Field Service Spares Procedure – Replacement PCU Assembly Kit, XX09 MK2, XX10, XX11 & XX11QOR

Approval:

Approving Authority	Signature	Date
Doc Control:	Ron Chaffee / Signature on file.	2-14-13
Assistant Service Manager, Global	John VanderJagt / Signature on file.	12-14-13
Author:	Stuart Broadfield / Signature on file.	12-05-12

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A	9325	Initial release	01-31-2012
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Field Service Procedure – Replacement PCU Assembly Kit, XX09 MK2, XX10, XX11 & XX11QOR

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the PCU assembly on the XX09 MK2, XX10, XX11 and XX11QOR series antennas.

2. Checklist:

- Verify Initialization
- Measure the Power Supply Input / Output Voltages
- PCU Status
- Pedestal Error
- Verify Stabilization
- Verify Targeting
- Test for Azimuth Drift
- Verify the Communications Path
- Test Pol Drive

3. Theory of Operation:

The XX09 MK2 PCU assembly contains the 24VDC pedestal power supply (kit: 135341), main motherboard PCB (kit: 135338), motion platform PCB (kit: 135342) and above decks 400MHz Modem PCB (kit: 135349).

The PCU motherboard calculates the amount of movement from the vessel based on the feedback from the sensors on the motion platform PCB and directional changes from the vessels gyro compass which are fed into the control loop. It then sends the command to the MDE enclosure to drive the relevant axis by an equal and opposite amount of movement to maintain stabilization and control the antennas dishscan pattern. The PCU software configures the function of the pedestal and is calibrated by the No parameter which sets the motor gains for the size of the antenna as well as configuring the dishscan pattern. The MK2 XX09 PCU Motherboard PCB features an integrated Pol Aux relay PCB as well as status LEDs for diagnostic purposes; a Mini USB port for software uploads and service serial port for Bluetooth connection.

The motion platform PCB houses 5 sensors. Two solid state MEM sensors which are used as the antennas horizon reference (level position) and long term stabilization reference, and 3 solid state rate sensors, one for each axis, which are used for short term stabilization reference. A faulty sensor on the motion platform PCB will cause the antenna to lose stability and mispoint from the satellite under dynamic conditions; however the system may appear to be operational in the port when there is no motion to counteract.

RS-422 Pedestal communications from the DAC-2202 are modulated into a frequency by the base 400MHz modem and diplexed with the L-Band receive signal. The communications frequency will then be demodulated by the pedestal 400MHz modem and converted back into RS-422 before being sent to the PCU. Radio MandC signals (RS-232, RS-422, or RS-485) can also be multiplexed along with the pedestal communications to interface with the SSPB.

The 150W, 24VDC power supply is switch mode and will convert either 110VAC or 220VAC into 24VDC. This component is universally used in the DAC-2202, XX97 and XX06 pedestal power supplies as well as the XX09 and XX10 PCU's and NJRC 24V BUC power supplies, meaning only a single unit is needed as a spare to cover a wide range of applications.

4. Verify Initialization:

- Power cycle the pedestal
    1. Brakes release from the EL and CL motors (not applicable to the XX10 or 3011 antennas)
    2. Elevation axis drives to 45 degrees based on the motion platform PCBs horizon reference
    3. Cross level axis drives to level based on the motion platform PCBs horizon reference
    4. Azimuth axis drives clockwise until the home flag and sensor make contact

***Note:** If the PCU software is 2.01a or higher, the EL and CL axis will initialize at the same time saving 20 seconds on the initialization process.

If the ACU reports model "xx09", the PCU's No parameter needs calibrating, refer to the "calibrating the PCU System Parameter (No)" section of this document. Failure of any of the initialization steps, or a pedestal error requires further troubleshooting.

5. Power Supply Troubleshooting:

***Caution:** Electrical Hazard - Dangerous AC voltages exist on the power supply. Observe proper safety precautions when working on the power supply. 1. Remove the cover from the PCU to allow access to the power supply for testing. 2. Measure the input voltage into the power supply on the 2 pins to the right of the connection block, 110 - 240 volts AC should be present. If no AC voltage is present verify the unit is switched on. If there is still no voltage present troubleshoot the source.	
3. Now measure the output voltage from the power supply on the 2 pins to the left of the connection block, the output should be 24VDC. ***Note:** This procedure shows a DAC-2202 in the images; however the DAC and PCU power supply is the same component so the procedure is the same.	

If the units AC input has been verified and the 24VDC is not present, the power supply is defective. If the power supply is outputting the 24VDC consistently then the power supply is operational and the problem lies elsewhere (possible failure with the PCU, DAC motherboard or harness connection).

6. PCU Status LED Diagnostics

A status LED is installed on the PCU Motherboard and can be viewed from the underside of the PCU assembly. The different colors statuses indicate…

Solid Green	PCU status is good.
Solid Red	PCU fault detection. Operational software will never leave the status LED solid RED. Reprogram the PCU software. Replace the motherboard PCB.
Solid Orange	Software update to the PCU motherboard is in process.
Blinking Orange	Software update to the motor driver enclosure (through the PCU) is in process.
Blinking Red	Communication error with the motor driver enclosure. Check the MDE status LEDs. If MDE is good, check to assure that the harness connections are seated properly. Check harness connections (pin-pin, wire-wire and wire-ground) for good continuity. Replace main PCB. Replace MDE.

