



# **CONTINUOUS TUNING OSCILLATOR**

**SERIES 400CV**  
INSTALLATION, OPERATION, MAINTENANCE  
MANUAL

## **ELGAR ELECTRONICS CORPORATION**

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## **ELGAR TWO-YEAR WARRANTY**

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Elgar Electronics Corporation (hereinafter referred to as Elgar) warrants its products to be free from defects in material and workmanship. This warranty is effective for two years from the date of shipment of the product to the original purchaser. Liability of Elgar under this warranty shall exist provided that:

- the Buyer exposes the product to normal use and service and provides normal maintenance on the product;
- Elgar is promptly notified of defects by the Buyer and that notification occurs within the warranty period;
- the Buyer receives a Return Material Authorization (RMA) number from Elgar's Repair Department prior to the return of the product to Elgar for repair, phone 800-73-ELGAR (800-733-5427), ext. 2295;
- the Buyer returns the defective product in the original, or equivalent, shipping container;
- if, upon examination of such product by Elgar it is disclosed that, in fact, a defect in materials and/or workmanship does exist, that the defect in the product was not caused by improper conditions, misuse, or negligence; and,
- that Elgar QA seal and nameplates have not been altered or removed and the equipment has not been repaired or modified by anyone other than Elgar authorized personnel.

This warranty is exclusive and in lieu of all other warranties, expressed or implied, including, but not limited to, implied warranties of merchantability and fitness of the product to a particular purpose. Elgar, its agents, or representatives shall in no circumstance be liable for any direct, indirect, special, penal, or consequential loss or damage of any nature resulting from the malfunction of the product. Remedies under this warranty are expressly limited to repair or replacement of the product.

### **CONDITIONS OF WARRANTY**

- To return a defective product, contact an Elgar representative or the Elgar factory for an RMA number. Unauthorized returns will not be accepted and will be returned at the shipper's expense.
- For Elgar products found to be defective within thirty days of receipt by the original purchaser, Elgar will absorb all ground freight charges for the repair. Products found defective within the warranty period, but beyond the initial thirty-day period, should be returned prepaid to Elgar for repair. Elgar will repair the unit and return it by ground freight pre-paid.
- Normal warranty service is performed at Elgar during the weekday hours of 7:30 am to 4:30 pm Pacific time. Warranty repair work requested to be accomplished outside of normal working hours will be subject to Elgar non-warranty service rates.
- Warranty field service is available on an emergency basis. Travel expenses (travel time, per diem expense, and related air fare) are the responsibility of the Buyer. A Buyer purchase order is required by Elgar prior to scheduling.
- A returned product found, upon inspection by Elgar, to be in specification is subject to an inspection fee and applicable freight charges.
- Equipment purchased in the United States carries only a United States warranty for which repair must be accomplished at the Elgar factory.

***ELGAR***

***Committed to Quality...Striving for Excellence***

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## Section I General Description

### 1.1 INTRODUCTION

1.1.1 The Series 400CV variable frequency oscillators are plug-in units which provide variable frequency AC signals to drive Elgar AC Power Sources. The frequency is determined by a precision potentiometer on the front panel.

1.1.2 The output amplitude of the 400CV oscillator is uncalibrated and may be adjusted by the front panel gain pot of the associated power source.

### 1.2 SCOPE OF MANUAL

1.2.1 This manual describes the Elgar Series 400CV oscillators. It includes specifications, operating instructions, circuit descriptions, circuit diagrams, maintenance information, and parts lists.

### 1.3 GENERAL DESCRIPTION OF OPERATION

1.3.1 The 400CV oscillator plugs into the front panel of the Elgar Power Source and is secured by two captive screws. Frequency output of the Model 400CV is controlled by the front panel precision potentiometer and is indicated by a two range dial.

1.3.2 The 400CV oscillator may be operated in two ranges: 45hz to 75hz, and 300hz to 500hz. Selection of the range is made via a toggle switch on the front panel.

