TECHNICAL NOTES

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Article applies to – AIT250, AIT1000 and CLB1000 AIS Transponders

ISSUE: Fault Finding Class B Transponders

Once an AIT250, AIT1000 or CLB1000 has been installed and has been operating correctly for some time, the most common causes of failure are the external connections i.e. Power, VHF antenna and GPS Antenna.

If, when you apply power to the transponder by turning on the circuit breaker or switch, you get no LEDs light up, then you most likely have a power connection problem. Make sure that any circuit breakers or fuses in the power supply circuit are OK and then measure the voltage across the Red (+) and Black (-) wires on the transponders power/data cable. If there is not a good supply voltage present of between 11v and 14.5v then you have a wiring problem.

If the power connections are all OK, the transponder will start its power up sequence during which the LEDs should light as follows;

1) Green LED will flash for a few seconds – this indicates that the microprocessor is running and searching for the software to load. If the green LED continues to flash for more than 5 seconds, then a corruption to the software may have occurred. This can be fixed but involves following a recovery procedure that you will need to get from Digital Yacht – please email support@digitalyacht.co.uk

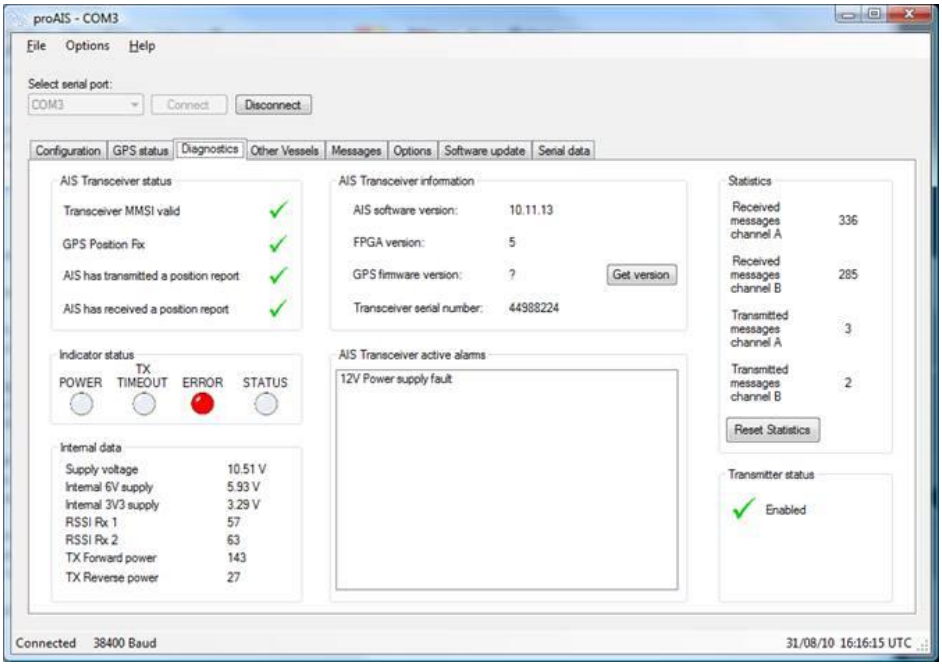
2) After a few seconds all four LEDs should slowly flash twice and then the Yellow LED should illuminate.

3) The yellow LED will stay on until the GPS gets its first fix and the transponder transmits its first AIS position report. At this point (usually within a few minutes of power up) theyellow LED will go OFF and the green LED will come ON.

4) The green LED will now stay on for the majority of the time and indicates that everything is OK and that the transponder is transmitting and receiving correctly. You may occasionally see the yellow LED come ON if the transponder tries to transmit but another vessel has taken its time slot or the GPS position is temporarily lost, but this is the exception and for >90% of the time the green LED should be the only LED illuminated.

