Field Service Spares Replacement Procedure – Level Cage Motor Kit, XX04 & 6003A/6004

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

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Field Service Procedure – Replacement Level Cage Motor Kit, XX04 & 6003A/6004

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the level cage motor on the XX04 and 6003A/6004 series antennas.

2. Checklist:

- Verify Initialization
- Verify Pointing
- Verify Targeting

3. Theory of Operation:

Elevation drive occurs from offsetting the level cage which introduces error into the PCU's control loop, the elevation motor will then drive the axis to bring the level cage back to level, removing the error and in turn changing the elevation look angle of the antenna. If the level cage motor is defective it will prevent the system from targeting the correct elevation, by not offsetting the level cage the correct amount and therefore causing the elevation targeting error.

A sign that the level cage motor is faulty is the system keeps finding the satellite at different elevation positions and the trims need adjusting to compensate for this. Another is the system mis-points completely and the look angle of the antenna doesn't correspond with the value displayed on the DAC. What is actually happening is the motor isn't offsetting the level cage properly, therefore the system isn't targeting correctly The DAC, however, will display the desired target position as there is no live feedback.

4. Verify Initialization:

- Power cycle the pedestal
    1. Level cage drives to its end stop, then backs off exactly 45 degrees
    2. Elevation axis drives to level based on the level cage's horizon reference
    3. Cross level axis drives to level based on the level cage's horizon reference
    4. Limited azimuth systems drive clockwise into the azimuth end stop, then back off to 630 degrees of relative

Verify if the level cage motor drives correctly, if not then the system won't target 45 degrees of elevation during the initialization process.
If the ACU reports model "xx03/xx04", the antennas No parameter needs calibrating and verifying that the PCU saves it correctly. A drive issue or pedestal error (error 8) requires further troubleshooting.

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5. Verify Pointing:

Drive the antenna throughout its elevation range and verify it points correctly. Target 0, 45 & 90 degrees, making sure the reflector is at the correct position displayed on the DAC.

6. Verify Targeting:

If the antenna appears to point correctly a more accurate way to verify this is to see if it can repeatedly target the correct elevation of a satellite. Trim the system to the correct elevation and then point the antenna away from the satellite. Now target the desired satellite and verify the system targets to within 0.5 degrees of the correct elevation.

Any error in the above steps is an indication the level cage motor is defective.

7. Test the Motor:

The stepper motor can be verified by measuring resistance across the following connections:

Pin 1 to 3 = 38 ohm

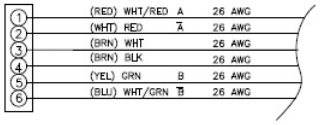
Pin 2 to 3 = 38 ohm

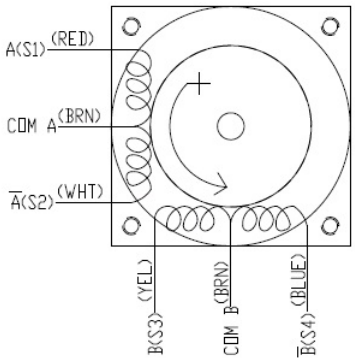
Pin 5 to 4 = 38 ohm

Pin 6 to 4 = 38 ohm

Pin 1 to 2 = 76 ohm

Pin 5 to 6 = 76 ohm





If one of the measuring points is open (no resistance) the motor is defective and needs to be replaced. Also measure from all the pins to ground (the metal case of the motor) they must be open, not shorted.

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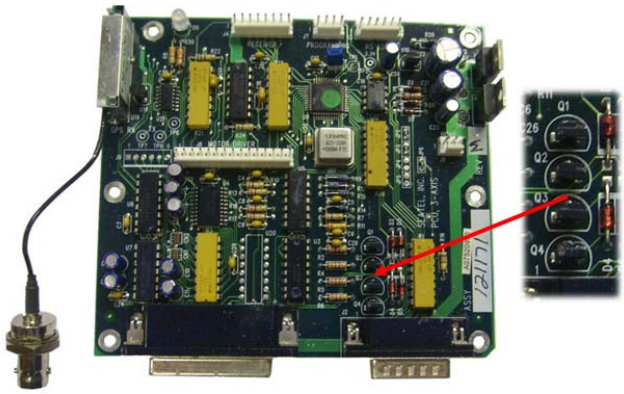
8. Further Information:

Now the motor has been replaced verify the system initializes properly, has the correct range of motion and targets the correct elevation values (if the elevation trim was adjusted because of the targeting error this will need resetting).

If the targeting issue still persists there is the possibility that the driver for the level cage motor on the PCU motherboard has failed. Test the four transistors on the PCU motherboard for damage as per the below image.



Set your multi-meter to the Diode setting  and test between the pins of the transistors as per the following procedure and verify the results.

