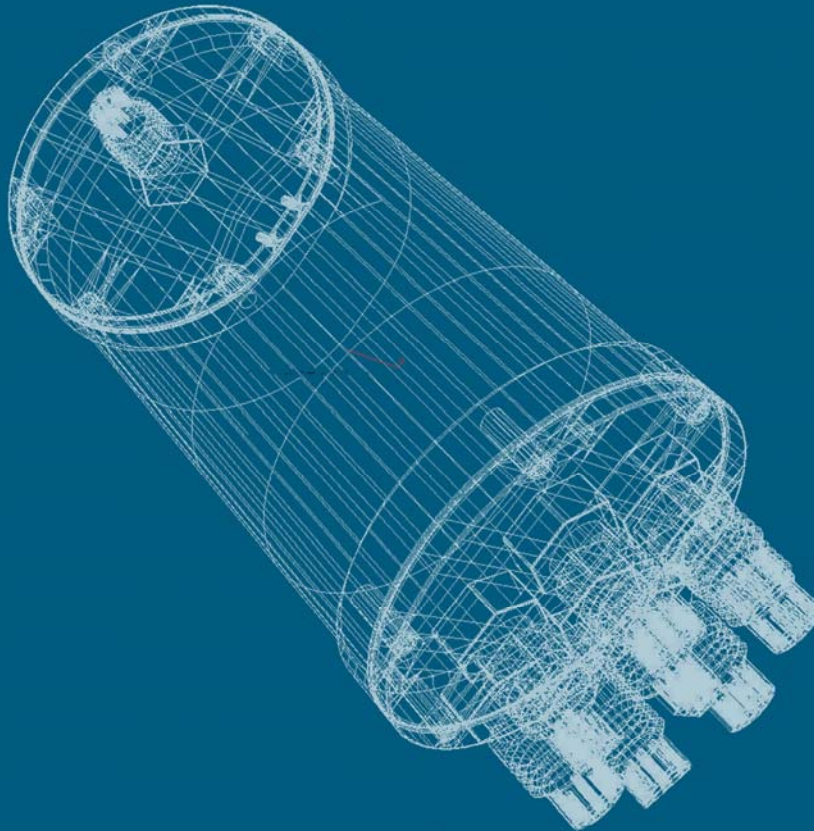




# MiniPlexer

Technical Manual



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**Document Rev E**

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## INTRODUCTION

### 1.0. WARNINGS AND NOTES

Throughout the manual the following symbols are used:



**Indicates a warning.** Failure to follow these instructions will result in serious injury, damage to equipment or incorrect operation of equipment.



**Indicates a note.** This indicates important information that should be followed to ensure correct operation of the unit.

### 1.1. GENERAL DESCRIPTION

The CDL MiniPlexer is a compact low power board set designed to transfer data from up to 8 separate RS232 channels over a single high speed data channel. For ROVs and other applications where umbilicals are used, this greatly increases the efficiency of data transfer, cuts down on umbilical cores needed, and reduces umbilical weight, size and cost.

The CDL MiniPlexer is 4 or 8-channel multiplexer/demultiplexer, optimized for the following conditions:

- A half-duplex connection between the ends.
- Widely varying baud rates per channel, including the possibility of a single channel using up to  $\frac{1}{4}$  of the total bandwidth available.

The product has the following features:

- Transparent transfer of RS232 data
- 4 or 8 channel options
- 3000m depth rated housing
- Surface and OEM versions
- RS 232 input at up to 57.6 Kbps
- Link data transfer up to 115 Kbps RS485
- Status indicator LEDs

### 1.2. OEM VERSION

The OEM version of MiniPlexer contains all the functionality of the full product but is supplied without external packaging or power supplies so that the user can build it into their own housing or enclosure.

Connection to the OEM MiniPlexer is by way of Molex connectors directly onto the circuit board. These are supplied as un-terminated tails with the OEM version to speed up and simplify installation. Figure 1.1 shows the OEM PCB



Figure 1.1: OEM PCB

### 1.3. SURFACE VERSION

The surface version of the multiplexer is supplied in a 2U rack mount case, figure 1.2. The unit should be supplied with a mains voltage of 110VAC-240VAC.



Figure 1.2: 2U Rack

The 8 channels of data from the MiniPlexer are available on the back of the rack via male 9-way d-types. There is also an umbilical connection on the back that supplies the sub sea unit with mains and has the data connections in it.

