**D400 Troubleshooting**

***Points to check if you think there’s a problem***

**Mechanical checks:**

• Spin the blades by hand – they should rotate smoothly and freely with no hard spots.

• Listen for any grinding, scraping or rumbling noises – these would indicate failed bearings or contact between rotating parts inside the alternator.

• Note: if the rotor rotates smoothly and silently, but feels stiff (like turning something in glue), refer to the electrical section on short circuits.

• Next, try rotating the D400 around its yaw axis. Again, it should turn smoothly and freely with no hard spots. If the yaw action is stiff or accompanied by undue noise, suspect the yaw bearings or the bush and slip ring assembly (see electrical section below).

• Check that the blades are fitted the right way round, with the concave surface facing forward, i.e. towards the wind.

• Also, establish that the hub is secure on the alternator shaft and that the rotor does not ‘wobble’ due to wear at the hub.

• Finally, check that all fasteners are tight and secure.

**Electrical checks:**

Very often poor turbine performance is traced to a problem elsewhere in the installation rather than a fault with the wind generator itself.

• First check that both the D400 and the regulator are the correct voltage for the electrical system. Both items have identification labels showing the voltage, typically 12 or 24 volt.

• The most common cause of low outputs is loose or corroded connections in the output cabling. Check and re-make all connections from turbine to battery. Seawater and electricity are not a good combination, and connections deteriorate very quickly when wet.

• Next, check the turbine by measuring its open circuit voltage. Disconnect the unit as close to the turbine as possible. If it is not too difficult, remove the turbine from its tower and measure at the fly lead cables exiting the yaw shaft of the machine itself.

• With a multimeter set to the 20 volt DC range, connect the red positive meter lead to the red output, the black meter lead to the black output, and spin the unit by hand. On a 12 V D400, you should be able to produce 4, 5 or even 6 volts, depending on how hard you spin. If you see voltages in this range, then the D400 is probably OK. If the D400 has an internal fault such as a missing phase in its alternator, then you will not be able to produce more than one or two volts.

• Assuming the output voltage is OK, try rotating the yaw shaft (where the cables exit) whilst continuing to spin the rotor. If the voltage varies or disappears as you rotate the yaw shaft, the brushes and slip rings require cleaning. Equally, if the voltage remains steady, but the yaw shaft is unduly stiff or squeaks when rotated, the brushes and slip rings would benefit from cleaning.

• If the turbine checks out OK on the voltage test, suspect the rest of the installation. Check each wiring connection for corrosion, tightness and security as well as the fuses, fuse holders etc.

• If a regulator bypass switch is incorporated within the installation, check that this is wired in accordance with the diagram contained in the D400 regulator instructions. Note that a similar switch can be used as a braking switch, and the wiring for this is shown on page 12 of the D400 User’s Manual. Ensure that the two uses of a switch have not been confused.

• Note that the ship’s battery monitor is driven by a shunt, which will be mounted close to the batteries. Ensure the D400 is connected to the non-battery side of the shunt. If it is not, then the D400 output will not be seen by the meter.

• Also, the D400 regulator incorporates a charge splitter (i.e has two outputs). If one of these is connected to the service battery bank and one to the cranking battery or windlass battery, it is possible that power from the D400 is flowing to them in preference to the service bank.

Try connecting both regulator positive outputs together and on to the service bank to see if that improves matters.

• Finally, put a dedicated ammeter in the positive line between turbine and regulator. This should read all current from the D400, including any diverted to the regulator dump loads.

**Troubleshooting continued – Poor Yaw Action:**

• Stiffness in yaw; the D400 will not rotate to face the wind – check for any physical obstructions and the action of the yaw shaft. If the yaw shaft does not rotate freely, suspect damaged or corroded yaw bearings, damaged or corroded slip rings/brush assembly or possibly a bent yaw shaft.

• Erratic yaw action; the D400 turns off the wind and is unstable – the D400 is normally very stable in yaw. If the turbine appears to ‘hunt around’ its axis, this could be due to turbulence in the airflow. If so, the problem should disappear when the wind changes direction or the yacht is in a different location.

Check that the D400 is properly secured to the mount tower. There should be no undue play between the turbine and the tower. Also, ensure that the tower is vertical and sufficiently rigid. If the tower is too flexible and bends excessively under wind loading, it should be braced or guyed to stiffen it.

• Open Circuit; this is a major cause of poor yaw action, indicating that the turbine is not properly connected to the batteries.

– in this open circuit condition, the rotor will over speed and the blades will become uncharacteristically noisy, emitting a whistling noise. The D400 will frequently turn off the wind, rotating through 360 ° on occasion. Check all wiring, looking for poor or broken connections. Also check fuses. If the fault remains, bypass the regulator to rule out regulator malfunction as the cause of the problem.

• Intermittent or occasional erratic yaw action – this could be due to an intermittent electrical fault. If you observe turbine output abruptly dropping out and then suddenly returning, this could indicate a poor connection between the brushes and slip rings.

To service, remove the four self-tapping screws that secure the black brush-holder plate. Remove the brush-holder plate, taking care not to displace the brushes or brush springs.

The slip rings and contact faces of the brushes can then be cleaned with a solvent soaked cloth or fine, wet and dry paper.

• Squeaking or grating noises audible in yaw – this could be caused by damaged yaw bearings. More typically, it is caused by dirt or corrosion on the slip rings/ brushes.

Remove the brush-plate as above. If noise is still present with the brush-plate clear of the housing, suspect yaw bearings. If the squeak has gone, it confirms the noise emanates from the brush and slip ring assembly. Clean these parts as in the last section. Also, using a fine file, remove any sharp edges from the contact surfaces of the brushes.

On re-assembly, the yaw shaft should rotate silently. If a squeak is still evident, remove the brush plate again and spray the slip rings and brushes with an electrical lubricant (WD40 or similar) or smear a little silver-loaded grease on the slip rings.

**Undue mechanically transmitted noise or vibration**

• Noise or vibration transmitted down the shaft – suspect a loose rotor. Grasp an blade and rock the rotor to check if there is any relative movement between the rotor and the alternator shaft. If play is felt, remove hub parts and re-build, fitting a new hub centre.

• Correct fit of nose cone – check that the nose cone is not catching on the alternator housing.

• Blade damage – check that the blades are not damaged or chipped. This may put the rotor out of balance. Replace blades as necessary.

• Tail bolts – check tail bolts are tight.

• Noises from the alternator – rotate the blades slowly and listen at the alternator housing. Grating or scraping noises indicate a fault within the alternator.