

Online ENGINE

ELECTROMAGNETIC RECEIVER MODULAR ROV OPERATING MANUAL

The 3002RS 3004 3011 ROV system is a 22Hz
Electromagnetic pipeline monitoring system used
for pig locating, tracking and signalling subsea

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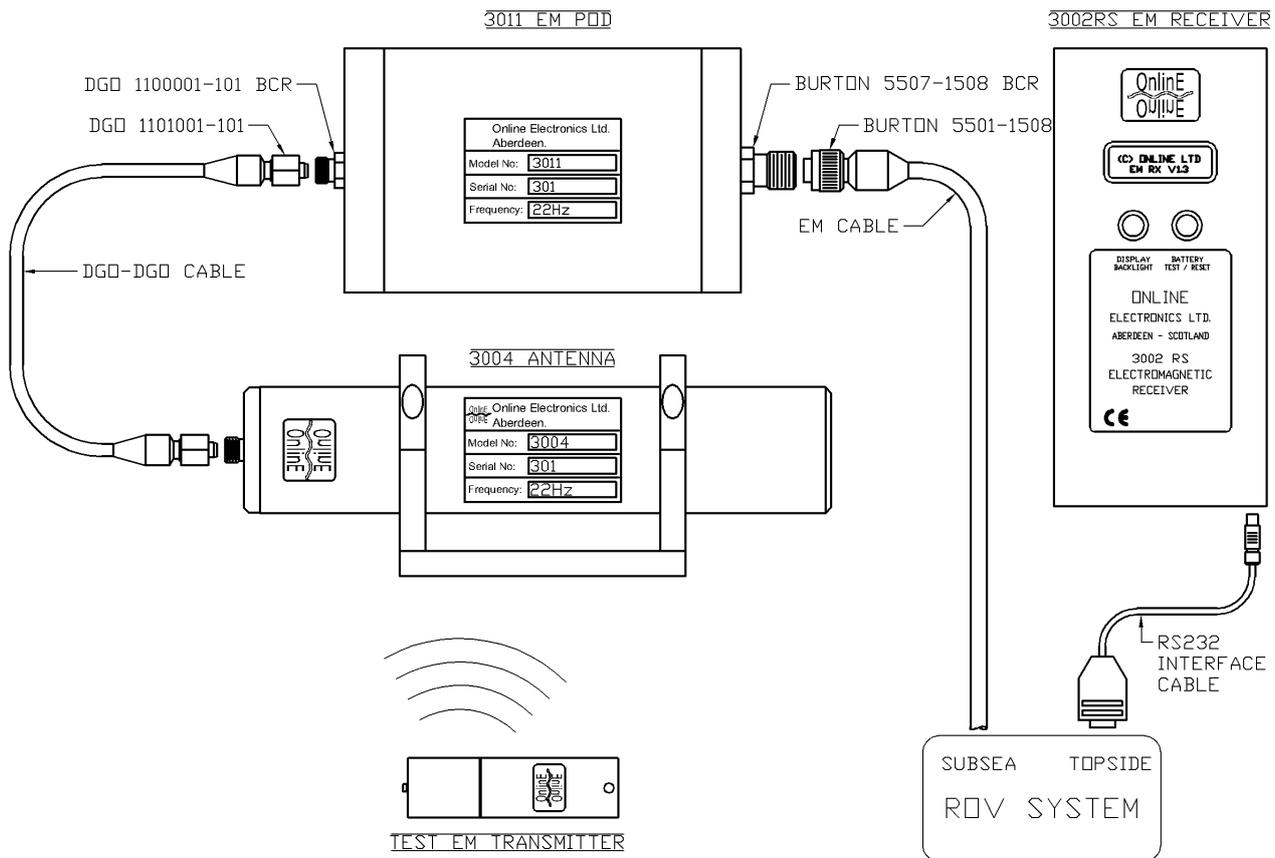
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1. GENERAL DESCRIPTION

Online Electronics' versatile 3002RS 3004 3011 ROV system is a 22Hz Electromagnetic (EM) pipeline pig monitoring system used for pig locating, tracking and signalling subsea. The system can be used to find lost and stuck pigs, to confirm a pig has left or arrived at a particular location, to count the number of pig passages at a particular location and for general monitoring of pig movement.

The system consists of an EM transmitter fitted to the pig which emits a 22Hz EM signal which can be detected using the 3002RS receiver, 3011 EM POD and 3004 antenna outside the pipeline.

When used for pig location the inherent "Null Spot" of the transmitter can be detected which allows the location of the transmitter to be determined with an accuracy of a few centimetres.



The 3002RS is a portable, battery operated, EM receiver designed to receive 22Hz pulsing or continuous signals. The receiver has loudspeaker and headphone audio outputs and an easy to interpret, backlit display which indicates signal strength and the number of detected 22Hz events. It also comes with simple sensitivity controls, 22Hz indicators and battery test functions.

