

Troubleshooting Guide

OUTLAND ROV 1000, 2000 & 2500

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1. Introduction

The following guide can be used for basic troubleshooting of Outland ROV 1000, 2000 and 2500's. Read all pages carefully before beginning to troubleshoot any equipment.



Warning

Troubleshooting described in this manual is to be done only by qualified service personnel. To avoid electrical shock or equipment damage, do not troubleshoot or service any components unless you are qualified to do so.



Caution

NEVER PLUG OR UNPLUG ELECTRONICS WITH POWER ON!
Damage or personal injury may result.

1.1. System Overview

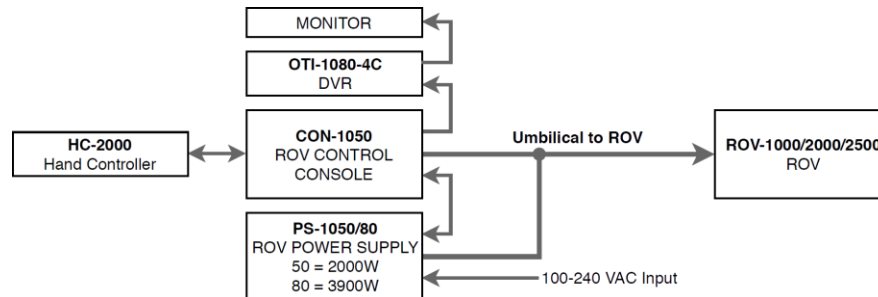


Figure 1: System Overview

1.2. System Components



Figure 2: ROV Power Supplies. Left: PS-1050 (ROV 1000), Right: PS-1080 (ROV 2000 & 2500)



Figure 3: Control Console CON-1050 (All ROVs)

1.3. ROV Power and Data Pinout

Table 1: ROV, Umbilical and Console Data and Power Connector Pinout

ROV Data		ROV Power	
Pin	Signal	Pin	Signal
1	Video +	1	HV +
2	Video -	2	HV -
3	COMM +	3	ROV Chassis
4	COMM -		
5	SPARE1 +		
6	SPARE1 -		
7	SPARE2 +		
8	SPARE2 -		

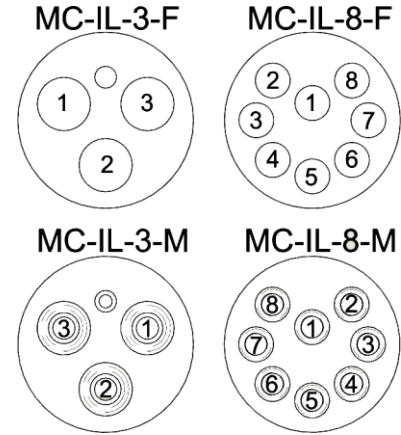


Figure 4: Umbilical Connections

Note: Bulkhead (BH) and Inline (IL) connectors have the same pinout.

2. Symptoms

The ROV system allows for the user to perform basic troubleshooting by use of diagnostic data that is displayed through the video overlay system. It is necessary for communications between the vehicle and the Hand Controller to be functioning in order to use the diagnostic data for troubleshooting. Communications can be verified with the system setup in a standard configuration. Turn on system power. The green COMM Good light should be illuminated.

Use the symptoms described below to work through your system issues.

2.1. NOTHING WORKS

(ROV, Console, DVR, Monitor)

- 2.1.1. Disconnect the ROV umbilical from the Power Supply PS1050/80 and Control CON-1050 consoles.
- 2.1.2. Verify the grey cable from the Power Supply is properly connected to the Control Console. This connection is required for the system to work.
- 2.1.3. Verify red light on the control console is illuminated. If light is illuminated skip to section 2.1.5.
- 2.1.4. Check the source power outlet for power. Check circuit breakers and/or fuses that power that outlet. NOTE: The Power Supply and CON-1050 console does not have fuses or circuit breakers.
- 2.1.5. Measure the voltage on the DVR/Monitor power jack for 12 V_{DC}. Center pin is +12V_{DC}, outside pin is GND. Refer to Figure 5.



