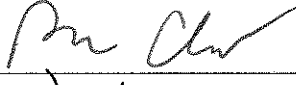




**Field Service Spares Replacement Procedure – MDE Enclosure Kit,  
XX09 MK2, XX10, XX11, XX11QOR & 4012**

**Approval:**

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**Revision History**

Rev.	ECO	Description of Change	Date
A	8795	Initial release	08-05-2011
B	9041	Clerical revisions	10-03-2011
C	9659	Add 4012 Info	03-05-2012

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# ***Field Service Procedure – Replacement MDE Kit, XX09 MK2, XX10, XX11, 4012, ST60, ST88, ST94 & ST144***

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## **1. Brief Summary:**

Troubleshooting document for diagnosing a fault with and replacing the motor driver enclosure on the XX09 MK2, XX10, XX11, XX11QOR, 4012, ST60, ST88, ST94 and ST144 antennas.

## **2. Checklist:**

- Verify Initialization
- Verify MDE LED Status
- Pedestal Error

## **3. Theory of Operation:**

Feedback from the motion platform PCB is fed into the PCU or ICU main PCB where the vessels motion is calculated. A command is then sent to the motor driver enclosure to drive the relevant axis accordingly to maintain stabilization. This also applies to targeting, pointing and tracking where commands are sent to the MDE to drive each axis as required.

The MDE PCB issues 24VDC to the elevation and cross level motors to release the brakes on initialization and outputs a constant 12VDC to hold them open during operation. The MDE uses feedback from the hall sensors inside the BLDC motors so it can commutate and control the torque output of the elevation, cross-level and azimuth motors. When no drive is applied to the motor it offers very little rotational friction, allowing inertia to provide 98 percent of stabilization in each axis.

## **4. Verify Initialization:**

- Power cycle the pedestal:
  1. 24VDC is supplied to the motors brakes to release them, then 12VDC holds them open.
  2. Elevation axis drives to 45 degrees based on the PCU's horizon reference.
  3. Cross level axis drives to level based on the PCU's horizon reference.
  4. Unlimited azimuth axis will drive clockwise until the home flag and sensor make contact.

**\*Note:** If the XX09 MK2 PCU software version is 2.01a or higher the elevation and cross level axis will initialize at the same time saving 20 seconds on the initialization process.

If any of these steps fail, the 09 series DAC reports model "XX09" then the PCUs No parameter needs calibrating and verifying that it saves correctly. Or verify that the 4012's Profile 1 setting is configured correctly and saves to the ICU. A drive issue, pedestal error or error LED requires further troubleshooting.

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## **Field Service Procedure – Replacement MDE Kit, XX09 MK2, XX10, XX11, 4012, ST60, ST88, ST94 & ST144**

### **5. MDE Status LEDs:**

#### **5.1. MDE Motor Status (top 3 LEDs are CL, EL and AZ):**

GREEN	Motor is good.
Solid RED	Motor/Harness short circuit (winding-winding, winding-ground, or winding to supply). Replace appropriate motor. If that does not clear the LED status, replace the MDE.
Solid ORANGE	Hall sensor error (Hall sensor or harness wire). Replace the motor. If that does not clear the LED status, replace the MDE.

#### **5.2. MDE Status (4<sup>th</sup> LED):**

GREEN	MDE is good.
Solid RED	MDE fault detection. Operational SW will never leave the status LED solid red. Replace MDE.
Solid ORANGE	Software update to the MDE in process.
Blinking RED	Comms error with PCU. Check harness connector is seated properly. Check harness (pin-pin, wire-wire and wire-ground) for good continuity. Replace the MDE. Replace the PCU/ICU motherboard PCB.

### **6. Pedestal Error (Error 8):**

#### **6.1. Decoding a Pedestal Error.**

For the 4012 antenna if you suspect a fault enter into the system screen and verify if the error indicator is illuminated if so click the error icon to view the displayed error(s). If using an XX09 MK2 PCU 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 4<sup>th</sup> 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		

## ***Field Service Procedure – Replacement MDE Kit, XX09 MK2, XX10, XX11, 4012, ST60, ST88, ST94 & ST144***

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### **6.2. Error Types.**

The 3 types of pedestal error are.....

1. **Servo Limit (CL, LV and AZ)** – A servo limit error means the PCU/ICU motherboard is issuing the command to the motor driver enclosure to drive the relevant axis harder than it should under normal operation (the servo limit has been reached). This could be while the antenna is trying to maintain its pointing angle, or while 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 sensor coming into contact with the home flag, the sensor coming into contact with the home flag too early, or a physical problem such as the chain slipping on the motor pulley or the pulley slipping on the motor shaft.

### **6.3. 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 or Profile setting is configured correctly for your model of antenna.
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 you find the motor is defective replace it and then test the function of the motor driver enclosure. If the axis still fails to drive correctly the motor may have damaged it. Replace the motor driver.

### **6.4. Troubleshooting Pedestal Errors – Azimuth Reference Error.**

1. Reinitialize the system and verify the sensor comes into contact with the home flag as the system drives clockwise in azimuth (the LED will illuminate). If not verify if the home sensor is present, if correct then there is a sensor or 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 or the pulley slipping on the motor shaft.

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# Field Service Procedure – Replacement MDE Kit, XX09 MK2, XX10, XX11, 4012, ST60, ST88, ST94 & ST144



## 7. Replacing the Motor Driver Enclosure (MDE):

### 7.1. Tools.

- Snips/Cutters
- 10mm Wrench/Spanner
- Cable Ties/Tie Wraps
- Loctite 242

### 7.2. Procedure.

Procedure for replacing the MDE assembly, Sea Tel kit part number: 135347 (MDE assembly part number: 131227-1).

<p><b>*Caution:</b> Power down the pedestal before following this procedure.</p> <p>Mark the connectors using the felt tip marker.</p> <p><b>Drive</b> - Motor Control Drive from the PCU.</p> <p><b>Home</b> – Proximity Sensor</p> <p><b>AZ</b> – Azimuth Motor</p> <p><b>EL</b> – Elevation Motor</p> <p><b>CL</b> – Cross-Level Motor</p>	
<p>1. Cut the three cable ties on the side of the MDE.</p> <p>2. Disconnect all 5 d-sub connectors using a 2mm flat blade screwdriver.</p>	
<p>3. Using a 10mm wrench remove the 4 nuts that mount the MDE to the pedestal. Remove the defective MDE and save the hardware for future use.</p> <p>4. Apply Loctite 242 to the four threaded mounting bolts and mount the replacement MDE using the four nuts removed in the previous step.</p> <p>5. Connect all 5 d-sub connectors.</p> <p>6. Install two cable ties into the vacant holes on the side of the MDE and secure the proximity sensor and AZ cables to the MDE.</p> <p>7. Install a cable tie to secure the TX and RX coaxes to the proximity sensor and AZ cables.</p>	