Field Service Spares Replacement Procedure – DAC-2202 Control Unit

Approval:

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Revision History

Rev.	ECO	Description of Change	Date
A	8798	Initial release	08-12-2011
B	9063	Clerical revisions	10-18-2011

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1. Brief Summary:

Troubleshooting document for diagnosing a fault with and replacing the DAC-2202 Control Unit.

2. Checklist:

- Verify the Heading Updates Correctly
- Verify Target Calculations
- Verify SW2 Switch Function
- Verify NV-RAM Saves Settings
- Verify ADE - BDE Communications

3. Theory of Operation:

The DAC-2202 uses a switch mode power supply so will accept 110V or 220VAC.
The DAC motherboard calculates the target azimuth, elevation, and polarity angles of the desired satellite based on the vessels GPS position and heading input. The internal tuner provides a DC voltage output that is directly proportional to the level of the satellite signal input. The receiver output will be positive going (voltage increases as satellite signal level increases) between 0.00-5.00 VDC. This output is converted from the analog voltage to a digital value by a 4096 bit A/D converter on the ACUs Main PCB. The L-Band tracking receivers (DVB and SCPC) produce approximately 20 counts of AGC per dB of satellite signal. Tracking signals are sent between the motherboard and PCU based on the highest AGC value from each dishscan revolution, commands are sent to the PCU to point the antenna accordingly and keep the receive signal optimised.

4. Communications:

The Comm IF module controls all the communications through the M&C, NMEA and Ethernet ports, including gyro compass and GPS updates as well as allowing local and remote monitoring via the Ethernet or serial M+C ports.

The motherboard has an internal FSK modem which is typically used with the xx04 and USAT configurations to multiplex the RS422 data and supply 24VDC power the pedestal. There is a jumper on the motherboard (JP3), which controls whether J4A or J4B is used for communication with the above decks equipment. J4B is the F type connection typically used with the xx04 and utilizing the DACs internal MUX, where as J4A is the 9 wire connection used in conjunction with an external below decks MUX.

5. Applications:

The motherboard is universal and can be used with various configurations of the DAC-2202/2302 although the DAC software is different between the two controllers (which can be downloaded from the Sea Tel support site). Depending whether an L-Band or 70/140MHz receiver is used jumper JP4 will need to be configured accordingly (pins 1 and 2 for L-Band, 2 and 3 for 70/140MHz).

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6. Tracking Receiver:

The L-band receivers can output a 22KHz tone and/or voltage. This can be used for example to control a multi-switch. To enable this function a value of 0064 must be included in the system type.

All TVRO systems are supplied with a DVB receiver which is capable of decoding a network identity (NID) from the satellite (if the tracking carrier provides one). VSAT antennas however are supplied with a SCPC (single channel per carrier) receiver which is capable of tracking a 300KHz narrow-band carrier. When using this receiver the FEC must be set to SCPC for it to function correctly. When in SCPC mode it is required to input MHz and KHz values (Note: The KHz value must always have a leading zero).

Various tracking receivers, and pedestal communication configurations can be used in the DAC-2202 for different applications, which will change the dash number of the DAC-2202 part number. These are as follows:

Part Number	Receiver	Antenna	Jumper JP3
125411-1	DVB	Coax	2 - 3
125411-2	DVB	9 Wire	1 – 2
125411-3	SCPC	9 Wire	1 – 2
125411-4	SCPC	Coax	2 – 3
125411-6	NBIF	9 Wire	1 – 2
125411-7	NBIF	Coax	2 – 3
125411-8	720MHz	9 Wire	1 – 2
125411-12	DVB	9 Wire	1 – 2

7. Motherboard Troubleshooting:

7.1. Verify Heading Updates.

First check the gyro connections on the TMS and the connection into the DAC. Take caution as Electrical Shock Potentials exist on the Gyro Compass output lines. Assure that the Gyro Compass output is turned OFF when handling and connecting wiring to the Terminal Mounting Strip or the boards inside the ACU.

If the connections are correct verify the Gyro Type setting is correct for the provided gyro feed.

If you experience suspected failure of the NMEA, serial M+C, and Ethernet ports then this is likely a failure of the rabbit module and the motherboard needs replacing. If you experience what you believe is a failure of just one port then verify that the port is not locked. To do this web browse into the DACs built in HTML page and check the port settings.

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7.2. Calculations.

The internal look up table in the DAC calculates the target angles of the satellite based on the vessels GPS position. If the DAC is displaying incorrect target values (AZ and EL) the most likely cause is an incorrect GPS position creating an error in the target calculation. Therefore first the GPS should be verified. You can verify the target position of the DAC by entering the relevant coordinates into the Satellite Calculator spreadsheet (satpos1.xls; this can be downloaded from the PC software utilities section of the support site) to compare if the DAC's readings are correct.

7.3. SW2.

If the antenna enters a blockage zone, goes into search mode, or flags a stability limit error the DAC motherboard will provide a contact closure to ground on the SW2 output of the ships gyro port. This is typically used to switch arbitrators or to mute the TX of a satellite modem. The logic can be reversed by using the system type function; this may be necessary for correct switching of an arbitrator or for the TX inhibit to function correctly.

