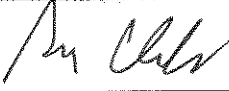

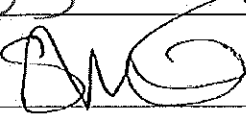


Field Service Spares Replacement – Servo Amplifier Kit

Approval:

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Revision History

Rev.	ECO	Description of Change	Date
X1	8870	Initial release	08-18-2011
A	9059	Clerical revisions	10-30-2011

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Field Service Procedure – Servo Amplifier Kit

1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the servo amplifiers on the XX97, XX97A, XX97B, XX00 and XX00B series antennas.

2. Checklist:

- Pedestal Error
- Test Motor
- Verify Servo Amplifier and PCU Operation

3. Theory of Operation:

A servo amplifier/motor controller is required to commutate and control the torque output of the brushless DC (BLDC) Motor. The motor drive output from the PCU provides the input to the motor controller. The controller provides drive connections to the windings of the motor and receives feedback from the hall sensors within the motor.

The input from the PCU is 2.5VDC (nominal) when no motor drive is required. As voltage increases the motor shaft will be driven one direction. Decreasing voltage below 2.5VDC will drive the motor shaft the opposite direction. The controller supplies current to the windings of the motor and reads the hall sensor feedback to monitor rotor position.

If the PCU has to output more drive commands than is necessary under normal operation then a servo limit pedestal error (error 8) will be raised. This could be due to a mechanical issue such as balance, a motor which isn't driving correctly or potential failure with the servo amplifier (which is usually caused by a faulty motor drawing too much current).

4. Applications:

Model	EL	CL	AZ
8897 and 9497	2.5A	2.5A	2.5A
8897A / 9497A	2.5A	2.5A	2.5A
8897B / 9497B	2.5A	2.5A	5A
XX00, XX00B and 9597B	5A	5A	5A

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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 input "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 (CL, LV and AZ)** – A servo limit error means the PCU motherboard is issuing the command to the servo amplifier to drive the relevant axis harder than it should under normal operation (the servo limit has been reached). This could be whilst the antenna is trying to maintain its pointing angle, or whilst the antenna is driving the axis to a target position.
2. **Stability Limit** – A stability limit error means the antenna has mispointed from its desired position by more than half a degree. When a stability limit error is flagged on a VSAT antenna the DAC will send the TX Mute command to inhibit the transmit function of the satellite modem (It's common to see the servo limit and stability limit errors together).
3. **AZ Reference Error** – An azimuth reference error means there is a corrupt reading in the antennas relative scale. This could be caused by the system completing a 360 degree rotation without the switch coming into contact with the home flag, the switch coming into contact with the home flag too early, or a physical problem such as the chain slipping on the motor pulley, the encoder belt slipping (if applicable) or the pulley slipping on the motor shaft.

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

1. Reinitialize the pedestal; does it drive correctly or at all? If none of the axis 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.
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 position.
3. If 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 test the function of the servo amplifier. If the axis still fails to drive correctly the defective motor has damaged the servo amplifier and it needs to be replaced. Excessive current draw from a defective motor could potentially damage the PCU, if normal operation doesn't return after replacing the motor and servo amplifier the PCU should be replaced.
4. If the antenna has braked motors verify if the brakes released properly. If the movement of the axis is restricted measure the output to the motor to verify if the 12V is present. If so the brake hasn't released the motor is defective. If the 12V isn't present trouble shoot the harness / brake servo PCB to diagnose the fault.
5. 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, pin to ground and also across the pins to verify there is no short in the connections.

5.4. Troubleshooting Pedestal Errors – Azimuth Reference Error.

1. Reinitialize the system and verify the sensor comes into alignment with the home flag as the system drives clockwise in azimuth (the LED will illuminate). If not verify if the home flag/sensor is present. If correct, the fault is likely to be a sensor/feedback failure.
2. Drive the azimuth axis in 90 degree increments and verify that 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 chain slipping on the motor pulley, the encoder belt slipping (if applicable) 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).

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 driver has also been damaged and its operation should be verified with a replacement motor. If after replacing the motor and driver the system is still not operational it's possible the current draw has damaged the PCU motherboard.

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6. Procedure for Replacing the Servo Amplifiers:

6.1. Tools.

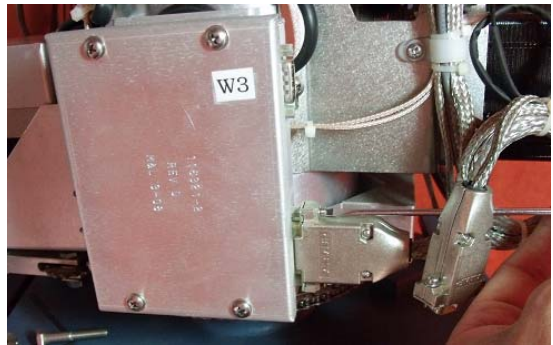
- 2mm Flat Blade (Terminal) Screwdriver
- #1 Phillips Screwdriver
- Loctite 242

6.2. Procedure.

Procedure for replacing the servo amplifiers Sea Tel kit part numbers: 135389 (2.5A) and 135390 (5A), servo amp assembly part numbers: 116000-1 (2.5A) and 116000-2 (5A).

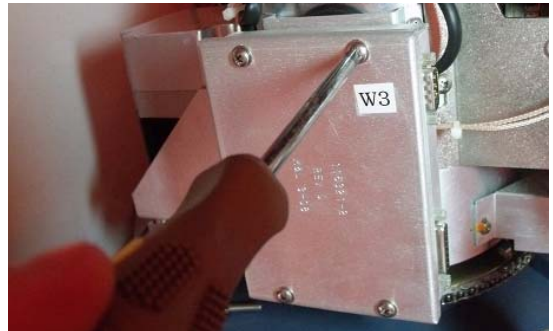
***CAUTION:** Power down the pedestal before following this procedure.

1. Disconnect the harness D-sub connectors from the servo amplifier using a 2mm flat blade screwdriver.



2. Using a #1 Phillips screwdriver remove the 4 screws securing the servo amplifier to the canister or equipment frame.

3. Install the replacement servo amplifier applying Loctite 242 to the threads.



4. Reconnect the harness D-sub connectors to the replacement servo amplifier assembly.

