

SENSORS

MANUAL - F460 WIND DIRECTION RESOLVER P/N M102139 Rev B

1.0 INTRODUCTION

Climatronics' F460 Wind Direction Resolver Sensor, P/N 102139, is designed to provide low starting threshold, fast dynamic response, and high accuracy under adverse environmental conditions. The sensor consists of a counterbalanced, lightweight vane attached to a shaft which is coupled to a precision, low torque brushless resolver. Wind direction via vane position is converted to a proportional DC voltage by the 102144 F460 Resolver PCB.

1.1 SPECIFICATIONS

Accuracy:	$\pm 2^\circ$
Threshold:	0.22 m/s (0.5 mph)
Distance Constant:	1.1 m (3.7 ft) of air maximum
Operating Range:	0 to 360°
Damping Ratio:	0.4 at 10° initial angle of attack.
Operating Temp:	-40 to $+60^\circ$ C
Power Requirement:	15 mA @ 12 VDC
Signal Output:	0 Vdc to $V_{REF} = 0$ to 360°
Weight:	Less than 0.9 kg (2 lbs.)

2.0 INSTALLATION

The sensor should be located in a clear, unobstructed area so as to minimize any turbulent effects caused by local obstructions (e.g. buildings, trees, etc). The sensor is mounted on the prewired F460 Crossarm, P/N 101994, secure the sensor by tightening the two set screws located at its base. Attach the vane by matching the vane hub with the shaft hub and lightly tightening the set screws. The Wind Direction sensor must be properly oriented with respect to north. For instructions, refer to the F460 Crossarm manual, P/N 101994. (Application of Anti-Seize compound on the set screws will facilitate disassembly should it become necessary.)

3.0 I/O CONNECTIONS

Note: V_{REF} must be at least 1.5Vdc lower than Power In voltage.

The connector pin designations are as follows:

<u>Pin</u>	<u>Function</u>
A	WD Output (+)
B	Power In (+5 to +14Vdc)
C	WD Return (-)
D	Ground
E	Not Used
F	V_{REF} (+1 to +5Vdc)

4.0 USER DEFINED OPTIONS

Both internal and external heaters are available. The internal heater is a continuously operating device which consumes 2W of the 12 Vdc power (When using internal heaters, Power In must be +12Vdc). This heater option is designed to minimize internal moisture build up and requires factory installation. The external heater (20 W/110 Vac) is thermostatically controlled and is designed to minimize sensor freeze-up in cold environments. This heater may be added as a field modification.