### 1.4. SUBSEA VERSION (3000M)

The sub sea version of the MiniPlexer comprises the same card set inside an anodised aluminium housing, depth rated to 3,000m in sea-water, figure 1.3.



*Figure 1.3: Sub sea bottle*

The bottle comprises 8 connections for the individual channels and a single connection on the rear for the umbilical

### **1.5. WARRANTY**

CDLtd UK warrants 'MiniPlexer' products to be free from defects in materials or workmanship for one year beginning on the date when the equipment was shipped from the CDL base or from their authorised distributor.

Units must be packaged with care when returning to the CDLtd base. CDLtd recommends that the original packing material is retained for this purpose.

The responsibility of CDLtd in respect of this warranty is limited solely to product replacement or repair at an authorised location only. Determination of replacement or repair will be made by CDLtd personnel or by personnel expressly authorised by CDLtd for this purpose.

This warranty will not extend to damage or failure resulting from misuse, neglect, accident, alteration, improper installation, non-approved cables or accessories, or operation in an environment other than intended.

In no event will CDLtd be liable for any indirect, incidental or consequential damages whether through tort, contract or otherwise. This warranty is expressly in lieu of all other warranties, expressed or implied, including without limitation the implied warranties of merchantability or fitness for a particular purpose. The foregoing states the entire liability of CDLtd with respect to the products described herein.

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**CONNECTIONS**

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**2.0. INTRODUCTION**

The various connector and connection options are described here. There are 3 sections describing connections directly to the PCB, connections to the surface 2U rack and connections to the sub sea bottle

**2.1. PCB CONNECTIONS****2.1.1. Channel Connections**

All communication port connections to the PCBs are via 10-way Molex connectors as shown in figure 2.1.

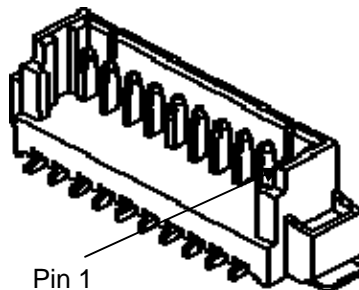


Figure 2.1: 10-way SMT Molex 53398

The connections are given in table 2.1.

Pin No	Function	Port
1	Rx	odd port number
2	Tx	odd port number
3	Data Gnd	odd port number
4	SD	odd port number
5	DE	odd port number
6	Rx	even port number
7	Tx	even port number
8	Data Gnd	even port number
9	SD	even port number
10	DE	even port number

Table 2.1: PCB serial connections

### 2.1.2. Umbilical Connections

The umbilical connection on the PCB is by way of a 6-way connector with connections detailed in table 2.2

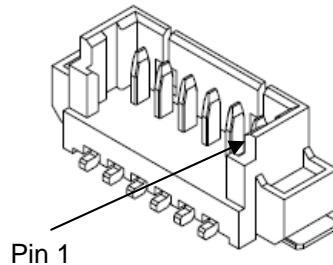
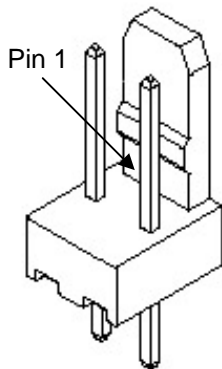


Figure 2.2: 6-way SMT 53398 Molex

Pin Number	Function
1	
2	
3	Twisted Pair Shield
4	
5	RS 485 Low
6	RS 485 High

Table 2.2: PCB umbilical connections

### 2.1.3. Power Connections



The MiniPlexer boardset is powered by a 8-30v supply onto the control board. The power is then distributed to the channel board(s) via the 50 way connector.

The power connector on the board is a 2-way Molex. Pin assignments are as shown below.

Pin Number	Signal
1	+5 volts
2	Gnd

Table 2.3: PCB power connections



For OEM applications, the user integrates the PCB card set within their own equipment. Connections for the OEM version are therefore the same as the PCB connections given above.

## 2.2. SURFACE 2U RACK CONNECTIONS

Figure 2.4 show the back of the 2U rack with all the connections.



Figure 2.4: The back of the 2U rack

### 2.2.1. Power Connection

Mains power is supplied to the surface unit via a standard kettle plug. The input voltage rating is 110 VAC – 240VAC. The fuse in the socket is a 5mm x 20mm F5A.