### 1.4 SPECIFICATIONS

1.4.1 Specifications for the Series 400CV oscillators are listed in Table 1-1.

## Section II Installation/Operation

### 2.1 INSPECTION

2.1.1 The Elgar plug-in oscillators are aligned, calibrated, and tested prior to shipment. The instrument is therefore ready for immediate use upon receipt. The following checks should be made, however, to assure the instrument has suffered no damage during shipment.

2.1.2 Make a visual inspection of the shipping container prior to accepting the package from the carrier. If extensive damage to the shipping container is evident, a description of the damage should be noted on the carrier's receipt and signed by the driver or the carrier's agent. If damage is not apparent until the instrument is unpacked, a claim for concealed damage should be placed with the carrier and all shipping containers and filler material saved for inspection. Forward a report of the damage to the Elgar Service Department, who will provide instructions for repair or replacement of the instrument.

2.1.3 Visually inspect the instrument for physical damage when it is removed from the shipping container. Test functional operation of the instrument as soon as possible. If damage is evident, or instrument does not function properly, notify the carrier immediately. The carrier's claim agent will prepare a report of damage to be forwarded to the Elgar Service Department. You will be advised as to the action necessary to have the instrument repaired or replaced.

### 2.2 INSTALLATION

2.2.1 The oscillator is quickly and easily installed by plugging it into the space provided on the front panel of the Elgar AC Power Source. When the oscillator is fully inserted and the captive screws secured the unit is ready for operation.

NOTE: Remove POWER from POWER SOURCE prior to installing oscillator!

### 2.3 OPERATION

2.3.1 After installation in the Elgar Power Source the oscillator operates automatically, receiving its power from the power source and requiring only that the front panel controls be set for the desired frequency and range. The amplitude of the power source output is controlled by the AMPLITUDE control on the front panel of the power source.