The 3011 EM POD is a subsea receiver which communicates with the 3002RS via a serial, RS232, data link. The 3011 EM POD receives 22Hz electromagnetic signals from the 3004 EM antenna, digitises them, and then transmits them to the 3002RS over the RS232 link.

The 3004 EM antenna is designed for use by ROV. The antenna allows the operator to locate 22Hz EM transmitters by observing the signal level received and the relative position of the antenna.

2. SPECIFICATIONS

3002RS

Frequency	22Hz
Battery life at +5°C	35 hours
Battery type	3VDC (2x Alkaline DURACELL ID1400 C CELLS)
Operating temperature range.....	0°C to +50°C
Height.....	60mm
Width.....	134mm
Length	291mm
Housing material	Acetal
Weight	2.3kg

3004 ANTENNA

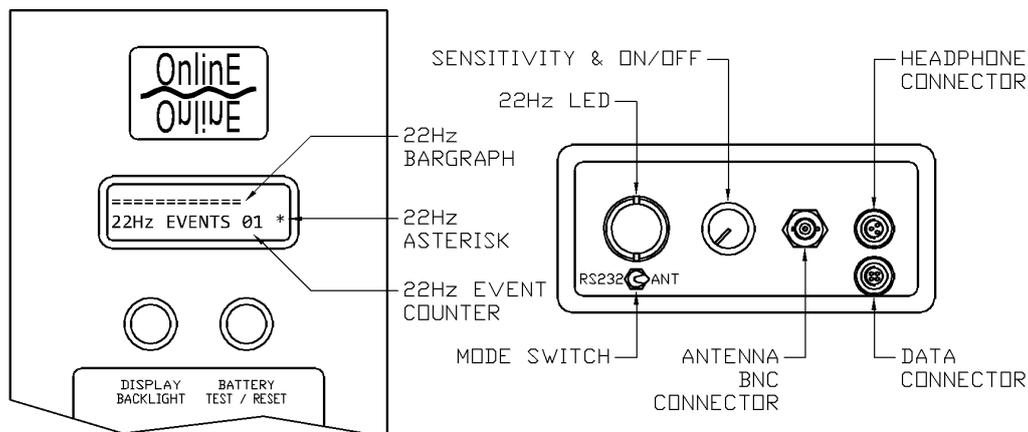
Operating depth	3000m
Operating temperature range.....	-20°C to +60°C
Length (including connectors)	388mm
Diameter	80mm
Height (including mount).....	140mm
Housing material	Acetal
Weight (including mount)	4.5kg
Received signal at 1m with OEL reference transmitter at +20°C in air.....	800mVpp

3011 EM 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
Housing material	Acetal
Weight (including mount)	6.8kg

3. 3002RS OPERATION

3.1. CONTROLS



- The 22Hz BARGRAPH shows the instantaneous signal level of the received 22Hz signal where no segments indicates minimum signal (0%) and 16 segments indicates maximum signal (100%). Note that if the received signal frequency is not 22Hz it may be heard through the headphones but not displayed by the 22Hz bargraph.
- The 22Hz ASTERISK appears whenever a 22Hz signal is being received. Note that if the received signal frequency is not 22Hz it may be heard through the headphones but not cause the 22Hz asterisk to appear.
- The 22Hz LED illuminates whenever a 22Hz signal is being received as per the 22Hz asterisk.
- The 22Hz EVENT COUNTER increments if a 22Hz signal is received continuously for 3 seconds. It will only function reliably with transmitters configured for continuous operation. If there is excessive background noise or the antenna is moved excessively it is not uncommon for the 22Hz EVENT COUNTER to increment.
- The SENSITIVITY & ON/OFF control is used to turn the unit ON and OFF and adjust sensitivity. To turn the unit ON / increase sensitivity, turn the knob clockwise. To turn the unit OFF / decrease sensitivity, turn the knob anti-clockwise. There should be a noticeable 'click' when the unit turns ON or OFF.
- The DISPLAY BACKLIGHT button turns on the display backlight for approximately 5 seconds.
- The BATTERY TEST / RESET button resets the 22Hz EVENT COUNTER and gives an indication of the battery lifetime remaining using the display bargraph.
- The ANTENNA BNC CONNECTOR is used to connect the EM antenna to the unit.
- The HEADPHONE CONNECTOR is used to connect headphones to the unit.
- The MODE SWITCH is used to configure the unit for use with an EM antenna (ANT position) or for use with an RS232 ROV system (RS232 position).
- The DATA CONNECTOR is used to connect the unit to an RS232 ROV system.