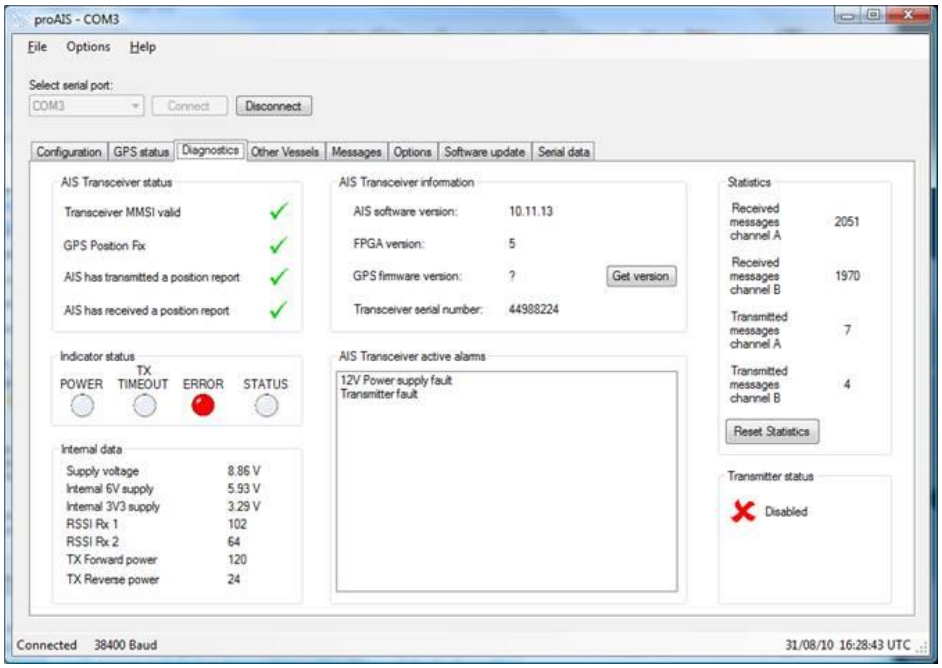
If the Yellow LED has stayed on after 20mins of operation or the Red LED has turned ON, then a fault condition has occurred which will need fault finding. If you have a PC with the proAIS software installed, it is strongly recommended that you connect it to the transponder now. When you run the proAIS software and connect to the transponder, the most useful page is the “Diagnostics” tab. Here you can see a lot of useful information about what is happening inside the transponder including any active Alarms.

Even if the power connections are OK and the transponder is powering up, it is possible that the supply voltage is low – particularly after a long passage in a sail boat. The Low Voltage Alarm is triggered at around 10.6v – see screen shot below. Note the “12v Power Supply Fault” is a warning rather than a critical alarm.



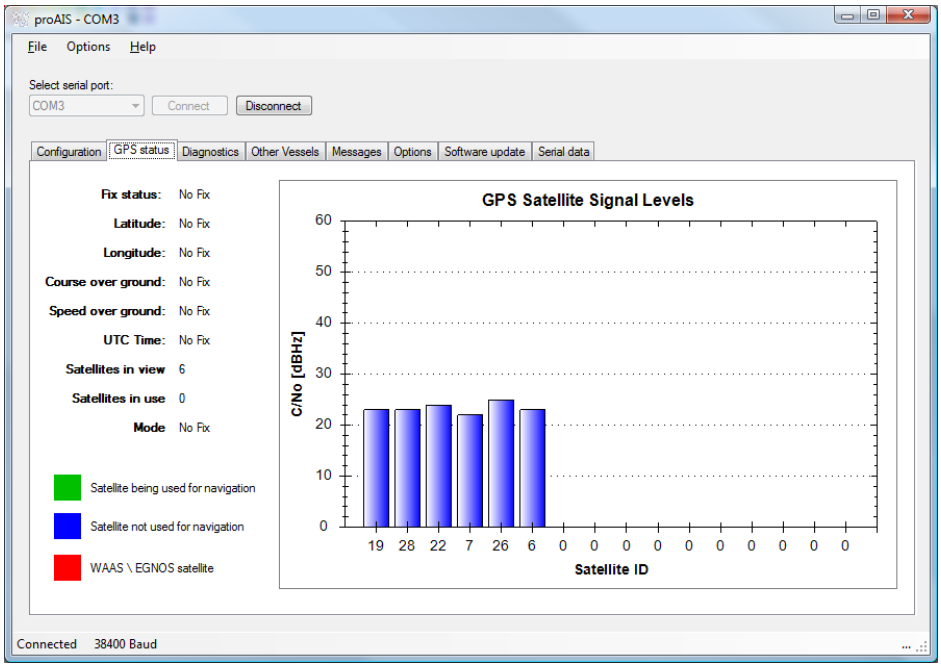
You will note in the bottom right panel that various internal voltages are measured and displayed by the proAIS software. The key voltage, the one that you have control over, is the Supply voltage. A problem on any of the internal voltages means that the transponder has a fault and a factory repair is necessary. However, a Supply Voltage problem is usually due to; poor wiring, large voltage drops in the system or low batteries.

