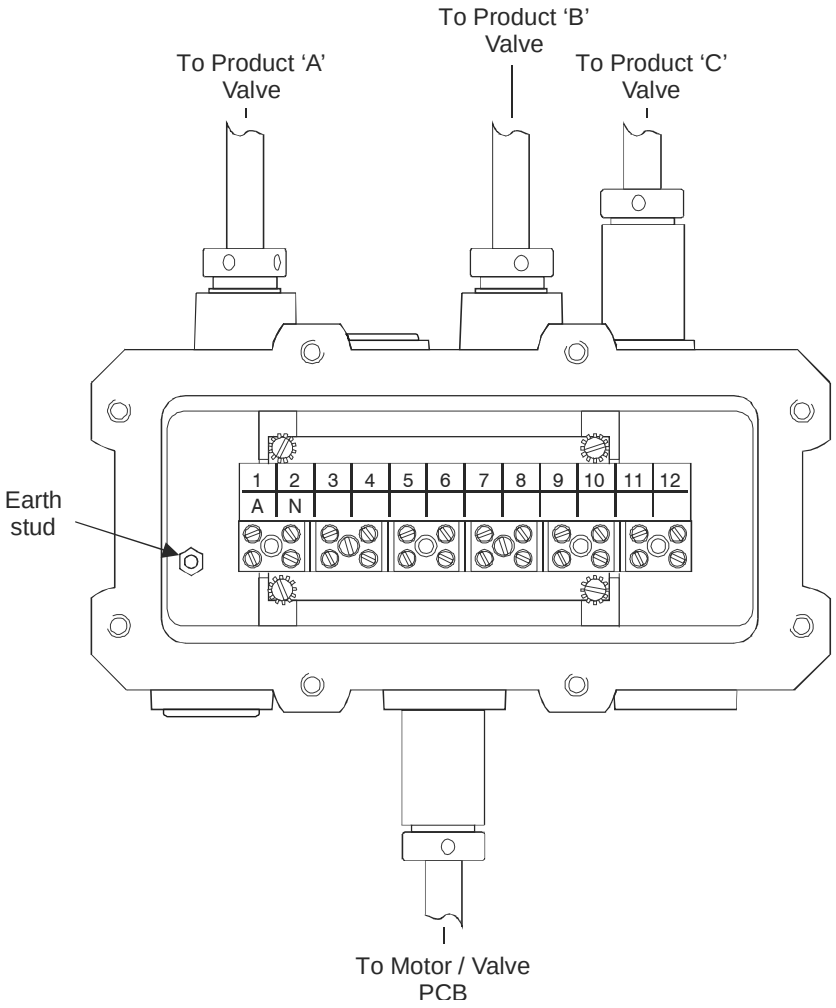

Figure 26 – Valves Junction Box

Refer Section 10 for tables and Wiring Diagrams.

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SECTION 6 FIELD SERVICING

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

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 Lowline Mk3 pumps other than the 4-piston meter(s) that may be calibrated as required.

Hose condition and drive belts should be checked periodically and replaced as needed.

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) and Users Manual are available, and that operators and attendants are fully aware of how to interpret them.

PROBLEM LOCALISATION

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 8 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 procedures outlined in the Replacement and Service Section of this manual.

8. If any electronic 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 electronic component is replaced and, when the system is rechecked, the repair action ***does*** correct the problem, adopt the following procedure.
   a) If possible 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 rechecking 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 – more than 4 flashes per sec.	Display(s) Unplugged

Table 2 - Processor LED Flash codes

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 CONDITIONS* later in this section 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	Not applicable
Err 3	RAM
Err 4	Earth quake sensor (Only on export models.)
Err 5	Display Error
Err 6	Preset Over-run
No Displays Fast Flashing of running LED	Display(s) unplugged.

Table 3 - Transaction Display Error codes

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 for all products based on the same set of electronics are listed below.

The details for each test as applied to the Lowline Mk3 are explained in the following section.

TEST #	DESCRIPTION	ELECTROLINE MK4 1 & 2 Hose [#]	ELECTROLINE MK4 Multi [#]	LOWLINE MK3 MPP/D
TEST 0	Flashing 8's test	yes	yes	yes
TEST 1	System test	yes	yes	yes
TEST 2	Settings. IDs, Type and Grades	yes	yes	yes
TEST 3	Valve Index Number display	yes	yes	yes
TEST 4	Nozzles and Pulsers input	yes	yes	yes
TEST 5	Keyboard and Preset test	yes	yes	yes
TEST 6	Jumpers & Remote Lights control	yes	yes	yes
TEST 7	STP Delay timer setting	yes	yes	yes
TEST 8	Walking Segments – Main Display	yes	yes	yes
TEST 9	Air detections – Status & Inst. counts	yes	yes	NO
TEST 10	Earthquake Sensor Status (not fitted in Australian models)	yes	yes	yes
TEST 11	Communications analyser - Poll count	yes	yes	yes
TEST 12	Communications analyser - Status	yes	yes	yes
TEST 13	External Manager's Switches Status	yes	yes	NO
TEST 14	Communications Protocol setting	yes	yes	yes
TEST 15	Data size format - 5 or 6 digit	yes	yes	yes
TEST 16	Walking Segments – PPU Display	NO	yes	yes
TEST 17	Spare	NO	NO	NO
TEST 18	Air Detections - – 60 sec duration	yes	yes	NO

[#] The Lowline Mk3 has been designed to utilise the same set of Self Tests numbers as the Electroline Mk4 range of Pumps and Dispensers. However some test are not available in early version software of these products. Refer to relevant model Service Manuals and Software Release Bulletins for effectivity and details – at time of issue Electroline MK4 software was at Issue V07 (*refer Service Bulletin 362*).

Table 4 - Diagnostics Self Tests

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.

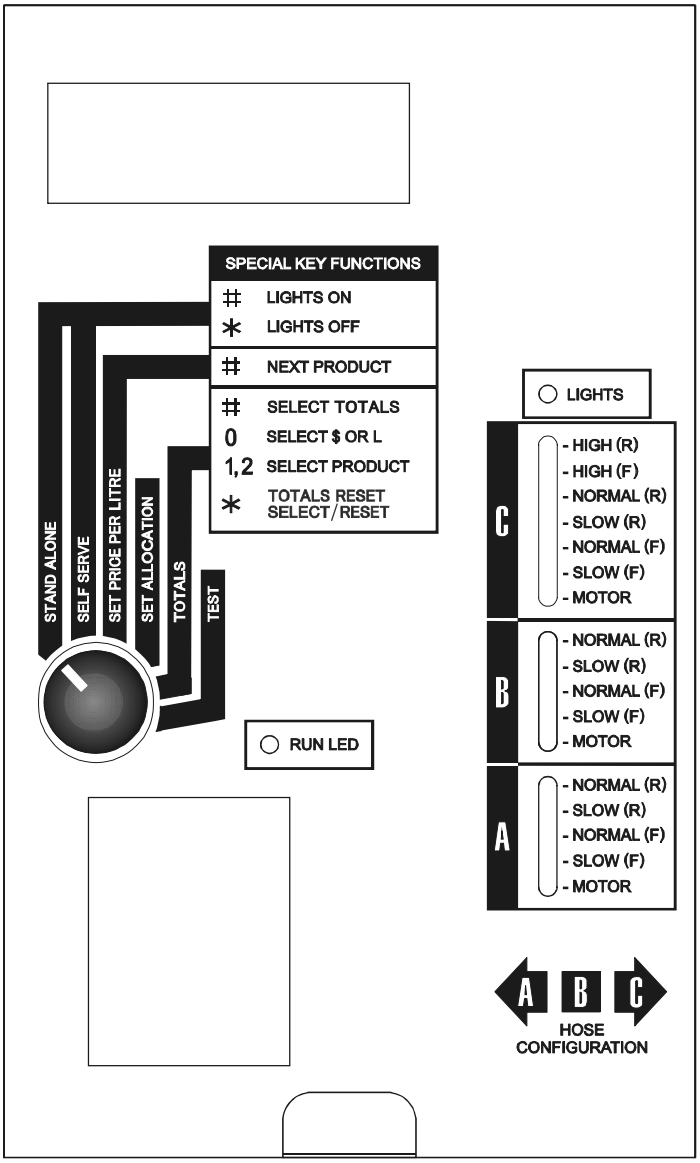


Figure 27 – Manager Function Panel – Lowline Mk3 Pump

TEST 0 – DISPLAY 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, TYPE & GRADE SETTINGS

The Fuelling Position numbers, for the Front and Rear positions are indicated as follows.

1. The **front** Fuelling Position numbers are displayed on the top display digits. An "F" is displayed, with the position number displayed on the last two digits of the display.
2. The **rear** Fuelling Position numbers are displayed on the bottom display. An "r" is displayed, 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. "**Grd**" and the assigned grade number are shown on the front PPU displays for the related products.
5. "**tYP**" and the programmed configuration type is displayed on the front transaction PPU digits.

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 shown on the hose Price per Litre digits on front and rear displays.

TEST 4 – NOZZLES & 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 **front** of the pump are indicated as follows.

– Product “A” displayed on the **3rd** digit from the **right** of the volume and money displays.

– Product “B” displayed on the **2nd** digit from the **right** of the volume and money displays.

– Product “C” displayed on the **1st** digit on the **right** of the volume and money displays.

The Pulser inputs status for nozzles on the **rear** of the pump is indicated as follows.

– Product “A” displayed on the **1st** digit on the **right** of the volume and money displays.

– Product “B” displayed on the **2nd** digit from the **right** of the volume and money displays.

– Product “C” displayed on the **3rd** digit from the **right** of the volume and money displays.

Carry out the following check procedure.

a) Lift the nozzle on 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.

