

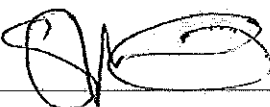


Field Service Spares Replacement Procedure – Pol Pot Kit, 4012,

Approval:

Approving Authority	Signature	Date
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Revision History

Rev.	ECO	Description of Change	Date
A	9487	Initial release	04-27-2012

Field Service Procedure – Replacement Pol Pot Kit, 4012

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the pol pot on the 4012 antenna.

2. Checklist:

- Verify Range of Motion
- Verify Pot Feedback
- Measure Resistance

3. Theory of Operation:

A polang potentiometer is used to provide a feedback reference for the position of the feed assembly for linear polarization. The pot acts as a potential divider giving an output voltage which varies from 0VDC to 5VDC throughout the feed assembly's 270 degree range of motion. The 4012 antenna has a phase card installed in the feed horn which will reflect the signal meaning for each 0.5 degree of physical rotation of the feed the change in signal will be 1.0 degree meaning that the feed assembly of the 4012 antenna only has to physically drive 135 degrees to view the full 270 degrees of rotation.

The ICU converts the voltage output from the pot into the numerical value to align the feed in the required position based on the vessels GPS location and the look angle to the required satellite. A failure with the pot will cause it to output an incorrect voltage will result in the feed assembly not being aligned correctly causing bad cross pol isolation.

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 MXP and that the antenna won't target correctly. It will sit 8 degrees above (or 8 degrees below at high elevation look angles) the satellites elevation look angle. As part of the antennas targeting procedure the system will target 8 degrees above (or 8 degrees below at high elevation look angles) the satellite, calculate the auto threshold setting based on the noise floor level and then align the feed for the correct reception position based on the vessels GPS location and the lookup table. If the system is unable to drive the pol motor to obtain the correct feedback, or if the pot has failed and won't give the correct feedback, the antenna can't complete the target process and the antenna will stay in this position. Setting the pol setting to manual will make the antenna target by removing the automatic function from the targeting process; however the miss alignment of the feed will cause bad cross pol isolation.

Page 1 of 16	Sea Tel COBHAM	Document No 136829 Rev A
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Field Service Procedure – Replacement Pol Pot Kit, 4012

4. Verify the Pol Pots Calibration:

To verify if the 4012 antennas polarity function is calibrated and operating correctly drive the pol to verify that the feed is aligned correctly (the pol pot is correctly calibrated) and also that the pot is outputting the correct resistances throughout its range. This will also verify if the pol motor is driving correctly.

Log into the MXP and from the configuration menu select the "Reflector" page from the configuration section and verify the polang drive option is set to "Automatic".

Polang

Drive Auto Manual

Linear Offset deg

Circular Offset deg

Now select the "Position Antenna" screen from the tools window and configure the satellite settings as follows:

- Longitude = Enter the longitudinal value of your current GPS location. I.e. if your current location is 1 degree west of GMT enter "1.0 W" into the longitude of the satellite parameters.
- TX Polarity = HORZ

Now press the submit button (as shown below).

Satellite

Longitude Tx Polarity

Frequency MHz Band

Skew deg Reflector Primary Secondary

Search Pattern LNB XPol CoPol

Threshold Auto mode On Off

Auto offset

Threshold

The antenna will now target the desired position and align the feed accordingly. Once the antenna has stopped targeting, turn off the tracking function to prevent it from going into a search.

Field Service Procedure – Replacement Pol Pot Kit, 4012

View the feed horn and verify that the alignment pins of the phase card are aligned vertically (on the top and bottom of the feed horn) you should also notice the tam mounting screws are parallel with each other as shown below...



Any error in alignment is an indication that the pol pot is not correctly calibrated. However a small amount of error could be calibrated out by using the linear offset setting (to electronically adjust the pol position).

If it's deemed there is a large amount of error then calibrating the pol pot will be required as per Fig. 22 to Fig. 27 in section 8 of this document.

If no drive was issued the function of the 24VDC polang motor should be verified as per section 7 of this document.

5. Verify the Feed Assemblies Range of Motion:

To verify if the 4012 antennas polarity function is calibrated correctly refer to section 3 of this document.

Once verified that the pot is calibrated the next step will be to verify that the system has the full range of motion (135 degrees of physical rotation), verifying that the pol pot is outputting the correct resistance through its range and also that the pol motor is driving the assembly correctly.

