

# SENSORS

## MANUAL - F460 WIND SPEED SENSOR P/N M100075 Rev E

### 1.0 INTRODUCTION

The F460 Wind Speed Sensor, P/N 100075, is designed to provide low starting threshold, wide dynamic response and high accuracy over a wide range of wind speeds and a variety of environmental conditions.

### 1.1 SPECIFICATIONS

**Accuracy:**  $\pm 0.07$  m/s (0.15 mph) or  $\pm 1.0\%$ , whichever is greater

**Threshold:** 0.22 m/s (0.5 mph)

**Distance Constant:**

Lexan: <1.5 m (4.9 ft) of air maximum

Heavy Duty: <4 m (13.1 ft.) of air maximum

**Operating Range:** 0-56 m/s (0-125 mph)

**Operating Temp:** -40° to 60°C (-40° to 140°F)

**Power Requirement:** +5 to +14Vdc @ 1 mA

**Signal Output:** 5 Vpp freq. proportional to WS

**Output Impedance:** 4.7K Ohm

**Dimensions:**

Diameter: 5.7 cm (2.25 inch)

Height: 29.2 cm (11.50 inch)

Weight: less than 2 lbs. (0.9 kg)

Turning Radius: 3.75 inch (9.5 cm)

**Anemometer Cup Transfer Functions:**

Lexan:  $\text{Freq(Hz)} = (\text{mph} - 0.3) \times 9.511$

Heavy Duty:  $\text{Freq(Hz)} = (\text{mph} - 0.5) \times 9.511$

SS:  $\text{Freq(Hz)} = (\text{mph} - 0.5) \times 10.425$

### 2.0 INSTALLATION

The sensor mounts to the Prewired F460 Crossarm, P/N 101994. Refer to the 101994 manual for proper installation instructions. Be sure the Sensor is located in a clear, unobstructed area to minimize any turbulent effects caused by obstructions (e.g., - trees, buildings, etc.)

The sensor mounts on the Crossarm by matching the connector keys and the notch on the lower part of the Sensor body to the alignment pin of the Crossarm. Secure the Sensor by tightening the two set screws located at the base of the Sensor. The cup set attaches to the Sensor by matching the groove in the cup assembly hub to the shaft hub and lightly tightening the set screws.

Note: Some Anti-Seize compound on the set screws will facilitate disassembly if it becomes necessary.

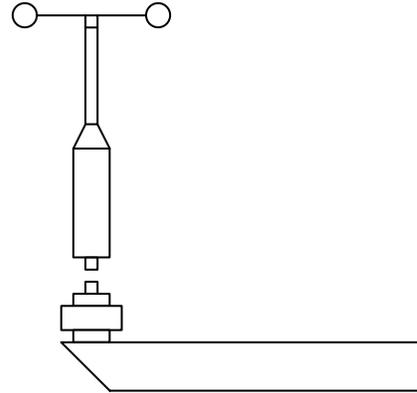


Figure 1

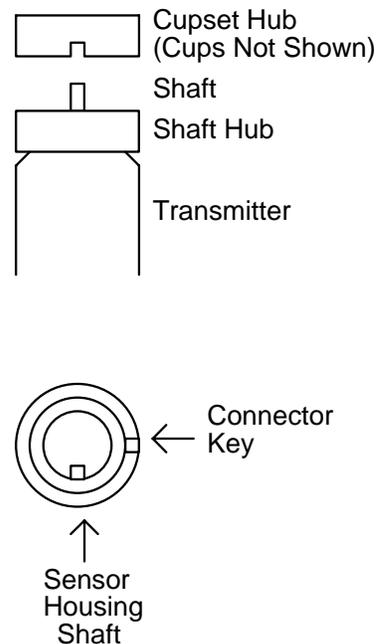


Figure 2

### **3.0 INPUT/OUTPUT CONNECTIONS**

<u>PIN</u>	<u>FUNCTION</u>
A	WS Frequency Output
B	+V In
C	Ground
D	Not Used
E	Not Used
F	Not Used

### **4.0 USER DEFINED OPTIONS**

Both internal and external sensor heaters are available. The internal heater is a continuously operating device which consumes 2W per sensor of the 12 Vdc sensor power. This heater option is designed to minimize internal moisture buildup and requires factory installation. The external heater is thermostatically controlled and is designed to minimize sensor freeze-up in cold environments. This heater option is powered by 110 Vac, requires approximately 20W per sensor, and may be added by the user as a field modification.