### 2.2.2. Channel Connections

There are 8 channel connections on the back of the 2U Rack these have the connections shown in Table 2.4

Pin	Function
1	
2	Rx Data In
3	Tx Data Out
4	
5	Gnd
6	
7	
8	
9	

Table 2.4: Channel 9-way Male D-type connections

### 2.2.3. Umbilical Connections

The umbilical connector on the back of the 2U rack is a 8way binder and has the RS485 data connection in it and also has main power to supply the sub sea bottle. The connections are shown in table 2.5 and the pin-out is shown in figure 2.5.

Pin	Function	Colour
1	Gnd (Twisted pair shield)	Black
2	AC Live	Brown
3	AC Neutral	Blue
4	AC Earth	Yellow/Green
5	RS 485 Hi	Orange/Black
6	RS 485 Lo	Grey/Black
7	Interlock 1	pink
8	Interlock 2	white

Table 2.5: Binder Connections



Twisted pair shield should be connected to the ground connection on the umbilical connector (pin 1)

Figure 2.5 shows the binder male face view.

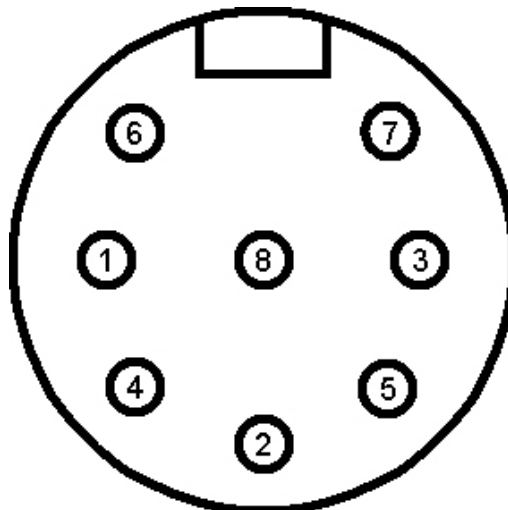


Figure 2.5: Male binder face view

## 2.3. SUB SEA BOTTLE CONNECTIONS

The sub sea bottle has connections on both ends see figure 2.6. Communications and power to the pod are supplied via the umbilical connection and channel data and 24 VDC are available on the 8 channel connections.



Figure 2.6: Sub sea bottle

### 2.3.1. Umbilical Connections

The umbilical connector is an 8-way Burton and has the connections shown in table 2.6.

Pin No	Function
1	
2	Ground
3	AC Live
4	AC Neutral
5	Earth
6	
7	RS485 High
8	RS485 Low

Table 2.6: Umbilical Connection



Twisted pair shield should be connected to the ground connection on the umbilical connector (pin 2)

Figure 2.7 shows the pin numbers on the connector.

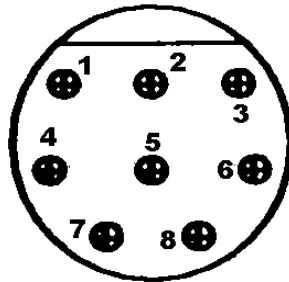


Figure 2.7: Female face view of 8-way Burton

### 2.3.2. Channel Connections

The eight channel connections are made on 8-way male Burton connections and are wired as shown in table 2.7.



**Each channel supplies 24V DC to the connected equipment**

Equipment Connections 1-8	
Pin No	Function
1	+24v DC
2	0v DC
3	
4	
5	
6	Data Ground
7	RS232 Data Out (Tx)
8	RS232 Data In (Rx)

Table 2.7: Channel connections

Figure 2.8 shows the female face view.

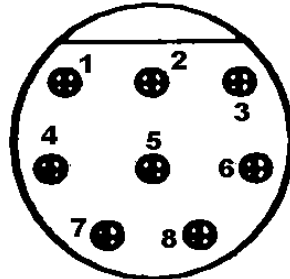


Figure 2.8: Female face view of 8-way Burton

### 2.3.3. Power Output from Channel Connections

The 8 channel connector supply 24 VDC to connected equipment. Each channel the current limits as shown in table 2.8.

Channel	Current Limit (Amps)
1	4A
2	1.3A
3	1.3A
4	1.3A
5	1A
6	1A
7	1A
8	1A

Table 2.8: Channel current limits



If connecting a MicroGyro to the unit it **MUST** be connected to channel ONE due to its high current draw

## OPERATION

### 3.0. DATA TRANSFER FORMAT

The data transfer protocol is based on the continuous exchange of packets between each end of the link.