7. Pedestal Error (Error 8):

7.1. Decoding a Pedestal Error (Error 8).

When the DAC displays a pedestal error enter into the remote command window and input "Soooo" then press enter twice. The error code will now be displayed in the Remote Monitor screen. Decode the 4th character of the error code from the below table…

@	None	**K**	Ref + LV + CL	**V**	Stab Limit + AZ + LV
A	CL	**L**	Ref + AZ	**W**	Stab Limit + AZ + LV + CL
B	LV	**M**	Ref + AZ + CL	**X**	Stab Limit + Ref
C	CL + LV	**N**	Ref + AZ + LV	**Y**	Stab Limit + Ref + CL
D	AZ	**O**	Ref + AZ + LV + CL	**Z**	Stab Limit + Ref + LV
E	AZ + CL	**P**	Stab Limit	**[**	Stab Limit + Ref + LV + CL
F	AZ + LV	**Q**	Stab Limit + CL	****	Stab Limit + Ref + AZ
G	AZ + LV + CL	**R**	Stab Limit + LV	**]**	Stab Limit + Ref + AZ + CL
H	Ref	**S**	Stab Limit + CL + LV	**^**	Stab Limit + Ref + AZ + LV
I	Ref + CL	**T**	Stab Limit + AZ	**_**	Stab Limit + Ref + AZ + LV + CL
J	Ref + LV	**U**	Stab Limit + AZ + CL		

7.2. Error Types.

The 3 types of pedestal error are…..

1. **Servo Limit (CL, LV and AZ) –** A servo limit error means the PCU motherboard is issuing the command to the motor driver enclosure to drive the relevant axis harder than it should under normal operation (the servo limit has been reached). This could be whilst the antenna is trying to maintain its pointing angle, or whilst the antenna is driving the axis to a target position.
2. **Stability Limit –** A stability limit error means the antenna has mispointed from its desired target position by more than half a degree. When a stability limit error is flagged on a VSAT antenna the DAC will send the TX Mute command to inhibit the transmit function of the satellite modem (It's common to see the servo limit and stability limit errors together).
3. **AZ Reference Error –** An azimuth reference error means there is a corrupt reading in the antennas relative scale. This could be caused by the system completing a 360 degree rotation without the sensor coming into contact with the home flag, the sensor coming into contact with the home flag too early, or a physical problem such as the chain or belt slipping on the motor pulley or the pulley slipping on the motor shaft.

7.3. Troubleshooting Pedestal Errors – Servo Limit and Stability Limit.

1. Reinitialize the pedestal. Does it drive correctly or not at all? - If none of the axis drive verify the No and motor gain parameters (N_1 = CL, N_2 = EL and N_3 = AZ) are correctly configured in the PCU through the Remote Command window of the DAC.
2. Verify the balance of the antenna and check for physical restrictions on the pedestal. If the axis isn't correctly balanced the PCU will be outputting additional drive commands to maintain the antennas level position.
3. If the motor isn't driving correctly or no motor drive is present, test the motor for faults using the procedure in section 8 of this document. If you find the motor is defective replace it and then test the function of the motor driver. If the axis still fails to drive correctly the motor may have damaged it. Replace the motor driver.
4. Verify if the brakes have released properly. If the movement of the axis is restricted measure the output to the motor to verify if the 12VDC is present. If so the brake hasn't released the motor is defective. If the 12VDC isn't present trouble shoot the harness / motor driver enclosure.
5. Another potential problem could be a damaged or intermittent harness connection. Remove the harness back shells and verify all the pins are seated correctly, check continuity from pin to pin and also across the pins to verify there is no short in the connections.

7.4. Troubleshooting Pedestal Errors – Azimuth Reference Error.

1. Reinitialize the system and verify the sensor comes into contact with the home flag as the system drives clockwise in azimuth (the LED will illuminate). If not verify if the home flag/sensor is present, if correct then it's a sensor/feedback failure.
2. Drive the azimuth axis in 90 degree increments and verify that the antenna points correctly and that the DAC displays the correct relative position. Also verify that there is no physical restriction on the azimuth axis such as the chain or belt slipping on the motor pulley or the pulley slipping on the motor shaft.

8. Test The Motor:

Check continuity between ground (the motor connector back shell) and the 3 driver outputs on pins 1, 2 and 3 of the harness.

Now check continuity between pins 4, 5, 6, 7, 8 and the ground (the motor connector back shell). Or this might be steps in a procedure that does not require a table.

Also check between the individual pins 1, 2, 3 and the rest of the pins (i.e. test pin 1 to pin 4, 5, 6, 7, 8 and so on, not between pins 1 and 2, 1 and 3 or 2 and 3).

If there is any continuity measured on the steps mentioned above, the motor is defective (which would be highlighted by the diagnostic LEDs on the MDE). The antennas operation should be verified with a replacement motor. If normal operation doesn't return the MDE/PCU will require further troubleshooting.

9. Verify Stabilization:

The purpose of this procedure is to physically move the systems axis under static conditions, introducing error into the PCU's control loop, and then verify the system is able to return to its level position (stabilize itself). These tests can be performed by monitoring the sensor outputs on DacRemP or also by physically moving the antenna and observing how it responds.