### **5.0 USER INTERFACE** N/A

### **6.0 THEORY OF OPERATION**

A lightweight, chemically etched disk divided into 30 sections rotates with the cup set. As the disk rotates, the light path between an IR LED and a phototransistor is alternately blocked and left clear. The Wind Speed Amplifier, P/N 102499 (101080), is located in the main body of the Sensor. To gain access to the Amplifier, the cover must be removed by pulling it toward the base with a slight twisting motion. Drawing No. 401467 (Section 9.0) is a schematic diagram of the Amplifier. U1 is a voltage regulator supplying regulated 5 volts to the circuit. Current flows through LED CR1 causing it to emit energy in the infrared region. The energy strikes phototransistor Q1 whenever a hole in the chopper passes in front of CR1. The resulting change in the collector voltage of Q1 is amplified by U2. The output of U2 is a 5 volt square wave. Resistors R7 and R8 along with Transzorb CR3 protect the circuitry from voltage transients.

### **7.0 CALIBRATION**

The sensor by itself does not require calibration. However, Climatronics can provide NIST traceable calibration in our wind tunnel for your sensor and cup assembly combination. Please contact the factory for further details.

### **8.0 MAINTENANCE**

The only maintenance required is to periodically check the bearing wear. This is easily done with Climatronics' Wind Speed Sensor Torque Meter, P/N 101257. Should it become necessary to replace the bearings, proceed as follows. Both bearings should be replaced if replacement is necessary. Drawing No. 100075 (Section 9.0) will help in locating the parts described below. Read through the whole procedure before starting.

1. Remove the cup assembly, by loosening the 2 set screws which holds it to the sensor shaft.
2. Remove the 2 screws holding the PCB, and move it away from the shutter.
3. Remove the two flat head screws holding the column assembly to the support and remove the column assembly.
4. Loosen the two set screws that hold the cap in place and remove the cap. Replace worn set screws, lubricate with anti-seize compound.
5. Remove the retaining ring from the top of the shaft with retainer ring pliers or a small pen knife. If the ring is bent, it must be replaced.
6. Allow the shaft to slide out through the open end of the column, being careful not to damage the shutter.
7. Remove and discard the old bearings.. It may be necessary to push the bearings out from the bottom of their sets with a long thin rod such as the shaft assembly. Pushing lightly all around the bearing is better than putting too much pressure on one side of the bearing.
8. Replace the spacer that was closest to the shutter on the shaft.

9. Place a new bearing on the shaft and guide the shaft back into its hole from the bottom until the bearing is seated. When the bearing is seated, the retainer ring groove will be visible at the top of the transmitter.

10. Hold the shaft in place from the bottom, being careful not to damage the shutter, and place a new bearing over the top of the shaft and press it down into its seat.

11. Replace the spacers on top of the bearing and then replace the retainer ring. If retainer ring pliers are not available, a small knife can be used to expand the retainer ring.

12. Replace the cap and screw the column back onto the transmitter. (Use thread locking compound under the flat head screws).

