

# Online ENGINE

## PINGER RECEIVER MODULAR ROV OPERATING MANUAL

The 2001RS 2401 2402 ROV system is a pipeline pig monitoring system used for tracking and locating underwater acoustic pingers

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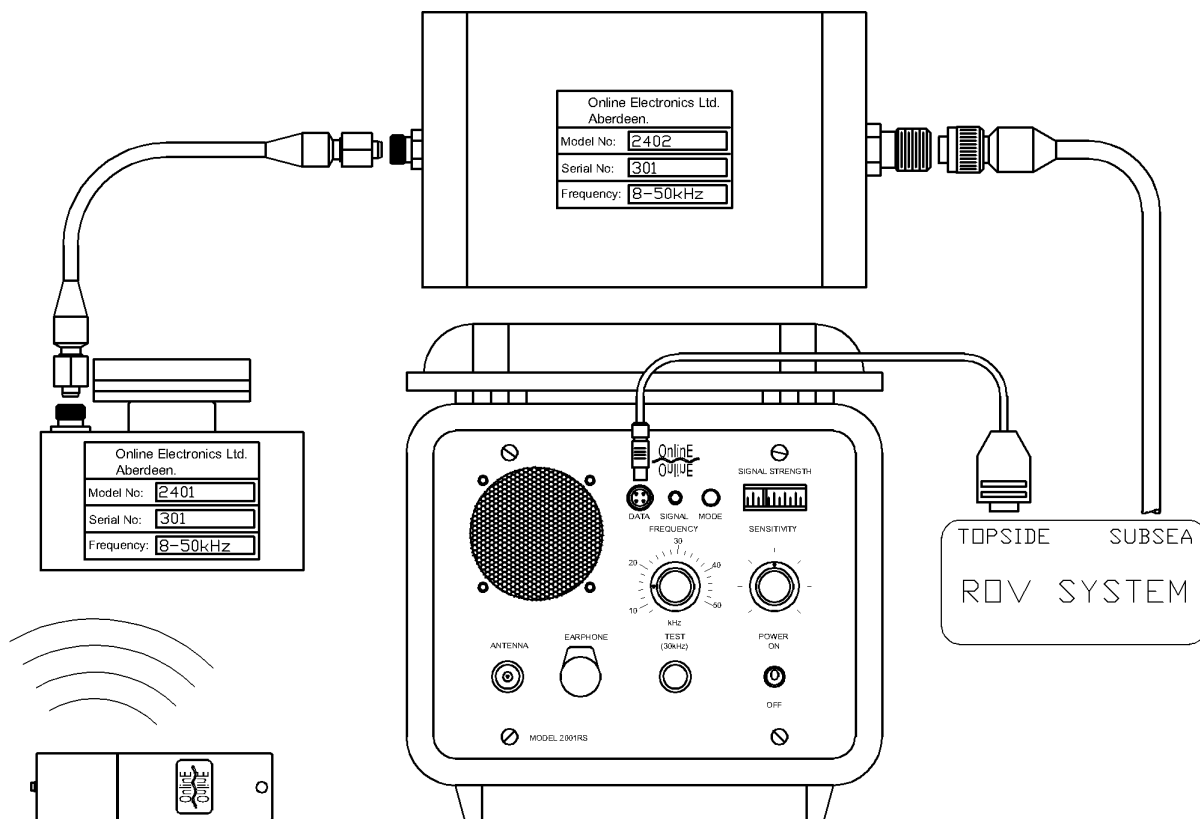


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# 1. GENERAL DESCRIPTION



The 2001RS Pinger Receiver is a portable, battery powered, acoustic receiver, tuneable to all frequencies between 8 kHz and 50 kHz which can be used for tracking and locating underwater acoustic transmitters. The receiver has loudspeaker and headphone audio outputs, an easy to interpret signal strength meter, simple frequency and sensitivity controls, and self-test / battery test functions. The 2001RS is used with a 2402 acoustic pod and 2401 ROV hydrophone when deployment via ROV is required.

The 2402 acoustic pod is a subsea acoustic receiver which communicates with the 2001RS via a serial, RS232, data link. The 2402 acoustic pod receives acoustic signals from the 2401 ROV hydrophone, digitises them, and then transmits them to the 2001RS over the RS232 link. The RS232 link is also used by the 2001RS to control the 2402 acoustic pod frequency and sensitivity.

The 2401 is a directional hydrophone designed for use by ROV. The directional sensitivity of the 2401 hydrophone allows the operator to locate acoustic transmitters by observing the signal level received and the relative orientation of the 2401 hydrophone.

