Field Service Spares Replacement Procedure – Pol Motor Kit, XX04, 4003A, XX06, XX09 & XX10

Approval:

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Revision History

Rev.	ECO	Description of Change	Date
A	8799	Initial release	08-12-2011
B	9063	Clerical revisions	10-19-2011

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the polang motor on the XX04, XX06, XX09 and XX10 series antennas.

2. Checklist:

- Verify Range of Motion
- Verify Pot Range
- Measure Motor Voltage
- Verify Harness

3. Theory of Operation:

To ensure the LNB is correctly aligned to the linear polarized receive signal the antennas feed assembly can be driven through a 180 degree range of motion by a 24VDC Motor. Based on the vessels GPS position and the look angle to the desired satellite the DAC will calculate the numerical value for the position of the pol assembly. The PCU will then send the command to the POL Aux relay to issue voltage to drive the pol motor until the pol pot outputs the correct value, at which point the feed will be aligned to the incoming satellite signal (provided it has been calibrated correctly). Then as the vessel sails and the GPS position changes the look angle to the satellite will also change and adjustments will be made to maintain good cross pol isolation (alignment to the satellites linear signal).

One indication that there is a fault with the feed alignment of the system is that the target light will be permanently illuminated on the DAC and the antenna won't target correctly. If this is the case it will sit 8 degrees above or 8 degrees below of the elevation look angle. This is because part of the antennas targeting procedure is to target the system above or below the satellite, to calculate the auto threshold setting based on the noise floor level, then it will align the feed for the correct reception position based on the vessels GPS position and the lookup table in the DAC, before targeting the satellite.

If the system is unable to drive the pol motor or the pol pot has failed, the correct feedback signal is not obtained, the system can't complete the targeting process and the antenna will stay in this position. Setting the pol type to "0009" will put the system into manual pol positioning which needs manually setting; however miss alignment of the feed will cause bad cross pol isolation.

4. Verify Range of Motion:

Firstly verify the settings in the DAC are correct, the pol scale should be set to "0090" to give the feed 180 degrees of motion. The default pol offset setting for an xx04 series antenna is "0030" and "0040" for the xx06, xx09 and xx10 ranges. You may find these have been modified slightly to "trim" the pol angle.

In the setup menu of the DAC set the pol type to "0009". This changes the operation mode of the pol assembly from automatic (pol type "0072") to manual there by removing the automatic calculation based on the vessels GPS position and allows the feed assembly to be manually driven for diagnostic purposes. Now enter the pol window and drive the pol assembly down into its end stop, observe the position of the feed. Now drive the pol assembly up, the feed should move 180 degrees under normal operation.

5. Verify Pot Range:

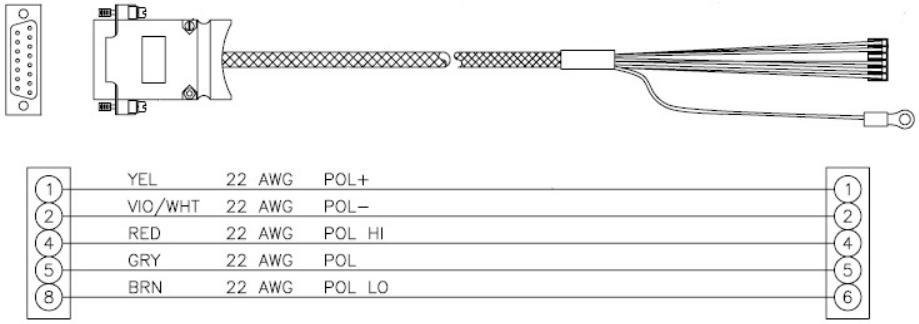
If no feed drive is present verify the pol reading on the DAC isn't out of range (i.e. displaying a value of either 0 or 255). If one of these values are displayed it's possible the pot isn't aligned correctly and that adjusting it may bring it back within the scale the DAC recognizes. Disengage the pot from the main gear sprocket and rotate its pulley verify the feedback changes on the DAC. If feedback changes proceed with calibrating the pol pot and verify operation, described in the later stages of this document. If the pol count on the DAC doesn't change when the pot is adjusted the pot has failed and is outputting a default value, no drive will be issued to the pol motor as the value is out of the range which the system operates in. Then the pol pot must be changed.

