

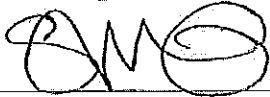


Procedure, Field Replacement, PCU Kit 6003A/6004, 2406 & 4003A

Approval:

Approving Authority	Signature	Date
Doc Control:	Ron Chaffee / Signature on file. 	10-26
Assistant Service Manager, Global	John VanderJagt / Signature on file. 	10-26
Author:	Stuart Broadfield / Signature on file. 	10.26.11

Revision History

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

Page 1 of 1	Sea Tel <small>COBHAM</small>	Document No 135300 Rev B
-------------	---	-----------------------------

Copyright © Sea Tel, Inc 2011 - The information contained in this document is proprietary to Sea Tel, Inc.. This document may not be reproduced or distributed in any form without prior written consent of Sea Tel, Inc.

Procedure, Field Replacement, PCU Kit, 6003A/6004, 2406 & 4003A

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the PCU assembly on the 6003A/6004, 2406 & 4003A series antennas.

2. Checklist:

- Verify Initialization
- No Parameter
- Pedestal Error
- Test Motor

3. Theory of Operation:

The PCU motherboard calculates the movement of the vessel based on the feedback from sensors in the level cage and directional changes from the vessels gyro compass. The PCU uses this data to drive the motor of the relevant axis to an equal and opposite amount of movement to the vessel to maintain stabilization. Along with stability, the PCU also controls the antenna dishscan pattern.

All tracking, targeting, pointing and polarization commands are sent from the DAC to the PCU. These commands are based on the vessel's GPS location, targeting calculations or operator inputs. The PCU software configures the function of the pedestal and is calibrated by the No parameter. This sets the motor gains for each axis and the dishscan pattern based on the size of the antenna. These settings are all stored as "Remote Parameters".

Should the PCU flag a pedestal error, further diagnostics will need to be completed to identify which axis the error is located in and also the component(s) which are faulty. This document will run through decoding the pedestal error, then further troubleshooting the relevant axis to diagnose which component(s) are defective.

4. Verify Initialization:

- Power cycle the pedestal.
 1. Level cage drives to its end stop then drives to 45 degrees.
 2. Elevation axis drives to 45 degrees based on the level cage.
 3. Cross level axis drives to level based on the level cages horizon reference.
 4. Limited azimuth axis systems drive clockwise into the azimuth end stop, at 630 degrees of relative.
 5. Unlimited azimuth axis systems drive clockwise until the home flag and sensor align.

If the ACU reports model "xx03" or "xx06", the PCU's No parameter needs calibrating. Refer to the calibrating the PCU No Parameter section of this document. Failures to complete any of the initialization steps, or a pedestal error, require further troubleshooting.

Page 1 of 8	Sea Tel COBHAM	Document No 135300 Rev B
-------------	--------------------------	-----------------------------

5. Pedestal Error (Error 8):

5.1. Decoding a Pedestal Error.

When the DAC displays a pedestal error, enter into the remote command window and enter "Soooo" then press Enter twice. The error code will now be displayed in the Remote Monitor screen. Decode the 4th character of the error code from the below table:

@	None	K	Ref + LV + CL	V	Stab Limit + AZ + LV
A	CL	L	Ref + AZ	W	Stab Limit + AZ + LV + CL
B	LV	M	Ref + AZ + CL	X	Stab Limit + Ref
C	CL + LV	N	Ref + AZ + LV	Y	Stab Limit + Ref + CL
D	AZ	O	Ref + AZ + LV + CL	Z	Stab Limit + Ref + LV
E	AZ + CL	P	Stab Limit	[Stab Limit + Ref + LV + CL
F	AZ + LV	Q	Stab Limit + CL	\	Stab Limit + Ref + AZ
G	AZ + LV + CL	R	Stab Limit + LV]	Stab Limit + Ref + AZ + CL
H	Ref	S	Stab Limit + CL + LV	^	Stab Limit + Ref + AZ + LV
I	Ref + CL	T	Stab Limit + AZ	_	Stab Limit + Ref + AZ + LV + CL
J	Ref + LV	U	Stab Limit + AZ + CL		

5.2. Error Types.

The 3 types of pedestal error are....