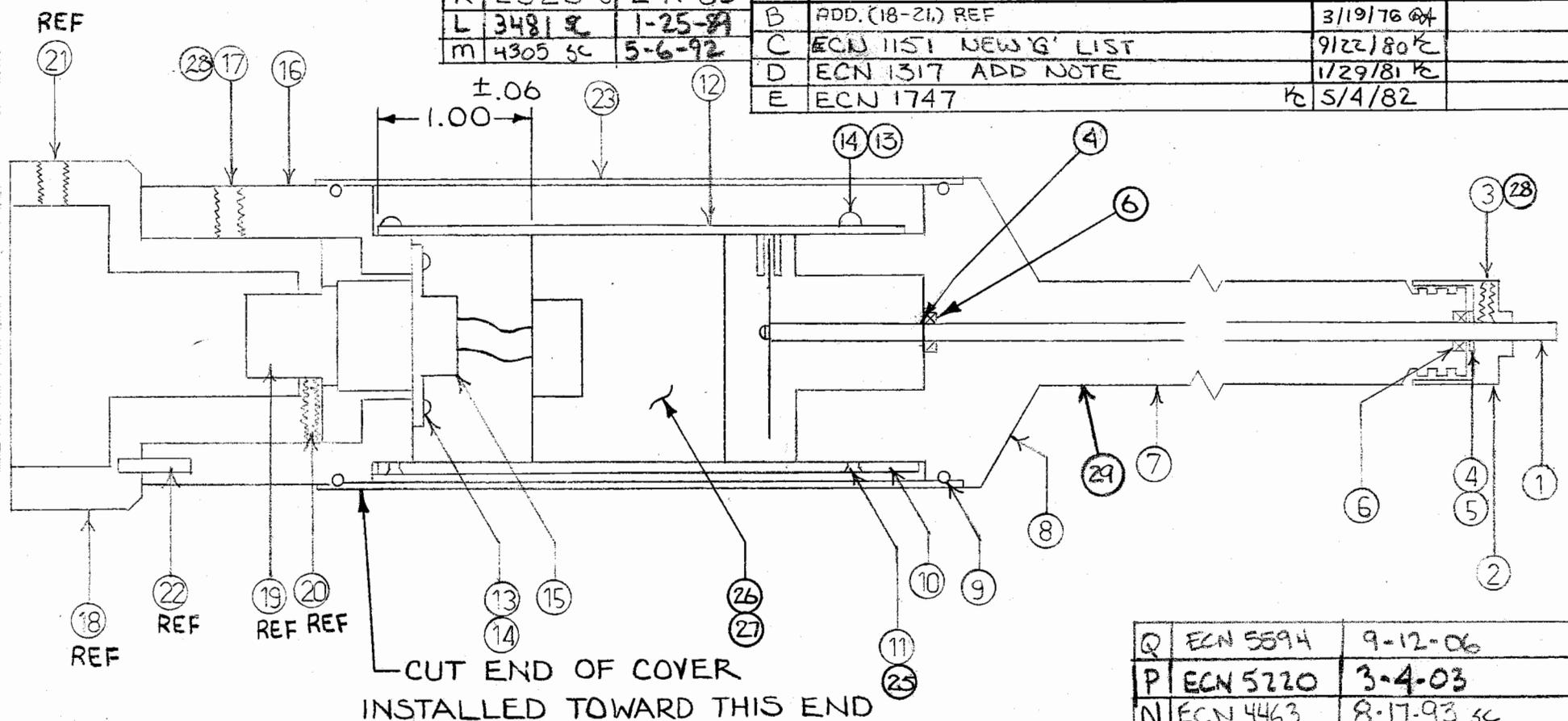
If the shaft assembly is to be replaced, the procedure is the same as outlined above, except that the spacers cannot necessarily be replaced as above. The lower spacer (one next to shutter) is always a 0.010 inch thick spacer (P/N SS1-7). The upper spacers are selected to allow 0.005 to 0.010 inches of shaft end play.

If the end play measurement cannot be made, it can be assumed to be correct if the shaft has some end play, and the shutter is free to rotate. In all cases, a minimum spacer of 0.010 inches is required at the top of the shaft.

A100075Q

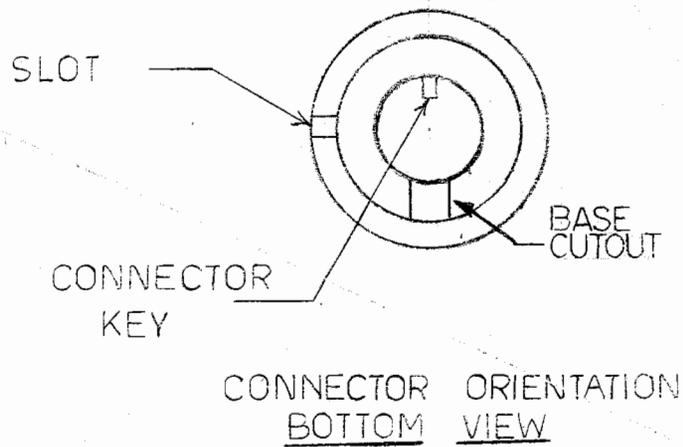
J	2221 BJ	12-5-83
K	2523 JS	2-11-85
L	3481 R	1-25-84
M	4305 SC	5-6-92