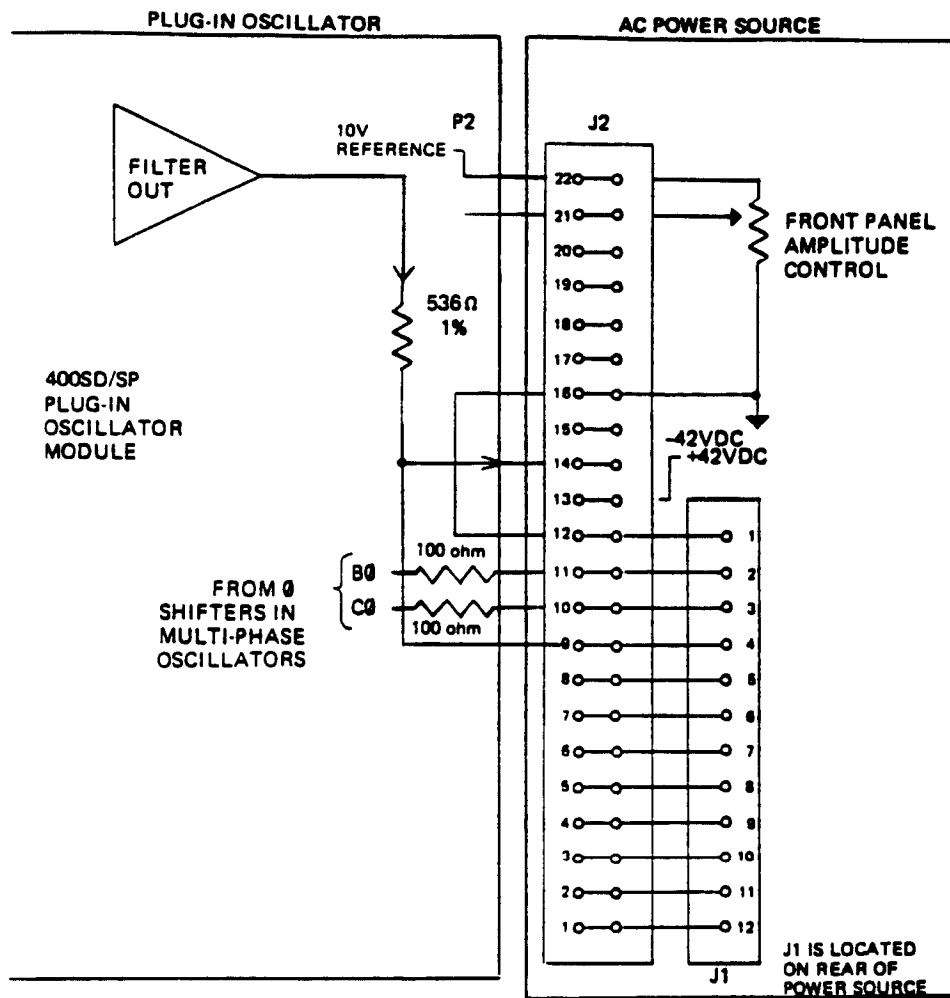


Figure 2-2. Typical Plug-in Oscillator/Power Source Interconnection

### SECTION III THEORY OF OPERATION

#### 3.1 VOLTAGE TO FREQUENCY CONVERTER

3.1.1 Digital synthesis of the output waveform is performed via a voltage to frequency converter. In the standard 400CV series oscillator this is performed by generating an approximately (slightly higher) 10vdc rail from U1-1. This rail is connected to the high end of the front panel precision potentiometer R51.

3.1.2 The wiper of the precision pot swings between exactly 10vdc at maximum output frequency (75hz or 500hz) to exactly 6vdc at minimum output frequency (45hz or 300hz). Thus a linear relationship is defined which is true for all cases: 10% of full scale variation in frequency for every 1 volt variation in amplitude on the potentiometer wiper regardless of the range selected. The 10vdc at the high end of the pot is obtained by adjustment of R6, while the 6vdc at the low end is obtained by adjusting R9.

3.1.3 The amplitude at the wiper of the precision potentiometer is applied through the input gain adjustment network (S2, R11, R12, R15, R16) to the VFC32 Voltage to Frequency Converter U3.

3.1.4 The output of the VFC32 (U3-7) is a pulse train that is proportional to the input voltage with a pulse count 128 times the selected output frequency.

#### 3.2 DIGITAL SYNTHESIS

3.2.1 Binary Counter U11 is an up/down counter which is counting up only. U11 is counting by 32 for each quarter wave of the output signal.

3.2.2 The outputs of the binary counter are controlled by exclusive OR gates U9 and U10 which, when controlled by U11 pin 2 create the equivalent of an up/down drive to U8.

3.2.3 Integrated circuit U8 is a 32 by 8 prom which has been programmed with a sine look up table. When the address input lines are driven by U9 and U10, it will produce a digital output code for a sine wave.

3.2.4 The outputs of the sine prom drive multiplying digital to analog converter (DAC) U7. The output of U7 is a current output proportional to the input digital signal multiplied by the reference current input through R22.