Figure 5: 12 VDC Power Cord

- 2.1.6. If 12V_{DC} is not present, the power supply may have failed. The 300V power supply unit requires the 12V_{DC} power supply to operate.



WARNING: AC Voltage is present in both the Power Supply (PS-1050/1080) and Control Console (CON-1050). Disconnect power before performing any maintenance.

- 2.1.7. Unless you have a qualified technician, do not open unit, return to Outland for diagnostics and repair. Refer to *Figure 6* for 12V_{DC} power supply location.

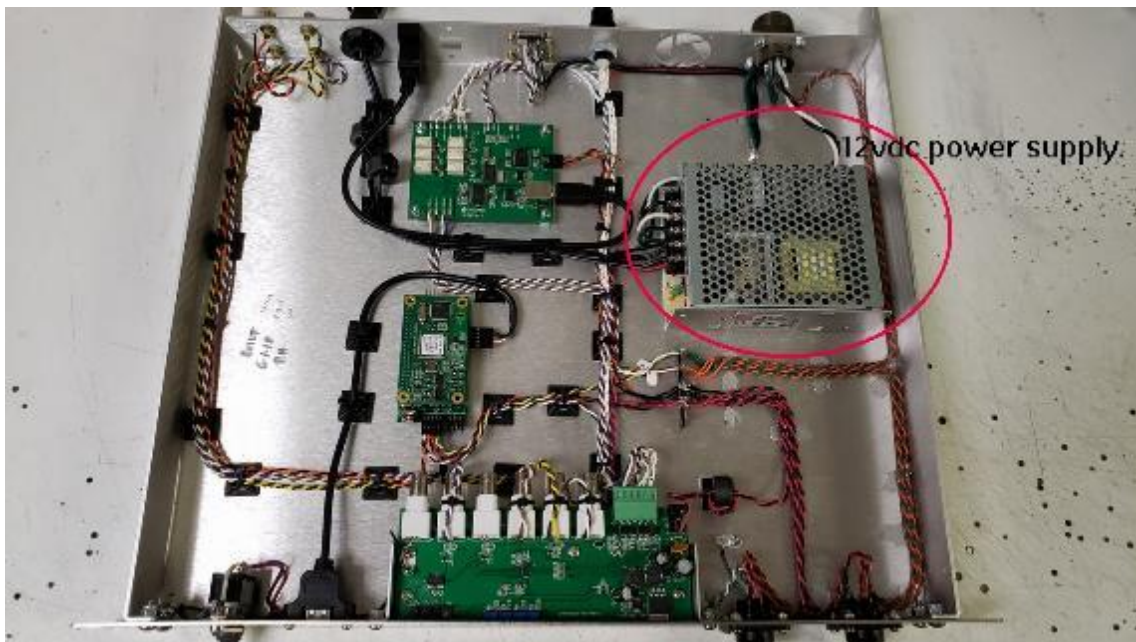


Figure 6: Control Console CON-1050 12Vdc Power Supply Location

2.2. ROV NOT RESPONDING

- 2.2.1. Setup unit in standard use configuration.
 2.2.2. Turn on power switch located on the Control Console.

2.2.3. Verify the **HV ON** light is illuminated on the Power supply, refer to Figure 7. If illuminated skip to step 2.2.5.