REVISIONS			
LTR	DESCRIPTION	DATE	APPROVED
B	ADD. (18-21) REF	3/19/76 <i>AK</i>	
C	ECN 1151 NEW 'G' LIST	9/22/80 <i>K</i>	
D	ECN 1317 ADD NOTE	1/29/81 <i>K</i>	
E	ECN 1747	<i>K</i> 5/4/82	

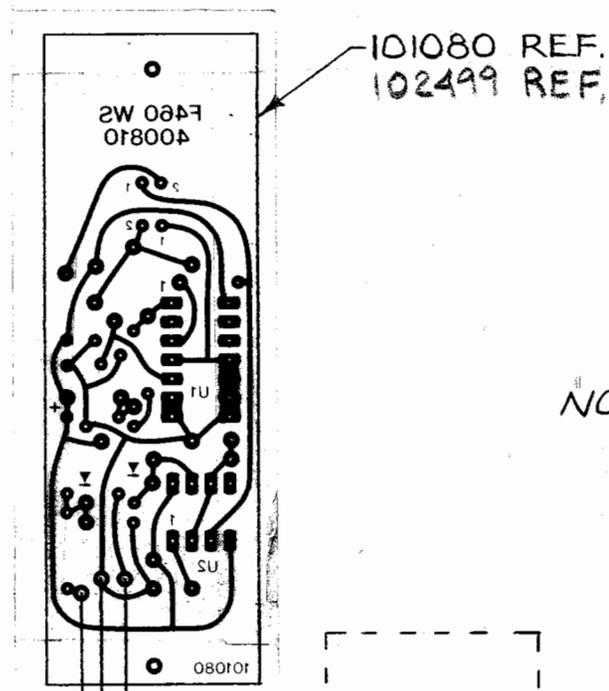


Q	ECN 5594	9-12-06
P	ECN 5220	3-4-03
N	ECN 4463	8-17-93 <i>SC</i>

F	ECN 1828	<i>K</i>	8/3/82
G	ECN 2032	<i>BJ</i>	3/23/83
H	ECN 2045	<i>BJ</i>	3-31-83



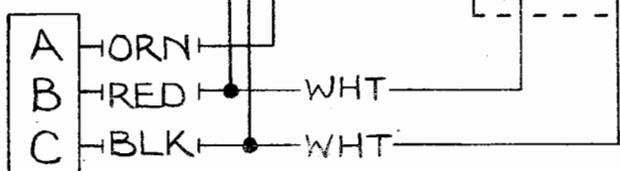
TOLERANCES UNLESS OTHERWISE SPECIFIED		<b>CLIMATRONICS CORP.</b>	
FRACTIONS	DEC		
±	±	±	F460 WIND SPEED TRANSMITTER ASS'Y. DRW.
APPROVALS	DATE		
DRAWN <i>S.D.S.</i>	5-14-74		
CHECKED			
		SCALE	SIZE
		DRAWING NO. A100075 Q	
DO NOT SCALE DRAWING			SHEET 1 OF 4



101080 REF.  
102499 REF.

NOTES:

1. ALL WIRES 22 GA, 2 IN. LONG
2. INSTALL #10 PVC TUBING 1/2 LONG ON CONNECTOR PINS A, B, & C AFTER SOLDERING WIRES
3. HEATER OPTION



NOTE 3  
101263 REF.

M53102R14S-6P  
REF.

TOLERANCES (EXCEPT AS NOTED)	REVISIONS		CLIMATRONICS CORP.			
	NO.	DESCRIPT	BY			
DECIMAL	A			F460 W.S. TRANSMITTER		
±	B					
FRACTIONAL	C					
±	D					
ANGULAR	E					
±				DRAWN BY <i>kc</i>	SCALE FULL	MATERIAL
				CHK'D	DATE 1/29/81	DRAWING NO.
				TRACED	APP'D	A100075Q