## 2. SPECIFICATIONS

### 2001RS

Frequency Range.....8kHz to 50kHz  
-6dB Bandwidth ..... 1kHz  
Battery life at +5°C ..... 150 hours continuous  
Battery type ..... 12VDC (8x DURACELL ID1300 D CELLS)  
Operating temperature range.....-2°C to +50°C  
Height..... 178mm  
Width..... 268mm  
Depth ..... 241mm  
Weight ..... 4.4 kg

### 2401 ROV HYDROPHONE

Supply voltage (from 2402) ..... +12VDC  
Operating depth ..... 3000m  
Operating temperature range.....-2°C to +50°C  
Height..... 78mm  
Width..... 148mm  
Depth ..... 86mm  
Weight (water) ..... 1.0 kg

### 2402 ACOUSTIC POD

Supply voltage (from ROV) .....+24VDC (+18VDC to +36VDC)  
Operating depth ..... 3000m  
Operating temperature range.....-2°C to +50°C  
Length (including connectors) ..... 300mm  
Diameter ..... 155mm  
Weight (water) ..... 1.1 kg

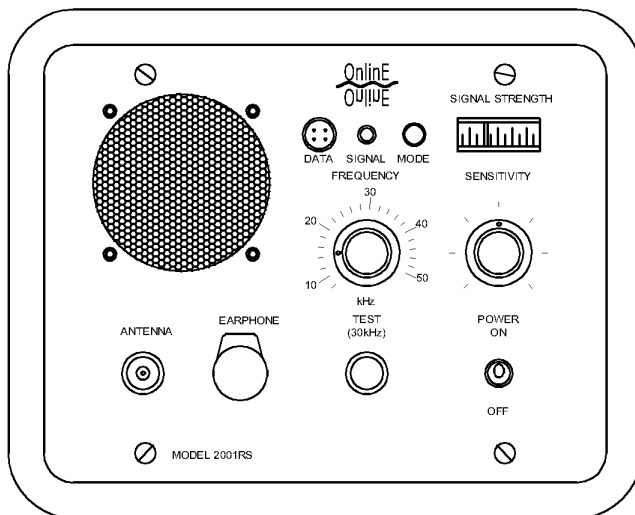
### 3. OPERATION

Before each deployment ensure that all checks in section 3.1 PRE-DEPLOYMENT CHECKS are completed.

As with all acoustic systems, the ambient acoustic noise existing in the environment will have a significant impact on the performance of the 2001RS system. Some of the most common sources of ambient acoustic noise are vessel engines, water turbulence and rough weather.

Also be aware that there may be nearby acoustic transmitters unexpectedly transmitting at the frequency of interest.

These should be disabled if possible. For example any acoustic beacons on the ROV must be disabled and any support vessels with dynamic positioning systems should be disabled or configured to work outside of the frequency of interest if possible.



The typical procedure for detecting an acoustic transmitter is given below. This procedure assumes the operator knows the expected frequency and pulse rate of the acoustic transmitter being searched for.

1. With the system powered and turned on confirm that the MODE LED is illuminated **GREEN** indicating that the RS232 link is functioning.
2. Point the active face of the 2401 hydrophone towards the expected location of the acoustic transmitter.
3. Turn the FREQUENCY control to the expected frequency of the acoustic transmitter.
4. Adjust the SENSITIVITY control until a background noise level of approximately 30% is achieved on the SIGNAL STRENGTH meter, this is typically the optimum setting for identifying an acoustic signal. It will be extremely difficult to detect a signal if the background noise is more than 70%. If the background noise is more than 70% then the SENSITIVITY should be reduced or a source for the excessive background noise must be identified and removed.
5. Very slowly adjust the FREQUENCY control back and forth while listening to the received signal and watching the SIGNAL STRENGTH meter to find the frequency setting which gives the strongest and clearest signal.
6. Slowly scan in different directions with the 2401 hydrophone while listening to the received signal and watching the SIGNAL STRENGTH meter to determine what direction gives the strongest and clearest signal. Move in this direction to get as close as possible to the transmitter.
7. Continue finely adjusting FREQUENCY and SENSITIVITY as well as gradually moving the ROV in the direction of the transmitter to achieve the strongest and clearest signal possible. Confirm that the FREQUENCY and pulse rate of the acoustic signal are as expected. Be aware that there may be other acoustic transmitters in the environment (such as ROV beacons or dynamic positioning beacons). These sources should be disabled if possible otherwise it should be possible to identify the signal of interest by carefully examining frequency and pulse rate

### 3.1. PRE-DEPLOYMENT CHECKS

Before each deployment ensure that the following checks have been completed.

