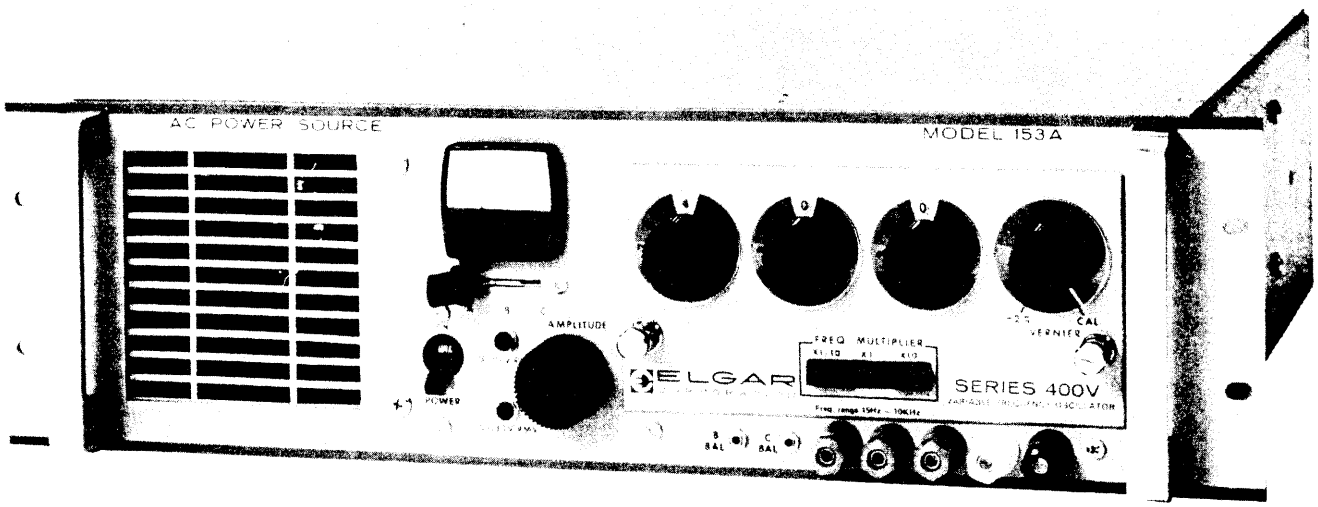

MODEL 153A
AC POWER SOURCE

904-058-90/3-74/250

Printed in USA

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- 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 Customer Service Department prior to the return of the product to Elgar for repair, phone 800-73-ELGAR (800-733-5427), ext. 295;
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- 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,
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- 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.
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SECTION I
DESCRIPTION

1-1. GENERAL DESCRIPTION

1-2. The Elgar Model 153A is a fully automatic, self-contained, solid state AC Power Source. It is capable of providing three phase AC power at adjustable amplitudes and precise frequencies for use in laboratories, production testing, automatic test systems using computers and frequency conversion applications.

1-3. Featured on the exterior of the Model 153A is a front panel mounted AC voltage meter, phase balance adjustments, a selector switch for monitoring A, B, or C phase outputs and front and rear panel mounted output terminals. Also featured is a blank space which enables either an Elgar fixed or variable frequency oscillator to be installed, thus completing the instrument package.

1-4. The Model 153A has two output voltage ranges of 0.0 to 32 VAC and 0.0 to 130 VAC, which are available in either line to neutral (wye) or line to line (delta) configurations. The two ranges are selected by positioning a four sided printed circuit board inside the instrument. The amplitude is adjustable by a front panel amplitude control.

1-5. The frequency output of the instrument is controlled by an Elgar three phase plug-in oscillator, which is available in either fixed or variable ranges from 45Hz to 5KHz, with fixed frequency accuracies to 0.0001%.

1-6. The instrument includes two DC power supplies which supply the unit's internal operating voltages. Three power amplifiers are also included to amplify the separately phased inputs and to drive the output transformers. The three output transformers included in the Model 153A use a multiple tap principle, thus providing the four dissimilar output voltage configurations.

