

EBSRAY PUMPS

**INSTALLATION, OPERATION &
MAINTENANCE INSTRUCTIONS**



CE

R SERIES MODEL RX10

***.... For Submersible
LPG APPLICATIONS
(50Hz & 60Hz)***



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IMPORTANT NOTES

1. This Publication is **TYPICAL ONLY** and only relates to the specifications of the minimum equipment required to ensure the optimum performance, maximum life and trouble-free operation of the Ebsray RX10 - 3.7 kW Submersible Pumpset and the pumping system in general.
2. Products with the mandatory European CE mark affixed indicate conformity to the essential health and safety requirements via their applicable EU Directives (eg. ATEX 94/09/EC, Machinery 98/37/EC etc).
As certain specific products/equipment outlined in this Publication are CE marked (meaning the equipment has been assessed and supplied in conformity to those Directives), **STRICT ADHERENCE** with **ALL** the Instructions and Recommendations forms an essential part in maintaining the product/equipment's conformity.
Failure to comply with the Instructions and Recommendations contained in this Publication may void CE conformity.
3. This Publication does **NOT** depict:
 - a) Ancillary required equipment related to the fabrication, installation and operation of the pumpset e.g. miscellaneous flanges, fittings etc.
 - b) Required equipment unrelated to the pumpset e.g. tank fill lines, vapour return lines, emergency shutdown systems etc.
 - c) The materials and method of fabrication and/or installation of the tank and required sub-systems.
4. It is the responsibility of the designer, fabricator and the installer of each actual tank and required sub-systems to ensure that:
 - a) The Ebsray specifications within this Publication and any other relevant Ebsray Documents are **STRICTLY** adhered to.
 - b) Any variation (including use of equipment deemed "Equivalent") or addition to the Ebsray Specifications, as related to the Pumpset and pumping system in general, meet Ebsray's Minimum requirements.
 - c) All design, fabrication and installation of the tank and sub-systems is **STRICTLY** in accordance with all relevant Federal, State and Local Codes, Regulations and Standards.
5. Ebsray reserves the right to:
 - a) Withdraw or alter any or all of the Ebsray Specifications within this publication and any other relevant Ebsray Documents without notification.
 - b) Determine the validity of Any Warranty claims for Ebsray Equipment based on the Proper Application of Ebsray Supplied Equipment by the way of Adherence to the Ebsray Specifications within this Publication and any other relevant Ebsray Documents.

Terms used in this publication requiring special attention:

1.  **DANGER**
Non-compliance with requirements under this heading could create circumstances which may lead to serious personal injury or death or substantial property damage.
2.  **WARNING**
Non-compliance with requirements under this heading could create circumstances which may lead to personal injury and/or which may cause damage to the pumpset and or ancillary equipment.
3.  **CAUTION**
Items under this heading draw attention to legal and/or statutory requirements which control the installation and use of this type of equipment. Non-compliance with these requirements may create a dangerous situation and/or result in damage to the pumpset and ancillary equipment.
4. **NOTE**
Items under this heading are to draw attention to assembly procedures, techniques and methods of operation etc. which are important to ensure correct installation and operation of equipment and which, if not followed, may result in damage, failure or poor performance of pumpset and ancillary equipment.

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SECTION 1 - GENERAL

1.1 INTRODUCTION

This publication is intended to assist those involved with the installation, operation and maintenance of EBSRAY Model RX10 Regenerative Turbine Submersible Pumpset and the pumping system.

 **DANGER** Before starting any work, this publication should be completely read/reviewed by all persons involved with the work. If any part of this publication is unclear, obtain clarification before proceeding with any work.

 **DANGER** As LPG (propane and butane) is regarded as a flammable liquid, extreme caution must be taken to ensure total compliance with all necessary statutory standards, directives, codes and regulations is fully understood and exercised in the installation, operation and maintenance of EBSRAY RX10 pumpsets. These instructions are intended to assist correct pump installation, operation and maintenance requirements. They are additional to, and do not supersede or override any applicable statutory, legal or regulatory requirements.

 **CAUTION** Installation and servicing of this equipment should be performed by qualified competent personnel in accordance with relevant directives, standards, codes, regulations and site restrictions, in conjunction with these instructions.

When the equipment supplied utilises components other than those manufactured by EBSRAY e.g. electrical equipment, switches, fittings, valves, etc reference should be made to the original manufacturer's data before installation or servicing is commenced. Failure to observe these details may void the Warranty.

 **WARNING** The pumpset must be operated within the original selected design parameters of flow, pressure, temperature, voltage and current with LPG of internationally accepted (ISO) quality and specification only. Should any change be contemplated, please confer with EBSRAY in order to verify the suitability of such a change.

1.2 TRANSPORTATION AND PACKING

Standard domestic packing is suitable for shipment in covered transports. Pump ports must be sealed to exclude ingress of condensation, moisture or foreign material. When received on site the pump must be stored in a dry covered area. Motor leads must not be damaged.

NOTE If Pumpset is not installed and commissioned immediately, special preservative techniques will be required. (refer to EBSRAY). e.g. If the pumpset is installed, but not commissioned, low pressure nitrogen can be used to purge and seal the pump chamber to protect pumpset from the effects of condensation.



WARNING

Never allow water or any corrosive product to enter the pump, motor or electrical conduit. This may damage the pumpset and will void the warranty.

1.3 RECEIVING INSPECTION

SHORTAGES and/or DAMAGE: On receipt of equipment, check all items against the dispatch documents and inspect for damage. Any damage or shortage incurred during transit should be noted on the packing note and on both your own and the carrier's copy of the consignment note. A claim should be made immediately on the transport company. Also advise EBSRAY or their appointed Representative. Should a shortage be evident on receipt, notify EBSRAY immediately giving full details and packing note number.

1.4 HANDLING

Do not drop Pumpset! Care should be taken in moving/handling pumpsets. A sling should be placed under or around a pumpset in order to minimise stress on the internal components. The pumpset should be lifted in such a manner as to ensure compliance with the relevant lifting codes. **Severe internal pumpset damage may result if correct handling and due care is not taken.**



WARNING

No welding is to be performed on any part of the system (discharge piping, vapour returns, conduits etc.) with pumpset/wires installed. Failure to observe this warning could result in severe motor and/or wiring damage and will void the warranty.

1.5 WARRANTY

1. All EBSRAY manufactured pumps and equipment are warranted as standard for one (1) year against faulty workmanship and/or materials. Refer RX10 exceptions below.
2. A two (2) year **or** 7,500 hours (whichever occurs first) New Pump Warranty applies on RX10 Pumpsets when installed and operated in conjunction with the Ebsray Control Console and in strict accordance with the system design and recommendations as set out in the current EBSRAY IO & M Data supplied with each pumpset.
3. RX10 Pumpset Warranty is void if the pumpset is installed and operated either **without** the EBSRAY Control Console **or** PLC installed and connected.
4. To validate Warranty conditions, a completed copy of the RX10 Inspection Run Log (Appendix E) **MUST** be completed in full and returned to EBSRAY. Failure to do so may void the Warranty.
5. Refer to EBSRAY or Factory Appointed Representative for further details on the RX10 Pumpset Warranty conditions.
6. Ancillary equipment supplied by EBSRAY but manufactured by others will be in accordance with those manufacturer's written warranty conditions.

SECTION 2 – SYSTEM DESCRIPTION

2.1 EBSRAY RX10 SUBMERSIBLE LPG PUMPING SYSTEM

The system is designed around the RX10 Submersible Pumpset which is a single stage Regenerative Turbine Pump, close coupled to a 3.7 kW Submersible Electric Motor (See Certifications APPENDIX F).

The combination of robust, specially designed, 'product lubricated' bearings using EBSRAY's unique BCL™ (Bearing Cooling and Lubrication system) and the EBSRAY "Three-Tier" Protection System ensures reliable operation over the intended periods between routine maintenance overhauls.

The EBSRAY RX10 is designed as a 'fully serviceable' pumpset.

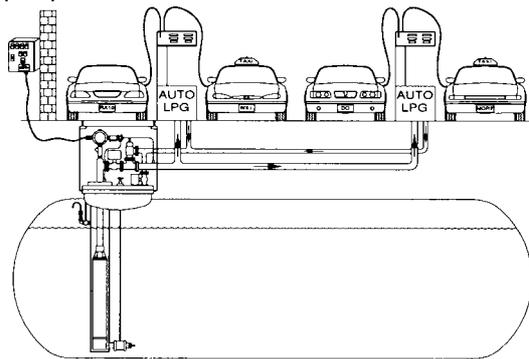


Figure 1

2.2 EBSRAY RX10 SUBMERSIBLE LPG PUMPSET

EBSRAY BCL™ (Bearing Cooling and Lubrication system)

In order to understand the operational and protection system requirements of the RX10 pumpset, some knowledge of the BCL™ system is required.

One of the key elements for optimal performance and longevity of any submersible motor/pump is to cool and lubricate the sleeve bearings. In order to cool and lubricate effectively, the LPG must remain in the liquid state **at all times**. As heat is absorbed by the LPG during its circulating/lubricating cycle, any excessive drop in pressure or increase in temperature would cause it to 'flash off' into vapour. This would in turn cause either a loss of lubrication and cooling or inject vapour into the liquid being pumped. Both these situations would be detrimental to pump service life and performance.

A - B (see figure 2)

At all times during operation, cool LPG at pump discharge pressure must be delivered through the thrust bearing assembly, through the lower motor bearing, through the gap between the stator and rotor and also through the upper motor bearing.

B - C (see figure 2)

Directly above the upper motor bearing is a temperature monitoring switch. From this area, LPG is returned and cooled via a spiral tube, (within the cooler pump discharge liquid) and finally returning into the intermediate pressure area of the impeller.

Adequate differential pressure is critical to maintain this internal flow and to maintain the liquid state of the LPG.

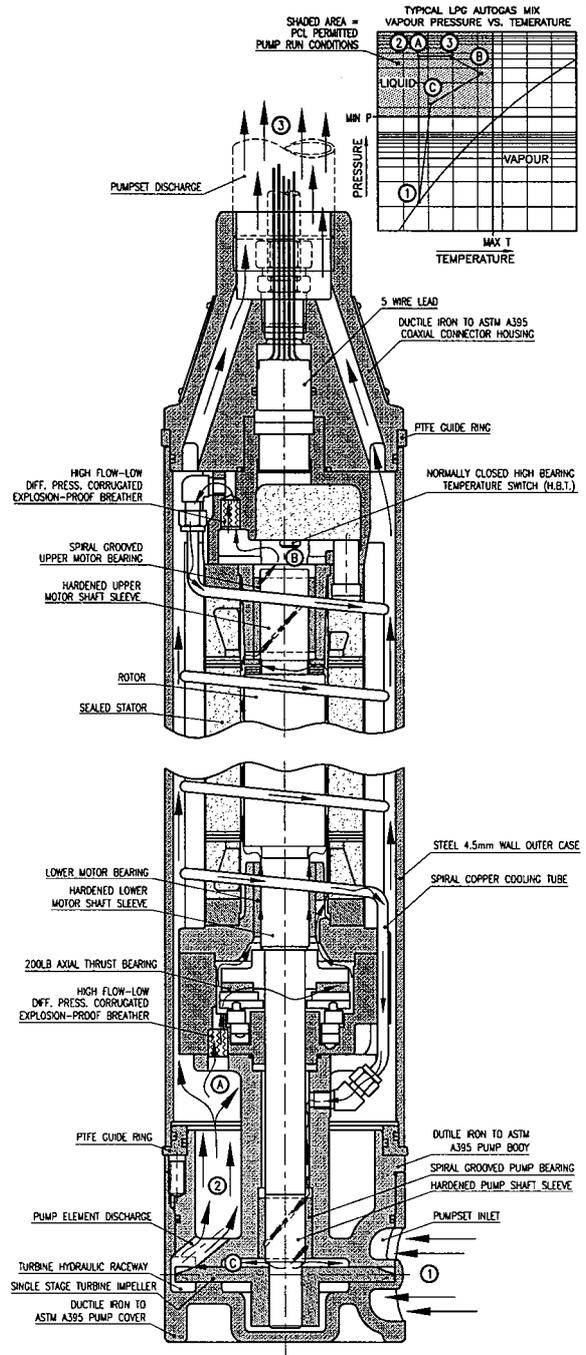


Figure 2

2.3 "THREE-TIER" PROTECTION SYSTEM

The EBSRAY "Three-Tier" Protection System forms an integral part of the pumping system. (Refer Warranty) It ensures proper pumpset performance as outlined previously. The basic functions of this system are as follows:

1. **'HBT'** (High Bearing Temperature) Operation of the system will be halted if fluid within the BCL™ System exceeds a preset temperature.
2. **'DPS'** (Differential Pressure Switch) Operation of the system will be halted if Differential Pressure falls below a preset level during operation or is not developed above the minimum level within a preset time after startup.

3. 'MOL' (Motor OverLoad) Operation of the system will be halted if motor current exceeds a preset maximum setting.

Following automatic pumpset shutdown from any of the above three functions requires access to the Control Console for reset. Reset is protected by a keylock. i.e. the fault can be isolated for 'controlled' assessment and fault rectification prior to reset and re-start.

**2.4 PPV™ VALVE
(POSITIVE PRESSURE VENTILATION VALVE)**

The PPV™ Valve's low opening/closing pressure allows equalisation of liquid level in the pump housing when the pump is not operating. In addition it prevents rapid dropping of the liquid level in the pump housing during start up, thus enabling maximum utilisation of the tank's capacity. Correct installation (vertically mounted) is essential for proper functioning of the PPV™ Valve.

2.5 BYPASS VALVE - EBSRAY MODEL RV18-NRV

The Bypass Valve plays a pivotal role in the overall LPG system. It controls the following functions:

1. Maintains pump system differential pressure as required for optimum flow rate into vehicles.
2. Enables the RX10 pumpset BCL™ System pressure requirements to be met and maintained.
3. Forms an integral part of the overall "Three Tier" protection system function.
4. Softseat 'backcheck' function helps to eliminate LPG drain-back when pump is idle.

2.6 DIFFERENTIAL PRESSURE SWITCH

To ensure adequate (lubrication/cooling) flow through the Pump/Motor internals, overall pumping system differential pressure is monitored and kept above a predetermined minimum level.

The Differential Pressure Switch signals the Control Console if the minimum system differential pressure:

- a) Is not attained on startup after the preset time delay.
- b) Falls below the predetermined pressure during pumping/operation of the Pumpset.

2.7 CONTROL CONSOLE (EBSRAY # C860001)

The Control Console houses the control circuits which provide the link between the power supply, the Pumpset and the various sensing and monitoring devices.

