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***Revolution Not Evolution***

**7329**

**DIPTRONIC™  
MEASURING SYSTEM MK1  
INSTALLATION MANUAL**



**Issue F October 2012**



## **P7403 Electrical equipment service and installation guide for road tankers**

Liquip supplies the following document as a guide for installing and operating electrical equipment on road tankers. It should be used in conjunction with local legislation and standards, owner's requirements and tank manufacturer procedures.

### **INFORMATION PERTAINING TO WORKING ON A TANK VEHICLE**

1. Prior to working on a tank vehicle it must be degassed or certified to work on. Before working in a tank compartment an appropriate device must be used to check for the presence of volatile gases.
2. Any work carried out on a tank vehicle must be done so in a non-hazardous area.
3. Before working on any electrical equipment on a tank vehicle power must be isolated either via the battery isolation switch (BIS), by disconnecting the truck battery or by disconnecting the positive of the electrical equipment.
4. Never weld on a tank vehicle unless all electronic equipment is completely disconnected electrically from both the tanker and other equipment.
5. Hazardous conditions may be present when working with high voltage devices (such as gantry monitors). Qualified technicians only should be servicing these devices.
6. Do not connect a battery charger or other pulsed power supply to the truck battery without first isolating all electrical equipment as permanent damage may result.
7. Long sleeve and pants protective clothing should be worn at all times. Clothing must be non-static generating. Any petroleum contact with skin should be washed off immediately.
8. Always follow manufacturer guidelines when working on electrical equipment. Failure to do so may void warranty or cause damage.

### **INFORMATION PERTAINING TO INSTALLING EQUIPMENT ON A TANK VEHICLE**

1. All electrical equipment and fittings must be suitable for use on a tanker and meet all local regulations for operation.
2. Use high quality waterproof conduit and fittings to IP66 minimum for all wiring and junction boxes.
3. Use waterproof flexible compound such as Silastic in all glands and joints not available as waterproof by design.
4. Mount all equipment away from direct spray areas such as behind the tyres and out of direct sunlight. Always select the most sheltered aspect.
5. Ensure all installations adhere to appropriate guidelines.
6. Coat all terminals, cable end and joints with non-conducting grease or Vaseline after final testing. This will prevent corrosion.



7. Prior to crimping, check wiring connections are electrically correct. When crimping make sure there is good electrical contact between the wire strands and metal section of the crimp terminal. Pull on the crimp to ensure a good connection has been made.
8. Cable ends may be crimped with ferrules for better connection. Do not solder the cable ends (fatigues and corrodes). Pre-coat with non-conductive grease for corrosion protection.
9. At any point a cable is extended or joined to a standard cable assembly, all cable screens must be connected to the chassis, refer to relevant wiring diagram. Insulate exposed screen wire using heat shrink, terminate with an eye terminal and attach to the junction box mounting screw. If the junction box is mounted to a panel not electrically connected to the chassis, the screens must still be joined together and connected to the chassis at one point, as per wiring diagram.
10. Common grounding of a system is most important. Do not rely on common chassis grounding at various points, run a full-length dedicated ground cable. Max resistance, battery ground to any ground point to be 1Ω. Refer Liquip Tech Talk #48: Electrical Bonding on Tankers. The electrical resistance between the tank and tanker chassis, prime mover chassis, or trailer undercarriage, and between the tank and the connection of the tanker pipework to the delivery hose, shall not exceed 10Ω (refer to AS2809.2).
11. Always fit as much loose cable length into junction boxes and housings as practicable to allow for future servicing.
12. Always segregate power and intrinsically safe wires in accordance with I.S wiring rules.
13. Carry out a complete wiring check for accuracy and continuity before connecting power to any device.
14. Observe international and local legal requirements. In the event of conflicting instructions seek qualified advice before proceeding.
15. Do not route communication cables past 'noisy' electrical apparatus such as solenoids and alternators.
16. Check instruction manual for recommended cable type and torque settings.
17. Use specialised, genuine tools for all electrical work.
18. Mount equipment to clean, dry, bare surfaces on a metal bracket mounted to the chassis/sub-frame. It is recommended the bracket be welded to the chassis/sub-frame to facilitate good electrical contact.
19. Ensure adequate clearance around equipment being installed. This will provide for ease in future maintenance.
20. When bolting equipment into place, the use of Teflon tape or anti-seize compound on threads is advised.
21. Fuses located in hazardous areas must be suited to that location.
22. Always allow suitable separation between intrinsically safe wiring and power from line power source.



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## **1.0 DIPTRONIC INSTALLATION**

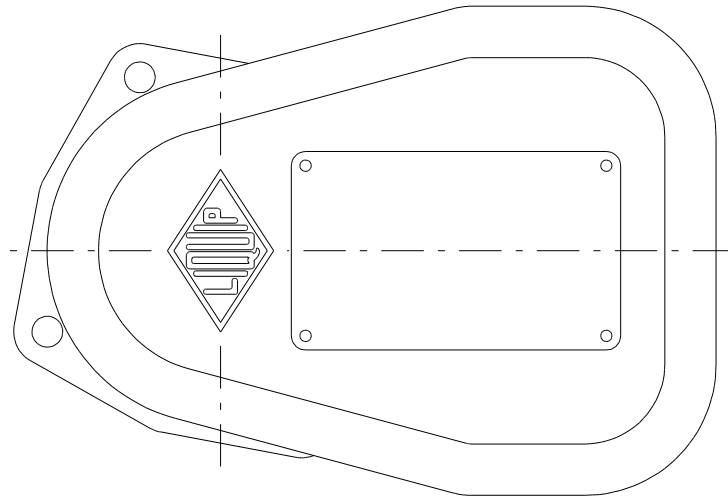
The following instructions apply to the installation of a Diptronic system on a road tanker.

Operational voltage ranges from 11.5 to 30 volts DC. A maximum current of 0.5 amps at 11.5 volts is drawn when the CPU is connected to 9 sensors. Note, there should be a minimum supply of 24 volts to the ticket printer (there is a corresponding increase in current draw).

The two main Diptronic components are the DIP100 sensors and DIP200 CPU's. A sensor is mounted in each compartment and communicates with the CPU the level in that compartment. Refer sensor and CPU photos on following pages and drawing X352001.



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ALUMINIUM COVER

HOUSING BASE WITH  
FLANGE MOUNT TO SUIT  
LIQUIP WELD FLANGES  
OR MANHOLE COVERS

CABLE  
GLAND

X351501

Issue: B



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## Diptronic Sensor



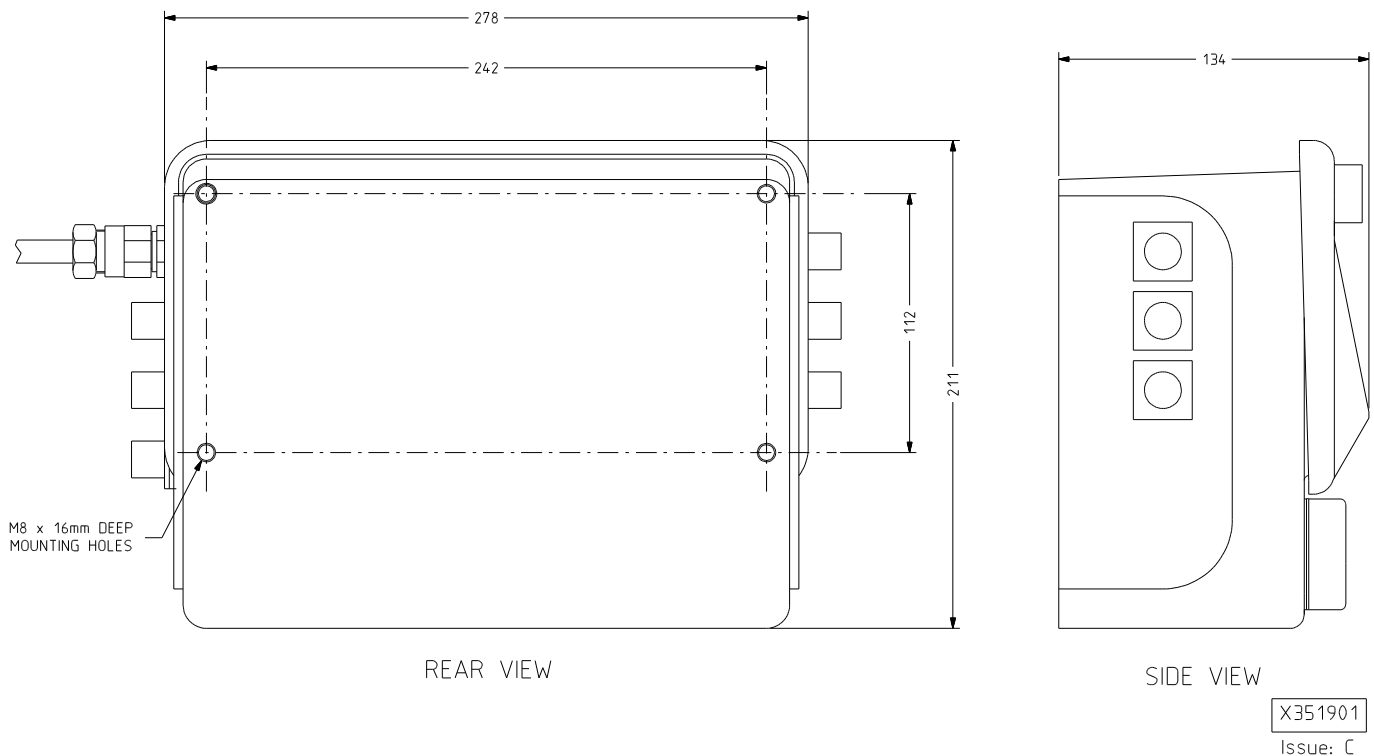


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## 2.0 CENTRAL PROCESSING UNIT (CPU) – DIP200 INSTALLATION

The CPU has up to six military specification connectors that connect to the sensors, printer and peripheral devices (where applicable).

The CPU is mounted using 4 x M8 bolts tapped into the rear of the body. It may be mounted direct to a plate or via brackets.



The CPU is sealed at the factory before delivery and access inside the CPU is not required at anytime. All wiring is done externally by military spec connectors or junction boxes. The front calibration buttons are sealed once the CPU has been calibrated.





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The CPU must be firmly mounted to the tanker. It must not be subjected to unnecessary vibration or stress. This is especially applicable to off-road applications. Do not bolt the CPU directly to the chassis, use metal brackets.





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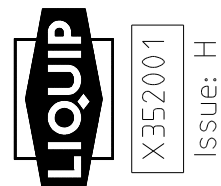
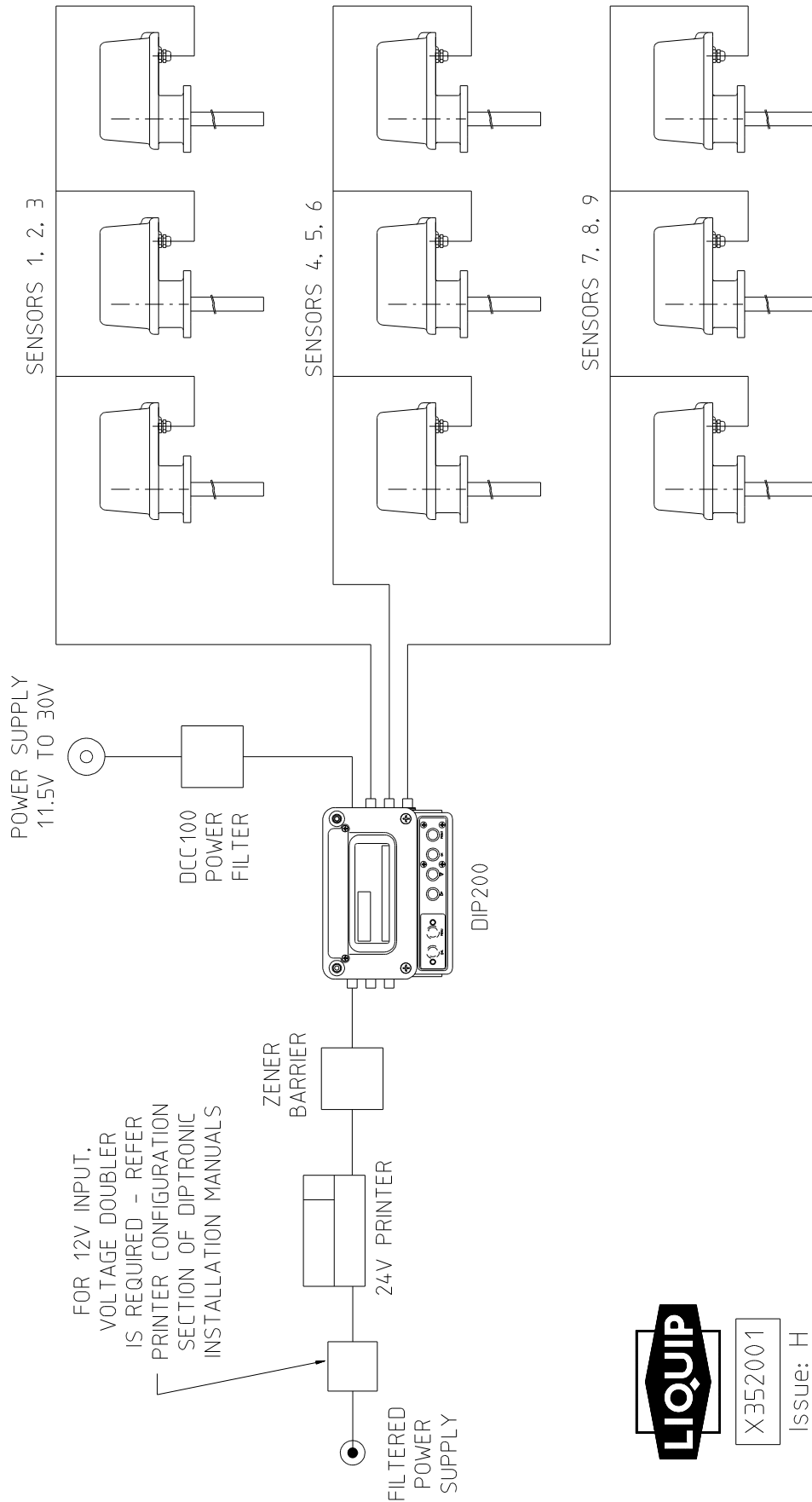
## Diptronic CPU





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## Basic Diptronic Component Layout





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### **3.0 SENSOR – DIP100 SERIES INSTALLATION**

The Diptronic sensor can be mounted to either a weld flange on the walkway or onto the manhole cover.

Insert each sensor into its corresponding compartment and bolt to the dip pads. Ensure they sit correctly in the tank bottom steadies. Note that each sensor must be inserted into the same compartment as indicated in the Determining Length of 'Diptronic' Electronic Dipstick form (refer P7331 General Information). The compartment number has been engraved into the flange of each sensor. It is also written on a tag attached to the sensor head prior to shipping.