1-7. A split primary, single phase input power transformer allows the Model 153A to be used with either 115 VAC, 47-63Hz or 230 VAC, 47-63Hz input power; 400Hz input power operation is available on a special order basis.

1-8. PHYSICAL DESCRIPTION

1-9. The Model 153A is housed in a rugged all steel enclosure. The front panel has been equipped to allow for mounting the instrument in a standard 19 inch rack. See Paragraph 2-4 for mounting instructions.

1-10. The Elgar Plug-In Oscillator module (supplied separately) mounts in the blank space located on the front panel of the Model 153A. In most cases, however, the Model 153A will already be equipped with this module depending on the original purchase order. If removal of the oscillator assembly is necessary, the two thumb screws will facilitate its removal or installation.

1-11. The grill assembly located on the front panel and rear panel provide the fan assembly with the necessary air intake and outlet locations for proper operation. The air is drawn into the front grill and exhausted through the rear grill.

CAUTION

Under no circumstances should the front or rear grill assemblies be blocked or serious damage to the Model 153A could occur.

1-12. PERFORMANCE SPECIFICATIONS

1-13. The performance specifications for the Model 153 appear in Table 1-1.

TABLE 1-1. SPECIFICATIONS

OUTPUT PER PHASE	0-50VA
POWER FACTOR	Unity – ±.7
OUTPUT VOLTAGE (Adjustable)	0-32 VAC line to line or line to neutral 0-130 VAC line to line or line to neutral
OUTPUT CONFIGURATION	4 wire wye, isolated from ground. Any one phase or neutral may be grounded.
OUTPUT FREQUENCY RANGE	45Hz – 5KHz at rated power
DISTORTION	Less than .9% (45Hz – 5KHz) Less than .5% (100Hz – 1KHz)
OUTPUT LOAD REGULATION (Regulation may be adjusted thru zero for specific loads and frequencies)	±1% 45Hz – 5KHz
INPUT LINE REGULATION	±.25% for ±10% input line change
HUM AND NOISE	–70 db below full output
INPUT POWER	115 or 230VAC, single phase 47-63Hz. 450 VA maximum.
OPERATING TEMPERATURE RANGE	0-50°C
WEIGHT	65 lbs approximately

1-14. BLOCK DIAGRAM DESCRIPTION

1-15. A general block diagram for the Model 153A is shown in Figure 1-1. The AC Power Source functionally consists of two DC power supplies, three power amplifiers with associated control circuitry and three output power transformers. The DC supplies are obtained from a full wave bridge rectifier connected to the secondary of the input power transformer. These supplies provide a nominal plus and minus 35V DC which are used as operating and bias voltages for the three amplifiers. The power ampli-