The Control Console also houses the "Three Tier" protection system PLC indicators and the key protected switches for control of Pumpset operation. In addition to these Red fault indicators, the Control Console has a Green indicator (C.C.) to indicate that the control circuit is energised. An Hour Run meter is provided for monitoring pumpset usage time. Access to the Control Console internals is secured by a keyed locking door.

**2.8 EBSRAY LPG SYSTEM CONTROLLER
(EBSRAY # C860101)**

A complete LPG System controller C860101 is available which combines all the functions of the standard Control Console with added functions such as Emergency Stop air switching, Voltage free contact for dispenser control etc. (Refer EBSRAY for details)

2.9 LIST OF SYSYTEM COMPONENTS

a) COMPONENTS SUPPLIED BY EBSRAY (refer P & ID Appendix A for corresponding Item #)

ITEM #	DESCRIPTION	QTY
1.	EBSRAY MODEL RX10 - 3.7 kW SUBMERSIBLE PUMPSET	1
2.	EBSRAY 'THREE-TIER' PROTECTION PLC MOTOR CONTROL CONSOLE - IP55 # C860001 ...	1
3.	DIFFERENTIAL PRESSURE SWITCH (DPS) - ¼" (F)NPT PRESSURE PORTS ½" (M)NPT ELECTRICAL CONDUIT # C860202	1

FOLLOWING ITEMS 4 & 5 ARE ALTERNATIVES.

ONLY ONE (ITEM 4 OR ITEM 5) IS REQUIRED FOR EACH INSTALLATION.

4. ELECTRICAL FITTING KIT # K860400 CONSISTING OF:
 - 4A JUNCTION BOX - Ex d WITH 1 x ½" NPT and 3 x M25 CONDUIT ENTRIES,
8 x 2.5 mm TERMINALS and 2.5 mm GROUND TERMINAL # C860400 1
 - 4B ¾" (F)NPT x.25(F)M CONDUIT SEAL - Ex d WITH COMPOUND # C860421 1
 - 4C 25(M)M HEX NIPPLE - Ex d # C860460 1
 - 4D 25(M)M PLUG - Ex d # C860465 1
 - 4E ARMOURED CABLE BARRIER GLAND Ex d U # C860470 1
5. ELECTRICAL FITTING KIT # K860403 CONSISTING OF:
 - 5A JUNCTION BOX - Ex d WITH 8 x M25 CONDUIT ENTRIES,
12 x 2.5 mm TERMINALS AND 2.5 mm GROUND TERMINAL # C860401 1
 - 5B ¾" (F)NPT x 25(F)M CONDUIT SEAL - Ex d WITH COMPOUND # C860421 1
 - 5C ½" (F)NPT x 25(M)M ADAPTOR - Exd #C860451 1
 - 5D 25(M)M HEX NIPPLE - Ex d # C860460 1
 - 5E 25(M)M PLUG - Ex d # C860465 5
 - 5F ARMOURED CABLE BARRIER GLAND Ex d U # C860470 1

FOLLOWING ITEMS 6 & 7 ARE ALTERNATIVES.

ONLY ONE (ITEM 6 OR ITEM 7) IS REQUIRED FOR EACH INSTALLATION.

6.	ANGLED TUBE FITTING KIT # K850500 CONSISTING OF:	
6A	3/4" (M)NPT x 3/4" TUBE CONNECTOR - SS # C850500.....	1
6B	3/4" (M)NPT x 3/4" MALE ELBOW - SS # C850520.....	1
6C	1" (M)NPT x 3/4" TUBE CONNECTOR - SS BORED THROUGH # C850540	1
7.	STRAIGHT TUBE FITTING KIT # K850501 CONSISTING OF:	
7A	3/4" (M)NPT x 3/4" TUBE CONNECTOR - SS # C850500.....	2
7B	1" (M)NPT x 3/4" TUBE CONNECTOR - SS BORED THROUGH # C850540	1
8.	EBSRAY PPV™ VALVE INTERNAL MOUNTING KIT # K850001 CONSISTING OF: (REFER TO ITEMS 30 - 33 FOR EXTERNAL PPV VALVE MOUNTING)	
8A	EBSRAY PPV™ VALVE (POSITIVE PRESSURE VENTILATION VALVE)	
	1/2" (F)NPT x 1/2" (F)NPT # C850001	1
8B	1/2" (M)NPT x 3/8" TUBE CONNECTOR - BRASS # C850510.....	1
8C	x 3/8" OD x 1.2mm WALL U-TUBE - COPPER # C850600.....	1
9.	EBSRAY 'RV18 NRV' (NON RETURN VALVE) BYPASS VALVE FLANGED	
	25mm NB ANSI 300LB, 500 - 900 kPa (5 – 9 Bar) DIFFERENTIAL PRESSURE RANGE	1
11.	63mm, 0-2500 kPa (0 –25 Bar) PRESSURE GAUGE # C850400.....	2

b) COMPONENTS SUPPLIED BY OTHERS (Refer to P & I D Appendix A for corresponding Item #)

ITEM #	DESCRIPTION	QTY
12.	2" (M)NPT EXCESS FLOW VALVE REGO A3500L4 (OR EQUAL).....	1
13.	50 NB Sch' 80 PIPE (DISCHARGE RISER) THREADED 2" (M)NPT ON PUMP END [LENGTH AS REQUIRED]	1
14.	150 NB Sch'40 OR Sch'80 PIPE (PUMP HOUSING) [PART OF PRESSURE VESSEL].....	1
15.	8 NB BALL VALVE	1
16.	VAPOUR BALANCE CLOSING MECHANISM WITH GLAND.....	1
17.	PUMP INLET CLOSING MECHANISM WITH GLAND	1
18.	8 NB VALVE	4
19.	32 NB (MIN) Sch'40 PIPE (PUMP DISCHARGE)	1
20.	1/4" OD x 0.9 WALL SS TUBING.....	1
21.	1/4" (M)NPT x 1/4" TUBE CONNECTOR - SS.....	4
22.	3/4" OD x 1.6 WALL SS TUBING (ELECTRICAL CONDUIT) [LENGTH AS REQUIRED].....	1
23.	25 FULL BORE (MIN) PNEUMATIC ACTUATED BALL VALVE	2
24.	25 NB(MIN) EXCESS FLOW VALVE.....	1
25.	50 FULL BORE BALL VALVE	1
26.	32 NB (MIN) SOFT SEATED IN-FLANGE BACK CHECK VALVE	1
27.	8-CORE PLUS GROUND x 2.5mm ² (MIN) ARMOURED PVC COATED CABLE	1
28.	8 NB HYDROSTATIC RELIEF VALVES.....	3
29.	FLANGE INSULATION GASKET KIT (SIZE AS REQUIRED)	3

PARTS REQUIRED FOR ALTERNATIVE EXTERNAL PLACEMENT OF PPV™ VALVE (Item 8A)

30.	8 NB INSULATING UNION	1
31.	20 NB EXCESS FLOW VALVE.....	2
32.	8 NB BALL VALVE	2
33.	3/8" OD (MIN) X 1.2 WALL SS TUBING	1

SECTION 3 - INSTALLATION

CAUTION

Installation and removal of this equipment should be performed by qualified competent personnel in accordance with relevant directives, standards, codes, regulations and site restrictions - in conjunction with these instructions.

DANGER

Never loosen or remove fittings, flanges, etc. while under pressure (vapour pressure of LPG may be very high), always isolate components or pipework and depressurise prior to work.

3.1 LOCATION

The pumpset is designed for installation in a housing/chamber which is installed in, and thus forms part of the pressure vessel. This housing is constructed from 150 NB (min) Sch'40 or Sch'80 pipe. The bore and end (inside bottom) of this housing must be clear of any intrusions. Allow a clearance of at least 50mm from the underside of the housing to the inside wall of the tank. The opening in the tank turret cover must be concentric with the housing. The housing must be perpendicular to the tank turret cover.

The inlet port of the housing must be at least 50mm diameter. It is isolated from the tank with a remotely operated 50mm (full bore) ball valve and an excess flow valve designed for pump inlet (suction) duties. The centre height of the inlet port must be 45mm (min) above the bottom (inside) of the housing. (Refer P&ID Appendix A)

3.2 PUMPSET INSTALLATION

Pump should hang vertically from the riser without contacting the sides or bottom of the pump housing. Two guide rings, one at each end of the pumpset, assist in electrical isolation of the pumpset from the housing walls should nominal contact occur. Ensure that the pump housing is straight and free from intrusions and/or debris. The discharge riser must be concentric with, and perpendicular to, the pump housing cover.

NOTE

Debris e.g. welding slag, pipe scale, grinding swarf etc. left in the pump housing can be drawn into the pump casing causing serious damage and voiding the Warranty. Clean pump housing **TOTALLY** prior to pumpset installation.

When installed, the riser flange must be totally insulated from the turret cover by means of a cathodic insulation gasket and insulated spacers at the fastenings.

3.3 PORT ALIGNMENT

Accurate alignment of the pump inlet port with the pump housing port is critical for efficient pump operation. Vertical and angular alignment must be within ± 5 mm for the pump to operate to maximum performance without cavitation.

When measuring and marking for port alignment, be sure to allow for thickness of cathodic gasket.

Clearance of 5mm (min) is required between bottom of pumpset and bottom (inside) of pump housing. Should underside of pump touch housing, electrical insulation will be ineffective.

NOTE

External position of inlet valve remote handle does not necessarily determine port alignment. Only rely upon actual measurements taken from the inside of the pump housing.

The suggested method for ensuring correct angular port alignment is to mark the edge of the pump housing cover (flange) in a position which represents the centreline of the pumpset inlet port. Also mark the top of the turret cover in a position which represents the centreline of the housing port. Using a stringline to ensure alignment, screw discharge riser into pumpset. Refer Figure 3. and Appendix B.

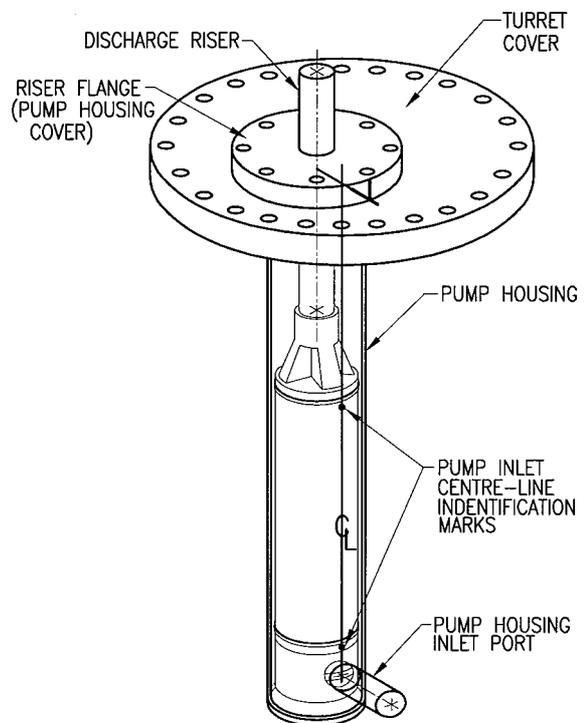


Figure 3

3.4 DISCHARGE RISER

To determine overall length of riser (Refer to figure 4):

1. Determine (measure) depth of pump housing inlet port centreline from top of turret cover (X).
2. Add thickness of isolation gasket (Y).
3. Subtract 982 mm to allow for pumpset length (to centre line of inlet port).

The result is the overall length of the riser (discharge pipe) from the end of the thread to the underside of the pump housing cover (flange) (A).

The top of the riser (above flange) must be fitted with a coaxial splitting arrangement which provides a 1" (F) NPT thread for the conduit exit, concentric and parallel with the riser pipe plus a 32 mm NB (min) discharge connection.

3.5 ELECTRICAL CONDUIT

To determine minimum overall length of conduit (Refer to figure 4):

1. Determine height of discharge riser above underside of flange (Z) (to top of 1" (F) NPT thread).
2. Add length of discharge riser pipe determined previously (A).
3. Add 90 mm to allow for minimum conduit length required for fittings.
4. The result is the minimum overall conduit length required (B).

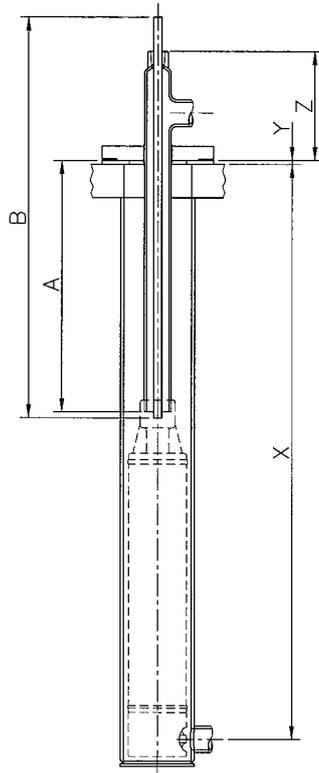


Figure 4

3.6 PUMP AND SYSTEM PIPING CONNECTIONS

CAUTION

Installation and removal of this equipment should be performed by qualified competent personnel in accordance with relevant directives, standards, codes, regulations, and site restrictions in conjunction with these instructions.

Refer to P&ID Appendix A for system arrangement and relative positioning of components.

WARNING

It is extremely important that no piping stresses be transferred to the pump.

Two connections to pumpset are required for installation:

- 1) The discharge pipe (riser)
- 2) The electrical conduit

The discharge port has a 2" NPT female thread and the conduit port has a 3/4" NPT female thread. Both NPT threaded connections on pumpset require a thread engagement as per NPT Standard. EBSRAY recommend at least 8 full turns for correct installation and sealing. (27 mm x 29 mm AF tube spanner is required)

The Tube Connectors for electrical conduit supplied by and/or recommended by EBSRAY must be fitted and secured in accordance with the manufacturer's (Swagelok or equal) recommendations. Ensure correct positioning prior to tightening. Once tightened, the axial position of fittings on the conduit cannot be altered and any changes will require replacement of conduit and fittings.



WARNING

Prior to fitting any wiring into conduits, all burrs and sharp edges must be removed from conduit ends.

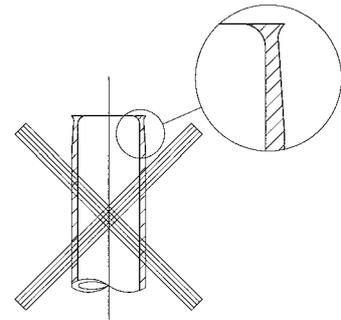


Figure 5

NOTE

Conduit length should be accurately determined prior to any installation. Cutting conduit with wires installed is not recommended.



WARNING

No welding is to be performed on any part of the system (discharge piping, vapour returns or conduits) with pumpset/wires installed. Failure to observe this warning could result in severe motor and/or wiring damage and void the warranty.