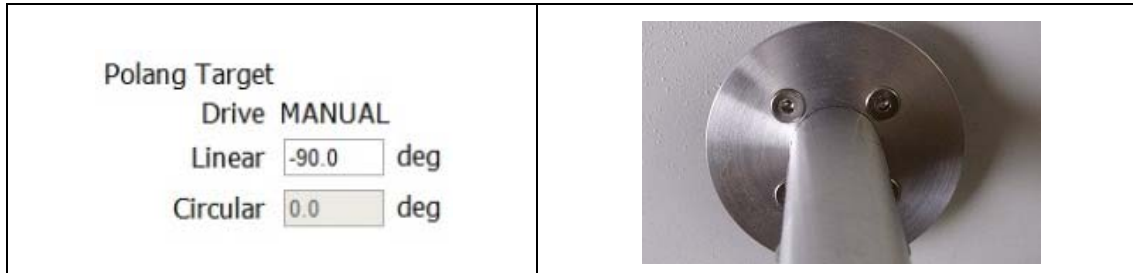
1. To verify the range of motion on the feed assembly enter into the "Reflector" screen under the configuration options and set the polang drive mode to manual and click the save button.

Polang
Drive Auto Manual
Linear Offset deg
Circular Offset deg

This will now give you the ability to manually drive the pol as opposed to the feed automatically aligning itself based on the vessels GPS location and the look angle to the desired satellite.

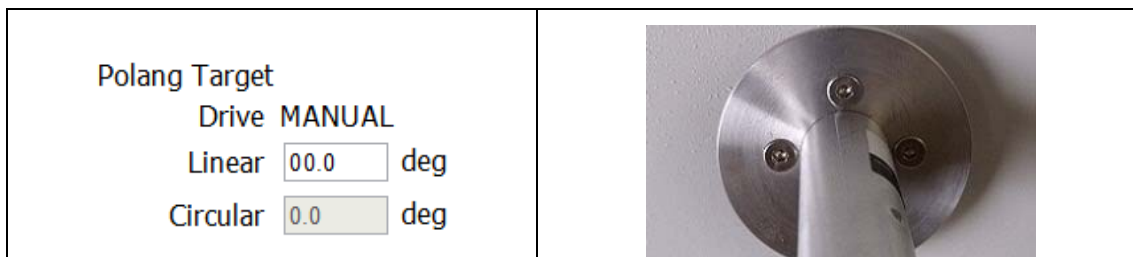
2. Now enter into the "Position Antenna" screen from the tools menu and enter the value "-90.0" into the linear window of the polang target option and press the enter key on the keyboard.

Field Service Procedure – Replacement Pol Pot Kit, 4012



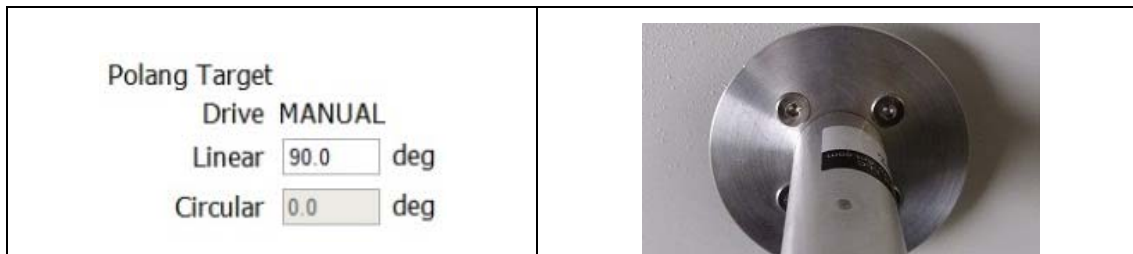
The feed horn should rotate 45.0 degrees clockwise (when viewed from the front of the reflector) so that the alignment marks of the phase card in the feed horn are aligned vertically, from left to right (as shown above).

3. Now enter into the value "00.0" into the linear window of the polang target option and press the enter key on the keyboard.



The feed horn should rotate 45.0 degrees counter-clockwise (when viewed from the front of the reflector) so that the alignment marks of the phase card in the feed horn are aligned diagonally in a north/east position (as shown above).