1. Ensure that the system has been installed as per section 4.2 ROV SYSTEM INSTALLATION.
2. Visually inspect all system components to ensure that they are secure and undamaged. Pay particular attention to all cables and connectors. Refer to section 4.2 ROV SYSTEM INSTALLATION.
3. Ensure that the active face of the 2401 hydrophone is pointing away from the ROV towards where the acoustic transmitter is expected to be. Refer to section 4.2 ROV SYSTEM INSTALLATION.
4. Confirm that the 2402 acoustic pod is being supplied with +24VDC from the ROV with the correct polarity. Refer to section 4.5.2 BURTON 5507-1508 BULKHEAD.
5. Ensure that the 2001RS is turned on and the batteries are showing more than 50% remaining capacity. Refer to section 4.3 BATTERY TEST AND REPLACEMENT.
6. Confirm that the RS232 data link has been configured as per section 4.4 RS232 LINK SETTINGS and enabled.
7. Complete a 3.2 SYSTEM SELF TEST and 3.3 SYSTEM FUNCTION TEST.
8. If using AUDIOSCOPE, confirm that it has been configured and tested as per the AUDIOSCOPE manual.

### 3.2. SYSTEM SELF TEST

1. With the system powered and turned on confirm that the MODE LED is illuminated **GREEN** indicating that the RS232 link is functioning.
2. Pressing and holding the TEST button will make the 2402 activate an internal, 1 ping per second, 30kHz, test signal which is processed by the 2402 and transmitted to the 2001RS via the RS232 link.
3. While holding the TEST button, turn the FREQUENCY control to 30kHz and turn the SENSITIVITY control to approximately mid-point. Confirm that every second an audible 'ping' is heard (via headphones or the speaker), the RED SIGNAL LED lights, and that the SIGNAL STRENGTH meter indicates the signal strength. Slowly adjust the FREQUENCY control back and forth to find the setting around 30kHz which gives maximum signal strength.
4. Turn the 'SENSITIVITY' control clockwise and anti-clockwise and confirm the volume of the 'ping' gets louder and quieter respectively.
5. Adjust the 'FREQUENCY' control and confirm that the ping is inaudible below approximately 27kHz and above approximately 33kHz.
6. To determine 2001RS battery status, remove the RS232 INTERFACE CABLE from the units front panel and then press and hold the TEST button. The SIGNAL STRENGTH meter will now give an indication of battery capacity remaining. If less than 50% is indicated then change the batteries as per section 4.3 BATTERY TEST AND REPLACEMENT.