When mounting the sensor to a manhole, it is important to check that the sensor head does not interfere with other components on the manhole cover such as the overfill probe housing, etc. Refer drawing X352202.

Check the operation of the emergency lid opening with the sensor in place.

**Note:** ***Each sensor must be mounted in the volumetric centre of its designated compartment. Tolerance to be within  $\pm 25\text{mm}$ . This is crucial in adhering to NMI requirements.***





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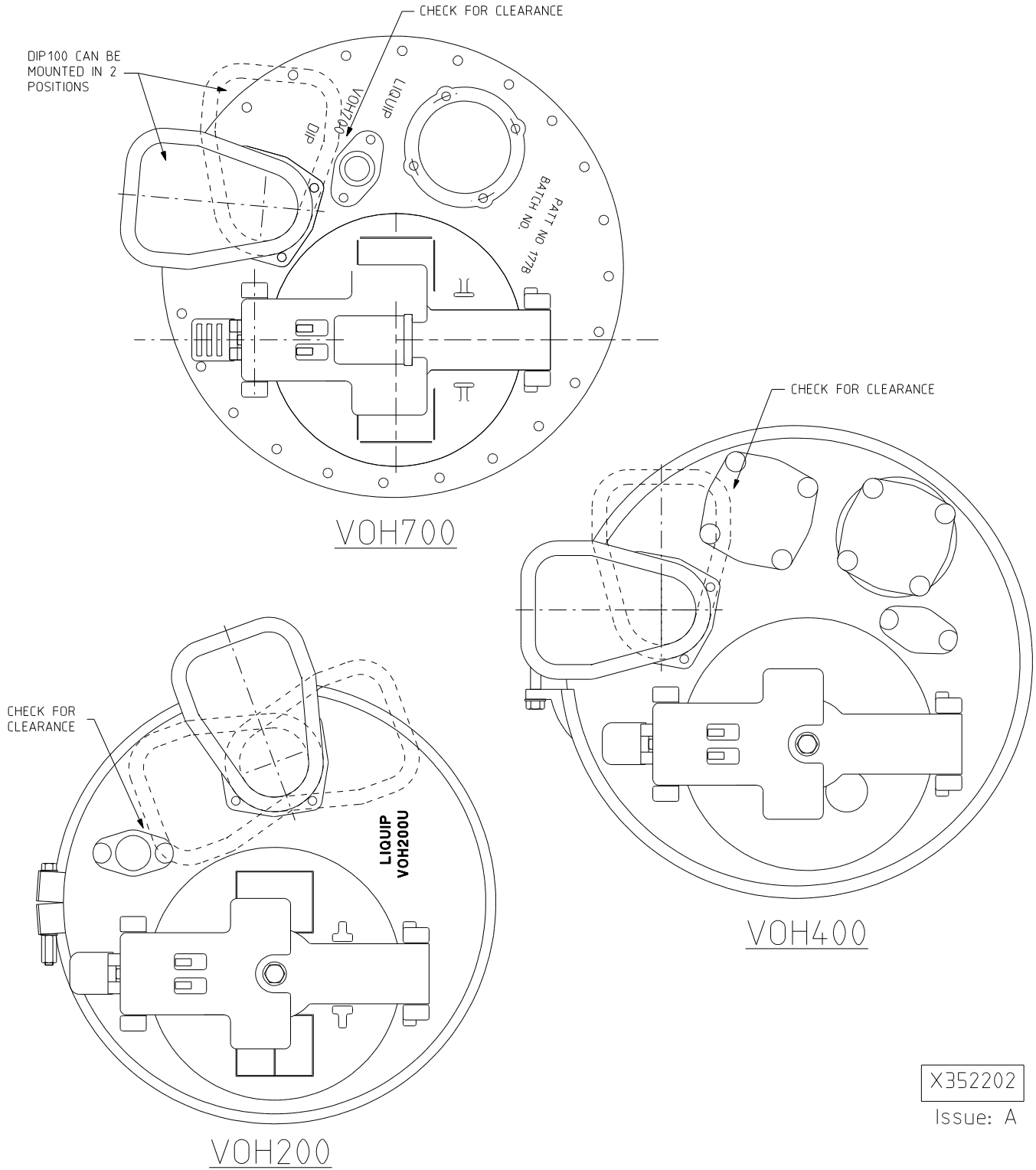
## Sensor Mounted on Walkway





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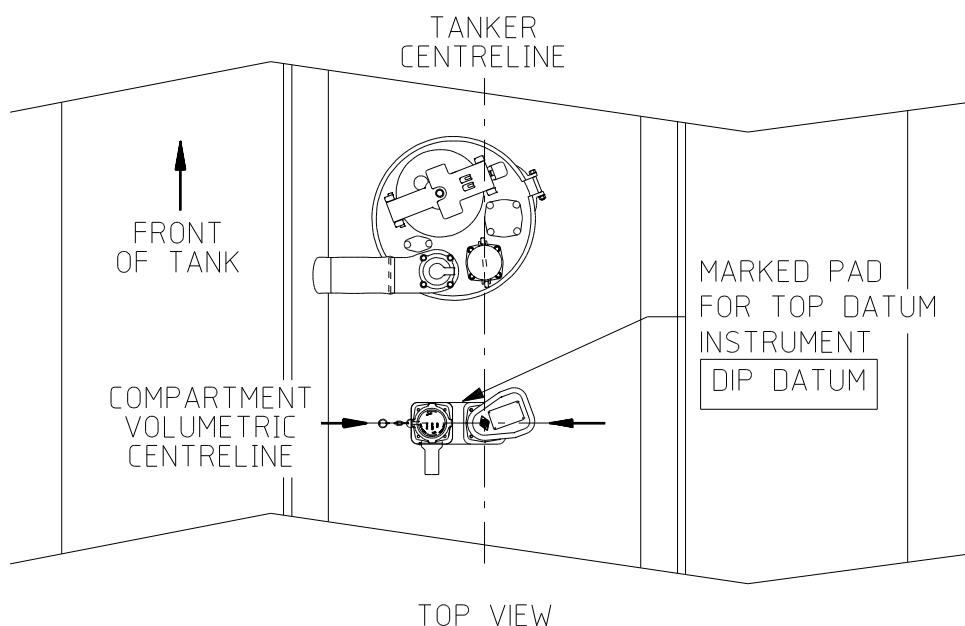
Check for clearance when mounting each sensor.



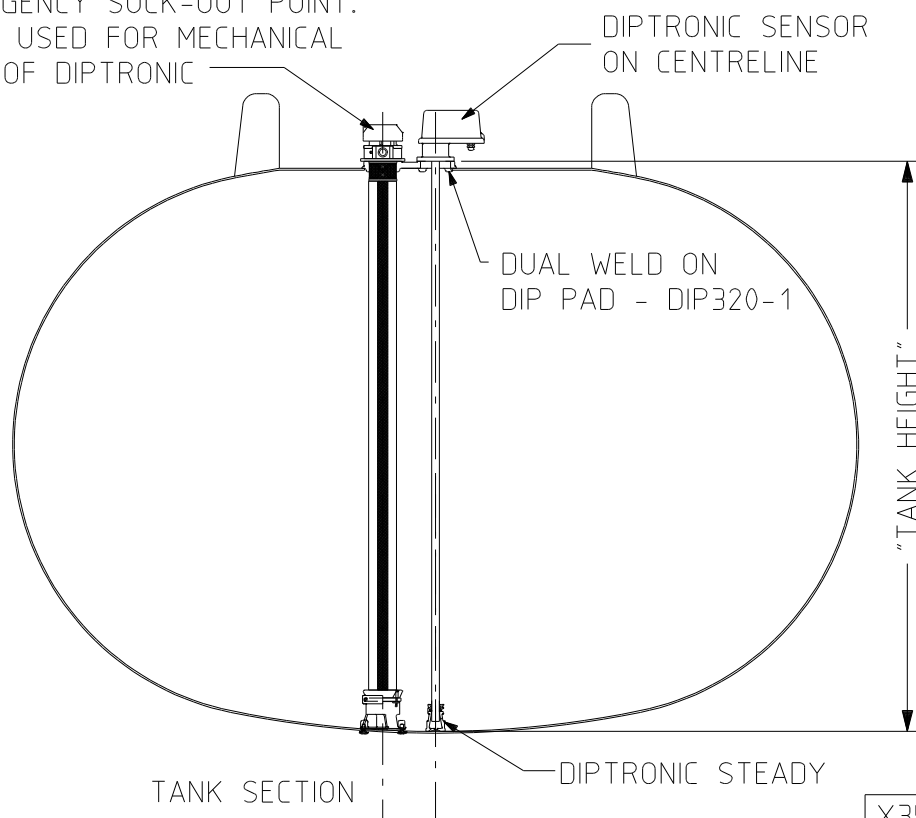


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## DIPTRONIC MOUNTED ON WALKWAY



OPTION: EMERGENCY SUCK-OUT POINT.  
CAN ALSO BE USED FOR MECHANICAL  
VERIFICATION OF DIPTRONIC



X351801

FIG 3  
Issue: C

The sensor extends into a steady that is welded to the bottom of the tank. The steady ensures the sensor is vertical and gives it support at the bottom.



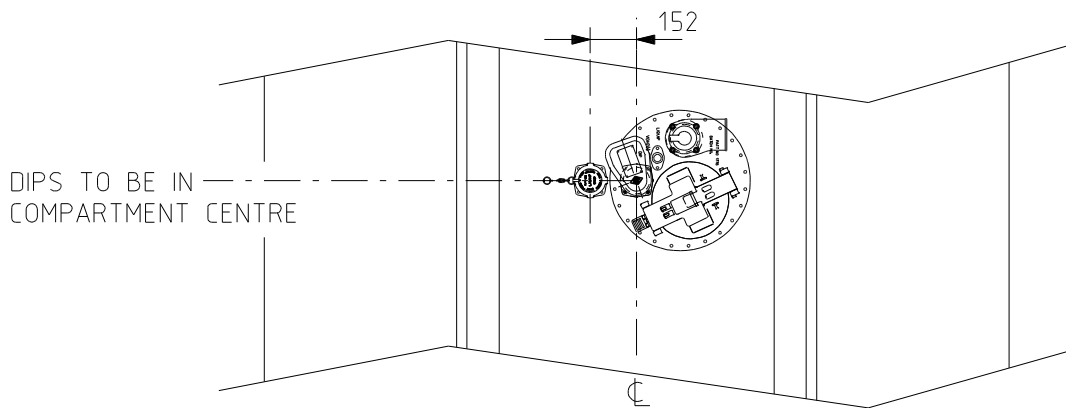
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When mounting the Diptronic sensor to a manhole cover, the sensor must be positioned so as not to interfere with the emergency vent or other items on the manhole such as the overfill probe housing or the vapour vent.

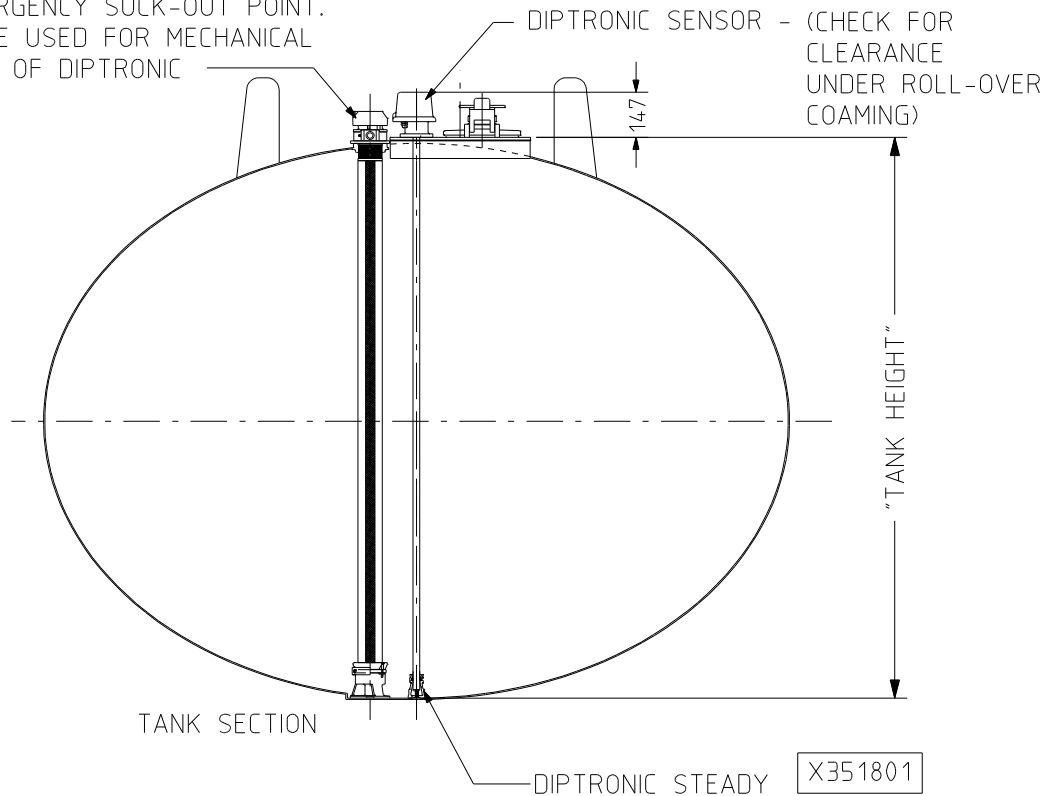
## DIPTRONIC MOUNTED ON MANHOLE COVER

NOTE: CHECK WEIGHTS & MEASURES REGULATIONS. SOME REQUIRE A FIXED MOUNT.

FRONT OF TANK



OPTION: EMERGENCY SUCK-OUT POINT.  
CAN ALSO BE USED FOR MECHANICAL  
VERIFICATION OF DIPTRONIC



X351801  
ISSUE: C





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Cut all sensor cables to the lengths required by measuring between the sensor mounting points to determine the required lengths.

Insert the sensor cables through the cable gland/s (refer drawing X350206). Attach the positive & negative wires to the terminals protruding from the epoxy surface using fork or eye terminals.

It is critical the screen wire is connected to the base of the sensor (make sure any exposed bare wire is insulated with heat shrink).

**DO NOT CONNECT THE SCREEN AND NEGATIVE WIRES TOGETHER  
INSIDE THE DIP1xx HOUSING OR ANYWHERE ELSE.**

Refer to wiring diagrams for detailed wiring instructions.

Sensors 1 to 3 should be connected to HART1, the mil spec plug located at the top right hand side of the CPU below the power harness. Sensors 4 to 6 should be connected to HART2, the mil spec connector located just below HART1. Sensors 7 to 9 should be connected to HART3, the mil spec connector located just below HART2.

Place the aluminium cover over the sensor (DIP1x0-12) and bolt into place. Tighten glands and bolts to specified torque. Refer appendix 4 for torque specifications.