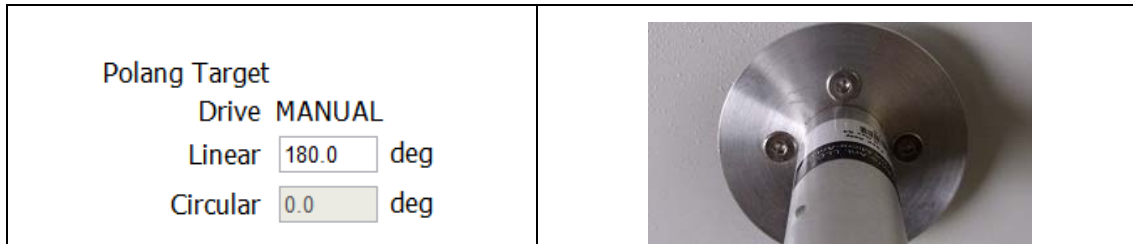
4. Now enter into the value "90.0" into the linear window of the polang target option and press the enter key on the keyboard.



The feed horn should rotate 45.0 degrees clockwise (when viewed from the front of the reflector) so that the alignment marks of the phase card in the feed horn are aligned horizontally, from top to bottom (as shown above).

Field Service Procedure – Replacement Pol Pot Kit, 4012

- Now enter into the value "180.0" into the linear window of the polang target option and press the enter key on the keyboard.



The feed horn should rotate 90.0 degrees clockwise (when viewed from the front of the reflector) so that the alignment marks of the phase card in the feed horn are aligned diagonally, in a north/west position (as shown above).

- If the system completes all of the above tests than the polang assembly is operating correctly.
Set the antenna back into automatic polang mode by entering into the "Reflector" screen under the configuration options and set the polang drive mode to "Automatic" and click the save button.



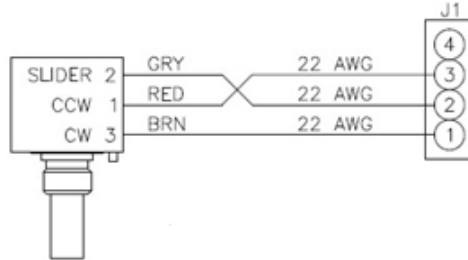
The antenna will now automatically calculate the correct reception position for the feed based on the vessels GPS location and the look angle to the desired satellite.

Should the feed assembly drive, but not target the correct position this is an indication that the pol pot is not calculating the feedback correctly and its resistance should be verified as per section 6 of this document.

Field Service Procedure – Replacement Pol Pot Kit, 4012

6. Verify the Resistance of the Pol Pot:

The polang potentiometer (pol pot) consists of an internal slider as well as a clockwise and counter-clockwise contact. To verify the resistance of the pot a multi meter can be used to measure between the slider and one of the wipers whilst rotating the shaft through its range and verifying the 0 – 5 ohms is outputted correctly. Remove the pot from the RF cage as per the replacement procedure of this document and measure the resistance.



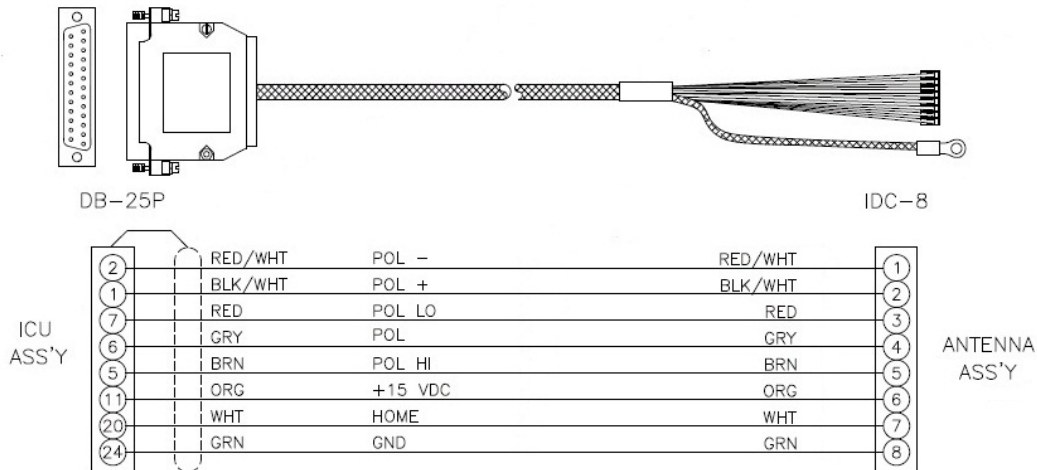
<p>Looking down onto the shaft of the pot rotate it clockwise until it reaches its end stop.</p> <p>Now measure the resistance between the slider and the CCW contact (grey cable, pin 2 on the IDC connector and the red cable pin 3 on the IDC connector).</p> <p>The feedback should be approximately 5k ohms.</p>	
<p>Now slowly rotate the shaft of the pot counter clockwise, the reading should count down sequentially. After one and a half turns the pot will be in the center of its range giving a resistance of approximately 2.5k ohms.</p>	
<p>Continue to rotate the pot until the counter clockwise end stop (it will now have turned through all 3 rotations of its range), the resistance should be approximately 0 ohms.</p>	

