Field Service Spares Replacement Procedure – Level Cage Motor Kit, XX97, XX97A, XX97B, XX00, XX00B & XX07

Approval:

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Revision History

Rev.	ECO	Description of Change	Date
X1	8878	Initial release	08-18-2011
A	9059	Clerical revisions	10-30-2011

Field Service Procedure – Level Cage Motor Kit, XX06, XX06R, XX06RZ, XX06RZA, XX97, XX97A, XX97B, XX00, XX00B & XX07

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the level cage motor on the XX06 & XX97, XX97A, XX97B, XX00, XX00B & XX07 series antennas.

2. Checklist:

- Verify Initialization
- Verify Pointing
- Verify Targeting
- Test the Motor

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, or the system mispoints completely and the look angle of the antenna doesn't correspond with the value displayed on the DAC. What's actually happening is the motor isn't offsetting the level cage properly, therefore the system isn't targeting correctly however the DAC will display the desired target position as there is no live feedback.

4. Verify Initialization:

- Power cycle the pedestal
    1. Brakes release (if applicable)
    2. Level cage drives to its end stop, then backs off exactly 45 degrees
    3. Elevation axis drives to level based on the level cages horizon reference
    4. Cross level axis drives to level based on the level cages horizon reference
    5. Unlimited azimuth systems drive clockwise until the home flag and sensor make contact

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/xx97", 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.

5. Verify Pointing:

Drive the antenna throughout its elevation range and verify it points correctly, targeting 0, 45 and 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 of 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

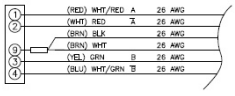
Pin 2 to 3 = 38 ohm

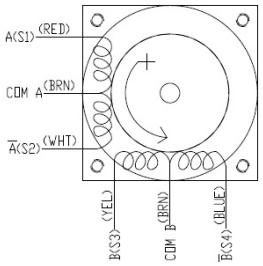
Pin 5 to 4 = 38 ohm

Pin 6 to 4 = 38 ohm

Pin 1 to 2 = 76 ohm

Pin 5 to 6 = 76 ohm



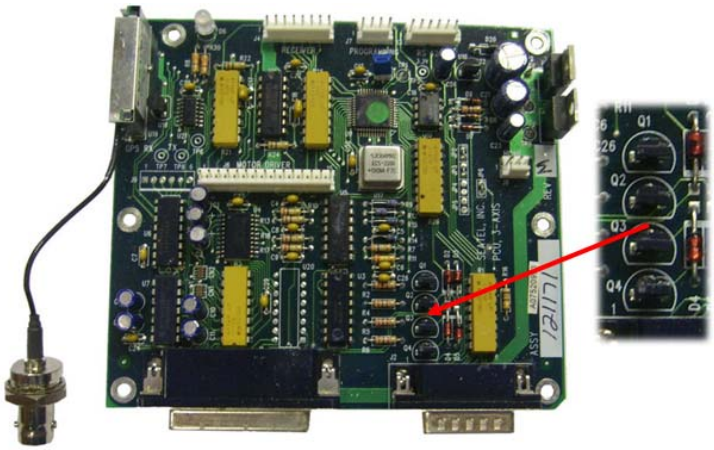


If one of the measuring points is open (no resistance) the motor is defective and need to be replaced. Also measure from all the pins to ground (the metal case of the motor) they must be open, not shorted.

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

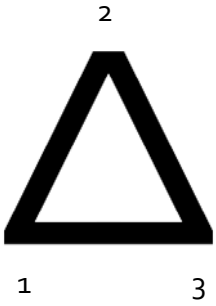
Pins 1 (+) and 3 (-) = 0.66V (+/- 0.03)

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 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.

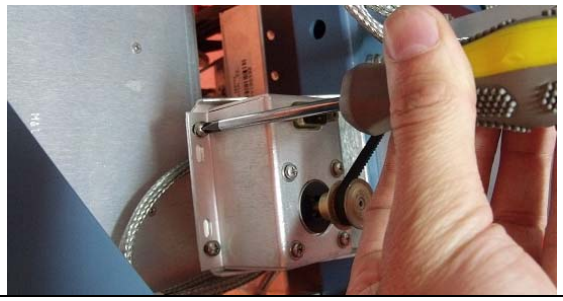
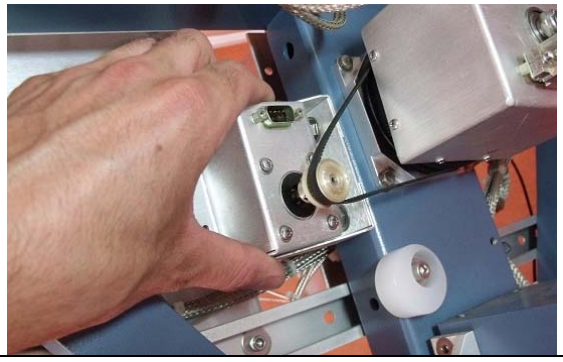
9. Replacing the Level Cage Motor:

9.1. Tools.

- 2mm Flat Blade (Terminal) Screwdriver
- #1 Phillips Screwdriver
- Loctite 242

9.2. Procedure.

Procedure for replacing the XX97, XX97A, XX97B, XX00, XX00B and XX07 series level cage motor assembly, Sea Tel kit part number: 135550 (assembly part number: 122532-1).

***CAUTION:** Power down the pedestal before following this procedure. 1. Disconnect the reference harness D-sub connector from the level cage motor enclosure using a 2mm flat blade screwdriver.	
2. Undo the four screws securing the level cage motor assembly to the bracket using a #1 Phillips screwdriver. 3. Slip the level cage motor assembly off of the belt without stressing it.	
4. Install the replacement level cage motor assembly with Loctite 242 on the four screws, do not fully tighten them at this time. 5. Pull the level cage motor assembly away from the level cage to tension the belt and tighten two of the screws.	

6. If the belt tension is correct (can be twisted ¼ of a turn relatively and then becomes tight) tighten the two remaining screws & re-check. ***Note:** If the belt can easily be twisted past 90 degrees, the tension is to loose, if it can't be twisted to 90 degrees the tension is too tight. 7. If belt tension is to tight/loose repeat the procedure until it is correct. .	
8. Reconnect the reference harness to the level cage motor assembly.