**Note:** 1. Communication cables and power cables must run through separate junction boxes.

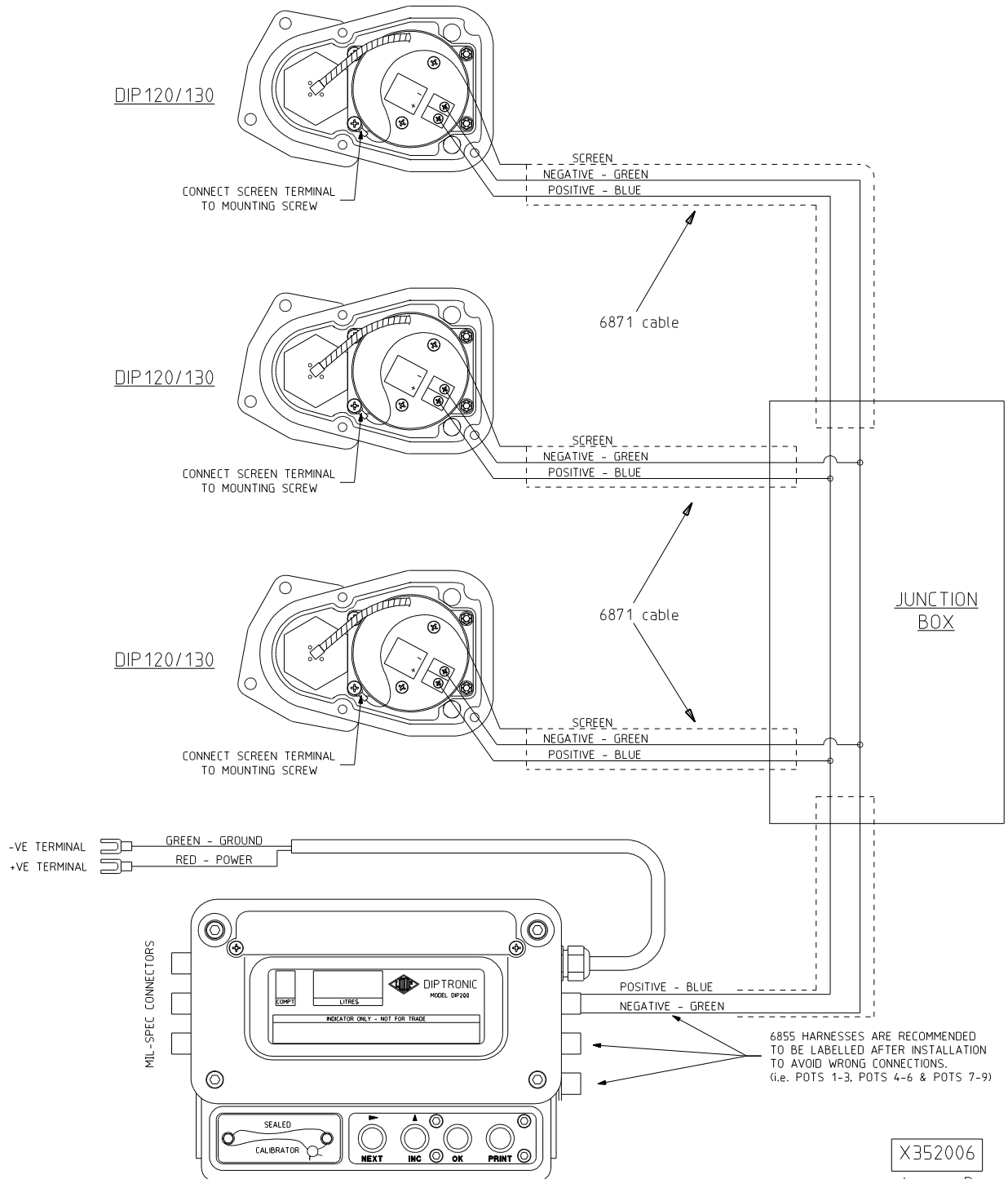
2. All exposed screen wires must be insulated using appropriate heat-shrink.



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## Wiring of Diptronic Sensors:

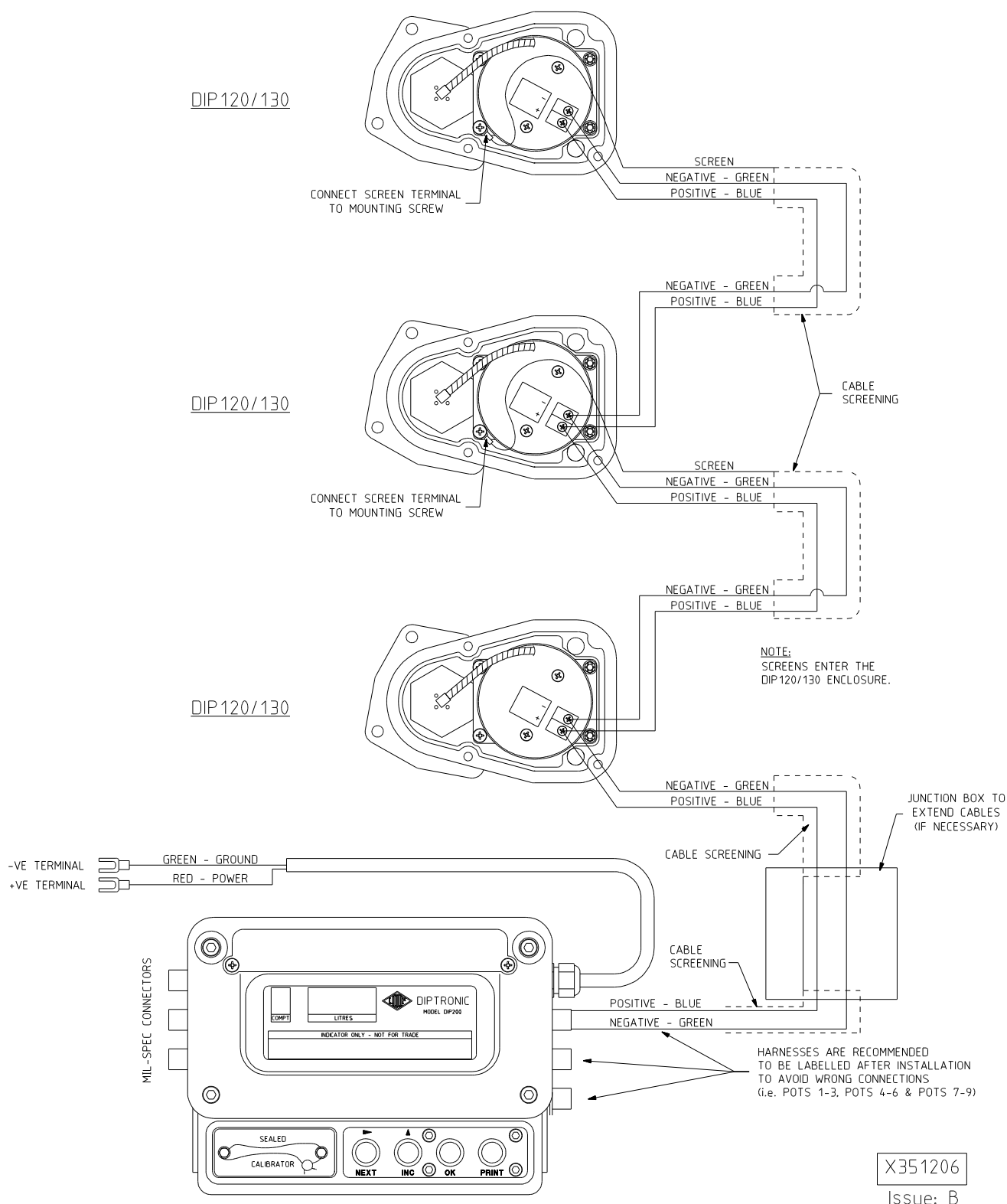
It is strongly recommended to wire as indicated in X352006 below. X351206 is an optional mounting method only when unable to wire as in X352006. Refer X351706 when 'C' and 'E' pots are mixed.



When using acetal plug to blank last port of sensor do not over tighten.  
Max torque 12Nm.



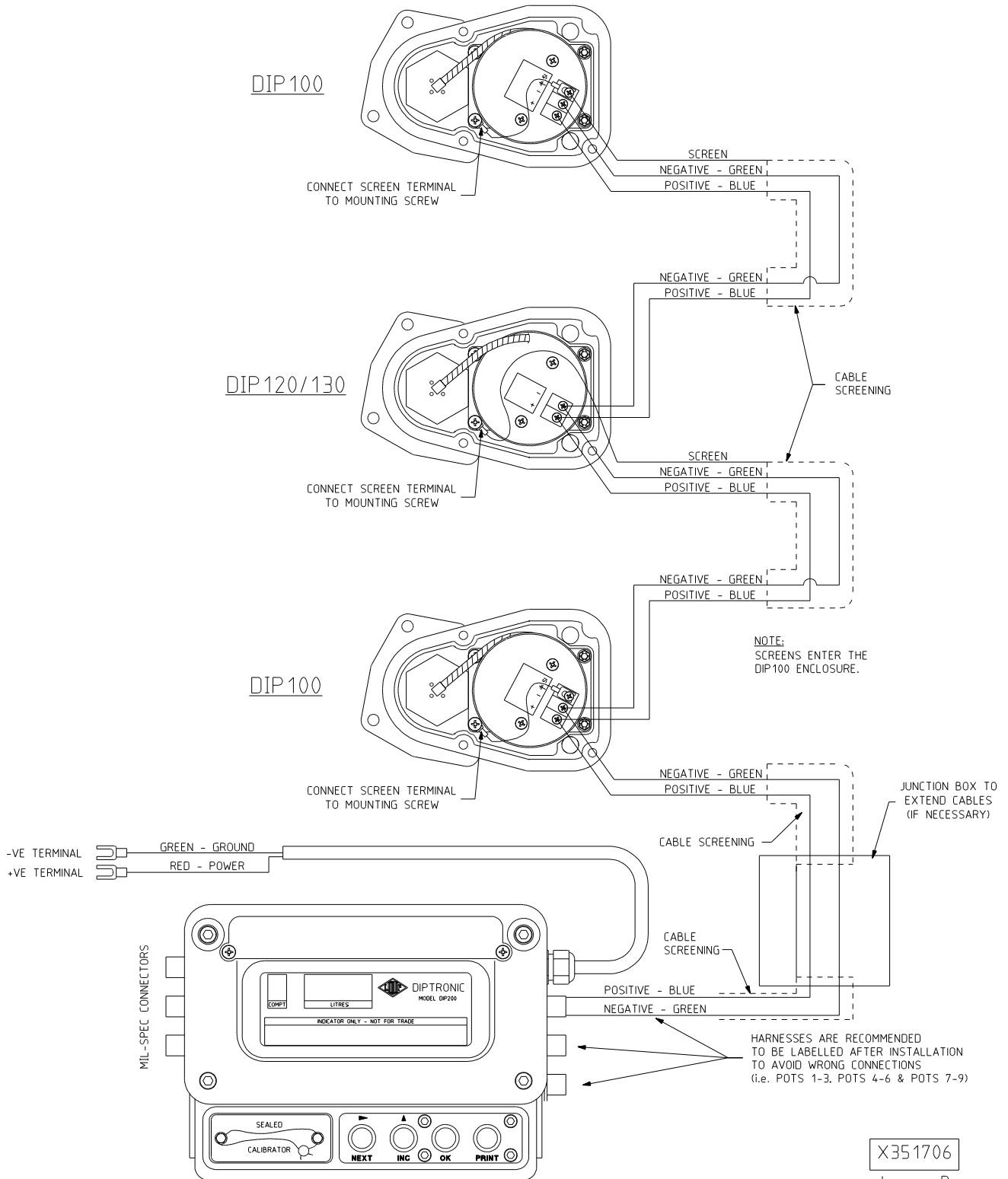
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**X351206—optional wiring method to be used only when unable to wire as indicated in X352006**



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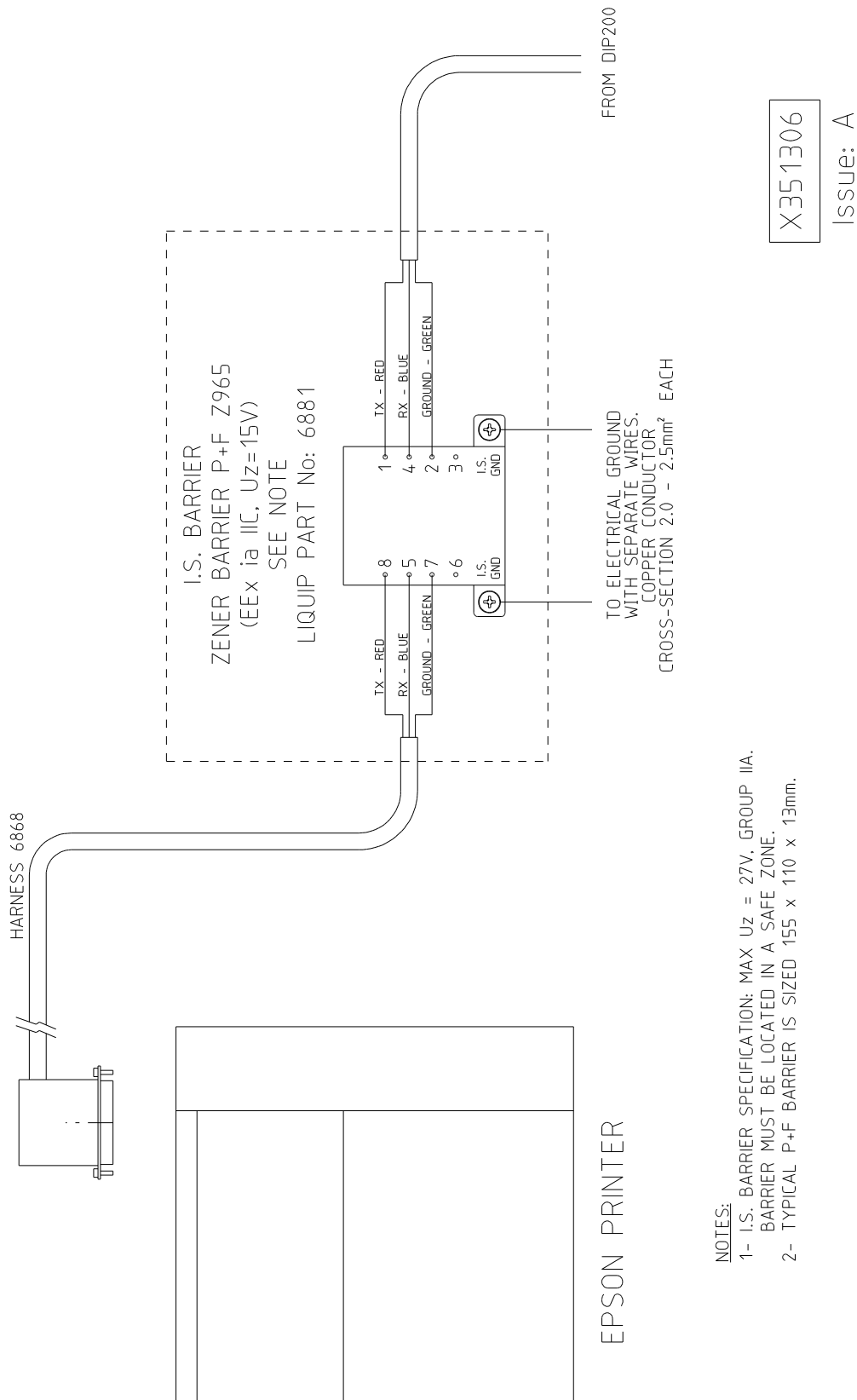
X351706  
 Issue: B



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## 4.0 PRINTER CONFIGURATION

For those cases where a printer is to be installed refer X351306 for communication wiring details.