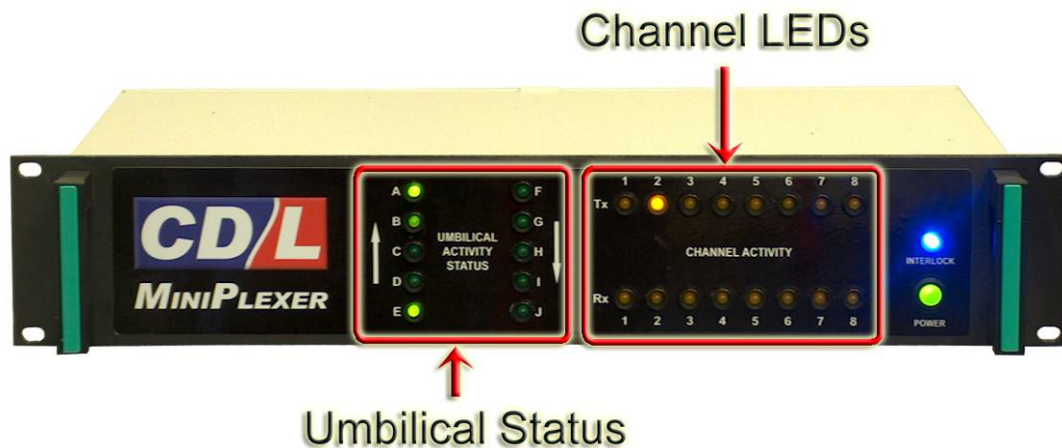
Two types of packets are defined:

- “byte packet” carrying single bytes
- “block packet”, carrying blocks of 8 bytes, for any or all channels.

The operation of this is completely transparent.

### 3.1. UMBILICAL STATUS LEDS

The surface rack has two rows of green LEDs that indicate the operation of the Umbilical (main link) on the MiniPlexer. See figure 3.1.



*Figure 3.1: Front panel indicator LEDs*

These are numbered A to J. LEDs A to E indicate uplink data, data from sub sea bottle to surface. F to J indicate downlink data, data from surface to sub-sea bottle. Under normal operation when data is being sent or received each group of five LEDs will cycle to indicate activity in the corresponding direction. The LED advances once per 256 characters transmitted or received. If any LED is blinking an error has occurred. These LEDs are detailed in table 3.1.

LED	Normal Operation	If LED is blinking
A	Downlink Activity	I2C Error
B	Downlink Activity	Collision - Cabling Problem or both ends tried to talk at the same time
C	Downlink Activity	Unexpected data received from the other end of link
D	Downlink Activity	Malformed serial data received from the other end of link
E	Downlink Activity	Over run.
F	Uplink Activity	Refused – unable to send data to channel PIC
G	Uplink Activity	Overflow – Other end of link did not respect flow control
H	Uplink Activity	
I	Uplink Activity	
J	Uplink Activity	

Table 3.1: LED indication



**LED B, C or D are expected error while the system is starting up. These errors will automatically be cleared once communications are successfully established.**

If LEDs B, C or D do not stop flashing after a few seconds then this indicates a problem with the connection between top and bottom.

Check top to bottom continuity

Try crossing over the RS 485 lines in case they have not been connected correctly

Check the characteristic impedance of the line and change the multiplexer termination resistance accordingly. See section 4.

### 3.2. CHANNEL ACTIVITY LEDS

The channel activities LEDs indicate the current state of the individual Tx and Rx channel buffers. This gives an indication of the data through put on each channel. When the system is operating correctly the LEDs associated with channels in use will flicker dimly. As the through put on an individual channel increases the brightness of the associated LED will increase accordingly.

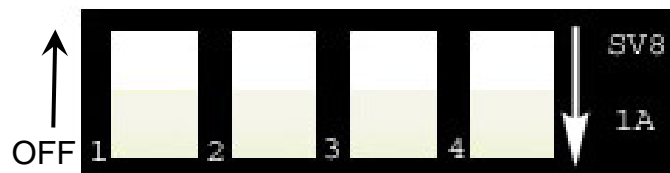
## CONFIGURATION

### 4.0. SETUP PROCEDURE

#### 4.0.1. Surface 2U Rack

The top panel has to be removed to gain access to the switches described below. The SIL switches are on the top side of the middle board and the underside of the bottom board which is removed by means of three M3 screws retaining screws.