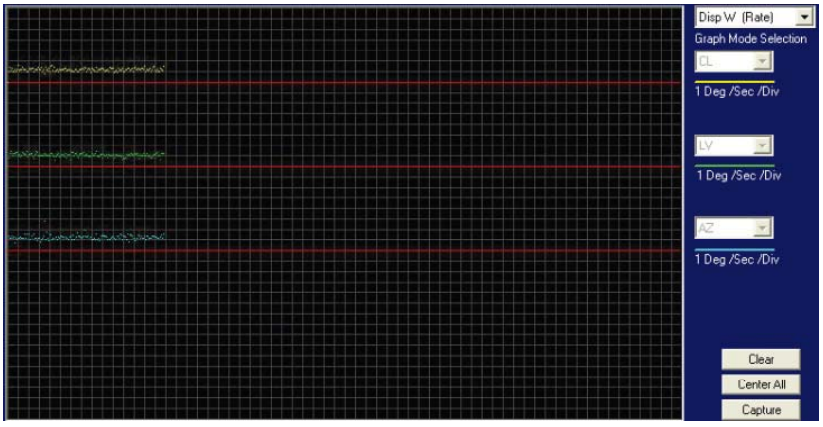
1. Turn tracking off and open the DISP_V screen of DacRemP. The software will now plot the level position of the LV and CL MEM sensors. Observe for any abnormalities.
2. Verify Cross Level response:

   Standing behind the system, push the cross level beam down to the left and hold it in position. Verify that the CL trace on DacRemP moves down an equal amount to the movement exerted on the axis. Release the axis and verify the DacRemP trace and system axis both return back to their original positions instantly, without deviating or taking time to settle. Now push the cross level beam down to the right and hold it in position. Verify that the CL trace on DacRemP moves up an equal amount to the movement exerted on the axis. Release the axis and verify the DacRemP trace and system axis both return back to their original positions instantly, without deviating or taking time to settle.
3. Verify Level (Elevation) response:

   Push the reflector up in elevation and hold it in position. Verify that the LV trace on DacRemP moves down an equal amount to the movement exerted on the axis. Release the axis and verify the DacRemP trace and system axis both return back to their original positions instantly, without deviating or taking time to settle. Push the reflector down in elevation and hold it in position. Verify that the LV trace on DacRemP moves up an equal amount to the movement exerted on the axis. Release the axis and verify the DacRemP trace and system axis both return back to their original positions instantly, without deviating or taking time to settle.
4. In DacRemP, the trace should look similar to the below image. Note how after each movement the system returns to its level position efficiently without taking time to settle.

10. Rate Sensor Monitoring:

Rate sensor outputs can also be monitored using the DISP_W screen of DacRemP to verify any deviations under static conditions. The traces should remain consistent; any drifting or spikes are an indication the sensors voltage output is changing and the sensor is defective (provided no forces are being exerted on the system).



11. Azimuth Targeting:

Should the antenna have issues targeting in azimuth, such as not accurately finding the satellite or repeatedly finding the satellite in different azimuth positions, then it's important to diagnose if the system is mispointing in azimuth or relative. Relative feedback from the AZ encoder can be verified by initializing the system, verifying it calibrates itself correctly, and then driving the pedestal clockwise in 90 degree increments over a 360 degree rotation. Note that the system points correctly relative to the vessel and that no AZ reference error is flagged by the PCU. A mechanical problem such as the belt slipping on the sprocket could also cause this kind of error.

If the system keeps finding the satellite at different azimuth positions but at the same relative, then the encoder is functioning correctly and the azimuth rate sensor is calculating the movement incorrectly causing the antenna to mispoint.

12. Drift:

If a rate sensor is "drifting", its nominal voltage output has changed from the correct 2.5VDC. This will cause error in the axis control loop and cause the antenna to move. It is more common to see this drift in the azimuth axis as the CL and EL axis both have a long term reference, provided by the tilt sensor. However, should the rate sensors drift be large enough, it can over-compensate the tilt sensor and the system will drive into one of the CL or EL end stops.

To verify if the system is drifting in azimuth, turn tracking off and monitor the relative position. Under static conditions, when the vessels heading is unchanged, the relative count should remain stationary. If the relative value begins to change from its current position, the azimuth rate sensor is drifting, introducing error into the axis control loop.

If the rate sensors are checked as OK, a ships gyro can induce drift. This will introduce loop error into the PCU control loop and cause the antenna to drift. This can be verified by checking the heading displayed on the DAC against the ships actual heading. The two headings should be the same. If there is a difference, enable Sat Ref Mode to temporarily bypass the ships gyro to prove the fault. If enabling Sat Ref Mode does prevent drift, verify the heading source.

13. Further Diagnostics:

If any of the above checks have indicated a problem, one or more of the axis control loops have incorrect loop errors. The most likely cause of this is a defective rate sensor. To rectify this, replace the motion platform PCB and repeat the checks above, to verify the antenna now functions correctly.

Should the problem persist, there are other possibilities that can produce the same results. These can be bad connections between the motion platform PCB and PCU motherboard or the PCU itself.

14. 400MHz Modem LED Indicators:

For diagnostic purposes, the 400MHz FSK Modem Assemblies have an LED Indicator (located on the bottom left hand side of the Enclosure for BDE modems and directly underneath the Rotary Joint port on the 09 Series PCU). By observing the amount of amber colored flashes during power up, the modems configuration may be established. You can also verify the communications link between above decks and below decks modems themselves. Refer to the below list for an explanation of the different LED states.

- Upon power up, the modems' LED will flash amber. The number of flashes indicates the dash number configuration of the modem. Refer to the configuration on page 8 of this document for the appropriate dash number configuration for your modem assembly.
- Solid green indicates dual channel communications lock between modems (i.e. there is enough signal being received to establish communications).
- Red and Green alternating LEDs indicates a single channel failure (i.e. there is low RSSI signal strength on one channel).
- A flashing Red LED indicates no communication between both modems (2 failed channels), (i.e. there is low RSSI signal strength on both channels).
- Solid RED - Modem fault detection, hardware or software failure of the modem.
- Solid ORANGE - Software update to the Modem in progress.