1. **Servo Limit** – A servo limit error means the PCU motherboard is issuing the command to the motor driver PCB to drive the relevant axis harder than it should under normal operation (the servo limit has been reached). This can occur through stabilisation or targeting.
2. **Stability Limit** – A stability limit error means the antenna has mis-pointed from its desired target position by more than half a degree. When a stability limit error is flagged on a VSAT antenna, the DAC will send a TX Mute command to inhibit the transmit function of the satellite modem; It is common to see the servo limit and stability limit errors together.
3. **AZ Reference Error** – An azimuth reference error means the antenna has a corrupt reading in the relative scale. If the system is limited azimuth it could be caused by it hitting its end stop under normal operation. If the system is unlimited azimuth it could be caused by the antenna completing a 360 degree rotation without the sensor detecting the home flag. Other possibilities are the encoder failing or a physical problem such as the belt slipping on the motor pulley or the pulley slipping on the motor shaft.

5.3. Troubleshooting Pedestal Errors – Servo Limit and Stability Limit.

1. Reinitialize the pedestal; does it drive correctly or not at all? If none of the axes drive, verify the No and motor gain parameters (N₁ = CL, N₂ = EL and N₃ = AZ) are correctly configured in the PCU through the Remote Command window of the DAC. Query by Nx999, where "x" is the axis identifier.
2. Verify the balance of the antenna and check for physical restrictions on the pedestal – If the axis isn't correctly balanced the PCU will be outputting additional drive commands to maintain the antennas level and pointing positions.
3. The motor isn't driving correctly or no motor drive is present, test the motor for faults using the below procedure. If the motor is defective replace it and then retest the function of the antenna. If the axis still fails to drive correctly the defective motor may have damaged the motor driver PCB. Replace the PCU assembly.
4. Another potential problem could be a damaged or intermittent harness connection. Remove the harness back shells and verify all the pins are seated correctly. Check continuity from pin to pin (end to end) and also across the pins (at each end) to verify there is no short in the connections.

5.4. Troubleshooting Pedestal Errors – Azimuth Reference Error.

1. If the system is limited azimuth, verify that the antenna drives clockwise to its end stop during initialization. If the antenna is unlimited azimuth, reinitialize it and verify that the sensor detects the home flag as the system drives clockwise. If this step fails, verify if the magnet/sensor is present or attempt to move the sensor closer to the magnet. Failing this, the sensor or its feedback has failed.
2. Drive the azimuth axis in 90 degree increments and verify the antenna points correctly and that the DAC displays the correct relative position. Also verify that there is no physical restriction on the azimuth axis such as the belt slipping on the motor pulley or the pulley slipping on the motor shaft.

5.5. Test the Motor.

1. Check continuity between ground (the motor connector back shell) and the 3 driver outputs on pins 1, 2 and 3 of the harness.
2. Now check continuity between pins 4, 5, 6, 7 and 8 and the ground (the motor connector back shell).
3. Also check between the individual pins 1, 2 and 3 and the rest of the pins (i.e. test pin 1 to pin 4, 5, 6, 7 and 8 and so on, not between pins 1 and 2, 1 and 3 or 2 and 3).
4. If there is any continuity measured on the steps mentioned above, the motor is defective. If the motor has drawn excessive current then there is a possibility the motor driver PCB (and potentially the PCU motherboard) has been damaged. The antenna's operation should be verified with a replacement motor. If after replacing the motor the antenna is still not operational, replace the PCU assembly as per the following procedure.

Procedure, Field Replacement, PCU Kit, 6003A/6004, 2406 & 4003A

6. Home Flag Offset:

If an unlimited azimuth antenna has been installed with an offset from the bow of the vessel, it is possible a Home Flag Offset (HFO) has been stored in the PCU to correct the relative position. Before replacing a PCU, it is advisable to query the HFO parameter to verify if it will need to be configured in the replacement PCU. When the DAC is showing 000.0 relative, the antenna should be pointing to the bow of the vessel. To query the HFO, combine the parameter code "N6" with the query code "999" and enter "N6999" into the remote command window of the DAC and press the Enter button.