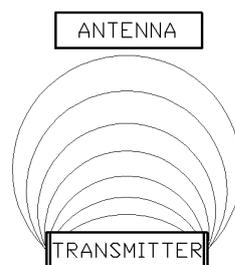
3.2. 3002RS SYSTEM FUNCTION TEST

At least 24 hours prior to deployment any personnel who are going to be involved in the operation of the system should review this entire manual and be given time to practice operating the transmitter and receiver system. By familiarizing themselves with the system prior to deployment the chances of a potentially costly operator error are greatly reduced.

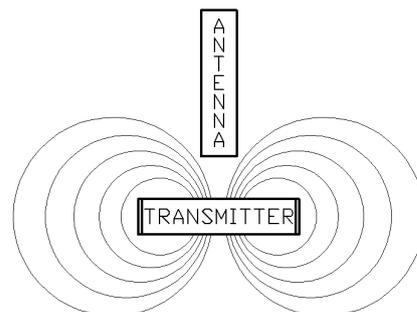
The function test assumes that the system has already been configured as per section 4.1 3002RS ROV SYSTEM DECK TEST or as per section 4.2 3002RS ROV SYSTEM INSTALLATION.

1. Connect the headphones to the 3002RS. Ensure the antenna is stationary and separated by at least 0.5m from the 3011 EM POD and 3002RS.
2. Switch ON the 3002RS by turning the SENSITIVITY & ON/OFF control clockwise until the control 'clicks' and the display activates. Turn the SENSITIVITY & ON/OFF control to approximately half scale. Ensure that the mode toggle switch on the front of the 3002RS is in the 'RS232' position.
3. Press and hold the BATTERY TEST / RESET button. If the bargraph shows less than 50% then the batteries should be replaced as per section 5 3002RS BATTERY TEST AND REPLACEMENT.
4. With no transmitter activated confirm that the signal indicated on the bargraph is less than 30% (assuming that the receiver is in a typical, electrically quiet, environment). If more than 30% signal is received then it indicates that there is a source of 22Hz electrical noise nearby and the sensitivity of the receiver may need to be reduced or the antenna moved away from the source. Ensure that the antenna is at least 0.5m from the 3002RS.
5. Gently bump the antenna. This should cause peaks in the received signal and gives a basic confirmation that the equipment is functional.
6. Pick up the antenna and gently shake it. This should cause peaks in the received signal due to the antenna picking up its own movement within earth's magnetic field. For this reason NEVER wave the antenna around while trying to detect a pig. This is normal and is a side effect of using magnetics for pig location and tracking.

7. If available a 22Hz test transmitter should always be used to confirm full functionality. Activate the test transmitter set to pulsing mode and orientate parallel to the antenna as shown separated by approximately 5m in air. Orientating the antenna parallel to the transmitter will provide the largest signal and should be used for approximate transmitter location as per section 3.4 APPROXIMATE TRANSMITTER LOCATION. Vary the sensitivity of the 3002RS receiver to achieve the cleanest signal and confirm that the pulse rate is as expected. Note that more sensitivity is not always best, if there is significant background noise and the sensitivity is too high then the transmitter signal may be hidden by the background noise. Note that the signal decreases if the antenna is moved away from the transmitter in any direction and increases if the antenna is moved towards the transmitter.



8. With the antenna and transmitter parallel and approximately 5m apart in air adjust the 3002RS sensitivity to achieve approximately 50% deflection on the bargraph. Turn the antenna 90° so that it is perpendicular to the transmitter as shown. In this orientation there should be a null spot where very little signal is received when the antenna is pointing at the centre of the transmitter but moving just a few centimetres ahead or behind this point will cause a relatively large and sudden increase in signal.



This configuration can be used for centimetre accurate transmitter location as per section 3.5 ACCURATE TRANSMITTER LOCATION. If the null spot cannot be found try increasing the distance between the transmitter and antenna and/or reducing sensitivity.

3.3. PRE-DEPLOYMENT CHECKS

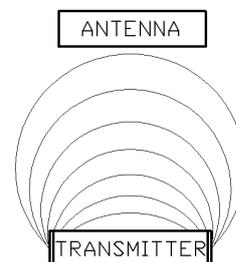
Before each deployment ensure that the following checks have been completed.

1. Ensure that the system has been installed as per section 4.2 3002RS ROV SYSTEM INSTALLATION.
2. Visually inspect all system components to ensure that they are secure and undamaged. Pay close attention to all cables and connectors. Refer to section 4.2 3002RS ROV SYSTEM INSTALLATION.
3. Ensure that the antenna is mounted so that it will be orientated parallel to the expected transmitter orientation for general tracking applications. Refer to section 4.2 3002RS ROV SYSTEM INSTALLATION
4. Confirm that the 3011 EM POD is being supplied with +24VDC from the ROV with the correct polarity. Refer to section 4.4.2 BURTON 5507-1508 BULKHEAD.
5. Ensure the 3002RS is turned ON and the batteries are showing more than 50% remaining capacity. Refer to section 5 3002RS BATTERY TEST AND REPLACEMENT.
6. Confirm the RS232 data link is configured as per section 4.3 RS232 LINK SETTINGS and enabled.
7. Complete 3.2 3002RS SYSTEM FUNCTION TEST
8. If using AUDIOSCOPE, confirm that it has been configured and tested as per the AUDIOSCOPE manual.