Below Decks Modem Assembly	Above Decks Modem (Located in the PCU Assembly)
LED Illuminated Green  **LED Illuminated Red** 	

15. 400MHz Modem Queries:

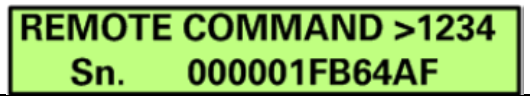
The 400MHz modem assemblies facilitate the use of line-based commands via the ACU's front panel, the internal HTML page, or using remote diagnostic software such as DacRemP and ProgTerm. The use of these commands will aid in troubleshooting communication failures between the above decks and below decks modems. Listed below are the available commands:

Command	Description	Typical Response
<0000 <cr>	BDE Modem RSSI (Receive Signal Strength Indicator)	**RSSI P-43 R-44** P = Pedestal Control Channel R = Radio Control Channel
<1234 <cr>	BDE Modem Serial Number Query	**Sn 000001D2F1F1**
<0273 <cr>	BDE Modem Temperature Query	**Temp = 34.9c** Temperature expressed in Celsius
<0411 <cr>	BDE Modem Software Version and Configuration Query	**Modem Ver 1.00B-1** Software version – configuration Dash #
>0000 <cr>	ADE Modem RSSI (Receive Signal Strength Indicator)	**RSSI P-43 R-50** P = Pedestal Control Channel R = Radio Control Channel
>1234 <cr>	ADE Modem Serial Number Query	**Sn. 00000102FC18**
>0273 <cr>	ADE Modem Temperature Query	**Temp = 27.5c** Temperature expressed in Celsius
>0411 <cr>	ADE Modem Software Version and Configuration Query	**Modem Ver 1.00B-2** Software version – configuration Dash #

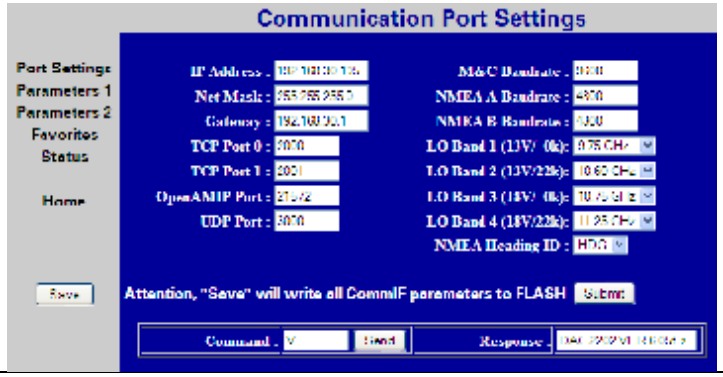
16. Modem Query Methods:

The following text provides instruction on how to submit modem queries using any one of four different methods as listed below. These instructions assume that the operator have a clear understanding of Menu navigation and entry via the Antenna Control Unit front panel, or connection requirements for using remote diagnostic software, and/or the internal HTML page of the ACU. Refer to the appropriate manual text if further instruction on wiring connections or button pushing is required.

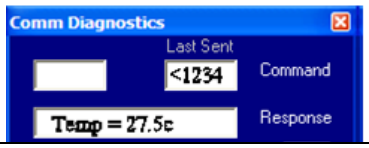
16.1. Using the ACU Front Panel:

1. Using the ACU's Front Panel, navigate through the Setup menu to access the Remote Command Sub-Menu.	
2. Enter in the desired Modem Query then press the **ENTER** key.	
3. Observe and/or Record the displayed response.	

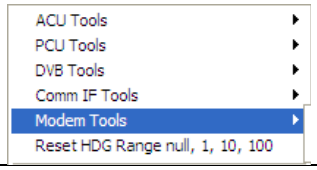
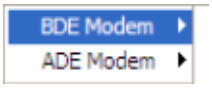
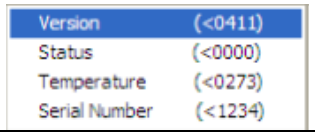
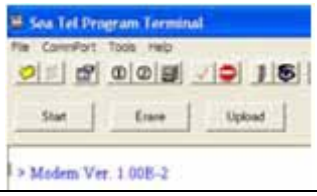
16.2. Using the Internal HTML Page:

1. Logon to the ACU's Internal HTML page. 2. Browse to the "Communication Port Settings" page.	
3. In the Command Window, Type in the desired Modem Query and hit Send.	
4. Observe and/or Record the displayed response. 5. Repeat as required until all desired modem queries are noted.	

16.3. Using DacRemP:

1. Open up DacRemP and select the Comm Diagnostics Tool (cntrl + c).	
2. In the Remote Command Entry Window, type in the desired Modem Query and hit Enter. i.e "<1234 <CR>"	
3. Observe and/or Record the displayed response. 4. Repeat as required until all desired modem queries are noted.	

16.4. Using ProgTerm:

1. Open up ProgTerm and select the Tools Menu.	
2. Select "Modem Tools".	
3. Select the desired modem location. BDE is the Below Decks Modem. ADE is the Above Decks Modem.	
4. Select the desired modem query.	
5. Observe and/or Record the displayed response. 6. Repeat as desired until all desired modem queries are noted.	