3.7 RECOMMENDED ORDER OF ASSEMBLY

1. Support the pumpset in the horizontal position.
2. Fit straight 3/4" NPT compression tube fitting to the conduit port of the pumpset with appropriate thread sealant or tape. This fitting **must** be gas-tight.
3. Fit conduit over motor leads taking great care not to damage the leads.
4. Fit conduit to compression tube fitting and tighten nut on fitting as shown in Figures 6 & 7 (2.5 mm hex key used as a no-go gauge which is approximately 1 3/4 turns after hand tight.) This connection **must** be gas-tight.
5. Fit Cathodic Insulation gasket over discharge riser and temporarily secure to pump housing cover with adhesive tape.

NOTE

This must be done before fitting pumpset to riser as the Cathodic Insulation gasket may not fit over the pumpset.

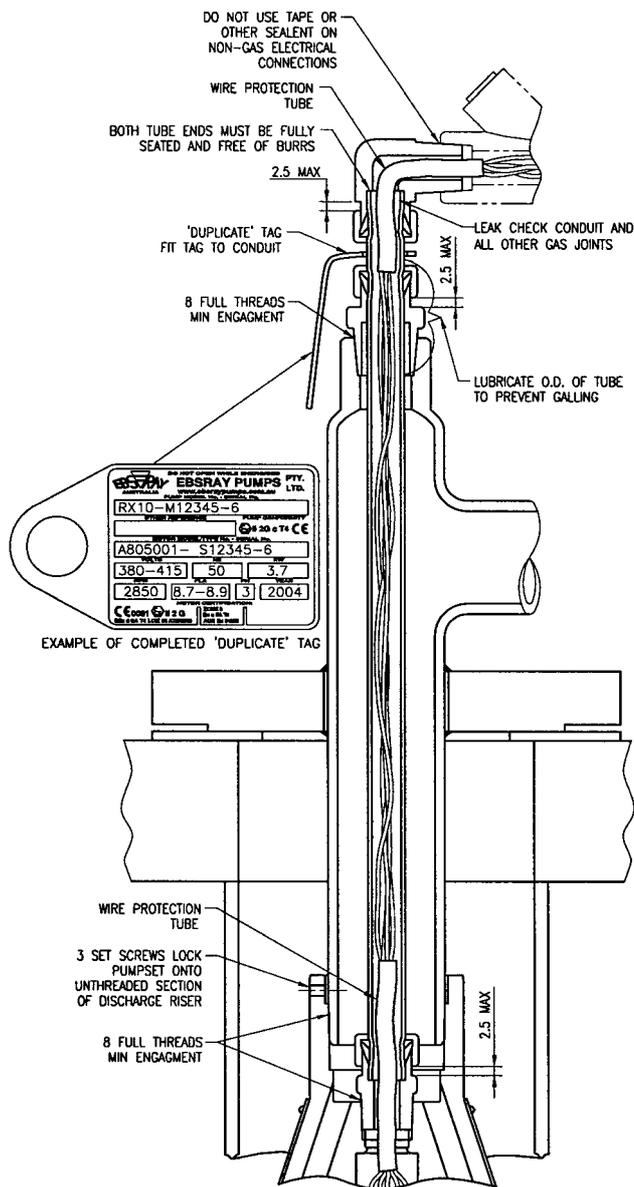


Figure 6

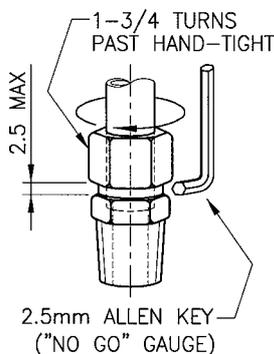


Figure 7

6. To help prevent damaging wires during installation, fit the wire protection tube provided in the Electrical Fitting Kit over wires and half way into conduit. (temporarily secure with adhesive tape) See Figure 8

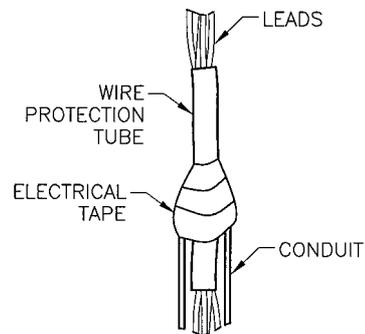


Figure 8

7. Carefully guide free ends of motor leads through discharge riser and out through the 1" (F) NPT port.
8. While keeping the motor leads taut, guide the discharge riser over the conduit taking great care not to damage the motor leads.
9. Fit discharge riser assembly to the pumpset with appropriate thread sealant or tape. With the pumpset stationary, screw discharge riser into pumpset ensuring 8 full threads minimum engagement. The end of the thread of the discharge riser must completely overlap the three setscrews in the top of the pumpset. This fitting should be gas tight.
10. Tighten (screw) discharge riser into pumpset until both inlet centreline identification marks on the pumpset are in line with the mark previously placed on the edge of the pump housing cover. Check this alignment with a stringline. *Do not* loosen (back off) discharge riser to achieve angular alignment.
11. Check overall length of riser/pumpset from cathodic insulation gasket to end of pumpset to ensure 5mm (min) clearance to bottom (inside) of pump housing.
12. Using Loctite 242 or equal, fit the three set screws in the top of the pumpset. Tighten setscrews against discharge riser.

NOTE

These screws must be tight

13. Lubricate the protruding conduit with light oil to prevent galling when fitting the 1" NPT bored-through compression tube fitting.
14. Fit the 1" NPT bored-through compression tube fitting to the discharge riser assembly with appropriate thread sealant or tape, ensuring 8 full threads minimum engagement. This fitting **must** be gas tight.

NOTE

Do not tighten nut at this stage. Once this nut is tightened, the only way of removing the pump from the discharge riser is by cutting through this fitting and the conduit.

15. Carefully lift the pumpset/discharge riser assembly into a vertical position.

NOTE

When raising or lowering the pumpset/discharge riser assembly, take care not to damage the pumpset, motor leads or conduit. Lift carefully with slings, chains etc.

16. Carefully lower the pumpset/discharge riser assembly into the pump housing making sure that the pump does not bind or drag on the sides of the pump housing.

NOTE

Before the pumpset/discharge riser assembly is completely inside the pump housing, remove the adhesive tape holding the cathodic insulation gasket to the pump housing cover. Carefully fit the cathodic insulation gasket to the turret cover.

17. Fit pump housing cover to turret cover with appropriate cathodic insulators/washers for bolts and nuts. Align marks on pump housing cover and turret cover. The seal between the pump housing cover and the turret cover **must** be gas tight.

18. Check that the pumpset/discharge riser is electrically insulated from the tank. If not insulated, rectify as required.

19. Determine basic location and orientation of Junction Box, Differential Pressure Switch etc in the pit. Based on this determination, assemble Electrical Fitting Kit and Differential Pressure Switch as follows:

NOTE

Do not use tape or sealant on NON-GAS electrical connections.

- a) Remove Junction Box cover.
 - b) Fit Differential Pressure Switch to Junction Box (For Junction Boxes which are not fitted with a 1/2" NPT(F) thread, use adaptor supplied) Take care when fitting to avoid damaging electrical leads.
 - c) Fit 25mm hex nipple to Junction Box.
 - d) Fit 25(F)M side of wire seal to hex nipple.
 - e) Fit 3/4" NPT compression tube fitting to 3/4"(F) NPT side of wiring seal.
 - f) Fit 25mm plug/s to unused Junction Box port/s.
 - g) Fit 25mm barrier gland to Junction Box.
20. Fit duplicate pumpset/motor identification tag over motor leads and over conduit as shown in figure 6
21. Remove adhesive tape from wire protection tube and slide tube off motor leads.
22. Slide wire protection tube half way into 3/4" NPT compression fitting. See figure 6
23. While holding the wire protection tube in place, carefully slide the motor leads through the wire protection tube and into the Junction Box.
24. Test the resistance from each lead to the conduit to ensure that they are electrically insulated. Rectify any fault as required.
25. Mount Junction Box to insulated support bracket if required.

NOTE

If Junction Box requires a support bracket, this must be electrically insulated from the turret cover and tank.

26. Trim excess wire from motor leads and Differential Pressure Switch leads (leave adequate length for connection without tension).

27. Individually cap the free ends of the leads with insulating tape ensuring that the cores are covered.

28. Coil the leads in the Junction Box.

29. Fit cover and gasket to Junction Box.

3.8 LPG/PRODUCT DISCHARGE PIPE FITTINGS

1. A 25 mm (min) full bore pneumatically actuated ball valve is required immediately downstream of discharge riser.
2. After this ball valve, a 25 mm NB (min) branch is required for the EBSRAY RV18 NRV Bypass Valve. This Bypass Valve mounts between 25 mm ANSI Class 300 flanges.
3. A port is required in this line to accept an isolation valve. This valve is for isolation of the pressure gauge plus the 1/4" tube fitting for the high pressure side of the Differential Pressure Switch. The line from the valve must be split with a 'Tee' arrangement. One side of the 'Tee' feeds a discharge pressure gauge (0-2500 kPa) (0 – 25 Bar) and the other side feeds the high pressure side of the Differential Pressure Switch via a 1/4" OD SS tube.

3.9 DIFFERENTIAL PRESSURE SWITCH

1. Fit the high-side 1/4" tube as mentioned in 3 above.
2. A low-side (vapour pressure) port must be provided through the pump housing cover. This port is required to accept a valve for isolation of the pressure gauge plus the 1/4" tube fitting for the low pressure side of the Differential Pressure Switch. The line from the valve must be split with a 'Tee' arrangement. One side of the 'Tee' feeds an inlet pressure gauge (0-2500 kPa) (0 – 25 Bar) and the other side feeds the low pressure side of the Differential Pressure Switch via a 1/4" OD SS tube.

NOTE

If positioning any components other than as stated above, ensure that they are electrically insulated from the turret cover, tank etc.

3.10 BYPASS VALVE

1. Fit Bypass Valve to flanges in bypass line. Ensure correct orientation i.e. flow is 'IN' from pump discharge line and 'OUT' returns to tank.
2. Flow from Bypass Valve returns to tank vapour space via a 25 mm NB (min) line, a 25 mm (min) full bore pneumatically actuated ball valve and a 25 mm (min) excess flow valve.

NOTE

If system is a twin pump turret cover using a common Bypass Valve return line, a 32mm (min) full bore ball valve and excess flow valve is required.

3. The Bypass Valve return line must be electrically insulated from the tank/turret cover. A hydrostatic relief valve must be fitted in this line as the Bypass Valve RV18 NRV is also a back-check valve.

3.11 PPV™ VALVE

- a) Internal Mounting: The EBSRAY PPV™ Valve 'Internal Mounting Kit' is intended for installation inside the tank, but outside the pump housing/chamber wall. Ensure that the inverted 'U' tube is no more than 50mm from the underside of the turret cover and remains in the vapour space of the tank at all times. A secondary shut off valve must be installed between pump housing/chamber and the PPV™ Valve and must be operable from above the turret cover.

NOTE

PPV™ Valve must be mounted in a vertical position with the arrow pointing up and away from the pump housing. i.e. flow path is only out from the pump housing/chamber, into the tank vapour space.

- b) External Mounting: Alternate 'External Mounting' is possible (e.g. retrofits to existing equalisation pipes). However, it is still critical to ensure that PPV™ Valve is mounted vertically and that the arrow points up and away from the side connected to the pump housing/chamber. i.e. flow path is **only out** from the pump housing/chamber, **into** the tank vapour space.

3.12 LEAK CHECK

1. Tighten nut on 1" NPT bored through compression fitting as shown in figure 7
2. Remove cover and gasket from Junction Box.
3. Carefully raise Electrical Fitting Kit to expose the motor leads and the top of the conduit. Take care not to damage motor leads on the Differential Pressure Switch pressure lines. Seal off motor leads to conduit with adhesive tape. Refer to figure 9.

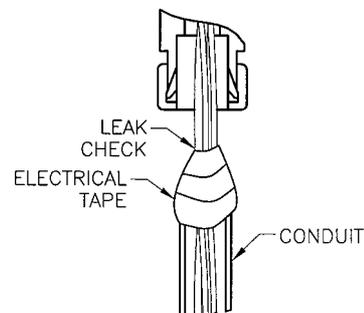


Figure 9

4. Leak check all conduit and other pressure connections.
5. Remove tape from conduit, refit compression tube fitting to conduit. Tighten nut on fitting as shown in figure 7
6. Refit cover and gasket to Junction Box.

3.13 ELECTRICAL CONNECTIONS - PUMPSET AND SYSTEM



DANGER

Important Electrical Installation Notes

1. **All construction and installation is only to be carried out by qualified personnel.**
2. **All construction is to be strictly in accordance with relevant directives, standards, codes, regulations and site restrictions. (in Australia, AS3000 wiring rules apply, other countries, as applicable)**
3. **EBSRAY control console is only to be installed in a non-hazardous area requiring IP55 (or less) rated enclosures.**
4. **Particular care must be taken to ensure all items requiring earthing are adequately linked and equipotentially bonded. e.g. junction box to pumpset.**

Typical electrical connections are as shown in the accompanying diagrams Fig 10 and Appendix C. Items provided by EBSRAY are suitable for use in the specified intended areas. Ensure that any substitute equipment supplied by others is certified and/or correct for the intended usage and location. Following is a brief description of the electrical wiring installation. Installer must provide additional items as listed in EBSRAY wiring diagram, NOTE 5 on Appendix C

NOTE

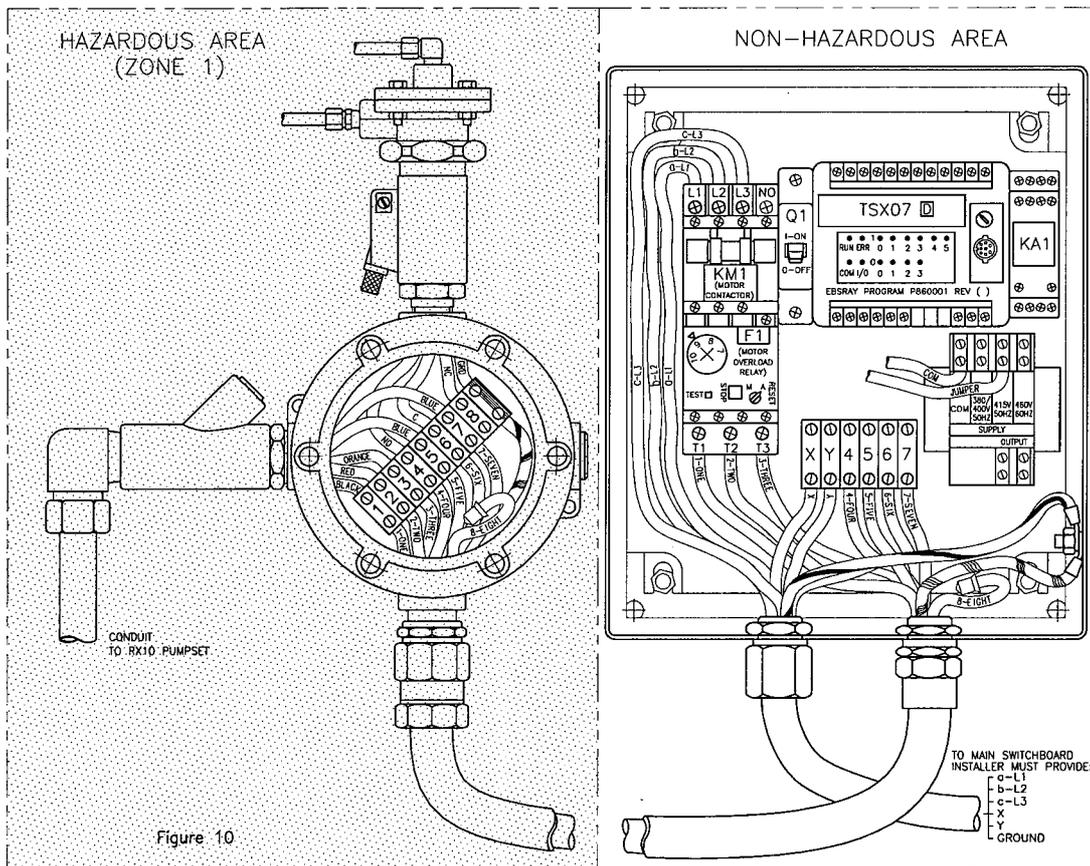
All gland, conduit, wiring terminations and connections are to be strictly in accordance with manufacturers instructions and relevant Standards, Codes and Regulations.