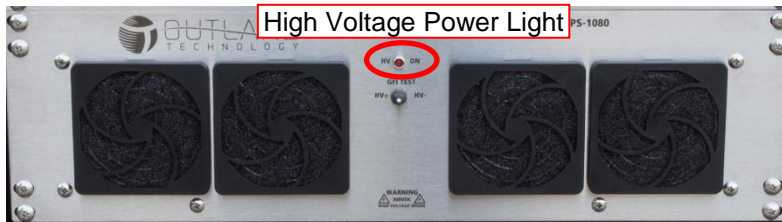


Figure 7: Power Supply Front Panel

2.2.4. Turn off power switch located on the Control Console. Unplug the umbilical from the ROV and turn on power to the Control Console. Verify the **HV ON** light is illuminated. If light illuminates with no umbilical, this indicates a potential issue with the umbilical. Isolate umbilical. If an additional umbilical is available, test unit with cable repeating steps 2.2.1-2.2.3. For assistance with damaged Umbilical cables contact Outland for support.

2.2.5. If the HV ON light is on, check that the lights on the ROV flash several times when turning on the ROV power switch. Flashing lights indicates the ROV bottle is powered and the internal ROV power supply is functioning. Refer to sections below for additional system troubleshooting.



WARNING: The following step requires measuring the 300V_{DC}. Do not continue unless you are a qualified technician.

2.2.6. If lights don't flash, measure the 300 V_{DC} at the end of the ROV Umbilical.

- 2.2.6.1. Turn off power to the Control Console.
- 2.2.6.2. Unplug the umbilical 3 pin connector from the ROV Bottle.
- 2.2.6.3. Connect multimeter leads to pins 1 and 2. Refer to Figure 4 and Figure 8.
- 2.2.6.4. Turn power on to the Control Console.
- 2.2.6.5. Verify voltage is approximately 300V_{DC}.



Figure 8: ROV Side of Umbilical

2.2.7. If measured voltage is less than 300 V_{DC} perform the following:

- 2.2.7.1. Turn off power to the Control Console.
- 2.2.7.2. Unplug the umbilical 3 pin connector from Power Supply Unit. Refer to Figure 9.
- 2.2.7.3. Connect multimeter leads to pins 1 and 2. Refer to Figure 4 and *Figure 9*.
- 2.2.7.4. Turn power on to the Control Console
- 2.2.7.5. Verify voltage is approximately 300V_{DC}.



Figure 9: Back side of ROV Power Supply

- 2.2.7.6. Verify green lights are illuminated on each of the 6 power units inside the console rear.
- 2.2.8. If 300V is not measured at back of console, verify the **HV ON** is illuminated but not blinking. A blinking **HV ON** light indicates a GFI fault. Cycle power to Control Console and verify HV ON light continues to blink. If blinking continues please contact Outland.
- 2.2.9. If measured voltage is approximately 300V_{DC}, then turn off power to the Control Console. Plug umbilical back into Power Supply Unit and the ROV.
- 2.2.10. Turn on power and verify ROV lights flash.
- 2.2.11. If still not working, please contact Outland.

2.3. NO VIDEO

- 2.3.1. Setup system in standard use configuration.
- 2.3.2. The DVR and monitor are powered when the console is plugged to power outlet.
- 2.3.3. Ensure DVR is set to Quad Screen View. Refer to DVR manual for setup instructions.
- 2.3.4. Verify correct video setup per ROV Manual.
- 2.3.5. Unplug and plug unit from power source. Verify the DVR displays Outland logo upon startup. If no video check DVR connections and setup. Note DVR and monitor are always powered when power supply is connected to power outlet.
- 2.3.6. Turn on power to the Control Console. The ROV lights should flash and video should be displayed on the monitor.
- 2.3.7. Verify the video overlay is displayed on channel 1 of the quad screen display. Refer to Figure 10 for view with no video.
- 2.3.8. Verify video is detected at the ROV. For steps on navigating overlay menus refer to the ROV User Manual.