17. 400MHz Modem Fault Diagnostic Procedure:

17.1. Query the ADE and BDE modems:

1. Issue "<0000" and ">0000" queries to the ADE and BDE modems and record the responses.

   ADE (>0000)_____ BDE (<0000)_____

2. Compare your recorded responses to the list below to determine which modem fault(s) (if any) are present.
3. Use the appropriate text following the failure table for a list of possible failures attributed to the failure type established.

400MHz FSK Modem Fault Reference Table		
ADE Modem RSSI	**BDE Modem RSSI**	**Failure**
P= <65, R= <65	P= <65, R= <65	None
P= >65, R= >65	P= >65, R= >65	Receive IF Path
No Response	No Response	BDE/ADE No Response
No Response	P= <65, R= <65	ADE No Response 1
No Response	P= >65, R= >65	ADE No Response 2
P= <65, R= <65	P= >65, R= <65	BDE Receive Or ADE Transmit (PED M&C)
P= <65, R= >65	P= <65, R= <65	BDE Transmit Or ADE Receive (PED M&C)
P= <65, R= <65	P= <65, R= >65	BDE Receive Or ADE Transmit (RF M&C)
P= <65, R= >65	P= <65, R= <65	BDE Transmit Or ADE Receive (RF M&C)

17.2. Tools Suggested:

Laptop or PC w/ an available comport and diagnostic software installed	ProgTerm Ver. 1.35 or Later DacRemP Ver. 0.20 or Later
9 pin Serial cable	Straight thru (1-1 Pin out) For Serial Based Connections
CAT5 Cross-over cable	Required for IP based connections (HTML, DacRemP IP)
Serial Loopback Connector Build a Loop Back Test Adapter by Shorting Pin 1 to Pin 8 and Shorting Pin 2 to Pin 3 on a female DB9(S) connector.	
SMA "T" splitter or N type "T" splitter	Or equivalent cabling
Spectrum Analyzer	Capable of handling 100KHz up to 3GHz and up to 48VDC

18. Failure Table:

Diagnostics from the above table, section: 17.1.

18.1. None.

No communication failures between ADE and BDE modems.

18.2. Receive IF Path.

The following points of failures assumes LED illumination on both modems.

1. Modem Configuration.
   Verify BDE modem and ADE modem are properly configured (jumper block settings).
2. Coax Cable failure
   Verify continuity on the below coaxes, repair or replace as required.
   1. BDE Modem connector bracket (Base Rack Panel Assembly)
   2. (CFE) BDE to ADE Rx IF (Base Rack Panel to radome Connector Bracket)
   3. Rx N to SMA Adapter (Located on connector bracket at radome base)
   4. SMA to SMA (From connector bracket to bottom the bottom side of the rotary joint)
   5. SMA to SMA (From top side rotary joint to PCU/ADE Modem
3. Rotary Joint (Receive channel).
   Verify continuity on the receive channel for its entire 360 degree range of motion. Replace rotary joint if any sector of it has failed.

18.3. BDE/ADE No Response.

The Following points of failures assumes LED illumination on both modems.

1. Modem Configuration
   Verify BDE modem and ADE modem are properly configured (jumper block settings).
2. ACU to BDE modem interface cable failure
   Verify harness continuity. Repair or replace as required
3. ACU Antenna Port Failure
   Install an RS232 Loopback connector** on Antenna Port of the ACU. Enter an "n0999" Remote Command and verify that it echoes back on the bottom line of the display.
   1. If loop back works, BDE Modem failure or ACU to BDE Interface cable failure.
   2. If loop back does not work, ACU failure.

18.4. ADE No Response 1 (assumes LED illumination on both modems).

1. Modem Configuration

   Verify BDE modem and ADE modem are properly configured (jumper block settings).

   Install Spectrum Analyzer in line with the Rx IF coax path.

   1. If 465.0MHz Transmit Beacon is present, the fault is the BDE modem.
   2. If 465.0MHz Transmit Beacon is NOT present fault is with the ADE modem.

18.5. ADE No Response 2.

1. ADE Modem Configuration

   Verify the ADE modem is properly configured (jumper block settings).

2. Coax Cable failure

   Verify continuity on the items listed below, repair or replace as required.

   1. Base Modem to connector bracket (Base Rack Panel Assembly)
   2. (CFE) BDE to ADE Rx (LMR-400)
   3. Rx N to SMA Adapter (Connector bracket at radome base)
   4. SMA to SMA connector bracket to bottom side rotary joint
   5. SMA to SMA top side rotary joint to PCU/ADE Modem

3. Rotary Joint (Receive channel)

   Verify continuity on the receive channel for its entire 360 degree range of motion. Replace rotary joint if any sector of it has failed.

18.6. BDE Receive Or ADE Transmit (PED MandC).

1. BDE Modem Rx Port Failure (Not receiving at 465.0MHz) or
2. ADE Modem Tx Port Failure (Not transmitting at 465.0MHz)

   Install Spectrum Analyzer in line with the Rx IF coax path.

   1. If 465.0MHz Transmit Beacon is present, the fault is the BDE modem.
   2. If 465.0MHz Transmit Beacon is NOT present fault is with the ADE modem.

18.7. BDE Transmit Or ADE Receive (PED MandC).

1. BDE Modem Tx Port Failure (Not transmitting at 452.5MHz) or
2. ADE Modem Rx Port Failure (Not receiving at 452.50MHz)

   Install Spectrum Analyzer in line with the Rx IF coax path.