F460 WIND SPEED SENSOR  
P/N 100075 Rev 0  
PARTS LIST  
Sheet 3 of 4

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
1		1.0	100082	F460 WND SPD SHAFT ASSMB
2		1.0	101441	F460 WIND SPEED CAP
3		0.0	SC8-5	SET SCREW 4-40 x 5/32
4		2.0	Q2-12	RING RETAINER
5		0.0	SS1	SPACER KIT
6		2.0	500096	BEARING
7		1.0	500107	COLUMN, F460
8		1.0	500108	TOP, F460
9		2.0	2-031	O-RING, BUNA N, 60 DURONETER
10		1.0	500109	SUPPORT TRANSMITTER F460
11		4.0	MS24693-C2	4-40 x 1/4 100 DEG. FH SCREW
12		1.0	102499	WIND SPEED AMPLIFIER, F460
13		6.0	MS51957-14	SCREW 4-40 x 5/16 FH
14		6.0	MS35338-135	WASHER, LOCK SPLIT #4
15		1.0	MS3102A14S-6P	CONNECTOR, RECEPTACLE
16		1.0	500110	BASE, F460
17		2.0	SC10-4	BR. TIP SET SCREW 1/4-20x 3/16
18		0.0	500112	ADAPTER, F460
19		0.0	MS3106A14S-6P	CONNECTOR, STRAIGHT PLUG
20		0.0	MS51021-21	SET SCREW 6-32 x 1/8
21		0.0	MS51023-60	SET SCREW 1/4-28 x 3/16
22		0.0	CP5-14	PIN, ROLL 7/16 in LENGTH

Notes: ITEMS 5,25,29 ARE TO BE USED AS REQUIRED  
ITEMS 3 AND 18 THRU 22 ARE FOR REFERENCE ONLY  
DP-190 MAY BE SUBSTITUTED FOR DP-125

F460 WIND SPEED SENSOR  
P/N 100075 Rev 0  
PARTS LIST  
Sheet 4 of 4

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
23		1.0	500111	TRANSMITTER COVER F460
24		0.0	100075G	SEE G LIST
25		0.0	512AD040	SEALANT 242, LOCTITE
26,27		0.0	100075H	SEE H LIST
28		0.0	76764	ANTI-SEIZE, LUBRICANT, 767
29		0.0	DF-125	SCOTCH-WELD EPOXY ADHESIVE

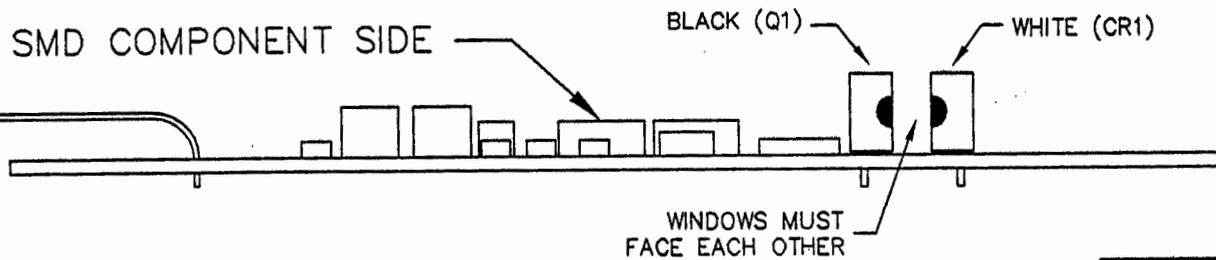
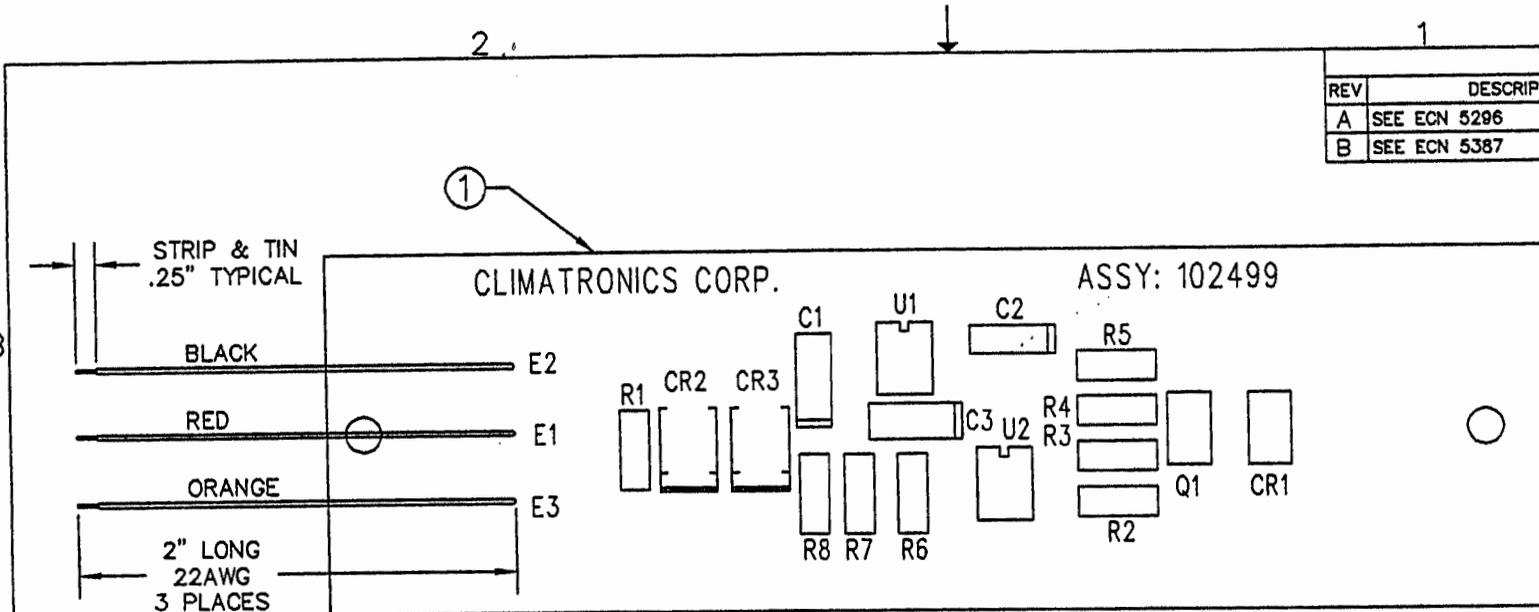
SEE G LIST  
P/N 100075G Rev  
PARTS LIST  
Sheet 1 of 1