5.0 USER INTERFACE N/A

6.0 THEORY OF OPERATION

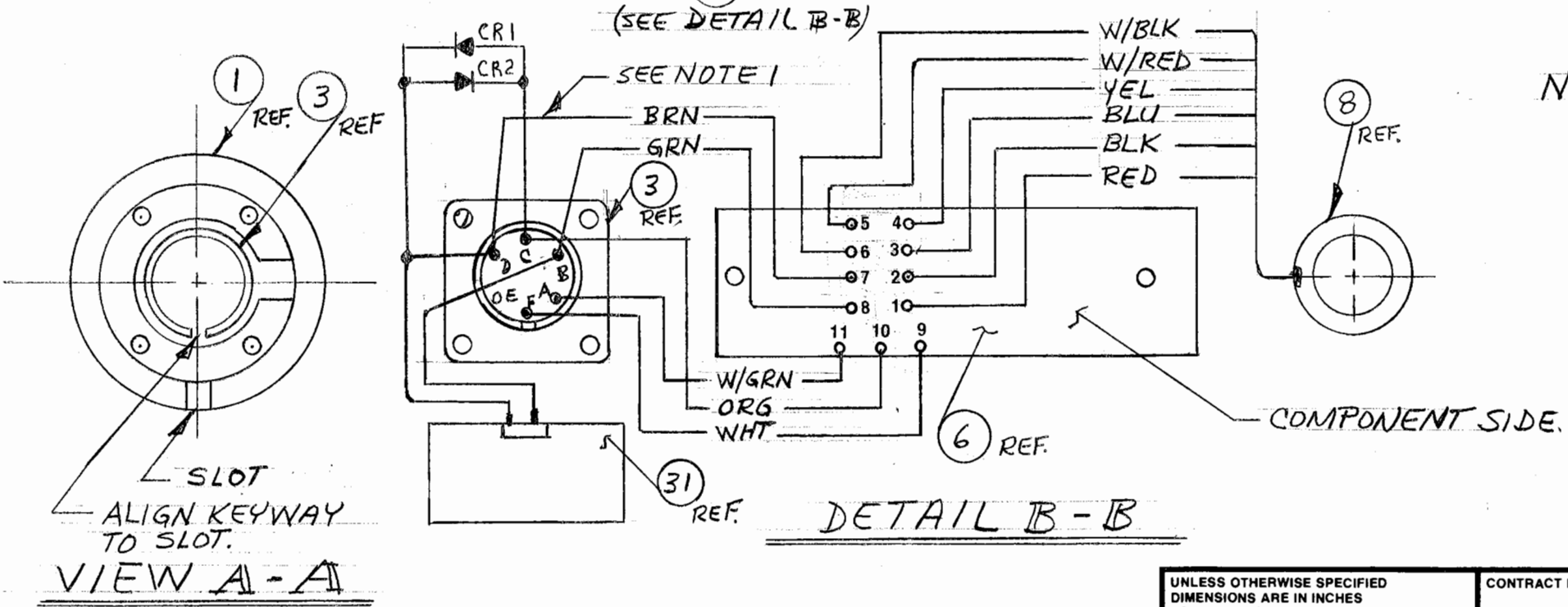
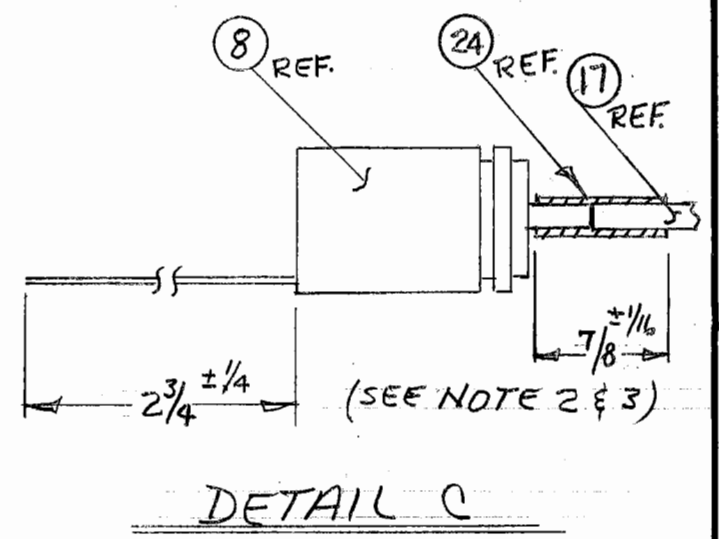
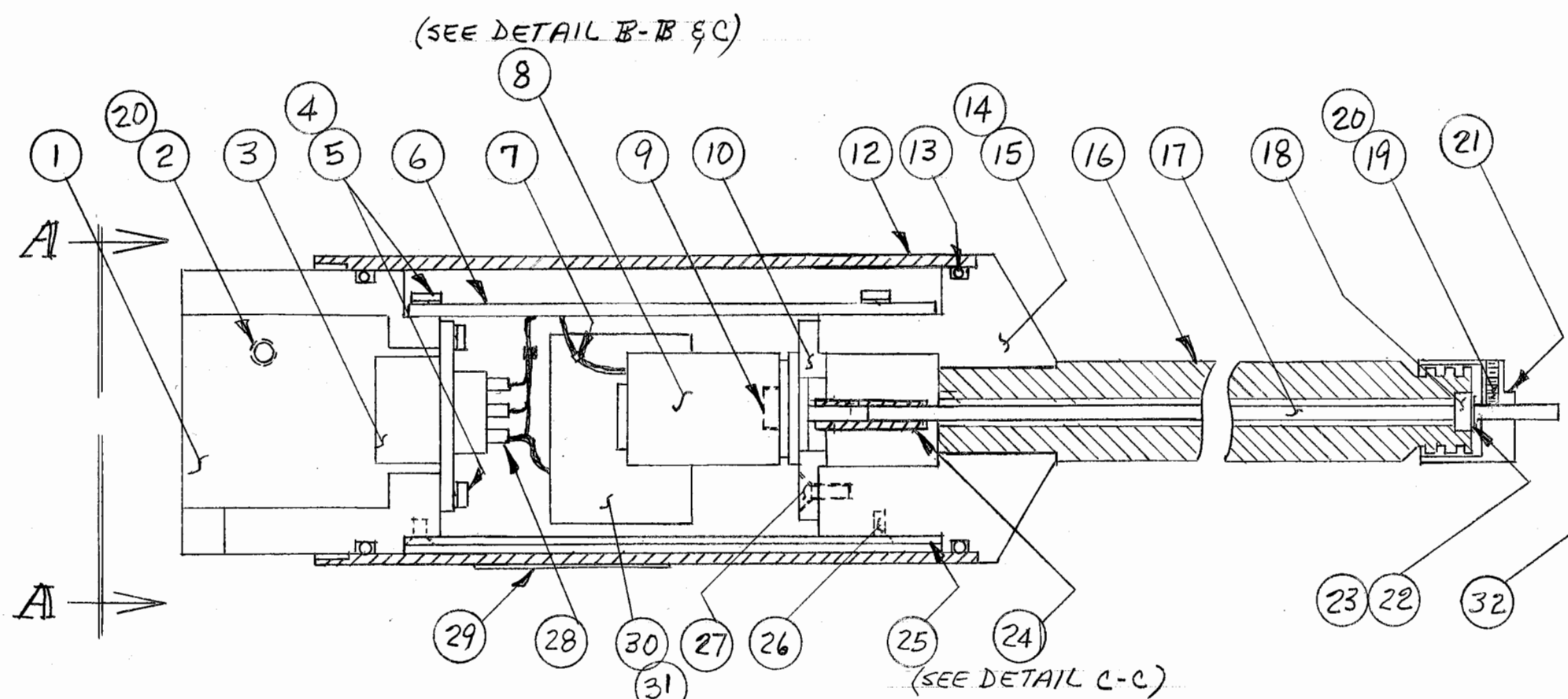
The Wind Direction vane is coupled to a brushless resolver, which interfaces to the 102144 Resolver PCB Assy; refer to schematic 401351. U5 is set up as an oscillator generating a frequency of 3.2 kHz, which is used as the clock for U1A. U4A inverts the 3.2 kHz signal, and the inverted signal is used for the clock of U1B. U1 and its associated resistors and capacitors generate the phases that are used to drive the resolver. The output of the resolver is sent to a zero crossing detector, composed of U2A, R6, R7, and C5. A 1 μ s pulse is created by U3A, R8, and C6; this pulse corresponds to the location of the vane. U3B compares this pulse with one of the fixed phases that drive the resolver, and the output is a pulse whose duty cycle corresponds to 0 to 360 degrees. U4B, U4D, and their associated components yield an analog output of 0 VDC to V_{REF} , which corresponds to 0 to 360 degrees. CR1 is used if an external reference is not available, CR2-4 are transient voltage suppressers protecting the input/output lines from transients.

