Field Service Spares Replacement Procedure – Pol Pot Kit, USAT

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 pot on the USAT series antennas.

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 180 degree range of motion. The PCU converts the voltage output from the pot into the numerical value displayed on the DAC. A failure with the pot causing 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 DAC and the antenna won't target correctly. It will sit 8 degrees above the satellites elevation look angle. As part of the antennas targeting procedure the system will target 8 degrees above 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 in the DAC. 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 type to "0009" will make the antenna target by removing the auto pol function from the targeting process; however the miss alignment of the feed will cause bad cross pol isolation.

4. Verify the Range of Motion:

Note: Do not try to drive the polarity of the antenna using the pol window of the DAC, remote commands must be used. Also no update on the pol value will be displayed on the DAC when the pot is rotated; it works solely from drive commands entered into the remote command screen.

First 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 a USAT antenna is 0030 (however this may have been modified slightly to "trim" the pol angle). Turn tracking off (if applicable) and drive the elevation to 0 degrees to make it easier to view the feed assembly for diagnostic purposes.

Set the pol type in the setup menu of the DAC to "0009" to set the mode of the pol assembly to manual.

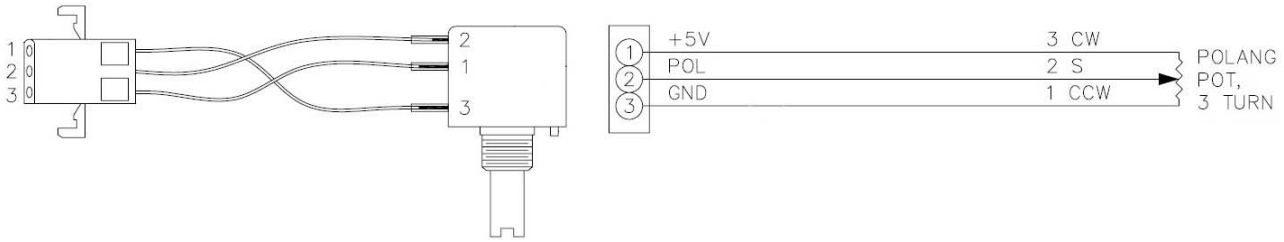
Now enter the remote command window (in the setup menu) and input the command "g0020" to drive the feed assembly to its lower limit. The LNB should be vertical, to the left of the OMT with the coax cable pointing downwards.

Now drive the feed to its upper limit by inputting "g0210" into the remote command screen of the DAC. The LNB should be, vertical to the right of the OMT with the coax cable pointing upwards.

If the feed doesn't have the full 180 degrees of rotation verify the resistance of the pot as per the following procedure.

5. Verify the Resistance of the Pol Pot:

The polang potentiometer (pol pot) consists of an internal slider as well as a clockwise and Ccounter-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 while rotating the shaft through its range and verifying the 0 – 5 ohms is outputted correctly. Disconnect the pot's reflector harness connector from the pol pots connection.



Looking down onto the shaft of the pot rotate it clockwise until it reaches its end stop. Now measure the resistance between the slider and the counter-clockwise contact (grey cable, pin 2 and the red cable, pin 3). The feedback should be approximately 5k ohms.	
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.	
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.	

Leaving the pot at its counter clockwise end stop measure between the clockwise contact and the slider (the grey cable pin 2 and the black cable pin 1). 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.

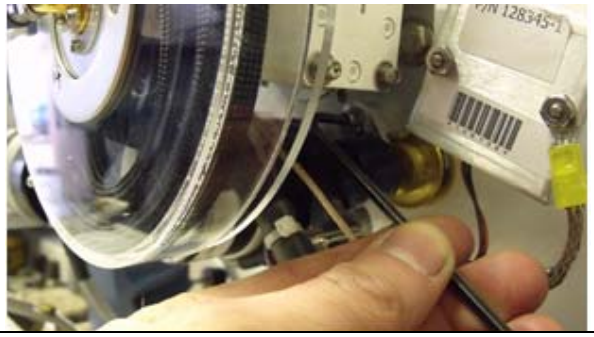
6. Replacing the Pol Pot Assembly:

