

3 Meteorological station

The meteorological station monitors several of the most crucial meteorological parameters: wind speed, wind direction, air temperature, relative humidity and atmospheric pressure. Although many yachts have various weather sensors, they are often incomplete. In addition they are generally not standardized, automated or fully integrated into the ship's computer. Most importantly, they have not been inspected and approved for inclusion in the weather modeling systems utilized by the United Nation's World Meteorological Organization (WMO) or the National Weather Services (NWS) of participating countries. For these reasons the SeaKeepers Society, as part of its system, supplies a complete WMO and NWS approved weather station.

The upper sensor measures wind speed and direction relative to the bow of the vessel (Figure 3.1). The larger gilled unit on the right is the radiation shield that contains the temperature and humidity sensors. The smaller gilled unit is a port for the pressure sensor that has been designed to minimize fluctuations in

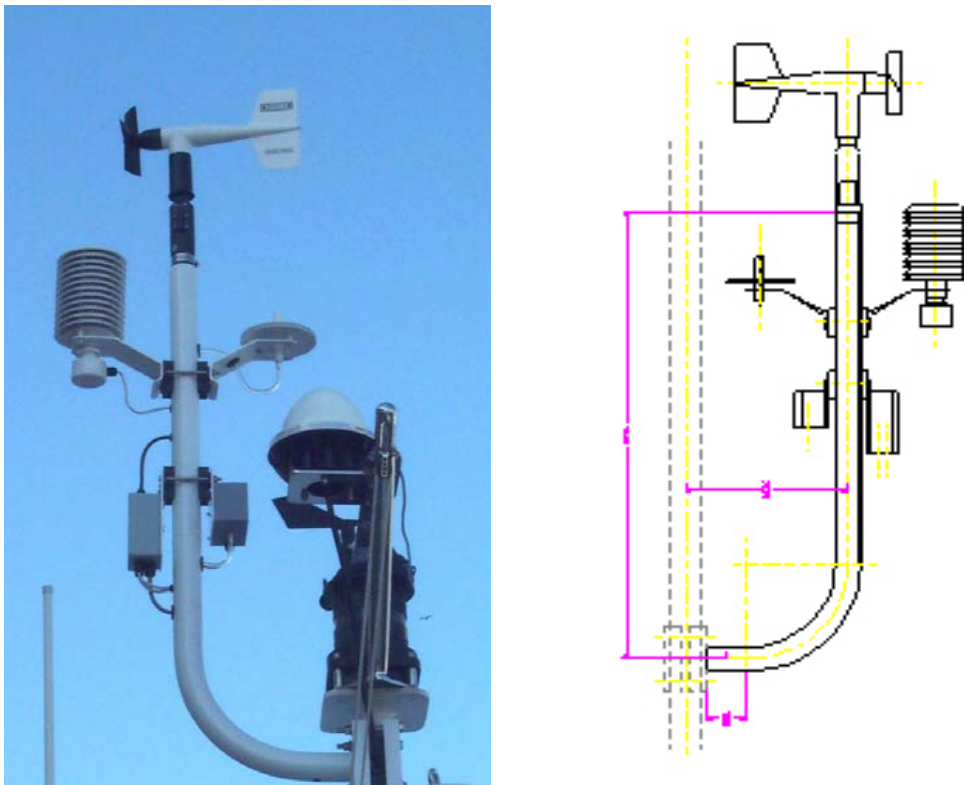


Figure 3.1

measured pressure that may otherwise be generated by fluctuations in wind or vessel speed. The two lower boxes contain the pressure sensor and the serial interface where the data are digitally encoded for serial transmission.

3.1 Choosing a location

In order to make good measurements that will be useful to the World Meteorological Office and National Weather Services, it is important that the sensors be well sited.