7.0 CALIBRATION

No calibrations are required.

CLIMATRONICS CORPORATION (516) 567-7300

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	SEE ECN 4326	7-15-92	S.F
B	SEE ECN 4357	9-29-92	SC
C	ECN 5256	10-20-03	DA



- NOTES:
- 1) WHEN WIRING ITEM 3 TO ITEM 6, USE 2 1/2" LG. # 26 AWG, 7 STRAND, WIRE PER DETAIL B-B.
 - 2) CUT SHRINK TUBING (ITEM 24) 7/8" LONG BEFORE ASSEMBLING ITEM 8 TO ITEM 24.
 - 3) CUT EXISTING WIRES OF ITEM 8 PER DIM'S SHOWN & SOLDER TO ITEM 6 PER DETAIL B-B.

BRUNING 76547 FORM

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± — .XX ± — ± — . — .XXX ± — ± —		CONTRACT NO.		CLIMATRONICS	
MATERIAL		APPROVALS	DATE		
FINISH		DRAWN S. FRANKS	5-18-92	F-460 W.D RESOLVER ASSY.	
NEXT ASSY		CHECKED R. NOLLI	6-15-92		
USED ON		ISSUED J. ROBERTSON	6-23-92	SIZE B	FSCM NO. 52332
APPLICATION		DO NOT SCALE DRAWING		DWG. NO. 102139	REV. C
				SCALE Full	SHEET 1 OF 3