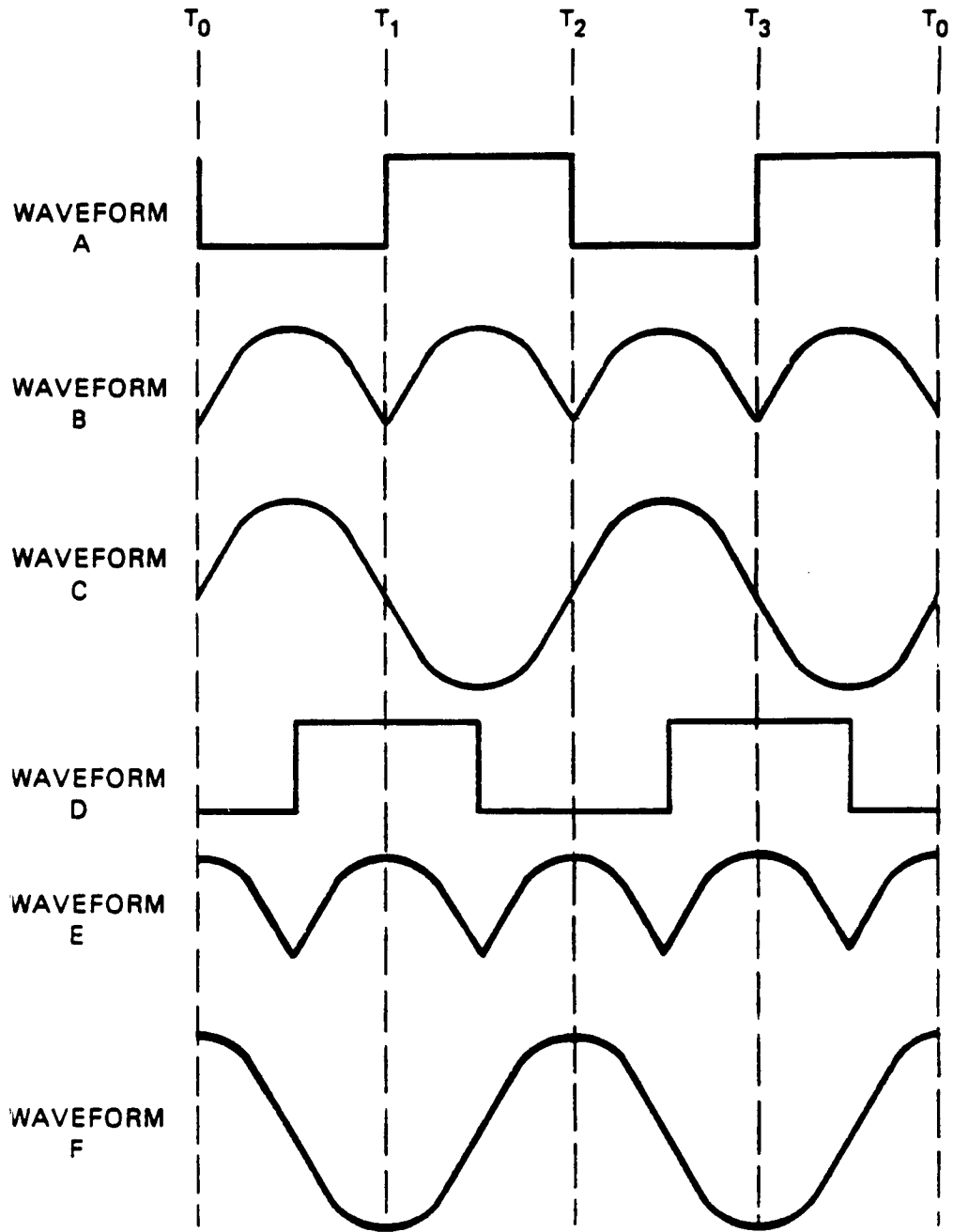


Figure 3-1. Timing Diagram



SECTION IV  
MAINTENANCE

## 4.1 SERVICE INFORMATION

4.1.1 Questions concerning the operation, repair, or servicing of this equipment should be forwarded to the nearest Elgar representative or the the Service Department, Elgar Corporation, 9250 Brown Deer Rd., San Diego, Ca. 92121. Include model number and serial number in any correspondence concerning the instrument.

## 4.2 FACTORY SERVICE

4.2.1 Should it be necessary to return an instrument to the factory for repair, please contact the Elgar Corporation Service Department for authorization to make shipment. DO NOT RETURN THE UNIT FOR REPAIR WITHOUT AUTHORIZATION.

## 4.3 SHIPPING DAMAGE

4.3.1 It is possible for equipment to be damaged in shipment. Therefore, it is imperative that the instrument be inspected and tested as soon as it is received. If the instrument shows signs of damage, notify the carrier immediately. The carrier's claim agent will prepare a report of damage to be forwarded to the Elgar Service Department. You will be advised as to the action necessary to have the instrument repaired or replaced.