3.4. APPROXIMATE TRANSMITTER LOCATION

Before each use ensure that all checks in section 3.3 PRE-DEPLOYMENT CHECKS are completed. The typical procedure for determining the approximate position of a 22Hz electromagnetic transmitter is given below.

1. Switch ON the 3002RS by turning the SENSITIVITY & ON/OFF control clockwise, set the sensitivity control to half scale and ensure the mode toggle switch on the front of the 3002RS is in the RS232 position.



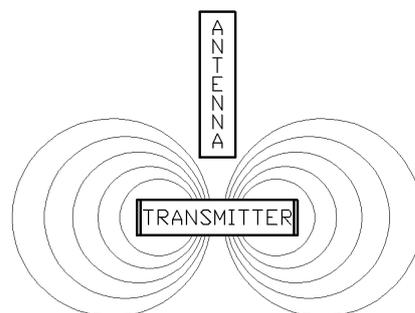
2. The antenna should be held stationary and as close as possible to the pipeline. Ideally it should be placed directly on top of the pipeline. The antenna should be orientated parallel to the expected transmitter orientation as shown to maximise received signal and range.
3. Increase the sensitivity to the maximum setting possible without allowing the background noise level to exceed 30% on the bargraph. The optimum background noise level for identifying an EM signal is typically 30% or less. It will be extremely difficult to detect a signal if the background noise level is more than 70%. If the background noise is more than 70% then the 3002RS sensitivity must be reduced or the source for the excessive background noise must be identified and removed. Note that more sensitivity is not always best, if there is significant background noise and the sensitivity is too high then the transmitter signal may be hidden by the background noise. Depending on the frequency of the background noise there may be no indication of the noise level on the 22Hz bargraph

or 22Hz LED but an audible tone can be heard, in this case care should be taken in interpreting the audio signal.

4. Keeping the antenna parallel to the pipeline move slowly and methodically up and down the pipeline while listening to the received signal and watching the 3002RS display to determine what direction gives the strongest and clearest signal. Keep moving in this direction until a peak in signal is received which will occur at the approximate position of the transmitter.
5. If the signal is strong and clear then it should be possible to find this peak by following the line keeping the antenna as still as possible and possibly reducing sensitivity. If the signal is weak and difficult to detect without high sensitivity then it is usually best to periodically place the antenna stationary on top of the pipeline at 2m intervals to prevent false signals caused by movement of the antenna. The 2m interval may be increased or decreased depending on whether a strong or weak signal is expected.
6. Methodically readjusting sensitivity can help to achieve the clearest received signal.
7. On reception of a true 22Hz signal, the 22Hz LED will illuminate, the 22Hz asterisk will appear on the display and the bargraph and audio tone will give an indication of the signal strength. When trying to detect a signal a combination of all of these outputs should be monitored.
8. When a continuous 22Hz signal is detected for more than 3 seconds continuously the 22Hz event counter will increment. The 22Hz event counter can be reset by pressing the BATTERY TEST/RESET or by turning the 3002RS OFF. The 22Hz event counter cannot be used reliably with transmitters configured in pulsing mode.
9. Once the approximate transmitter location has been established refer to section 3.5 ACCURATE TRANSMITTER LOCATION if a more accurate location is required.