F460 WIND DIR RESOLVER ASSY
 F/N 102139 Rev C
 PARTS LIST
 Sheet 2 of 3

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
1		1.0	500110	BASE, F460
2		2.0	SC10-4	BR. TIP SET SCREW 1/4-20x 3/16
3		1.0	MS3102A14S-6P	CONNECTOR, RECEPTACLE
4		6.0	MS51957-14	SCREW 4-40 x 5/16 PH
5		6.0	MS35338-135	WASHER, LOCK SPLIT #4
6		1.0	102144	F460 WIND DIRECTION RESOLVER
7		4.0	PLT1M	TIE WRAP, SMALL
8		1.0	08-BHW-32LA/F741	SYNCHRO/RESOLVER/F460
9		2.0	SB-8	CLAMP, SYNCHRO
10		1.0	501347	SPACER, WIND SENSOR/SIMULATOR
12		1.0	500111	TRANSMITTER COVER F460
13		2.0	2-031	O-RING, BUNA N, 60 DUROMETER
14		0.0	14310	ADHESIVE, 2 TON EPOXY
15		1.0	500108	TOP, F460
16		1.0	500107	COLUMN, F460
17		1.0	501348	SHAFT, F460 WIND DIR RESOLVER
18		1.0	500096	BEARING
19		1.0	SC8-5	SET SCREW 4-40 x 5/32
20		0.0	76764	ANTI-SEIZE, LUBRICANT, 767
21		1.0	101357	F460 WIND DIRECTION CAP
22		2.0	SS1-10	SPACER .006

- Notes: 1. USE ITEMS 14,20 AS REQUIRED
 2. ITEM 11 IS NOT USED

CR1 AND CR2 ARE INSTALLED BACK TO BACK ON
 ON THE CONNECTOR, BETWEEN PINS C AND D.

F460 WIND DIR RESOLVER ASSY
 P/N 102139 Rev C
 PARTS LIST
 Sheet 3 of 3

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
23		1.0	Q2-12	RING RETAINER
24		1.0	ATUM-1/4	TUBING, SHRINK 1/4 x 1-1/4
25		1.0	500109	SUPPORT TRANSMITTER F460
26		4.0	MS24693-C2	4-40 x 1/4 100 DEG. FH SCREW
27		2.0	MS51959-14	SCREW 4-40 x 5/16 FH
28		0.0	PVC-105-10	TUBING, CLEAR AWG#10
29		1.0	500827	LABEL, SERIAL NO/PART NO
30,31		0.0	102139H	SEE H LIST
32		0.0	102139G	SEE G LIST
	CR1,CR2	2.0	1N4004	RECTIFIER 400V 1 AMP

SEE G LIST
P/N 1021396 Rev
PARTS LIST
Sheet 1 of 1

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
		1.0	10213960	VANE ASSY, FAST RESPONSE
		1.0	10213961	VANE ASSY, HEAVY DUTY
		1.0	10213962	NO VANE ASSY

VANE ASSY, FAST RESPONSE
P/N 10213960 Rev A
PARTS LIST
Sheet 1 of 1

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
32		1.0	101907	VANE ASSY, F460 FAST RESPONSE

VANE ASSY, HEAVY DUTY
P/N 102139G1 Rev
PARTS LIST
Sheet 1 of 1

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
32		1.0	101200	F460 VANE ASSY HEAVY DUTY