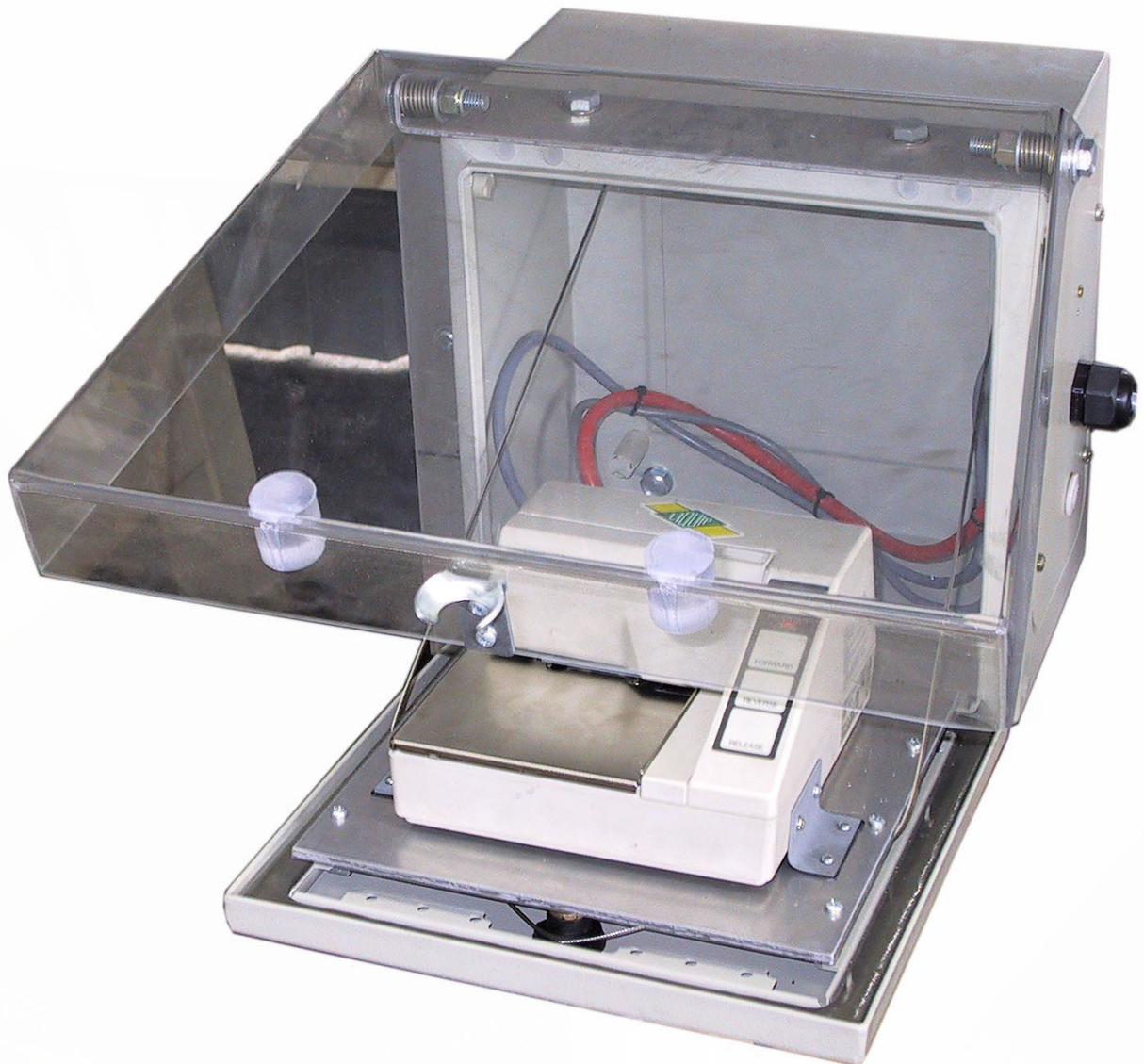


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The printer should be mounted in a suitable enclosure, Liquip PPC100 series. The Zener barrier mounted between the printer and CPU must be located in a safe area in a junction box. For 12V installations, a voltage doubler is required for the printer power input.

Note: Dip switch settings:

1. Power off printer
2. Toggle dip switches #1 & #3 to ON position. Remaining switches to be in the OFF position.
3. Power printer on.





## **5.0 ELECTRICAL INSTALLATION**

Refer wiring diagrams in appendix 2 for details on wiring from battery isolation switch to CPU. These diagrams cover installation for Rigid, Rigid-Dog, Semi or A/B-Double combinations with no peripheral devices.

For configurations that require installations of ticket printers, registers and PC's, alternate wiring diagrams are available from Liquip. For these cases the appropriate wiring diagram should be selected at the time of order.

The Zener Barrier that is mounted between the printer and DIP200 is required to meet safety approvals. However, the printer will still operate without the barrier if safety approvals are not required to be met.

### **Notes:**

1. For safety requirements *power and communication* must run through separate cables and junction boxes.
2. In the case of printer, register or PC installation, a Zener barrier must be used. The Zener barrier must be mounted according to safety requirements.
3. If welding needs to be carried out on the tanker, the CPU mil spec connectors must be disconnected. Also, the power lead in the first junction box from the truck battery must be isolated. Failure to do so will void warranty and may permanently damage the sensors and CPU.
4. A power conditioner (DCC100 series) must be fitted as near the battery isolation switch as possible (not on the trailer) in accordance with the wiring diagrams of Appendix 2. For Australia only it is permissible to mount the DCC100 in the junction box on the trailer connecting power to the CPU in a safe area only.





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5. Insulate all exposed screen wires using appropriate heat-shrink.
6. For all Diptronic installations it is a requirement that power be taken directly from the battery isolation switch (use the lugs on the output side of the battery isolation switch). This will ensure a 'clean' power supply to each CPU.
7. For all Diptronic installations it is a requirement that 2 wires are used for positive and 2 wires used for negative on rigid trucks. For Prime-mover / Trailer applications utilizing sockets and plugs, 2 wires are used for positive and 3 wires used for negative.
8. Two separate wires per plug are connected to Chassis Ground and prevent static build up between the prime mover and trailer.
9. Refer Liquip Diptronic Electrical Installation and Commissioning Checklist to ensure correct electrical installation.

Adhere to Liquip general wiring guidelines summarised in Appendix 1.





## **6.0 FINAL CONFIGURATION**

Fit the sensor cover ensuring the main seal is seated correctly. Make sure the delay line and wires are not crushed in the process.

Position the cover square to the base when fitting to prevent the seal being dislodged by a sliding action. Tighten to 4 - 5Nm (do not over tighten as it may damage the sensitive electronics in the housing). Carry out final checks on the security of all sensors, glands and conduit brackets.

Lead sealing is required at all points where the sensor can be removed or tampered with. Two of the screws that are supplied with the dip guides have holes in them that are required to be sealed. Also, two of the screws that hold the cover onto the base of the sensor have holes that are required to be sealed.

Switch on the battery isolation switch. The CPU screen may flicker followed by a boot up routine where the software version is displayed and sensor communication established.

The main display (top) should be blinking as it is in dynamic measurement mode.

Press and hold the *NEXT* button on the front panel of the CPU to cycle through each of the sensors and ensure there is communication between each sensor and the CPU (there should be no COMMUNICATION ERROR messages). Follow APPENDIX 7, System messages / Troubleshooting if any error messages occur.

**Following Diptronic installation it is a Liquip requirement that an installation and commissioning checklist be completed and returned to Liquip. Refer Diptronic Electrical Installation and Commissioning Checklist. Failure to complete the checklist may void warranty.**



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## **7.0 CABLE PROTECTION**

All electrical cabling must be protected from external environmental influences. This can be achieved by using appropriate conduit, sealed to IP68. In the case of the supplied harness, the cable is protected by a double insulation and polyurethane coating and sealed using a military specification connector and water proof gland. Refer to the appendix for recommended conduit.

All harnesses should be secured close to the mil spec connectors to remove any strain on the connectors. Special care should be taken for off-road applications where harnesses must be firmly attached to prevent excess movement.

## APPENDIX 1 - GENERAL WIRING GUIDELINES

### TYPICAL CONDUIT

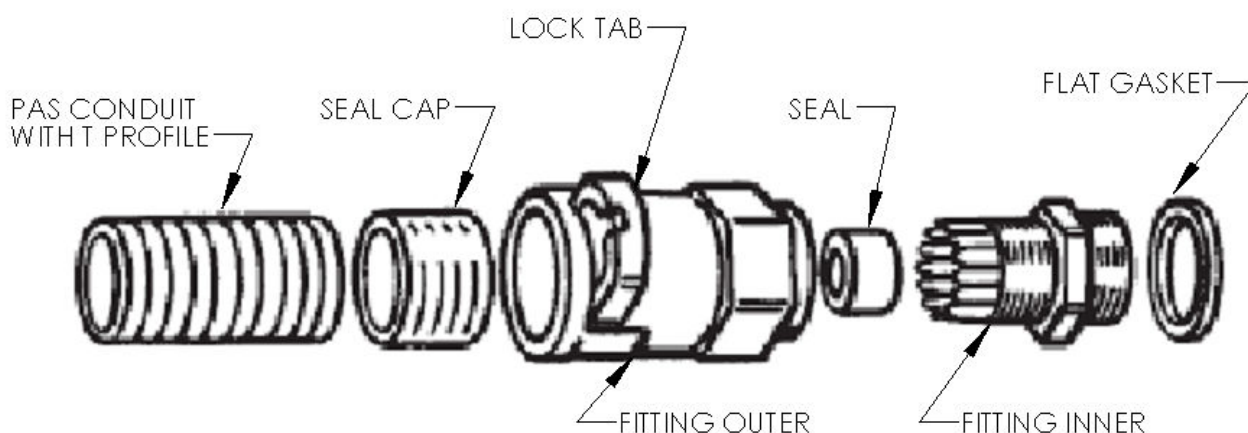
PMAFLEX is a product used for many years in arduous conditions such as mine sites, and is distributed in many countries. Type PAS is tolerant to petroleum fuels and temperatures from  $-40^{\circ}\text{C}$  to  $+100^{\circ}\text{C}$  (order as suffix "U" for U-V resistance - see example later).

Sizes available are from 6mm OD to 47mm OD.

Threads are available in NPT and Metric.

Colours black or grey.

Adaptors come in straight,  $45^{\circ}$  or  $90^{\circ}$  with threads in plastic or metal.



Adapter Strain Relief Gland

Liquip Part Number: 56044

Conduit: 20mm

Torque: 5Nm for Fitting Inner thread.

3Nm Fitting Outer strain relief.

Use sealant or adhesive:

Loctite 4212 Adhesive, Liquip Part: 7837

Loctite 5331 Sealant, Liquip Part: 7597

To achieve IP68 rating (waterproof) it is essential that strain relief type glands are used and seal caps be fitted to the conduit ends before clipping into the threaded adaptor. The flat gasket is under the shoulder of the screw fitting. Thread sealant should be applied as additional protection against leaks and vibration.



**RECOMMENDED CABLE TYPES FOR “DIPTRONIC” SYSTEM WIRING:**

Item	Usage	Cable Type	Comments
1	Power Supply (CPU power harness)	3-core shielded 1.0mm <sup>2</sup> (32x0.2mm) with drain wire. (Red/Green/Blue). PVC inner sheath and Polyurethane outer sheath.	Typical cable type: Liquip Part #6871
2	Power supply (BIS to CPU power harness)	12-core shielded 0.75mm <sup>2</sup> PVC GREY 9.9 OD. Numbered cores + green/ yellow.	Typical cable type: Liquip Part #6930
3	Sensor to sensor	2-core shielded 1.0mm <sup>2</sup> (32x0.2mm) with drain wire. (Blue/Green). PVC inner sheath and Polyurethane outer sheath.	Typical cable type: Liquip Part #56045

When servicing wiring to the sensor terminals, it is necessary to strip the wires back by 6mm before crimping with a fork terminal. The terminals on the epoxy surface of the sensor must be fully screwed open before inserting the fork terminal. Refer P7359.

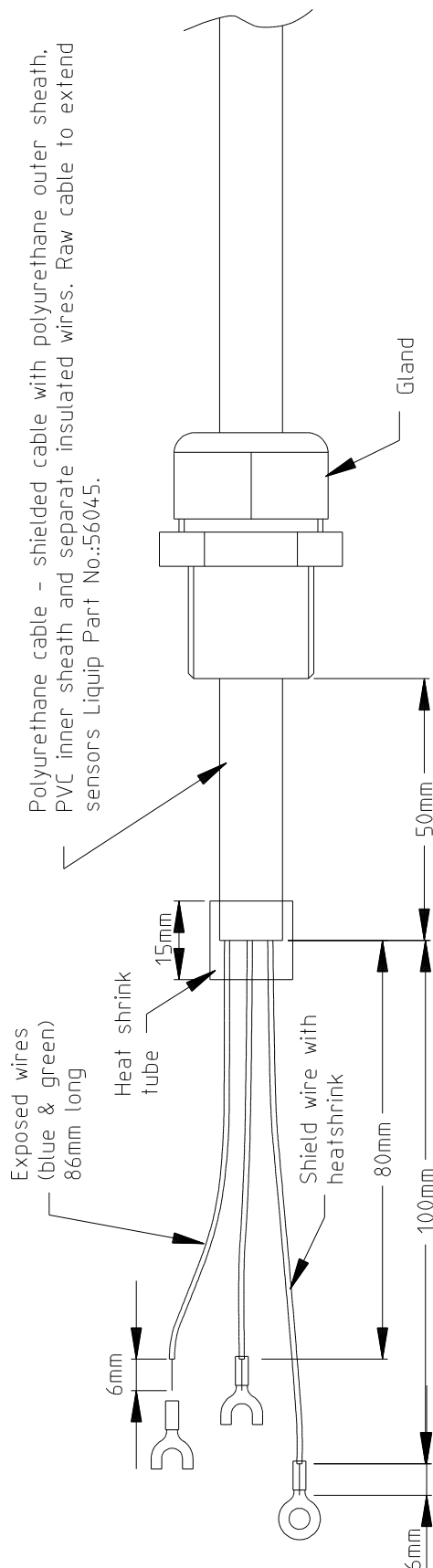
After electrical connections have been made, apply a small amount of non-conductive grease or lube to all connections to prevent corrosion.