The Met station must be placed in an unobstructed area where it can record accurate wind speed and direction data. The aesthetics of private yachts are a primary concern of the owners and captains. The wind sensor cannot perform adequately, however, unless it is in an exposed location offering a complete or nearly complete unobstructed view of 360 degrees. The anemometer (wind speed and direction) should be mounted where it is clear of turbulent air spinning over the tops of deck houses and around stacks, which usually dictates a position as high above the highest deck as possible. Ancillary masts have been designed to mount the various packages that comprise the met station. See figure 3.1 and 3.4.

The total height of this mast is approximately 1 meter. Several different mast designs are available.

3.2 Mounting the MET Station

Figures 3.1 and 3.4 illustrates the mounting method recommended to minimize the appearance of unsightly interconnections on the mast, note that the U bolts supplied by the manufacturers of these sensors have been replaced by straight bolts interconnecting the two paired sets of devices. The anemometer base has an aligning notch to position it. In this installation it should point to the bow of the vessel so that when the wind is from dead ahead, the sensor will report 180°. This is the same as facing the six screws that hold the cable clamp on the bottom of the wind sensor forward (see figure 3.2).

The serial interface box mounted lower on the mast contains a magnetic compass and the four screws that attach the cover to this box must also face forward so that it is perfectly aligned with the wind sensor (see figure 3.3).



Figure 3.2 Wind sensor



Figure 3.3 Serial interface box

face these
screws
forward
and align
the units

The wind sensor may be separated from the serial interface box by as much as 50 feet (15 m) but their alignment is critical.

A collection of holes has been drilled in the mast through which the various cables and hoses may be threaded through rubber grommets.

Figure 3.5 illustrates one mast arrangement that has been used to mount the sensors. The hole sizes have been chosen to accommodate grommets with CAT5 cable and their positions have been selected to optimize appearance. Item 4 in the upper drawing illustrates a hollow plug adapter to mount the wind sensor atop the pole. Figure 3.6 gives the details of an optional branch for this mast, which can mount the INMARSAT antenna.