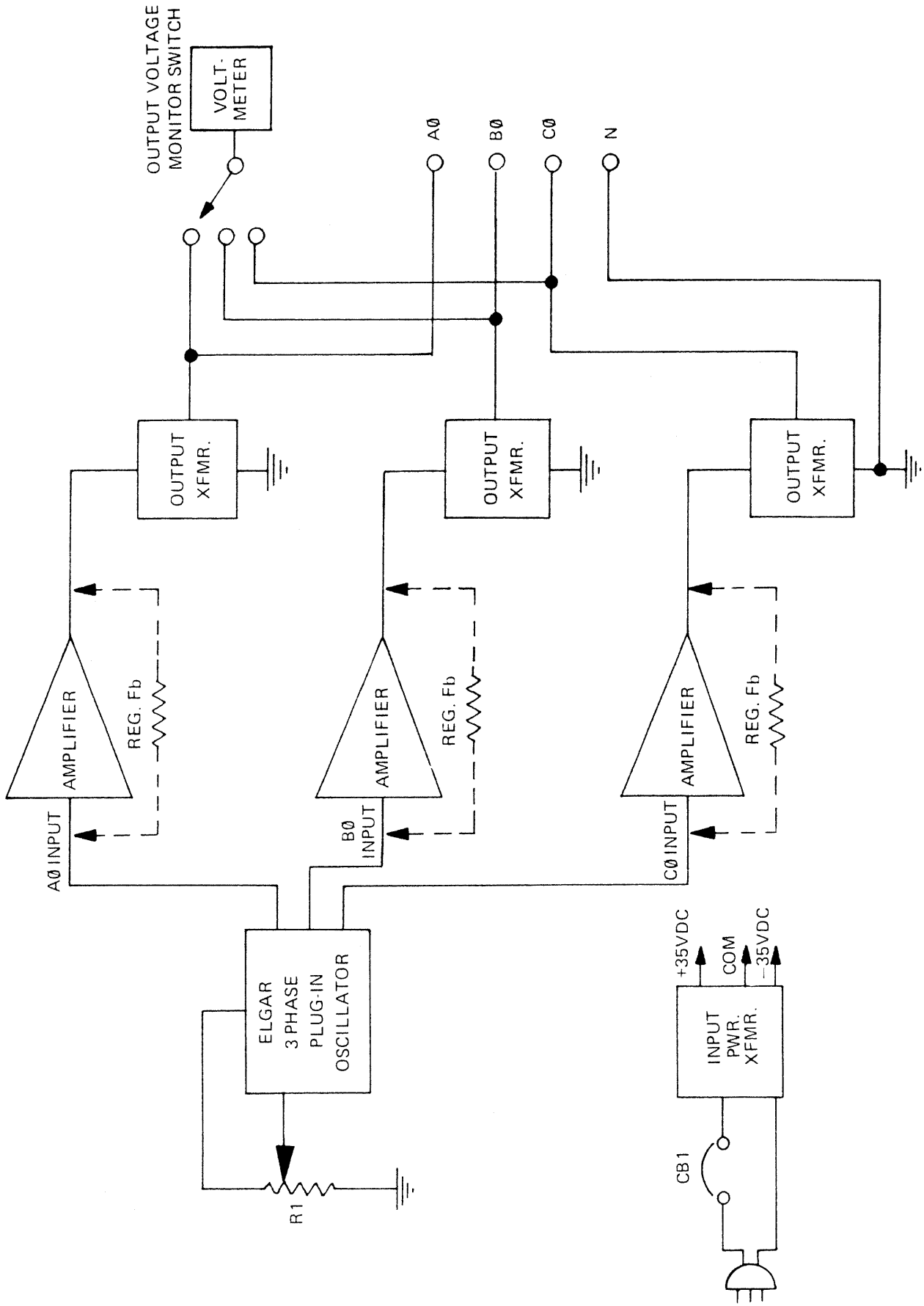

FIGURE 1-1. MODEL 153A BLOCK DIAGRAM

fiers and associated control circuitry are mounted on a heatsink assembly in the wind tunnel. The Elgar plug-in oscillator signals are AC coupled to the inputs of the three amplifiers and determine the A, B, and C phase outputs. The amplitude of the three power amplifiers is varied simultaneously by the amplitude control potentiometer located on the front panel of the 153A. The amplified A, B, and C phase signals are applied to the output transformers, whose outputs are available at either the front panel winding posts or the rear panel terminal block. Output configurations are selected by a plug-in card located inside the 153A, which provides 0-32VAC line to line, 0-32VAC line to neutral, 0-130VAC line to line or 0-130VAC line to neutral. Front panel indicators illuminate to indicate the output voltage range selected.

1-16. Each power amplifier is internally protected against short circuits or overloads on the outputs of the AC Power Source. Internal current limit transistors clamp drive signals to the output power transistors when the preset current levels are exceeded. The amplifier recovers immediately upon removal of the overload or short circuit. Regulation circuitry consisting of positive feedback and frequency compensation are employed to provide output voltage regulation over the frequency range of the AC Power Source.