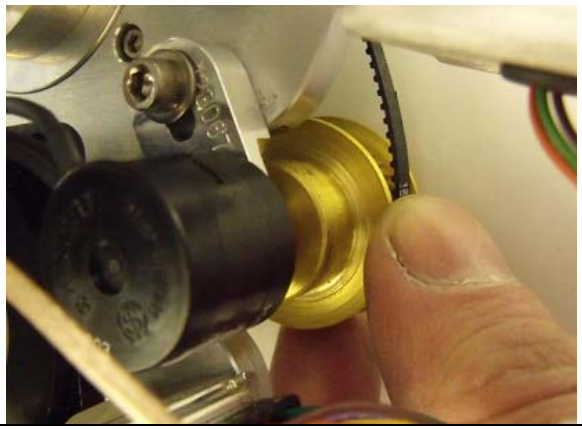
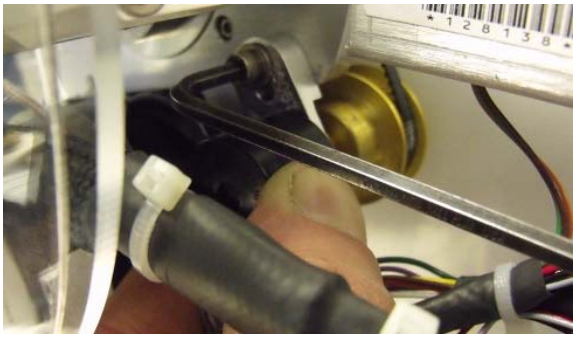
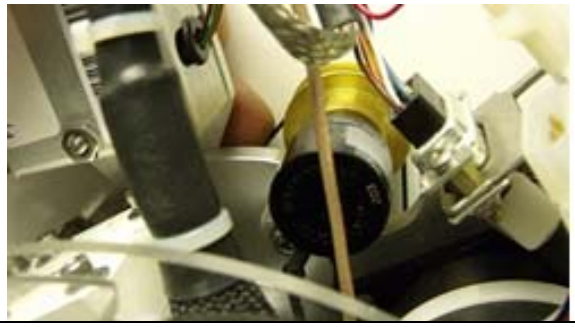
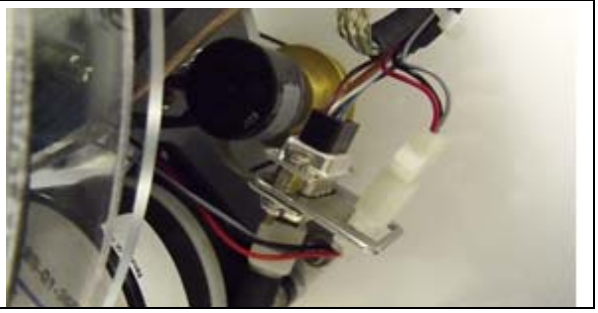
6.1. Tools.

- 9/64" Allen Wrench/Key
- 12mm Wrench/Spanner
- 1/16" Wrench/Spanner
- Loctite 222, 242 and 638

6.2. Procedure.

Procedure for replacing the pol pot, Sea Tel kit part number: 134918 (pol pot part number: 128915-1).

***Caution:** Power down the pedestal before following this procedure. 1. Disconnect the reflector harness connector from the pol pot connection and then compress the retaining clips to remove the pol pot connector from its mounting bracket.	
2. Locate the pol pot on the feed assembly and remove it using a 9/64" Allen wrench. The pot is secured via a single screw, washer and star washer, save the hardware for future use.	
3. Now using the parts supplied in the kit build up the replacement pol pot assembly. First install the bracket to the pot and secure the nut using a 12mm wrench. ***Note:** The orientation of the bracket and the position it's installed in, in relation to the pol pots cables. 4. Now install the pulley, applying Loctite 638 to the shaft. Apply Loctite 222 to the set screws and tighten using a 1/16" Allen wrench. Use the defective pot as a reference to ensure the pulley is installed in the correct position.	

5. The rotation of the pol pot consists of 3 complete revolutions. When installing the pot it's good practice to set it in the center of its range (1.5 turns from one of its end stops) while aligning the feed in the centre of its range (so that the LNB is horizontal with the coax cable pointing towards the left). This means the calibration of the pot will only require minimal adjustment and prevent damage to the assembly by allowing it to drive into one of its mechanical end stops (which is possible if there is a large amount of error in the pot alignment).	
6. Install the replacement pot assembly onto the feed by looping the pulley through the belt. Then install the flat washer, followed by the star washer onto the retaining screw and apply Loctite 242 to the thread. Pull down on the assembly to tension the belt and tighten the retaining screw. ***Note:*** Additional mounting hardware is provided in the kit should it be required.	
7. Verify the tension of the belt by pressing on it at the central position between the pol pot pulley and the main drive sprocket. There should be a little give, but the belt should be tight enough that the axis will drive correctly, without skipping on the teeth of the pulley. If the belt is too tight/loose repeat the previous step until the belt tension is correct.	
8. Install the pol pots harness connection into its mounting point and connect the reflector harness to the pol pot connector. 9. Refer to the following calibration procedure to align the potentiometer.	

7. Pol Pot Alignment and Verification:

***Note:** Do not try to drive the polarity of the antenna using the pol window of the DAC, remote commands must be used.

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 again to display the "Pol Offset" window. Verify the pol offset is set to "0030", if not 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 to "0030" and press the ENTER button.

4. Now press the ENTER button again to display the "Pol Scale" window. Verify the pol scale is set to "0090", if not 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 to "0030" and press the ENTER button.

   ***Note:** If the pol offset was set to another value other than "0090" the feed won't have the full 180 degrees of rotation which would have caused alignment issues. If this was the case set the pol scale to '0090' and repeat the "verify the range of motion" test at the beginning of this procedure.

5. Now keep pressing the ENTER button until the "Remote Command" window is displayed and press the ◄ arrow key to activate the window. Now use the ◄ and ► arrow keys to scroll along and the ▲ or ▼ arrow keys to change the characters to read "g0120" and press the ENTER button to send the command to drive the feed assembly to the center of its range.

