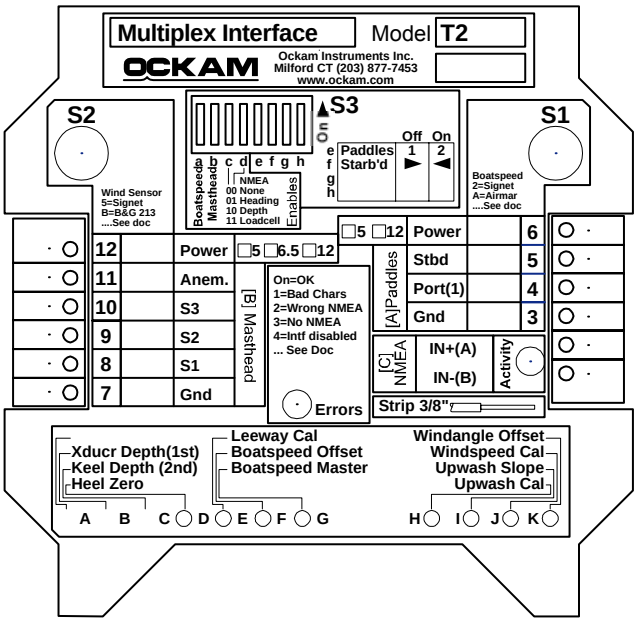
The T2 interface supplies the Ockam system with up to 3 sensor input sets:

- Boatspeed from one or two paddle-type sensors. Separate 5 or 12 volt power is available for these sensors if required.
- Apparent wind angle and speed, from standard pot-type marine mastheads. Sensor power of 5, 6.5 or 12 volts is available. An internal MEMS sensor provides heel angle when this sensor set is enabled.
- Heading or Depth or Loadcell readings from a NMEA-output sensor.



SPECIFICATIONS

Dimensions:	4-3/4" W x 4-3/4" H x 2" D
Mounting:	Velcro™ or 10-24 x 5/8" on 4-5/16" x 3-1/2" Ctrs
Weight:	1 Lb.
Orientation:	Any
Power Requirements:	100ma
Fuse:	500ma Picofuse
Mating Connections:	BUS: BNC Female
	Sensors: 3 Terminal strips
Compatible Devices:	Masthead: B&G 213, Signet Mk.24, others.
	Boatspeed: Signet Mk.33, others.
	NMEA: see below.

THEORY OF OPERATION

It's best to think of the T2 as three independent interfaces in one box. The following interfaces are provided:

- Boatspeed (emulates the 015 interface)
- Masthead (emulates the 022 interface)
- One of Heading or Depth or Loadcell NMEA interface

Each interface can be enabled independently.

[A] Boatspeed Interface

All paddle-wheel boatspeed sensors make pulses at a rate proportional to the speed of the water flowing past the sensor. The 015 Boatspeed interface passes pulse counts from the transducer(s) to the CPU where they are used to determine the boatspeed. Additional information from the

Signature and Transducer switches, and three calibration controls are sent to allow accurate calibration.

The interface can use any of several paddle-type sensors for input. Kenyon, Signet and Brookes & Gatehouse sensors have been interfaced successfully, and others will be published as they are checked out.

Boatspeed Interface Enable (S3a)

In order for the Boatspeed interface to operate, switch S3a must be ON (up).

Boatspeed Signature Switch (S1)

The signature switch determines the nominal calibration number (ie pulses per mile) to be used in calculating boatspeed. This control could be considered the "Coarse Adjust" for boatspeed. Signature switch settings for some common paddlewheel sensors are given in the table below.

Number of Transducers (S3e)

The transducer switch tells the system whether to expect one or two paddle inputs. If two transducers are selected, the system will switch from one sensor to the other (terminal 4 or 5) when the boat tacks, and give an alarm if their speed differs too much. If the switch is set to 1 transducer, then input is taken only from terminal 4. For both settings, the calibration will change depending on the tack (see below).