3.14 JUNCTION BOX

The Junction Box houses all electrical terminations between the Pumpset, the Differential Pressure Switch and the Control Console.

The Pumpset (motor) has five (5) colourcoded leads:

- a) Motor
Three (3) leads: Black, Red, Orange, are from the motor windings and must be connected respectively as a,b,c (clockwise) phase sequence for correct direction of rotation - to terminals One (1), Two (2) and Three (3) in the Junction Box.
- b) Temperature Switch
Two (2) Blue leads are interchangeable and connect to terminals Five (5) and Seven (7) in the Junction Box.



3.15 DIFFERENTIAL PRESSURE SWITCH (DPS)

The Differential Pressure Switch (DPS) has Four (4) leads: Blue, Black, Red and Green. Connect Blue (Common) and Black (N.O.) leads to Junction Box terminals Six (6) and Four (4) respectively. Cap off Red lead (N.C.) by connecting to terminal Eight (8) in the Junction Box. Connect Green lead (Ground) to ground terminal in Junction Box.

3.16 CONNECTING CABLE

The connecting cable between the Junction Box and the Control Console is normally an armoured, Eight (8) core plus ground cable (*Six core plus ground cable can be accommodated with modifications. For information contact EBSRAY*) 2.5 mm² (min). Cores One (1) through Seven (7) connect to respective Junction Box terminals. (Any extra unused cores should be capped off) The ground core must be connected to the Junction Box ground terminal.

3.17 CONTROL CONSOLE

The Control Console is only to be installed in non-hazardous areas requiring IP55 (or less) enclosures. The Control Console houses all electrical terminations between the main switch board and the Ex d Junction Box. Refer to wiring diagram in conjunction with following instructions.

1. Ensure that the Primary Selection Jumper which sets Control Console voltage to site supply power is correctly set. This is normally factory preset for 415 V 50 Hz site supply power and must be moved to the appropriate position for other site supply powers. **Check setting before use** (See Page 21 section 14)

2. Connect incoming isolated 3 phase power leads to L1, L2, and L3. Connect Normally Open Voltage Free contact leads to X and Y. Connect a suitable Ground to Ground Lug.
3. Activate power to Control Console (Pumpset motor wiring should NOT be connected at this stage). Check incoming phase sequence, ensure that L1, L2, L3 is abc (clockwise) sequence.
4. Isolate power from Control Console.
5. Fit 8 core plus ground (see CONNECTING CABLE this page) 2.5mm² Armoured Cable to Barrier Gland on Junction Box as per manufacturer's instructions.
6. Connect leads from armoured cable to terminal strip in Junction Box (see figure 10) then refit Junction Box cover and gasket.
7. Remove Plug from wiring seal, dam and fill with compound provided, (mix with water as per instructions). Refit Plug.
8. The wiring from the Junction Box is connected to the Control Console as follows: Cores One (1), Two (2) and (3) are connected to terminals T1, T2 and T3 respectively on the motor overload relay. Cores Four (4), Five (5), Six (6) and Seven (7) connect to Terminals Four (4), Five (5), Six (6) and Seven (7) respectively on the terminal strip in the Control Console (Any extra unused cores should be capped off). The ground core is connected to the Control Console ground.

SECTION 4 - OPERATION

4.1 DESCRIPTION

1 Pump

The EBSRAY Model RX10 pumpset is a compact close-coupled Submersible Regenerative Turbine pump-motor unit, designed for pumping LPG of Internationally accepted (ISO) quality and specification. The Pumpset meets the requirements of Australian, European and other International Standards and Codes for use in potentially explosive atmospheres.

2 Motor

The 3.7 kW Submersible Electric Motor is designed to meet the requirements of Australian, European and other International Standards and Codes. The motor is Certified for the specified area and application (See APPENDIX F). (Refer maximum starts per hour WARNING this section)

4.2 LUBRICATION

No 'in service' lubrication (other than the designed BCL™ System) is required on EBSRAY's Model RX10 Pumpset.



WARNING

Severe internal damage to the pumpset will result if unauthorised or uncontrolled resetting occurs after any fault symptom is indicated on the control console. Before resetting correct the fault. Refer to trouble shooting section.

Warranty will be void if unauthorised resetting is conducted without first correcting the fault.

4.3 PRE-STARTUP CHECKLIST

Record pre-start inspection on checklist (appendix D)

1. Check that all electrical wiring is insulated from the ground, conduits, tank etc.
2. Check for leak free installation at pump and pipe and electrical conduit connections.
3. **Direction of rotation - This MUST be tested prior to pump operation by using a Phase Sequence Indicator at the Control Console.**
With pump wiring at the Junction Box in the order: BLACK (1), RED (2), ORANGE (3), the power supply phase sequence must be a, b, c. (or R,S,T.) (CLOCKWISE)



WARNING

Do not run pump in reverse. Severe internal damage to the pump and motor may result.

4. Ensure voltage is correct and that all relevant electrical components are adequate for the application.



WARNING

Do not run pump dry. Severe internal damage to the pump and motor will result.

5. Valves should be in the following positions:
(see P&ID Appendix A for locations)

Pump Housing/Chamber Inlet Valve OPEN
PPV™ Isolation Valve OPEN
Valves to High and Low sides of
Differential Pressure Switch OPEN
Valves to Both Pressure Gauges OPEN
Discharge Line Valve/s OPEN
Vapour/Bypass Return Line Valve/s OPEN



WARNING

Do not start pump against closed discharge valve or with chamber inlet valve throttled.

6. Ensure that Pump is LPG liquid filled by removing all vapour in an approved manner from the pump discharge riser.
7. Back off Bypass Valve Adjusting Screw fully i.e. Minimum Differential Pressure.
8. Ensure timer in PLC is set to required minimum delay time for the site (refer Control Console operating instructions Section 5)
9. Ensure Keyswitch on Control Console is in "OFF" position.
10. Ensure circuit breaker (Q1) in Control Console is in "OFF" position.
11. Ensure MOL relay is set to FLA rating (refer Appendix B or C) and is in automatic reset mode.

4.4 STARTUP PROCEDURE

A Pump run log is provided in Appendix E. Fill in the startup section of the log as indicated below.

For commissioning and testing it may be advantageous for two persons, with some means of communication, one stationed at the Control Console and the other stationed at or near the pump location.

1. Check readings on both pressure gauges. Note any difference in static readings as this will have to be taken into account when setting Bypass Valve. *Record vapour pressure in the commissioning section of the Pump run log.*
2. Connect amp meter to Control Console lead(s) T1, T2 or T3.
3. Activate power to Control Console.

4. Switch "ON" Q1 circuit breaker in Control Console.
5. Turn 'RESET' key clockwise to verify Fault Indicator Lamp functionality i.e. Lamp test sequence. (One green and all three Red Fault Indicators should light)
6. Turn key switch to 'TEST' at Control Console.
This will start Pumpset. (If any aspect of the pumpset or pumping system does not function properly, immediately turn the keyswitch to 'OFF' and rectify the problem)



WARNING

Motor MUST NOT exceed 20 starts per hour OR be re-started in less than 2 minutes after last start (i.e. 2 minutes MINIMUM run-on time after last start). Severe and permanent internal electrical damage to the motor may result.

7. Check system functionality, pump should immediately begin to build **differential pressure** up to approximately 500 - 600 kPa. (5 – 6 Bar)
Record discharge pressure in the commissioning section of the Pump run Log.
8. Check that current reading is below FLA rating (refer Appendix B or C) on T1, T2, & T3.
Record T1, T2, & T3 current readings in the commissioning section of the Pump run log.
9. Ensure that liquid is flowing through Bypass Valve. This should be detectable audibly (by listening) or by feeling the valve/pipework (by hand).

Screw in the Bypass Valve Adjusting Screw not exceeding two turns per minute until a differential pressure of 700 kPa (7 Bar) is achieved.

NOTE

During this procedure check current at Control Console on T1, T2 & T3 (Must not exceed FLA rating - refer Appendix B or C)

10. When 700 kPa (7 Bar) differential pressure is reached, turn pump off and leave off for approximately 1 minute.
11. Restart pump in 'TEST' mode. Note differential pressure reading. This may be slightly different to when first set (This is a normal characteristic of Bypass Valve operation when first set in this manner).
12. Reset differential pressure as required (do not exceed 800 kPa (8 Bar) @ 50Hz or 700 kPa (7 Bar) @ 60Hz at this stage).
Record discharge pressure and T1, T2, & T3 current readings in the commissioning section of the Pump run Log.
13. The Pumpset is now ready for automatic (dispenser actuated) operation via terminals X and Y.
Turn keyswitch on Control Console to "RUN" mode. Pumpset will now run under the control of the Dispenser/Communication System.



WARNING

Running-in Period

Due to the precision manufacturing tolerances and the nature of the sleeve bearing material, the pump should be run-in under automatic (dispenser actuated) operation ("run" mode) for approximately 20 hours. The differential pressure setting should not exceed 800 kPa (8 bar) @ 50Hz or 700 kPa (7 bar) @ 60Hz during this period.

14. After the 20 hour run-in period, differential pressure can be set to maximum (Do not exceed FLA rating - refer Appendix B or C). This differential pressure is dependent upon setting required by end user.
Record any changes to the discharge pressure in the Pump run log.



WARNING

Do not exceed full load Amps on any leg.

15. After any Bypass Valve adjustment, tighten adjusting screw locknut and wire in place for security.
16. The startup procedure is now complete for the RX10 Pumpset and Protection System.
17. Inspect Pumpset/pumping system frequently during the first few hours of operation then periodically thereafter. *Record observations from these inspections in the Pump run log .*
 - a) Inspect the pumping system checking for LPG leaks, vibration, unusual noises, etc.
 - b) Check the tank vapour pressure and the pumpset discharge pressure.
 - c) Check L1, L2 and L3 current.
 - d) Check Pump run hours.
 - e) Ambient temperature of LPG in tank.

NOTE

Dispensing/pumping may be interrupted by DPS cutout during storage tank filling (tanker unloading). Resetting must only occur after filling operation is completed and the LPG in the tank has stabilised to the new state/mix/temperature conditions.

SECTION 5 - CONTROL CONSOLE - DESCRIPTION, OPERATION & ADJUSTMENT

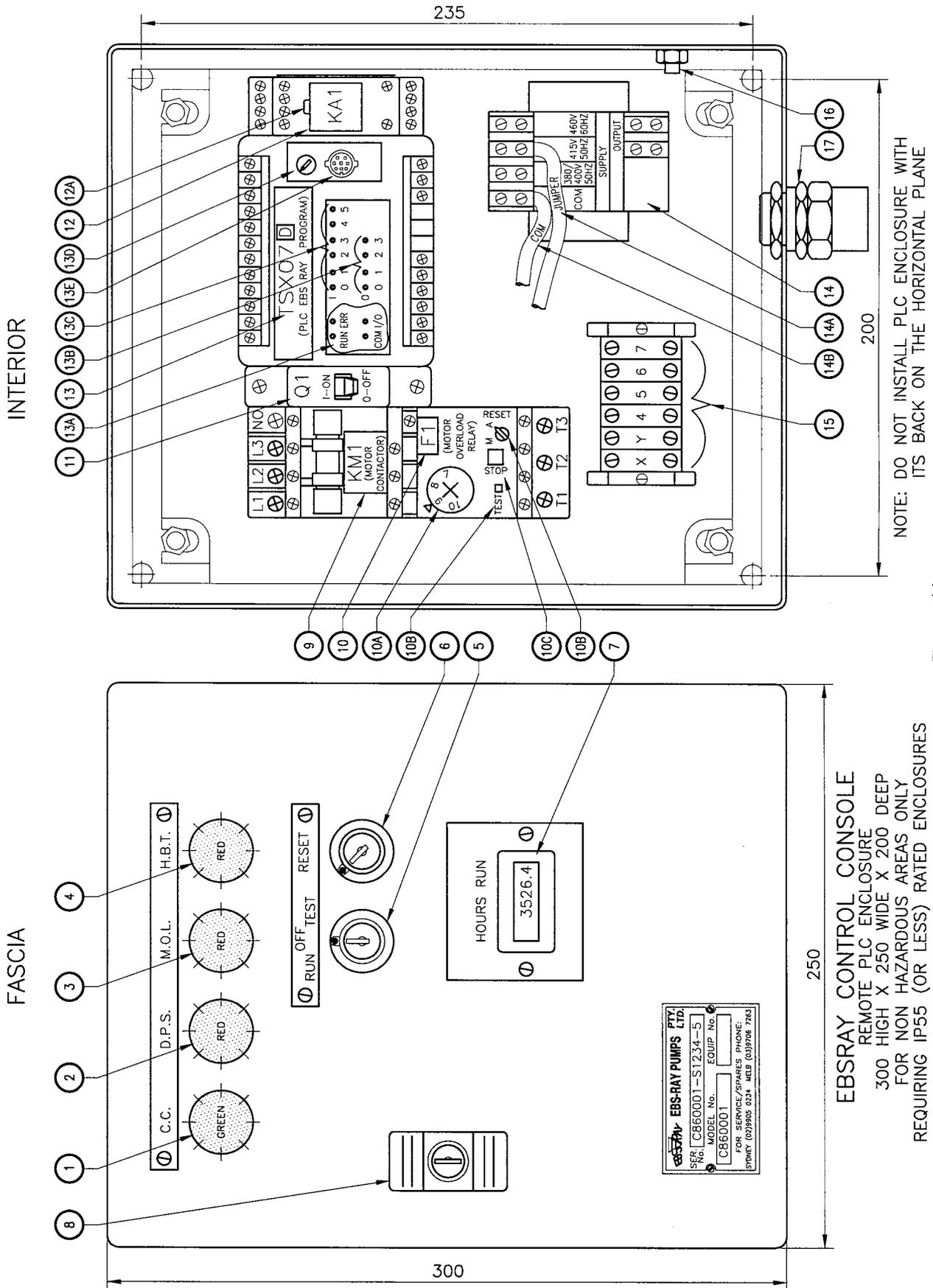


Figure 11

The Control Console (Item # C860001) controls the RX10 Pumpset and monitors the pumping system. If the Control Console detects that various aspects of the pumpset or the pumping system are operating out of specification, the pumpset will shutdown. Furthermore, following a shutdown, the pumpset will be locked out such that it cannot be restarted without a keyed reset.

