OCKAM
INSTRUMENTS, INC.

Troubleshooting Boatspeed Problems

Boatspeed is an important measurement of relative performance while racing. On the Ockam instrument system, it is also used to calculate true wind speed and angle, wind direction, and dead reckoning. When there is a problem with boatspeed, all those data items that depend on it will not be correct. This document can guide you to troubleshoot your problems before seeking outside assistance.

Are there any systems errors?

The Ockam system will output error codes based on problems detected with interfaces, sensors, or the CPU. The System Manual has a section on error codes; this may help focus your troubleshooting efforts.

Does the CPU see all expected interfaces?

The CPU will not be able to provide good data if the required interfaces are not present. The Ockam system assigns a numerical value to each interface; these values are added together to produce what is called a configuration number (a.k.a. "TEST Configuration", "Diagnostic Configuration", or simply "Configuration"). If the configuration number is known for a particular installation, then missing interfaces can be determined by comparing the reported configuration number to the known theoretical configuration number for the installation. See the System Manual for more information regarding use of the configuration number.

Is any boatspeed data displayed?

If the display shows all dashes (----), the power-on message (HI), or blank data, then the CPU does not see the boatspeed interface. If there is no boatspeed data, check the following:

❑ Is the interface connected to the bus cable, and are the cable and connectors in good condition? The interface is not communicating with the CPU if: on the 005 display there are only dashes or the power-on message (HI); on the 007, the data item has a label, but shows blank data. Also check the interface's main fuse if possible.
❑ If using a T2 interface, is the boatspeed portion disabled? Switch S3, position "a" should be turned on to use the boatspeed interface on the T2

Check to see if any boatspeed data is reaching the instrument system. If the boatspeed displayed is all zeros (0.00), then it is most likely that the transducer signal is not reaching the interface. Check the following:

❑ Is the wiring intact from the transducer to the interface? If the wiring is damaged or disconnected, then the signal will not reach the interface. Pay special attention to splices, junctions, and connectors. Also see if the transducer cable is lying in water, as this may eventually cause failure through corrosion if there is a damaged cable sheath or simply through osmosis through the sheathing.
❑ Is the wiring correct? Are the correct conductors connected to the proper terminals on the boatspeed interface? The Ockam System Manual section for the interface (either T2 or 015) details the connection scheme for most transducers. Connection information for other transducers not in the manual can be found on the Ockam web site.
❑ If two transducers are installed, does boatspeed work on one tack but not the other? This may indicate that one transducer is damaged or the wiring is damaged. If possible, try connecting the known good transducer to the side that is not working. If the boatspeed then works on that tack, the transducer or wiring is at fault. Otherwise, there may be a problem

with the interface. If the transducer is at fault, you can set the interface to use one transducer, and then connect the working transducer to the port input connector.

❏ If only one transducer is installed, is it connected to the port connector on the boatspeed interface? On the 015 interface, it is the TNC connector to the left. On the T2 interface, it is connector terminal 3. The system will report error code 23 if it is receiving a signal on the starboard input with the number of transducers set to one.

❏ Is the impeller fouled or physically damaged? If the transducer impeller is fouled with marine growth or foreign objects, then it might not spin at all. Striking an underwater object may also damage the paddlewheel to the point where it cannot spin freely.

❏ Is the transducer powered correctly? Some transducers require 5 VDC, while others require 12 VDC. Check the System Manual section for the interface (T2 or 015) to see if the interface is configured properly.

❏ If using the Airmar CS4500 ultrasonic transducer, is there power to the separate Airmar junction box? The CS4500 transducer does not go directly to the Ockam interface, but rather goes through an intermediary junction box with a powered circuit board. If this circuit board is not connected to live 12 VDC, then there will be no signal to the Ockam interface.

Does boatspeed suddenly jump up or down?

Sometimes boatspeed may suddenly jump up or down to absurd values and then return to normal. Typically, this is due to an interface going off-line and coming back, but there are other causes. Check the following:

❏ Are all bus cables and connectors intact and in good condition? If the bus wire to the interface is damaged or corroded so that it shorts or looses continuity, then the CPU will not consistently see the interface and its data; likewise with a damaged connector. The easiest way to check this is by shaking and moving the bus cable near the interface and observing any changes.

❏ Are there any foreign objects inside the interface causing shorting? Shake the interface to see if there is anything loose inside that may be causing a short circuit.

❏ If using an 015 (black box) interface, is the front panel firmly attached to the box? There are two boards inside the 015 interface. The front board is attached to the front panel, so if the panel is loose, then the two boards may not be making reliable contact.

❏ Is the transducer wiring in good condition? If there is a problem splice or connector, then the boatspeed would most likely drop lower than what is correct and then come back.

