Procedure, Field Replacement, Motion Platform PCB Kit, XX09 MK2 & XX10

Approval:

Approving Authority	Signature	Date
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Revision History

Rev.	ECO	Description of Change	Date
A	8791	Initial release	08-05-2011
B	9041	Clerical revisions	10-03-2011

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the motion platform PCB on the XX09 MK2 and XX10 series antennas.

2. Checklist:

- Verify Initialization
- Verify Sensor Outputs using DacRemP
- Azimuth Targeting
- Drift and Sensor Monitoring

3. Theory of Operation:

The motion platform PCB houses 5 sensors. Two solid state MEM sensors which are used as the antennas horizon reference (level position) and long term stabilization reference, and 3 solid state rate sensors, one for each axis, which are used for short term stabilization reference. A faulty sensor on the motion platform PCB will cause the antenna to lose stability and mispoint from the satellite under dynamic conditions; however the system may appear to be operational in the port when there is no motion to counteract.

4. Verify Initialization:

- Power cycle the pedestal.
    1. Brakes release from the EL and CL motors.
    2. Elevation axis drives to 45 degrees based on the motion platform PCBs horizon reference.
    3. Cross level axis drives to level based on the motion platform PCBs horizon reference.
    4. Azimuth axis drives clockwise until the home flag and sensor make contact.

Note: If the PCU software 2.01a or higher the EL & CL axis will initialize at the same time saving 20 seconds on the initialization process.

If any of these steps fail or the ACU reports model "xx09", the antennas No parameter needs calibrating and verified it saves correctly. A drive issue or pedestal error requires further troubleshooting.

5. Verify Stabilization:

The purpose of this procedure is to physically move the systems axis under static conditions, introducing error into the PCU's control loop, and then verify the system is able to return to its level position (stabilize itself). These tests can be performed by monitoring the sensor outputs on DacRemP or also by physically moving the antenna and observing how it responds.

1. Turn tracking off and open the DISP_V screen of DacRemP. The software will now plot the level position of the LV and CL MEM sensors. Observe for any abnormalities.
2. Verify Cross Level response:

   Standing behind the system, push the cross level beam down to the left and hold it in position. Verify that the CL trace on DacRemP moves down an equal amount to the movement exerted on the axis. Release the axis and verify the DacRemP trace and system axis both return back to their original positions instantly, without deviating or taking time to settle. Now push the cross level beam down to the right and hold it in position. Verify that the CL trace on DacRemP moves up an equal amount to the movement exerted on the axis. Release the axis and verify the DacRemP trace and system axis both return back to their original positions instantly, without deviating or taking time to settle.
3. Verify Level (Elevation) response:

   Push the reflector up in elevation and hold it in position. Verify that the LV trace on DacRemP moves down an equal amount to the movement exerted on the axis. Release the axis and verify the DacRemP trace and system axis both return back to their original positions instantly, without deviating or taking time to settle. Push the reflector down in elevation and hold it in position. Verify that the LV trace on DacRemP moves up an equal amount to the movement exerted on the axis. Release the axis and verify the DacRemP trace and system axis both return back to their original positions instantly, without deviating or taking time to settle.
4. In DacRemP, the trace should look similar to the below image. Note how after each movement the system returns to its level position efficiently without taking time to settle.

6. Rate Sensor Monitoring:

Rate sensor outputs can also be monitored using the DISP_W screen of DacRemP to verify any deviations under static conditions. The traces should remain consistent; any drifting or spikes are an indication the sensors voltage output is changing and the sensor is defective (provided no forces are being exerted on the system).

7. Azimuth Targeting:

Should the antenna have issues targeting in azimuth, such as not accurately finding the satellite or repeatedly finding the satellite in different azimuth positions, then it's important to diagnose if the system is mispointing in azimuth or relative. Relative feedback from the AZ encoder can be verified by initializing the system, verifying it calibrates itself correctly, and then driving the pedestal clockwise in 90 degree increments over a 360 degree rotation. Note that the system points correctly relative to the vessel and that no AZ reference error is flagged by the PCU. A mechanical problem such as the belt slipping on the sprocket could also cause this kind of error.

If the system keeps finding the satellite at different azimuth positions but at the same relative, then the encoder is functioning correctly and the azimuth rate sensor is calculating the movement incorrectly causing the antenna to mispoint.