SEE H LIST
P/N 102139H Rev
PARTS LIST
Sheet 1 of 1

ITEM	SYM. NO	QTY	PART NO.	DESCRIPTION
		1.0	102139H0	NO INTERNAL HEATER
		1.0	102139H1	HEATER

NO INTERNAL HEATER
P/N 102139H0 Rev
PARTS LIST
Sheet 1 of 1

ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
30, 31		0.0	NONE	NONE

HEATER
P/N 102139H1 Rev
PARTS LIST
Sheet 1 of 1

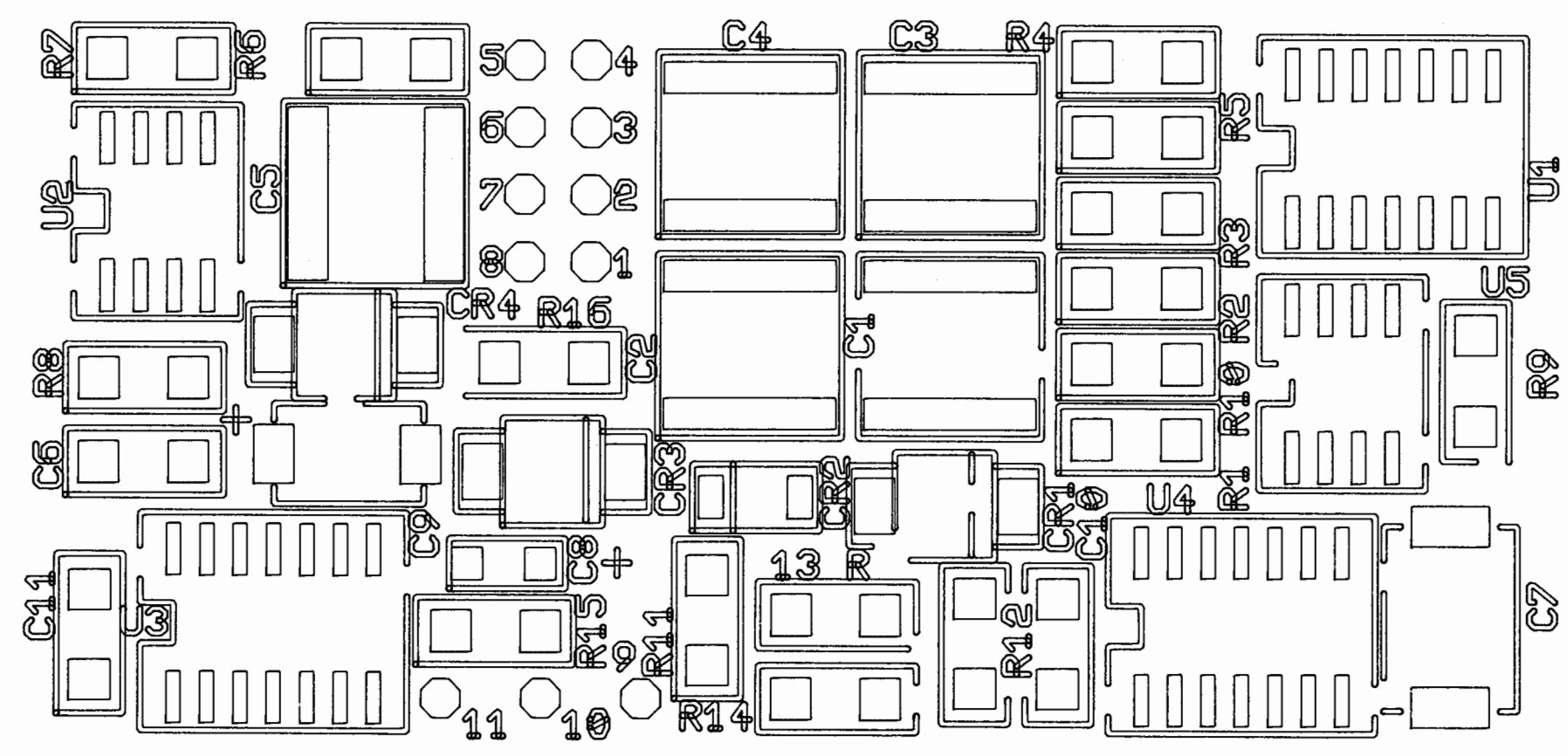
ITEM	SYM.NO	QTY	PART NO.	DESCRIPTION
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Notes: ITEM 30 IS TO BE USED AS REQUIRED

30		0.0	999	RTV, DOW CORNING
31		1.0	101263	F460 INTERNAL HEATERS 2 WATT

H	ECN 5578	7-19-06
I	ECN 5669	6-18-07

REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED
A	ECN 4320	6-24-92	
B	ECN 4338	8-13-92	
C	ECN 4360	10-13-92	
D	ECN 4792	2-24-97	
E	ECN 4829	8/15/97	
F	ECN 4887	5-7-99	
G	ECN 5256	10-20-03	



NOTES:

INSTALL CR5 ON TOP OF C11 (BAND ON BOTTOM).