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
		1.0	100075G0	LEXAN CUPSET/CONSTANT 9.511
		1.0	100075G1	SS CUPSET/CONSTANT 10.425
		1.0	100075G2	HD CUPSET/CONSTANT 9.511

SEE H LIST  
P/N 100075H Rev  
PARTS LIST  
Sheet 1 of 1

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
		0.0	100075H0	NO INTERNAL HEATER
		0.0	100075H1	HEATER

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	SEE ECN 5296	4/28/04	
B	SEE ECN 5387	1/26/05	



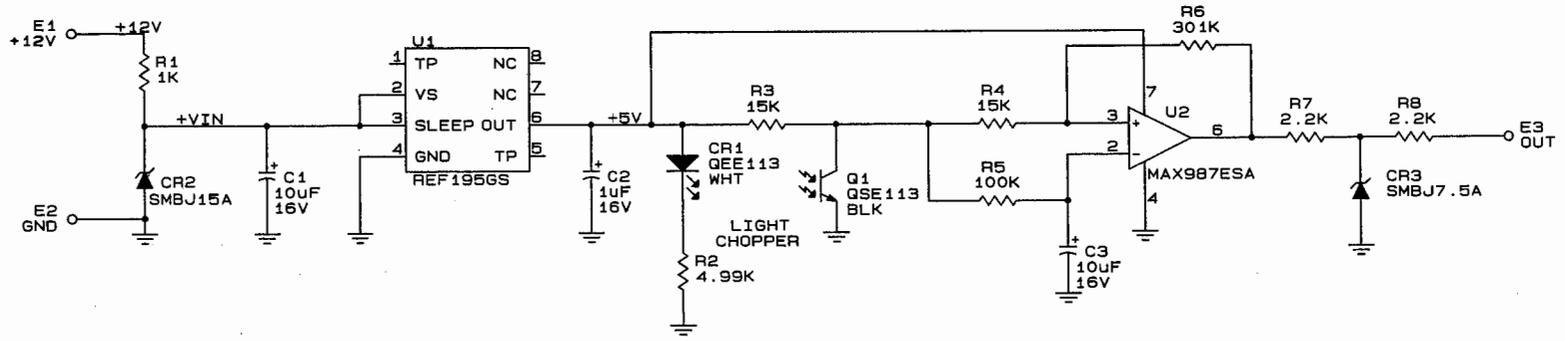
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± 1/64 .001 ± .010 ± 1° .000 ± .005		CONTRACT NO.		140 Wilbur Place Airport International Plaza Bohemia, NY 11716 USA FAX (631)567-7585 Phone (631)567-7300	
NA		MATERIAL NOT APPLICABLE	APPROVALS	DATE	ASSEMBLY, PCB, F460 WIND SPEED AMPLIFIER
NEXT ASSY	USED ON	FINISH NOT APPLICABLE	DRAWN PL	1/03	
APPLICATION		DO NOT SCALE DRAWING	CHECKED DA	1/03	SIZE B
			ISSUED TJS	3/13/03	FSCM NO. 52332
			SCALE: NONE	P: \DRAWINGS\ASSY\102499B.DWG	DWG. NO. 102499
					REV. B
					SHEET 1 OF 2