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

b) If an “E” is displayed in place of “1” or “0” then the pump is configured as a Mixed Flow (TYPE 4) and the nozzle on the rear “C” position is plugged into the rear “C” connection when it needs to be plugged into the rear “B” connection point.

Repeat this procedure for all installed nozzles.

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 (LINKS) & REMOTE LIGHTS CONTROL

This test displays the current settings for the links on the Processor PCB and the configuration status of the remote lights control.

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. Refer to Section 3 for HARDWARE CONFIGURATION – LINK SETTINGS.

The status of the remote lights control is displayed on the front volume and PPU digits. “EN” or “DIS” depending if the status is enabled or disabled respectively.

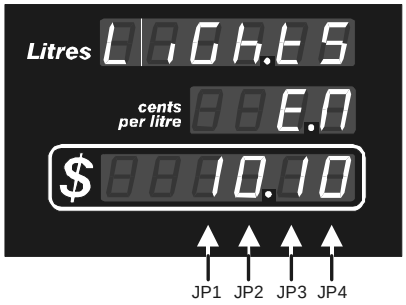


Figure 28 – Link indications and remote lights control status
(JP1 is in, JP2 is out, JP3 is in and JP4 is out)

TEST 7 – STP TIME DELAY

This test displays the current setting for delaying the turn on of the valves after the start-up of the pump motor.

The time in seconds is displayed on the front money digits.

TEST 8 – WALKING SEGMENTS – TRANSACTION DISPLAY

This test checks only the Transaction Displays to ensure each individual segment is functioning properly. Each display digit consists of seven 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 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 – NOT USED

This test is not activated in the Lowline Mk3 range of products.

TEST 10 – EARTHQUAKE SENSOR STATUS

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

The status is displayed on the front side volume display as follows:

Figure 29 – Earthquake Sensor status

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

Note: Earthquake sensors are not installed in pumps manufactured for the Australian market.

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 (Fuelling Position Number) 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.

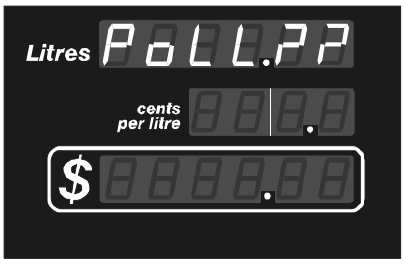


Figure 30 – Test 11, Poll ID

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.

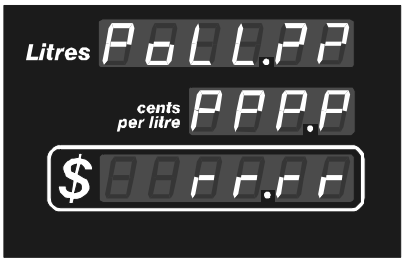


Figure 31 – Test 11, Poll counts

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 previously 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 (Fuelling Position Number) 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.

Figure 32 – Test 12, Status ID

where: ? = Selected ID

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

Figure 33 – Test 12, Status Codes

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
N o _ S t	No status response received	Pump is not responding.
O f f _ _	Off	Pump is off, not authorised & nozzle is in.
C A l l _	Call	Pump is off, not authorised & nozzle is out.
A U t h _	Authorised	Pump is off, authorised & nozzle is in.
b U S Y _	Busy	Pump is on, authorised & nozzle is out.
P A Y _ _	Paying	Pump is waiting for Paid command or for end of delivery time to complete. This response should only last approximately 5 seconds.
S T O P _	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 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 – NOT USED.

This test is not activated in the Lowline Mk3 range of products.

TEST 14 – ASSIGNED PROTOCOL

Non Multi grade type pumps may be assigned with either Protocol 1 or 2. However Multi grade pumps, such as the Lowline Mk3, must operate with Protocol 2.

This test displays the assigned Protocol type for the front and rear pumping positions. It will always indicate Protocol "2" for Lowline Mk3 pumps.

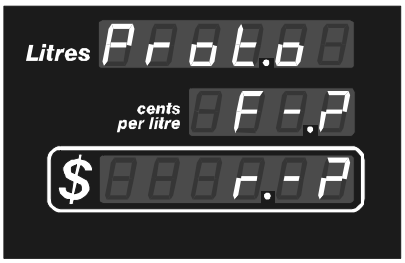


Figure 34 – Test 14, Protocol setting

where: ? 1 = Protocol 1
2 = Protocol 2

F = Front
r = Rear

TEST 15 – DATA FORMAT - 5 & 6 DIGIT

This test displays the current selected format for transaction money and volume data digits for both Standalone (SA) and Self Serve (SS) modes of operation. The test is provided to allow service staff to check and confirm the current settings.

The traditional 5-digit format is XXX.XX dollars. However with the common usage of prices per litre of more than $1 a change to 6-digit format of X,XXX.XX dollars has been provided on the Lowline Mk3.

The Standalone setting is fixed to be 6 and the Self Serve setting is factory defaulted to be 5 digit format.

The Self Serve setting must be compatible with the POS's ability to communicate and display the correct transaction data.

The Lowline Mk3 is designed to allow the Self Serve setting to be checked and changed automatically by the POS as required. If a POS is capable of operating in 6 digit mode and cannot configure the pump via the 2-Wire loop, then Service Staff may set the 6 digit format to be activated at the Pump. Refer Commissioning Section.

The display format of this test alternates between the Front and Rear settings:

Alternating with

Figure 35 – Test 15, Data Format

where: F = Front
r = Rear
SS = Self Serve
SA = Standalone
? = “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 regarding upgrading of POS equipment to use 6 digit data formats should be referred to the local Gilbarco Sales Branch.

TEST 16 – WALKING SEGMENTS, PPU DISPLAY DIGITS ONLY

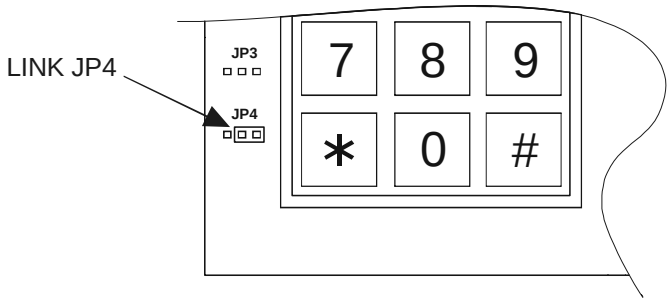
TEST 17 – NOT USED

TEST 18 – NOT USED

FLOW RATE TESTS

ENTER FLOW RATE TEST MODE

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



NOTE: Links are shown in their appropriate position on the PCB

Figure 36 – Link positions on Processor PCB

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

♦ FOR NORMAL & HIGH FLOW PUMP OPERATION

❑ FOR FRONT PUMPING POSITION

- 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 “nor" (normal flow) and ”SLO" (slow down). Delivery ***cannot*** start until a valve setting has been selected.
- Pressing the “1” button will reset the “Maximum Flow Rate”.

❑ FOR REAR PUMPING POSITION

- 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 “nor" (normal flow) and “SLO" (slow down).
- Pressing the “3” button will reset the “Maximum Flow Rate”.

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

FLOW RATE TEST DISPLAY DATA

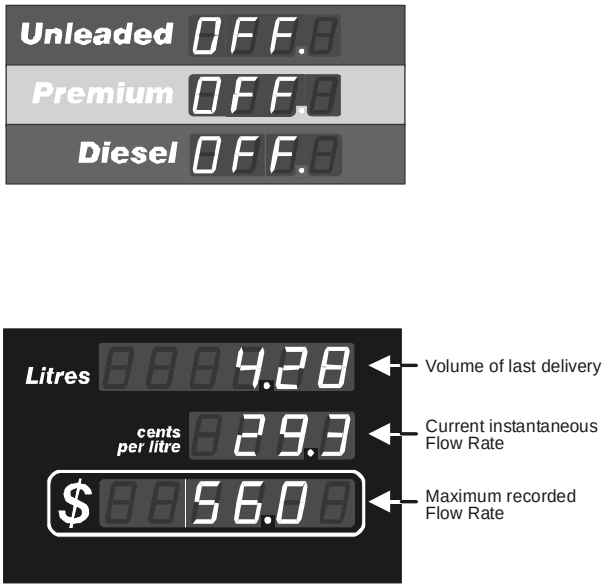


Figure 37 – Flow Rate Test Display

Flow Rate test valve operation indication is displayed on the PPU digits;

where:

OFF	=	Motor and both valve coils off.
On	=	Motor on, both valve coils off.
nor	=	Normal and Slow valve coils on.
SLO	=	Slow valve coil only on.

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.

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	Not applicable.	
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 5	A cable in the display system is making intermittent connection.	1. Power down and up to clear error record. 2. Check all display cables and links on Display Interconnect PCB.
Err 6	Preset over-run	1. Press digit “5” on Managers Keypad.
Delivery stopped or will not start. Running LED on Processor PCB flashing extra fast.	A cable in the display system has become unplugged.	1. Power down and check all display cables and links on the Display Interconnect PCB. 2. If after power up the display flashes “Err 5”, then power down and back up to clear.

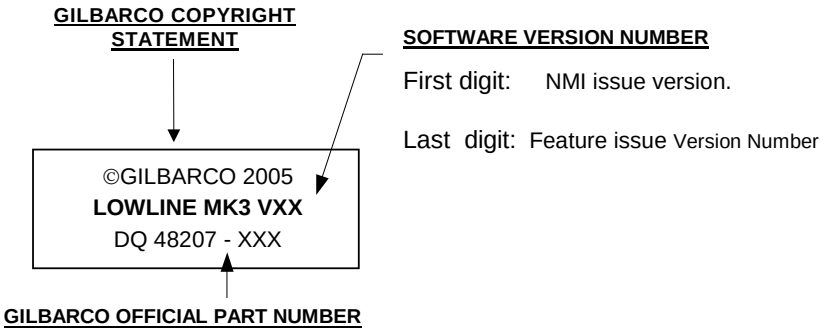
Table 5 - Error codes

UPGRADING SOFTWARE

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

There is only one EPROM version for all models.