Use ferrules on the wires when terminating the wiring into cage clamp terminals, or use fork or eye terminals when terminating the wiring into screw block terminals.

Refer X350206 for cable gland installation and insertion of cable.

## Cable gland installation:

### DIPTRONIC GUIDELINES FOR SENSOR CABLE AND GLAND INSTALLATION



#### NOTES:

1. Tighten gland dome nut to 3Nm using calibrated torque wrench.
2. Recommended torque of 3Nm is approximately 1.5 turns after initial clamping of cable by gland.
3. Ensure sealing ring (internal rubber grommet) is seated correctly when passing cable through gland.
4. Only pull cable when gland is not tightened.
5. Cut polyurethane cable to 156mm from gland.
6. Trim polyurethane cable sheath to 50mm from gland to expose wires. Do not cut wires.
7. Cut blue and green wire to 86mm, use cable strippers to expose 6mm of bare wire to crimp on fork terminals.
8. Heat shrink 100mm of heat shrink tube over shield wire.
9. Heat shrink 15mm of heat shrink tube over wires and cable as indicated.
10. Crimp eye terminal (Red, 5mm stud, 8mm width) on end of shield wire.
11. Cable sheath to be installed at least 50mm above gland (5mm above the pot).
11. Use teflon tape on all threaded parts.

X350206

Issue: D

Not to scale



## **General Guidelines for Diptronic Electronics on Vehicles.**

- Never weld on a vehicle unless all electronic equipment is completely disconnected electrically from both the tanker and other equipment. Isolate power to the CPU by disconnecting inside the 1st junction box from the battery isolation switch. Disconnect all military spec connectors.
- Check entire electrical circuit and housings for potential water entry prior to sign off.
- Always completely segregate power and intrinsically safe wires in accordance with I.S. wiring rules.
- All equipment is to be supplied from a fused power supply.
- Do not route communication cables past 'noisy' electrical apparatus such as solenoids and alternators.
- When installing DIP200 or DIP100 covers, ensure no cables will be compressed when tightened. DIP200 internal cables to the terminal connector should be pushed flush against the side of the casting. The lid should then be placed in a sliding motion ensuring the cables are not compressed against the terminal.
- It is permissible to degas with Diptronic still mounted so long as it is in accordance with the AIP code of practice CP13 "temperature of tank must not exceed 75°C...."
- Ensure all communication port protection caps and cables are properly connected to avoid moisture ingress

Note, refer P7403 Electrical equipment service and installation guide for road tankers at the beginning of this document.

When welding or plasma cutting on a tanker disconnect all electronics as indicated. Also ensure all electronic hardware is disconnected prior to jump starting the engine.



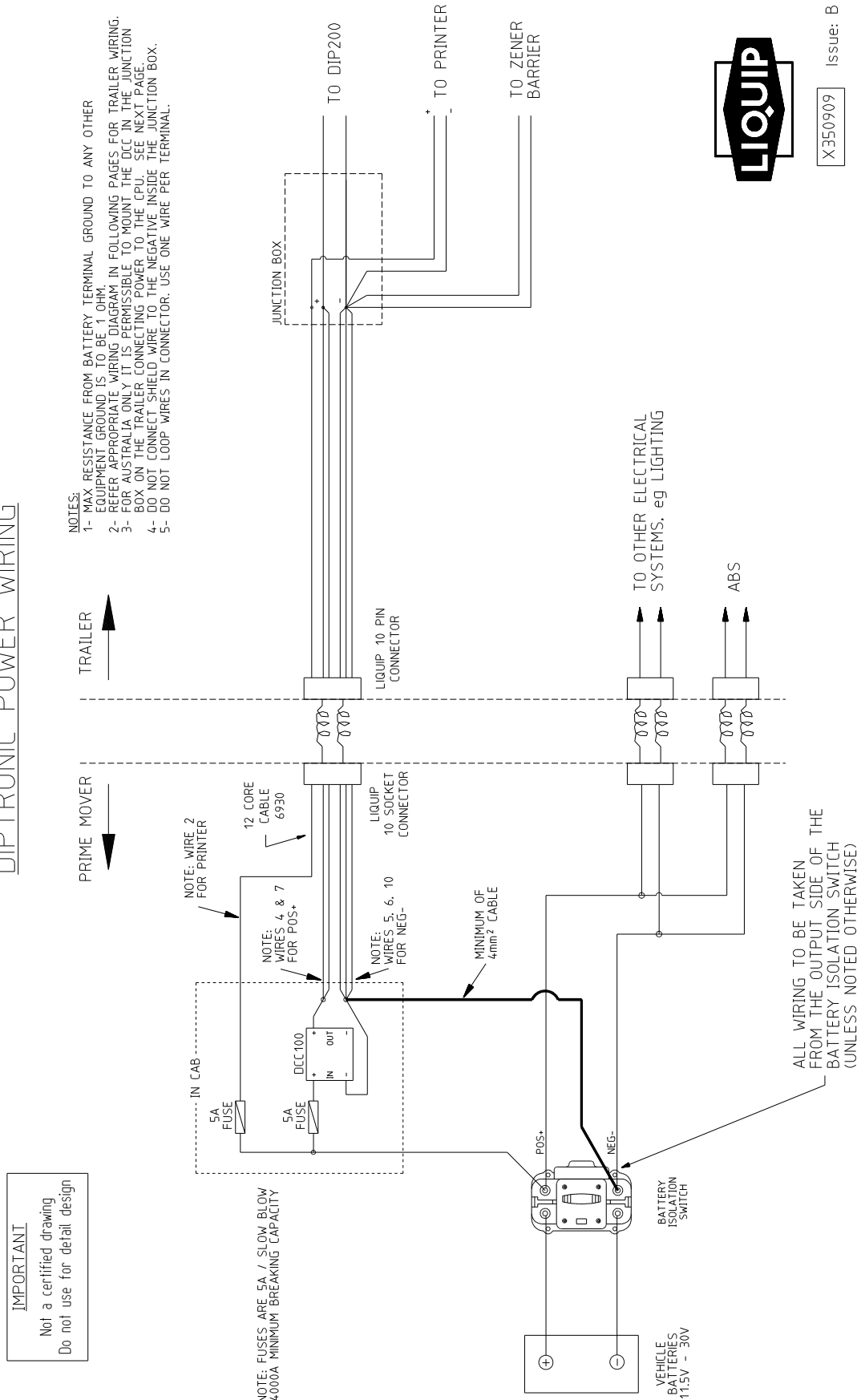


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## APPENDIX 2 - WIRING DIAGRAMS

Note: printer and associated barrier are optional for Diptronic MK1 installations.

### DIPTRONIC POWER WIRING



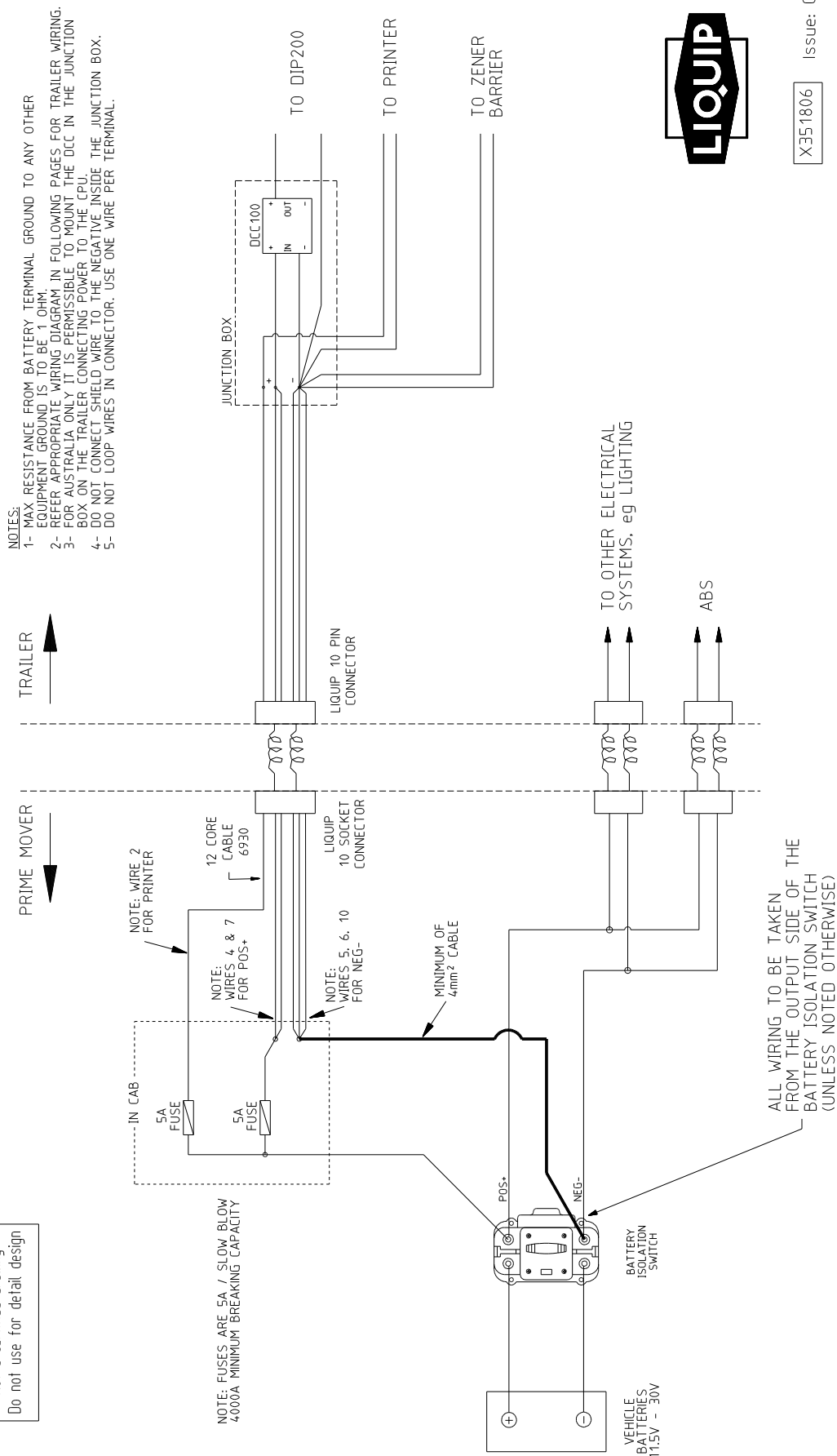




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## DIPTRONIC POWER WIRING

**IMPORTANT**  
Not a certified drawing  
Do not use for detail design



OPTION: DCC100 MOUNTED ON THE TRAILER



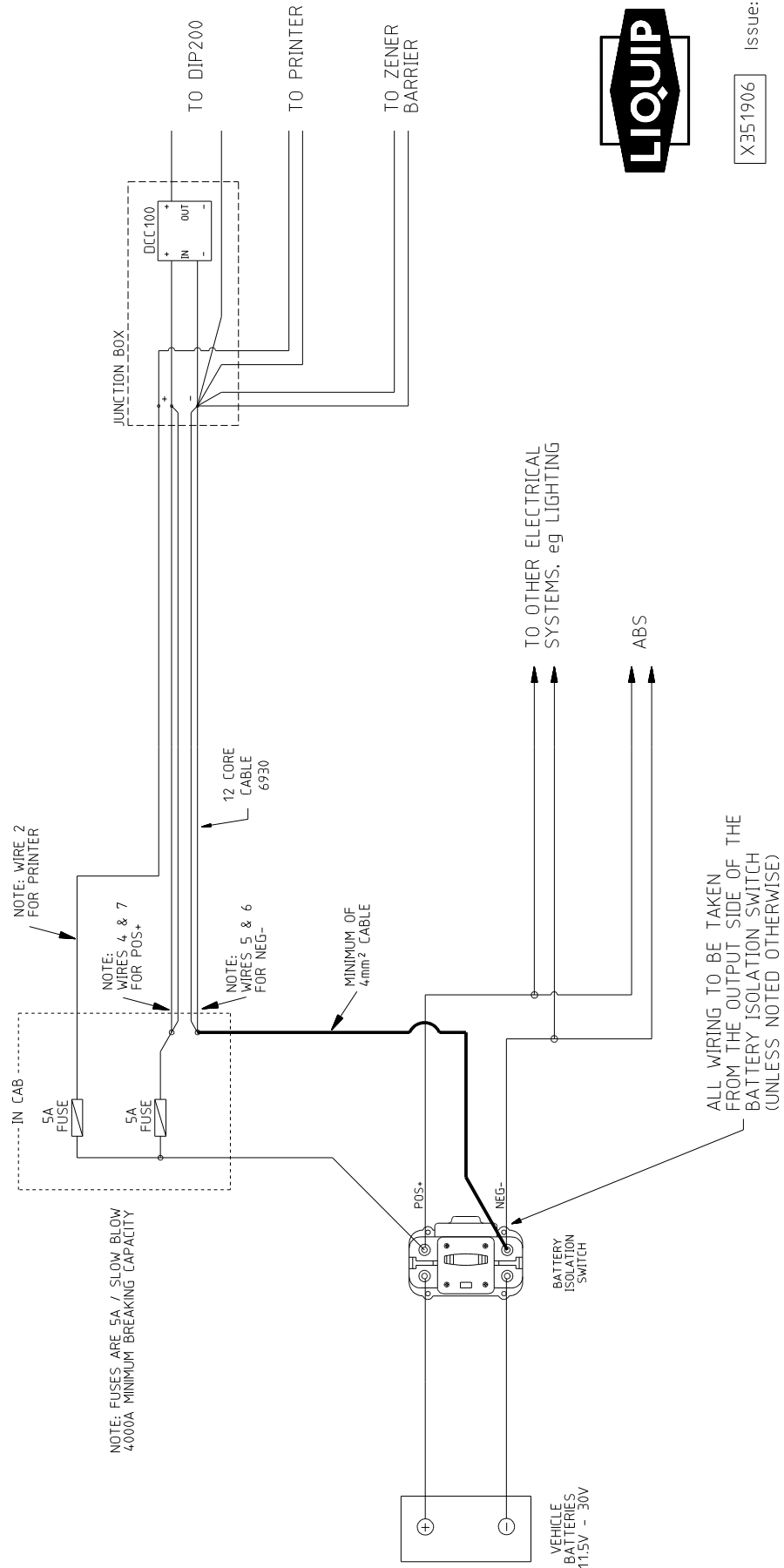
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## DIPTRONIC POWER WIRING – RIGID VEHICLE ONLY

### IMPORTANT

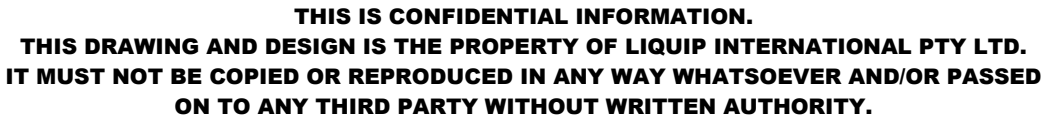
Not a certified drawing  
Do not use for detail design

- NOTES:
- 1- MAX RESISTANCE FROM BATTERY TERMINAL GROUND TO ANY OTHER EQUIPMENT GROUND IS TO BE 1 OHM.
  - 2- REFER APPROPRIATE WIRING DIAGRAM IN FOLLOWING PAGES FOR WIRING.
  - 3- DO NOT CONNECT SHIELD WIRE TO THE NEGATIVE INSIDE THE JUNCTION BOX.
  - 4- DO NOT LOOP WIRES IN CONNECTOR. USE ONE WIRE PER TERMINAL.