3.5. ACCURATE TRANSMITTER LOCATION

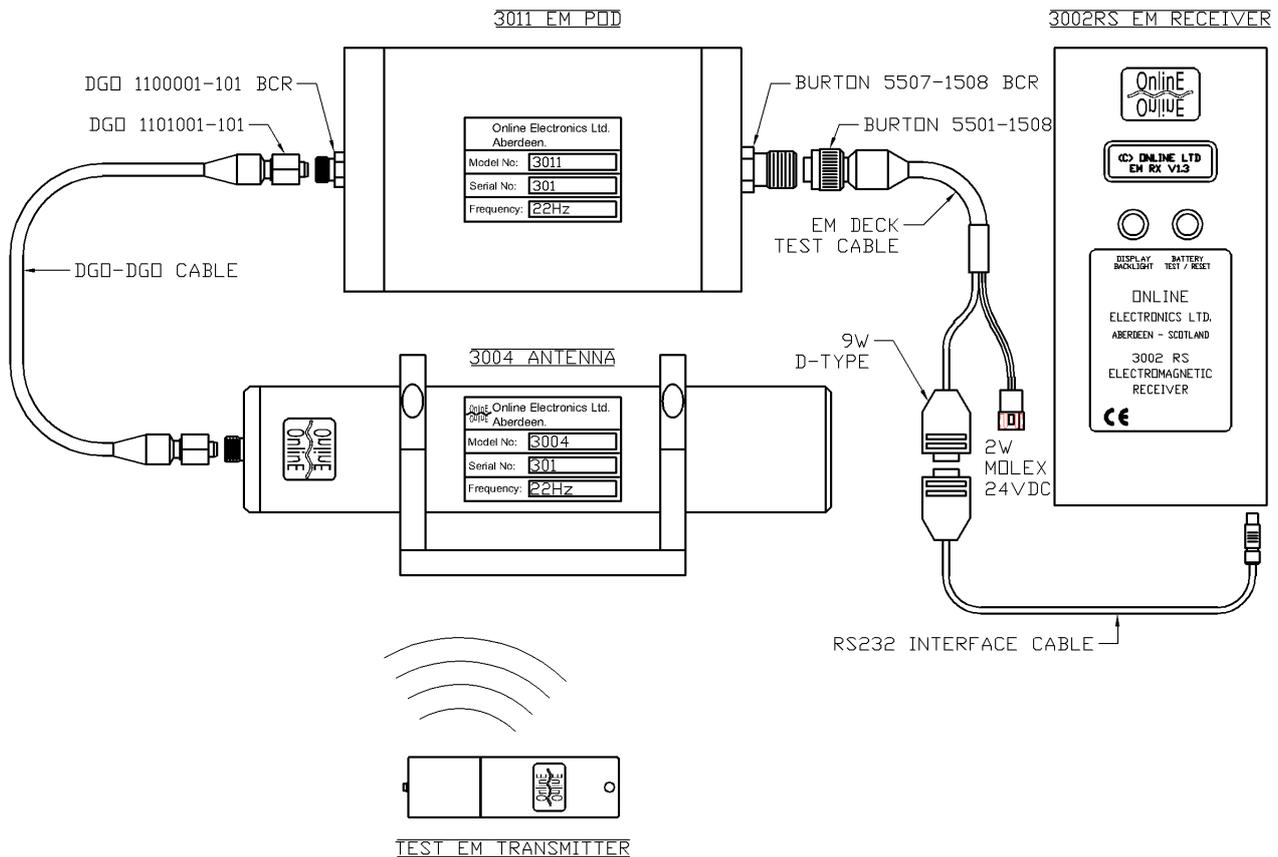
1. Establish the approximate transmitter location as per section 3.4 APPROXIMATE TRANSMITTER LOCATION before attempting to establish a more accurate location. The perpendicular antenna orientation used to establish the accurate transmitter location is not suitable for searching for the approximate transmitter location due to the relative insensitivity of this orientation.
2. Once the approximate location of the transmitter has been determined turn the antenna 90° so that it is perpendicular to the transmitter and pointing at its centre as shown. Typically the antenna should be held stationary approximately 1m from the pipeline surface however this distance may need to be reduced or increased depending on how weak or strong the received signal is respectively.
3. Adjust the 3002RS sensitivity until the bargraph shows a received signal of approximately half scale. Move closer to the transmitter if required.
4. Maintain the separation and orientation and slowly and methodically move the antenna along the pipeline in either direction from the approximate transmitter location. The received signal should drop significantly as you pass the inherent 'null spot' of the transmitter which occurs when the perpendicular antenna is pointing at the centre of the transmitter. Moving just a few centimetres ahead or behind this point will cause a relatively large and sudden increase in signal.



- In a situation where a very weak signal is being received it may not be possible to detect the accurate location of the transmitter using this method however if this is the case then the results of the approximate transmitter location will usually be a relatively narrow, well defined peak giving a relatively accurate location for the transmitter.

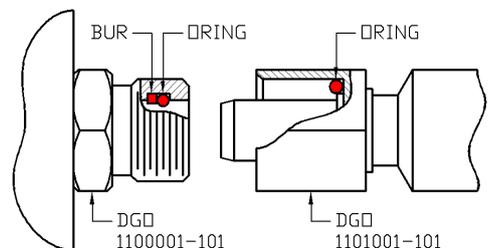
4. 3002RS INSTALLATION

4.1. 3002RS ROV SYSTEM DECK TEST



Prior to installation with the ROV and ROV umbilical, ensure that this 3002RS ROV system deck test has been completed. This will confirm that the system components are functional prior to installation on the ROV and familiarise the user with the equipment, installation, and operation. In this test the EM DECK TEST CABLE takes the place of the ROV and ROV umbilical.