The baud rate is controlled by means of 4 way SIL switched as shown in figure 4.1. The location of these switches is shown in figure 4.2. Each one of the Sil switches controls one of the eight channels, channel 1 and channel 8 Sil switches are labelled on the PCB.



*Figure:4.1 Surface SIL switches*

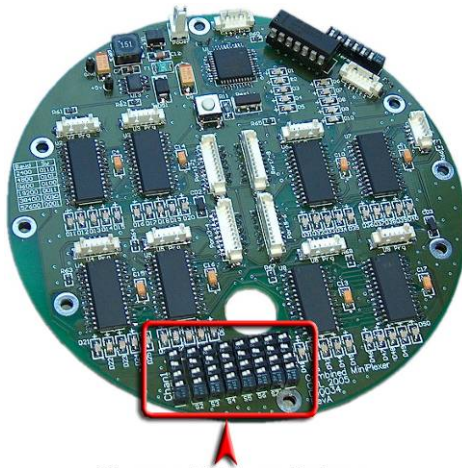
The baud rate is set as shown in table 4.1.

SIL Switch Number				Baud Rate
1	2	3	4	
OFF				SW1 always off
	ON	ON	ON	1200
	ON	ON	OFF	2400
	ON	OFF	ON	4800
	ON	OFF	OFF	9600
	OFF	ON	ON	19200
	OFF	ON	OFF	38400
	OFF	OFF	ON	57600

*Table 4.1: Baud rate settings*

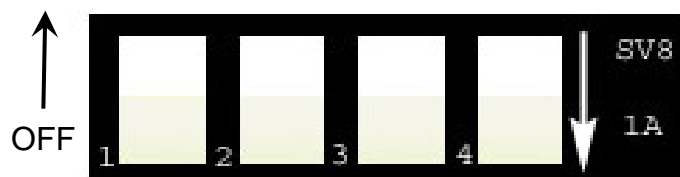
#### 4.0.2. Sub Sea Bottle

The end cap with the umbilical on it has to be removed to gain access to the dip switches in the bottle that control the baud rate. The SIL switches will then be seen on the PCB as a row of eight 4-way switches, figure 4.2


**Channel SIL switches**
*Figure 4.2: Channel SIL switches*

The Channel 1 SIL switch and the channel 8 switch are labelled on the board and each SIL switch controls the baud rate of the next numerical channel. Table 4.2 how the SIL switch should be configured for each baud rate. Figure 4.3 shows the in which direction the SIL switch should be for ON and OFF.

SIL Switch Number				Baud Rate
1	2	3	4	
OFF				SW1 always off
	ON	ON	ON	1200
	ON	ON	OFF	2400
	ON	OFF	ON	4800
	ON	OFF	OFF	9600
	OFF	ON	ON	19200
	OFF	ON	OFF	38400
	OFF	OFF	ON	57600

*Table 4.3: Baud rate settings*

*Figure 4.3: Sub sea bottle Baud SIL switches*

#### 4.1. CABLE TERMINATION

To cope with different cable types there is a 6-way SIL switch on both the top and bottom board set to allow the cable termination resistor to be changed. Figure 4.5 shows the SIL switches and their off direction. The six way SIL switch is on the top of both systems so should be apparent when the lid is

taken off the 2U rack and when the umbilical end cap is taken off the bottle.  
Table 4.4 shows the available terminations.

SIL Switch	Termination Resistance $\Omega$
1	150
2	120
3	75
4	50
5	22
6	10

Table 4.4: Termination resistance

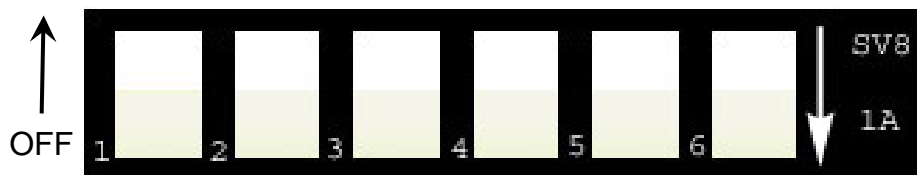


Figure 4.4: Cable termination SIL switches



Only ONE of the SIL switches should be on at any on time. If changing the termination always switch off the SIL switch before switching on another one



The SIL switch is set for 120ohm at CDL, this is suitable for most twisted pair cable

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## MOUNTING ARRANGEMENTS

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The MiniPlexer can be mounted as follows:

### **5.0. OEM VERSION**

The OEM version comprises of a single circular PCB, a drawing of this can be found in section 7.1. Four holes are provided on the circumference of the PCB to allow mounting of the PCB. These holes are suitable for M3 screw sizes.