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



SOFTWARE PRODUCT & VERSION NUMBERS

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
87 = Lowline MK3 Pumps and Dispensers

V V = Installed Software Version
00 = Development version (dated on label)
99 = Demo version (dated on label)
01 to 98 = Valid released version numbers

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SECTION 7 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)
4. Display System. (Part of the CDM assembly)
5. Nozzle boot and switch assemblies.
6. Intrinsically Safe Barrier PCB. (Part of the CDM assembly)
7. Motor & Valve Control PCB. (Part of the CDM assembly)
8. Hydraulic cabinet.
9. Pumping units. (Part of the Hydraulic cabinet)
10. Pulser assemblies. (Part of the Hydraulic cabinet)
11. Meter(s). (Part of the Hydraulic cabinet)
12. Flow Control Valves. (Part of the Hydraulic cabinet)
13. Motor(s). (Part of the Hydraulic cabinet)
14. J-Box assemblies . (Part of the Hydraulic cabinet)

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. Employ Gilbarco's Protection of Electronic Sensitive Devices in the Field Procedure DQ00500-027.
3. 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 may be required by service personnel when working on Lowline Mk3 pumps.

- WAGO terminal connector tool or small flat screw driver.
- Allen Key 6mm (J-Box)
- Flat-Blade Screwdriver - 3.5mm (Mains J-Boxes)
- Phillips Head Screwdriver - No. 2 (misc.)
- Nutdriver - M4 (Mains J-Boxes)
- Long Nose Pliers
- Small Cutters
- IC Extraction Tool (Processor PCB)
- IC Insertion Tool (Processor PCB)
- Nutdriver - 10mm
- Long Allen Key - 6mm (for Air Separator)

CDM ASSEMBLY

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

1. Power supply assembly.
2. Transaction Display PCBs.
3. Preset Keypad.
4. Processor PCB.
5. Display Interconnection PCB.
6. Intrinsically Safe Barrier PCB.
7. Motor & Valve control interface PCB.
8. Totes and Loom assembly.
9. Light tube.

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, open the rear CDM door.

c) Unscrew the Power Supply from the mounting bracket.

d) 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, open the required CDM door, front or rear.

c) Unplug all the ribbon cables from the door at the Interconnection PCB.

d) Push the centre of the display PCB mounting plate upwards to clear the locking slots on the side support brackets. The display mounting plate, with display PCBs and display dial move together.

e) Lift out the Display assembly, Mounting plate, PCBs and dial.

f) Slide and unclip the dial from the mounting plate.

g) Unplug the cable(s) and remove the display PCB(s) from the mounting plate as required.

2. Replacement

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

PPU DISPLAYS

1. Removal

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

b) Using the keys provided, open the required CDM door, front or rear.

c) Unplug all the ribbon cables from the door at the Interconnection PCB.

d) Push the centre of the display PCB mounting plate upwards to clear the locking slots on the side support brackets. The display mounting plate, with display PCBs and display dial move together.

e) Lift out the Display assembly, Mounting plate, PCBs and dial.

f) Slide and unclip the dial from the mounting plate.

g) Unplug the cable(s) and remove the display PCB(s) from the mounting plate as required.

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, open the required CDM door, front pr rear.

c) Cut tie wraps as required and unplug the Preset cable from the Display interconnect PCB.

d) Using an Allen Key, remove the screws holding the Preset Panel to the door.

e) Remove the Preset keypad Panel.

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, open the front CDM door.

c) Unclip the Processor PCB cover by pulling at the bottom.

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, open the CDM doors, front and rear.

c) Unplug all cables from the Interconnection PCB.

d) Loosen the Display Interconnection PCB mounting bracket at the securing screws on the mounting shelf.

e) Remove the mounting bracket with the PCB attached.

2. Replacement

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

Display Interconnection Links.
There are four pin headers on the Display Interconnection PCB that are not used in the Lowline MK3 application. These headers each require one link on specific position as listed below.

Pin Header P4	Link on pins 19 and 20 (across two bottom pins)
Pin Header P5	Link on pins 19 and 20 (across two bottom pins)
Pin Header P14	Link on pins 19 and 20 (across two top pins)
Pin Header P15	Link on pins 19 and 20 (across two top pins)

NOZZLE BOOTS AND SWITCHES

1. Removal

On either side of the Lowline Mk3.

a) Unscrew the two hydraulic cabinet panel securing screws, then lift off the panel.

b) Unscrew the two nozzle boot panel screws. (That were concealed under the hydraulic cabinet panel.)

c) Unscrew the column upper panel securing screws, then lift out the panel.

d) Reach inside the column and unplug the nozzle switches. Clip the leads into the slots provided in the top of the nozzle boot panel.

e) Lift the nozzle panel off the positioning hooks.

2. Replacement

The replacement procedure is the reverse of the removal procedure. Ensure all nozzle switch cables are connected properly. Perform Self Test # 4 to check correct operation.

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, open front the CDM door.

c) Loosen the Processor PCB mounting bracket at the pivot screws on the mounting shelf, then pivot the processor PCB assembly to give access to the rear side of the bracket.

d) On the IS Barrier PCB, which is mounted on the rear of the Processor PCB mounting bracket, 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, open the CDM doors, front and rear.

c) Unscrew Motor/Valve PCB cover screw at the top of the cover against the Column wall and remove the cover.

d) Unplug all cables from the Motor/Valve PCB. Use Wago terminal tool to disconnect valve wiring.

e) Unscrew the Motor/Valve PCB heatsink mounting plate and remove it. (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 CABLE ASSEMBLY

1. Removal

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

b) Using the keys provided, open the front CDM door.

c) Remove the Pump Processor PCB cover.

d) Undo the screw on the Tote assembly bracket. Unplug the cable loom from the Processor PCB and remove the complete loom assembly.

2. Replacement

The replacement procedure is the reverse of the removal procedure. Ensure tote cable is connected properly.

LIGHT TUBE

1. Removal

a) Remove the mains power from the pump.

b) Using the keys provided, open a CDM door, front or rear.

c) Rotate tube in holder 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. GPU-90 Pump

The following topics outline the removal and replacement procedures recommended to ensure safety of 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) Unscrew the front and rear hydraulic cabinet panels and remove them.

c) Unscrew the Hydraulic cabinet top cover securing screws, that were concealed by the front and rear covers.

d) Locate the faulty Pulser, through the top access area, and release the cover of the Pulser assembly.

e) Unplug the Pulser cable.

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

2. Replacement

The replacement procedure is the reverse of the removal procedure. Ensure all cables are connected properly and ensure earth bonding strap is replaced on cabinet panels.

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 solenoid, only the front or rear panel may need to be removed.)

c) Unscrew the Hydraulic cabinet top cover securing screws that were concealed by the front and rear covers.

d) Locate the faulty Valve assembly and trace the Valve cable back to the associated J-Box.

e) Undo the J-box cover bolts and loosen the appropriate cable gland then loosen the screws on the terminal strip.

f) Pull the valve cable through the cable gland.

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

Note: The rear Product “A” solenoid coil needs to be mounted on the valve body with the coil cable gland pointing into 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) 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 its cover.

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

f) Loosen 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 drive belt adjustment bolts and remove the belt.

i) Remove the belt adjustment arms and undo the motor mounting plate pivot pin bolt.

h) Remove the motor, with the mounting plate.

i) Unbolt and separate the motor from the mounting plate.

2. Replacement

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

PUMP UNIT REPLACEMENT

Note: Replacement of a Pump Unit should only be considered if service actions cannot correct the problem. – Refer “Pump Unit Service” section of this manual.

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) Refer steps in “Motor Replacement” procedure. Note that the motor can be positioned away from the pump without disconnecting the cable.

f) Unscrew the outlet pipe flange screws on the top of the pump, then undo the pipe flange joint at the meter inlet pipe, and lift the pipe up out of the pump housing.

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.

PUMP UNIT SERVICE – GPU - 90

Figure 38 – GPU-90 General View Front & Rear

DRAINING PUMPS

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

1. Remove the Air Test plug and adapter on the inlet filter cover at the rear of the pump. This port may be labelled “Drain” on some units. 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.

2. Manually turn the pump pulley COUNTER CLOCKWISE to aid in fluid removal.
3. Properly dispose of fluid drained from the pump.
4. After pump is drained, replace **ALL** plugs using a non-hardening pipe sealant. **DO NOT** use Teflon tape.
5. Replace W & M sealing wire, if required, on Air test plug and adapter.

INLET STRAINER AND CHECK VALVE

Figure 39 – GPU-90 – Strainer & Check Valve (Cover gasket not shown)
(Check valve shown in open position against closing spring.)

STRAINER / CHECK VALVE REMOVAL.

Check valves should be replaced if pump is experiencing frequent prime loss, indicating the check valve is not functioning correctly.

The strainer is used to hold the check valve in place and must be clean to ensure proper operation and to extend pump life.

1. Lower pump fluid level by draining the pump as indicated previously in this section.
2. Remove the four inlet filter cover screws .
3. Remove the filter cover. The retaining spring will push the cover away from the pump body as all screws are removed.
4. Carefully pull out strainer. Keep strainer in a horizontal position to avoid contaminating pump with strainer debris.
5. Remove the inlet check valve assembly. Central post may need slight sideways leverage to free assembly from its seat.
6. Inspect valve seat and check for cracked or otherwise damaged gaskets. Replace if necessary.

STRAINER / CHECK VALVE INSTALLATION.