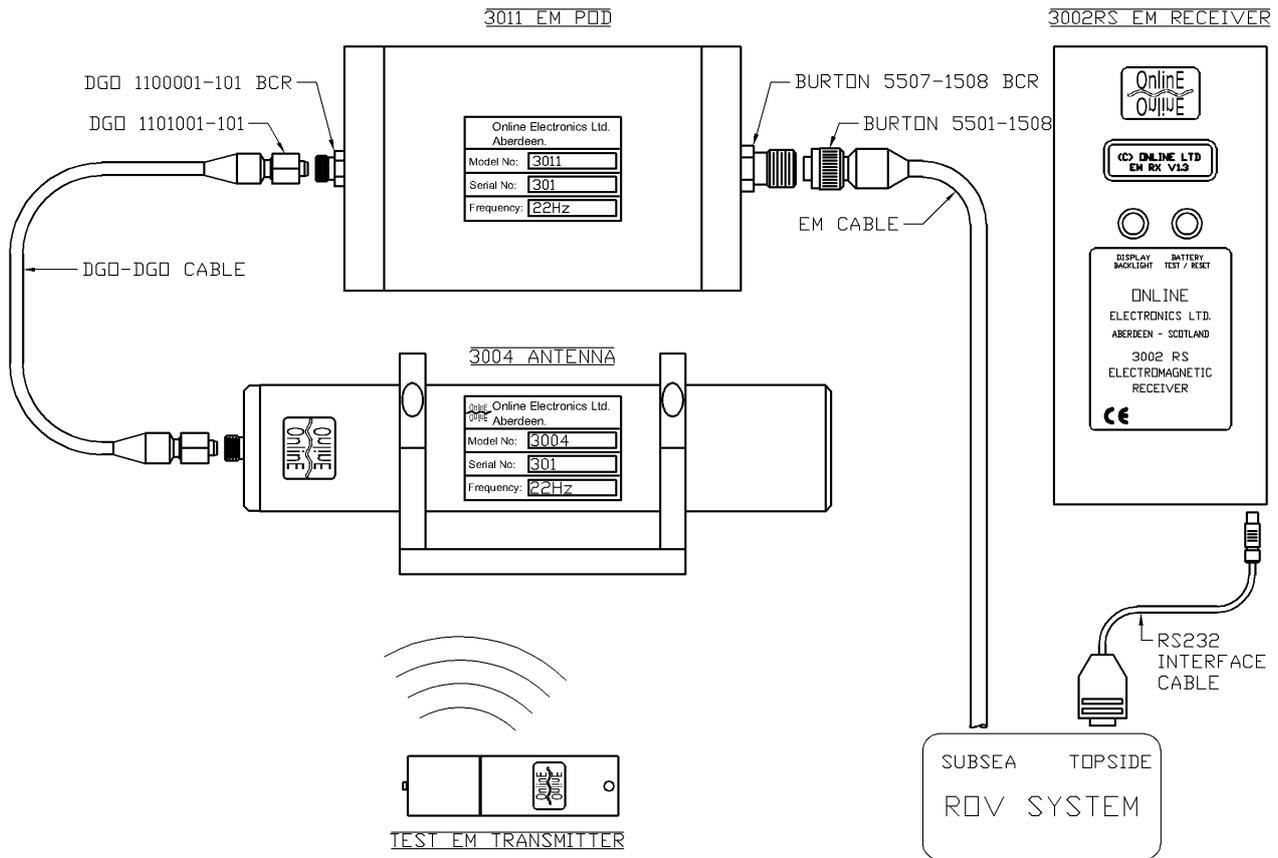
- Identify the DGO-DGO cable and examine for any signs of damage to the cable or connectors. Note that each DGO cable connector includes an internal O-ring positioned as shown. Look into each connector and confirm that the O-ring is in position and is undamaged. If this O-ring is missing or damaged then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



- Identify the 3011 EM POD and 3004 ANTENNA and examine for any signs of damage to the housings or connectors. Note that each DGO bulkhead includes an internal Backup ring (BUR) and O-ring positioned as shown. Look into each DGO bulkhead connector and confirm that the O-ring and BUR are in position and are undamaged. If the O-ring or BUR are missing or damaged then the system may malfunction when deployed subsea.

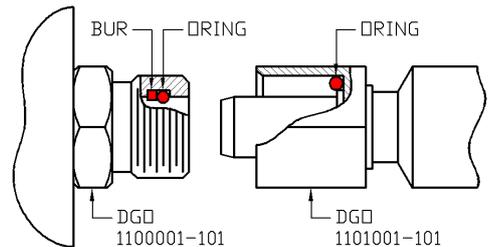
3. Connect the 3011 EM POD to the 3004 ANTENNA using the DGO-DGO cable. DO NOT USE SPANNERS TO TIGHTEN THE DGO COLLARS OTHERWISE DAMAGE MAY OCCUR, THE COLLARS SHOULD BE HAND TIGHTENED ONLY. Grease the connectors if necessary.
4. Identify the EM DECK TEST CABLE (5501-1508 BURTON connector cable terminated 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 EM DECK TEST CABLE to the 5507-1508 BURTON BCR connector on the 3011 EM 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 and connectors.
7. Connect the 9W D-Type connector on the RS232 INTERFACE CABLE to the 9W D-Type connector on the EM DECK TEST CABLE.
8. Connect the 4W FISCHER connector on the RS232 INTERFACE CABLE to the DATA connection on the front of the 3002RS.
9. Connect the test battery to the 2W Molex connector on the EM DECK TEST CABLE. Confirm that the test battery voltage maintains at least 24VDC.
10. Ensure the mode toggle switch on the front panel of the 3002RS is set in the RS232 position and turn ON the 3002RS receiver using the SENSITIVITY & ON/OFF control.
11. Complete section 3.2 3002RS SYSTEM FUNCTION TEST to confirm that the system is fully functional.