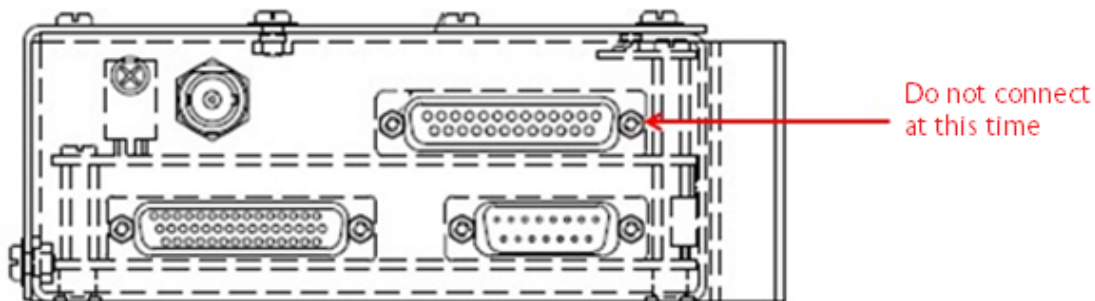
7. Configuring the 6003A/6004, 2406 and 4003A PCU Software:

Part number 121185-2 is commonly used between a number of Sea Tel antenna models. Out of the box, it is supplied with software 123385 for a 6003A/6004 pedestal. If this PCU is to be used on a 6003A or 6004, it can be installed without change and the No can be set. If the PCU is to be used on a 6003, 4003A or 2406, the PCU software will need to be reprogrammed for correct operation as per the below table. Failure to do this may result in damage to the pedestal.

Antenna Model	Software Part Number	Software Revision
6003A / 6004	123385	x04-2.53k (or later)
4003A	121449	x03-2.53 (or later)
2406	123091	x03-2.86 (or later)

**Contact your local Sea Tel service department to verify the latest software version for your antenna.*

Install the PCU on the pedestal using the following procedure. Do not connect the motor driver harness. Looking at the D-sub connections on the rear of the PCU, the lower right is for the interface harness, the lower left is for the reference harness and the upper right connector is for the motor driver harness. Do not connect this harness.



Energize the pedestal, the system will now try to initialize but won't be able to drive any of its axes due to the motors not being connected (preventing any potential damage). After the system has come out of the initialization process, use Progterm to program the PCU with the correct software version for the model of antenna.

Once the software upload is complete, configure the PCUs No parameter as per the following procedure. Then power down the system, connect the motor driver harness and re-energize the pedestal verifying the antenna initializes correctly.

Procedure, Field Replacement, PCU Kit, 6003A/6004, 2406 & 4003A

8. Replacing the PCU Assembly:

8.1. Tools.

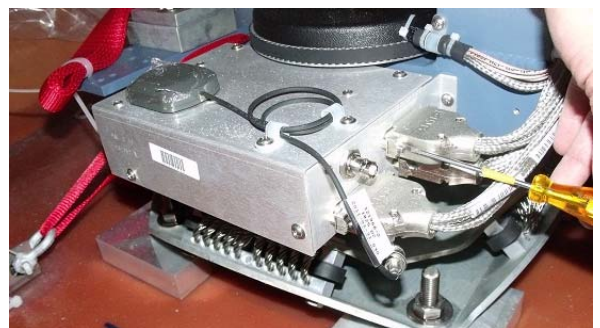
- 2mm Flat Blade (Terminal) Screwdriver
- #1 Phillips Screwdriver
- Loctite 242

8.2. Procedure.

Replacing the 6003A/6004, 4003A and 2406 PCU, Sea Tel kit part number: 135337 (PCU assembly part number: 121185-X, depending on configuration).

***CAUTION:** Power down the pedestal before following this procedure.

1. Using a 2mm flat blade screwdriver, remove harness connections from the back of the PCU and disconnect the BNC connector coming from the GPS antenna.



2. Using a #1 Phillips screwdriver, remove the 4 screws attaching the PCU to the azimuth post and remove the assembly.



3. Now remove the GPS antenna from the faulty PCU and attach it to the replacement PCU using the adhesive pad provided in the kit & secure the excess with the P-clips, applying Loctite 242 to the threads.