X351906

Issue: B



**RIGID CHASSIS MOUNTED ELECTRONICS**

**JUNCTION BOX**

POWER IN +115V TO +30V WIRE 2

POWER IN +115V TO +30V WIRE 4

POWER IN +115V TO +30V WIRE 7

POWER IN (-) WIRE 6

POWER IN (-) WIRE 5

DCC100

TICKET PRINTER (24V)

ZENER BARRIER

DIP200 DIPTRONIC CPU

POWER GROUND

TX RX GND

RED BLUE GREEN

SCREEN

HARNESS 4188

HARNESS 6865

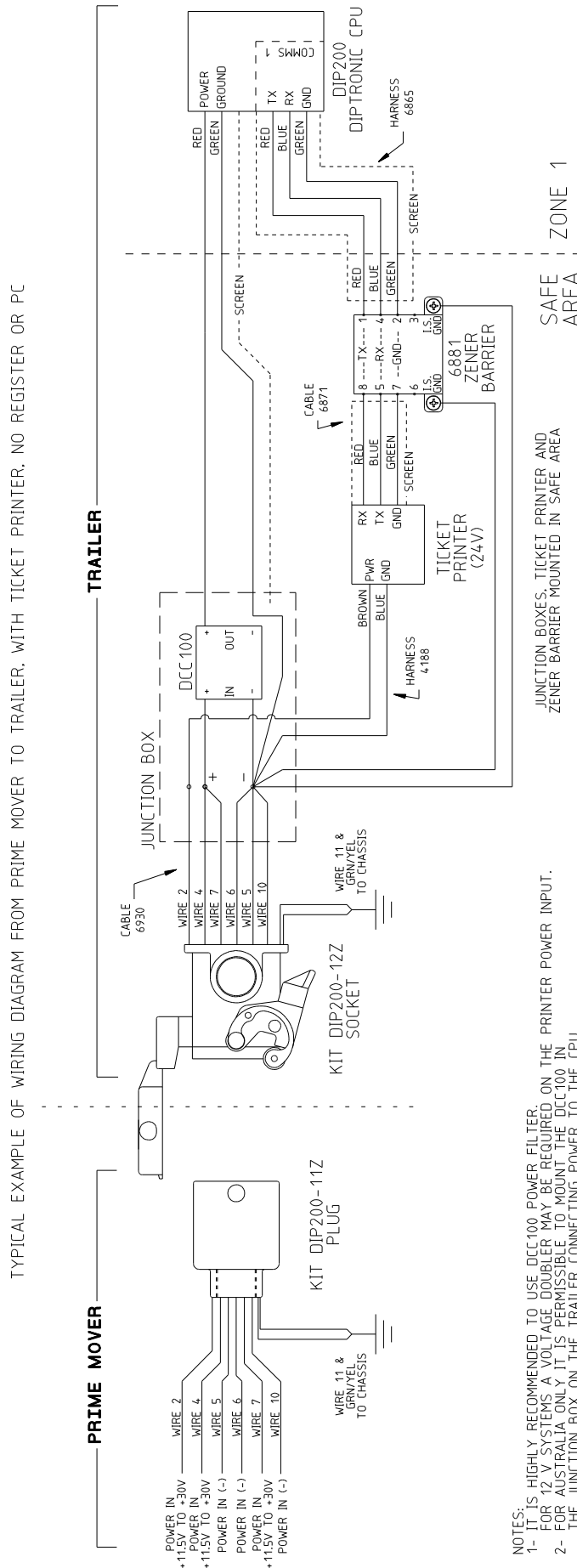
HARNESS 6881

SAFE AREA

ZONE 1

- 1- IT IS HIGHLY RECOMMENDED TO USE DCC100 POWER FILTER.
- 2- FOR 12 V SYSTEMS A VOLTAGE DOUBLER MAY BE REQUIRED ON THE PRINTER POWER INPUT.
- 3- REFER WIRING DIAGRAMS REGARDING CORRECT CONNECTION OF SCREEN.
- 4- FOR DCC 100 CONNECTION SEE DRAWINGS X350909, X351806 & X351906.
- 5- DO NOT LOOP WIRES IN CONNECTOR. USE ONE WIRE PER TERMINAL.
- 6- FOR AUSTRALIA USE APPROVED CONDUIT AS PER AS2809.2.

Issue: C

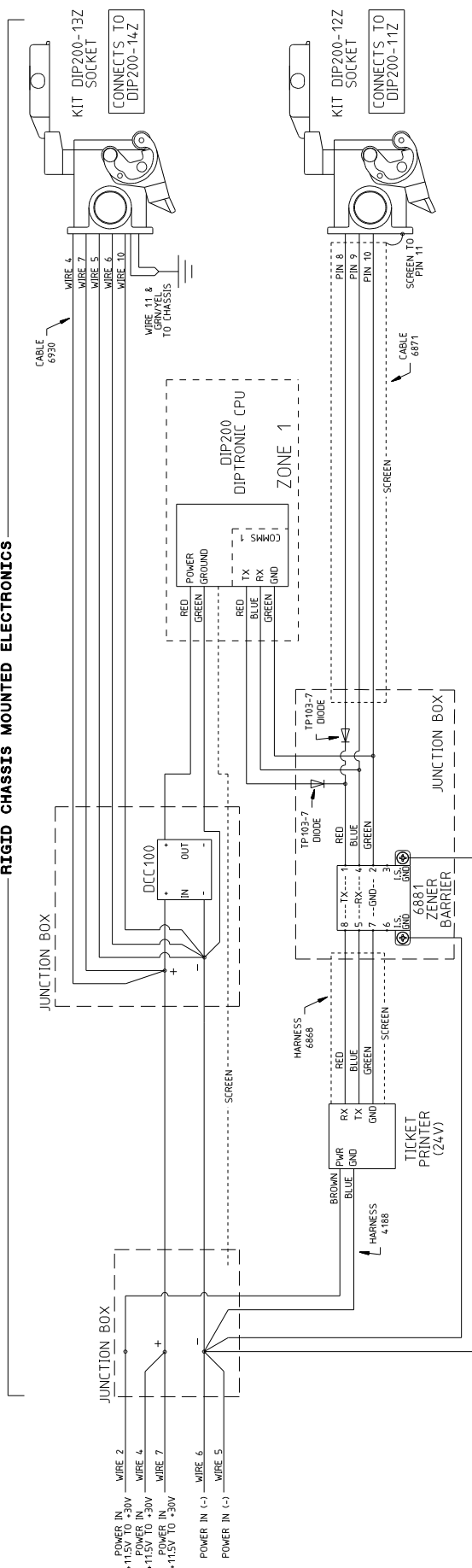


X351506  
 FIG 2  
 Issue: C

- NOTES:
- 1- IT IS HIGHLY RECOMMENDED TO USE DCC100 POWER FILTER.
  - 2- FOR 12 V SYSTEMS A VOLTAGE DOUBLER MAY BE REQUIRED ON THE PRINTER POWER INPUT.
  - 3- FOR AUSTRALIA ONLY IT IS PERMISSIBLE TO MOUNT THE DCC100 IN THE JUNCTION BOX ON THE TRAILER CONNECTING POWER TO THE CPU.
  - 4- REFER WIRING DIAGRAMS REGARDING CORRECT CONNECTION OF SCREEN.
  - 5- DO NOT LOOP WIRES IN CONNECTOR. USE ONE WIRE PER TERMINAL.
  - 6- FOR AUSTRALIA USE APPROVED CONDUIT AS PER AS2809.2.

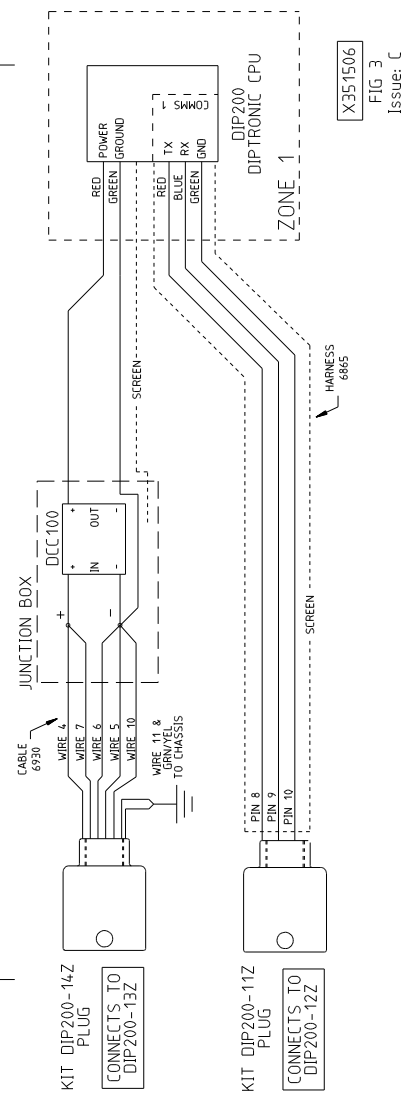
TYPICAL EXAMPLE OF WIRING DIAGRAM OF RIGID/DOG COMBINATION WITH A SINGLE TICKET PRINTER, NO REGISTERS OR PC

**RIGID CHASSIS MOUNTED ELECTRONICS**



JUNCTION BOXES, TICKET PRINTER AND ZENER BARRIER MOUNTED IN SAFE AREA

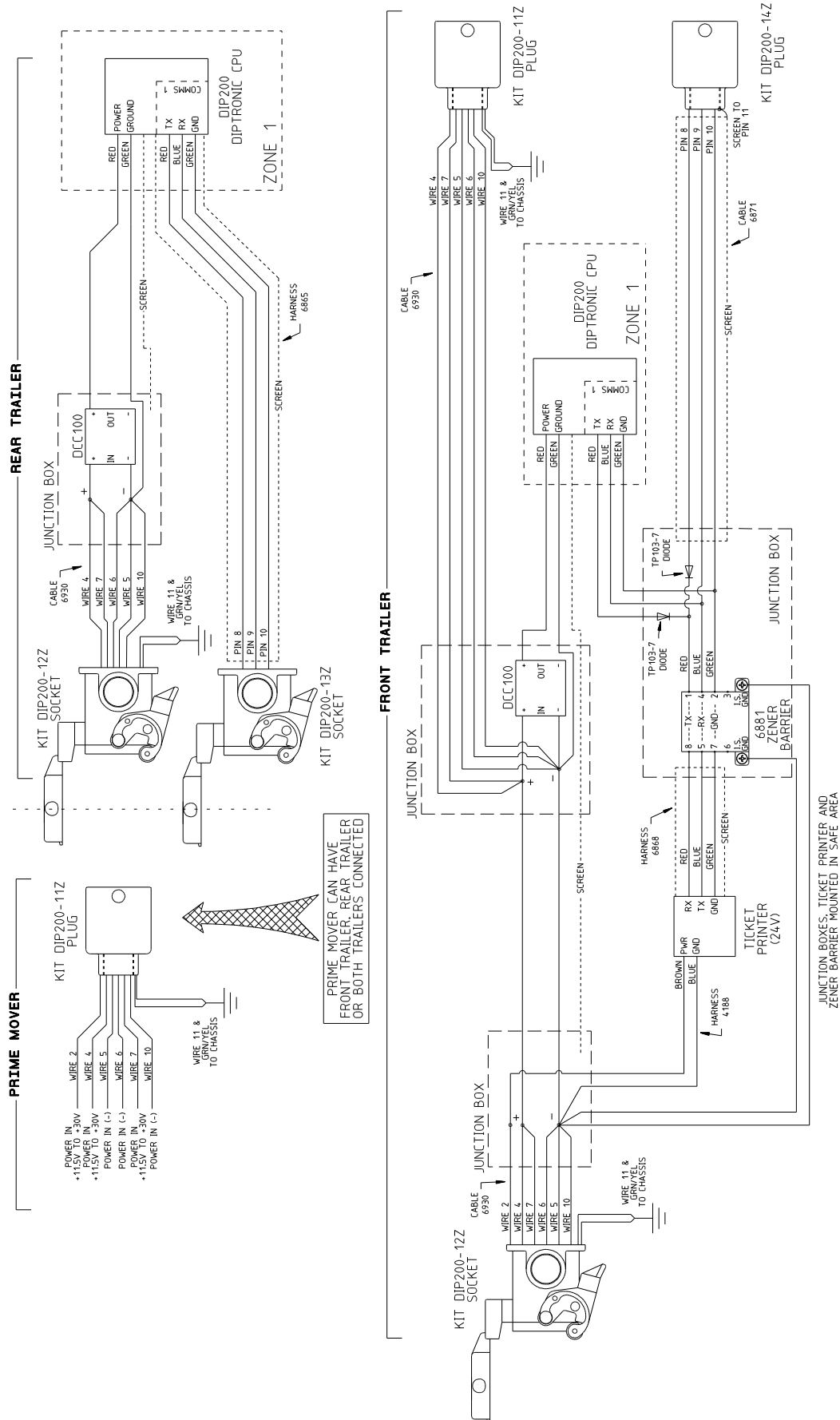
**DOG TRAILER**



- NOTES:
- 1- IT IS HIGHLY RECOMMENDED TO USE DCC100 POWER FILTER.
  - 2- FOR 12 V SYSTEMS A VOLTAGE DOUBLER MAY BE REQUIRED ON THE PRINTER POWER INPUT.
  - 3- FOR AUSTRALIA ONLY IT IS PERMITTED TO MODIFY THE DCC100 INPUT.
  - 4- REFER WIRING DIAGRAMS REGARDING CORRECT CONNECTION OF SCREEN.
  - 5- DO NOT LOOP WIRES IN CONNECTOR. USE ONE WIRE PER TERMINAL.
  - 6- FOR AUSTRALIA USE APPROVED CONDUIT AS PER AS2809.2.