6. Measure Motor Voltage:

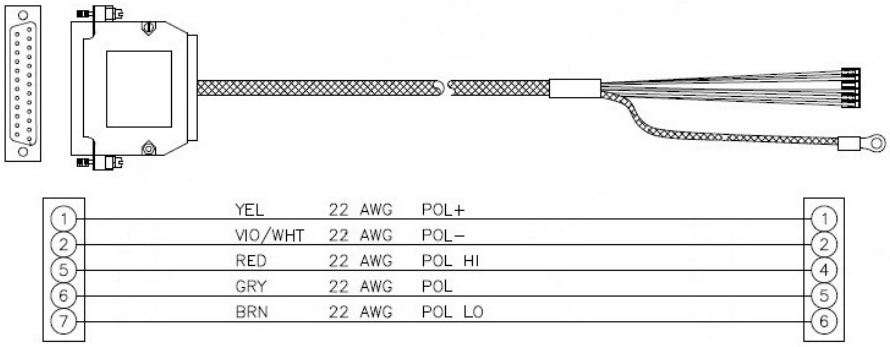
Leaving the pol type in manual mode (pol type 0009), apply drive to the feed assembly & measure the voltage to the motor on the IDC connector, 24VDC should be present. If voltage is present but the motor isn't driving the motor is defective & needs replacing.

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

XX04, XX06 & XX09 MK1



XX09 MK2 & XX10



If the harness connections are good, then the pol aux relay for the XX04, XX06 & XX09 MK1 antennas, or PCU motherboard for the XX09 MK2 & XX10 antennas, isn't outputting the voltage to drive the motor & 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 issue the command to switch the pol aux relay to drive the pol motor for the XX04, XX06 & XX09 MK1 antennas, or for the XX09 MK2 & XX10 antennas the PCU motherboard will issue the voltage to the motor directly. The motor will then 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 & calibrated correctly). Therefore there is also the possibility for a pol drive fault to be caused by the PCU motherboard.

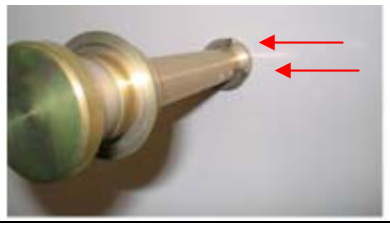
7. Replacing the Polang Motor (Old Style):

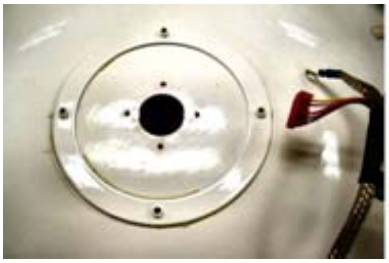
7.1. Tools.

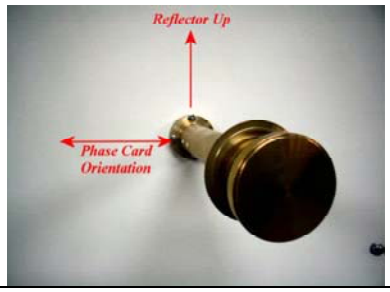
- 1/4" Wrench/Spanner
- 7/16" Wrench/Spanner
- 7/64" Allen Wrench/Key
- 5/64" Allen Wrench/Key
- 3/32" Allen Wrench/Key
- Snips/Cutters
- Loctite 222, 242 and 638

7.2. Procedure.

Procedure for replacing the polang motor assembly on the old style antennas where the motor assembly is bolted on from behind the feed, using Sea Tel kit part number: 124108-2 (motor part number: 121880-1).