The reason for the shutdown is indicated by one of the 'fault' indicators on the Fascia of the Control Console. These 'fault' indicators cannot be turned off without a keyed reset such that the fault indication is preserved for assessment prior to restart.

5.1 OPERATIONAL FEATURES OF THE CONTROL CONSOLE - a) FASCIA

Paragraph numbers refer to Control Console Diagram Figure 11

**1. Control Circuit (CC)
- Green Indicator Lamp**

ON = Indicates that the control circuit is energised i.e. L1 is active and the circuit breaker, Q1, is in the 'ON' position.

OFF= Indicates that the control circuit is not energised i.e. L1 is not active or the circuit breaker, Q1, is in the 'OFF' position.



DANGER

'OFF' does NOT indicate the absence of all power to the Control Console. A separate three phase isolator must be provided by the installer in order to completely isolate power to the Control Console.

**2. Differential Pressure Switch (DPS)
- Red Indicator Lamp**

Operation of the pumpset will be halted if Differential Pressure falls below a preset level during operation or is not developed within an adjustable preset time after startup.

FLASHING (ON 0.5 sec OFF 0.5 sec) =
DPS Bypass time has not elapsed and Pumpset has yet to reach minimum differential pressure.

Note: The flashing DPS indicator is a normal function of each start of the pumpset and allows a person at the Control Console to determine if the pumpset is operating and how long it takes for the pumpset to develop Minimum Differential Pressure following a startup.

OFF = No fault condition Pumpset is able to run or is running. Minimum Differential Pressure has been reached before DPS Bypass time has elapsed. i.e. normal condition.

ON = Minimum Differential Pressure has NOT been maintained after the DPS Bypass time has elapsed. Once the reason for the fault has been assessed and rectified, the Control Console can be reset (see Item 6 this section).

FLASHING (ON 5 sec OFF 1 sec) =
Minimum Differential Pressure has NOT been reached before DPS Bypass time has elapsed. Once the reason for the fault has been assessed and rectified, the Control Console can be reset (see Item 6 this section).

**3. Motor Overload Relay (MOL)
- Red Indicator Lamp**

Operation of the Pumpset will be halted if the motor current exceeds a maximum setting (see Item 10A this section)

OFF = No fault condition, Pumpset is able to run or is running. i.e. normal condition.

FLASHING (ON 0.5 sec OFF 0.5 sec) =
The Motor Overload Relay has detected high motor current, has actuated and has not yet automatically returned to its normal (Normally Open) position.

NOTE
Until the Motor Overload Relay automatically returns to its normal position, i.e. the Indicator stops flashing, the Control Console CANNOT be reset (see Item 6 this section).

ON = The Motor Overload Relay has detected high motor current, has actuated and has automatically returned to its normal position. Once the reason for the fault has been assessed and rectified, the Control Console can be reset (see Item 6 this section).

FLASHING (ON 5 sec OFF 1 sec) =
The Motor Overload Relay has detected locked rotor motor current, has actuated and has automatically returned to its normal position. This must not be reset until the reason for the fault has been assessed and rectified. The Control Console then can be reset (see Item 6 this section).

4. High Bearing Temperature Switch (HBT) - Red Indicator Lamp

Operation of the Pumpset will be halted if fluid within the BCL™ System exceeds a preset temperature.

OFF = No fault condition, Pumpset is able to run or is running. i.e. normal condition.

FLASHING (ON 0.5 sec OFF 0.5 sec) =
The High Bearing Temperature Switch has detected high BCL™ fluid temperature, actuated and has not yet automatically returned to its normal (Normally Closed) position.

NOTE

Until the High Bearing Temperature Switch automatically returns to its normal position, i.e. the Indicator stops flashing, the Control Console CANNOT be reset (see Item 6 this section).

ON = The High Bearing Temperature Switch has detected high BCL™ fluid temperature **while the pump was running**, has actuated and has automatically returned to its normal (Normally Closed) position. Once the reason for the fault has been assessed and rectified, the Control Console can be reset (see Item 6 this section).

FLASHING (ON 1 sec OFF 5 sec) =
The High Bearing Temperature Switch has detected high BCL™ fluid temperature **while the pump was not running**, has actuated and has automatically returned to its normal (Normally Closed) position. This condition will not prevent pump from running, however, when running, lamp will be off and when stopped lamp will revert to this flashing sequence.

FLASHING (ON 0.5 sec OFF 0.5 sec ON 0.5 sec OFF 3 sec) =
As above except that the HBT switch is still actuated and a run signal is detected. In this case pump will run as soon as the HBT switch resets itself.

5. Run-Off-Test Mode Selector Switch (Uses same key as Reset Switch)

The keyed mode selector designates the parameters that operate the pumpset.

RUN = The Pumpset will start/stop under the control of the Dispenser/ Communications System via terminals X and Y (see wiring diagram Appendix C). This is the normal mode of operation.

OFF = The Pumpset is isolated i.e. the pumpset will not run.

TEST = The Pumpset will start and continuously run regardless of a signal from the Dispenser/ Communications System via terminals X and Y (see wiring diagram Appendix C). This mode is **ONLY** to be used to aid in startup/ commissioning procedures and maintenance / evaluation operations e.g. setting the bypass pressure. This is **NOT** a normal mode of operation. However, full 'Three Tier' protection functionality is still active during this TEST mode of operation.

6. Reset Switch (Uses same key as Run-Off-Test Mode Selector Switch)

Fully turning the keyed reset clockwise provides two functions:

FUNCTION 1 An indicated fault is Cleared and Resets when switch is released.

NOTE

In order to reset an indicated fault, Run-Off-Test Mode Selector Switch should be in the 'OFF' mode and the device detecting the fault must have returned to its normal position i.e. the indicator stops flashing.

FUNCTION 2 Provides a lamp test by illuminating all four lamps on the door when held.

NOTE

Failure of any lamp to illuminate during this test indicates a faulty bulb - Isolate power from Control Console and replace with correct bulb, Re-test lamps.

7. Hour Run Meter

Indicates the actual number of hours the pumpset has run. This meter is to be used to assist in determining pumpset usage, maintenance and inspection frequency.

8. Door Latch (Uses different key to Run-Off-Test Mode Selector and Reset Switches)

This limits access to the Control Console's 'live' wiring. This also allows the separation of duties/authorisation of personnel responsible for basic Pumpset maintenance and/or evaluation operations and those responsible for more involved startup and/or commissioning procedures.

NOTE

It is highly recommended that only suitably trained and qualified personnel be given access to the Door Latch Key.

9. Motor Contactor - Labelled KM1

Coil operated contactor sends three phase power to pumpset when its coil is energised via a signal from the PLC (TSX07) (Item 13 this section) and the Motor Run Relay (KA1) (Item 12 this section).

Coil In = Coil Energised = Pumpset energised

10. Motor Overload Relay - Labelled F1

The Motor Overload Relay actuates if the amperage on any one of the three legs exceeds the value as set on the current cutout selector. The MOL has two selectors and two test switches as follows:

10.A. Current Cutout Selector - *This MUST be checked to ensure it is set to the FLA rating of the motor at the correct supply voltage and frequency* (refer Appendix B or C).

10.B. Manual-Automatic Reset Selector determines the reset mode for the MOL -

a) Manual

requires the MOL to be manually returned to normal position by depressing the 'Reset Selector' switch (see below) *This is not the recommended mode.*

b) Automatic

MOL automatically returns to normal position as soon as fault is no longer present. *This is the recommended mode*

10.C. Stop Switch while pressed, de-energises the coil of contactor KM1.

10.D. Test Switch Actuates Motor Overload Relay (F1).

When the Manual-Automatic Reset selector (10B) is in the manual position, the MOL (F1) remains actuated until the Stop Switch is pressed.

When the Manual-Automatic Reset selector is in the automatic position, MOL (F1) is actuated only while Test Switch is pressed.

11. Circuit Breaker - labelled Q1

The Circuit Breaker will actuate if the combined current being drawn by the PLC (TSX07), the Motor Run Relay (KA1), the coil of Motor Contactor (KM1) and the indicator lamps exceeds two (2) amps. By switching the Circuit Breaker (Q1) to the 'OFF' position, it can also be used as an aid for local isolation of power to the control circuits.



DANGER

This does not isolate all power in the control console. A separate three phase isolator must be provided by the installer in order to completely isolate power to the control console.

12. Run Relay - labelled KA1

KA1 is actuated under the control of the dispenser/communication system via terminals X and Y (see wiring diagram Appendix C) and directly energises the motor Run Contactor and sends a signal to the PLC indicating a 'RUN' condition.

12.A. Test Switch located on top of KA1 which, while pressed, simulates a 'RUN' signal from the dispenser/ communication system. This can be used as an aid in evaluation/inspection of the link between the dispenser/ communications system and the Control Console.

NOTE

This is not a normal mode of operation.

13. PLC (TSX07)

Controls the Control Console and has the following main Functions/Features:

- a) Six inputs - 24Vdc
- b) Four relay outputs - 110 Volt 2A
- c) Displays status of PLC at all times
- d) Displays status of inputs/outputs when in either 'RUN' (with active run signal from X and Y terminals) or 'TEST' mode.
- e) Displays DPS delay time when in either 'RUN' (without active run signal from X and Y terminals) or in 'OFF' mode. INPUT Status LED 5 flashes to indicate that PLC display is in DPS timer mode.
- f) One potentiometer used to set the DPS delay time.

13.A. The four PLC Status LEDs have the following functions:

RUN LED (GREEN)

"on steady" , The PLC is running and is executing the program: i.e. normal condition.
"flashing" , The PLC has stopped executing.

ERR LED (RED)

"off" , No fault condition: PLC is OK
"on" or "flashing" , A fault has been detected either internally or in the execution of the program.

COM LED (RED)

"off" , No fault condition: PLC is OK
"on" Indicates Communication error. Should not be applicable to this control system.

I/O LED (RED)

"off" , No fault condition: PLC is OK

"on" fault detected with the PLC inputs or outputs.

- 13.B. **The four OUTPUT status LEDs** (red) when 'ON' indicate the following conditions:

OUTPUT Status LED 0

MOL (Motor OverLoad relay) - This mimics the operation of the MOL Fault Indicator Lamp on the Fascia (see Item 3 this section)

OUTPUT Status LED 1

DPS (Differential Pressure Switch) - This mimics the operation of the DPS Fault Indicator Lamp on the Fascia (see Item 2 this section)

OUTPUT Status LED 2

HBT (High Bearing Temperature switch) - This mimics the operation of the HBT Fault Indicator Lamp on the Fascia (see Item 4 this section)

OUTPUT Status LED 3

Motor Contactor (KM1) status indicator -

ON = Motor Contactor KM1 is energised (i.e. Pumpset Running)

OFF = Motor Contactor KM1 is not energised (i.e. Pumpset is not Running)

- 13.C. **The six INPUT status LEDs** (Red) 'ON' indicate that the input device is currently in the closed position

INPUT Status LED 0

MOL (Motor Overload Relay) - [normally open]

ON = MOL Switch is in closed position = fault condition

OFF = MOL Switch is in normal open position = no fault condition

INPUT Status LED 1

DPS (Differential Pressure Switch) - [normally open]

ON = DPS Switch closed = minimum (or above) differential pressure is present

OFF = DPS Switch open = minimum differential pressure is not present

INPUT Status LED 2

HBT (High Bearing Temperature switch) - [normally closed]

ON = HBT Switch is in normal closed position = no fault condition

OFF = HBT Switch is in open position = fault condition

INPUT Status LED 3

Run Relay (KA1) - [normally open] in conjunction with Run-Off-Test Mode Selector Switch

ON = KA1 is closed, the Run-Off-Test Mode Selector Switch is in RUN mode and an active Run signal from the dispenser/communications system is present via terminals X and Y.

OFF = KA1 is open or Run-Off-Test Mode Selector Switch is in either in OFF or TEST mode.

INPUT Status LED 4

Run-Off-Test Mode Selector Switch

ON = Run-Off-Test Mode Selector Switch is in TEST mode.

OFF = Run-Off-Test Mode Selector Switch is in either in OFF or RUN mode.

INPUT Status LED 5

Reset Selector - normally open

ON = Keyed Reset switch activated.

OFF = Keyed Reset switch NOT activated.

- 13.D. **Bypass Timer** (delay) Display and Setting.

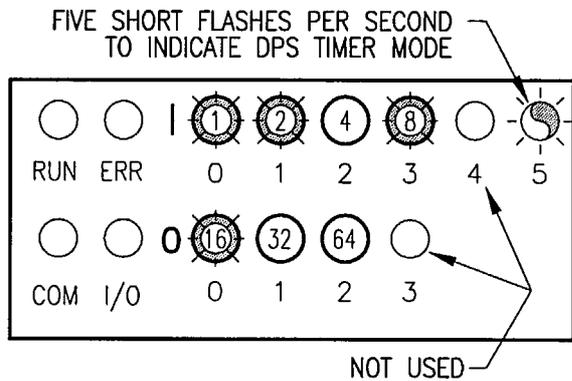
The PLC includes an adjustable timer (0 - 127 seconds) that enables the pumpset to start and run for a limited period before responding to differential pressure. This allows Pump to build up differential pressure on startup without indicating any fault. This timer is factory set to 12 seconds. To adjust the timer to suit site conditions, e.g. long discharge line to dispensers, a potentiometer is provided. (inside the small opening door on the right hand side of the PLC) With the adjustment tool provided, turn the potentiometer clockwise to increase the preset time and anticlockwise to decrease preset time.