Leaving the pot at its counter clockwise end stop measure between the clockwise contact and the slider (grey cable, pin 2 on the IDC connector and the brown cable pin 1 on the IDC connector) the resistance should be reversed from the previous rotation, reading 5 ohms. Rotating the shaft of the pot clockwise should reduce the resistance through its range to 0 ohms. Any error with the pot not giving the correct resistance is an indication the pot is defective and needs replacing.

Field Service Procedure – Replacement Pol Pot Kit, 4012

7. Measure Motor Voltage:

Leaving the polang setting in manual mode 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 ICU main PCB isn't outputting the voltage to drive the motor and needs replacing. As long as the pol range is within the pot limits the ICU will issue the voltage to drive the motor based on the antenna targeting, a change in the vessels GPS position or operator inputs. 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 and calibrated correctly). Therefore there is also the possibility for a pol drive fault to be caused by the ICU motherboard PCB.

Field Service Procedure – Replacement Pol Pot Kit, 4012




8. Replacing the 4012 Pol Pot Assembly:

8.1. Tools.


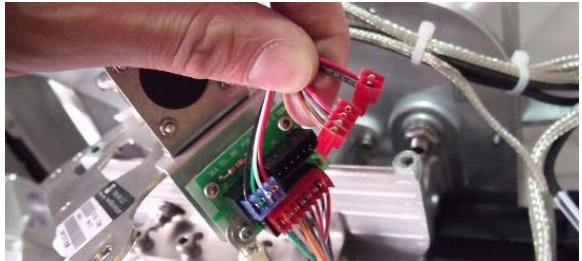

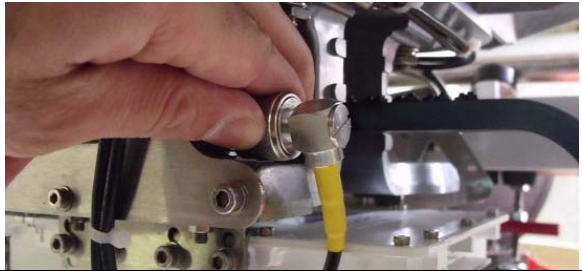

- 2.5mm Allen Wrench/Key
- 4mm Allen wrench/Key
- Snips/Cutters
- 17mm Wrench/Spanner
- 3mm Allen Wrench/Key
- 2mm Flat Blade (Terminal) Screwdriver
- Ruler/Straight Edge
- Cable Ties/Tie Wraps
- Loctite 242

8.2. Procedure.

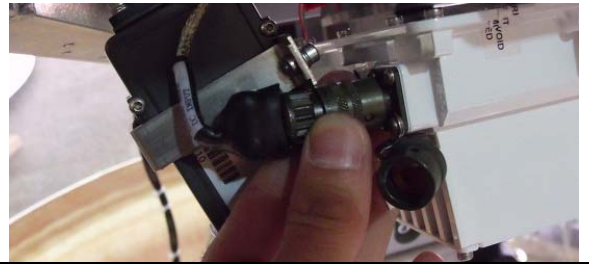


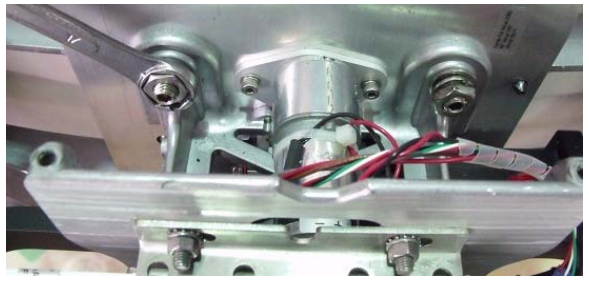

Procedure for replacing the pol pot, Sea Tel kit part number: 136741 (pol pot part number: 115425-6).