1. Ensure all debris is removed from the check valve, especially at the valve housing seat.
2. Insert check valve into the bore of the pump body.
   Press assembly squarely over receiving cylindrical surface until housing seats firmly over the surface and holds assembly in position, with central post straight in pump body.
3. Insert new or cleaned strainer into bore, over check valve assembly.
4. Position the retaining spring between the strainer end and the inside of the cover, with the gasket positioned on the pump body, and compress sufficiently so the cover screws can be started in their threads.
5. Tighten the cover screws, alternating between each screw to keep the cover parallel to the casing face. **DO NOT OVERTIGHTEN**.
6. Ensure the W& M Air Test plug and adapter are tight and the wiring seal is in place where required.

BY-PASS PRESSURE VALVE

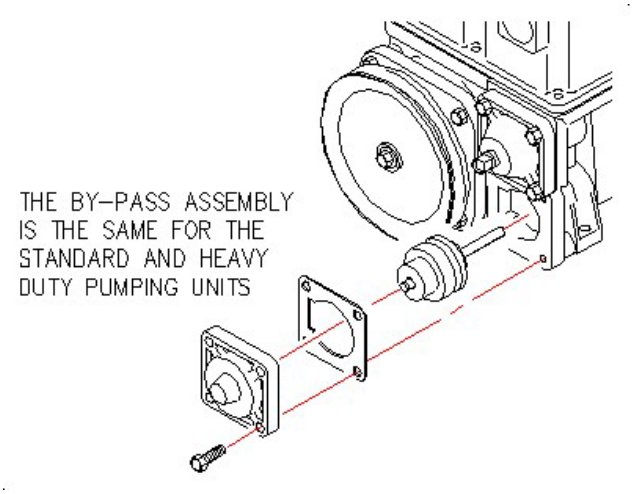

Figure 40 – GPU-90 – BY-Pass Pressure Valve removal

By-Pass valve assembly

By-Pass valve Cover Plate and adjusting screw (Gasket not show)

Adjusting Screw Cover

(Sealing gasket shown around adjusting screw on Valve cover.)

The pumping unit uses a bypass valve assembly in order to relieve the pumping unit pressure when the motor is running, but no fuel is being dispensed.

The bypass assembly includes a valve spring and guide. An entire bypass assembly is used when making repairs.

BY-PASS PRESSURE VALVE REMOVAL.

Excessive wear of the By-Pass valve can cause improper pump performance, including flow loss, excessive or low discharge pressure.

1. Drain the pump following the procedure outlined under “Drain Pump” section.
2. Unscrew the four valve cover screws and remove the cover.
3. Remove the valve assembly.

BY-PASS PRESSURE VALVE INSTALLATION.

1. Inspect valve for damage or excessive wear. Replace if necessary.
2. Install pressure control valve in the reverse order to removal steps.

BY-PASS PRESSURE VALVE OPERATION & ADJUSTMENT.

The pump pressure must not exceed 36 psi (2.5 bar, 250 kPa).

By-pass Pressure Valve must be set to the desired single hose operating pressure.

(Pressure for Petrol and normal flow Diesel typically between 120 and 180 kPa.)

1. To **INCREASE** the pressure setting, turn the By-Pass valve adjusting screw ***inwards*** (clockwise).
2. To **DECREASE** the pressure setting, turn the By-Pass valve adjusting screw ***outwards*** (counter clockwise).

NOTE:

1. OUTLET pressure may be checked with a gauge at the Control Pressure seal plug. Refer Figure 38.
2. INLET Vacuum may be checked with a gauge at the Air Test adapter plug. Refer Figure 38.
3. Factory setting of By-Pass adjusting screw is approximately 1½ turns anticlockwise OUT from the fully IN position.
4. Excessive By-Pass pressure will increase load on the motor.
5. Flow restrictor washers are fitted in the pipe between the column pipe and the hose adapter fitting, at the top of the column, for all Normal flow hoses. Do not increase By-Pass pressure to increase flow rate without first fitting a larger ID washer.

CONTROL VALVE

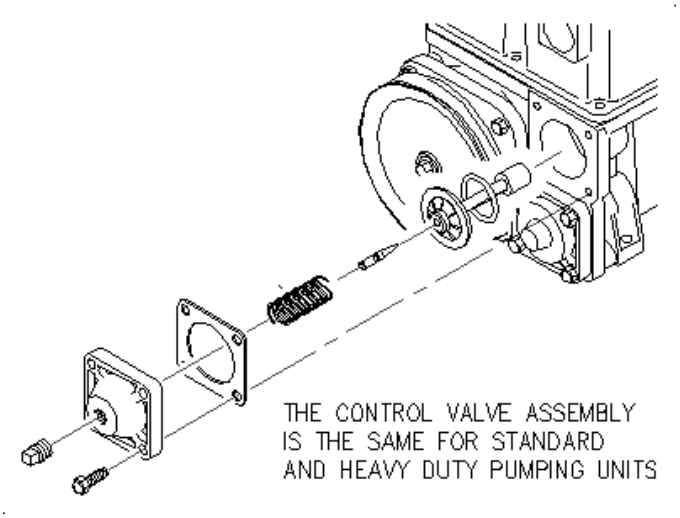

Figure 41 – GPU-90 - Control Valve removal

Control Valve and Pressure relief valve

Control Valve Spring (Heavy Duty)

Control Valve Cover and Pressure monitor point.

The pumping unit uses a control valve that aids in the elimination of air by producing a back pressure, and is also used as a check valve for any fuel beyond it.

The control valve also contains a pressure relief valve. This valve ports excess hose pressure, which may result from the expansion of fuel during hot weather, to the air eliminator chamber. This action prevents hoses from bursting and helps to prevent pumping unit leaks.

PUMP CARTRIDGE

Rotor Assembly Maintenance

Should it become necessary to service the pumping unit's rotor, shaft assembly or blades, the rotor shaft assembly should be removed. Refer Figure 42 and 43.

1. Use a bearing puller to remove the pulley if possible. If a crowbar needs to be used then a small block of wood must be used to protect the pulley and/or the pump housing.

2. Remove the four bolts that hold the clamping ring in place.

3. Let the clamping ring hang on the rotor cage.

4. It is recommended that the "Q" ring, which secures the rotor cover, be replaced whenever the rotor assembly is removed from the pumping unit.

5. When reassembling the pumping unit, tap the rotor cover into position and carefully tighten the clamping ring.

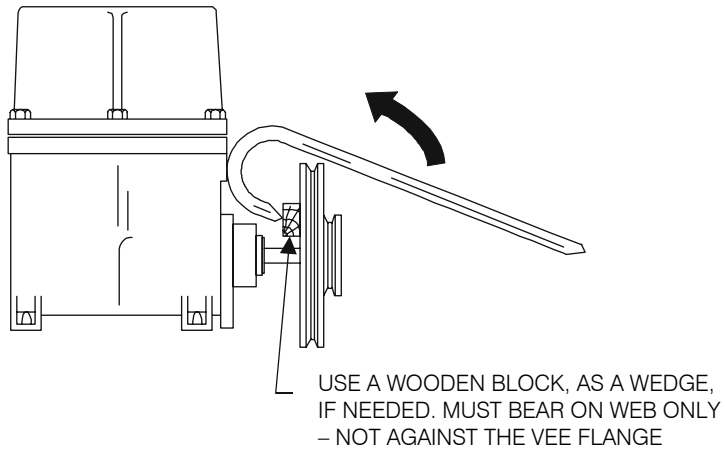

Figure 42 – GPU-90 – Pump Pulley removal

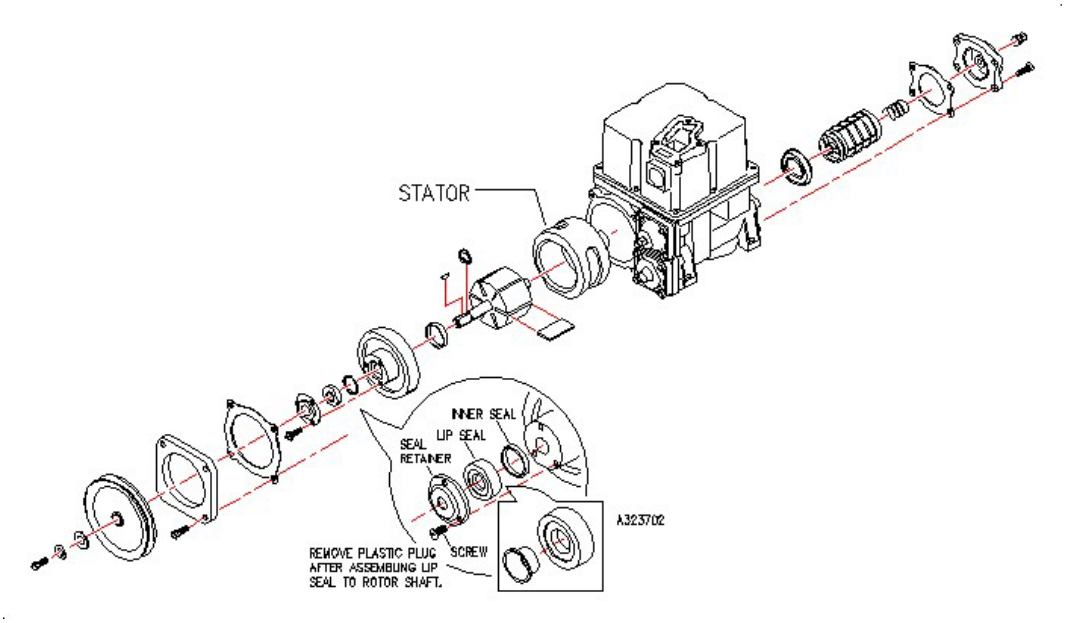

Figure 43 – GPU-90 – Pump cartridge and Inlet strainer assembly

Lip Seal Replacement.