WIND SPEED AMPLIFIER, F460  
P/N 102499 Rev B  
PARTS LIST  
Sheet 2 of 2

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
1		1.0	401468	BOARD, PRINTED CIRCUIT
	C1,C3	2.0	SMCB16106M	CAP SMT 10uF TANT 16V 20%
	C2	1.0	105K16AH	CAP, SMT 1uF TANT 16V 10%
	CR1	1.0	QEE113	INFRARED LED
	CR2	1.0	SMBJ15A-LM	TRANSZORB, 15V 600W SMT
	CR3	1.0	SMBJ7.5A-KP	TRANSZORB, 7.5V 600W SMT
	Q1	1.0	QSE113	INFRARED PHOTOTRANSISTOR
	R1	1.0	SMR12061001F	RES SMT 1K 1%
	R2	1.0	SMR12064991F	RES SMT 4.99K 1%
	R3,R4	2.0	SMR12061502F	RES SMT 15K 1%
	R5	1.0	SMR12061003F	RES SMT 100K 1%
	R6	1.0	SMR12063013F	RES SMT 301K 1%
	R7,R8	2.0	SMR12062211F	RES, SMT 2.21K 1% 1206 SIZE
	U1	1.0	REF195GS	VOLTAGE REFERENCE, 5.0V
	U2	1.0	MAX987ESA	SINGLE COMPARATOR IC SMT
		0.0	401467	SCHEMATIC

DWG. NO. 401467 SH1 REV. A

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
-	RELEASED FOR PRODUCTION	03-13-03	TJS
A	ECN 5387	01-26-05	



102499	102499
NEXT ASSY	USED ON
APPLICATION	

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS    DECIMALS    ANGLES ±                .XX ±                ± .XXX ±			CONTRACT NO.	
MATERIAL			APPROVALS	
NOT APPLICABLE			DATE	
FINISH			DRAWN	
NOT APPLICABLE			P. L.    1/03	
DO NOT SCALE DRAWING			CHECKED	
			D. A.    1/03	
			ISSUED	
			T. J. S.   3/03	

SCHEMATIC, F460 WIND SPEED AMPLIFIER			
SIZE	FSCM NO.	DWG. NO.	REV.
B	52332	401467	A
SCALE N/A 401467A.SCH		SHEET 1 OF 1	

106103

LEXAN CUPSET/CONSTANT 9.511

P/N 10007500 Rev A

PARTS LIST

Sheet 1 of 1

ITEM	SYM. NO	QTY	PART NO.	DESCRIPTION
24		1.0	102104	CUPSET ASSY, STD. WS F460

SS CUPSET/CONSTANT 10.425  
P/N 10007501 Rev  
PARTS LIST  
Sheet 1 of 1

ITEM	SYM. NO	QTY	PART NO.	DESCRIPTION
24		1.0	100057	WM-1/3 CUP ANEMOMETER ASSY

HD CUPSET/CONSTANT 9.511  
P/N 10007562 Rev  
PARTS LIST  
Sheet 1 of 1

ITEM	SYM. NO	QTY	PART NO.	DESCRIPTION
24		1.0	101287	F460 HEAVY DUTY CUP ASSEMBLY

HEATER  
P/N 100075H1 Rev  
PARTS LIST  
Sheet 1 of 1

ITEM	SYM. NO	QTY	PART NO.	DESCRIPTION
26,27		1.0	101263	F460 INTERNAL HEATERS 2 WATT