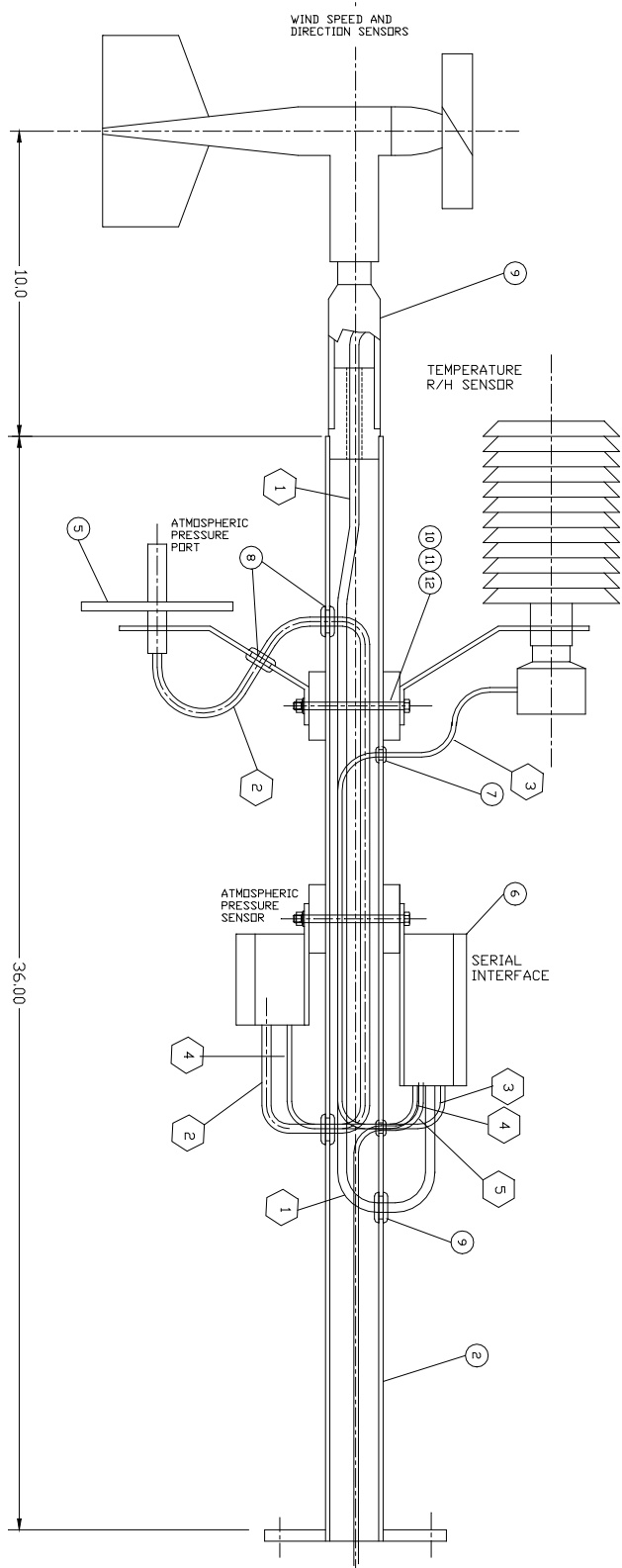
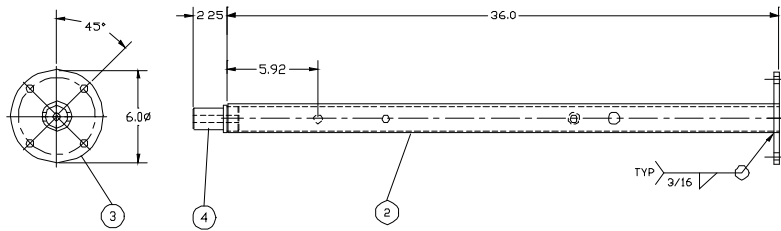
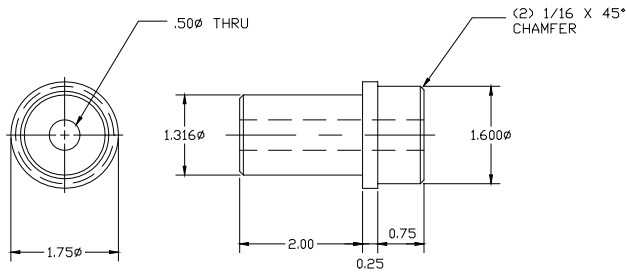


Figure 3.4 Starboard side view of met mast



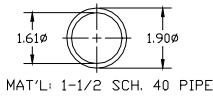
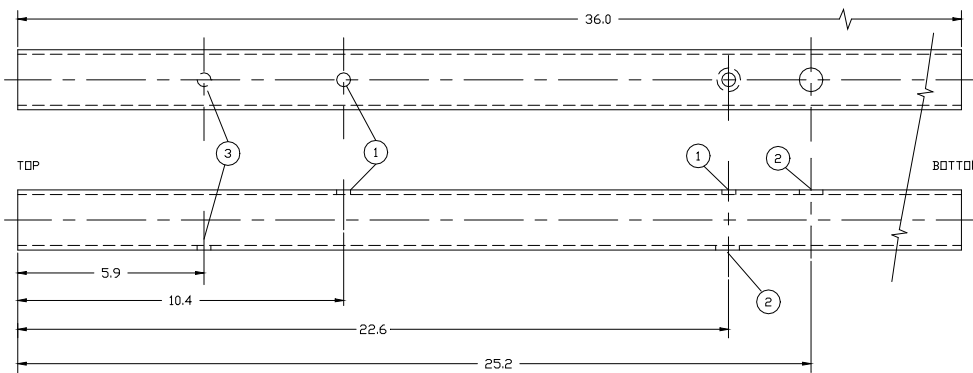
a) General arrangement of a simple straight mast