To replace the Lip Seal follow this procedure:

1. Remove the belt, pulley, and shaft key.
2. Remove the three screws that hold the seal retainer. See Figure 43. Carefully pry the old seal from the recess in the cover plate. Do not scratch the shaft.
3. Wipe the shaft clean.
4. With a small plastic plug tool (furnished with each new seal), slip the new seal over the shaft. Remove the tool.
5. Reinstall the seal retainer screws, key, pulley, and belt.

Stator Removal

Should it become necessary to repair or replace the stator, remove the rotor cover and rotor shaft assembly see Figure 43. Be careful to catch the blades when the rotor and shaft assembly is being removed. The stator, in most cases, can be slid out of the pumping unit body at this point.

NOTE: Use caution. Do not tap too hard as this will further wedge the stator in it's body.

In extreme cases, the entire pumping unit must be removed from the unit. Once the pumping unit is removed, it should be completely drained.

Throw Out Rings & Blades

To replace blades in rotors with throw-out rings, follow this procedure:

1. Install throw out rings in the recesses of the rotor.
2. Install the rotor in the stator assembly.
3. Rotate the rotor until a blade slot is at the 12:00 o'clock position. Install the 1st. blade.
4. Rotate the rotor 2 slots from the installed blade. Make sure the second slot is at the 12:00 o'clock position. Install a blade.

   Repeat step 4 for the third blade.

5. Repeat step 3 for the remaining blades. See Figure 44

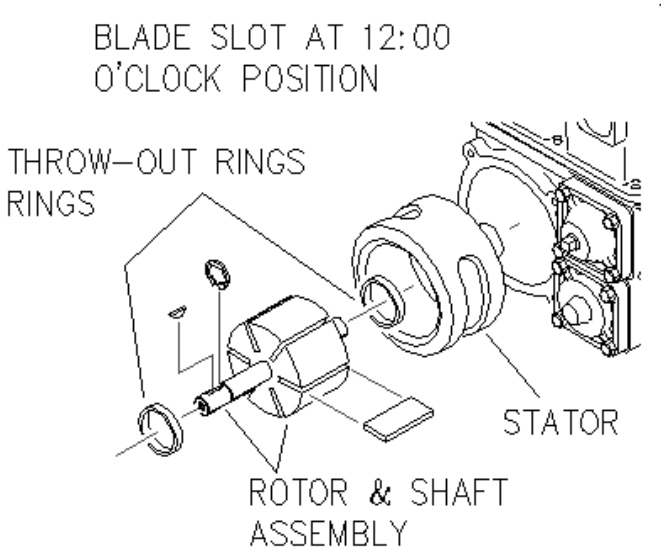

Figure 44 – GPU-90 – Pump cartridge blade assembly

SUMP FLOAT ASSEMBLY

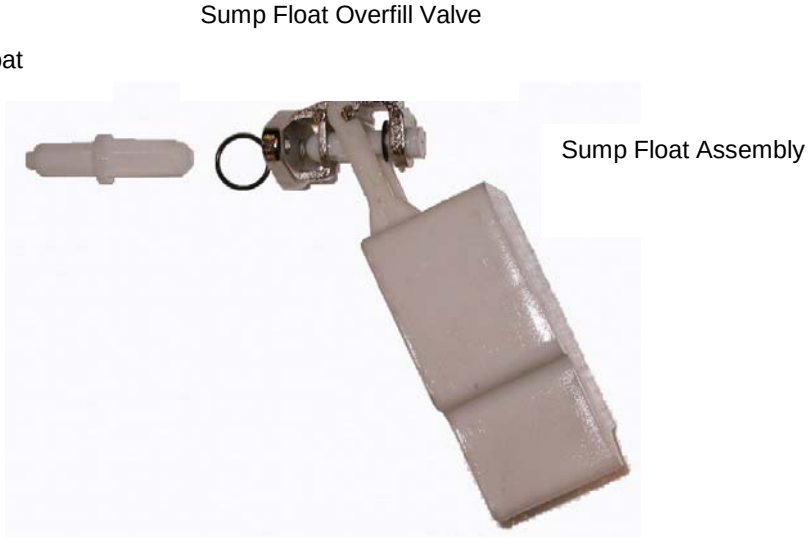

Figure 45 – GPU-90 – Sump Float assembly

SUMP FLOAT REMOVAL.

The pump may have poor suction or sump overflow if the sump float mechanism is worn or damaged.

1. Drain the pump following the procedure outlined under “Draining the Pump” section.
2. Remove the motor from the pump.
3. Remove the pump outlet pipe from the pump to the meters, and the vent discharge line.
4. Remove the pump from the dispenser.
5. Remove the top sump cover screws.
6. Lift off the sump cover and gasket. Inspect gasket and replace if worn, damaged or stretched.
7. The sump return float mechanism should operate freely. At full down position, the float valve should centre and seat against the seal surface. If it does not seat, or parts are worn or damaged, remove the sump float assembly and replace.

The sump return float mechanism should operate freely.

SUMP FLOAT INSTALLATION.

1. Install the sump return float assembly then the sump overfill float assembly, holding the mount to the casing with one finger and inserting the two screws with the other hand. Take care the rubber washer has not fallen out and is properly seated in the recess of the float assembly mount.
2. Tighten the screws .
3. Check float mechanism. It should operate freely.

   At full down position, the sump return float valve should centre and seal against the seal surface.

   The sump overflow float assembly should seat when the float is fully elevated.
4. Install the sump cover gasket. Correctly position the gasket onto the sealing surface.
5. Lower the sump cover gently into place over the gasket so as not to move the gasket.
6. Install and tighten the sump cover screw.
7. Remount the pump and motor in the dispenser.

VENT VALVE ASSEMBLY

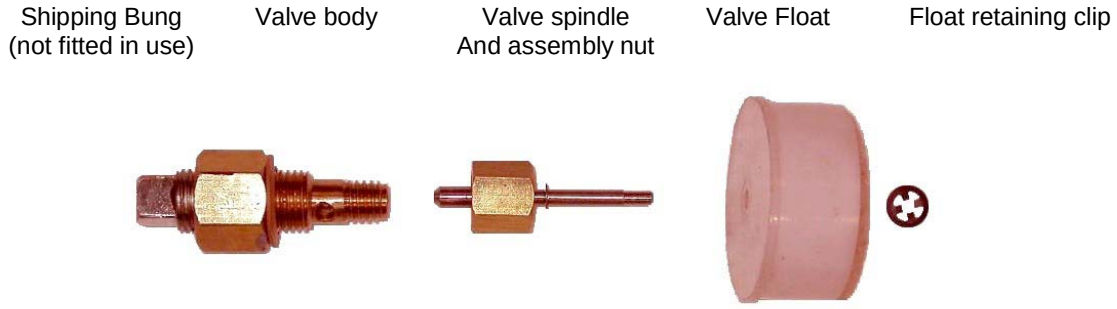

Figure 46 – GPU-90 – Vent Valve assembly

VENT VALVE REMOVAL.

The Vent Valve assembly is located inside the pump air separation chamber, it is mounted on the valve body that is attached to the top of the chamber. It may discharge liquid through the vent line under “flooding” conditions if the valve is not operating correctly.

1. Drain the pump following the procedure outlined under “Draining the Pump” section.
2. Remove the motor from the pump.
3. Remove the pump outlet pipe from the pump to the meters, and the vent discharge line.
4. Remove the top sump cover screws.
5. Lift off the sump cover and gasket. Inspect the gasket and replace if worn or damaged.
6. The vent float should be retained on the spindle and the mechanism should operate freely.

When dismantled, as required:

- check that the valve spindle “seats” and seals against the valve body.
- Check that the float has no fluid inside and that it is air tight.

VENT VALVE INSTALLATION.

The Vent Valve assembly is installed in the reverse order of the removal steps.

Ensure the valve spindle moves freely and the float retainer clip is secure and griped to the spindle.

AIR ELIMINATOR ASSEMBLY

Figure 47 – GPU-90 – Air Eliminator assembly

The Air Eliminator assembly is located inside the pump air separation chamber, it is bolted to the top of the pump body.

If incorrect operation develops in the air eliminator assembly a difference in accuracy may be detected between tests conducted with air introduced into the pump via the Air Test plug and with deliveries without introduced air.

AIR ELIMINATOR REMOVAL.

1. Remove the motor from the pump.
2. Remove the pump outlet pipe from the pump to the meters, and the vent discharge line (If necessary remove the pump unit from the housing).
3. Remove the top sump cover screws.
4. Lift off the sump cover and gasket. Inspect the gasket and replace if worn or damaged.
5. Remove the four securing screws that hold the Air Eliminator to the pump body.
6. Lift the assembly out noting the position of the guides in the inlet and outlet ports.

AIR ELIMINATOR INSTALLATION.

The Air Eliminator assembly is installed in the reverse order of the removal steps.

Ensure the inlet and outlet port guides, under the eliminator assembly are installed and aligned correctly. Ensure the gaskets are in good order and the mounting screws are tight.

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SECTION 8 TROUBLESHOOTING

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 Lowline Mk3 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 different product motors 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 5, 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 is 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 5 appears on the main display.	1. Power down and up to clear the condition. 2. Check all display cables and links on the display interconnect PCB.
Err 6 appears on the main display.	1. Push Managers Keypad button 5 to clear. If the problem persists, check the Valve Index Numbers of each valve and repair or replace the valves as required.
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. At the pulser box end, check each cable pin terminal is fully inserted into the connector housing. • Replace Pulser Box for the hose that was in use when the error occurred.

Displays (Continued)	
Flow stops during delivery.	3. Check that the Air detection switch of the pump unit is operational (Refer Self Tests) and is plugged in. 4. Check for leaks in the incoming pipes and fittings. 5. Check all pipe flanges are tight. 6. 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 then one or more display cables are not plugged in correctly or the display I/C PCB is missing one or more Links
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 240VAC is OK. 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 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. 2. Replace relevant Valve assembly. 3. Check Pump unit components. Inlet strainer not blocked, inlet check valve, Bypass valve and Control Pressure valves are not jammed.
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.