SECTION II
INSTALLATION

2-1. UNPACKING INSTRUCTIONS

2-2. Because of the rugged construction of the Model 153A, little need be done to ensure the instrument has arrived free of shipping damage. However, to aid in completing the necessary receiving inspection the following steps are provided:

1. Visually inspect the instrument's exterior for any signs of damage, such as dents, scratches or distortion.

2. Check the front panel controls for ease of operation.

3. Ensure the front panel meter and indicators are not damaged.

4. Remove the top and bottom covers and ensure all three circuit boards are securely inserted in their receptacles.

5. Ensure the heat sinks, located at the bottom of the instrument, are securely fastened.

6. Ensure the harness and wire leads are free from breaks, cracks or broken insulation.

NOTE

If obvious damage is evident, both the shipping agency and Elgar Corporation should be notified immediately. It is important to save all shipping material for inspection. To notify Elgar Corporation in the event of damage, send a damage report to the Elgar Service Department, 9250 Brown Deer Road San Diego, Ca 92121. Elgar, in return, will provide instructions for repair or replacement of the damaged instrument. Under no circumstances should you return the instrument without the approval of Elgar Corporation.

2-3. RACK MOUNTING

2-4. The Model 153A has been designed for rack mounting capabilities. The external dimensions of the instrument are shown in Figure 2-1.

2-5. For slide out capability, the unit has been factory equipped with threaded screw holes on each side for installation with Zero Mfg. Co. slides CTHRN-118.

CAUTION

When mounting the Model 153A, ensure that the flow of air into the front panel grill and out of the rear panel grill is not obstructed. Obstruction of these grills will result in serious damage to the instrument.