<p>*Caution: Power down the pedestal before following this procedure.</p> <p>1. Using a 2.5mm Allen wrench remove the four screws securing the feed horn to the front of the reflector and remove the feed horn. Save the hardware for futures use.</p>	
<p>2. Disconnect the military spec connector from its socket to allow access to the screws to remove the upper bracket.</p>	
<p>3. Remove the 5 screws which securing the mounting plate with the cannon connection and IDC connection PCB to the RF cage. Retain the hardware for future use.</p> <p>*Note: The mounting plate will remain attached to the harness while the RF cage is removed from the rear of the reflector.</p>	


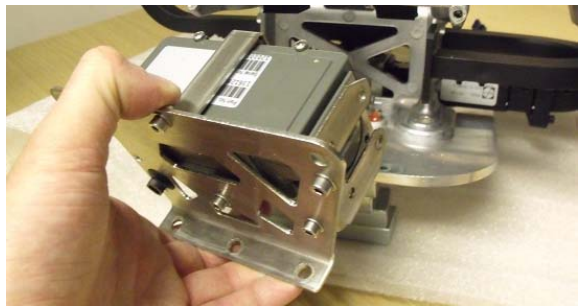

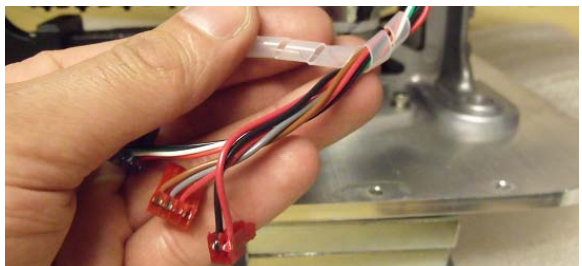
Field Service Procedure – Replacement Pol Pot Kit, 4012

<p>4. Snip the cable tie securing the RF cage harness to the mounting plate</p>	
<p>5. Disconnect the pol pot, pol motor and optical switch IDC connections from the termination block on the</p>	
<p>6. Disconnect the orange coax cable from the X-Pol LNB.</p>	
<p>7. Disconnect the yellow coax cable from the Co-Pol LNB, mounted on the underside of the RF cage.</p>	
<p>8. Snip the cable tie securing the receive coax cables to the RF cage.</p>	

Field Service Procedure – Replacement Pol Pot Kit, 4012

<p>9. Disconnect the DC power connection from the BUC (also mounted on the underside of the RF cage).</p>	
<p>10. Disconnect the TX IF coax cable from the BUC.</p>	
<p>11. Unwind the harness from around the RF cage and set it over the cross level beam to allow removal of the RF cage from the rear of the reflector.</p>	
<p>12. Using a 17mm wrench remove the four mounting nuts and washers securing the RF cage from the back of the reflector. Save the hardware for future use.</p> <p>13. Support the weight of the RF cage while removing it from the rear of the reflector.</p>	
<p>14. Using a 3mm Allen wrench remove the 4 screws from the waveguide flange mated to the Co-Pol LNB. Save the hardware for future use.</p>	

Field Service Procedure – Replacement Pol Pot Kit, 4012

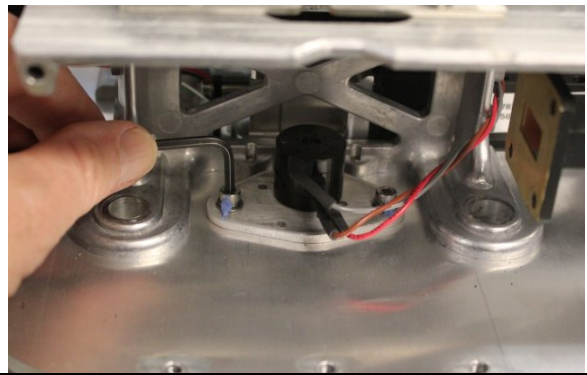
<p>15. Using a 4mm Allen wrench remove the 5 screws securing the bracket to the RF cage. Save the hardware for future use.</p> <p>*Note: The four 3mm screws do not need to be removed to gain access to the pol pot.</p>	
<p>16. Remove the bracket along with the Co-Pol LNB as a complete assembly to allow access to the pol pot assembly.</p>	
<p>17. Using a 3mm Allen wrench loosed the pol motor screws enough to allow the backlash gear to be disengaged from the main sprocket.</p>	
<p>18. Remove the cable wrap to free the pol pot harness so the assembly can be removed.</p>	