   1. If 452.5MHz Transmit Beacon is present, the fault is the BDE modem.
   2. If 452.5MHz Transmit Beacon is NOT present, the fault is with the ADE modem.

18.8. BDE Receive or ADE Transmit (RF MandC).

1. BDE Modem Rx Port Failure (Not receiving at 460.0MHz) or
2. ADE Modem Tx Port Failure (Not transmitting at 460.0MHz)

   Install Spectrum Analyzer in line with the Rx IF coax path.
   1. If 465.0MHz Transmit Beacon in present, the fault is the BDE modem.
   2. If 465.0MHz Transmit Beacon is NOT present, the fault is with the ADE modem.

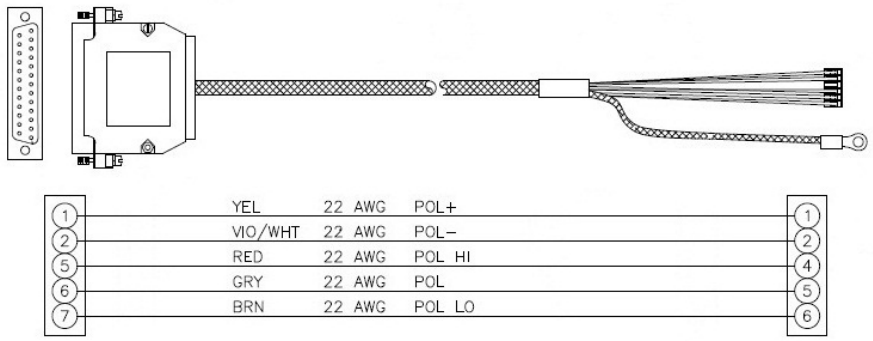
18.9. BDE Transmit Or ADE Receive (Radio MandC).

1. BDE Modem Tx Port Failure (Not transmitting at 447.5MHz) or
2. ADE Modem Rx Port Failure (Not receiving at 447.5MHz)

   Install Spectrum Analyzer in line with the Rx IF coax path.
   1. If 465.0MHz Transmit Beacon in present, the fault is the BDE modem.
   2. If 465.0MHz Transmit Beacon is NOT present, the fault is with the ADE modem.

19. Pol Drive – 3011, XX09 MK2, XX10 and 9711QOR (KU-Band):

As the pol aux relay is integrated into the PCU motherboard a fault with the pol alignment could potentially be caused by this PCB. If no pol drive is present set the pol type to manual mode (0009), apply drive to the feed assembly and measure the voltage to the motor on the IDC connector, 24VDC should be present. If voltage is present but the motor isn't driving the motor is defective and needs replacing. If no voltage is present verify the connections of the reflector harness by measuring pin to pin as per the below diagram.



If the harness connections are good, then the PCU Motherboard isn't outputting the voltage to drive the motor and needs replacing.

As long as the pol range is within the pot limits the DAC will issue the pol drive command to the PCU motherboard, based on the antenna targeting, a change in the vessels GPS position or operator inputs. The PCU motherboard will then drive the pol motor, which will drive the feed until the correct output from the pot has been received. At which point the feed will be in the correct reception position (providing the system is functioning and calibrated correctly). Therefore there is also the possibility for a pol drive fault to be caused by the PCU motherboard.

20. Pol Drive – 9711 and 9711QOR (C-Band):

Both the linear and circular sections of the 9711 C-Band feed assembly are actively driven when selecting between the linear and circular modes. This is controlled by toggling the TX polarity function of the system to drive the polarizer to align either the left-hand circular, right-hand circular, vertical or horizontal positions.

TX Polarity 1 – Drives the circular motor and pot to align the phase card 45 degrees counter-clockwise from the OMT E plane to align the LHCP to transmit and the RHCP to receive.

TX Polarity 2 – Drives the linear motor and pot to align the OMT to the horizontal transmit and vertical receive positions +/- the calculated polarization skew.

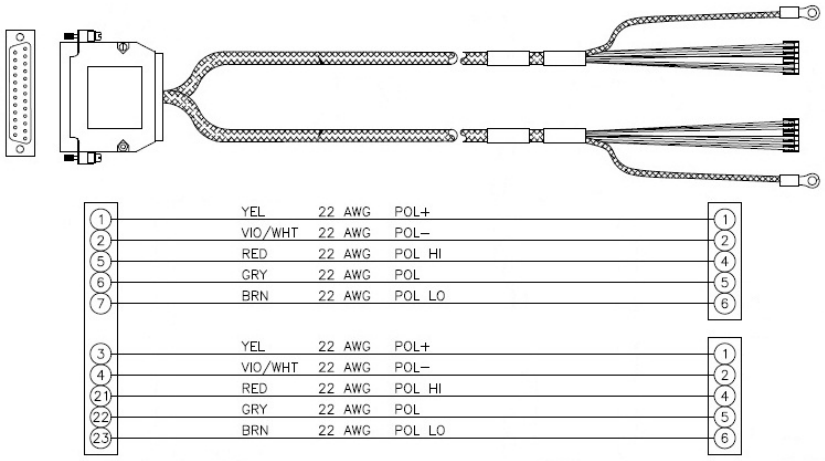
TX Polarity 3 - Drives the circular motor and pot to align the phase card 45 degrees clockwise from the OMT E plane to align the RHCP to transmit and the LHCP to receive.

TX Polarity 4 - Drives the linear motor and pot to align the OMT to the vertical transmit and horizontal receive positions +/- the calculated polarization skew.