***CAUTION:** Power down the pedestal before following this procedure. 1. Firstly set the pol type setting in the DAC to "0009" (manual pol). 2. Using a ¼" wrench/spanner, remove the four hex nuts and washers and remove the vertex feed tube and set aside. Save all hardware for future use.	
3. Using a 7/16" wrench/spanner, remove the RF cables connecting to the LNB. Using snips cut the tie wrap(s) securing the harness to the LNB (it's advisable to photograph them for future reference of their orientation). 4. Using a 7/64" Allen wrench/key remove the polang harness ground lug attached to polang plate and unplug the polang harness IDC connection.	
5. Using a 5/64" Allen wrench, loosen the three set screws in the LNB mounting cuff and remove the LNB from the feed assembly. (Photo shown without LNB installed for clarity). 6. Using snips, cut the tie wraps securing the harness to the polang motor assembly. 7. Using a 7/64" Allen wrench, remove the screws securing the polang assembly to the reflector plate.	

8. Carefully remove the polang assembly from the reflector, you may find this needs gently working off to break the seal of any epoxy which has gotten in between the polang assembly & the reflector. 9. Do not pry off the retaining ring as it's epoxied to the reflector (4004 and 5004 dishes are as shown, 3004 systems do not have an epoxy ring installed).	
10. From the back side of the feed assembly, use a 5/32" Allen wrench to remove the screws securing the 24V polang motor to the bracket assembly and save the hardware for future use. Remove the polang motor and set aside.	
11. Fit the pulley to the replacement polang motor in the same position as on the defective motor, applying Loctite 638 to the motor shaft & Loctite 222 to the set screws and tighten with a 3/32" Allen wrench. ***Note:*** For further information refer to the Loctite Procedure 121730 provided with this kit.	
12. Install the replacement polang motor, using Loctite 242 and the hardware removed earlier, with the body of motor mounted flush on the standoffs.	
13. View the polang assembly from bottom and verify that the polang motor sprocket is fully engaged with the polang gear.	

14. Reconnect the pol pot IDC connector & secure both the pol pot and polang motor harness's to the body of the pol motor using tie wraps.	
15. Install the feed assembly back onto the reflector and secure with Loctite 222.	
16. Install the vertex feed tube with the phase card oriented in the horizontal axis ref. to reflector (for the xx04 series only). 17. Secure with the Loctite 242.	
18. Re-Install the LNB and secure the 3 set screws with Loctite 222. Reconnect the RF cables & secure the RF cable harness with a tie wrap around body of the LNB and with enough service loop to allow the full range of LNB travel. 19. Secure the pol harness ground lug to the feed plate and reconnect the pol harness to the motor termination PCB.	
20. Rotate reflector by hand from upper elevation stop to lower elevation stop and verify LNB and/or Feed harnesses do not hit CL beam. 21. Check and adjust antenna balance. If system is configured with a linear LNB follow the instructions for calibrating the pol pot. For systems configured with a circular LNB no further adjustments are needed.	

8. Replacing the Polang Motor (New Style):

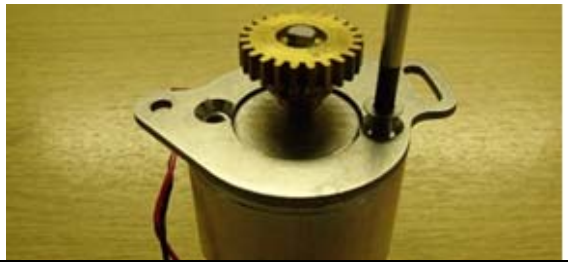
8.1. Tools.

- Snips/Cutters
- 1/8" Allen Wrench/Key
- #1 Phillips Screwdriver
- Cable Ties/Tie Wraps
- Loctite 222, 242 and 638

8.2. Procedure.

Procedure for replacing the polang motor assembly on the new style antennas where the motor assembly is bolted on from behind the feed, using Sea Tel kit part number: 124108-2 (motor part number: 121880-1).