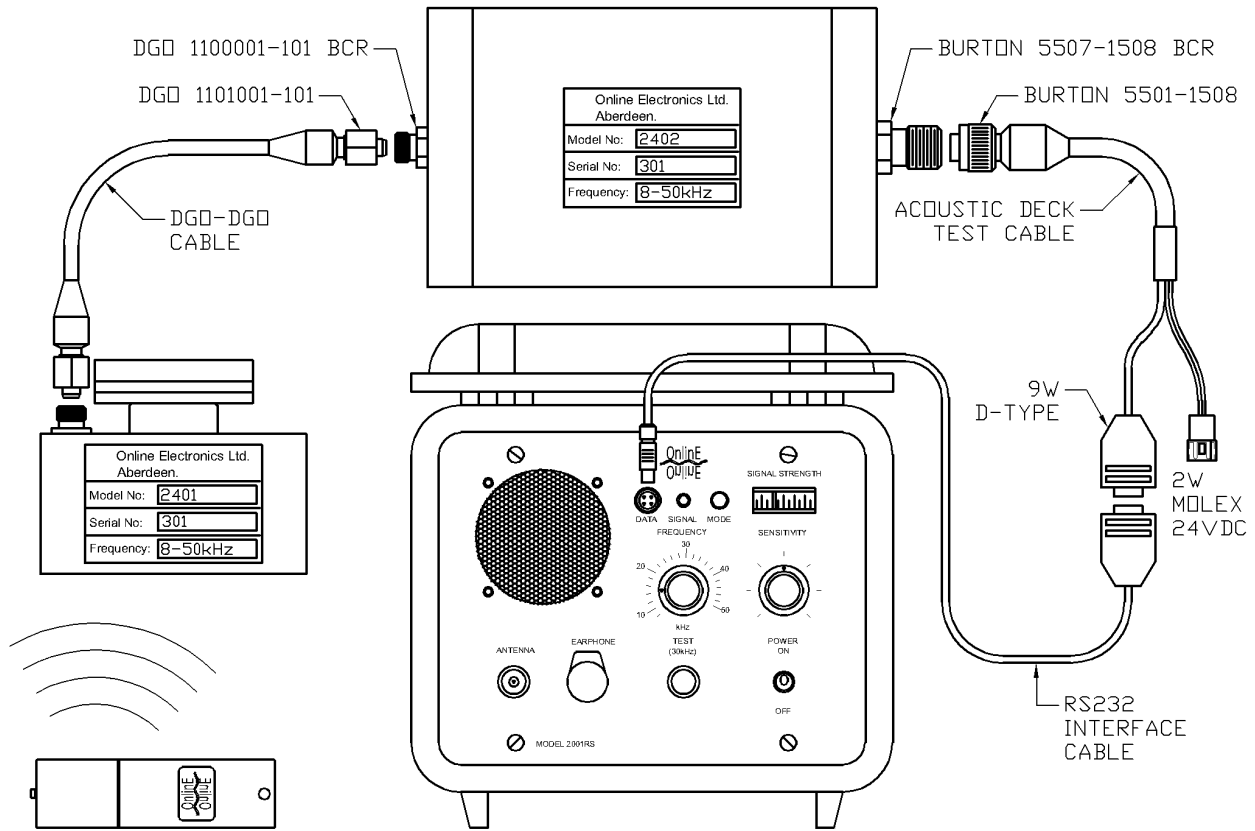
### 3.3. SYSTEM FUNCTION TEST

1. With the system powered and turned on confirm that the MODE LED is illuminated **GREEN** indicating that the RS232 link is functioning.
2. Activate a test transmitter of known frequency and pulse rate within range of the 2401 ROV hydrophone. A range of approximately 5cm should be used if in air.
3. Adjust the FREQUENCY control to the transmitter frequency and set SENSITIVITY to mid-point. Confirm that an audible 'ping' is heard (via headphones or the speaker), the RED SIGNAL LED lights, and that the SIGNAL STRENGTH meter indicates the signal strength at the expected pulse rate. Slowly adjust the FREQUENCY control back and forth to find the setting which gives maximum signal strength. Turn down SENSITIVITY if the signal strength is reaching full scale on the SIGNAL STRENGTH meter.
4. If a test transmitter is not available then a crude signal can be generated by very gently tapping the active face of the 2401 hydrophone with a finger. It should be possible to detect this with the FREQUENCY set to approximately 9kHz and SENSITIVITY set to approximately mid-point.
5. Turn off any test transmitters and remove any local sources of noise and/or vibration. With SENSITIVITY set to mid-point, slowly sweep the FREQUENCY control from 8kHz to 50kHz and confirm that the SIGNAL STRENGTH meter never exceeds 50%. This confirms that the background noise level is acceptably low and in particular there is nothing causing electrical interference in the system.
6. If all results were as expected then the system is functional. If any problems were encountered, refer to Section 5 TROUBLESHOOTING.



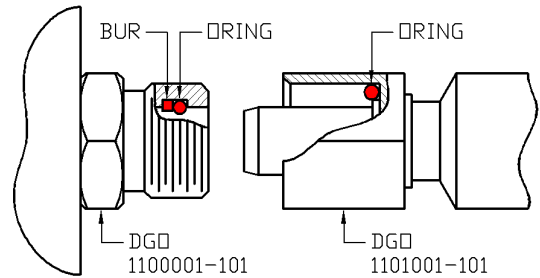
# 4. SYSTEM INSTALLATION

## 4.1. ROV SYSTEM DECK TEST



Prior to installation with the ROV and ROV umbilical, ensure that the system deck test has been completed. This will confirm that the system components are functional prior to installation on the ROV and familiarize the user with the equipment, installation, and operation. In this test the ACOUSTIC DECK TEST CABLE takes the place of the ROV and ROV umbilical.