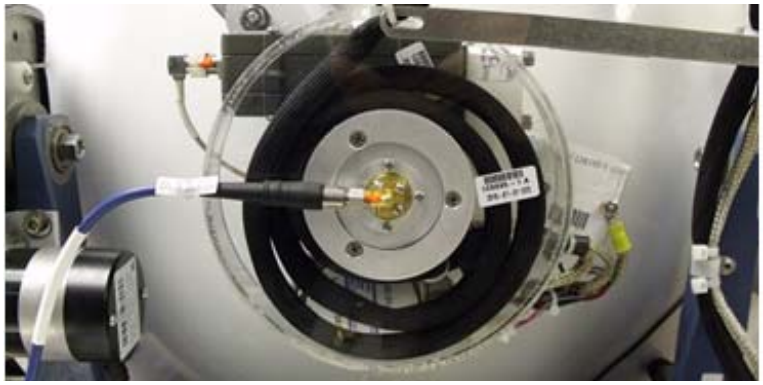
   ***Note:** It's advisable to have someone watching the feed while it's being driven as if the pot isn't correctly calibrated there is the possibility to damage the motor if the feed assembly hits its mechanical end stop.

(Steps 6-11 require assistance to observe and operate antenna simultaneously)

6. Observe the physical alignment of the LNB:

   The LNB should be aligned horizontally with the coax cable pointing to the left (as shown below in Fig. 1.1). If not continue on to step 7, otherwise skip ahead to step11.

Note: A level bubble or spirit level can be placed on the LNB to verify the accuracy of its alignment.



(Fig: 1.1)

7. If the LNB isn't horizontal at the central position of the pots range (120 counts) the LNB will then need to be physically driven until it is aligned horizontally and then adjustments will need to be made to the position of the pol pot to calibrate it for a value of 120 counts. To drive the LNB to horizontal enter drive commands into the remote command screen of the DAC to rotate the feed assembly by issuing drive to the pol motor:

   For example if the LNB is over to the left of center and needs to be driven clockwise to bring it to horizontal increase the pol value. Enter "g0130", "g0135", g0137" and so on into the remote command screen until the LNB is aligned horizontally.

   Should the LNB be over to the right of center and needs to be driven counter-clockwise to bring it to horizontal decrease the pol value. Enter "g0110", "g0105", g0103" and so on into the remote command screen until the LNB is aligned horizontally.

8. Once the LNB has been aligned horizontally (as per Fig 1.1) locate the pol pot on the feed assembly and loosen the retaining screw using a 9/64" Allen wrench (as shown below in Fig. 1.2).

   Slide the pol pots bracket towards the feed assembly to slacken the belt tension and allow the pol pot's pulley to be rotated (as shown below in Fig. 1.3). Adjust the pol pot as necessary:

   If the LNB is to the left of center (needs to be rotated clockwise to bring it to level) rotate the pulley counter-clockwise. If the LNB is to the right of center (needs to be rotated counter-clockwise to bring it to level) rotate the pulley clockwise.

(Fig. 1.2)

(Fig. 1.3)

9. Resend the remote command "g0120" to re-center the feed, you may find it easier to drive the feed away from its central position and then back to center (I.e. send the command "g0130" followed by "g0120").

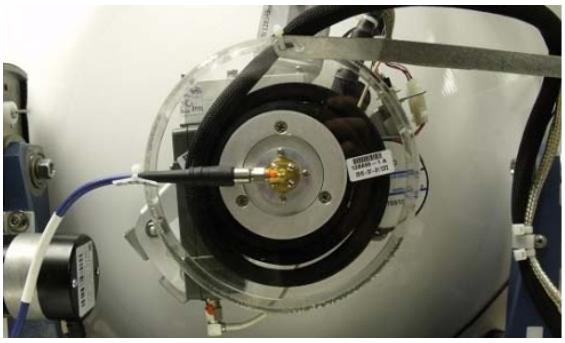
10. Verify if the LNB is horizontal in the center of the pots range (120 counts), if the LNB is not horizontal (as per Fig. 1.1) repeat steps 7-9 until correct, otherwise move onto step 11.

    ***Note:** The tolerance for calibration of the pol pot is +/- 2 degrees, meaning the LNB can be aligned +/- 2 degrees from horizontal at a pol count of 120. Any error will be electronically trimmed using the pol offset function.

11. Now the pot is correctly aligned verify feed has the complete 180 degree range of motion by driving the assembly from end stop to end stop:

    Enter the command "g0020" into the remote command screen of the DAC. This will drive the feed assembly to its lower electronic end stop (set by the potentiometer). Once the pol motor has finished driving the LNB should be vertical, to the left of the OMT with the coax cable pointing downwards as shown below in Fig. 1.4.

    Now enter the command "g0210" into the remote command screen of the DAC. This will drive the feed assembly to its upper electronic end stop (set by the potentiometer). Once the pol motor has finished driving the LNB should be vertical, to the right of the OMT with the coax cable pointing upwards as shown below in Fig. 1.5.



(Fig. 1.4)

(Fig 1.5)

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 antennas pol offset setting 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.