Even in the fault/alarm condition above, the transponder still continues to work and will not stop transmitting until the supply voltage gets down to around 9.3v. Then transmission will stop and you will see the following screen in proAIS. Note the Transmitter is shown as “Disabled” in the lower right pane and the “Transmitter Fault” Alarm has been triggered.



As soon as the supply voltage increases again, transmission will recommence. It is possible that operation of other high current devices on the boat (such as an anchor winch, inverter, starter motor, etc.) could cause the supply voltage to momentarily go low, which would trigger an alarm but the AIT1000 should recover and start re-transmitting within 30secs of the fault condition. During the 30secs the Red and/or Yellow light will be lit.

The most common cause of the transponder not transmitting its position (Yellow LED continuously on), is no GPS fix but it can be caused by other faults. To check the GPS reception, click on the "GPS Status" tab.



All of the GPS signals should be >25 and will be green in colour if good enough for navigation. The image above was actually taken with no antenna connected.

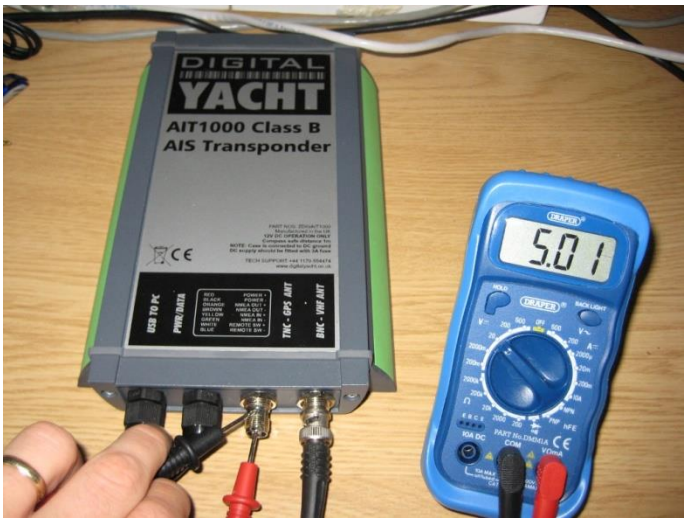
If the GPS signals are low or non-existent, a simple voltage reading can be taken at either end of the GPS antenna cable to see if the 5v supply voltage to the antenna is present. The following process should be followed;

1) Disconnect the TNC connector of the GPS antenna cable from the AIT250/AIT1000

2) Using a Multi-Meter set to measure DC voltage, see if there is 5v signal between the inner and outer connector of the AIT250/AIT1000 TNC connector as shown in the image opposite

3) If there is no 5v signal, then the AIT250/AIT1000 must be assumed to be faulty

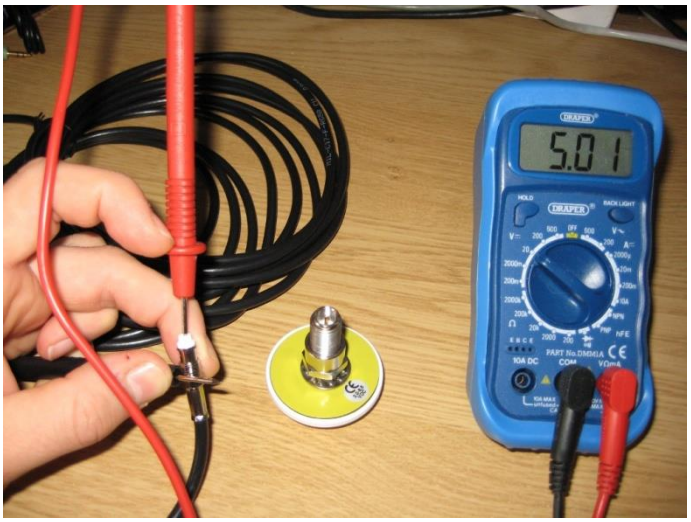
4) If there is a 5v signal, reconnect the TNC connector at the transponder and go to the GPS antenna end of the cable



5) Disconnect the GPS antenna and repeat the 5v measurement in to the cable as shown in the image opposite

6) If there is no 5v signal, the cable (or a connection in the cable) must be assumed to be faulty