With the 25 pin ribbon cable connected between the ships gyro port of the DAC and the TMS you can verify the functionality of the transistor at SW2 on the motherboard. You should see a 0-12VDC change or vice versa depending on logic selection. To test this activate a blockage output from the tracking display window; when in the window scroll the cursor all the way to the right and then press the down arrow key. The tracking window should now display "blocked" and the voltage should have changed on SW2. If the voltage doesn't change the SW2 transistor of the motherboard has failed.

7.4. Verify the Settings Save.

All of the DAC settings including the tracking parameters and setup menu are saved on the motherboards NV-RAM (remote parameters are saved in the PCU). Once calibrated make a note of the settings for future reference, save the parameters and cycle the power to the DAC. Verify the setting have saved once the DAC powers up, failure to store the parameters is a failure of the NV-RAM on the motherboard. Should you find that your settings are not saving it is recommended you try a re-flash of the ACU software.

7.5. Verify FSK Modem Operation.

If no comms are present verify that jumper JP3 is in the correct position for your system configuration. For the XX04 and USAT series antennas using the internal FSK modem the jumper should be across pins 2 and 3, for a system with an external below decks FSK modem such as an XX06, XX09 or XX97 series antenna the jumper should be across pins 1 and 2.

If the system is having communication problems a replacement ADE FSK modem can be connected quickly to verify if comms return and isolate whether the issue is caused by the above decks or below decks (also take into account the communications coax path and pedestal interface harness between the ADE modem and PCU.

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8. Tracking Receiver Troubleshooting:

8.1. Low Signal.

A low AGC (0 – 700 counts) is an indication that no signal is being received; this could be a potential failure with the tracking receiver itself or another RF component. Firstly measure if the LNB is receiving the 13/18VDC to power it and then target a satellite, if the receiver is powering the LNB verify that "64" is in the system type. On later systems such as XX06RZA and XX09 the ADE MUX provides the LNB voltage.

Connect an analyzer directly to the LNB to verify if the spectrum is present. If the LNB is operational troubleshoot down the RF path. If the spectrum is present before entering the tracking receiver the receiver is defective.

8.2. NID.

The DVB receiver will decode the satellites Network Identity. If no NID is being received verify the tracking parameters are correct using www.lyngsat.com. If the parameters are correct it's possible the service has been switched from DVB to DVB-S2 (Hi-Def). Calculate some different tracking parameters using the RF – LO = IF calculation for the relevant band of the LNB. If multiple NID's fail to download there is a fault with the function of the DVB receiver (it's advisable to test this on a different satellite incase the provider has moved their services to DVB-S2, the receiver can still track a DVB-S2 carrier however no NID will be received). SCPC receivers will not decode a NID as it's a function of DVB, a DAC with an SCPC receiver will display the NID as "1234" or "ABCD" as default.

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9. Procedure for Replacing the DAC-2200/2202 Control Unit:

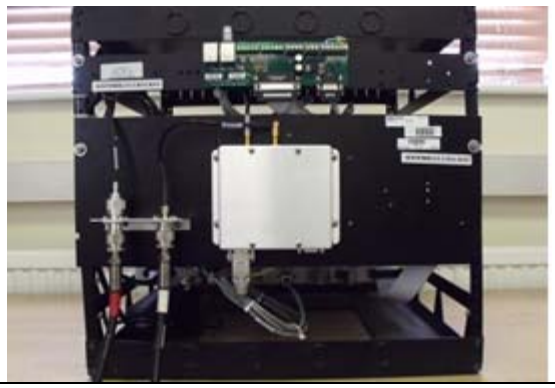
9.1. Tools.

- 2mm Flat Blade (Terminal) Screwdriver
- 4mm Phillips Screwdriver
- #2 Phillips screwdriver

***Note:** Tools may vary depending on the installation configuration.

9.2. Procedure.

Procedure for replacing the DAC-2202 control unit.

***CAUTION:** Disconnect the AC Voltage to the rack before and power down the pedestal before following this procedure. ***Note:** Connections may vary depending on the antenna model and installation configuration.	
1. Disconnect the AC power cable from the DAC.	
2. Disconnect the RF in cable from the back of the DAC.	

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3. Disconnect the RF out cable from the back of the DAC. ***Note:*** Depending on your antenna model this may not be connected.	
4. Disconnect the RJ-45 connecter from the Ethernet port in the back of the DAC.	
5. Using a 2mm flat blade screwdriver, undo the two screws securing the antenna D-sub connector from the modem to the DAC and disconnect it (if applicable).	
6. Undo the two retaining screws and remove the serial connection from the M&C port (if applicable).	
7. Using a 4mm Phillips screwdriver undo the two screws securing the 9-pin NMEA cable and disconnect it from the DAC.	

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***Note:** If the antenna has a synchro gyro compass AC voltage will be present on the ships gyro connection from the TMS to the DAC. To verify the type of gyro connected to the system check the input into the terminal mounting strip, a synchro gyro uses five wires.	
8. Using a 4mm Phillips screwdriver undo the two screws securing the 25-pin ship gyro cable and disconnect it from the DAC. ***Caution:** Risk of electric shock if a synchro gyro is used, be careful not to short the pins of the cable when disconnecting/connecting.	
9. Using a #2 Phillips screwdriver remove the four screws securing the DAC to the front of the rack. Save the hardware for future use. ***Note:** A different tool may be required depending on how the DAC was installed.	
10. Install the replacement DAC using the hardware removed in the previous step.	
11. Reinstall the cables from the previous steps following this procedure in reverse.	

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