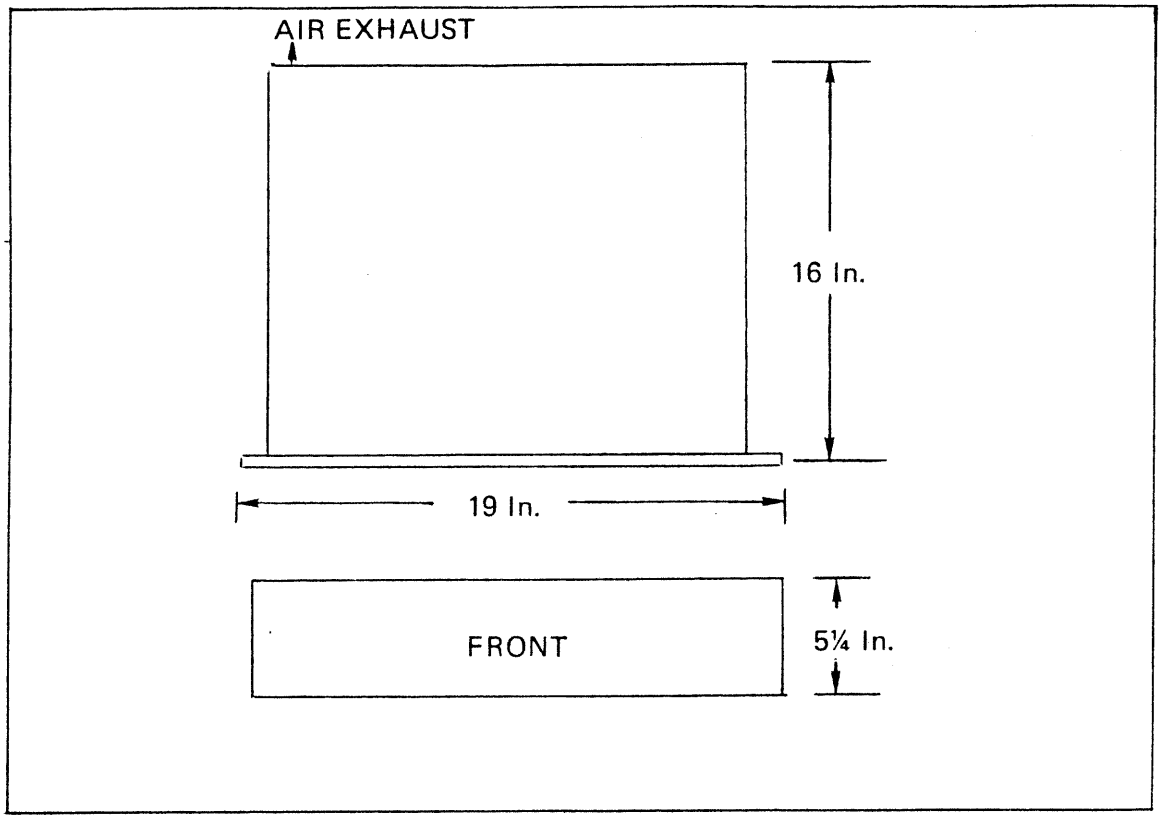

FIGURE 2-1. MOUNTING DIMENSIONS

2-6. POWER REQUIREMENTS

2-7. The Model 153A operates from either 115 VAC, 47-63Hz or 230 VAC, 47-63Hz. 400Hz operation is available on a special order basis. Units are normally wired for 115 VAC operation. If 230 VAC operation is desired refer to the schematic for changes to the instrument.

2-8. INPUT SIGNAL REQUIREMENTS

2-9. In some applications it may be desirable to use an external oscillator rather than an Elgar plug-in module. If this situation does occur, the blank space in the front panel should contain a blank filler panel (supplied separately).

2-10. When using an external oscillator all input and control signals should be connected to the 12 pin Cinch Jones Connector, J1. This connector is located on the rear panel of the Model 153A. Connector J1 may also be used for external amplitude programming and synchronization of the internal Elgar Plug-In Oscillator to external timing source. It is important to know that when an external oscillator is used the three power amplifiers used in the Model 153A will except only input signals of 2.5V RMS or greater for optimum performance.

NOTE

Because of the versatility of the Model 153A, Connector J1 is internally jumpered with regard to the instruments particular application. Table 2-1 shows the connector pin information for using the 153A with an external three phase oscillator. The connector pin information for the internally mounted connector, J2, is also shown in Table 2-1.

2-11. INSTALLATION

2-12. To install the Model 153A, the following list of procedures is provided:

Table 2-1. Input/Output Connector Data

Connector/Pin Designation	Function
J1-1	Signal Common
J1-2	B-Phase Control
J1-3	C-Phase Control
J1-4	A-Phase Control
J1-5 thru 12	Spares
J2-13	+35 VDC
J2-14	A-Phase Control
J2-15	−35 VDC
J2-16	Common
J2-21	Amplitude Control (ARM)
J2-22	Amplitude Control Excitation

NOTE: Connector J1 is jumpered according to its application. Wiring data is provided with the ELGAR unit to be used.

1. Ensure the instrument has been correctly wired with regard to input power requirements.

NOTE

Units wired for 230 VAC operation at the factory will have a red tag attached to the instrument indicating the 230 VAC requirement.

2. Ensure that at least 6 inches has been left for clearance around the fan intake and outlet.

3. Set the front panel mounted circuit breaker to the OFF position.

4. Rotate the front panel mounted amplitude control fully CCW.

5. If an Elgar Plug-In Oscillator is being used, ensure that it is securely fastened into the Model 153A using the two thumb screws. If an external oscillator is being used ensure that it is correctly wired to Connector J1.

6. Connect the load to either the front panel output binding posts or to the rear panel output terminals.

NOTE

For initial installation a dummy load may be used until the instrument is check out and verified as operational.