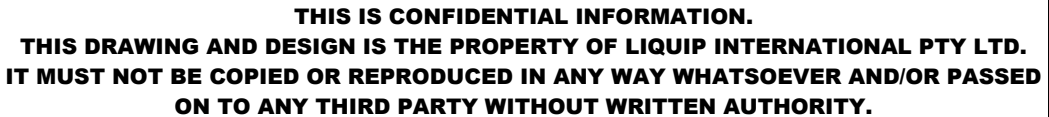
X351506  
 FIG 3  
 Issue: C

TYPICAL EXAMPLE OF WIRING DIAGRAM FROM PRIME MOVER TO TRAILER & B-DOUBLE WITH A SINGLE TICKET PRINTER, NO REGISTERS OR PC



- NOTES:
- 1- FOR 24V SYSTEMS A VOLTAGE DOUBLER MAY BE REQUIRED ON THE PRINTER POWER INPUT.
  - 2- THE JUNCTION BOX ONLY IT IS PERMISSIBLE TO MOUNT THE DCC100 IN.
  - 3- REFER WIRING DIAGRAMS ON THE TRAILER CONNECTING POWER TO THE CPU.
  - 4- FOR DCC100 CONNECTION SEE DRAWINGS X350909, X351806 & X351906.
  - 5- FOR DCC100 WIRE IN CONDUIT USE ONLY DIFFERENT TERMINAL.
  - 6- FOR AUSTRALIA USE APPROVED CONDUIT AS PER AS2809.2.

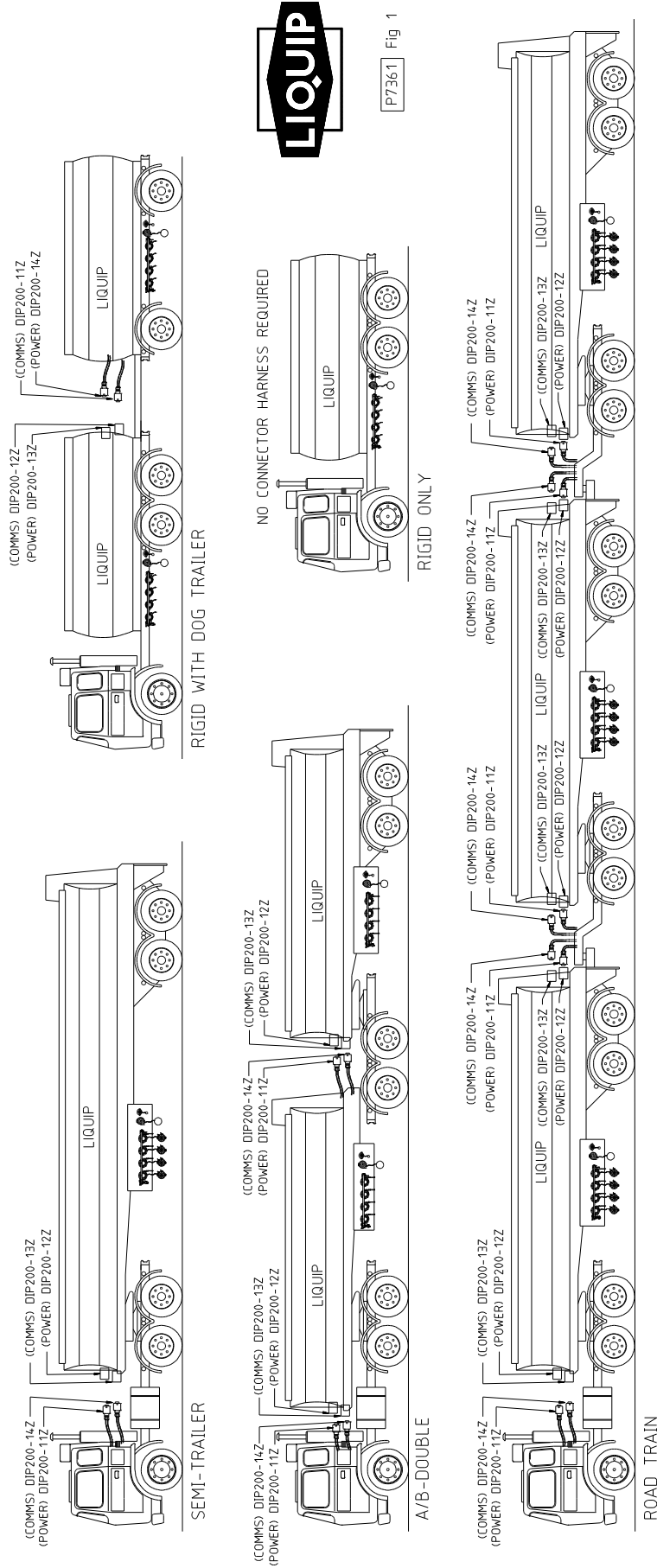
X351506  
 FIG 4  
 Issue: C



## APPENDIX 3 - DIPTRONIC CONNECTOR HARNESS

The type of connection components installed depends on the tanker configuration.

### ELECTRICAL POWER CONNECTIONS BETWEEN PRIME MOVER & TRAILER



#### Kit DIP200-11Z

Plug, cable end, body – female electrical contacts

#### Kit DIP200-12Z

Socket, surface mount, body – male electrical contacts

#### Kit DIP200-13Z

Socket, surface mount, body – female electrical contacts

#### Kit DIP200-14Z

Plug, cable end, body – male electrical contacts

Note: Refer appropriate wiring diagram for printer electrical connections.



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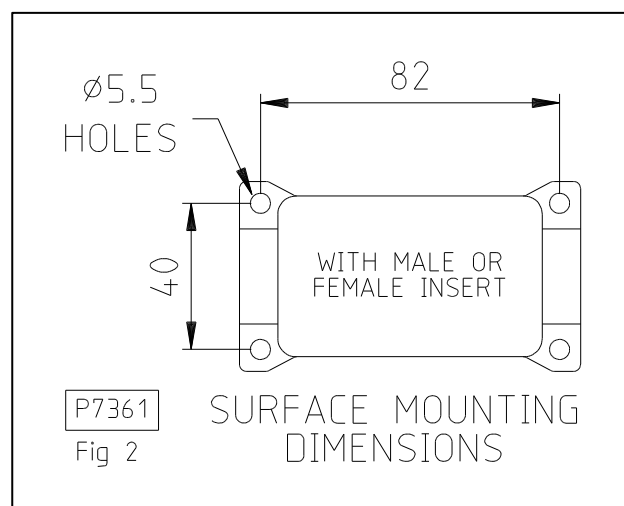




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For surface mounted socket bodies, 4 off M5 x 30mm long capscrews are supplied with star washers and nyloc nuts. Drill 4 x Ø5.5 holes spaced as shown at right through panel that connector is to be mounted to.

*Be careful not to drill into any wiring that may be behind the panel or into a tank compartment!*



When mounting body onto panel, ensure star washers are used under the head of the capscrew and under the nyloc nut. Star washers are used so that tightening the mounting bolts cause the washer to bite into both the connector housing and the panel it is mounted onto to provide optimal electrical continuity between the ground connection in the housing and the chassis of the vehicle.

To connect the wires coming out of the connectors to the appropriate hardware/connections, see the wiring table following. (Note: cores within cable are numbered from 1 to 11 plus a green/yellow).

Cable will need to have approximately 60mm of outside sheath removed and sufficient insulation removed from each core.

Liquip recommends the use of crimped or soldered ferrules on wire ends to ensure long life and secure connections.



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# Power Connector

## SOCKET

Core No.	Pin No.	Trailer Connects to:
1	1	Not Used
2	2	POWER IN on printer
3	3	Not Used
4	4	POWER IN +11.5V to +30V on CPU (or to POWER IN (+) BBC)
5	5	ELECTRICAL GND (-) Negative return
6	6	ELECTRICAL GND (-) Negative return
7	7	POWER IN +11.5V to +30V on CPU (or to POWER IN (+) BBC)
8	8	Not Used
9	9	Not Used
10	10	ELECTRICAL GND (-) Negative return
11	Housing	Chassis of Vehicle
GRN/YEL	Housing	Chassis of Vehicle

## PLUG

Core No.	Pin No.	Prime Mover Connects to:
1	1	Not Used
2	2	POWER IN
3	3	Not Used
4	4	POWER IN +11.5V to +30V, DCC100
5	5	ELECTRICAL GND (-) Negative return , DCC100
6	6	ELECTRICAL GND (-) Negative return , DCC100
7	7	POWER IN +11.5V to +30V, DCC100
8	8	Not Used
9	9	Not Used
10	10	ELECTRICAL GND (-) Negative return
11	Housing	Chassis of Vehicle
GRN/YEL	Housing	Chassis of Vehicle



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# Communications

## SOCKET

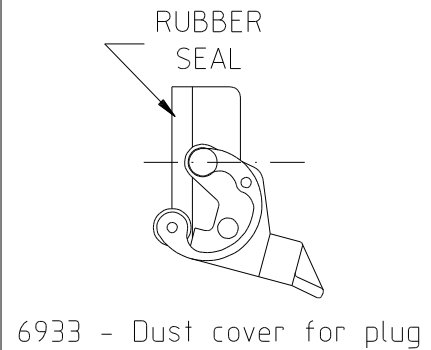
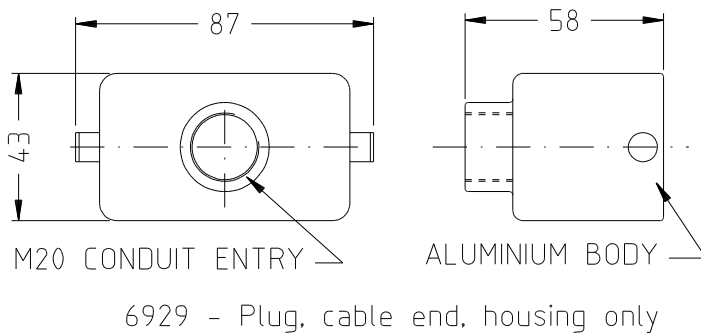
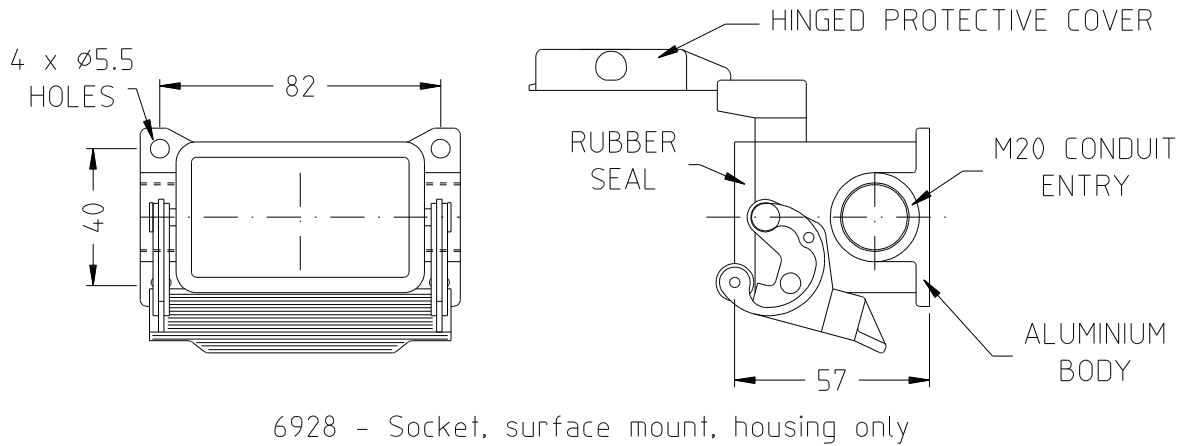
Core No.	Pin No.	Trailer Connects to:
1	1	Tx on CPU, Rx on external device, COM 2
2	2	Not used
3	3	Rx on CPU, Tx on external device, COM 2
4	4	Not used
5	5	GND on external device, COM 2
6	6	GND on external device, COM 2
7	7	Not used
8	8	Tx on CPU, Rx on printer, COM 1
9	9	Rx on CPU, Tx on printer, COM 1
10	10	GND on printer, COM 1
11	Housing	Not used
GRN/YEL	Housing	Not used

## PLUG

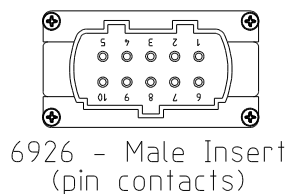
Core No.	Pin No.	Prime mover Connects to:
1	1	Tx on CPU, Rx on external device, COM 2
2	2	Not used
3	3	Rx on CPU, Tx on external device, COM 2
4	4	Not used
5	5	GND on external device, COM 2
6	6	GND on external device, COM 2
7	7	Not used
8	8	Tx on CPU, Rx on printer, COM 1
9	9	Rx on CPU, Tx on printer, COM 1
10	10	GND on printer, COM 1
11	Housing	Not used
GRN/YEL	Housing	Not used

# LIQUIP

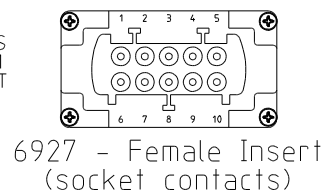
## HEAVY DUTY HARNESS KITS



RATINGS  
 PROTECTION: IP65  
 CURRENT: 16A



VIEWS  
 FROM  
 FRONT



KIT PART No	COMPONENTS
DIP200-11Z	CABLE END PLUG (WITH COVER) & FEMALE INSERT
DIP200-12Z	SURFACE MOUNTED SOCKET & MALE INSERT
DIP200-13Z	SURFACE MOUNTED SOCKET & FEMALE INSERT
DIP200-14Z	CABLE END PLUG (WITH COVER) & MALE INSERT

