

0.5 Gill R2 Sonic Anemometer

Quick Reference

0.5.1 Description:

The Gill sonic anemometer consists of following pieces:

- transducer head
- analog input box and RS422/232 converter box (not needed)
- Red Teflon 15 meter cable (digital cable)

The following NCAR built pieces are required for mounting the sensor on the PAM mast:

- sonic clamp
- two piece mast clamp, and bolts
- rectangular boom adapter
- SBUS front panel RS485-RS232 converter board (mounted inside PAM box)

The sonic is usually the last sensor to be installed on the tower before the mast is raised. There are no electronic levels in the R2 sonic head.

0.5.2 Gill / PAM Cabling Adaptor:

The adaptor needed for the EVE electronics only provides serial receive from the sensor. It does not support transmit to the sensor. The shield drain wires are attached at both ends. Twisted pair cable is used with pairings as shown.

Signal	Gill 10-Pin	DB-15	PAM 9-Pin Amp
=====	=====	=====	=====
+12 VDC	1	7	8
Power Gnd	9	2	7
RS422 Tx-A	2	12	5 RS485+
RS422 Tx-B	3	8	9 RS485-
Sig. Gnd	4	9	4
Analog Gnd	4	15	
Chassis	10	1	6 shield
Analog 4	6	6	
Analog 3	8	13	
Analog 2	5	4	
Analog 1	7	11	

0.5.3 GILL R2 UVW Directions:

View the R2 from above. An arrow points to "N". The transducer which is 30deg counter-clockwise from "N" is in the direction of -U. The support spar which is 120deg counter-clockwise from N is +V.

PAM GILL UV Alignment:

This is how EVE makes R2 and R3 vectors compatible. On the R2 sonic V is negated. On the R3 sonic U and V are negated. Thus +V is 60 degrees, and +U is 150 degrees.

0.5.4 Maintenance / Performance:

Transducer performance is adversely effected by icing. A layer of ice 0.5mm thick can cause false triggering of the receiver at low temperatures especially when the true receive signal is smaller. If possible, the transducers should be kept clear of ice by lightly wiping them off.

In NCAR's use, The Solent is extremely reliable, but somewhat less accurate than the ATI or CSAT. The Solent almost always works in the rain, the ATI works in some rain, and the CSAT rarely works in the rain. The ATI and CSAT stop working properly when a drop of water covers a transducer. This occurs more easily with the CSAT because the transducers are 0.5 cm in diameter, while the ATI's are 1 cm in diameter.

0.5.5 Path Curvature Correction of Sonic Virtual Temperature for Gill R2:

Virtual temperature is derived from the speed of sound from the uvw components. Physical curvature of the path causes errors proportional to wind speed. The proper correction for dealing with these errors is:

$$T_c = ((u^2 + w^2)/2 + v^2 + c^2) * 2.481e-3 - 273$$

The correction can be applied either in post processing of the data or else in the EVE configuration when using PAM. The EVE configuration declarations would be:

```
# Convert c to sonic temp with wind correction (Gill R2 only)
# Tc = (c^2 + vn^2)/403
# vn^2 = v^2 + 0.5*(u+w)^2
CREATE: v2=multiply SONIC.V SONIC.V
CREATE: c2=multiply SONIC.c SONIC.c

CREATE: tmp=add SONIC.U SONIC.W
CREATE: tmp=multiply SONIC.tmp SONIC.tmp
CREATE: tmp=multiplyC SONIC.tmp 0.5
CREATE: tmp=add SONIC.tmp SONIC.v2
CREATE: tmp=add SONIC.tmp SONIC.c2
CREATE: tmp=multiplyC SONIC.tmp 2.4813896e-3
CREATE: Tsonic=subtractC SONIC.tmp 273.15
```