Table 6 - Fault Finding – Symptoms and Corrections

GPU-90 TROUBLE SHOOTING GUIDE

CAUTION

Maintenance must be performed by qualified technicians only.

Refer to separate GPU-90 subassembly sections for corrective action steps.

Trouble Shooting

Use of Vacuum (at the Air Test Plug) and Pressure (at the Control Valve cover) Gauge Readings to Troubleshoot problems.

There are a variety of conditions that can contribute to no delivery or slow delivery.

A pressure/vacuum gauge is a useful tool in determining whether the problem is on the vacuum side or pressure side of the pump.

The vacuum gauge reading can help you determine if there are restrictions of flow in the suction piping system. It will also help you determine the ability of the pumping unit to pump.

To test the vacuum of the pump, follow this procedure:

1. Remove the pipe plug in the center of the strainer or rear cover. The cover is marked for easy identification.
2. Install the vacuum gauge.
3. Start the pump and open the nozzle to full flow for a true reading.
4. With the nozzle open, a normal vacuum reading is 20 – 27 KPA (6-8 inches of mercury) for normal suction.
5. With the nozzle closed, a normal vacuum reading is 0.

To test the pressure of the pump, follow this procedure:

1. Remove the pipe plug in the centre of the control valve cover. Covers are marked for easy identification.
2. Install the pressure gauge.
3. Start the pump and open the nozzle to full flow for a true reading.
4. With the nozzle open, a normal pressure reading is 111 – 125 KPA (16-18 pounds per square inch) pressure. With the nozzle closed, a normal pressure reading is 172 – 193 KPA (25-28 pounds per inch).

Typical Service Issues and possible causes

PROBLEM	CAUSE	ACTION
The pump runs, but there is no delivery or it is slow.	The fuel supply level is low or below the suction stub in the storage tank.	Fill the storage tank.
	The strainer screen or filter assembly has a partial obstruction.	Remove obstructions from the screen or filter assembly
	The bypass valve is not seated properly.	Check the valve for an obstruction causing the valve to stay open
	The v-belt is loose.	Adjust the v-belt – or replace if worn.
	A blade or blades in the rotary pump will not move in the slot(s).	Check the rotor and blades for damage. Replace the blades and/or rotor, if necessary.
	There is a slow leak in the suction line or connections below the check-valve.	Check inlet vacuum with gauge at Air-test port. If bursts of air are felt while holding a finger on the vent tube, the suction intake may be damaged. Repair or replace pipes / connections.
	The intake foot valve or vertical check valve is partially obstructed.	Clean or replace the suction line components.
	The control valve is partially obstructed.	Check the valve for an obstruction or replace if required.
	There is an obstruction in the Air separation / Float chamber.	Clear any obstruction in the chamber. Check that the float and return valve close and operate freely.
	Two pumps are connected to one storage tank with one suction line.	Disconnect the vent line on the idle pump. Install a copper tube in place of the vent line. Place the end of the tube in a small container of fuel. Run the opposite pump with the nozzle open, if the level of fuel in the small container drops then the check valve in the idle pump is faulty. Replace the check valve.
No delivery after period of non-use. (First delivery in the morning.	Drain-Back	Check valves not seating due to dirt on seal surface. Remove and clean.
	Leaks	Check for leaks in pipes and fittings between tank and check-valve.

PROBLEM	CAUSE	ACTION
Noise	Cavitation	Low fuel in tank
		Damaged rotor blades, replace.
		Poor installation quality, too many bends or poor surface finish.
		Temperature – check that tank lines are not too close to the forecourt surface.
	Damaged parts or loose pulley.	Replace pulley if it has been running loose, replace rotor if damaged. Worn main bearings will require a whole pump cartridge change.
The dispenser does not deliver an accurate amount of product.	a. The meter needs calibration.	Check calibration test equipment for accuracy. Calibrate the meter.
	b. Air Eliminator is faulty.	Do test deliveries while opening and closing the air test point. Flow rate should drop when test point is open. If no change in flow rate replace GPU-90 or Air Eliminator in pump body.
There is fuel running out the vent tube opening when the pump is in operation.	a. There is an obstruction in the atmospheric float valve. The valve is being held closed.	Clean the float and valve area. Make sure the float opens completely.
	b. The suction chamber in the pump is flooded. * (above ground tank). * Not recommended.	Check the storage tank level. If it is higher than the pumping unit, the condition will continue. Install a Tokheim 52 line valve.
The display jumps when the pump is turned on.	a. The control valve is not seated properly.	Check the valve for an obstruction between the o-ring and the seat. Inspect the o-ring for damage. Replace the valve or o-ring, if needed.
	b. There is an obstruction in the expansion relief dill valve.	Check the valve by pulling the spring loaded seat. Clean any foreign matter from the valve. To instill the dill valve in the control valve, use a valve tool.
	c. The gaskets are leaking.	Replace worn gaskets.
	d. There is a worn nozzle.	Replace the nozzle.
	e. There is a leak in the hose.	Replace the hose.
	f. Temperature extremes cause the liquid to expand & contract.	Problem will be solved when the pump begins to operate.

Table 7 - GPU-90 Problem Investigations

SECTION 9 SPECIFICATIONS

REQUIREMENTS	**Voltage**	240VAC -15% +10% 50Hz single phase.
	Current	12 amps. **Maximum**
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 9*0 litres per minute – for one nozzle
OPERATING TEMPERATURE RANGE		-25°C to +55° (Factoty tested to 60 °C)
OPERATING HUMIDITY RANGE		5% to 95% relative humidity – non-condensing
TOTALS	**(Electro-Mechanical)**	
	Volume by Grade (Electronic)	To nearest whole litre up to 9,999,999 litres
	Volume by Hose	To nearest 1/100th litre up to 99,999,999.99 litres
	Money by Hose	To nearest Dollar up to 9999,999,999 dollars
	Total Number of Transactions	Up to 9,999
	Total Number of Preset Transactions	Up to 9,999
OPERATING NOISE LEVEL		Less than 75 dB at a distance of 1 meter
NOZZLES		Normally fitted with a manual Elaflex ZVA 19 (19mm) nozzle. (High and Ultra Hi flow models require different nozzles.)
APPROVALS	**Statutory Requirements**	To NMI & OIML Requirements
	Safety	To ANZEx Ex standards.
	EMC	To Australian Communications Authority requirements.

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SECTION 10 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