8. Drift:

If a rate sensor is "drifting", its nominal voltage output has changed from the correct 2.5VDC. This will cause error in the axis control loop and cause the antenna to move. It is more common to see this drift in the azimuth axis as the CL and EL axis both have a long term reference, provided by the tilt sensor. However, should the rate sensors drift be large enough, it can over-compensate the tilt sensor and the system will drive into one of the CL or EL end stops.

To verify if the system is drifting in azimuth, turn tracking off and monitor the relative position. Under static conditions, when the vessels heading is unchanged, the relative count should remain stationary. If the relative value begins to change from its current position, the azimuth rate sensor is drifting, introducing error into the axis control loop.

9. Diagnostics:

If any of the above checks have indicated a problem, one or more of the axis control loops have incorrect loop errors. The most likely cause of this is a defective rate sensor. To rectify this, replace the motion platform PCB and repeat the checks above, to verify the antenna now functions correctly.

Should the problem persist, there are other possibilities that can produce the same results. These can be bad connections between the motion platform PCB and PCU motherboard or the PCU itself.

10. Further Information:

If the system is displaying a pedestal error, there is a drive issue with the antenna and attention will need to be paid to each axis motor and the motor driver enclosure. A pedestal error is raised when an axis motor draws more current than its upper limit. This will induce a stability limit. If this stability limit is present for more than 7 seconds, an error 8 (pedestal error) will be raised.

If the rate sensors are checked as OK, a ships gyro can induce drift. This will introduce loop error into the PCU control loop and cause the antenna to drift. This can be verified by checking the heading displayed on the DAC against the ships actual heading. The two headings should be the same. If there is a difference, enable Sat Ref Mode to temporarily bypass the ships gyro to prove the fault. If enabling Sat Ref Mode does prevent drift, verify the heading source.

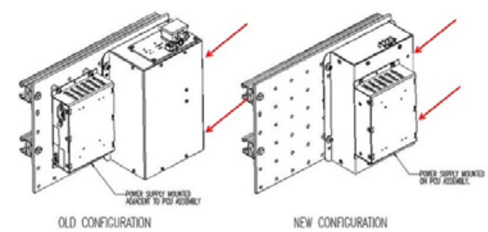
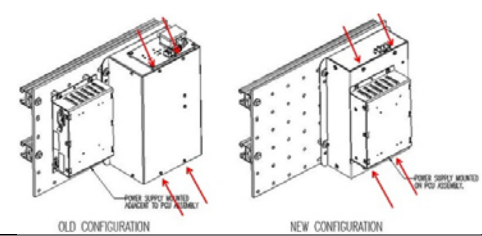
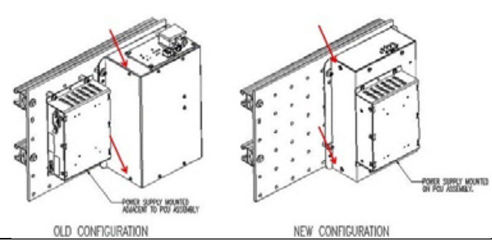
11. Replacing the Motion Platform PCB:

11.1. Tools.

- #1 Phillips Screwdriver
- Loctite 242

11.2. Procedure.

Procedure for replacing the motion platform PCB, Sea Tel replacement kit part number: 135342 (Motion platform PCB part number: 130787-1).

***CAUTION:** Power down the pedestal before following this procedure. ***Note:** PCB components are static sensitive and correct handling procedures must be adhered to. 1. Using a #1 Phillips screwdriver, remove the 2 Phillips screws in the lip edge above the connectors.	
2. Remove the 4 Phillips screws on the top of the PCU.	
3. Remove the 2 Phillips screws on the back side of the PCU. 4. Retain all of the screws for later reuse. 5. Remove the cover off of the PCU	
6. Disconnect the ribbon cable from the Motion Platform PCB. 7. Using a #1 Phillips screwdriver, remove the 4 Phillips screws that mount the Motion Platform PCB. Retain all of the screws for later reuse.	

8. Remove the defective Motion Platform PCB. 9. Install the replacement Motion Platform PCB. 10. Apply Loctite 242 to, and reinstall, the 4 Phillips screws to mount the Motion Platform PCB. 11. Reconnect the ribbon cable to the Motion Platform PCB. 12. Reinstall the PCU cover, applying Loctite 242 to the hardware.