## 4.4 SINGLE PHASE CALIBRATION

4.4.1 Single phase calibration for the 400CV is as follows:

1. Place front panel range switch in 45-75 range.
2. Connect a Digital Multimeter between common (C20 - ) and R51 (front panel pot) pin 2.
3. Rotate the front panel dial fully counter clockwise until the highest setting on the dial is aligned with the indicator marker on the front panel.
4. Adjust R6 so that the multimeter measures 10.00XXX volts.
5. Rotate the front panel dial fully clockwise until the lowest setting on the dial is aligned with the indicator marker on the front panel.

4.5 MULTI-PHASE CALIBRATION - Continued

6. Adjust R32 for 240 +/- 1 degrees.

7. Monitor Cphase output with phase angle meter and adjust R32 for 120 +/- 1 degrees.

8. Repeat steps 6 and 7 until the phase angle error (if any) is equally distributed between B and C phases.

4.6 CIRCUIT BOARD COMPONENT LOCATION

4.6.1 Component location diagrams are given for the basic oscillator in Section 5 DIAGRAMS.

4.7 TEST EQUIPMENT REQUIRED

Distortion Analyzer  
Digital Voltmeter  
Phase Angle Meter  
Frequency Counter

Krohn-Hite 6800 or equivalent  
Fluke 8050A or equivalent  
Dytronic 224 or equivalent  
Hewlett Packard 5307A or equivalent

**SECTION V  
DIAGRAMS****5.1 GENERAL**

5.1.1 This section contains the schematic diagrams for the Series 400CV Plug-In Oscillators. The schematic diagrams should be used to understand the theory of operation and as an aid in troubleshooting the unit. Reference designators shown on schematics correspond to reference designators shown in parts lists where exact component values are given.

**5.2 DIAGRAMS**

5.2.1 Diagrams included in this section are the schematic diagram for the 400CV oscillator along with associated assembly drawing.

SECTION VI  
PARTS LIST

6.1 GENERAL

6.1.1 This section contains a listing of all parts necessary for factory authorized repair of the unit. Parts are located on the diagrams in Section V and correlated on the parts list by using their reference designators.

6.2 SPARE PARTS ORDERING

6.2.1 When ordering spare parts, specify part name, part number, manufacturer, component value, and rating. If complete assemblies are desired, contact:

ELGAR ELECTRONICS  
9250 Brown Deer Road  
San Diego, CA 92121-2294

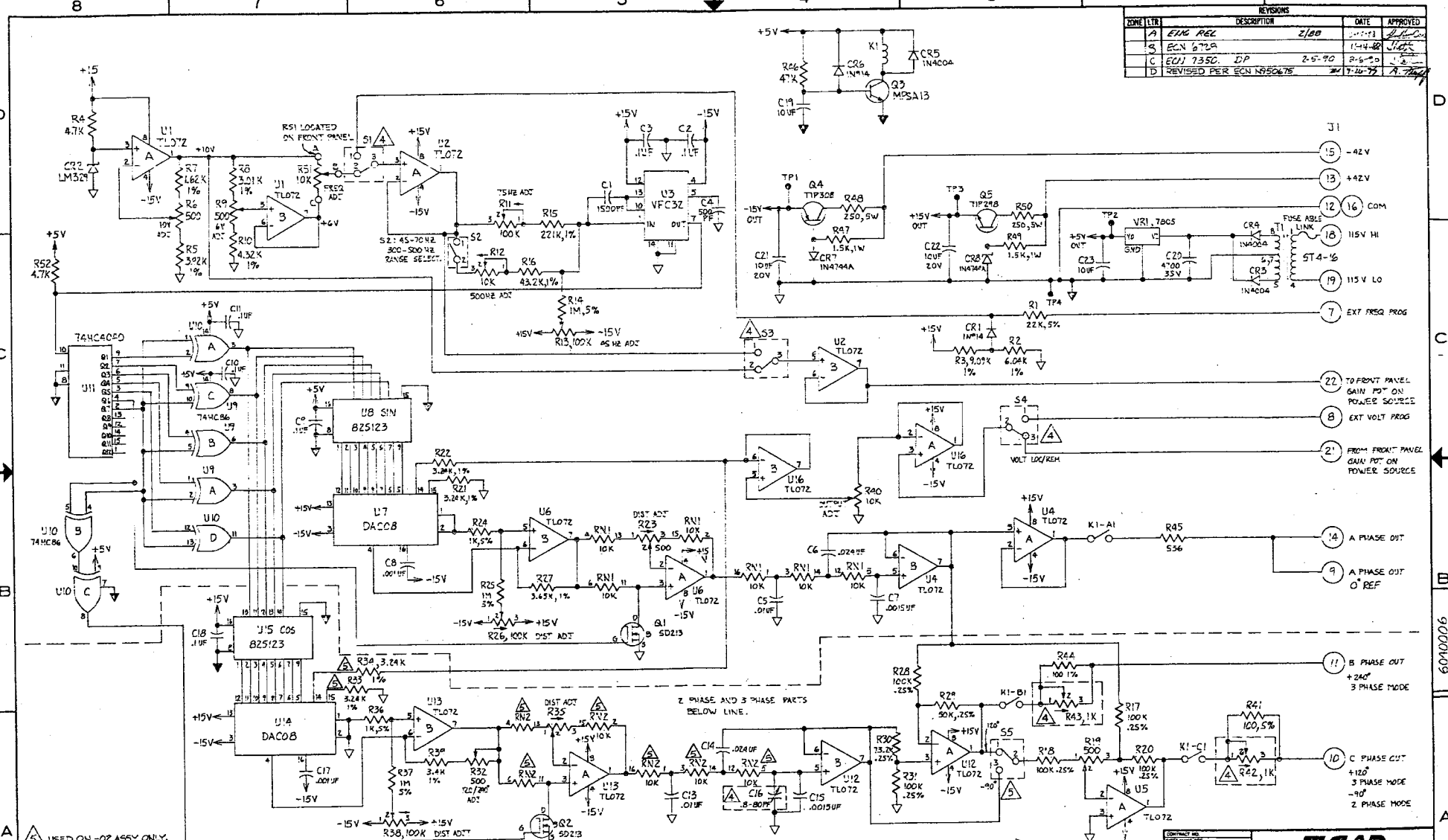
Specify assembly number, instrument series number, and instrument name when ordering.

## PARTS LIST

PC ASSEMBLY 5040006 MODEL 403CV 3 PHASE - Continued

REF DESIG	MANUFACTURER	MANUFACTURER'S PART NO.	DESCRIPTION	ELGAR PART NO.
R16	DALE	RN60C4322F	RES 43.2K, 1/8W, 1%	813-432-2F
R17, 18, 20, 28, 31	DALE	RN60C1003C	RES 100K, .1W, 1%	814-100-3F
R21, 22, 33, 34	DALE	RN60C3241F	RES 3.24K, 1/8W, 1%	813-324-1F
R26, 38	SPECTROL	63P-104	POT 100K	819-104-63
R27	DALE	RN60C3651F	RES 3.65K, 1/8W, 1%	813-365-1F
R29	DALE	RN60C5002C	RES 50K, .1W, 1%	814-500-2C
R38	DALE	RN60C7322C	RES 73.2K, .1W, 1%	814-732-2C
R39	DALE	RN60C3401F	RES 3.40K, 1/8W, 1%	813-340-1F