4.2. 3002RS ROV SYSTEM INSTALLATION



Prior to installation with the ROV and ROV umbilical, ensure that section 4.1 3002RS ROV SYSTEM DECK TEST has been completed. This will confirm that the system components are functional prior to installation on the ROV and familiarise the user with the equipment, installation, and operation. Note that the diagram above shows the standard connector (BURTON 5507-1508 BCR) on the 3011 EM POD, 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 O-ring positioned as shown. Look into each connector and confirm that the O-ring is in position and is undamaged. If this O-ring is missing or damaged then the system may malfunction when deployed subsea.



2. Identify the 3011 EM POD and 3004 ANTENNA and examine for any signs of damage to the housings or connectors. Note that each DGO bulkhead includes an internal Backup ring (BUR) and O-ring positioned as shown. Look into each DGO bulkhead connector and confirm that the O-ring and BUR are in position and are undamaged. If the O-ring or BUR are missing or damaged then the system may malfunction when deployed subsea.
3. Connect the 3011 EM POD to the 3004 ANTENNA 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 3004 ANTENNA should be mounted at the front of the ROV or in the manipulator using a fishtail, ensure that the antenna is mounted so that it will be orientated parallel to the expected transmitter orientation for general tracking applications.

5. The 3011 EM POD should be secured to the ROV using the supplied mounting bracket. Maintain at least 0.5m metre separation between the 3011 EM POD and the 3004 ANTENNA. Closer distances can result in electrical interference between the units.
6. Identify the EM 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 4.4 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 5501-1508 BURTON connector on the EM CABLE to the 5507-1508 BURTON BCR connector on the 3011 EM POD. Grease the connectors if necessary.
8. Connect the opposite end of the EM CABLE to a suitable port on the ROV. Note that this port must provide 24VDC to the 3011 EM POD and also provide access to a transparent RS232 data link between the 3011 EM POD and the 3002RS over the ROV umbilical. See section 4.3 RS232 LINK SETTINGS for more information. Grease 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 3011 EM POD and 3002RS over the umbilical. See section 4.3 RS232 LINK SETTINGS for more information.
11. Connect the 4W FISCHER connector on the RS232 INTERFACE CABLE to the DATA connection on the 3002RS.
12. Ensure that the RS232 data link is configured as per section 4.3 RS232 LINK SETTINGS and enabled.
13. Enable the 24VDC supply for the 3011 EM POD.
14. Ensure the mode toggle switch on the front panel of the 3002RS is set to the RS232 and turn ON the 3002RS receiver using the SENSITIVITY & ON/OFF control.
15. Complete section 3.2 3002RS 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 3002RS SYSTEM FUNCTION TEST to confirm that AUDIOSCOPE is functioning as expected.

4.3. RS232 LINK SETTINGS

An RS232 link must be provided between the 3002RS and 3011 EM POD and configured with the settings below. This link must be 'transparent' meaning that it behaves as if the connections between the 3002RS and 3011 EM POD were made with wires (as they are in section 4.1 3002RS ROV SYSTEM DECK TEST) so when any individual byte of data is sent from the 3011 EM POD it is immediately received by the 3002RS. The data must not be packetized, buffered, or disrupted in any way otherwise the system may not function reliability.

Baud Rate 9600
 Data Bits 8
 Parity None
 Stop Bits 1
 Flow Control None

4.4. STANDARD SYSTEM WIRING

4.4.1. D. G. O'BRIEN 1100001-101 BULKHEAD COAXIAL

CentreSignal
 OuterScreen
 Connector Shell.....Screen

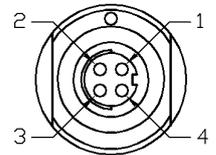
4.4.2. BURTON 5507-1508 BULKHEAD

1 0V 3011 POWER
 2 +24VDC 3011 POWER (+18VDC to +36VDC)
 3 Not Used
 4 Not Used
 5 RS232 Data Ground
 6 RS232 Data to 3002RS
 7 Not Used
 8 Not Used

4.4.3. FISCHER CONNECTOR

Note that the view of the 3002RS front panel bulkhead is shown for pin designations.