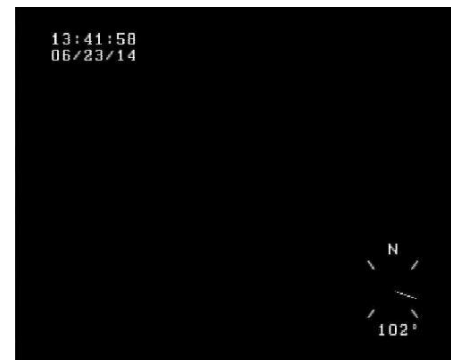


Figure 10: Standard Overlay View with no video

- 2.3.8.1. Using overlay navigate to the Setup menu.
- 2.3.8.2. Navigate to the List Video Channels menu.
- 2.3.8.3. Verify Video is detected. The Rear Bottle Camera should be detected on channel 8. Front video should be detected on channel 1 (SD) and 2 (HD).
- 2.3.8.4. If no video is detected contact Outland for support.
- 2.3.9. Check the video amp lights on the control console. If video is present the lights will be green for that channel. Channel 1 is the primary video channel. Use the Camera Select button on the Hand Controller to switch between Forward and Read Cameras. Channel 2 is used for HD video and channel 3 is for an optional 3rd camera.



Figure 11: Control Console Video Amplifier Section

- 2.3.10. Switch between the Front and Rear cameras on the ROV by pushing the Camera select button on the hand controller.
- 2.3.11. If the lights indicate video and you see nothing on the monitor, then check the DVR cables are connected and are working properly.
- 2.3.12. Check the monitor by pressing the menu button on the DVR to see if the menu appears. If not, check the monitor source input that it is properly set.
- 2.3.13. If the video amplifier lights are not green on either the front, rear or HD camera check that all other functions of the ROV are working.
- 2.3.14. Adjust video amplifier per ROV manual and see if video starts working.
- 2.3.15. If only the cameras are not working, there could be a problem with the Umbilical.
- 2.3.16. Check the Umbilical for continuity and or shorts.
- 2.3.17. If only one camera is not working, it is most likely the cable going to the camera or the camera has failed. Call Outland for more detailed help.

2.4. THRUSTER NOT WORKING



WARNING: Thruster will be active during test. Keep hands, feet and objects away from propellers.

- 2.4.1. If you see any thruster not working or the thruster enable button blinks but does not stay on, check the video overlay screen for a "?". If the "?" is not present skip to step 2.4.10.

Fault (?) Indicated on Video Overlay

- 2.4.2. A "?" present on the screen indicates there is a high voltage fault.
- 2.4.3. Press the "?" key on the keyboard to display the fault information. The diagnostic information will list the Fault Type and Thruster. Until the fault is cleared the

vehicle will not allow the thrusters to be powered. Each time the Thruster Enable button is pressed, each thruster will be tested again.

- 2.4.4. Turn off power to the ROV and inspect connections from bottle to the faulty thruster. Inspect for damage to the cable and connector pins/sockets.
- 2.4.5. Keep faulty thruster disconnected and turn on power to the system.
- 2.4.6. Press the Enable Thrusters button and verify fault has been cleared (“?” will no longer be visible)
- 2.4.7. If fault was not cleared take note of new fault message. Repeat steps 2.4.4-2.4.7 until fault message is cleared. If fault message does not clear contact Outland for assistance.
- 2.4.8. If fault was cleared, power down unit and disconnect working thruster cable.
- 2.4.9. Plug cable into faulty thruster and verify if thruster is working. If thruster works, contact Outland for a replacement thruster cable. If fault remains, contact Outland for assistance.