X352203

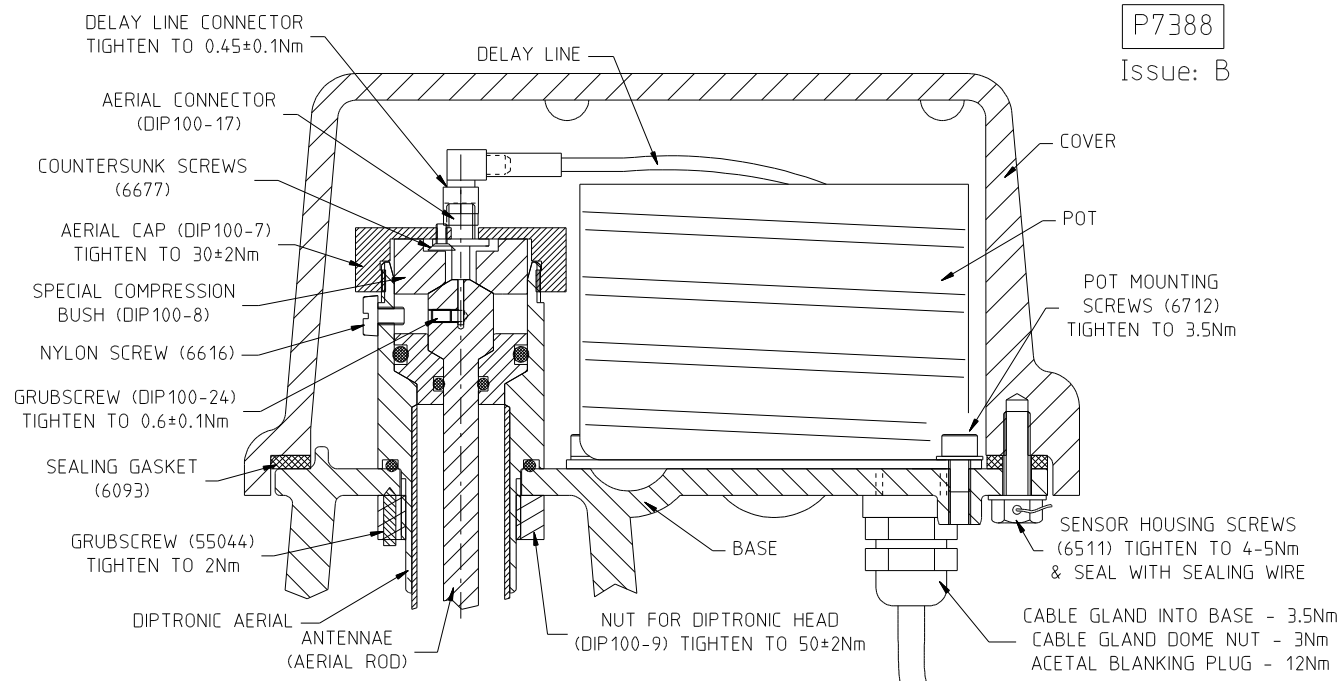
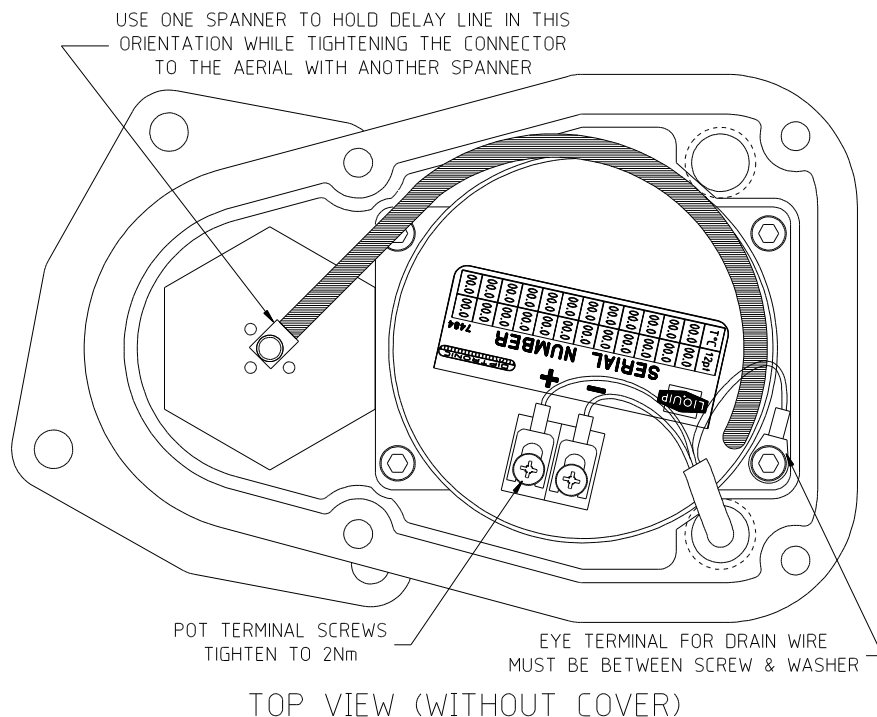
Issue: A

CABLE (LIQUIP PART 6930) IS SUPPLIED SEPARATELY. WHEN ORDERING SPECIFY REQUIRED LENGTH  
 ALL KITS ARE SUPPLIED WITH CABLE GLAND (6931) AND INSTRUCTION LEAFLET FOR WIRING.  
 SURFACE MOUNTED HOUSINGS ARE SUPPLIED WITH MOUNTING FASTENERS.



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## APPENDIX 4 - DIPTRONIC SENSOR TORQUE SETTINGS





## **APPENDIX 5 – TANKER OVERFILL PROTECTION: SETTING TRIP HEIGHT OF PROBES**

*“Many tankers do not have their overfill probes installed deep enough to allow rack flow over-run to stop before overflow occurs.”*

Comment from a major oil company in USA.

Oil companies in Australia have also issued bulletins and this note is a re-issue of previous reminders.

- 
- \* The requirement is that all road tankers should have their probes set to activate at least 200 litres below tank full (230L for API RP 1004).

This is because all loading racks require a delay of 4 to 6 seconds from the time a probe is wetted to the closure of the rack valve. This time delay is necessary to allow a flow rate of 2,400 litres/min to be stopped without any damaging shock or pulsations. 2,400 litres/min is 40 litres/second so in 5 seconds there is a flow of 200 litres at max rate.

- \* Most current tankers have their safe-fill marked (and possibly entered into Terminal Automation Systems) as equal to 3% of the full capacity.

Where compartments are smaller than 7,000 litres, such a setting risks an overflow in the event of a probe activation due to the insufficient space left for the over-run volume during shut-down.



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## APPENDIX 6 – TEST HARNESS

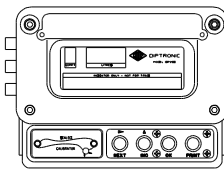
# LIQUIP

## 6888 TEST HARNESS FOR DIPTRONIC

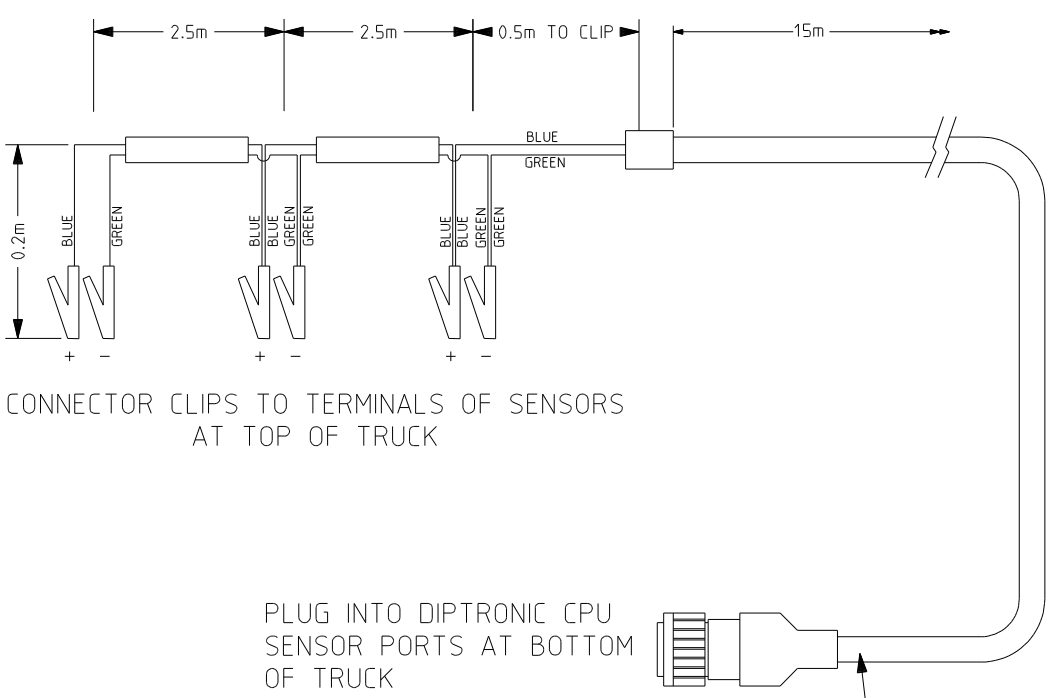
HARNESS 6888 CAN BE USED TO CHECK SENSORS WHEN IT IS BELIEVED THAT THERE IS A POSSIBLE FAULT WITH THE WIRING OF THE SENSORS TO THE CPU.

CHECKING SENSOR WIRING:

1. TURN POWER OFF TO CPU AND SENSORS.
2. DISCONNECT THE SENSOR HARNESS FROM CPU.  
(ON RIGHT HAND SIDE OF CPU)
3. REMOVE THE LID OF THE SENSORS THAT NEED CHECKING.  
NOTE: 3 SENSORS CAN BE CHECKED WITH 1 OFF 6888 HARNESS.
4. CONNECT CLIPS TO THE SENSOR.  
RED CLIP (BLUE WIRE) TO SIGNAL (+), BLACK CLIP (GREEN WIRE) TO GROUND (-).
5. TURN POWER ON TO THE CPU AND SENSORS AND CHECK THAT SENSORS ARE OPERATING PROPERLY.



- SENSOR 1, 2, 3
- SENSOR 4, 5, 6
- SENSOR 7, 8, 9



CONNECTOR CLIPS TO TERMINALS OF SENSORS  
AT TOP OF TRUCK

PLUG INTO DIPTRONIC CPU  
SENSOR PORTS AT BOTTOM  
OF TRUCK

SHIELDED CABLE WITH  
POLYURETHANE SHEATH

X353802  
Issue: A

METERS - VALVES - VENTS - MANHOLES - PUMPS - HOSEREELS - OVERFILL PROTECTION - LOADING ARMS - ELECTRONIC DIPSTICKS

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## APPENDIX 7 - SYSTEM MESSAGES / TROUBLESHOOTING

SYMPTOM	CAUSE	CORRECTIVE ACTION
"Maximum level exceeded" message	Product overflow	Drain product
"Above measured limit" message	Product above sensor range	Drain product to a level that is within sensor range
"Safe fill level exceeded" message	Product above safe fill level	Drain product to a level that is within safe fill
"Communication error" message (sensor)	CPU unable to communicate with sensor	<ul style="list-style-type: none"> <li>* Check wiring to sensors for open/short circuits</li> <li>* Check wiring under sensor housing for short circuits</li> </ul>
"Communication error" message (printer)	CPU unable to communicate with printer	<ul style="list-style-type: none"> <li>* Switch on printer</li> <li>* Check wiring to printer for open/short circuits</li> <li>* Check voltage to printer between 24 and 30V DC</li> </ul>
CPU doesn't power up	No power from truck battery	<ul style="list-style-type: none"> <li>* Check isolation switch is on</li> <li>* Check wiring between CPU and isolation switch</li> <li>* Check fuses</li> </ul>
CPU powers intermittently	Voltage supply too low	Voltage should be minimum 11.5V
Printer doesn't power up	<ul style="list-style-type: none"> <li>* Printer not turned on</li> <li>* Voltage to printer too low</li> <li>* No power to printer</li> </ul>	<ul style="list-style-type: none"> <li>* Switch on printer</li> <li>* Voltage should be min 24V DC.</li> <li>* Check wiring to printer for open/short circuits</li> </ul>





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## APPENDIX 8 - DIPTRONIC REFERENCE BOOKLETS

PART #	DOCUMENT	FILENAME
7310	DIPTRONIC MEASURING SYSTEM MK1 DRIVERS MANUAL	DIP200_INST_DIPTRONIC_MEASURING_DRIVER_INSTRUCTIONS_P7310.pub
7326	DIPTRONIC MEASURING SYSTEM MK1 & L.I.P.S. (WITH GPS) CALIBRATION MANUAL	DIP200_INST_DIPTRONIC_CALIBRATION_P7326.pub
7327	DIPTRONIC MEASURING SYSTEM MK1 & LIPS AUTOMATIC CALIBRATION RIG MANUAL	DIP200_INST_DIPTRONIC_CALIBRATION_RIG_P7327.pub
7328	DIPTRONIC L.I.P.S DRIVERS MANUAL	DIP200_INST_DIPTRONIC_LIPS_DRIVER_INSTRUCTIONS_P7328.pub
7329	DIPTRONIC MEASURING SYSTEM MK1 INSTALLATION MANUAL	DIP200_INST_DIPTRONIC_MEASURING_INSTALLATION_INSTRUCTIONS_P7329.pub
7330	DIPTRONIC L.I.P.S. & GPS INSTALLATION MANUAL	DIP200_INST_DIPTRONIC_LIPS_INSTALLATION_INSTRUCTIONS_P7330.pub
7331	DIPTRONIC GENERAL INFORMATION	DIP200_INST_DIPTRONIC_GENERAL_INFORMATION_P7331.pub
7333	DIPTRONIC CPU (DIP200 & DIP240) SOFTWARE UPGRADE INSTRUCTIONS	DIP200_INST_DIPTRONIC_SOFTWARE_UPGRADE_INSTRUCTIONS_P7333.pub
7334	DIPTRONIC MEASURING SYSTEM MK1 & L.I.P.S. CPU REPLACEMENT INSTRUCTIONS	DIP200_INST_DIPTRONIC_CPU_REPLACEMENT_INSTRUCTIONS_P7334.pub
7335	DIPTRONIC MEASURING SYSTEM MK1 & L.I.P.S. SENSOR (ANTENNAE & DIP100-12, DIP120-12 & DIP130-12) REPLACEMENT INSTRUCTIONS	DIP200_INST_DIPTRONIC_SENSOR_REPLACEMENT_INSTRUCTIONS_P7335.pub
7400	DIPTRONIC MEASURING SYSTEM MK1 & L.I.P.S. DipRecall MANUAL	DIP200_INST_DIPTRONIC_DIPRECALL_INSTRUCTIONS_P7400.pub



## **NOTICE FOR USE IN CEN**

### **Instructions specific to hazardous area installations (reference European ATEX Directive 94/9/EC, Annex<sup>22</sup>, 1.0.6.)**

The following instructions apply to equipment covered by certificate numbers Sira 02ATEX3323X (DIP200) and Sira 02ATEX2322X (DIP100):

1. The equipment may be used in a hazardous area with flammable gases and vapours with apparatus group IIA and with temperature classes T1, T2, T3, and T4.
2. The apparatus is only certified for use in ambient temperatures in the range -20°C to +60°C and should not be used outside this range.
3. The certified numbers have an 'X' suffix that indicates that special conditions of certification apply. These conditions are; The DIP100 has an aluminium cover and precautions must be taken to reduce the risk of a frictional spark occurring. The DIP200 power must be supplied via a fuse that has a breaking capacity capable of clearing the maximum short circuit current of the truck battery.
4. Installation shall be carried out in accordance with the applicable code of practice by suitably trained personnel.
5. Repair of this equipment shall be carried out in accordance with the applicable code of practice.
6. Certification marking as detailed in DIP100 series drawing number P7278 & DIP200 series drawing number P7284.
7. If it is likely the equipment will come in contact with aggressive substances, then it is the responsibility of the user to take suitable precautions to prevent the equipment being adversely effected, ensuring the type of protection is not compromised.

Aggressive Substances: e.g. acidic liquids or gases that may attack metals or solvents that may effect polymeric materials. inspections or establishing from the materials data sheet that it is resistant to specific chemicals.



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