1RS232 Data Ground
 2 RS232 Data to 3002RS
 3 Not Used
 4 Connected to 1 via RS232 INTERFACE CABLE



4.4.4. 9W D-TYPE CONNECTOR

1 Not Used
 2 Not Used
 3 RS232 Data to 3002RS
 4 Not Used
 5 RS232 Data Ground
 6 Not Used
 7 Not Used
 8 Not Used
 9 Not used

4.5. SEANET CONNECTOR WIRING

If a SEANET connector is fitted to the 3011 EM POD then the standard connections below are used.

1 (Outer).....	+24VDC 3011 POWER (+18VDC to +36VDC)
2	0V 3011 POWER & RS232 Data Ground
3	Not Used
4	Not Used
5	RS232 Data to 3002RS
6	Not Used
7 (Centre)	Not Used

4.6. TROUBLESHOOTING

If problems persist contact Online Electronics Limited for support.

Complete all tests in section 3.3 PRE-DEPLOYMENT CHECKS.

Initially check that the system components are all functional by completing section 4.1 3002RS 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 3002RS ROV SYSTEM INSTALLATION.

If section 4.1 3002RS ROV SYSTEM DECK TEST is successfully completed but problems are encountered during section 4.2 3002RS ROV SYSTEM INSTALLATION then it indicates that the problem is related to the ROV system/configuration.

Note that the 3011 EM 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 3011 EM POD.

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 4.4 STANDARD SYSTEM WIRING.

Referring to section 4.4 STANDARD SYSTEM WIRING check continuity of all cable connections.

4.7. 3011 RS232 TROUBLESHOOTING

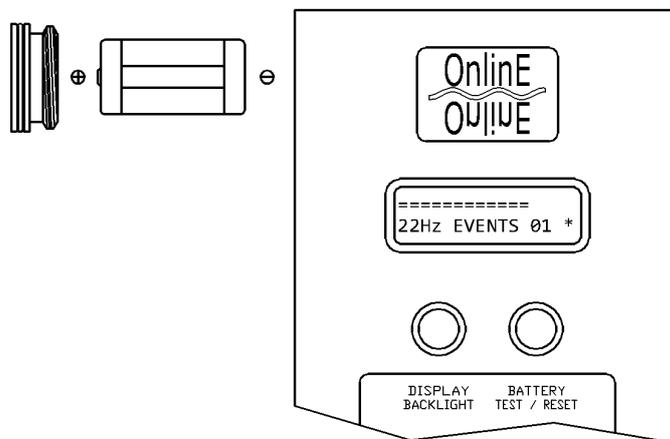
In order to confirm RS232 transmission from the 3011 EM POD use the EM DECK TEST CABLE to connect the 3011 EM POD to a PC running a terminal program such as HyperTerminal configured as per section 4.3 RS232 LINK SETTINGS. An adaptor to swap RS232 Rx and Tx may be required. Refer to section 4.4.4 9W D-TYPE CONNECTOR.

Confirm that while powered the 3011 EM POD is transmitting a continuous stream of data consisting of random characters.

5. 3002RS BATTERY TEST AND REPLACEMENT

While the 3002RS receiver is ON press and hold the BATTERY TEST / RESET button. The display bargraph will give an indication of the battery level. If the level is less than 50% then the batteries should be replaced as per the steps below.

1. Switch the unit OFF using the SENSITIVITY & ON/OFF control.
2. The battery compartment is located on the side of the housing as shown in the graphic below.
3. The 3002RS battery compartment must only be opened in an indoor, clean and dry environment.
4. Unscrew the battery cover using a suitable large screwdriver and remove old batteries.
5. Referring to the graphic below for guidance, insert the replacement batteries, observing the correct polarity. Only use C Cell battery types. Always replace all of the batteries; **NEVER** use a mix of new and used batteries. **NEVER** mix brands of batteries.
6. Screw the battery cover back on.
7. Switch the unit ON using the SENSITIVITY & ON/OFF control.
8. Press and hold the BATTERY TEST / RESET button and confirm the battery level is a 100%.
9. Switch the unit OFF using the SENSITIVITY & ON/OFF control.



6. MAINTENANCE

All Online Electronics Ltd products are designed to require minimum maintenance. The housing 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, the acrylic window, or any connectors.

Frequent inspections should be made. A schedule for maintenance checks should be generated according to the environment and frequency of use but should be regular enough to ensure the equipment continues to operate in the designed manner. It is recommended that it should be at least once a year.

If the unit is to be placed in storage for a long period of time ensure the unit has been cleaned and the batteries are removed.

7. 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 separately collected for the proper treatment and recovery.

The crossed out bin symbol, placed on the product, reminds you of the need to dispose of 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**.

8. 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.