BRUNING 76547 FORM

		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± .XX ± ± ± .XXX ± ±		CONTRACT NO.		CLIMATRONICS	
		MATERIAL		APPROVALS	DATE	ASSEMBLY DWG., F460 WIND DIRECTION RESOLVER	
		FINISH		DRAWN JFS	6/92		
		NEXT ASSY USED ON		CHECKED RVN	6/92		
APPLICATION		DO NOT SCALE DRAWING		ISSUED TJS	6/92	SIZE B	FSCM NO. 52332
						DWG. NO. 102144	REV. I
						SCALE 2:1	SHEET 1 OF 2

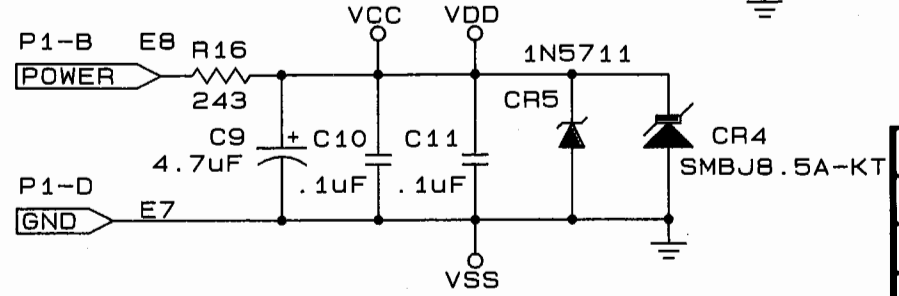
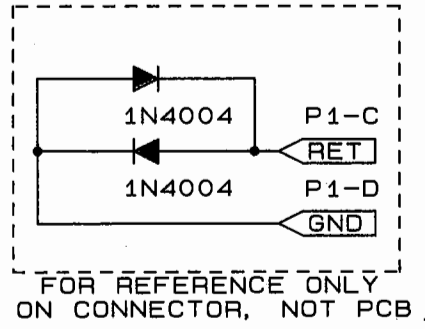
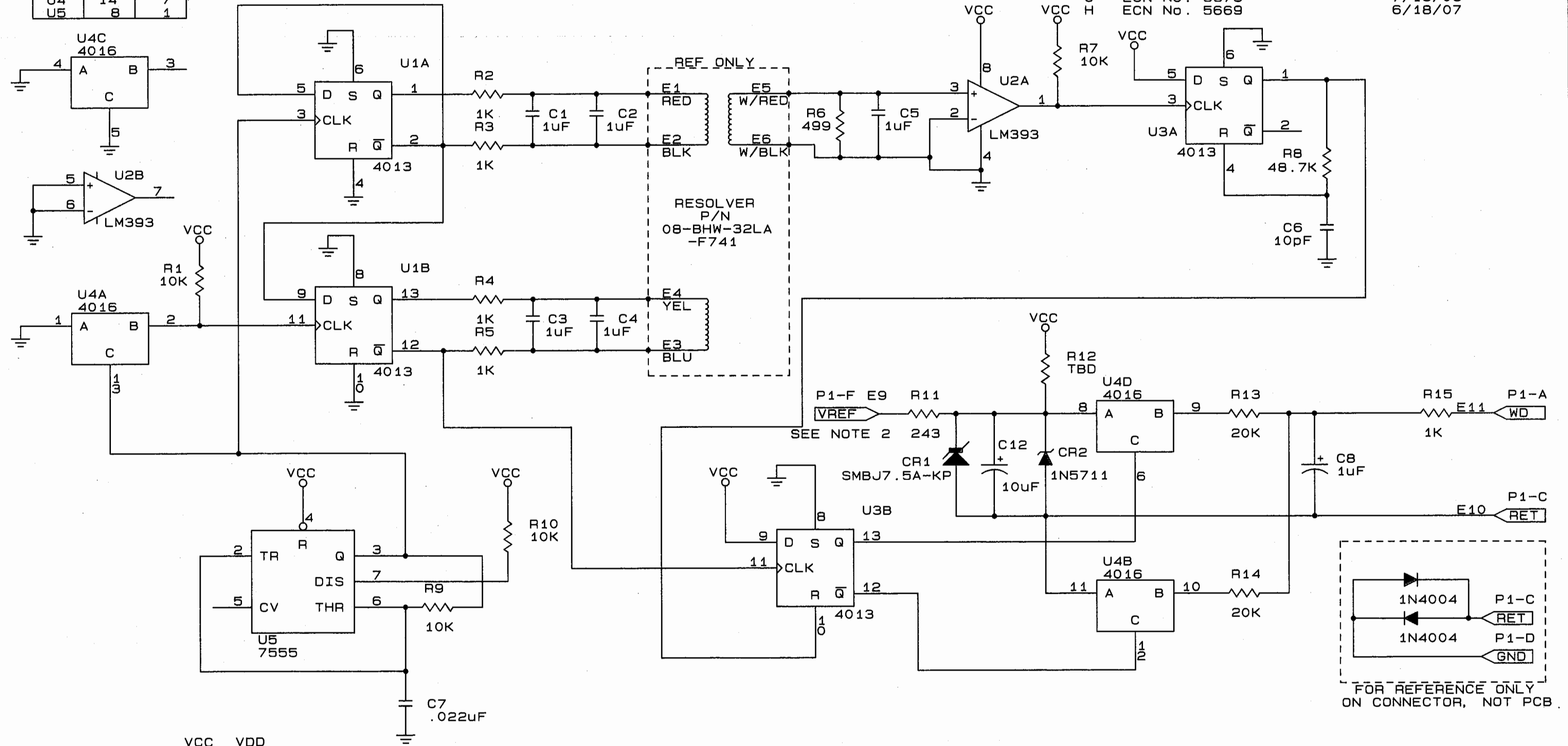
F460 WIND DIRECTION RESOLVER
P/N 102144 Rev I
PARTS LIST
Sheet 2 of 2