NOTE

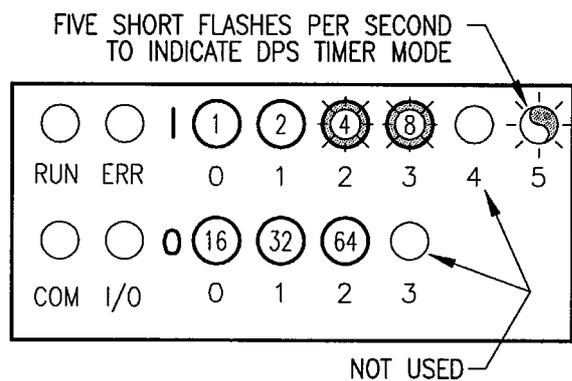
Minimum time setting relative to site conditions is recommended to best support the Pumpset BCL™ System functionality.

With Keyswitch in either **RUN** (without active run signal from X and Y terminals) or in **OFF** mode, the preset time is displayed on the first four input LEDs and the **output LEDs** of the PLC as follows:

The value for each of the timer display LEDs is shown in the diagram below (the number inside the circle represents seconds), adding together the values of all the I/O LEDs which are on (not flashing) gives the preset time delay in seconds.



Example 1: In the figure above the timer is set to 27 seconds ($1 + 2 + 8 + 16 = 27$)



Example 2: In the figure above the timer is set to 12 seconds ($4 + 8 = 12$)
Recommended initial setting

13.E. **PLC Communication Port**

Allows communication via the PLC for other devices such as modems, loggers etc. For more information about this feature, please contact EBSRAY.

14. **Transformer**

Converts the various electrical supply options to Control Console voltage.

Primary - site supply power:
 380/400 V 50 Hz
 or 415 V 50 Hz (Factory Set)
 or 460 V 60 Hz

14.A. **Primary Selection Jumper**

This lead, is used to set Control Console voltage to site supply power. This is normally factory preset for 415 V 50 Hz (**check setting before use**) site supply power and must be moved to the appropriate position for other site supply powers.

14.B. **Primary Common**

This lead is common to all Voltage/Frequency combinations and should not be moved

15. **Control Console Terminal Strip**

See Installation Section

16. **Control Console Ground Lug**

See Installation Section

17. **Armoured Cable Gland - Non-Hazardous**

See Installation Section

SECTION 6 - MAINTENANCE



CAUTION

Prior to any system disassembly or service, verify that all requirements of statutory standards, directives, codes or regulations are met and that specific site requirements etc are satisfied.

6.1 INSPECTION

Periodic Inspection of the Pump System and Ancillary Equipment is recommended. EBSRAY recommend a maximum interval of three months or 500 hours operation between routine periodic maintenance inspections (More frequent inspections may be necessary dependent upon usage, site conditions, operation etc).

Check:

- a) Inspect the pumping system checking for LPG leaks, vibration, unusual noises, etc.
- b) Check the tank vapour pressure and the pumpset discharge pressure.
- c) Check L1, L2 and L3 current.
- d) Check Pump run hours.
- e) Ambient LPG temperature in tank.

If condition is considered to be of an urgent or critical nature, consult Ebsray or service maintainer immediately. Record observations from these inspections in the Pump run log, Appendix E.

6.2 SERVICE

a) RX10 Pumpset

As the RX10 Pumpset is an integrated unit which includes a Certified Electric Motor, Pumpset overhaul/repair can only be conducted by repairers who are certified/qualified to overhaul or repair explosion protected electrical equipment.

The RX10 Pumpset is designed to enable complete overhaul if required.

Complete information regarding overhaul and repair of RX10 Pumpsets is available to certified repairers trained and approved by EBSRAY.

Prior to removal of the RX10 from its installation, please contact EBSRAY for specific instructions. The Discharge Head of the RX10 is fitted with a tamper evident seal (see Appendix B).

Warranty will be void should unauthorised disassembly be conducted.

b) Control Console and Ancillary Equipment.

All equipment supplied by EBSRAY can be serviced by competent (qualified) persons, or returned to EBSRAY for Factory Service.

Refer to specific equipment Service Instructions to ensure correct maintenance procedures.

NOTE

Control Console is fitted with a Factory Coded PLC. This item must maintain its original logic to perform its operating function correctly. Refer to EBSRAY for specific information and instructions.

6.3 SERVICE EXCHANGE

Ebsray maintains RX10 Service Exchange Pumpsets to facilitate rapid and economical changeover should the need arise. Contact Ebsray or your local representative to arrange.

(An EBSRAY Service Exchange Pumpset is a fully reconditioned, 'as-new' performance, Factory Warranted item which has been in service prior to its return for overhaul.)

6.4 SPARE PARTS

All Spare Parts for the RX10 Pumpset, Control Console and/or Ancillary Equipment are readily available. (refer to SERVICE above relating to restrictions as to the extent of overhaul/repair only by certified/qualified persons)

A Spare Parts listing is available to certified overhaulers or repairers trained and approved by EBSRAY.

SECTION 7 - TROUBLE SHOOTING			
Control Indicator/ Symptom	Possible Problem	Possible Cause	Remedy
DPS Fault Indicator Lamp 'ON' (NOT Flashing)	Differential Pressure too low	Insufficient LPG in Supply Tank	Fill Supply Tank
		Incorrect Bypass Valve setting.	Adjust (Increase) Bypass Valve setting to achieve required Differential Pressure.
		Bypass Valve jammed open	Check Bypass Valve, remove any obstruction, roughness, corrosion etc.
		Pumpset has 'Dead Headed' -Restriction in discharge system or Bypass line e.g. Discharge isolation valve, Bypass Valve, Bypass EFV or Isolation Valve closed	Check all devices in the discharge system and bypass line, remove blockage, repair or replace as required
		Excessive inlet restriction - Inlet Isolation Valve not opened fully - Faulty Inlet Excess Flow Valve	Check / open Inlet Valve Check, repair or replace Inlet Excess Flow Valve as required
		Storage tank filling by tanker during dispenser operation	Wait until filling operation is completed and mix/temp/state has stabilised in tank
		Insufficient liquid in Pump Housing - PPV™ Valve not fully open	Open PPV™ Valve Isolation Valve
		Normal wear after extended service	Reconditioning (Certified Persons ONLY) or Service Exchange Pumpset required.
		Power Supply to Control Console faulty	Check Power Supply (with Pumpset running and with Pumpset stopped): a) To Main Switch Board b) To Control Console
		Contact(s) or coil in Motor Contactor (KM1) faulty	Check Contactor, repair or replace as required
	Differential Pressure Switch not functioning or unable to function correctly	Isolation Valves (Low side and/or high side) to Differential Pressure Switch not open	Open both Isolation Valves to Differential Pressure Switch
		DPS Sensor Lines damaged	Repair or replace Sensor Lines
		Discharge Valve not fully open	Check Actuator/ open Discharge Valve
		Incorrectly adjusted Differential Pressure Switch (DPS)	Check DPS as per Manufacturer's Instructions
		Faulty Differential Pressure Switch	Replace Differential Pressure Switch
	Control Circuit not functioning correctly	Circuit/Communications outside EBSRAY Control Console faulty	Check Circuit/Communications, repair or replace as required
		Cables / connections between Main Switch Board, EBSRAY Control Console and DPS faulty	Check cables/connections, repair or replace as required
		EBSRAY Control Console faulty (See Control Console section below)	See Control Console section below
	DPS Fault Indicator Lamp Flashing ON 0.5 sec OFF 0.5 sec	DPS bypass time has not elapsed and Pumpset has yet to reach minimum differential pressure.	The flashing DPS Indicator is a normal function at each start of the Pumpset

Control Indicator/ Symptom	Possible Problem	Possible Cause	Remedy
DPS Fault Indicator Lamp Flashing ON 4.5 sec OFF 0.5 sec	Pumpset has not reached minimum differential pressure. before DPS bypass time has elapsed.	Insufficient LPG in supply tank	Fill Supply Tank
		Excessive inlet restriction - Inlet Isolation Valve not opened fully - Faulty Inlet Excess Flow Valve	Check/open Inlet Valve Check, repair or replace Inlet Excess Flow Valve as required
		Incorrectly adjusted Differential Pressure Switch	Check DPS as per Manufacturer's Instructions
		Faulty Differential Pressure Switch	Replace Differential Pressure Switch
	DPS Bypass Timer set too low for site conditions	- Long discharge line to dispenser - No Liquid in discharge line e.g. drained back through Dispenser's Vapour Return or 'boiled off' - Extended delays between pumpset starts	Increase DPS Bypass Timer to suit site conditions (see Operating Instructions for timer adjustment) Note: Always set the DPS Bypass Timer to the MINIMUM time required for the site conditions

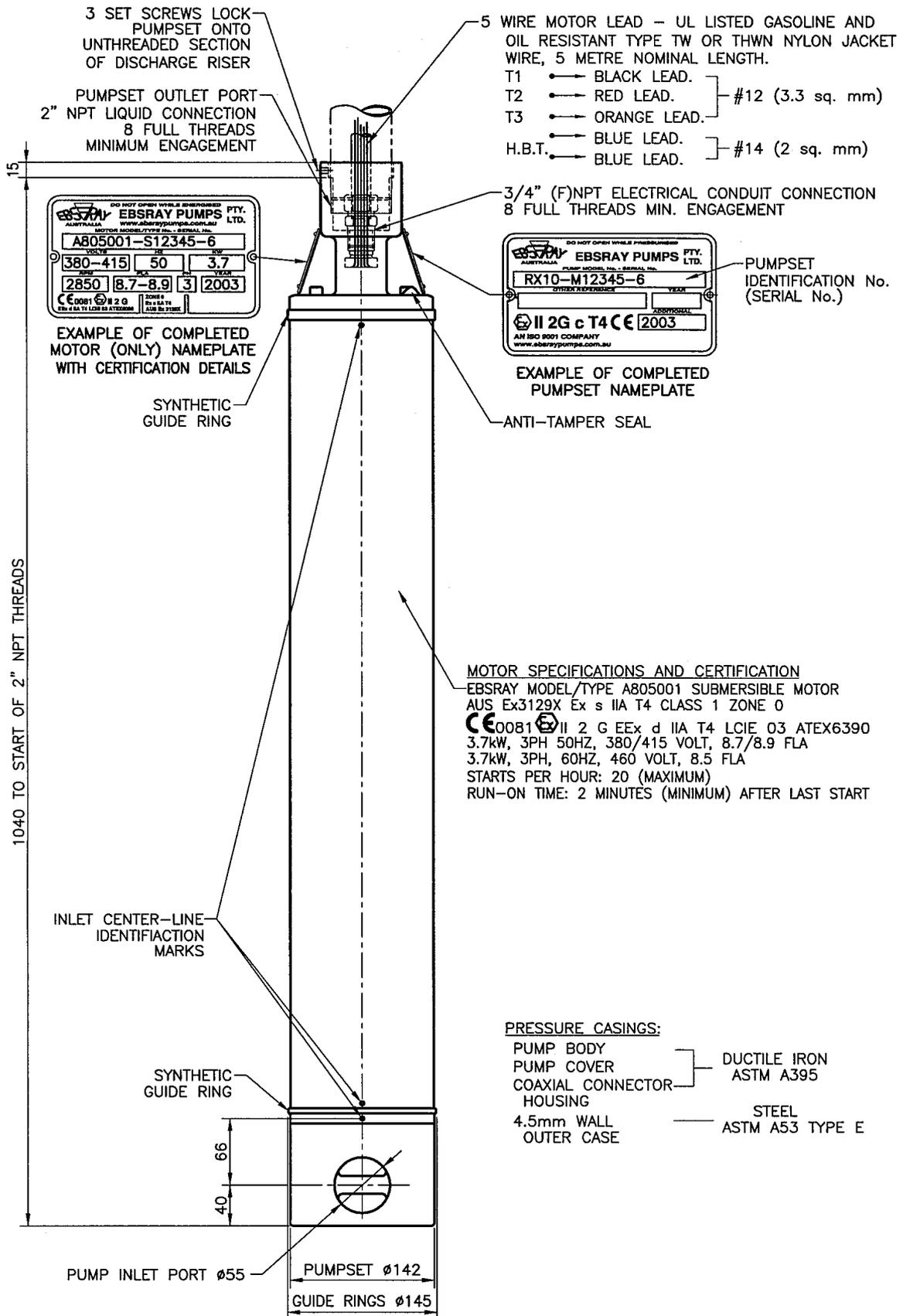
HBT (Fault Indicator Lamp 'ON' or Flashing) 'ON' indicates that a fault has occurred when the pump was running and HBT switch has reset Flashing ON 0.5 sec OFF 0.5 sec indicates that the fault is still present i.e. HBT switch has not reset	Differential Pressure too low	See DPS above	See DPS above
		Normal wear after extended service	Reconditioning (Certified Persons ONLY) or service exchange Pumpset required.
	Differential Pressure too high - no flow or very low flow through Pumpset	Pumpset has 'Dead Headed' - restriction in discharge system or Bypass line e.g. Discharge isolation valve, Bypass Valve, Bypass EFV or Isolation Valve closed	Check all devices in the Discharge Line or the Bypass Line. Adjust (decrease) Bypass Valve setting, repair or replace as required
	Obstruction in BCL™ Breathers/Filters	Dirt/debris/contaminate in supply tank or Pump Housing	If Pumpset will not run after reset, contact Factory or Representative
Control Circuit not functioning correctly	Circuit/Communications outside EBSRAY Control Console faulty	Check Circuit/Communications, repair or replace as required	
		Cables/connections between Main Switch Board, EBSRAY Control Console and Pumpset (HBT switch) faulty	Check cables/connections, repair or replace as required
		Fault in EBSRAY Control Console	See Control Console below
HBT (Fault Indicator Lamp 'ON' or Flashing in any sequence)	Excessive pump starts (more than 20 starts per hour) OR re-starting in less than 2 minutes after last start	Too frequent repeat run signal from dispenser (may be faulty signal cycling or "hunting")	Limit number of starts or check/repair dispenser signal quality
		Control circuit/Console malfunction (Run Relay cycling)	See Control Console below
		Excessive manual "resets" of Control Console after faults	Remedy problem before resetting.
HBT Flashing ON 1 sec OFF 5 sec OR Flashing ON 0.5 sec OFF 0.5 sec ON 0.5 sec OFF 3 sec	High liquid temperature in Supply Tank	High liquid temperature when delivered	Allow liquid in tank to cool over time. Top up to maximum allowable level with cool LPG. Or refer to EBSRAY
		Pumpset running continuously for extended period - ensure that key is not left in "TEST" position.	
	Low liquid level in Supply Tank	Tank contents gauge may be reading incorrectly.	Fill supply tank, check for correct functioning of contents gauge
	PPV™ Valve not functioning correctly	PPV™ isolation valve not open	Open PPV™ isolation Valve
		Blocked or faulty PPV™ Valve	Inspect PPV™ Valve, replace if faulty