b) Item 4 from GA detail of top hollow adapter plug

HOLE SCHEDULE		
NO.1 HOLE	.44 ϕ	2 HOLES
NO.2 HOLE	.62 ϕ	2 HOLES
NO.3 HOLE	.56 ϕ	1 HOLES

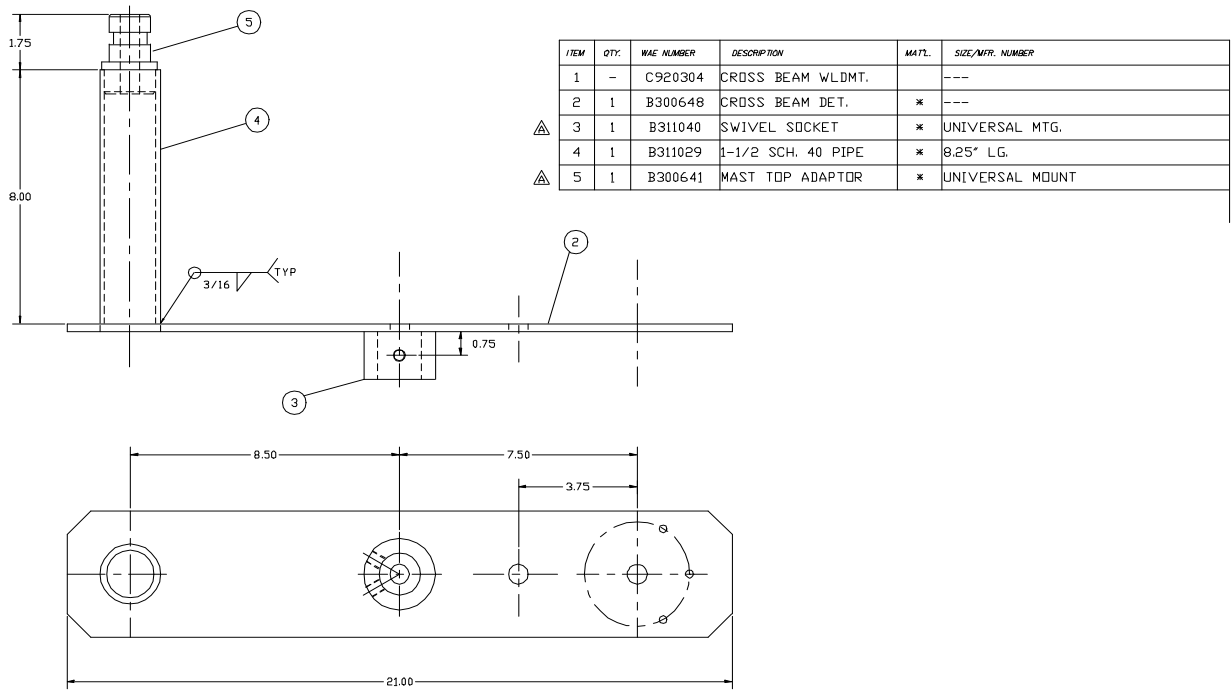
MAT'L. PER CUSTOMER REQ'MT.
 DASH 1 304 STN'LS STL.
 DASH 2 6061-T6 ALUM.