Pins 1 (+) and 2 (-) = LO

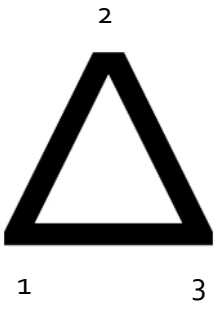
Pins 1 (+) and 3 (-) = 0.66V (+/- 0.03)

Pins 1 (-) and 3 (+) = LO

Pins 1 (-) and 2 (+) = 0.66V (+/- 0.01)

Pins 3 (-) and 2 (+) = 0.66V (+/- 0.01)

Pins 3 (+) and 2 (-) = LO



Any readings shorted to ground or out of the above tolerances mean the transistor is defective and the PCU needs to be replaced (if this is the case it's possible the original motor is not defective).

If the system is displaying a pedestal error (error 8) then there is a drive issue with the antenna and attention will need to be paid to the motor and motor driver for the relevant axis.

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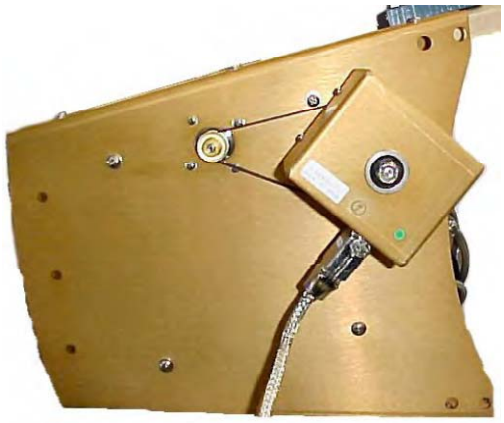
9. Replacing the Level Cage Motor:

9.1. Tools.

- 2mm Flat Blade (Terminal) Screwdriver
- #1 Phillips Screwdriver
- #2 Phillips Screwdriver
- ½" Wrench/Spanner
- Loctite 222, 242 and 638

9.2. Procedure.

Procedure for replacing the level cage motor, Sea Tel part number: 124115-2 (level cage motor part number: 116059-2).

***CAUTION:** Power down the pedestal before following this procedure. 1. Using a 2mm flat blade screwdriver loosen the retaining screws from the D-sub connector & remove the reference harness from the level cage. 2. Using a #1 Phillips screwdriver loosen (don't fully remove) the 4 screws securing the level cage motor and push the motor towards the level cage. 3. Now using a ½" wrench undo the Nylock nut and remove the level cage assembly. 4. Using a #2 Phillips screwdriver remove the four screws attaching the EL pan cover to the POL AUX Relay assembly (one of these is located behind the level cage as shown) and remove the six screws & two P-clamps attaching the outer EL pan cover to the inside EL pan cover.	
6. Slide the EL Pan cover to the left & carefully remove it to expose the level cage motor wiring harness & disconnect the IDC connector from motor termination PCB.	

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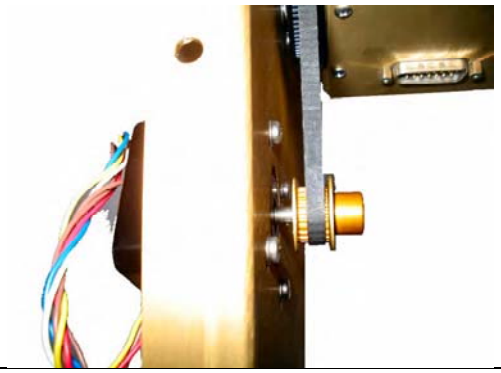
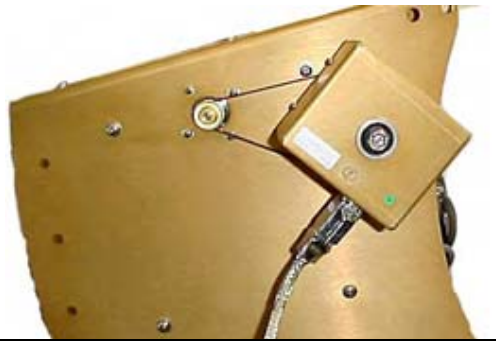
7. Using a #1 Phillips screwdriver remove the four screws securing the motor to the EL pan & save the hardware for future use. 8. Apply Loctite 638 to the shaft of the replacement motor and fit the pulley in the same position as the one on the defective motor. Fit the set screws into the pulley with Loctite 222. ***Note:** For further information refer to the Loctite Procedure 121730 provided with this kit. 9. Install the replacement level cage motor into the EL pan with the belt around the sprocket and loosely secure the motor.	
10. Connect the IDC connector into the motor termination PCB & re-Install the right EL pan. 11. Apply Loctite 242 to the hardware & reinstall all 10 screws making sure the longer 2 screws are used on the P-clips which secure the reference harness. 12. Refit the level cage, aligning its end stops so it has 90 degrees of rotation from horizontal to vertical. Install the Nylock nut removed earlier and connect the reference harness into the D-sub connector, tightening the retaining screws using a 2mm flat blade screwdriver.	
13. Verify the level cage has 90 degrees of movement without the reference harness being pulled taught. 14. Tension the belt by sliding the motor assembly by hand away from the level cage & tighten <u>one</u> of the four screws.	
15. Increase the belt tension until the belt can only be easily twisted just ¼ turn with your fingers. 16. If the belt tension is too tight/loose, adjust until correct & then secure the motor. 17. If the belt tension is correct tighten the 3 loose screws.	

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