NO Fault Indicated on Video Overlay

- 2.4.10. Turn power off to ROV and perform normal maintenance to thruster as described in the ROV Manual.
- 2.4.11. Turn on power to ROV.
- 2.4.12. Press the Enable Thrusters button on the Hand Controller. If the button blinks and goes out as described above, it indicates there is a failure on one of the thrusters. Go to step 2.4.2 above.
- 2.4.13. Using the overlay menu system, navigate to the non-working thruster data screen. Refer to the ROV Manual for help with navigating the overlay menus.
- 2.4.14. If faulty thruster does not appear on the devices screen, the thruster is not communicating to the ROV bottle. Turn power off to the ROV and check thruster connections. Reconnect cable and turn on power and repeat steps 2.4.10-2.4.14. If the thruster continues to not display on Devices Screen, contact outland for assistance.
- 2.4.15. If thruster does appear, check the following electrical parameters: thruster voltage (300V_{DC}), V_{cc} voltage (≈13.5V), and current (≤100mA no load). If all electrical parameters are correct, and thruster still not functioning correctly it could be a mechanical failure. Contact Outland for assistance.
- 2.4.16. If you need assistance or values are incorrect, please take a screen shot and contact Outland for help.



Figure 12: Device Select Screen Example



WARNING: The following step requires measuring the 300V_{DC}. Do not continue unless you are a qualified technician.

2.4.17. If you see a thruster not working you can also check power to the thruster by using a multimeter. Power ROV and Pins 2 and 3 should be 300 VDC on all 2000 and 2500 ROVs as well as all Serial Numbers greater than 242 for Outland 1000 ROVs. Serial numbers below 242 are set to 165 V_{DC}.

2.5. LIGHT NOT WORKING

2.5.1. One Light Not Working

Typically, this indicates an issue within that light assembly. Perform the quick test below.

- 2.5.1.1. Turn off power to the Control Console.
- 2.5.1.2. Disconnect working light and Manipulator (if installed).
- 2.5.1.3. Turn on power and verify that light does not work.
- 2.5.1.4. If light continues to not work, return to Outland for service.

2.5.2. Both Lights Not Working

- 2.5.2.1. If both lights are out, then the resettable fuse may have tripped inside the electronics bottle, indicating a short. The fuse will reset once the short has been removed.
- 2.5.2.2. Turn off power and disconnect one light. Power ROV and verify if connected light works.
- 2.5.2.3. Turn off power and disconnect tested light. Connect the untested light. Turn on power and verify if light works.
- 2.5.2.4. If the lights are still not working, turn off power and unplug the Manipulator if connected. Repeat Steps 2.5.2.2-2.5.2.3.
- 2.5.2.5. If all lights begin to work, this indicates there is a problem inside the Manipulator. Please return Manipulator to Outland for service.

2.6. COMM GOOD

The COMM GOOD light located on the Hand Controller indicates there are communications present between the ROV and Control Console. If the light is not illuminated, you have a communications failure. Communications between ROV and Control Console is required for ROV diagnostic data to be displayed on the video overlay. Communications failures typically occur due to umbilical faults. Follow the steps below to troubleshoot:

- 2.6.1. Turn off power to the ROV.
- 2.6.2. Check that the umbilical is properly connected on both the ROV and Control Console.
- 2.6.3. Power ROV and verify vehicle has power. When there are no communications the ROV lights will flash and remain on.
- 2.6.4. If the lights are not functioning, you may have a power failure. Please refer to section **2.2 ROV NOT RESPONDING**.
- 2.6.5. If nothing on the ROV is working, other than video, then the umbilical could have a problem.
- 2.6.6. Turn off power to the ROV, disconnect umbilical at both ends and test continuity and for short circuits between conductors. Refer to **Table 1** for pinout.
- 2.6.7. If no issue with continuity and no short circuits are found reconnect umbilical and test again. If COMM GOOD illuminates you may have a damaged bulkhead connector on either the ROV bottle or Control Console.
- 2.6.8. If issue continues there may be an issue in the ROV bottle or Control Console that requires repair or replacement. Please contact Outland for further assistance.

2.7. AUTO-HEADING/DEPTH NOT WORKING

Follow the instructions below if the compass rose is stuck on North and depth does not move.

- 2.7.1. Using the Overlay menu system navigate to the Nav Module data screen. Refer to the ROV Manual for help with Navigating the Overlay menus.
- 2.7.2. If the Nav Module is not listed this indicates there is a communication issue to the unit. Check connection and cable for continuity, short circuits and connector issues.
- 2.7.3. If the screen does not have a version number, this indicates the Nav Module is not communicating to the vehicle. Check the Nav Module connections.
- 2.7.4. If the version number is populated, but other information is blank, the Nav Module may have failed. Please contact Outland for assistance.