The card set can be fitted in any convenient and suitable location. It must be mounted in a dry enclosed location. It does not generate significant heat so it does not need any forced cooling. The OEM PCBs need a 12-24 vDC power supply.

### **5.1. SURFACE VERSION**

The Surface version is self contained in its own 2U rack enclosure. The surface versions needs an 110 – 240 VAC power source, supplied via a standard kettle plug.

### **5.2. SUBSEA VERSIONS**

The sub sea version is mounted in a 3000 metre rated housing as shown in section. A cable is moulded directly into the lid, which has a multi-way splice on the other end. This is customised for each application as it has the necessary connectors to plug into the equipment in use.



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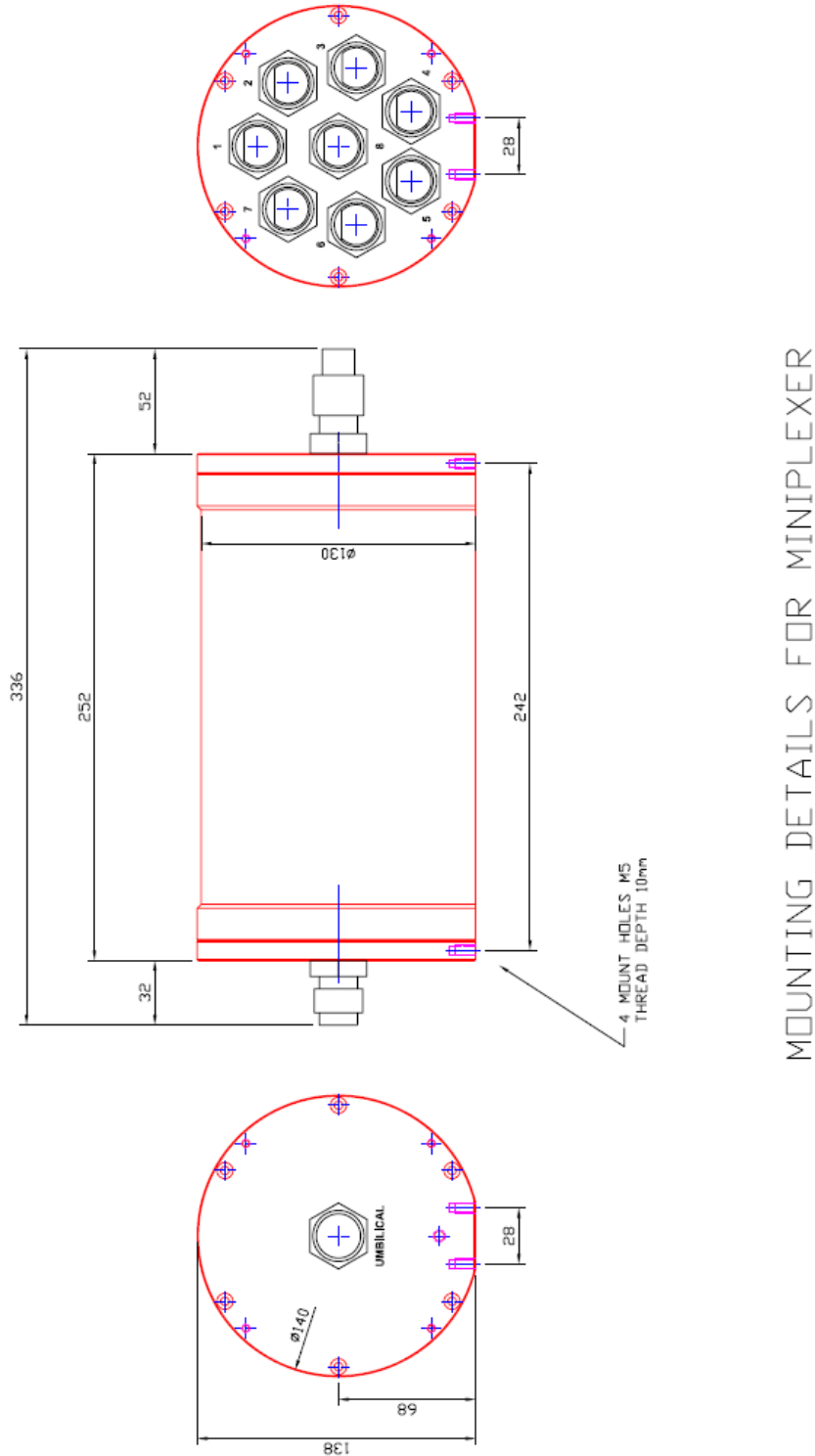
## SPECIFICATIONS