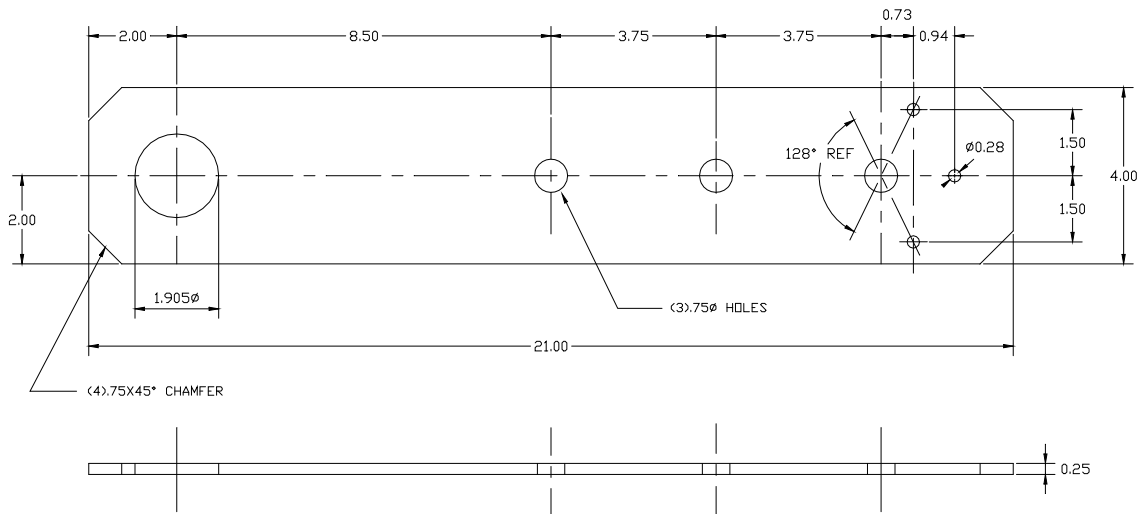
c) Item 2 from GA detail of drilling pattern in mast pole

Figure 3.5

Drawings of parts required to mount INMARSAT Std C antenna at head of Met mast

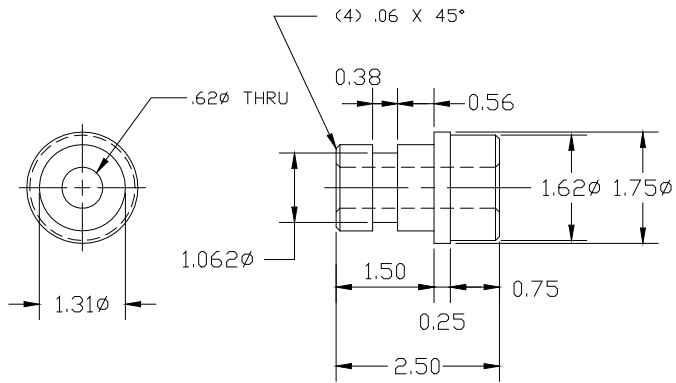


(a) Met mast-head cross beam weldment

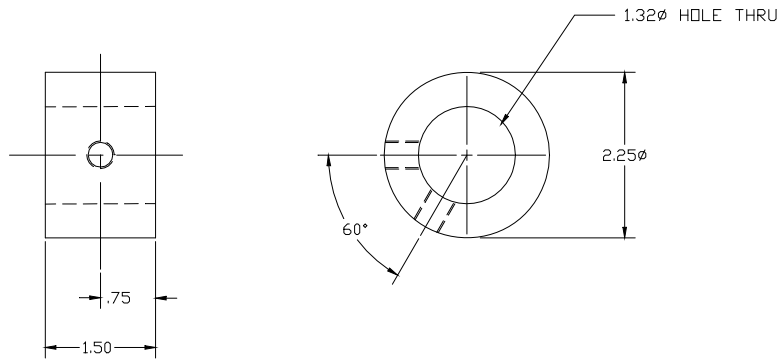


(b) Met mast-head cross beam detail

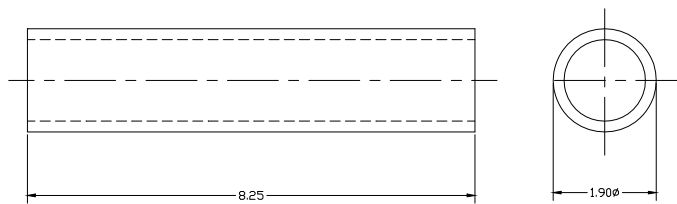
Figure 3.6 (a,b)