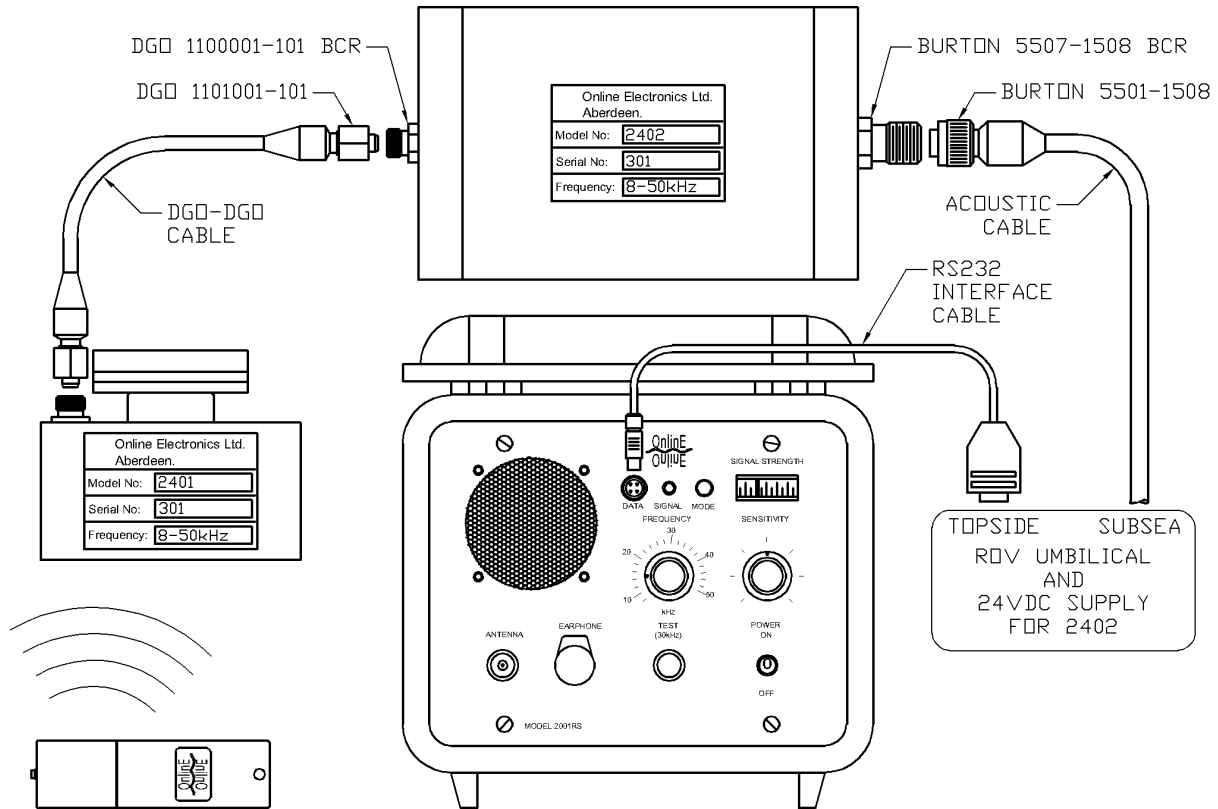
1. Identify the DGO-DGO cable and examine for any signs of damage to the cable or connectors. Note that each DGO cable connector includes an internal Oring positioned as shown. Look into each connector and confirm that the Oring is in position and is undamaged. If this Oring is missing or damaged then the system may malfunction when deployed subsea.



2. Identify the 2402 ACOUSTIC POD and 2401 ROV HYDROPHONE and examine for any signs of damage to the housings or connectors. Note that each DGO bulkhead connector includes an internal Backup ring (BUR) and Oring positioned as shown. Look into each DGO bulkhead connector and confirm that the Oring and BUR are in position and are undamaged. If the Oring or BUR is missing or damaged then the system may malfunction when deployed subsea.
3. Connect the 2402 ACOUSTIC POD to the 2401 ROV hydrophone using the DGO-DGO cable. DO NOT USE SPANNERS TO TIGHTEN THE DGO COLLARS OTHERWISE DAMAGE MAY OCCUR, THE COLLARS SHOULD BE HAND TIGHTENED ONLY. Grease the connectors if necessary.

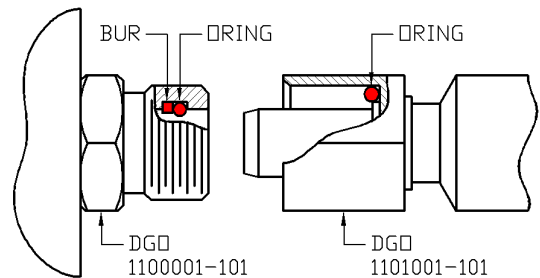
4. Identify the ACOUSTIC DECK TEST CABLE (5501-1508 BURTON connector cable terminated with a 9W D-Type connector and 2W MOLEX connector) and examine for any signs of damage to the cable or connectors.
5. Connect the 5501-1508 BURTON connector on the ACOUSTIC DECK TEST CABLE to the 5507-1508 BURTON BCR connector on the 2402 ACOUSTIC POD. Grease the connectors if necessary.
6. Identify the RS232 INTERFACE CABLE (4W FISCHER circular connector to 9W D-Type connector) and examine for any signs of damage to the cable or connectors.
7. Connect the 9W D-Type connector on the RS232 INTERFACE CABLE to the 9W D-type connector on the ACOUSTIC DECK TEST CABLE.
8. Connect the 4W FISCHER connector on the RS232 INTERFACE CABLE to the DATA connection on the front panel of the 2001RS.
9. Connect the test battery to the 2W Molex connector on the ACOUSTIC DECK TEST CABLE. Confirm that the test battery voltage maintains at least 24VDC.
10. Turn ON the unit using the POWER toggle switch. When power is applied to the system and the RS232 link is functioning, the MODE LED will illuminate **GREEN**. If there is a problem with the RS232 link then the MODE LED will illuminate **RED** until the problem is rectified, refer to Section 5 TROUBLESHOOTING.
11. Complete section 3.2 SYSTEM SELF TEST and section 3.3 SYSTEM FUNCTION TEST to confirm that the system is fully functional.