When either TX polarity 2 or 4 is selected for linear operation the circular motor and pot will drive the phase card in line with the OMT.

As the pol aux relay is integrated into the PCU motherboard a fault with the pol alignment could potentially be caused by the PCU. If no pol drive is present set the pol type to manual mode (0009), apply drive to the feed assembly and measure the voltage to the motors on the IDC connectors, 24VDC should be present on each. If voltage is present but the motor isn't driving the motor is defective and needs replacing.

If no voltage is present verify the connections of the reflector harness by measuring pin to pin as per the below diagram.



If the harness connections are good, then the PCU Motherboard isn't outputting the voltage to drive the motor and needs replacing.

As long as the pol range is within the pot limits the DAC will issue the pol drive command to the PCU motherboard, based on the antenna targeting, a change in the vessels GPS position or operator inputs. The PCU motherboard will then drive the pol motor, which will drive the feed until the correct output from the pot has been received. At which point the feed will be in the correct reception position (providing the system is functioning and calibrated correctly). Therefore there is also the possibility for a pol drive fault to be caused by the PCU motherboard.

21. Replacing the XX09 MK2, XX10, XX11 and XX10QOR PCU Assembly:

21.1. Tools.

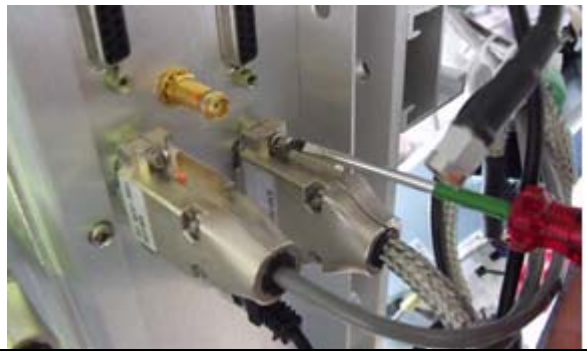
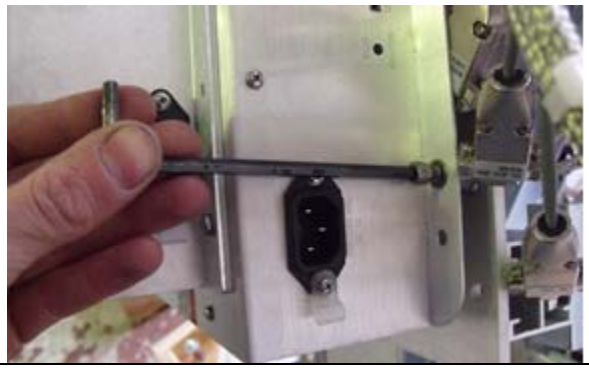
- 5/16" Wrench/Spanner
- 2mm Flat Blade (Terminal) Screwdriver
- Snips/Cutters
- 3/16" Allen Wrench/Key
- #1 Phillips Screwdriver
- Loctite 242

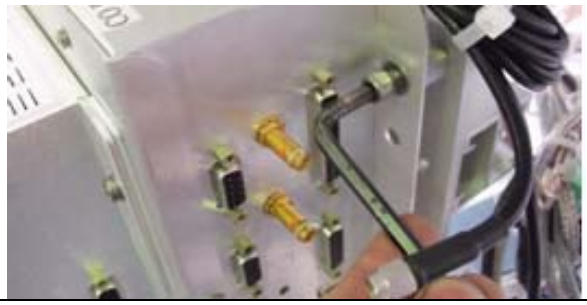
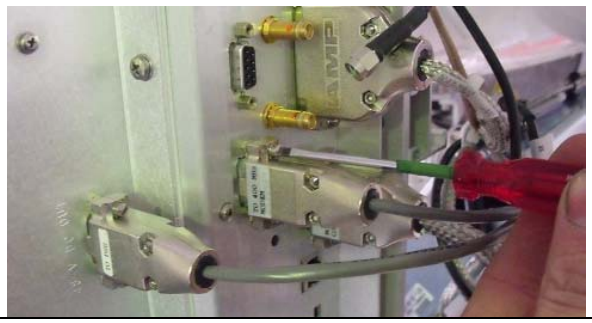
21.2. Procedure.

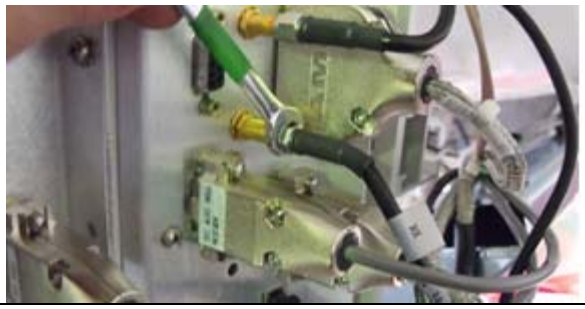
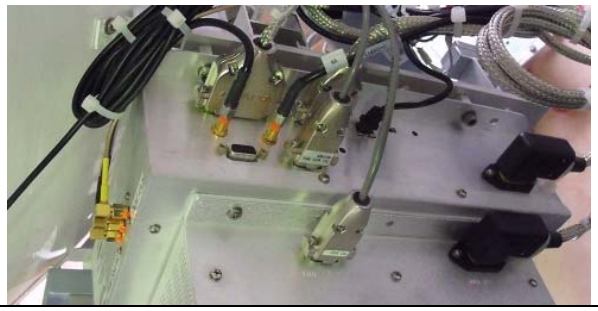
Procedure for replacing the XX09 MK2, XX10, XX11 and XX11QOR PCU assembly, Sea Tel kit part number: 136613 (PCU Assembly part number: 131057-1).