R41, 44	DALE	CMF07101G	RES 100R, 1/4W, 2%	801-101-05
R45	DALE	RN60C5360F	RES 536R, 1/8W, 1%	813-536-0F
R46	DALE	CMF473G	RES 47K, 1/4W, 2%	801-473-05
R47, 49	DALE	RC32GF152J	RES 1.5K, 1W, 5%	803-152-05
R48, 50	DALE	CW5250R5%	RES 250R, 5W, 5%	807-251-05
R51	SPECTROL	100SERVO10K	POT 10K	819-103-X1
RN1, 2	BECKMAN	698-3-10K	RES 10K DIP	818-103-DR
S1, 2	ALCO	A101SYZG	SWITCH SPST	860-105-DX
TI	SIGNAL	ST4-16	TRANSFORMER	850-ST4-16
U1, 2, 4-6, 12 13, 16	T.I.	TLO72	IC DUAL OP AMP	849-TLO-72
U3	ANALOG DEV	VFC32KP	IC VOLT-FREQ CONV	849-VFC-32
U7, 14	MOTOROLA	DAC-08EP	IC 8 BIT DAC	849-N50-08
U8	SIGNETICS	N82S123N	IC SIN LOOKUP	849-SIN-82
U9, 10	MOTOROLA	74HC86	IC XOR	849-H86-XX
U11	MOTOROLA	74HC4040	IC 12 BIT BINCT	849-H40-40
U15	T.I.	TBP18S030N	IC COS LOOKUP	849-COS-82
VR1	FAIRCHILD	UA7805UC	IC 5V REGUL	849-780-5P