(c) Met mast-head adapter



(d) Swivel socket



MAKE FROM 1-1/2 SCH. 40 PIPE

(e) Schedule 80 pipe section

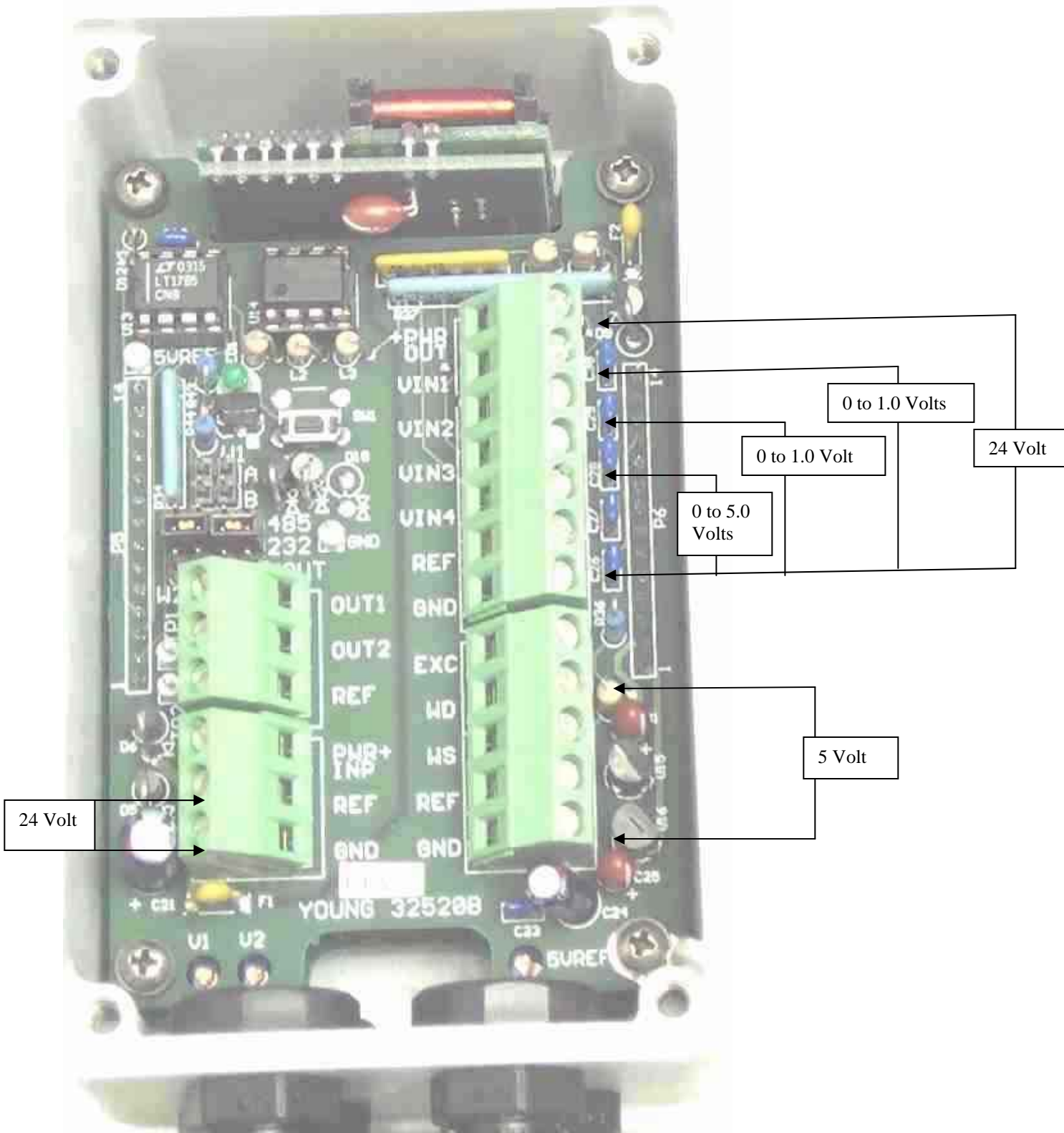
Figure 3.6 (c, d, e)

3.3 Electrical interconnection

All of the sensors connect back to the serial interface box. Table 3.1 indicates the interconnections. There are 2 versions of the wiring diagrams to correspond to 2 versions of the barometric pressure sensor; with either 5 or 4 wires. The wind sensor is provided with a set of flying leads, the other sensors will require the installer to run his own cables. Connections in the serial interface box are by terminal strip and require only a small screwdriver.