7. Insert the input power plug into the AC input power source and reference to Section III for preliminary check out.

SECTION III
OPERATION

3-1. INTRODUCTION

3-2. This section contains information regarding the preliminary check-out of the Model 153A, as well as a list of simplified instructions pertaining to its operation. To aid in understanding the instrument, a description of the controls and indicators is also provided.

3-3. CONTROLS AND INDICATORS

3-4. The controls and indicators associated with the operation of the Model 153A are shown in Figure 3-1 and Figure 3-2. Their functions are described as follows:

1. POWER SWITCH-CIRCUIT BREAKER
   Applies the AC line input power to the Model 153A. Safeguards the instrument by disconnecting the AC line input when the input current exceeds the rated value of the circuit breaker.

2. OUTPUT VOLTAGE METER
   Monitors either A, B, or C phase output voltage as programmed by the Output Voltage Selector Switch.

3. OUTPUT VOLTAGE SELECTOR SWITCH
   Connects either A,B, or C phase output voltage to the front panel voltage meter.

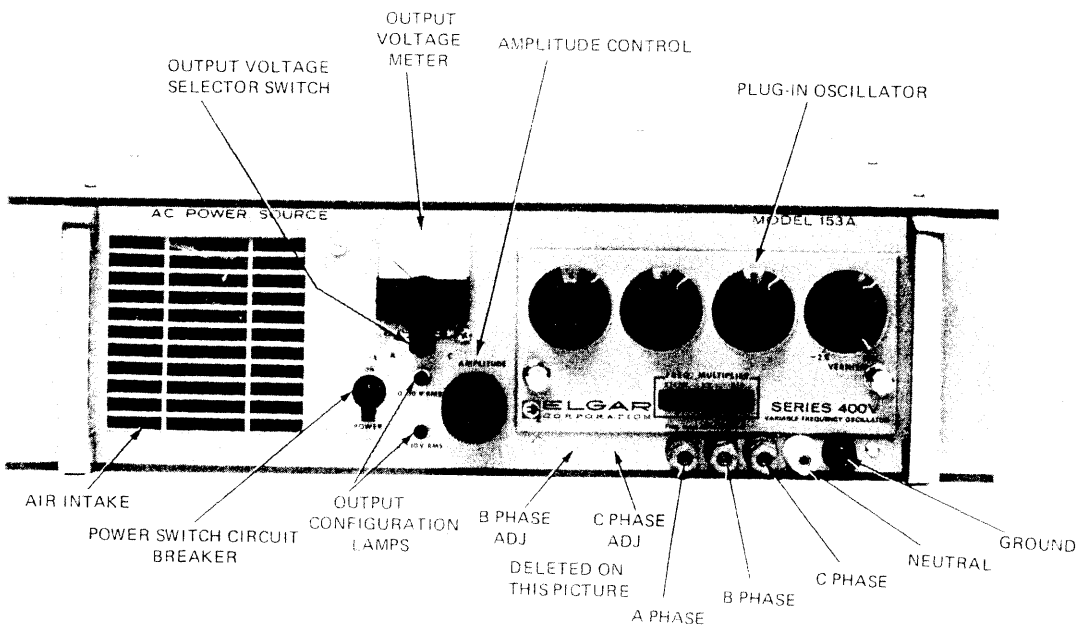

FIGURE 3-1. FRONT PANEL VIEW

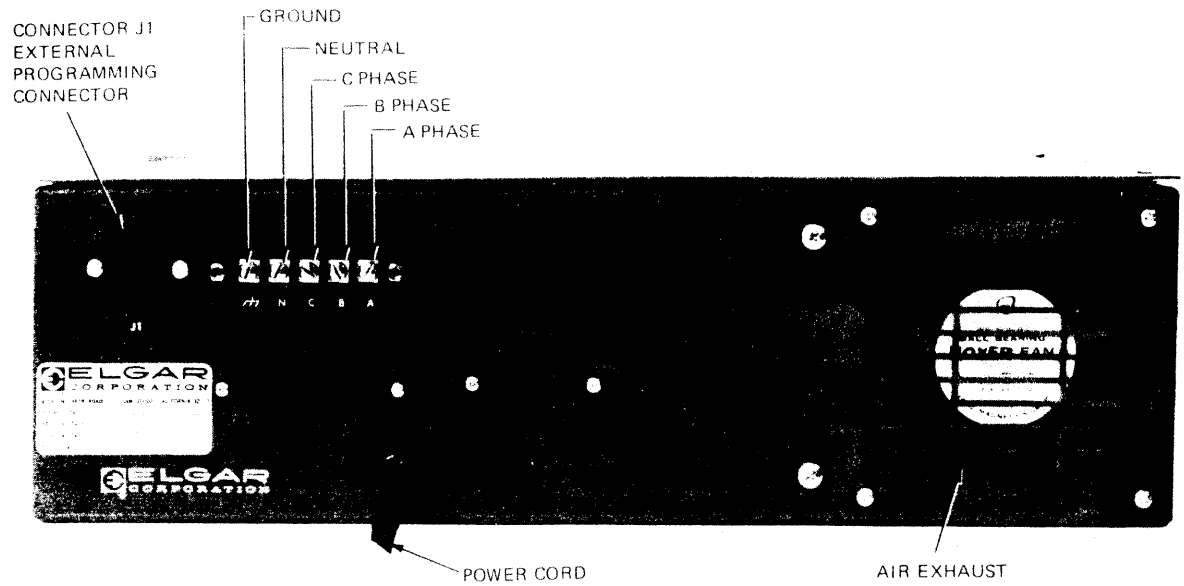

FIGURE 3-2. REAR PANEL VIEW

4. AMPLITUDE CONTROL
Adjusts the amplitude of A, B, or C phase output voltage from 0.0 to 32 VAC or 0.0 to 130 VAC at the output terminals.

5. OUTPUT POWER BINDING POSTS
Provide A, B, or C phase output voltage connections to load for 0.0 to 32 VAC or 0.0 to 130 VAC as selected by the position of the output configuration card inside the Model 153A. Ground and neutral connections are also available.

6. OUTPUT CONFIGURATION LAMPS
When power is applied to the Model 153A one of these two lights will illuminate indicating that power is applied and which voltage range has been selected.