***CAUTION:** Power down the pedestal before following this procedure. 1. Cut the snips securing the pol motor harness to the pol pot harness.	
2. Disconnect the pol motors IDC connector from the termination block.	
3. Using a 1/8" Allen wrench remove the two screws securing the pol motor assembly to the feed and save for future use. 4. Remove the pol motor assembly.	

5. Remove the motor mounting bracket from the motor using a #1 Phillips screwdriver, save the hardware for future use.	
6. Install the bracket to the replacement motor noting it's orientation in relation to the motor shaft. Apply Loctite 242 to the screws. ***Note:** Motor shaft is offset from the body of the motor.	
7. Install the pulley to the replacement motor in the same orientation as on the defective motor. Apply Loctite 638 to the shaft and Loctite 222 to the set screw. Tighten the set screw using a 3/32" Allen wrench insuring it's installed against the flat edge of the motor shaft. ***Note:** For further information refer to the Loctite Procedure 121730 provided with this kit.	
8. Apply Loctite 242 to the two screws and install the motor to the feed. Loosely install both screws and insert the motor pulley into the teeth of the main drive sprocket. 9. Tighten the upper screw (with the slotted mount) whilst holding the motor in place then tighten the lower screw.	
10. Connect the pol motor IDC connector to the termination block. 11. Secure the harness to the body of the motor using a cable tie. 12. Secure the excess harness to the pol pot harness using cable ties.	

9. Pol Pot Alignment and Verification:

1. Drive the reflector to zero degrees of elevation to view the orientation of the LNB:

   Press the TRACK button to turn the tracking function off (if applicable) to prevent the antenna from going into a search. Push the NEXT button until the 'Antenna' window is displayed (the screen will show the AZ, EL and REL values). Press the ENTER button twice to isolate the 'EL' window and then press the ◄ arrow to activate it (a cursor will be displayed). Now use the ◄ and ► arrow keys to scroll the cursor along and use the ▲ and ▼ arrow keys to change the elevation value to "00.0" and press the ENTER button.

2. Set the Pol Type to manual mode:

   Enter the 'Setup Menu' mode by pressing and holding the ◄ ► arrow keys together until the "EL Trim' or 'Auto Trim' window is displayed. Push the ▼ arrow key until the 'Polang Type' window is displayed. Press the ◄ arrow key to activate the window. Now use the ◄ and ► arrow keys to scroll the cursor along and use the ▲ and ▼ arrow keys to change the characters. Set the 'Polang Type' to "0009" which is manual mode and press the ENTER button.

3. Press the ENTER button to go to the 'Pol Offset' window and verify the default setting "0015" for a 4003A antenna, "0030" for an xx04 series antenna or "0040" for an xx06, xx09 or xx10 series antenna. (If necessary use arrow keys to select the appropriate digits and change accordingly).

4. Now keep pressing the NEXT button until the 'Antenna' window is displayed (the screen will show the AZ, EL and REL values).

5. Press the ENTER button 4 times until 'Pol xxx' is displayed and then press the ◄ arrow key to activate the window.

6. Now hold either the ▲ or ▼ arrow key to drive the pol until a count of "105" for the 4003A antenna, "120" for the XX04 series or "130" for the XX06, XX09 and XX10 series is displayed.

   Note: It's advisable to have someone watching the feed while it's being driven as if the pot isn't correctly calibrated there is the possibility to damage the assembly if the LNB hits the pol motor or the reflector harness is coiled around the feed.

7. Observe the physical alignment of the LNB:

   For the 4003A antenna the LNB should be aligned vertically with the coax pointing upwards, the LNB of the xx04 series antennas should be aligned vertically, for the xx06, xx09 andl10 series antennas the LNB should be aligned horizontally with the coax pointing to the right (as shown below). If not continue on to step 8, otherwise skip ahead to step 12.