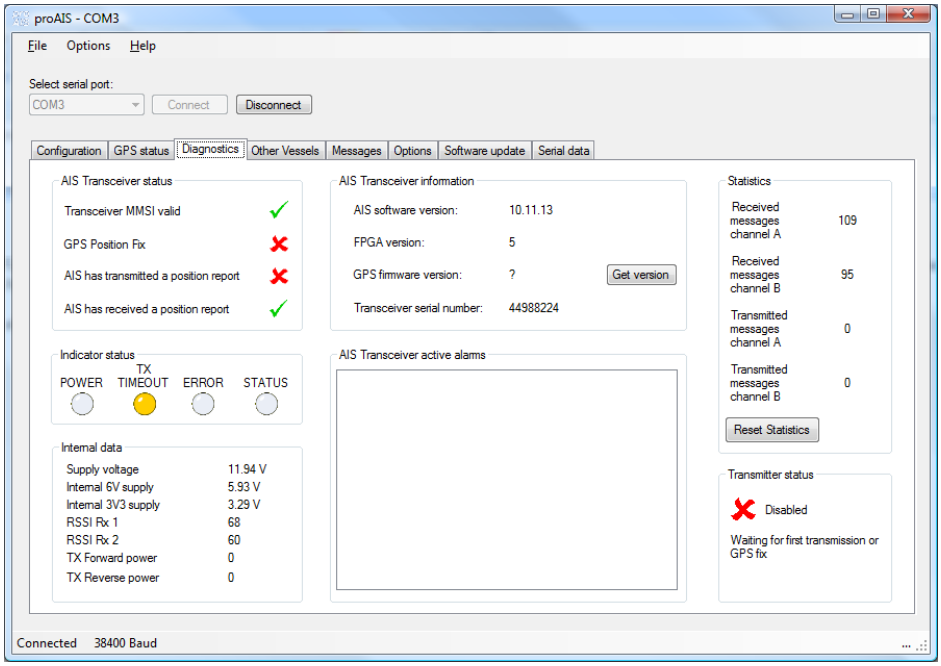
7) If there is a 5v signal, the GPS antenna must be assumed to be faulty



If the GPS is OK and the transponder is getting a good position fix, then the next most likely problem is the AIS/VHF antenna connection. If you are using a splitter to connect the boat's existing VHF antenna to the transponder, ensure that the splitter is definitely recommended for use with a transponder and is not one of the simpler/cheaper splitters that is only suitable for connecting an AIS receiver.

Whilst fault finding the transponder it is recommended that you disconnect the splitter and connect the VHF antenna directly to the transponder to prove that the splitter is not causing a problem with the AIS transmission and reception.

Returning to the "Diagnostics" Tab of proAIS again, see image below, pay particular attention to the Receiver Signal Strength Indicators (RSSI) of the dual channel receiver and the Forward and Reverse Power of the transmitter, bottom left hand corner.



The RRSI (Received Signal Strength Indicator) and TX Power values are good indicators of how well your antenna is receiving and sending data.

- RRSI values should be between 20 and 100 - if they are continually lower than this there may be a problem with the antenna or transponder
- TX Forward Power should be as high as possible, typically between 130-150
- TX Reverse Power should be as low as possible, typically between 10-30

A VHF antenna failure may cause all AIS reception and transmission to stop or it may just give poor reception and transmission range. Either way, if the forward and reverse power values and the RRSI readings are outside of the normal ranges, this could indicate an antenna problem which needs to be fixed to avoid ongoing damage to the transponder.

After a close visual inspection of all joints and connections in the VHF cable, the best way to prove if the antenna is at fault is to temporarily swap it for a known good antenna. The VHF antenna connection on the transponder is a BNC connector and it may be necessary to fit a BNC to TNC or BNC to PL259 (VHF) adaptor in order to connect another VHF antenna.

If the VHF antenna that you have fitted to the transponder has a cable that is removable from the antenna, then you can check the cable for continuity and isolation using a Multi-Meter set to measure resistance. Simply follow this procedure;

1) Disconnect the VHF antenna coax cable from the transponder

2) Disconnect the VHF antenna from the coax cable

3) Using a wire or other metallic (conductive) object short together the inner and outer connections at one end of the coax cable

4) Walk to the other end of the cable and measure the resistance between the inner and outer connector of the coax cable – you should measure < 1ohm if the cable continuity is good

5) Now remove the wire or other metallic object that was shorting together the inner and outer connections and repeat the resistance test – this time you should measure >10 Megohms (10 million) if the isolation of the cable is good

If both of the resistance values were correct, then the cable is good and the fault must lie with the VHF antenna or the transponder.