Cal Boatspeed Master (Pot G)

This control is the "fine tune" of boatspeed calibration. The setting of this control can be read on the CAL Boatspeed Master display. A setting of 1.00 will cause the system to calculate a nominal boatspeed (based on the setting of the Signature switch). A setting of 1.01 will result in a boatspeed which is 1 percent higher than nominal, and so on. The limits of this control are 0.50 and 1.50.

Cal Boatspeed Offset (Pot F)

This control is used in conjunction with the Heel input from the Masthead Interface (which is required for Boatspeed Offset to work) to allow the system to change the boatspeed calibration from tack to tack. The setting of this control can be read on the CAL Boatspeed Offset display. A setting of +0.010 would raise the Starboard paddle (Port tack) calibration 1% and lower the Port paddle (Starboard tack) calibration 1%.

Leeway Cal (Pot E)

This control is used in conjunction with the Heel input from the Masthead Interface (which is required for Leeway to work) to calculate Leeway (the angle that the boat goes sideways).

$$\text{LEEWAY} = \frac{(\text{CAL Leeway}) \bullet \text{HEEL}}{\text{BOATSPEED}^2}$$

Values generally fall between 8.0 and 12.0 and can be read on the CAL Leeway display.

Sw	Hz/Kt	Transducer	Type	Pwr	Sig	Gnd	Cal	NOTE
0	20.1	*(Unassigned)*	COIL					
1	11.9	*(Unassigned)*	COIL					
2	7.00	SIGNET MK 33.1	COIL	none	Red	Blk,Sh	1.00	
3	5.57	Brookes& Gatehouse	COIL				0.90	
4	3.90	Kenyon C10050	COIL	none	Centr	Shield	1.00	
5	2.35	*(Unassigned)*	COIL					
6	1.54	*(Unassigned)*	COIL					
7	1.00	*(Unassigned)*	COIL					
8	20.1	*(Unassigned)*	HALL					
9	13.1	Kaytek K-100 (Sonic)	HALL	none	term4	term 5	0.95	
A	8.53	Airmar (B&G paddle)	HALL	?	Red	Shield	1.28	51Ω pullup,?v
B	5.56	*(Unassigned)*	HALL					
C	3.62	Datamarine	HALL	?			0.83	30k pullup,?v
D	2.35	*(Unassigned)*	HALL					
E	1.54	*(Unassigned)*	HALL					
F	1.00	*(Unassigned)*	HALL					

[B] Wind Interface

Calculating true wind requires very accurate knowledge of the apparent wind. The readings must be properly corrected for heel, leeway and upwash in order to get accurate true wind angle and direction. There are six controls on the interface to aid in calibration.

The interface can use any of several synchro-pot (360 degree) mastheads for input. These sensors produce three triangle wave DC voltage outputs carrying the angular information, and a pulse rate for the speed. The interface measures the three voltages and pulse rate, and passes them to the CPU where they are used to determine the apparent wind angle and speed. The interface also measures the heel angle (another voltage generated inside the interface), and sends it and the settings of the Signature and Heel Sign switches, and the four calibrations to the system.

Wind Interface Enable (S3b)

In order for the Wind interface to operate, switch S3b must be ON (up).

Wind Signature Switch (S2)

The signature switch determines the nominal calibrations to be used in calculating apparent wind speed and angle. This control could be considered the "Coarse Adjust". Signature switch settings for some common paddlewheel sensors are given in the table below.

Heel Sign (S3f)

The Heel Sign switch tells the system whether the interface is “facing forward” or “facing aft”, thus changing the sign of the heel sensor. When properly set, Heel and Wind Angle Apparent have the same sign (ie starboard tack is positive heel).

Heel Zero (Pot D)

This control allows the heel angle reading to be corrected for misalignment of the interface. There is no readout of this adjustment – when upright, adjust the control for zero heel angle.

Cal Wind Angle Offset (Pot K)

This control adjusts the zero of the apparent wind angle. The adjustment can be read on the CAL Wind Angle Offset display. A reading of '+1.0' will decrease the masthead's basic angle by 1 degree, and a reading of '-1.0' will increase it by 1 degree. The range of adjustment is from -16 to +15.9.