Field Service Procedure – Replacement Pol Pot Kit, 4012

19. Use a 3mm Allen wrench to remove the 2 screws that mount the pol pot assembly to the bottom plate of the RF cage. Retain the hardware for future use.

20. Pull the failed pot forward and lift it up to remove the defective pol pot assembly.

21. Install the replacement pol pot assembly in the same manner, applying Loctite 242 to the threads. Do not fully tighten the screws at this time.



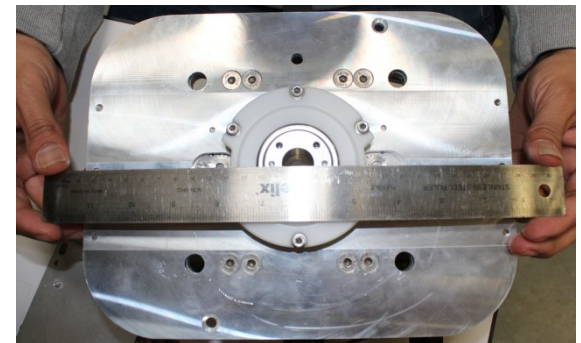
22. Flip the RF cage over to expose the feed/motor/pot gears.

23. Connect your multi-meter and measure the resistance across, the red and grey wire connections in the IDC connector Using needle point probes, or wires inserted into the IDC connector pins.

24. Set the multi-meter to Ohms/Resistance function.

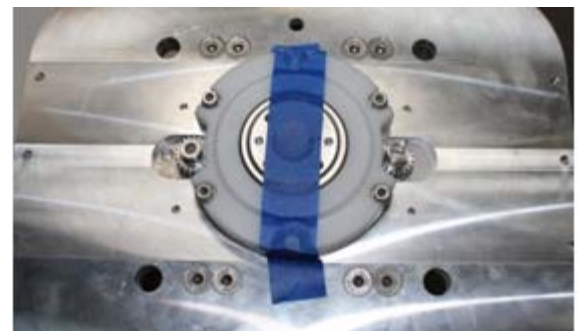


25. The picture to the right is the view looking down on the assembly. You will rotate the feed throat by hand as needed to align the 2 alignment pin holes with the 2 outer holes in the long axis of the RF Cage mounting plate. Use a ruler (straightedge) to align the pins with center threaded holes on outer edge of the long axis of the RF Cage Mounting Plate.



26. While holding the feed in alignment, carefully cover the port with tape to prevent it from rotating and to keep any debris from accidentally entering the feed. Verify that the feed is still properly aligned.

27. Rotate the backlash gear (pot shaft) to a measure resistance of 3050 +/- 50 ohms on the multi-meter.



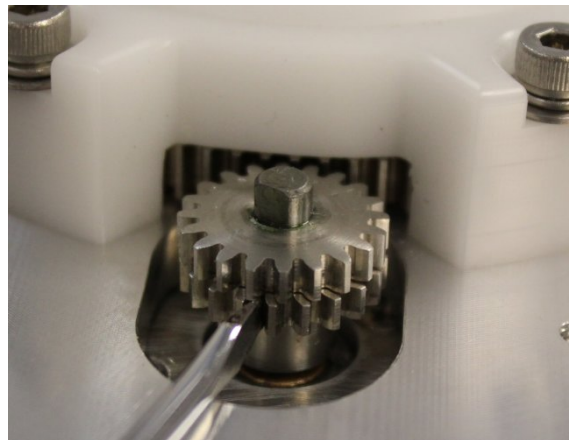
Field Service Procedure – Replacement Pol Pot Kit, 4012

28. Use a screwdriver to hold the bottom half of the backlash gear (pot shaft) steady while rotating the top half CW one tooth (against the spring action) and push the pot assembly forward to mate into the driven gear in the feed.