4003A

xx04

xx06, xx09 & xx10

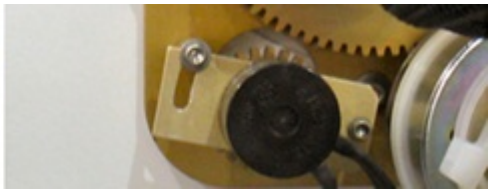
(***Steps 8-12 requires assistance to observe and operate antenna simultaneously***)

8. Using the DAC-2202 drive the feed assembly to vertical/horizontal:

   Press the ▶ arrow key to activate the cursor on the pol window. Now hold either the ▲ or ▼ arrow key to drive the pol motor until the LNB is aligned vertically for the xx04 series antennas or horizontally for the xx06, xx09 and xx10 series antennas. Now press the ENTER button to de-activate the window.

9. Locate the pol potentiometer on the feed and loosen the screw that secures the slotted mounting plate (fig. 1.1) with a 3/32 Allen wrench and then carefully move the pol pot gear out of alignment with the main sprocket (Fig. 1.2).

(Fig. 1.1)



(Fig. 1.2)

10. Align the potentiometer:

    On the DAC verify the cursor is not displayed on the Pol window, if it is press the ENTER button (Fig 1.3) (failure to do this will result in display not changing). Now rotate the pot manually until a count of 105 is achieved for the 4003A antenna, 120 is achieved for the xx04 series antennas or 130 for the xx06, xx09 and xx10 series antennas. Now reinstall the pot on the main sprocket (Fig 1.4).

    ***Note:** When re-installing the pot onto the main sprocket its common for the reading to change as the teeth of the sprockets are engaged. Because of this the tolerance is +/- 2 degrees so 118-122 for an XX04 series antenna and 128-132 for an XX06, XX09 or XX10 series antenna.

(Fig 1.3)

(Fig 1.4)

11. Drive the pol motor to its upper and lower electrical limits and verify the assembly drives in the correct direction and that the feed assembly has 180 degrees of rotation:

    On the DAC press the ▶ arrow key to display cursor underneath the pol value and then press and hold the ▲ arrow key to drive the feed to its upper end stop. Verify the xx04 series LNB is horizontal with the coax cable towards the left or if using an xx06, xx09 or xx10 series the LNB should be vertical, to the right of the OMT with the coax pointing downwards (the pol reading should be approximately 211 counts). Now press and hold the ▼ arrow key to drive the feed to its lower end stop and verify the xx04 series LNB is horizontal with the coax cables towards the right or if using an xx06, xx09 or xx10 series the LNB should be vertical, to the left of the OMT with the coax pointing upwards (the pol count should be approximately 28 counts).

12. Set the Pol Type to Automatic (auto pol):

    Press and hold the ◀ ▶ arrow keys together until the 'EL Trim' or 'Auto Trim' window is displayed. Push the ▼ arrow key to scroll through the settings until the 'Polang Type' window is displayed and press the ◀ arrow key to activate the window. Now use the ◀ and ▶ arrow keys to scroll the cursor along and use the ▲ and ▼ arrow keys to change the value from "0009" to "0072" and then press the ENTER button to put the system back into Automatic Polang (auto pol) mode.

    Watch the LNB and verify it returns to the correct reception position (while the Pol motor is driving the target light will be illuminated on the DAC).

    ***Note:** If making adjustments to the polarization alignment of a VSAT antenna contacting the NOC afterwards to run through a cross-pol isolation test and calibrating the Pol Offset will be necessary.

13. Save the settings in the DAC-2202:

    Press and hold the ◀ ▶ arrow keys together briefly, "Save New Parameters" will be displayed. Press the ▶ arrow key to activate the window and then press the ENTER button, "Parameters Saved" will be displayed and the pol type and pol offset will be stored in the DAC.