***Note:** Depending on your antenna model and configuration the BUC power supply and mounting may vary.

***Caution:** Power down the pedestal before following this procedure. 1. Using a 5/16" wrench disconnect the three SMA cables from the coax switch inside the PCU assembly.	
2. Now disconnect the SMA cables from the rotary joint connector and L-band connector from the coax switch into the ADE 400MHz modem PCB inside the PCU assembly, using a 5/16" wrench.	
3. By hand disconnect the RJ-45 connector for the GPS antenna from the socket on the PCU motherboard PCB inside the PCU assembly.	

4. Using a 2mm flat blade screwdriver remove the 25-pin D-sub connector for the reflector harness and the 15-pin D-sub connector for the MDE harness from their termination points on the PCU motherboard PCB. 5. Now remove the 9-pin D-sub connector for the RF communications into the 400MHz modem PCB. ***Note:** The RF communications will only be connected if the BUC on the system supports this function.	
6. Now disconnect the 9-pin D-sub connector for the DC power to the BUC from the BUC power supply assembly which is installed on the XX09 MK2 PCU assembly, using a 2mm flat blade screwdriver.	
7. Using a pair of cutters cut the cable ties securing the AC power input connections to both the BUC power supply and the PCU assembly and disconnect the socket connectors.	
8. Verify all the connections from the PCU assembly and BUC power supply have been removed and undo the four screws securing the PCU assembly to the equipment frame, using a 3/16" Allen wrench. ***Note:** The BUC power supply will still be attached to the PCU assembly at this point. Support the weight of the PCU assembly and power supply whilst undoing the hardware and remove as one. Save the hardware for future use.	

9. Using a #1 Phillips screwdriver undo the four screws securing the BUC power supply to the top of the PCU assembly. 10. Retain the hardware from the previous step and install the BUC power supply to the replacement PCU assembly, ensuring the AC input sockets are facing the same direction. Apply Loctite 242 to the threads. ***Note:** Depending on your antenna model the BUC power supply may not be installed on the PCU assembly.	
11. Now using the hardware removed in step8 reinstall the replacement PCU and BUC power supply assembly to the equipment frame using a 3/16" Allen wrench, applying Loctite 242 to the threads.	
12. Reconnect the harness D-sub connectors to the replacement PCU assembly and BUC power supply using a 2mm flat blade screwdriver. ***Note:** The RF communications (if supported by your system) and DC BUC power supply harnesses are both male 9-pin D-sub connectors, ensure the labels on the connectors are correct for the application.	
13. Reconnect the SMA cables to the coax switch using a 3/8" wrench in the following order: Co-Pol - Yellow 400MHz Modem - Black Cross-Pol - Orange	

14. Reconnect the SMA cable from the coax switch into the L-band SMA connector (as shown on the right using a 5/16" wrench and the coax cable from the rotary joint into the lower SMA connector on the 400MHz modem PCB. 15. Reconnect the GPS antennas RJ-45 connector to the replacement PCU.	
16. Install the AC power connectors to both the PCU and BUC power supply and secure them in place with a cable tie through the P-clip installed on the mounting point. Snip the cable tie using a pair of cutters.	
17. Verify all connections are installed correctly and secure. 18. Now energize the pedestal and configure the replacement PCU's No parameter as per the following procedure.	

22. Calibrating the XX09, XX10, XX11 and XX11QOR PCUs No Parameter:

As PCUs are universal across the models ranges it's necessary to configure the No parameter of the replacement PCU to the specification of the pedestal it will be installed on. This will set the motor gains for CL (N1), EL (N2), AZ (N3) and also configure the dishscan pattern(s) (N7) for the size of the pedestals reflector(s).

Without the No parameter configured in the PCU the antenna won't initialize as none of the motor gains will be set, the status window of the DAC will display the model number of the antenna as "xx09" opposed to 4009, 5010 or 9711 etc.

Enter into the remote command screen and input the correct No parameter for the model of antenna as per the below table. I.e. the No parameter for a 4009 is "004" so enter "N0004" ("No" for the system parameter + "004" for the antenna model). Enter into the Remote Parameters screen of the DAC and save the settings to the PCU motherboard.
Cycle power to the system to reinitialize the pedestal, verifying the No has saved and the system initializes correctly.

Model	No	N1	N2	N3	N7A	N7B
3011	015	016	016	016	042	
3011 Mini BUC	011	016	016	024	022	
4009	004	040	020	020	026	
4009 Gilat	002	020	016	016	026	
4009 Mini BUC	007	030	016	016	026	
4009QOR	024	040	032	028	021	
4010	076	040	030	014	025	
4010KX	078	050	050	026	025	4
4010W	072	026	026	008	045	
5009	005	050	040	020	021	
5009 Mini BUC	009	030	016	030	022	
5010	077	050	050	026	025	
5010 Mini BUC	074	024	024	020	089	
6009 KU	006	051	051	035	022	
6009 C	003	051	051	035	021	
ST60	022	051	051	035	021	
6011 Qor	001	051	051	035	085	106
9497S	10	50	50	30	149	
9711C	211	050	050	026	193	
9711K	215	50	50	26	193	
9711QOR	210	051	051	035	149	149
ST88	212	050	050	030	149	
ST94	213	050	050	030	149	
ST144 / 144S	208	051	051	035	192	