SIX HOSE PUMP OR DISPENSER

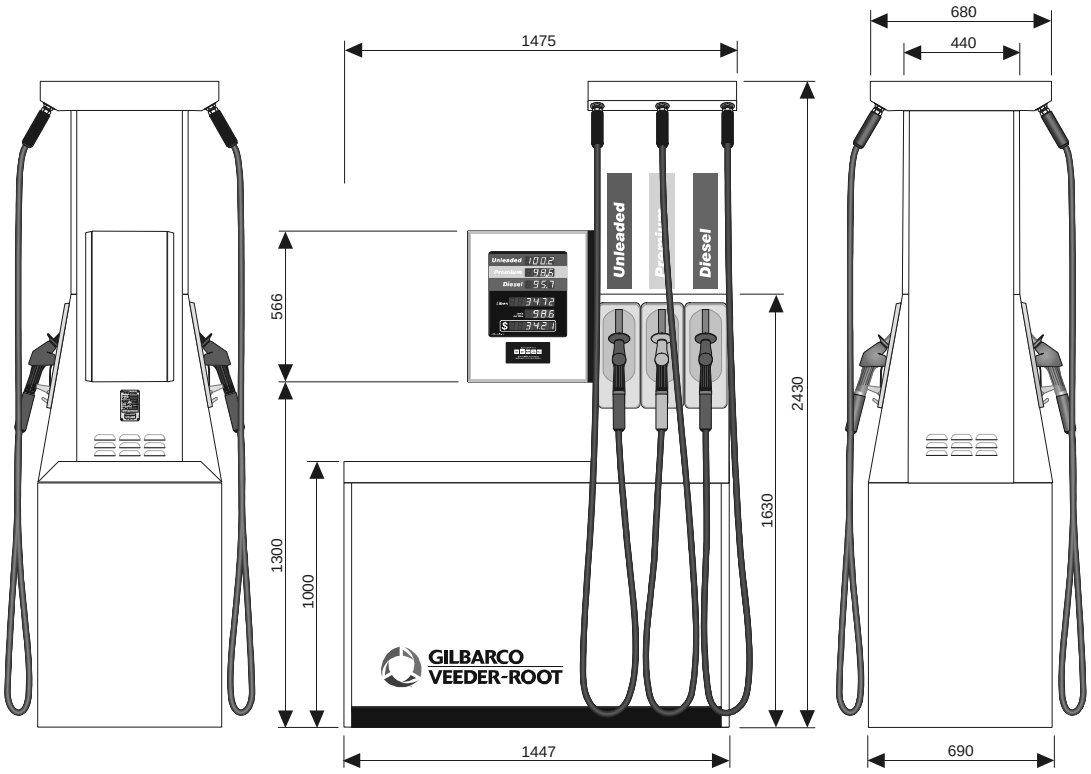

Figure 48 – Dimensional view – Six Hose- Pump or Dispenser

MAINS JUNCTION BOX

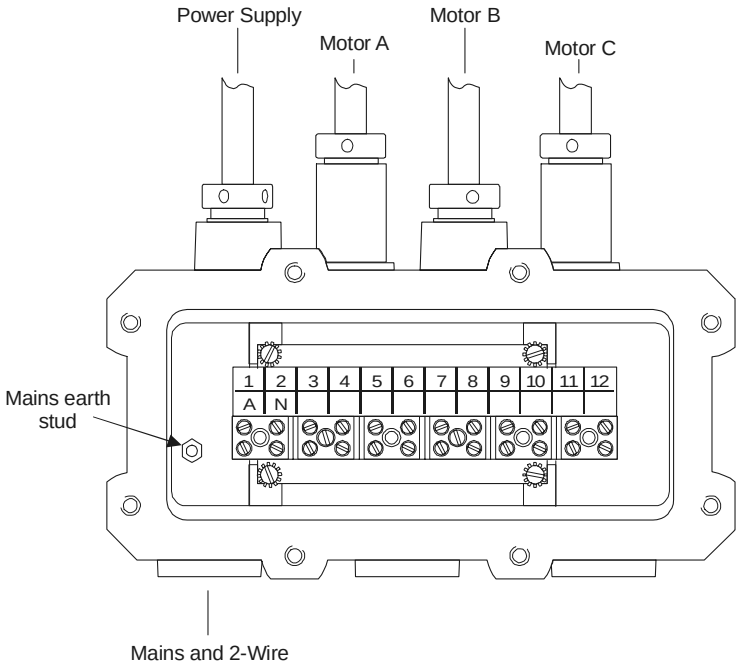

Figure 49 – Mains J-Box for Lowline Mk3 Pumps

MAINS JUNCTION BOX TERMINAL WIRING

Terminal	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**EARTH STUD**
Designation	Active	Neutral	Filtered Neutral	Motor A /STP A	Motor A Neutral	Motor B / STP B	Motor B Neutral	Motor C / STP C	Motor C Neutral		Loop +	Loop –	Earth
Power Supply Cable DR09458-001	RED	BLACK	BLUE	VIOLET		ORANGE		BROWN			WHITE	GREY	GRN/YL
Neutral link		BLUE			BLUE		BLUE		BLUE				
3 Product Pump				Motor A 1 & 3	Motor A 2 & 4	Motor B 1 & 3	Motor B 2 & 4	Motor C 1 & 3	Motor C 2 & 4				Motor A, B, C earth
2 Product Pump Normal Flow				Motor A 1 & 3	Motor A 2 & 4			Motor C 1 & 3	Motor C 2 & 4				Motor A, C earth
2 Product Pump Mixed Flow				Motor A 1 & 3	Motor A 2 & 4	Motor B 1 & 3	Motor B 2 & 4	Motor C 1 & 3	Motor C 2 & 4				Motor A, B, C earth
FIELD WIRING													
Mains INPUT	**X**	**X**											**X**
Comms INPUT											**X**	**X**	
DISPENSER WIRING													
3 Product Dispenser INPUT			**X**	**X**		**X**		**X**					
2 Product Dispenser INPUT			**X**	**X**				**X**					

Note: Any unused incoming cables most be terminated safely. They may be connected to the earth terminal.

Table 8 - Mains J-Box Wiring

VALVE JUNCTION BOX(S)

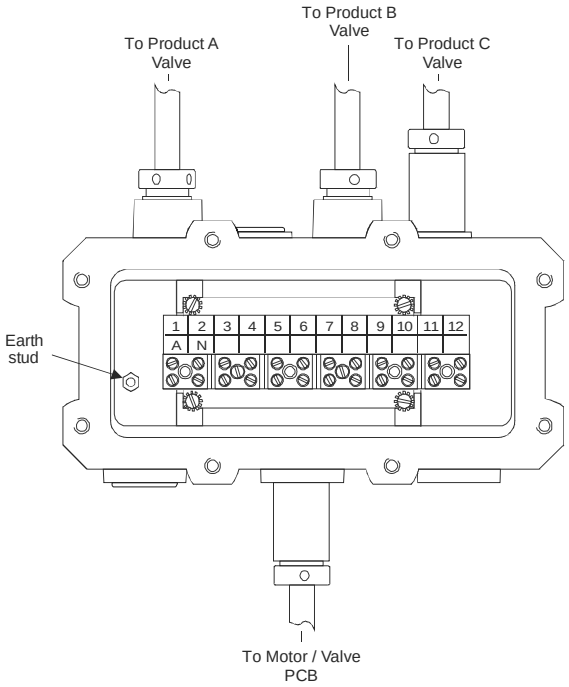

Figure 50 – Valves J-Box(s) Lowline Mk3 Pumps and Dispensers

See following table for connection details.

VALVE JUNCTION BOX TERMINAL WIRING

Terminal Designation	**1** F or R Prod. A Normal	**2** Neutral	**3** F or R Prod. A Slow	**4** Earth	**5** F or R Prod. B Normal	**6** Neutral	**7** F or R Prod. B Slow	**8** Earth	**9** F or R Prod. C Normal	**10** Neutral	**11** F or R Prod. C Slow	**12** Earth	**Earth Stud**
3 Product	Brown	Blue	White	Grn/Yl	Brown	Blue	White	Grn/Yl	Brown	Blue	White	Grn/Yl	-
2 Product	Brown	Blue	White	Grn/Yl	-	-	-	-	Brown	Blue	White	Grn/Yl	-
Motor Valve Cable DN09498	Brown	Blue	White	-	Red	-	Black	-	Orange	Grey	Viloet	-	Grn/Yl

Table 9 - Valve J-Box(s) Wiring

Note: Wiring is common for both Front and Rear Valve J-Boxes.
2 off Neutral Link Cables DK09288-002 are wired between terminals 2, 6 & 10
2 off Earth Link Cables DK09288-001 are wired between terminals 4, 8 & 12
Earth Link Cable DK09499 is wired between terminal 4 and earth stud in junction box.

MOTOR & VALVE PCB WIRING CONNECTIONS

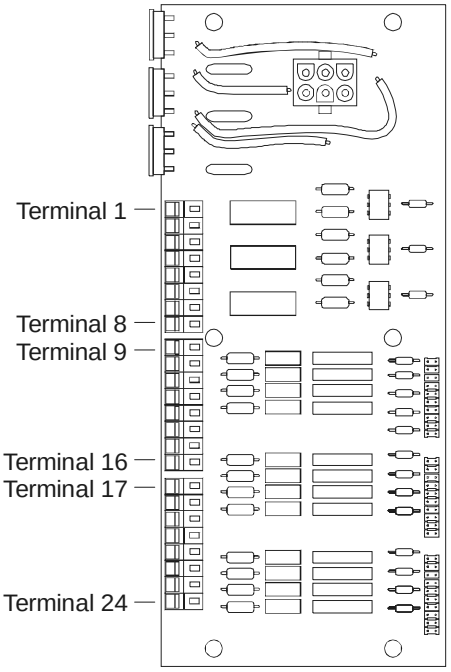

Figure 51 – Motor/Valve PCB – Layout.

Terminal Designation	**PT 1** Front Prod. A Normal	**PT 2** Neutral	**PT 3** Front Prod. A Slow	**PT 4** Earth	**PT 5** Rear Prod. A Normal	**PT 6** Neutral	**PT 7** Rear Prod. A Slow	**PT 8** Earth	**PT 9** Front Prod. B Normal	**PT 10** Neutral	**PT 11** Front Prod. B Slow	**PT 12** Earth	**PT 13** Rear Prod. B Normal
3 Product	Front JB Brown	Front JB Blue	Front JB White	-	Rear JB Brown	Rear JB Blue	Rear JB White	-	Front JB Red	-	Rear JB Black	-	Rear JB Red
2 Product	Front JB Brown	Front JB Blue	Front JB White	-	Rear JB Brown	Rear JB Blue	Rear JB White	-	Front JB Red	-	Rear JB Black	-	Rear JB Red

Terminal Designation	**PT 14** Neutral	**PT 15** Rear Prod. B Slow	**PT 16** Earth	**PT 17** Front Prod. C Normal	**PT 18** Neutral	**PT 19** Front Prod. C Slow	**PT 20** Earth	**PT 21** Rear Prod. C Normal	**PT 22** Neutral	**PT 23** Rear Prod. C Slow	**PT 24** Earth	**Earth Stud on CDM chassis**
3 Product	-	Rear JB Black	-	Front JB Orange	Front JB Grey	Front JB Violet	-	Rear JB Orange	Rear JB Grey	Rear JB Violet	-	Front JB Grn/Yel Rear JB Grn/Yel
2 Product	-	Rear JB Black	-	Front JB Orange	Front JB Grey	Front JB Violet	-	Rear JB Orange	Rear JB Grey	Rear JB Violet	-	Front JB Grn/Yel Rear JB Grn/Yel