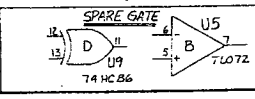
REVISIONS				
ZONE	ITER	DESCRIPTION	DATE	APPROVED
A		ELGAR REL	2/80	
G		ECN 6725	1-4-80	
C		ECN 7350 - DP	2-5-90	
D		REVISED PER ECN N950175	17-10-79	



- △ USED ON -02 ASSY ONLY.
- ▲ SPECIAL APPLICATION ONLY.
- 3. RESISTANCE VALUES ARE IN OHMS.
- Z (▼) INDICATE DIGITAL GROUND.
- △ (▽) INDICATE ANALOG GROUND.
- NOTES: UNLESS OTHERWISE SPECIFIED.

- △ 55 NOT NORMALLY INSTALLED ADD FOR 2/3 PHASE OPERATION.
- SS-1 TO 2 CONNECTION IS FOR 3 PHASE.
- SS-2 TO 3 IS FOR 2 PHASE.

REFERENCE DESIGNATORS	
LAST USED	C23 CR8 K1 U15 VR1 & 5 R2 R12 T1 TP4 S5
NOT USED	

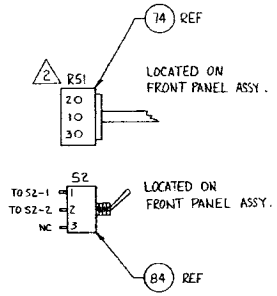
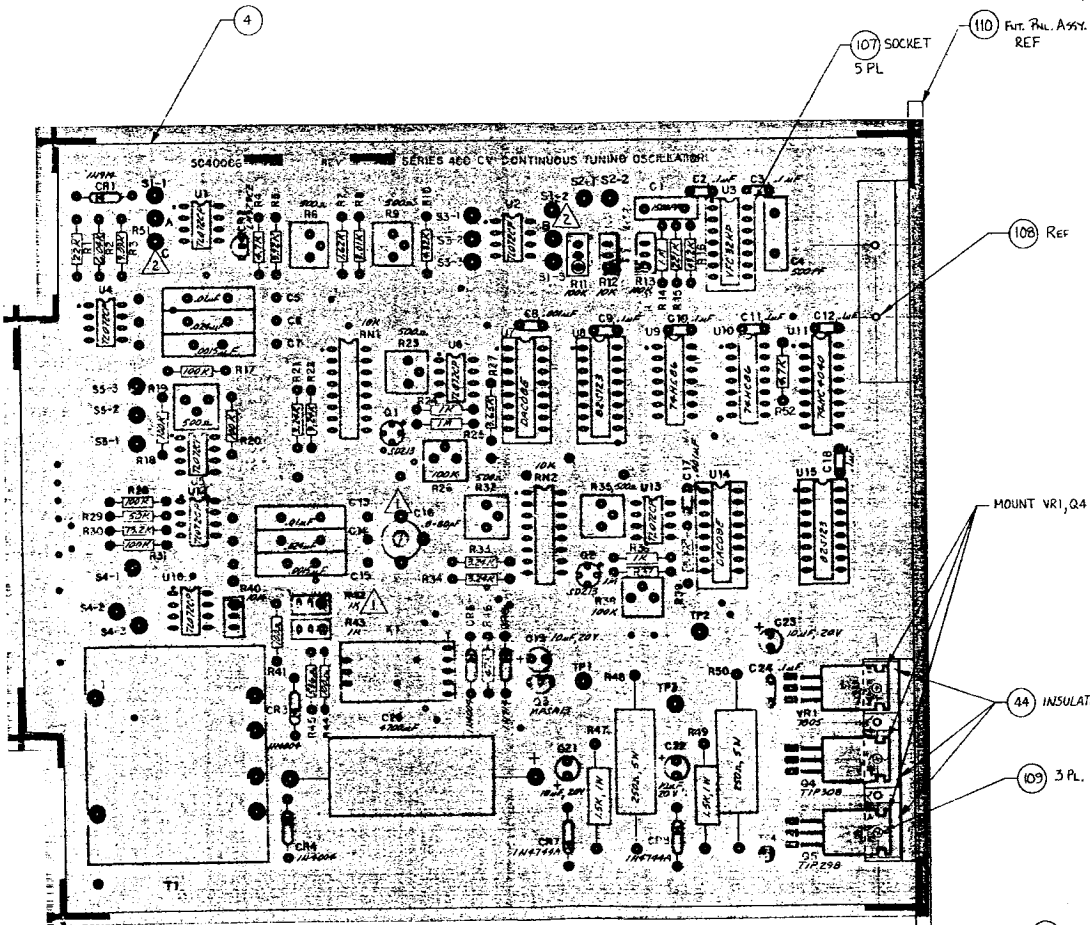


<b>ELGAR</b>	
SERIES 40077 CONTINUOUS TUNING OSC.	
DATE	REV
D 25965	6040006 3
SCALE	SHEET 1 OF 1

REVISIONS				
ZONE	LTB	DESCRIPTION	DATE	APPROVED
A	ENG REL	2/68	2-15-68	[Signature]
B	ECN 6774	6-15-67 YF	11-11-68	[Signature]
C	REVISED PER ECN N950675		3-26-73	[Signature]

PARTS NOT INSTALLED ON -01 ASSY.

- C13, C14, C15, C17
- Q2
- R17 - R20, R23 - R39, R41, R44.
- RN2
- U5, U12 - U15

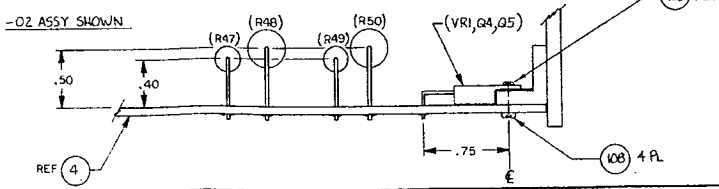


MOUNT VR1, Q4 & Q5 FACE DOWN

44 INSULATOR PADS

103 3 PL.

-01 ASSY, 401 CV  
-02 ASSY, 403 CV



WIRE R51 WITH 22GA WHT: R51-1 TO A  
R51-2 TO B  
R51-3 TO C

SPECIAL APPLICATION, NOT NORMALLY INSTALLED, C16, R42, R43.

NOTES: UNLESS OTHERWISE SPECIFIED.

<b>ELGAR</b> SERIES 400 CV CONTINUOUS TUNING OSCILLATOR			
CONTRACT NO.	REV	DATE	REV
25965	D	25965	5040006
SCALE 2/1	SHEET 1 OF 1		

5040006