ITEM	SYM. NO	QTY	PART NO.	DESCRIPTION
Notes: R12 AND CR3 NOT USED. PLUS SIDE OF C12 TO BE SOLDERED TO THE BANDED SIDE OF CR1.				
1		1.0	401353	BOARD, PRINTED CIRCUIT
	C1-C5	5.0	C2225C105K5RAC	CAPACITOR, SMT 1uF 50V 10%
	C6	1.0	12061A100JAT050	CAPACITOR, SMT 10pF 50V
	C7	1.0	223UMR100K	CAP .022 UF 100V
	C8	1.0	105K16AH	CAP, SMT 1uF TANT 16V 10%
	C9	1.0	SMCC25475K	CAP, 4.7uF, 25V, 10%
	C10, C11	2.0	SMC120650104K	CAP SMT .1uF 50V 10%
	C12	1.0	41DS106C016K	CAP 10 UF 16V
	CR1	1.0	SMBJ7.5A-KP	TRANSZORB, 7.5V 600W SMT
	CR4	1.0	SMBJ8.5A-KT	TRANSZORB, 8.5V 600W SMT
	CR5, CR2	2.0	1N5711	DIODE 55V 250mW SIGNAL
	R1, R7, R9, R10	4.0	CR12061002FVBA	RESISTOR, SMT 10K 1% 1/BW
	R2-R5, R15	5.0	CR12061001FVBA	RESISTOR, SMT 1K 1% 1/BW
	R6	1.0	CR12064990FVBA	RESISTOR, SMT 499 OHM 1% 1/BW
	R8	1.0	CR12064872FVBA	RESISTOR, SMT 48.7K 1% 1/BW
	R11, R16	2.0	SMR12062430F	RES SMT 243 OHM 1%
	R13, R14	2.0	CR12062002FVBA	RESISTOR, SMT 20K 1% 1/BW
	U1, U3	2.0	MC14013BD	D FLIP-FLOP, SMT SO-14
	U2	1.0	LM393D	DUAL COMPARATOR, SMT SO-8
	U4	1.0	MC14016BD	QUAD ANALOG SWITCH, SMT SO-14
	U5	1.0	TLC555CD	CMOS TIMER, SMT SO-8
		0.0	401351	SCHEMATIC

REVISIONS

REV.	DESCRIPTION	DATE	APPROVED
C	ECN No. 4792	2/24/97	
D	ECN No. 4829	8/15/97	
E	ECN No. 4887	5/07/99	
F	ECN No. 5256	10/20/03	
G	ECN No. 5578	7/19/06	
H	ECN No. 5669	6/18/07	

REF	VCC	GND
U1	14	7
U3	14	7
U4	14	7
U5	8	1



UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES TOLERANCES ARE: FRACTIONS DECIMALS ANGLES ± .XX ± .XXX ±		CONTRACT NO.			
MATERIAL NOT APPLICABLE		APPROVALS	DATE		
102144	102139	DRAWN RVN	5/92	F460 RESOLVER WIND DIRECTION SCHEMATIC	
NEXT ASSY	USED ON	CHECKED JCS	6/92		
FINISH NOT APPLICABLE		ISSUED TJS	6/92	SIZE B	FSCM NO. 52332
APPLICATION		DO NOT SCALE DRAWING		DWG. NO. 401351	REV. H
				SCALE	SHEET 1 of 1