### 6.0. MINIPLEXER SPECIFICATIONS

Power Input (DC with regulator)	5-30 Vdc
Power Input (DC without reg)	5 Vdc
Power Input (AC)	100 – 240 Vac
Current consumption	<5mA (@24Vdc typical)
Temperature Range	Operating: -30°C to +55°C Storage -55°C to +65°C
Link Data Format	RS485
Baud Rate	115200 bps
Input Data Format	RS232
Baud Rate	2400 bps – 57600 bps
Data Bit, Stop bit, Parity	Transparent to both ASCII and pure binary data. This will accept any combination of data, stop, parity

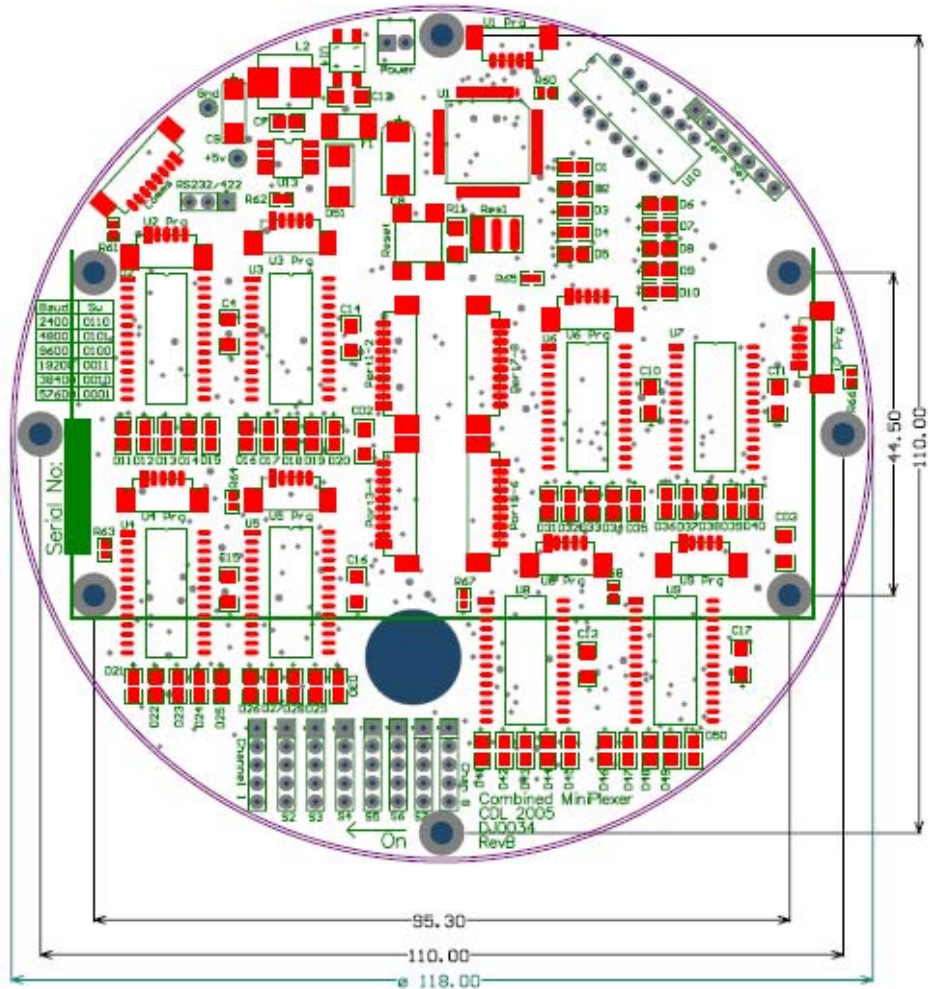
## MECHANICAL DRAWINGS

### 7.0. SUBSEA HOUSING



MOUNTING DETAILS FOR MINIPLEXER

### 7.1. PCB MOUNTING



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