Field Service Spares Replacement Procedure - Pol Motor Kit, Coastal

Approval:

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Revision History

Rev.	ECO	Description of Change	Date
A	9117	Initial release	11-15-2011

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the pol motor on the Coastal series antennas.

2. Checklist:

- Verify Motor Drive
- Drive the Pol from Progterm
- Run the Built-In Test

3. Theory of Operation:

The polarization motor located on the feed assembly of the system is used to counteract roll of the vessel exerted on the system, meaning as the vessel rolls the feed assembly will be driven to maintain the linear polarization look angle to the satellite. Feedback from the sensor(s) is feed into the PCU where the amount of voltage change overtime is calculated into the amount of physical movement being exerted on the system and in turn the PCU will output the drive command to the pol motor to move it the opposite amount of movement therefore maintaining the position of the feed in relation to the satellite signal.

4. Test the Pol Motor Drive:

Pol motor drive can be verified by introducing error into the system which the pol motor will have to counteract. Remove the radome top and unbolt the pedestal from its mounting point, now if you rock the antenna from side to side (when facing the back of the reflector) the pol motor will drive the feed assembly to counteract the motion being exerted on the system.

Note: The Coastal 20, Coastal 24 and Coastal 30 antennas have a phase card installed in the feed horn which reverses the polarity of the system, therefore when you rotate the pedestal to the left the feed will drive left; when you rotate the feed right the feed will drive right. The coastal 18's do not have a phase card in their feed horn therefore when you rotate the system left or right the motor will make adjustments to keep the LNB in the same position.

If it is suspected there is a dead spot in the motor power down the system and gently rotate the axis by moving the belt backwards and forwards. This in turn will rotate the motor pulley and shaft and it should be apparent if there is a dead spot as the rotation will feel taught at that position.

Caution: Be extremely careful rotating the pedestal around while your fingers are in this area to prevent pinching or crushing your fingers in the pedestal assembly.

5. Drive the Pol from Progterm:

If when performing the above test the pol motor doesn't appear to drive correctly its possible this is being caused by a faulty rate sensor which is in turn causing the PCU to drive an incorrect amount in relation to the motion being detected.

To verify this connect a laptop to the antennas control panel using a straight through 9-pin serial cable and open Sea Tel's Progterm software. From the comport settings select "Coastal PCU Direct", once communications have been established the updates from the control panel will be shown in the Progterm window.

Using the "p" command will drive the pol motor. Type "p90" into the Progterm window and press the "enter" key to drive the pol to 90 degrees (you won't see the characters as you type in progterm). Entering "p180" will now drive the pol a further 90 degrees to its end stop, now entering "p0" will drive the pol 180 degrees to its opposite end stop. As these commands are entered verify the motor drives consistently for the correct amount of motion.

6. Run the Built-In Test (BIT):

Coastal PCU software 2.06 and above supports a built in test function used to isolate problems with components in the antenna system. To run the BIT test power off the antenna by pressing the Power button on the control panel, now press and hold the Next button, and then press the Power button. As opposed to initializing the control panel will now display "Built In Test Next to Begin".

Pressing the Next button will run automatically until completed, if no faults are found with the system "BIT Finished No Errors" will be displayed or unless a an error is discovered the test will pause while the specific error is highlighted, this should be recorded for further diagnostics. Pressing next will continue to run the test. Any errors recorded require further diagnostics as per the below information.

6.1. Analogue to Digital Convertor Test.

This test checks for basic communication with the Analogue-to-Digital Converter on the PCU main board. A bad A/D could make all other tests fail.

"Testing ADC" will be displayed as the test runs. An Error code 1.01-1.08 will be displayed if one of these tests fails. If any test fails, replace the PCU and re-run BIT tests.

6.2. Digital to Analogue Convertor Test.

This test checks the basic integrity of the Digital-to-Analogue Converter on the PCU main board by looping back one of its outputs to the D/A.

"Testing DAC" will be displayed as the test runs. An Error code 2.01-2.21 will be displayed if one of these tests fails. If any test fails, replace the PCU and re-run BIT tests.

6.3. Azimuth Motor Drive Test.

This test checks the ability of the motor driver to drive current through the azimuth motor. The current to the motor is controlled by a PWM circuit. The PWM current is repeatedly sampled and statistically analyzed during this test.

"Testing AZ MTR" will be displayed as the test runs. An Error code 3.01-3.17 will be displayed if one of these tests fails.

A failure indicates a defective motor, motor driver PCB or harness. Temporarily connect a spare motor to the PCU in place of the failed motor (or swap the azimuth motor with the pol motor connection at the PCU) to isolate the failure to the PCU or motor. Then re-run the same test.

If the test passes, replace the failed motor (if you swapped the azimuth and pol motor connections and the pol motor test did not fail) and rerun the BIT tests.