Cal Wind Speed (Pot J)

This control is the adjustment for windspeed relative to the basic calibration of the signature. The value of this adjustment can be read on the CAL Windspeed display. A reading of '1.00' will give a calibration equal to the nominal calibration of the signature. A reading of '1.01' increases the windspeed 1 percent, and '0.99' will decrease it 1 percent. The range of adjustment is from '0.50' to '1.50'.

Cal Upwash (Pot H)
Cal Upwash Slope (Pot I)

These controls adjust the upwash correction applied to the apparent wind angle. They are POWERFUL adjustment that will cause grief if injudiciously used. DON'T mess with them until you need to. See section 3 for details on the proper use of these calibrations.

Sw	Transducer Type	Type	Zero	Hz/Kt	Cal	Notes
0	*(Unassigned)*	COIL	0	8.000		
1	*(Unassigned)*	COIL	0	4.516		
2	*(Unassigned)*	COIL	0	2.549		
3	Kenyon C50050	COIL	0	1.432	1.12	
4	*(Unassigned)*	COIL	0	1.104		
5	Signet Mk 24.31	COIL	0	0.670	1.07	Reposition vane
6	*(Unassigned)*	COIL	0	0.410		
7	*(Unassigned)*	COIL	0	0.250		
8	*(Unassigned)*	HALL	0	8.000		
9	*(Unassigned)*	HALL	0	4.516		
A	*(Unassigned)*	HALL	0	2.549		
B	B & G 213 Electronic	HALL	180	1.096	1.13	560 ohm pullup
C	B & G Older Pot types	HALL	180	1.096	1.13	560 ohm pullup
D	*(Unassigned)*	HALL	0	0.670		
E	Standard Horizon	HALL	0	0.410		560 ohm pullup, Reverse Vane
F	*(Unassigned)*	HALL	0	0.250		

[C] NMEA Interface

A NMEA output sensor outputing Heading, Depth or Load can be connected to the T2. On Tryad systems, Heading or Depth could also be input to T1 NMEA channel, but without any disable switches. Be careful not to have another interface on the system doing the same job (ie before enabling, check that TEST Configuration/***Conf*** is even), or neither will work.

NMEA Interface Enables (S3c,d)

S3c	S3d	Interface	***Conf***	Note
off	off	None		
off	ON	Heading	8	Only NMEA (Not 3D heading eg 033H)
ON	off	Depth	16	Adjust Transducer Depth (B) until Depth Surface is OK, then adjust Keel Depth (C) until Depth Keel is OK.
ON	ON	Loadcell	512	Accepts Navtec (Axxx) or $YXXDR.. input (4800 baud only). Fixed on Slot 0, Tag 'M'

INSTALLATION

1 If the interface requires modification for hall power, do the appropriate modification before installing the interface (see NOTE column below). After re-assembly, check that the interface still works properly as described in (3) below.

2 Mount the interface in a protected location. To simplify calibration, mount the interface so that the adjustments can be gotten at, preferably while an indicator is visible.

3 Connect the interface to the system via the coaxial bus, and power the system up. Check the enable switches (S3a thru f). For each enabled interface, TEST Configuration divided by "Config" should be odd.

Interface	Config	Interface	Config	Interface	Config
Boatspeed	2	Heading	8	Loadcell	512
Wind	4	Depth	16		

4 Set the Signature and DIP switches to their appropriate values.

5 Connect the transducer(s) to the correct terminals on the interface. Spin and twiddle the sensors to determine that they are operating correctly.

For systems with MASTHEAD interface and 2 transducers, the PORT transducer is selected when the HEEL angle is positive, and the STARBOARD transducer is selected when the HEEL angle is negative. For debugging purposes, the sign of HEEL can be changed by dismounting the MASTHEAD interface and tilting it to the appropriate angle.

Fuses, Pullups and Jumpers