Figure 13: NAV Module Data Screen

2.8. HAND CONTROLLER NOT WORKING

The Hand Controller is responsible for all communications and processing of data. It processes the sensor data from the vehicle and controls the vehicle based on current stick position and selected control options (auto depth/altitude, heading, etc.)

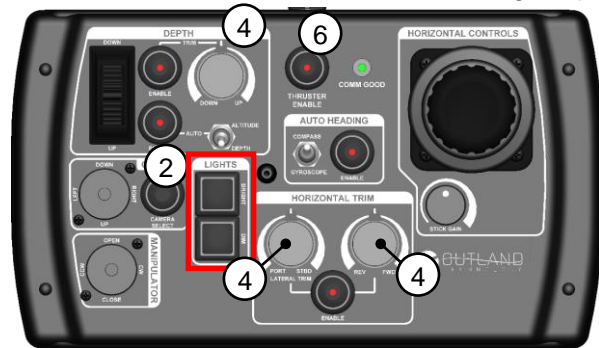
- 2.8.1. Check that the Hand Controller is properly connected to the Hand Controller port on the control console.
- 2.8.2. If the COMM GOOD light is not illuminated, please refer to Section 2.6.
- 2.8.3. Check that all other lights on the hand controller are working including all trim and auto functions.
- 2.8.4. Navigate to the Hand Controller data screen.
- 2.8.5. Enable Turbo mode. Refer to the ROV Manual for help with navigating the overlay menus and enabling turbo mode.
- 2.8.6. Refer to Figure 14 for example of Hand Controller data screen.
- 2.8.7. Verify a Version Number is listed.
- 2.8.8. Move the stick and other controls and verify the values change.
- 2.8.9. If the information does not update, there might be a problem with your hand controller. Please contact Outland for further assistance.



Figure 14: Hand Controller Data Screen

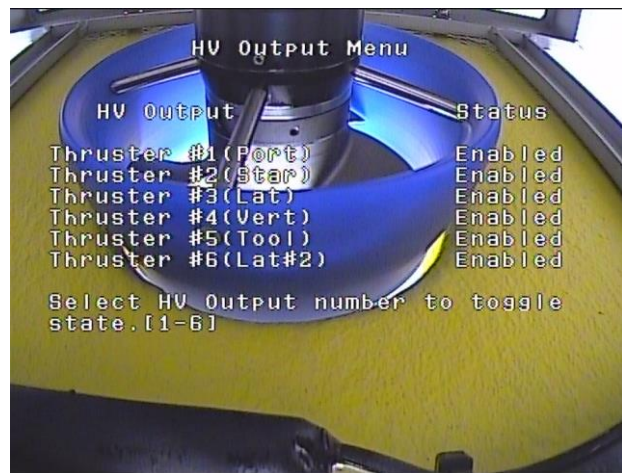
2.9. HAND CONTROLLER NEEDS CALIBRATION

- 2.9.1. Power off system
- 2.9.2. Press and hold Light Dim and Light Bright buttons (2)
- 2.9.3. Power on system and verify all lights on Hand Controller are flashing. This indicates the Hand Controller is in calibration mode.
- 2.9.4. Release the Light Buttons
- 2.9.5. Place the Depth Trim knob, Lateral Trim Know and Rev/FWD trim knob (4) to their center positions by turning the knob such that the indicator faces straight up.
- 2.9.6. Do not move Horizontal Control joystick, stick gain or Depth Thumbwheel.
- 2.9.7. Press the Thruster enable button (6). LED's should stop flashing indicating calibration is completed.