If the test fails, replace the PCU and re-run the BIT tests.

6.4. Elevation Motor Drive Test.

This test checks the ability of the motor driver to drive current through the Elevation motor. The current to the motor is controlled by a PWM circuit. The PWM current is repeatedly sampled and statistically analyzed during this test.

"Testing EL MTR" will be displayed as the test runs. An Error code 4.01-4.17 will be displayed if one of these tests fails.

A failure indicates a failed motor, motor driver PCB or harness. Temporarily connect a spare motor to the PCU in place of the failed motor (or swap the elevation motor with the azimuth motor connection at the PCU) to isolate the failure to the PCU or motor. Then re-run the same test.

If the test passes, replace the failed motor (if you swapped the elevation and azimuth motor connections and the azimuth motor test did not fail) and rerun the BIT tests.

If the test fails, replace the PCU and re-run the BIT tests.

6.5. POL Motor Driver Test.

This test checks the ability of the motor driver to drive current through the pol motor. The current to the motor is controlled by a PWM circuit. The PWM current is repeatedly sampled and statistically analyzed during this test. "Testing POL MTR" will be displayed as the test runs. An Error code 5.01-5.17 will be displayed if one of these tests fails.

A failure indicates a failed motor, motor driver PCB or harness. Temporarily connect a spare motor to the PCU in place of the failed motor (or swap the POL motor with the AZ motor connection at the PCU) to isolate the failure to the PCU or motor. Then re-run the same test.

If the test passes, replace the failed motor (if you swapped motors the other motor test will not fail) and rerun the BIT tests.

If the test fails, replace the PCU and re-run the BIT tests.

6.6. Sensor Test.

This test checks for null sensor offsets for a level, motionless system. The checks have fairly wide pass/fail criteria, but can still fail if pedestal is in motion or out of level more than a few degrees.

"Test Sensor Bias" will be displayed as the test runs. An Error code 6.01-6.05 will be displayed if one of these tests fails. If any test fails, replace the PCU and re-run BIT tests.

6.7. Azimuth Move / Rate Sensor Test.

This test command moves the dish at various speeds in azimuth and checks the results using the azimutrh rate sensor. "Test AZ Sensor" will be displayed as the test runs. An Error code 7.01-7.05 will be displayed if one of these tests fails. An error indicates a motor drive rate or sensor failure. This could be due to:

1. Mechanical binding of the pedestal or the azimuth bearing - With the power off, visually inspect the antenna and radome (inside of base and top) for drag against the radome or binding/fouling of pedestal in the antenna cables or against the cable connector bracket. Rotate the antenna in azimuth by hand to feel for any binding in the azimuth axis. Re-route cables and/or bend connector bracket to remove fouling with the pedestal. If the pedestal is dragging inside the radome itself or if the azimuth bearing has failed, the radome and/or pedestal will have to be replaced. If this check found a problem and you have corrected it, re-run the BIT tests.
2. Azimuth belt dragging, or slipping - Inspect the azimuth drive belt for chaffing or wear (leaves black dust). Inspect the azimuth drive belt for proper tension (belt should be taught when pinched in on both sides of the azimuth motor drive sprocket, it should not flex more than 1/16th inch on both sides when pinched. Re-align and tension the motor for correct belt path and tension. If this check found a problem and you have corrected it, re-run the BIT tests.
3. Azimuth motor failure - Replace the azimuth motor and re-run the BIT tests.
4. Azimuth drive or azimuth rate sensor failure - Replace the PCU and re-run the BIT tests.

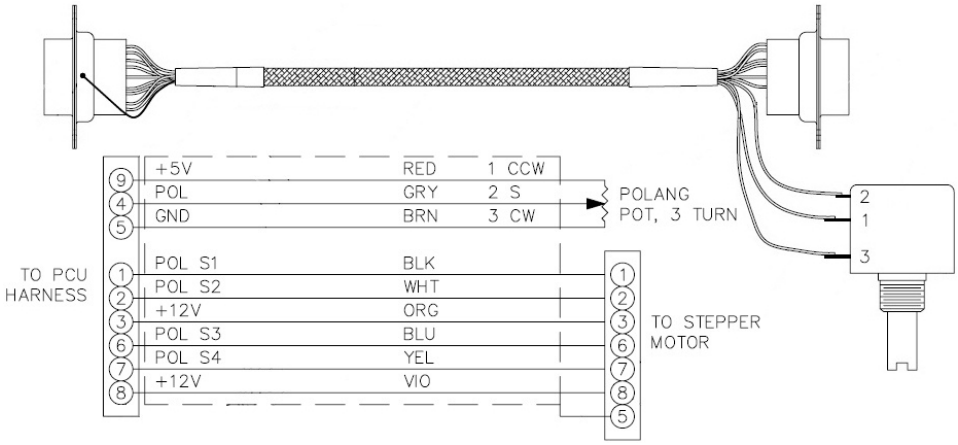
6.8. Pol Pot / Motor Move Test.