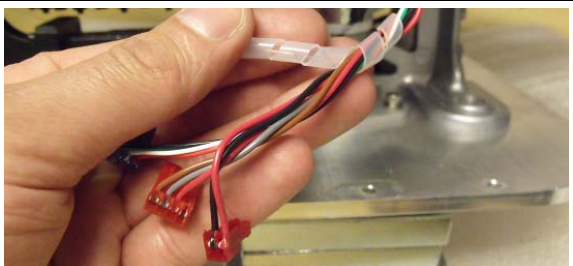
29. Hold tension against the pot bracket, and while assuring that the pot resistance reading is still 3050 +/- 50 ohms, tighten the mounting screws.

30. If the pot resistance is not 3050 +/- 50 ohms, repeat steps 23-29 until the proper reading is achieved at exact feed alignment.

31. Remove the tape from the feed and verify alignment and resistance when exactly aligned. If correct, this completes calibration of the assembly.



32. Route the pot wires through the RF cage where they will not be pinched when re-installing the side bracket and install the harnesses back into the wrap removed in step 18.

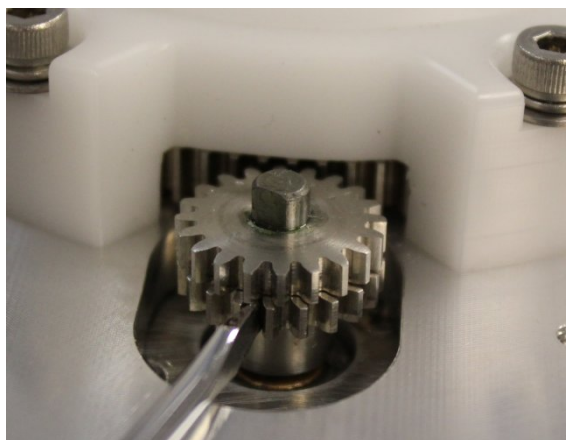


33. Flip the RF cage over to expose the pol motor backlash gear.

34. Use a small flat blade screwdriver to hold the bottom half of the backlash gear steady while rotating the top half CW one tooth (against the spring action) and push the motor assembly forward to mate into the driven gear in the feed.

35. Once engaged tighten the screws securing the pol motor to the bottom plate of the RF cage using a 3mm Allen wrench. Apply Loctite 242 to the threads.

***Note:** Precise alignment of the feed is not required when re-coupling the motor.

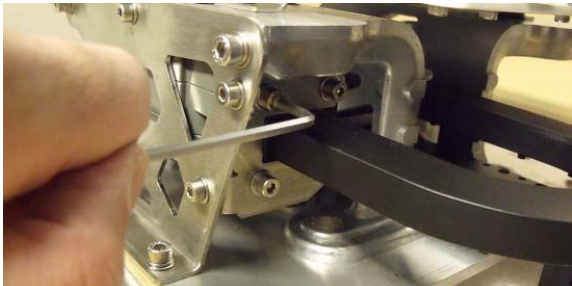
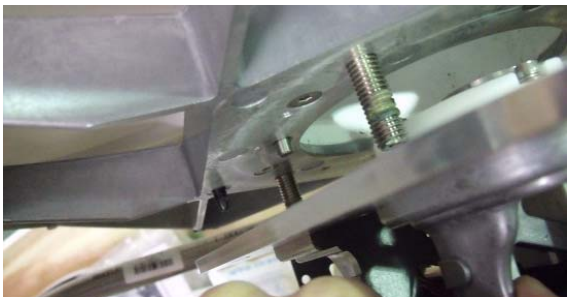





36. Install the Co-Pol LNB and bracket assembly to the RF cage using the 5 screws removed in step 15 and a 4mm Allen wrench. Apply Loctite 242 to the threads, do not fully tighten at this time.