## 4.2. ROV SYSTEM INSTALLATION



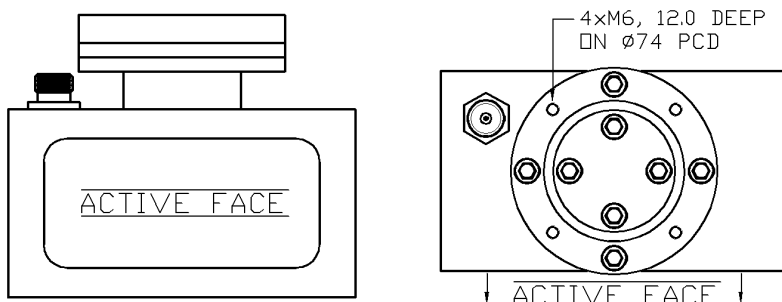
Prior to installation with the ROV and ROV umbilical, ensure that section 4.1 ROV SYSTEM DECK TEST has been completed. This will confirm that the system components are functional prior to installation on the ROV and familiarize the user with the equipment, installation, and operation. Note that the diagram above shows the standard connector (BURTON 5507-1508 BCR) on the 2402, alternative connectors such as SEANET may be fitted if requested at time of order.

1. Identify the DGO-DGO cable and examine for any signs of damage to the cable or connectors. Note that each DGO cable connector includes an internal Oring positioned as shown. Look into each connector and confirm that the Oring is in position and is undamaged. If this Oring is missing or damaged then the system may malfunction when deployed subsea.



2. Identify the 2402 ACOUSTIC POD and 2401 ROV HYDROPHONE and examine for any signs of damage to the housings or connectors. Note that each DGO bulkhead connector includes an internal Backup ring (BUR) and Oring positioned as shown. Look into each DGO bulkhead connector and confirm that the Oring and BUR are in position and are undamaged. If the Oring or BUR is missing or damaged then the system may malfunction when deployed subsea.
3. Connect the 2402 ACOUSTIC POD to the 2401 ROV hydrophone using the DGO-DGO cable. DO NOT USE SPANNERS TO TIGHTEN THE DGO COLLARS OTHERWISE DAMAGE MAY OCCUR, THE COLLARS SHOULD BE HAND TIGHTENED ONLY. Grease the connectors if necessary.

4. The 2401 ROV hydrophone should be mounted at the front of the ROV or in the manipulator using a fishtail. The circular, rubber mounted, bracket on top of the 2401 ROV hydrophone must be used. This bracket is designed to reduce mechanical vibration and decouple the ROV from the hydrophone. The mounting bracket has 4xM6 threaded entries available for securing the bracket to the ROV as shown below. When mounted, the active face of the 2401 hydrophone must be pointing outwards from the ROV, towards where the acoustic transmitter of interest is expected to be.



5. The 2402 acoustic pod should be secured to the ROV using the supplied mounting bracket. Maintain at least 1 metre separation between the 2402 acoustic pod and the 2401 hydrophone. Closer distances can result in electrical interference between the units.
6. Identify the ACOUSTIC CABLE (5501-1508 BURTON connector to open end) and examine for any signs of damage to the cable or connectors. As standard the system is supplied with this open ended cable which must be terminated by the customer with a suitable connector for their ROV system prior to use. Refer to section 4.5 STANDARD SYSTEM WIRING for pin designations. Alternatively the type of connector (e.g. SEANET) and associated pin designations can be specified at time of order.
7. Connect the Burton 5501-1508 BURTON connector on the ACOUSTIC CABLE to the 5507-1508 BURTON BCR connector on the 2402 ACOUSTIC POD. Grease the connectors if necessary.
8. Connect the opposite end of the ACOUSTIC CABLE to a suitable port on the ROV. Note that this port must provide 24VDC to the 2402 and also provide access to a transparent RS232 data link between the 2402 and the 2001RS over the ROV umbilical. See section 4.4 RS232 LINK SETTINGS for more information. Grease the connectors if necessary.
9. Identify the RS232 INTERFACE CABLE (4W FISCHER circular connector to 9W D-Type connector) and examine for any signs of damage to the cable or connectors.
10. Connect the 9W D-Type connector on the RS232 INTERFACE CABLE to a suitable port in the topside ROV control system. Note that this port must provide access to a transparent RS232 data link between the 2402 and the 2001RS over the ROV umbilical. See section 4.4 RS232 LINK SETTINGS for more information.
11. Connect the 4W FISCHER connector on the RS232 INTERFACE CABLE to the DATA connection on the front panel of the 2001RS.
12. Ensure that the RS232 data link is configured as per section 4.4 RS232 LINK SETTINGS and enabled.
13. Enable the 24VDC supply for the 2402 acoustic pod to power the 2402 and 2401.
14. Turn ON the unit using the POWER toggle switch on the front panel. When power is applied to the system and the RS232 link is functioning, the MODE LED will illuminate **GREEN**. If there is a problem with the RS232 link then the MODE LED will illuminate **RED** until the problem is rectified, refer to Section 5 TROUBLESHOOTING.