This test moves the feed assembly at various speeds in Polarization and checks the results using the POL potentiometer. "Test POL Assy" will be displayed as the test runs. An Error code 8.01-8.07 will be displayed if one of these tests fails. A failure indicates a failed motor, belt or potentiometer. This could be due to:

1. Mechanical binding of the polarization assembly - With the antenna powered down, visually inspect the polarization assembly (including LNB and cables) for drag against the pedestal or dish. Rotate the polarization assembly by hand to feel for any binding in rotation. Re-route cables to remove fouling with the pedestal. If binding is felt, remove motor belt and re-check binding. If the polarization assembly is still binding (indicating bearing failure) it must be replaced. If this check found a problem, and you have corrected it, re-run the BIT tests.

2. Pol drive belt or pol pot drive belt dragging or slipping - Inspect drive belts for chaffing or wear (leaves black dust). Inspect the drive belts proper tension (belts should be semi-taut when pinched in on both sides of the motor drive sprocket or pot drive sprocket. The belts should not flex more than 1/16th inch on both sides when pinched). Re-align and tension the motor and pot for correct belt path and tension. If this check found a problem, and you have corrected it, re-run the BIT tests.
3. Rotate the polarization assembly to center of its mechanical range (LNB vertical) and observe while BIT test runs. If the pol motor does not drive during the test, replace the pol motor and re-run the BIT tests. If the polang potentiometer (pol pot) is mounted out of position or has failed, rotate the polarization assembly to the center of its mechanical range. Loosen pot mounting bracket to de-couple the belt and rotate the pot sprocket. If the sprocket is loose on the shaft of the pot, tighten the set screws. If the pot does not rotate, replace it.

Check continuity of the pot from the wiper and both the clockwise and counter-clockwise contacts. Clockwise to counter-clockwise ends and vice versa, a steady resistance from 0 – 5 or 5 – 0 ohms should be measured (depending on the direction of rotation) from wiper to clockwise, or counter-clockwise, to verify proper operation. The pot is a three turn potentiometer, rotate the sprocket to find one end stop and then rotate it exactly 1 ½ turns away from that stop to the center of rotation. Hold the sprocket in place while re-coupling the belt, tension the belt as you tighten the pot mounting bracket. If this check found a problem, and you have corrected it, re-run the BIT tests.



Check the harness for good continuity from point-to-point and that there are no shorts from wire-to-wire or from wire-to-ground that are not supposed to be there as per the above diagram. Repair any harness problems found and re-run the BIT tests. If there are no problems with any of the steps above, replace the PCU and re-run the BIT tests.

7. Procedure for Replacing the Pol Motor:

7.1. Tools.

- #1 Phillips Screwdriver
- 7/64" Allen Wrench/Key
- 9/64" Allen Wrench/Key
- 3/16" Wrench/Spanner
- 1/16" Allen Wrench/Key
- Long-Nose Pliers
- Tie Wraps/Cable Ties
- Loctite 222, 242, and 638

7.2. Procedure.

Procedure for replacing the pol motor on the Coastal series antennas, Sea Tel kit part number: 125266-1 (motor part number: 124700).

***Caution:** Power down the pedestal before following this procedure. 1. Using a #1 Phillips screwdriver remove the two screws securing the pol harness into the 9-pin connector. Save the hardware for future use.	
2. Disconnect the screw securing the pol motor connector bracket to the feed using a 7/64" Allen wrench.	
3. Using a 9/64" Allen wrench remove the 3 screws securing the pol motor to the feed assembly. Take care not to lose the spacers and washers/nuts behind the feed. Save the hardware for future use.	
4. Using a pair of 3/16" Allen wrenches remove the standoffs securing the pol motor connector to the bracket. Fit the bracket to the replacement motor using the hardware removed from the original assembly. ***Note:** If two 3/16" wrenches aren't available a pair of long-nose pliers can be used.	

5. In the same orientation as on the defective motor install the new pulley to the replacement motor, applying Loctite 638 to the shaft. Apply Loctite 222 to the set screw and install it into the pulley, making sure it's aligned with the flat edge of the motor shaft. Tighten the set screw using a 1/16" Allen wrench. ***Note:** For further information refer to the Loctite Procedure 121730 provided with this kit.	
6. Apply Loctite 242 to the 3 screws and install the replacement motor assembly, making sure the spaces are used in between the motor and feed. Take care to secure the nuts behind the feed to prevent losing them.	
7. Install the screw and lock washer to secure the pol motor connector bracket to the feed, apply Loctite 242 to the thread.	
8. Install the pol harness to the connector; apply Loctite 242 to the two screws removed in step 1.	
9. Secure the pol motor cable to the body of the motor using a cable tie.