Table 10 - Motor / Valve PCB Wiring connections

VAPOUR BARRIER CABLE AND GLAND POSITIONS

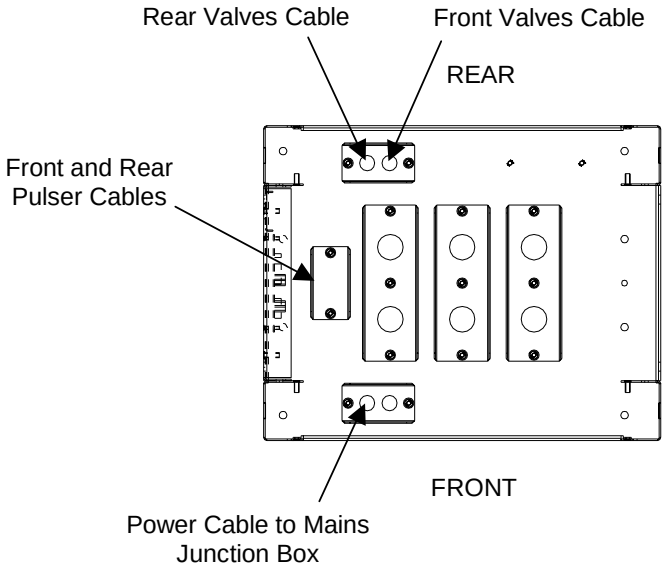

Figure 52 – Vapour Barrier Cable Position, Column Horizontal Barrier

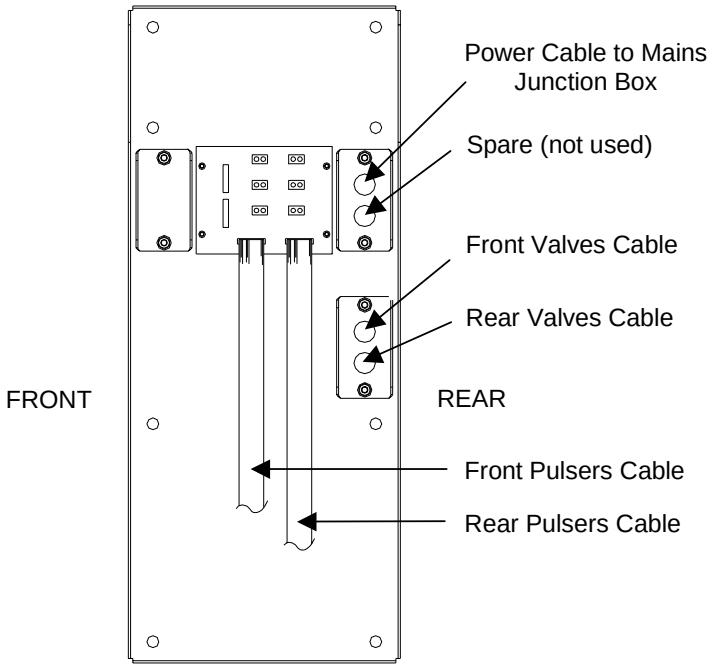

Figure 53 – Vapour Barrier Cable Position, CDM Vertical Barrier

NOZZLE SWITCH ASSIGNMENTS

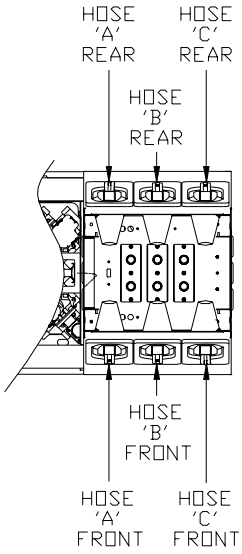

Figure 54 – Nozzle Switch Assignment Positions

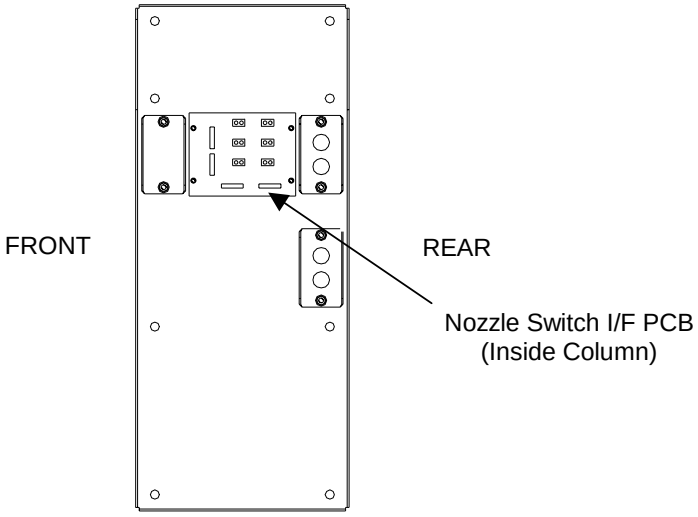

Figure 55 – Nozzle Switch I/F PCB – Column mounting position

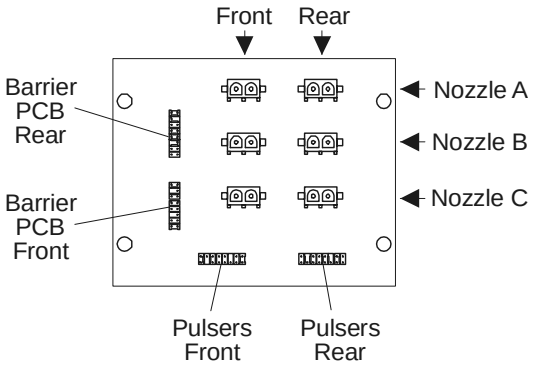

Figure 56 – Nozzle Switch I/F PCB – Cable plug positions

CABLE INTERCONNECTION DIAGRAMS

SIX HOSE THREE PRODUCT PUMP OR DISPENSER

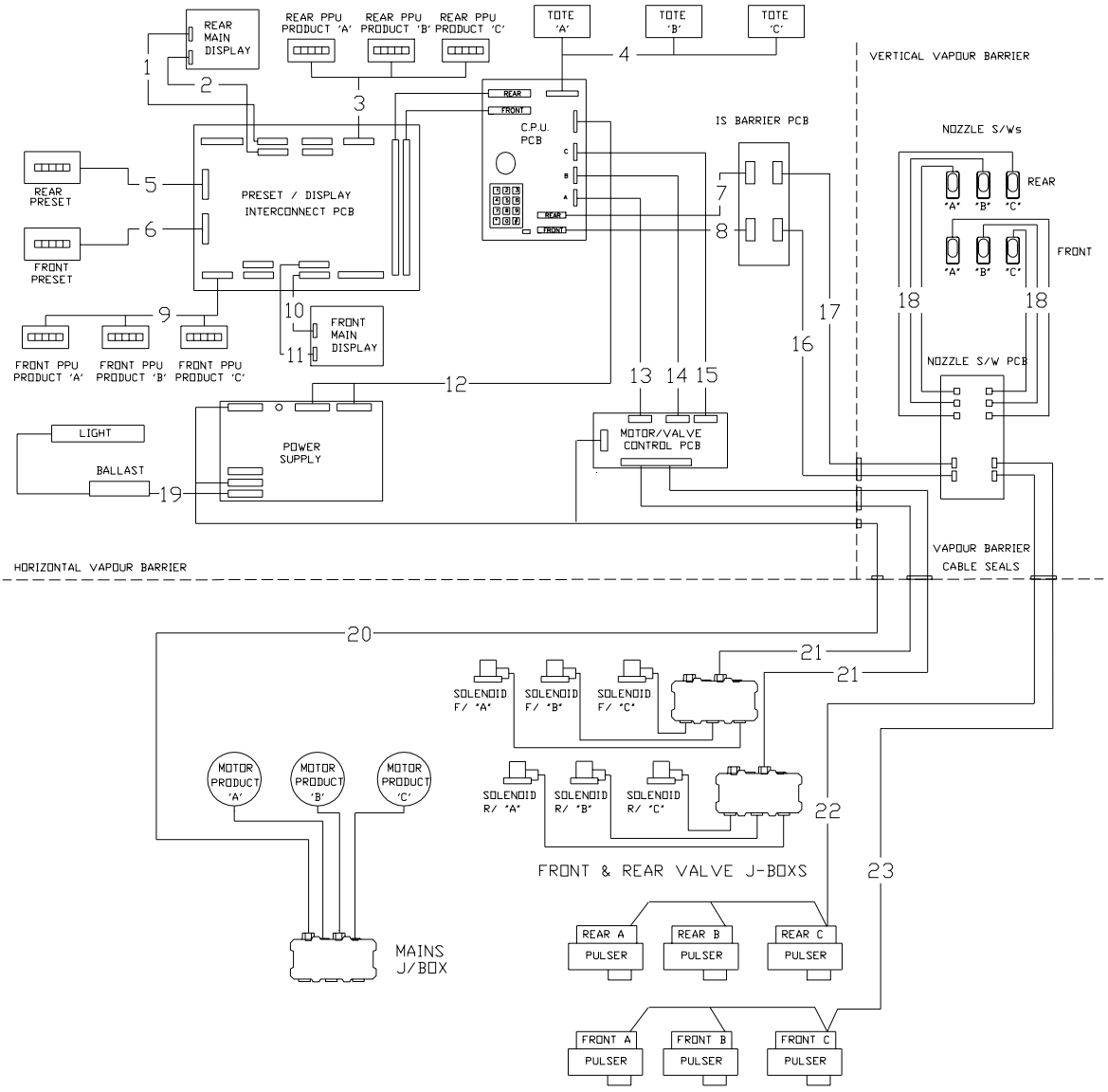

Figure 57 – Cabling Diagram – Six Hose Three Product Lowline MK3 Pump and Dispenser

Ref.	Part Number	Cable Description
1	DN09234-027	Segment Select Rear Display
2	DN09234-028	Digit Select Rear Display
3	DN04538-012	PPU Rear Display
4	DN09455	CPU to Totes
5	DN09234-004	Preset Touch Pad Rear
6	DN09234-003	Preset Touch Pad Front
7	DN09234-019	CPU to ISB PCB Rear
8	DN09234-018	CPU to ISB PCB Front
9	DN04538-011	PPU Front Display
10	DN09234-025	Segment Select Front Display
11	DN09234-026	Digit Select Front Display
12	DN09203	Power Supply to CPU
13	DN09234-020	Product A CPU to Motor Valve PCB
14	DN09234-021	Product B CPU to Motor Valve PCB
15	DN09234-022	Product C CPU to Motor Valve PCB
16	DN09234-023	ISB PCB to Nozzle PCB Front
17	DN09234-024	ISB PCB to Nozzle PCB Rear
18	DN06521-003	Nozzle Switch Medium
19	DN09464-001	Lighting
20	DR09458-001	Power
21	DN09498	Valve Junction Box to Motor Valve PCB
22	DR08111-011	Nozzle PCB to IS Pulser Rear
23	DR08111-010	Nozzle PBB to IS Pulser Front

Table 11 - Cables

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LIST OF FIGURES

LIST OF TABLES

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