- 15. Complete section 3.2 SYSTEM SELF TEST and section 3.3 SYSTEM FUNCTION TEST to confirm that the system is fully functional.
- 16. If using AUDIOSCOPE then configure the software as per the AUDIOSCOPE manual and repeat section 3.2 SYSTEM SELF TEST and section 3.3 SYSTEM FUNCTION TEST to confirm that AUDIOSCOPE is functioning as expected.

### 4.3. BATTERY TEST AND REPLACEMENT

To determine unit battery status, remove the RS232 INTERFACE CABLE from the front panel and then press and hold the TEST button. The SIGNAL STRENGTH meter will now give an indication of battery capacity remaining. If less than 50% is indicated then change the batteries as described below.

- 1. Ensure the POWER switch is in the OFF position.
- 2. Loosen the four panel screws on the corners of the front panel and lift out the assembly.
- 3. Loosen the four BATTERY COVER screws and remove the BATTERY COVER.
- 4. Check for any signs of corrosion on the battery holder contacts. Clean if necessary, a light coating of silicone grease will inhibit future corrosion.
- 5. Install new batteries observing the correct polarity.
- 6. Install the BATTERY COVER, do not over tighten screws.
- 7. Refit the front panel assembly. Ensure that the four panel screws are all partially engaged before tightening. Ensure the gasket is properly seated. DO NOT OVER TIGHTEN THE MOUNTING SCREWS.
- 8. Switch the unit ON and depress the 'TEST' button.
- 9. Verify that the meter needle is showing full scale with new batteries fitted.
- 10. Turn the unit OFF.

### 4.4. RS232 LINK SETTINGS

An RS232 link must be provided between the 2001RS and 2402 and configured with the settings below. This link must be 'transparent' meaning that it behaves as if the connections between the 2001RS and 2402 were made with wires (as they are in section 4.1 ROV SYSTEM DECK TEST) so when any individual byte of data is sent from the 2402 it is immediately received by the 2001RS and vice versa. The data must not be packetized, buffered, or disrupted in any way otherwise the system may not function reliably.

Baud Rate .....115200  
 Data Bits ..... 8  
 Parity..... None  
 Stop Bits ..... 1  
 Flow Control ..... None

**4.5. STANDARD SYSTEM WIRING**

**4.5.1. D. G. O'BRIEN 1100001-101 BULKHEAD COAXIAL**

Centre ..... Signal & 12VDC  
 Outer ..... Screen  
 Connector Shell ..... Screen

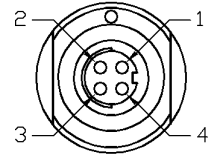
**4.5.2. BURTON 5507-1508 BULKHEAD**

1 ..... 0V 2402 POWER  
 2 ..... +24VDC 2402 POWER (+18VDC to +36VDC)  
 3 ..... Not Used  
 4 ..... RS232 Data to 2402  
 5 ..... RS232 Data Ground  
 6 ..... RS232 Data to 2001RS  
 7 ..... Not Used  
 8 ..... Not Used

**4.5.3. FISCHER CONNECTOR**

Note that the view of the 2001RS front panel bulkhead is shown for pin designations.

1 ..... RS232 Data Ground  
 2 ..... RS232 Data to 2001RS  
 3 ..... RS232 Data to 2402  
 4 ..... Connected to 1 via RS232 INTERFACE CABLE



**4.5.4. 9W D-TYPE CONNECTOR**

1 ..... Not Used  
 2 ..... RS232 Data to 2402  
 3 ..... RS232 Data to 2001RS  
 4 ..... Not Used  
 5 ..... RS232 Data Ground  
 6 ..... Not Used  
 7 ..... Not Used  
 8 ..... Not Used  
 9 ..... Not used

**4.6. SEANET CONNECTOR WIRING**

If a SEANET connector is fitted to the 2402 ACOUSTIC POD then the standard connections below are used.

1 (Outer) ..... +24VDC 2402 POWER (+18VDC to +36VDC)  
 2 ..... 0V 2402 POWER & RS232 Data Ground  
 3 ..... Not Used  
 4 ..... Not Used  
 5 ..... RS232 Data to 2001RS  
 6 ..... RS232 Data to 2402  
 7 (Centre) ..... Not Used

## 5. TROUBLESHOOTING

If problems persist contact Online Electronics Limited for support.