2.10. ROV WORKING BUT HV BIAS IS DETECTED

- 2.10.1. Navigate to the Diagnostic screen to view HV bias. If reading anything over ± 2 there may be a high voltage leak.
- 2.10.2. First, eliminate the thrusters from the circuit by disabling the thrusters using the Enable Thrusters button on the hand controller. Light should not be illuminated.
- 2.10.3. If the HV bias returns to near zero, then one thruster may have a problem.
- 2.10.4. Isolate each thruster by disabling power output to all thrusters except one.
- 2.10.5. Navigate to the advanced menu. Contact Outland for assistance with navigating the Advanced Menu.



- 2.10.6. Disable all outputs except one.
- 2.10.7. Navigate back to Diagnostic screen and check HV bias.
- 2.10.8. Using the above steps, test each thruster one by one until you find the thruster that is causing the HV bias. Replace the thruster and return to Outland for repair.
- 2.10.9. If it fails on all thrusters, the ROV umbilical may be damaged.
- 2.10.10. Replace ROV umbilical and test again.
- 2.10.11. If problem continues contact Outland for additional support.

3. Options

3.1. SONAR NOT WORKING

3.1.1. Outland ROV's can communicate with many different manufacturers and types of Sonars. Please refer to the sonar manufacturers manual for sonar setup.

3.1.2. Sonar with RS-485 Output

3.1.2.1. The Outland Control Console, CON-1050, provides a RS-485 serial port pass-through to a DB9 connector or UART to USB using a USB 2.0 B connector. Refer to Table 2 for DB9 Connector pinout.

Table 2: Spare Connector Pinout, Connector DB9

Pin	Signal	Function	Description
1	Spare1 -	Bi-directional	Spare twisted pair output. Selectable between CP Ground/differential signal or video
2	Spare1 +		
3,4,6,7	NC	NA	No Connection
5	GND	Power	Chassis ground
8	Spare2 -	Bi-directional	Spare twisted pair output. Selectable between differential signal (Sonar) or video
9	Spare +		

3.1.2.2. The output port selection is typically setup at Outland for your specific sonar. The output port can be changed using the advanced menu of the video overlay. Please refer to ROV manual or contact Outland for additional details.

3.1.3. Sonar with Ethernet Output

3.1.3.1. If using an ethernet based sonar, we provide a VDSL modem on the ROV and inside the console to output the ethernet signal through a RJ45 port on the rear of the console. Refer to Figure 15

3.1.3.2. If using a Sonar with internal VDSL modem and external VDSL topside modem, then the console will be programmed to output the sonar VDSL signal through pins 8 and 9 on the top DB9 connector on the rear of the console. This would be connected to the external VDSL modem for processing.



Figure 15: CON-1050 with internal VDSL modem

3.2. MANIPULATOR NOT WORKING

3.2.1. Any Manipulator mounted on an Outland ROV will be using a 4-pin connector.

3.2.2. Check Manipulator communication

3.2.2.1. Navigate to the Devices menu.

- 3.2.2.2. Verify the manipulator is listed. If it is not listed, this indicates a communications failure. Contact Outland for support.
- 3.2.3. Refer to Table 3 and Figure 16 for pinout of lights and manipulator.
- 3.2.4. If your lights are working properly the Manipulator should be as well. If the lights have quit working properly refer to section 2.5.
- 3.2.5. If the lights are working with the Manipulator disconnected, then there is a potential problem with the Manipulator and should be returned to Outland for repair.

Table 3: Lights & Manipulator Pinout

Pin	Signal
1	GND
2	+24V _{DC}
3	COMM+
4	COMM-

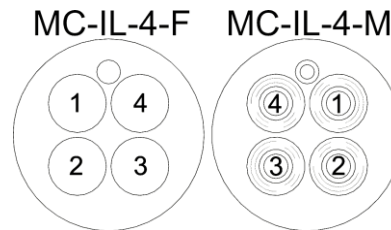


Figure 16: Lights and Manipulator Connectors