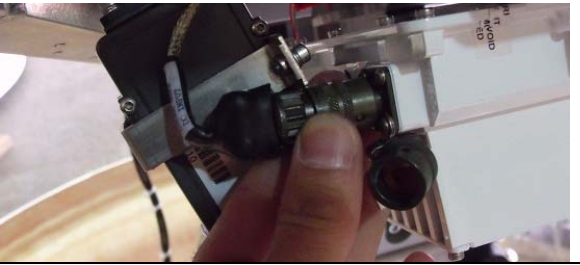
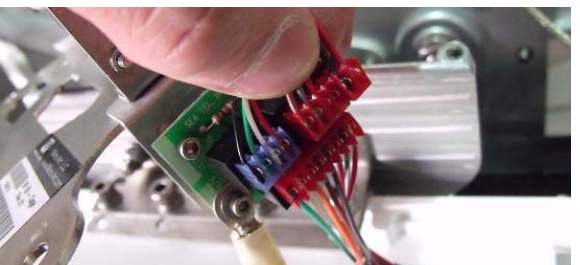
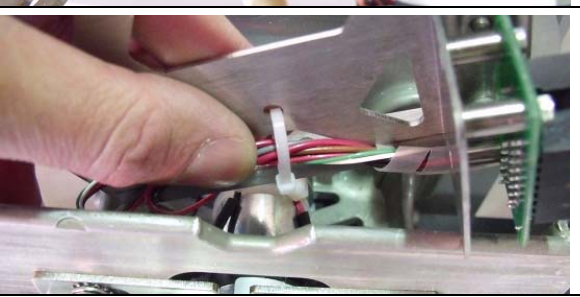


***Note:** Ensure the waveguide bracket is installed on the outside of the flange so the 5 mounting points align correctly.




Field Service Procedure – Replacement Pol Pot Kit, 4012

<p>37. Install the four screws removed in step 14 to secure the waveguide flange to the Co-Pol LNB ensuring the LNB is correctly aligned. Apply loctite 242 to the threads.</p>	
<p>38. Locate the RF cage onto the rear of the reflector. *Note: When reinstalling the RF cage ensure that it is oriented correctly so that the alignment pin on the left side of the reflector will locate into the hole on the back of the RF cage. (In this orientation the X-Pol LNB will be on the right of the RF cage).</p>	
<p>39. Using the hardware removed in step 12 secure the RF cage to the rear of the reflector using a 17mm wrench. Apply Loctite 242 to the threads.</p>	
<p>40. Route the harness assembly back over the RF cage and connect the following connections: 41. Connect the orange coax cable to the X-Pol LNB (on the right of the BUC). 42. Connect the yellow coax cable to the Co-Pol LNB (underneath the BUC). 43. Connect the black, TX IF cable to the BUC.</p>	
<p>44. Secure the coax cables to the underside of the RF cage using cable ties.</p>	

Field Service Procedure – Replacement Pol Pot Kit, 4012

<p>45. Route the BUC DC power cable around between X-Pol LNB and the RF cage and connect it to the BUC.</p>	
<p>46. Sit the upper bracket on top of the RF cage and reconnect the IDC connectors with the 4-pin sensor connector on the left, the 5-pin pot connector in the center and the 2-pin motor connector on the right (as shown in the image on the right).</p>	
<p>47. Secure the pot, motor and sensor harness to the underside of the upper bracket using a cable tie.</p>	
<p>48. Using the hardware removed in step 3 secure the upper bracket to the RF cage, tightening with a 4mm Allen wrench. Apply Loctite 242 to the threads.</p>	
<p>49. Reconnect the military spec connector to its mounting bracket.</p>	

Field Service Procedure – Replacement Pol Pot Kit, 4012

<p>50. Reinstall the feed horn using the hardware removed in step 1, tighten with a 2.5mm Allen wrench. Apply Loctite 242 to the threads.</p> <p>*Note: The feed horn has alignment pins located in it to so it can only be installed with the phase card in the correct orientation. Verify these are in the correct position when installing.</p>	
<p>51. Access the configuration – reflector page to adjust the linear offset value by the amount of change in skew.</p> <p>*Example: The amount of change in skew was +2 degrees, so you need to add that amount to whatever value is currently in the linear offset field. If the change in skew is a negative value, you will subtract from the value in the linear offset field.</p>	<p>Polang</p> <p>Drive <input checked="" type="radio"/> Auto <input type="radio"/> Manual</p> <p>Linear Offset <input type="text" value="0.0"/> deg</p> <p>Circular Offset <input type="text" value="0.0"/> deg</p>
<p>Save the final linear offset value.</p> <p>Log out of the MXP.</p>	