❏ Is the transducer coming out of the water? If it is especially windy, the boat may be heeled over to the point where the transducer is not always in the water. On high-performance boats, the transducer may be out of the water while planing or surfing.

❏ Is heel configured correctly? Heel determines which transducer to use in a two-transducer system, so if heel direction is incorrect, then the transducer that is nearly out of the water may be mistakenly selected. When on starboard tack, heel should read positive numbers; when on port tack, it should read negative numbers. The wind interface (either T2 or 022) has the switches that determine heel direction; see the System Manual section regarding the appropriate wind interface for more information. Alternatively, some compasses provide heel information, and that may be used by the instrument system instead.

Is boatspeed not zero at rest, or is it different than observed boatspeed?

Depending on the installation, this may be due to a variety of factors. Check the following:

❏ Is an Airmar CS4500 ultrasonic transducer installed? Non-zero boatspeeds at rest are normal with this transducer, as it is extremely sensitive. Typically, values will be under one knot, but higher values may be seen in places with more extreme current, such as in a river.

❑ Is there current? Remember that boatspeed measures speed through the water, not speed over the bottom. In areas with extreme current, the boatspeed value may be very different than GPS speed over ground.

❑ Is boatspeed calibrated? A bad CAL Boatspeed Master setting will produce values that are consistently too high or too low.

❑ Is the transducer impeller fouled or damaged? Marine growth and physical damage may cause the boatspeed readings to be consistently low.

❑ Is the boatspeed transducer signature switch set properly? If the wrong signature switch setting is used, then the interface will use the output of the transducer incorrectly. See the System Manual section regarding the interface (T2 or 015) for the correct switch settings.

❑ Is GPS speed over ground substituted for boatspeed? The system will report error code 27 if this is the case.

❑ Is the transducer in a poor position? If the transducer is "shadowed" by an appendage such as a forward rudder, keel, or other underwater protuberance, then the passage of water past the transducer may be affected, giving incorrect data. Also, if the boat tends to plane, the transducer that is too far forward may come out of the water, giving readings lower than observed speeds.

❑ Is an inverter or battery charger interfering with the transducer signal? The 015 interface is especially prone to this problem, as it is very sensitive. If the boatspeed is absurdly high, try turning off everything except the instrument system, and disconnecting from shore power. If the problem goes away, then electrical noise from another piece of equipment is interfering with the signal from the transducer to the interface. Try isolating the offending equipment by powering one piece of equipment at a time and observing its effect on the boatspeed reading.

Is boatspeed different on opposite tacks?

There may be differences on opposite tacks even with a single transducer installation. However, installation with two boatspeed transducers can be troublesome, since it can be a source of confusion. In addition, the heel must be set correctly (zero point and orientation correct) for some boatspeed functions (CAL Leeway and Offset, two transducer switching) to work correctly. If there are problems with different readings from tack to tack, check the following:

❑ Is heel configured correctly? Since several functions depend on heel, be sure that this is correct. Heel should read zero when the boat is upright. When on starboard tack, heel should read positive numbers; when on port tack, it should read negative numbers. Heel determines which transducer to use in a two-transducer system, so if heel direction is incorrect, then the transducer that is nearly out of the water may be mistakenly selected. If there is a problem with heel, there will also likely be problems with some of the wind functions. The wind interface (either T2 or 022) has the switches that determine heel zero and direction; see the System Manual section regarding the appropriate wind interface for more information. Alternatively, some compasses provide heel information, and that may be used by the instrument system instead.

❑ On a two-transducer installation, is one of the transducers fouled? Boatspeed would be lower or zero on one tack, while the other would be normal. The lee transducer on the tack with lower boatspeed should be the one that needs attention if heel is set correctly.

❑ Is the wiring for both transducers in good condition? If one transducer has faulty wiring or connectors, then it may not be operating as well as the other, leading to differences between tacks.

❑ Are the transducers placed on the correct sides? It is very easy to swap the transducers between port and starboard, especially if the transducers are pulled out for winter storage. Labels or tags attached at both ends of the transducer wire can help reduce confusion.

❑ Is CAL Offset set to a normal value? By default, it is set to zero. A positive value will raise the speed on port tack, while a negative value will raise the speed on starboard tack.

❑ Is CAL Leeway set to a normal value? A setting of 7.0 seems to be almost universal. Deviation from this value may produce some alarming effects, so it should be adjusted with care.

❑ Are the transducers identical on both sides? The interface assumes that both interfaces are identical models, as there is only one setting for signature and power. The transducers **must** be identical.

What should be done after checking all this?

If, after examining the suggested items in this document, the boatspeed data is still not correct, you should contact a marine electronics specialist for service. After further examination, it may be necessary to send items to Ockam Instruments for testing and repair; call Ockam to discuss options and obtain a repair RMA if required.