Control Indicator/ Symptom	Possible Problem	Possible Cause	Remedy
MOL (Fault Indicator Lamp 'ON' or Flashing) 'ON' indicates that a fault has occurred and MOL switch has reset Flashing ON 0.5 sec OFF 0.5 sec indicates that the fault is still present i.e. MOL switch has not reset	MOL Relay set too low	Incorrect setting on MOL Relay	Reset MOL setting to FLA of Motor as per Specification (See Operating Instructions)
	Differential Pressure Too High	Incorrect Bypass Valve Setting.	Adjust (decrease) Bypass Valve setting to achieve required lower pressure.
		Pumpset has 'Dead Headed' - restriction in discharge system or Bypass line e.g. Discharge isolation valve, Bypass Valve, Bypass EFV or Isolation Valve closed	Check all devices in the Discharge Line or the Bypass Line, remove blockage, repair or replace as required
		Discharge Valve not fully open	Check Actuator and/or Open Discharge Valve
	Power Supply to Pumpset faulty	Power Supply to Control Console faulty	Check Power Supply (with Pumpset running and with Pumpset stopped): a) To Main Switch Board b) To Control Console
		Contact(s) or Coil in Motor Contactor (KM1) faulty	Check Contactor, repair or replace as required
		Motor Overload Relay (F1) faulty	Check Motor Overload Relay, repair or replace as required
	Excessive pump starts (more than 20 starts per hour) <u>OR</u> re-starting in less than 2 minutes after last start	Too frequent repeat run signal from dispenser (may be faulty signal cycling or "hunting")	Limit number of starts or check/repair dispenser signal quality
		Control circuit/Console malfunction (Run Relay cycling)	See Control Console below
		Excessive manual "resets" of Control Console after faults	Remedy problem before resetting.
	Motor damaged by excessive pump starts (more than 20 starts per hour)	See Excessive starts above	Reconditioning (Certified Persons ONLY) or Service Exchange Pumpset required.
	MOL Fault Indicator Lamp as above, OR MOL (Fault Indicator Lamp Flashing ON 4.5 sec OFF 0.5 sec) NOTE: This indicates that locked rotor current has been detected at start-up, Console MUST NOT be reset and restarted until cause found and rectified	MOL Relay set too low	Incorrect setting on MOL Relay
Obstruction in Pumpset Impeller		Dirt/debris/contaminate lodged in Pump	Clear Pump, Tank/Pump Chamber. If Pump will not run after reset, contact Factory or Representative
Motor / Pump Sleeve and/or Thrust Bearings worn		Dirt/debris/contaminate in Supply Tank and/or Pump Housing	Clean Supply tank and/or Pump Housing before refilling with clean product
		Normal wear after extended service	Reconditioning (Certified Persons ONLY) or Service Exchange Pumpset required.
Control Circuit not functioning correctly	Fault in EBSRAY Control Console	See Control Console below	

Control Indicator/ Symptom	Possible Problem	Possible Cause	Remedy
Excessive Noise and/or Vibration	Obstruction in Pumpset impeller	Dirt/debris/contaminant lodged in Pump	Clean Tank/ Pump Chamber. If Pump will not run after reset, contact Factory or Representative
	Faulty EFV on inlet, Bypass or Discharge	EFV Spring faulty or EFV ports partially blocked	Check EFV(s), repair or replace as required
	Faulty Back-check Valve in Discharge Line	Inspect Back-check Valve: Spring, Seat, Poppet, Flapper etc.	Repair or replace Back-check Valve as required
	Faulty Bypass Valve	Improperly set Bypass Valve or Bypass Valve faulty	Check Bypass Valve, adjust, repair or replace as required
	Motor / Pump Sleeve and/or Thrust Bearings worn	Dirt/debris/contaminant in Supply tank and/or Pump Housing	Clean Supply tank and/or Pump Housing before refilling with clean product
Normal wear after extended service		Reconditioning (Certified Persons ONLY) or Service Exchange Pumpset required.	
"Pulsing" flow	Pumpset cavitating	Insufficient LPG in supply tank - Pump Inlet (suction) Port not fully covered with liquid	Fill supply tank
		Pumpset has 'Dead Headed' - restriction in discharge system or Bypass line e.g. Discharge isolation valve, Bypass Valve, Bypass EFV or Isolation Valve closed	Check all devices in the Discharge Line or the Bypass Line, remove blockage, repair or replace as required
		Excessive Inlet (suction) restriction - Inlet Valve not opened fully - Faulty Inlet Excess Flow Valve	Check / Open Inlet Valve, repair or replace Excess Flow Valve as required
Slow Vehicle Fill	Low Pump flow	Insufficient LPG in Supply Tank - Pumpset Inlet (Suction) Port not fully covered with liquid	Fill Supply Tank
		Excessive pressure in vehicle tank	As filling proceeds, temperature (and pressure) will fall - increasing fill rate
	Low Differential Pressure	See DPS above	See DPS above
	Obstruction Between Pumpset and Vehicle tank	Malfunctioning AFL Valve or blocked filter in AFL Valve in Vehicle	Repair, clean filter or replace AFL Valve in Vehicle as required
		Blocked filter in Meter/Dispenser	Check and clean or replace as required
		Blocked filter in Nozzle	Check and clean or replace as required
		Blockage within vehicle's fill piping or vehicle Back-check valve faulty	Clear blockage. Check, clean or replace as required

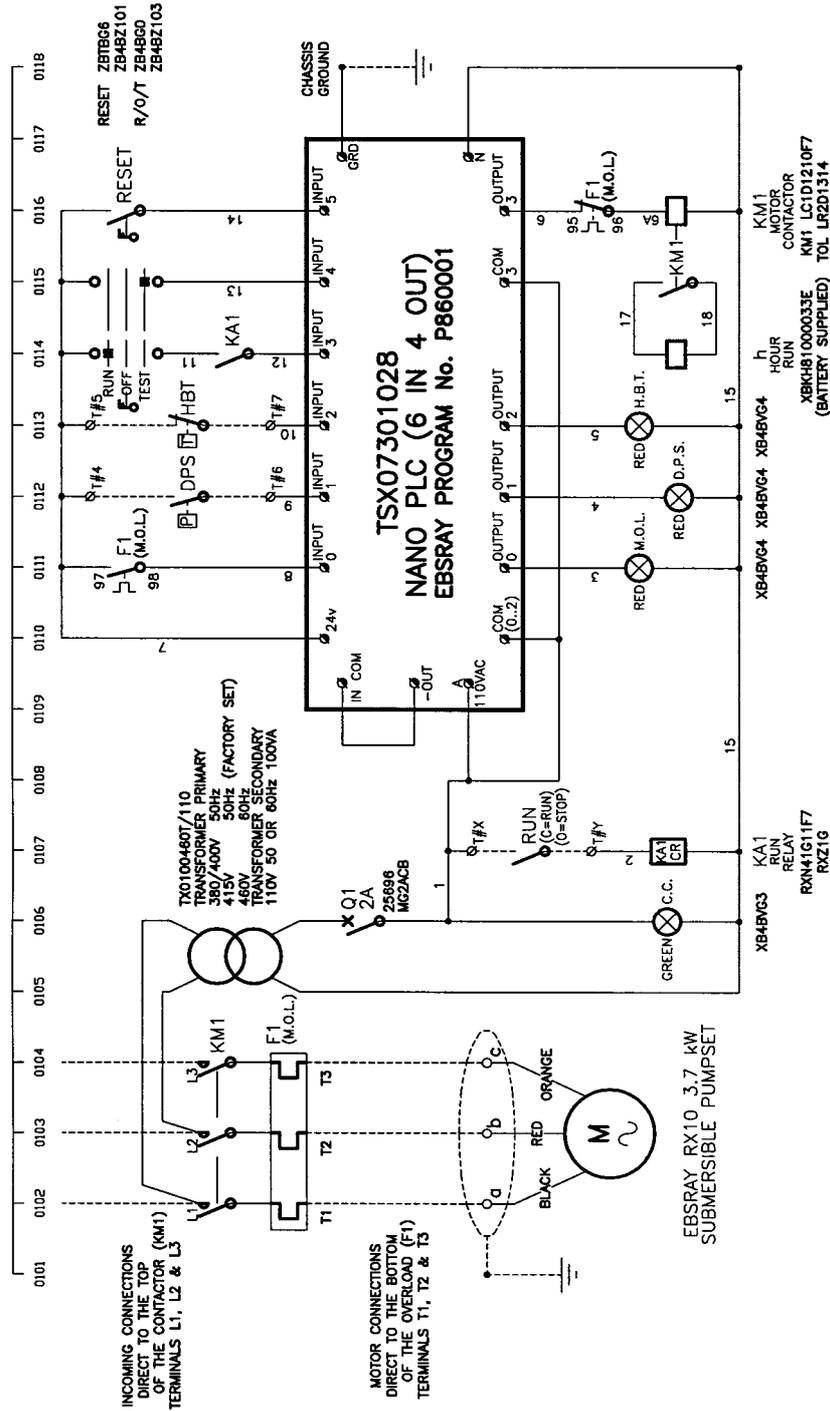
Control Indicator/ Symptom	Possible Problem	Possible Cause	Remedy
No Vehicle Fill	Pumpset operating but fails to deliver LPG	Vehicle tank already full	No problem exists
		Insufficient LPG in Supply Tank	Fill Supply Tank
		Blockage in discharge line from Pumpset	Clear blockage e.g. Excess Flow Valve at Dispenser etc.
		Dispenser malfunctioning or not authorised correctly	Re-authorise or check Dispenser as required.
		Insufficient system Differential Pressure (See DPS above)	Increase Differential Pressure (See DPS above)
		Excessive pressure in Vehicle Tank	Allow Vehicle Tank to cool until pressure decreases
		Malfunctioning AFL Valve or blocked Filter in AFL Valve in vehicle	Repair, clean filter or replace AFL Valve in vehicle as required
		Blocked Filter in Meter/Dispenser	Check and clean or replace as required
		Blocked Filter in Nozzle	Check and clean or replace as required
	Pumpset will NOT run when authorised by the Dispenser/ Communications System	With any Red Fault Indicator Lamp on Control Console 'ON' or flashing	See above for specific indicator i.e. DPS, MOL or HBT
All Red Fault Indicator Lamps on Control Console 'OFF'		See Control Console below	
Pumpset Will Not Run - No Control Console Fault Indicator Lamps (red)	Dispenser/ Communications System faulty	Dispenser/Communications System not providing signal to Control Console via Terminals X and Y (See Wiring Diagram)	Check for signal on terminals X and Y X to Y Closed = Pumpset On X to Y Open = Pumpset Off Check and/or Repair Dispenser / Communications System as required
	Power Supply faulty	Supply Power to EBSRAY Control Console faulty	Check Power Supply: a) To Main Board b) To EBSRAY Control Console
		Contact(s) or Coil in Motor Contactor (KM1) faulty	Check Contactor, repair or replace as required
		Motor Overload Relay (F1) faulty	Check Motor Overload Relay, repair or replace as required
	Control Console's Fault Indicator Lamp faulty	Fault Indicator Lamp (LED) faulty	Perform Lamp test (See Operating Section) replace Lamp (LED) if required See Above for Specific Indicator
	Run Relay (KA1) faulty	Coil or Contacts of Relay faulty	Check Relay, replace if required
	Motor Contactor (KM1) faulty	Coil or Contacts of Contactor faulty	Check Contactor, replace as required
	PLC inside EBSRAY Control Console has detected an internal or an Input/Output fault and has suspended operation (See Operating Section)	When the Green 'RUN' LED on the PLC Status Display is flashing - The PLC has detected an internal fault and suspended operation	Switch Power 'OFF' at Circuit Breaker (Q1), leave 'OFF' for 10 Seconds, turn power back 'ON' at Circuit Breaker (Q1). If 'RUN' LED is 'OFF' or flashing contact Factory or Representative.
		When the Red 'ERR' LED on the PLC Status Display is flashing or 'ON' - The PLC has detected an internal execution fault and suspended operation	Switch power 'OFF' at Circuit Breaker (Q1), leave 'OFF' for 10 Seconds, turn power back 'ON' at Circuit Breaker (Q1). If 'ERR' LED is flashing or 'ON' contact Factory or Representative.
		When the Red 'I/O' LED on the PLC Status Display is 'ON' - The PLC has detected an external fault with the Inputs (DPS, HBT, MOL) or the Outputs (Indicator Lamps, Motor Contactor) and suspended operation	Check Input/Outputs to PLC for shorted connections, induced current, faulty grounding, incorrectly applied voltage, etc. Rectify as required. If I/O LED is 'ON' contact Factory or Representative.