Procedure, Field Replacement, PCU Kit, 6003A/6004, 2406 & 4003A

4. Install the replacement PCU and secure it to the azimuth post using the 4 screws and washers removed earlier, using Loctite 242 during installation.
5. Re-Connect the D-sub harness connectors and the GPS antennas BNC connector.
6. Configure the PCU's No parameter (as per the following procedure) and adjust the remote tilt if necessary.



9. Calibrating the 6003A/6004, 2406 and 4003A PCU No Parameter:

As PCUs are universal across the model range, it is necessary to configure the No parameter of the replacement PCU to the specification of the pedestal it will be installed on. This will set the motor gains for CL (N1), EL (N2) and AZ (N3) and also configure the dishscan pattern (N7) for the size of the pedestals reflector.

Without the No parameter configured in the PCU the antenna won't initialize as none of the motor gains will be set - only the level cage will drive. The status window of the DAC will also display the model number of the antenna as "xx03" opposed to 6004, 4003A or 2406.


- Enter into the remote command screen and enter the correct No parameter for the model of antenna as per the below table. I.e. the No parameter for a 4003A is "008". You would enter "N0008" ("No" for the system parameter + "008" for the antenna model).
- Save the remote parameters.
- Cycle power to the system to reinitialize the pedestal, verifying the No has saved and the system initializes correctly, displaying the correct model number on the DAC once the initialization has completed.


Model	No	N1	N2	N3	N7
4003A	008	030	030	020	009
6003A	073	051	051	025	025
6004	076	051	051	025	025
2406	017	020	010	012	042




10. Calibrating the Remote Tilt Setting:



This procedure is required to calibrate the level cage so that all the sensors will be accurately aligned to their axis. The fluid filled tilt sensor provides a two dimensional horizon reference. The system is not able to automatically calculate the exact center value, therefore it is necessary to perform this procedure to manually enter any offset required to make sure the PCU receives a true horizon reference.

1. Turn dishscan off:




Enter into the Setup Menu by pressing and holding the  arrows together until the EL Trim or Auto Trim parameter is displayed.





Use the  arrow key to scroll through the menu until the dishscan window is displayed.

Press the  arrow to activate the window and then press the  arrow, followed by the  button to turn dishscan from on to off.

***Note:** When you press the  arrow to turn dishscan off you won't see the display change until you press the  button.

(Steps 2-7 requires assistance to observe and operate antenna simultaneously)


2. Enter into the Setup Menu by pressing and holding the  arrows together until the EL Trim or Auto Trim parameter is displayed.
3. Push the  arrow key until the Remote Tilt window is displayed.
4. Push the  arrow key to activate the Remote Tilt setting.
5. Use the arrow keys to position the bubble as close to the center as possible. Each press of an arrow key on the directional pad will move the Remote Tilt ½ a degree. It is advised that you only press the button once and wait for the axis to move before pressing it again.

When standing behind the antenna looking at the bubble, if the bubble is over to the right, you need to press the  (right) arrow to bring the bubble into the center. If the bubble is down towards you, you need to press the  (down) arrow to bring it towards the center. If the bubble is to the left, you need to press the  (left) arrow and if the bubble is up towards the top, you need press the  (up) arrow to move it towards the center.



Procedure, Field Replacement, PCU Kit, 6003A/6004, 2406 & 4003A


When correct the bubble should be as close to the center of the fluid as possible








6. When the bubble is as central as possible press the  button to deactivate the Remote Tilt setting.

7. Turn dishscan on:


Enter into the Setup Menu by pressing and holding the   arrows until either the EL Trim or Auto Trim parameter is displayed.



Use the  arrow key to scroll through the menu until the dishscan window is displayed.

Press the  arrow key to activate the window and then press the  arrow key, followed by the  button to turn dishscan from off to on.

***Note:** When you press the  arrow to turn dishscan on you won't see the display change until you press the  button.

8. Save the Remote Tilt setting in the PCU:

Press the  arrow key until the Remote Parameters window is displayed.

Press the  arrow key to activate the window followed by the  button (you'll see a confirmation on the display saying "Saved").

9. As good practice make a note of your N4 and N5 parameters once you have correctly set the remote tilt. The N4 and N5 parameters are a numeric read of the remote tilt. To do this go to the remote command window and key in N4999 to read the CL setting, followed by N5999 to read the EL setting.