The installer can utilize the supplied five conductor shielded (Belden 9503) cable from the serial interface box to the computer module. This cable will use two conductors to supply 24 Volts to the Met package and three conductors to connect to the DB9 connector on the RS485 interface (Com3, the top card in the computer). It is also possible to utilize two twisted shielded pairs from the Belden 1218 cable to implement this. The pin 5 connection to the DB9 can use the screen of one of these pairs and the Gnd connection assigned to the screen can be left open.

In addition, it is necessary to move the 2 jumpers in the serial interface box to the RS485 position. *Compass and serial interface trouble shooting guide*



Reality check

Temperature = $(\text{Vin } 1 * 100) - 50 \text{ deg C}$ Rh = $\text{Vin}2 * 100 \%$ Barometric pressure = $((\text{Vin } 3/5.0) * 300) + 800 \text{ hPa}$

Table 3.1a SeaKeepers Meteorological Station inter-wiring: 5 wire Barometric Pressure

Serial Interface	color	Pressure sensor	color	Temperature / Rh Sensor	color	Wind speed / Direction	color	Computer box
+ Power out		#4 + Power		#1 + Power				
V in 1				#4 Temp				
V in 2				#5 Rh				
V in 3		#1 +OUT						
V in 4								
Ref		#2 –OUT #5 – power		#2 Signal Ref #2 Power Ref				
GND		#3 Shld		#3 Earth gnd				
Exc					WHT	# 5		
WD					GRN	# 4		
WS					RED	# 6		
Ref					BLK BLU or BRN	# 3		
GND					SHL D	# 1		
OUT1								DB9 # 3
OUT2								DB9 # 2
REF								DB9 # 5
PWR+ INP								+24 V supply
REF								V supply return
GND								

In addition, it is necessary to move the 2 jumpers in the serial interface box to the 232 position.

Table 3.1b SeaKeepers Meteorological Station inter-wiring: 4 wire Barometric Pressure

Serial Interface	color	Pressure sensor	color	Temperature / Rh Sensor	color	Wind speed / Direction	color	Computer box
+ Power out		+ power		#1 + Power				
V in 1				#4 Temp				
V in 2				#5 Rh				
V in 3		V						
V in 4								
Ref		Ref		#2 Signal Ref #2 Power Ref				
GND		Shld		#3 Shld				
Exc					WHT	# 5		
WD					GRN	# 4		
WS					RED	# 6		
Ref					BLK BLU or BRN	# 3		
GND					SHLD	# 1		
OUT1								DB9 # 3
OUT2								DB9 # 2
REF								DB9 # 5
PWR+ INP								+24 V supply
REF								V supply return
GND								

In addition, it is necessary to move the 2 jumpers in the serial interface box to the 232 position

Table 3.1c SeaKeepers Meteorological Station inter-wiring: 4 wire Temperature / Rh sensor

Serial Interface	color	Pressure sensor	color	Temperature / Rh Sensor	color	Wind speed / Direction	color	Computer box
+ Power out		+ power		#1 + Power				
V in 1				#4 Temp				
V in 2				#3 Rh				
V in 3		V						
V in 4								
Ref		Ref		#2 Signal Ref #2 Power Ref				
GND		Shld						
Exc					WHT	# 5		
WD					GRN	# 4		
WS					RED	# 6		
Ref					BLK BLU or BRN	# 3		
GND					SHLD	# 1		
OUT1								DB9 # 3
OUT2								DB9 # 2
REF								DB9 # 5
PWR+ INP								+24 V supply
REF								V supply return
GND								

In addition, it is necessary to move the 2 jumpers in the serial interface box to the 232 position