**APPENDIX B - EBSRAY RX10 3.7 KW SUBMERSIBLE PUMPSET
OUTLINE DIMENSIONS AND SPECIFICATION**



EBSRAY RX10 3.7kW SUBMERSIBLE PUMPSET
OUTLINE DIMENSIONS AND SPECIFICATION
DRG. No. A315001C REV. G
DATE: 06.09.04

APPENDIX C - TYPICAL WIRING SCHEMATICS AND CONNECTION DIAGRAM



- NOTES:
1. ALL CONSTRUCTION AND INSTALLATION IS TO BE CARRIED OUT ONLY BY QUALIFIED PERSONNEL.
 2. ALL CONSTRUCTION AND INSTALLATION IS TO BE STRICTLY IN ACCORDANCE WITH ALL RELEVANT FEDERAL, STATE AND LOCAL CODES, REGULATIONS AND STANDARDS.
 3. EBSRAY CONTROL CONSOLE IS ONLY TO BE INSTALLED IN A NON-HAZARDOUS AREA REQUIRING IP55 (OR LESS) RATED ENCLOSURES.
 4. T# INDICATES WIRING CONNECTIONS TO BE MADE ON THE TERMINAL STRIP IN THE EBSRAY CONTROL CONSOLE AT THE INDICATED TERMINAL.
 5. INSTALLER MUST PROVIDE:
 - A. ISOLATED 3 PHASE:
 - 50 HZ, 380/400 VOLT, 8.7 FLA -OR-
 - 50 HZ, 415 VOLT, 8.9 FLA -OR-
 - 60 HZ, 460 VOLT, 8.5 FLA
 - B. EARTH GROUND
 - C. N.O. VOLTAGE-FREE CONTACT SWITCHING 110 VAC, 2A
 - D. 8 CORE PLUS GROUND* x 2.5mm² (MIN), ARMOURED CABLE CONTINUOUS FROM EXD BARRIER GLAND ON REMOTE MOUNTED EXD JUNCTION BOX TO NON-HAZARDOUS GLAND ON EBSRAY CONTROL CONSOLE.
 - * 6 CORE PLUS GROUND CAN BE ACCOMMODATED WITH MODIFICATIONS, CONTACT EBSRAY

ITEM	DESCRIPTION	SUPPLIED BY	LOCATION OF REMOTE WIRING TERMINATION	SPECIAL WIRING NOTES
M	EBSRAY MODEL/TYPE AR05001 SUBMERSIBLE MOTOR CEC0081011 2 G EE d IA T4 LCE 03 ATEX380 AUS E3120X Ex IA T4 CLASS I ZONE 0 3.7KW, 3PH, 50HZ, 380/415 VOLT, 8.7/8.9 FLA 3.7KW, 3PH, 60HZ, 460 VOLT, 8.5 FLA	EBSRAY	End JUNCTION BOX AT PUMP TURRET	abc PHASE SEQUENCE = BLACK, RED, ORANGE MOTOR LEAD SEQUENCE PHASE SEQUENCE MUST BE DETERMINED AT THE EXD JUNCTION BOX BEFORE CONNECTING MOTOR LEADS. MOTOR GROUND IS VA CONDUIT - EXD JUNCTION BOX MUST BE GROUNDED TO EARTH
DPS	EBSRAY DIFFERENTIAL PRESSURE SWITCH (DPS) No. CB60202 AUS E460-1 Ex # IIC T6 CLASS I ZONE 1 GROUP II @ DENRO #EBS00301 Ex m CLAS I ZONE 1 GROUP II U.L. LISTED/CSA CERT. CLASS 1 GROUPS A, B, C & D DIV. 1 & 2	EBSRAY	End JUNCTION BOX AT PUMP TURRET	CONNECT TO COMMON (BLUE) AND N.O. (BLACK) LEADS. CAP OFF N.C. (RED) LEAD. CONNECT GRD (GREEN) TO EXD JUNCTION BOX GROUND TERMINAL
HBT	HIGH BEARING TEMPERATURE SWITCH - N.C. (INTERNAL TO CERTIFIED EBSRAY MOTOR)	EBSRAY	End JUNCTION BOX AT PUMP TURRET	HIGH BEARING TEMPERATURE SWITCH CONNECT TO THE TWO BLUE MOTOR LEADS.
RUN	NORMALLY OPEN VOLTAGE-FREE CONTACT SWITCHING 110 VAC, 2A CLOSED = PUMP RUN	OTHERS	IN MAIN SWITCHBOARD (OUTSIDE HAZARDOUS LOCATION)	SEE TYPICAL RETRO-FIT DIAGRAM

EBSRAY AUSTRALIA
EBS-RAY PUMPS PTY.LTD
HN 22 00 01 003

CONTROL-MOTOR-7.5kW-IP55
WIRING DIAGRAM
DRG. No. CB60001 REV. L
PAGE 1 OF 2
(PAGE 2 OF 2 SEE FIG. 11)
DATE: 08-09-04

APPENDIX D - RX10 SYSTEM PRE-STARTUP COMMISSIONING CHECKLIST

Date: _____ Location: _____ Pumpset Serial No. _____

Installation Company: _____ Installer's Name: _____

Indicate Inspection Satisfactorily Completed with a ✓ in the appropriate

- 1. Check that all electrical wiring is insulated from the ground, conduits, tank etc.
- 2. Check for leak free installation at pump and pipe and electrical conduit connections.



WARNING

DO NOT RUN PUMP IN REVERSE.

- 3. **Direction of rotation - This MUST be tested prior to pump operation by**
using a Phase Sequence Indicator.
 With pump wiring at the Junction Box in the order: BLACK (1), RED (2), ORANGE (3), the power supply phase sequence must be a, b, c. (or R,S,T.) (CLOCKWISE)
- 4. Ensure voltage is correct and that all relevant electrical components are adequate for the application.



WARNING

DO NOT RUN PUMP DRY, OR EXCEED MAXIMUM 20 MOTOR STARTS PER HOUR, OR RE- START IN LESS THAN 2 MINUTES AFTER LAST START. (I.E. MINIMUM 2 MINUTES RUN-ON TIME AFTER LAST START)

- 5. Valves should be in the following positions:
 (see P & I D Appendix A for locations)
- Pump Housing/Chamber Inlet Valve..... OPEN
- PPV™ Isolation Valve OPEN
- Valves to Both Sides of Differential Pressure Switch..... OPEN
- Valves to Both Pressure Gauges..... OPEN
- Discharge Line Valve/s OPEN
- Vapour/Bypass Return Line Valve/s OPEN



WARNING

DO NOT START PUMP AGAINST CLOSED DISCHARGE VALVE OR WITH CHAMBER INLET VALVE THROTTLED

- 6. Ensure that Pump is in LPG liquid by removing all vapour, in an approved manner, from the discharge riser.
- 7. Back off Bypass Valve Adjusting Screw fully i.e. Minimum Differential Pressure.
- 8. Ensure timer in PLC is set to required delay time (refer Control Console operating instructions)
- 9. Ensure Keyed Run-Off-Test Selector switch on Control Console is in "OFF" mode.
- 10. Ensure circuit breaker (Q1) in Control Console is in "OFF" position.
- 11. Set MOL relay to FLA to suit voltage (Refer Appendix C) and automatic reset mode.

Notes:

**APPENDIX F - COPIES OF CERTIFICATIONS & DECLARATIONS FOR RX10 PUMP/MOTOR
ATEX CERTIFICATE**



EC DECLARATION OF CONFORMITY

L C I E	
1 ATTESTATION D'EXAMEN CE DE TYPE	1 EC TYPE EXAMINATION CERTIFICATE
2 Appareils et systèmes de protection destinés à être utilisés en atmosphères explosibles Directive 94/9/CE	2 Equipment or protective system intended for use in potentially explosive atmospheres Directive 94/9/EC
3 Numéro de l'attestation d'examen CE de type LCIE 03 ATEX 6390	3 EC Type Examination Certificate number LCIE 03 ATEX 6390
4 Appareil ou système de protection : Pompe submersible triphasée Type : A805001	4 Equipment or protective system : Three phase submersible pump Type : A805001
5 Demandeur : EBS-RAY PUMPS PTY, LTD	5 Applicant : EBS-RAY PUMPS PTY, LTD
6 Adresse : 628 Pittwater Road BROOKVALE NSW 2100 AUSTRALIE	6 Address : 628 Pittwater Road BROOKVALE NSW 2100 AUSTRALIA
7 Cet appareil ou système de protection et ses variantes éventuelles acceptées est décrit dans l'annexe de la présente attestation et dans les documents décrits ci-dessous en annexe.	7 This equipment or protective system and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.
8 La LCIE, organisme notifié sous la référence 0081 conformément à l'article 9 de la directive 94/9/CE du Parlement européen et du Conseil du 23 mars 1994, certifie que cet appareil ou système de protection est conforme aux exigences essentielles en ce qui concerne la sécurité et la santé pour la conception et la construction d'appareils et de systèmes de protection destinés à être utilisés en atmosphères explosibles, données dans l'annexe II de la directive. Les vérifications et épreuves figurent dans notre rapport confidentiel N° 00016379-509276.	8 LCIE, notified body number 0081 in accordance with article 9 of the Directive 94/9/EC of the European Parliament and Council of 23 March 1994, certifies that this equipment or protective system has been found to comply with the essential Health and Safety Requirements relating to the design and construction of equipment and protective system intended for use in potentially explosive atmospheres, given in Annex II of the Directive. The examination and test results are recorded in confidential report No. 00016379-509276.
9 Le respect des exigences essentielles en ce qui concerne la sécurité et la santé est assuré par la conformité aux documents suivants : -EN 50014 (1997) + amendements 1 et 2, -EN 50018 (2000) + amendement 1.	9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with : -EN 50014 (1997) + amendments 1 and 2, -EN 50018 (2000) + amendment 1.
10 Le signe X lorsqu'il est placé à la suite du numéro de l'attestation, indique que ce matériel ou système de protection est soumis aux conditions spéciales pour une utilisation sûre, mentionnées dans l'annexe de la présente attestation.	10 If the sign X is placed after the certificate number, it indicates that the equipment or protective system is subject to special conditions for safe use specified in the schedule to this certificate.
11 Cette attestation d'examen CE de type concerne uniquement la conception et la construction de l'appareil ou du système de protection spécifié, conformément à la directive 94/9/CE. Des exigences supplémentaires de cette directive sont applicables pour la fabrication et la fourniture de l'appareil ou du système de protection.	11 This EC Type examination certificate relates only to the design and construction of this specified equipment or protective system in accordance with the Directive 94/9/EC. Further requirements of the Directive apply to the manufacture and supply of this equipment or protective system.
12 Le marquage de l'appareil ou du système de protection devra comporter, entre autres indications utiles, les mentions suivantes : II 2 G EEx d IIA T4	12 The marking of the equipment or protective system shall include the following : II 2 G EEx d IIA T4

Fontenay-aux-Roses, le 16 octobre 2003

Le Directeur de l'organisme certificateur
Manager of the certification body

Michel BRENDON
Timbre sec / Dry seal

Item	Content based upon Annex X of ATEX Directive 94/9/EC
Manufacturer	Ebsray Pumps Pty Ltd
Address	628 Pittwater Road Brookvale NSW 2100 Australia
Manufacturer's Declaration	We, Ebsray Pumps Pty Ltd declare that the following equipment :
Description of Equipment	Submersible Pump - Motor ; Model / Type RX10 (All types) - A805001 (All types) ; for pumping LPG and other light hydrocarbons ; and bearing the following marking for the motor : II 2 G EEx d IIA T4
Declaration of compliance	Is designed and manufactured in compliance with the following applicable Directives :
Applicable Directives	ATEX Directive 94/9/EC
First applicable Directive	ATEX Directive 94/9/EC
Individual declaration of compliance	By application of the following Standards : EN 50014 (1993) EN 50018 (1996)
Proof of compliance	For which an EC-Type Examination Certificate LCIE 03 ATEX6090 has been obtained
Under this first Directive because included in ATEX and other applicable Directives - but not checked by the Notified Body	By application of the following Standards : EN 1127-1 (1998) EN 13463-1 (2001) prEN 13463-5 (2003)
Second applicable Directive	Pressure Equipment Directive (PED) 97/23/EC - but excluded under Article 3.10
Third applicable Directive	Electromagnetic Compatibility Directive (EMC) 89/336/EEC - by application of the following Standards : EN 55014-1 (2001) EN 55014-2 (1997)
Fourth applicable Directive	Machinery Directive (MD) 98/37/EC - by application of the following Standards : EN 292-1 (1991) EN 292-2 (1991) EN 809 (1998)
Notified Body involved	The Notified Body responsible for monitoring the ATEX Directive is : LCIE 03 ATEX 6390 Fontenay-aux-Roses cedex France LCIE Identification No is 0081
Manufacturer's own warning	Subject to the use for which the product(s) were designed and/or installed in accordance with the relevant Standards and Codes - all in conjunction with the Manufacturer's own Installation and Operating Instructions and recommendations
Final declaration	We, the undersigned, hereby declare that the product(s) specified conform to the listed Directive(s) and Standard(s)
Signatory of person legally responsible	W.A. Ebsray <i>W.A. Ebsray</i> Managing Director, Ebsray Pumps Pty Ltd
Place / Date	Brookvale, Australia / 01 October 2003

L C I E	
(A1) ANNEXE	(A1) SCHEDULE
(A2) ATTESTATION D'EXAMEN CE DE TYPE	(A2) EC TYPE EXAMINATION CERTIFICATE
LCIE 03 ATEX 6390	LCIE 03 ATEX 6390
(A3) Description de l'équipement ou du système de protection : Pompe submersible triphasée Type : A805001 Pompe submersible d'une puissance 3,7 kW qui fonctionne dans un liquide. Le marquage est le suivant : EBS-RAY PUMPS PTY, LTD Adresse : ... Type : A805001 N° de fabrication : ... Année de fabrication : ... II 2 G EEx d IIA T4 LCIE 03 ATEX 6390 NE PAS OUVRIR SOUS TENSION	(A3) Description of Equipment or Protective System: Three phase submersible pump Type : A805001 3,7 kW power submersible pump intended to operate in liquid. The marking is the following : EBS-RAY PUMPS PTY, LTD Address : ... Type : A805001 Serial number : ... Year of manufacturing : ... II 2 G EEx d IIA T4 LCIE 03 ATEX 6390 DO NOT OPEN WHILE ENERGIZED
Le marquage CE est accompagné du numéro d'identification de l'organisme notifié responsable de la surveillance du système approuvé de qualité (0081 pour la LCIE).	The CE marking shall be accompanied by the identification number of the notified body responsible for surveillance of the approved quality system (0081 for LCIE).
Le matériel devra également comporter le marquage normalement prévu par les normes de construction du matériel électrique concerné	The equipment must also carry the usual marking required by the manufacturing standards applying to such equipments.
Paramètres électriques relatifs à la sécurité : Puissance : 3,7 kW Alimentation : 380-415 V, 50 Hz 208-230 V ou 460 V, 60 Hz	Electrical parameters relative to safety : Power : 3,7 kW Power supply : 380-415 V, 50 Hz 208-230 V or 460 V, 60 Hz
(A4) Documents décrits : Dossier technique N°EBS805/01.DOC Rév. C du 10 octobre 2003. Ce document comporte 4 rubriques (6 pages).	(A4) Descriptive documents : Technical file No. EBS805/01.DOC Rev. C dated October 10 th , 2003. This file includes 4 items (6 pages).
(A5) Conditions spéciales pour une utilisation sûre : Néant.	(A5) Special conditions for safe use: Néant
(A6) Exigences essentielles en ce qui concerne la sécurité et la santé : Conformité aux normes européennes EN 50014 (1997 + amendements 1 et 2), EN 50018 (2000 + amendement 1).	(A6) Essential Health and Safety Requirements: Conformity to the European standards EN 50014 (1997 + amendments 1 and 2), EN 50018 (2000 + amendment 1).
Vérifications et épreuves individuelles L'appareil est dispensé d'épreuve individuelle.	Individual examinations and tests The equipment is not submitted to routine test.

Fontenay-aux-Roses, le 16 octobre 2003

Le Directeur de l'organisme certificateur
Manager of the certification body

Michel BRENDON
Timbre sec / Dry seal

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