Complete all tests in section 3.1 PRE-DEPLOYMENT CHECKS.

Initially check that the system components are all functional by completing section 4.1 ROV SYSTEM DECK TEST. If this section cannot be completed then it indicates there is a problem with one of the system components which must be identified and fixed before attempting section 4.2 ROV SYSTEM INSTALLATION.

If section 4.1 ROV SYSTEM DECK TEST is successfully completed but problems are encountered during section 4.2 ROV SYSTEM INSTALLATION then it indicates that the problem is related to the ROV system/configuration.

Note that the 2402 acoustic pod internal circuitry 0V is isolated from the 24VDC supply connections but not from the RS232 Data Ground. This can cause problems if very sensitive ground leakage detection is used by the ROV system or there is excessive electrical noise on the ROV RS232 Data Ground. If possible use an isolated RS232 port on the ROV and provide an isolated supply to the 2402.

One of the most common problems encountered is having RS232 Tx and Rx configured incorrectly within the ROV system. Often the ROV system is capable of swapping these connections remotely at each end of the umbilical. Systematically try all possible combinations. Refer to section 4.5 STANDARD SYSTEM WIRING.

Referring to section 4.5 STANDARD SYSTEM WIRING check continuity of all cable connections.

### 5.1. 2001RS RS232 TROUBLESHOOTING

In order to confirm RS232 transmission from the 2001RS use the RS232 INTERFACE CABLE to connect the 2001RS to a PC running a terminal program such as HyperTerminal configured as per section 4.4 RS232 LINK SETTINGS and with line feeds appended to incoming line ends.

The 2001RS continuously transmits the data below. Adjusting the SENSITIVITY and FREQUENCY controls on the 2001RS should alter the numbers following G and F respectively.

```
... G204  
    F110  
    N ...
```

### 5.2. 2402 RS232 TROUBLESHOOTING

In order to confirm RS232 transmission from the 2402 use the ACOUSTIC DECK TEST CABLE to connect the 2402 to a PC running a terminal program such as HyperTerminal configured as per section 4.4 RS232 LINK SETTINGS. An adaptor to swap RS232 Rx and Tx may be required. Refer to section 4.5.4 9W D-TYPE CONNECTOR.

AT POWER UP ONLY the 2402 transmits the message below.

```
Online Electronics Ltd  
2402 Acoustic Link  
V1.x
```

## 6. MAINTENANCE

**NOTE 1 - DO NOT EXPOSE TO AGGRESSIVE SOLVENTS OR CHEMICALS WHICH COULD BE HARMFUL TO THE HOUSING, NITRILE RUBBER O-RINGS, OR CONNECTORS.**

**NOTE 2 - OPENING OF HOUSINGS SHOULD ONLY TAKE PLACE IN A CLEAN, DRY, LABORATORY ENVIRONMENT.**

**NOTE 3 - TO PREVENT THE FORMATION OF CONDENSATION WITHIN THE UNIT ALLOW THE UNIT TO STABILISE WITHIN THE LABORATORY ENVIRONMENT FOR A MINIMUM OF 6 HOURS PRIOR TO OPENING.**

All Online Electronics Ltd products are designed to require minimum maintenance. The housings should be cleaned using fresh water and cleaning agents as necessary. Do not use chemicals which could be damaging to the housing, the nitrile rubber O-rings, or any connectors.

If the unit is to be placed in storage for a long period of time ensure the unit has been cleaned using fresh water and disconnect all batteries.

## 7. WARRANTY

Online products are guaranteed for one year from the date of purchase. Goods should be returned transportation prepaid to Online Electronics Limited.

There is no charge for parts or labour should any product require repair due to a manufacturing deficiency during the guarantee period.

In the event of a manufacturing deficiency the inward transportation costs will be repaid to the client.

## 8. DISPOSAL OF UNIT

Online Electronics Ltd (OEL) takes its responsibilities under the WEEE Regulations extremely Seriously and has taken steps to be compliant in line with our corporate and social responsibilities. In the UK, OEL has joined a registered compliance scheme WeeeCare (registration number **WEE/MP3538PZ/SCH**)

Electrical and electronic equipment should never be disposed of with general waste but must be collected separately for the proper treatment and recovery.

The crossed out bin symbol, placed on the product, reminds you of the need to dispose it correctly at the end of its life.

When buying a new product you will have the possibility to return, free of charge, another end of life product of equivalent type that has fulfilled the same functions as the supplied equipment. These items may be deposited at: Online Electronics Ltd, Online House, Woodburn road, Blackburn Business Park, Blackburn, Aberdeen, AB21 0PS, UK

Alternatively, to arrange a collection of any waste electrical equipment, obligated to OEL please telephone WeeeCare on **0844 800 2004**