7. ELGAR PLUG-IN OSCILLATOR
Refer to the oscillator's instruction manual for a description of controls.

8. B AND C PHASE BALANCE ADJUSTMENTS
Enables B and C phase amplitudes to be adjusted without the necessity of using the front panel amplitude control.

3-5. PRELIMINARY CHECKOUT

3-6. To successfully checkout the Model 153A, the following list of instructions is provided:

1. Set the front panel mounted Power Switch-Circuit Breaker to the ON position.

2. Ensure the fan is operational.

3. Set the Elgar Plug-In Oscillator to the desired frequency. Refer to the oscillator's instruction manual for operating instructions.

4. Place the Output Voltage Selector Switch to the "A" position.

5. Rotate the front panel mounted Amplitude Control clockwise until a reading of 32 or 115 VAC is obtained on the front panel Output Voltage Meter.

6. Place the Output Voltage Selector Switch to the "B" position and adjust, if necessary, the B Phase Balance Adjust until the reading on the voltage meter is identical to the "A" position.

7. Place the Output Voltage Selector Switch to the "C" position and adjust, if necessary the C Phase Balance Adjust until the reading on the voltage meter is identical to that of "A" and "B" phases.

8. Rotate the Amplitude Control fully CCW and ensure that "A", "B", and "C" phase voltages reduce to zero.

9. Place the Power Switch-Circuit Breaker to the OFF position and ensure that Output Configuration Lamps extinguish and the fan stops.

3-7. OPERATING INSTRUCTIONS

3-8. Once the preliminary check-out procedures have been performed and the instrument is verified as operational, the following list of instructions will aid in the operation of the Model 153A.

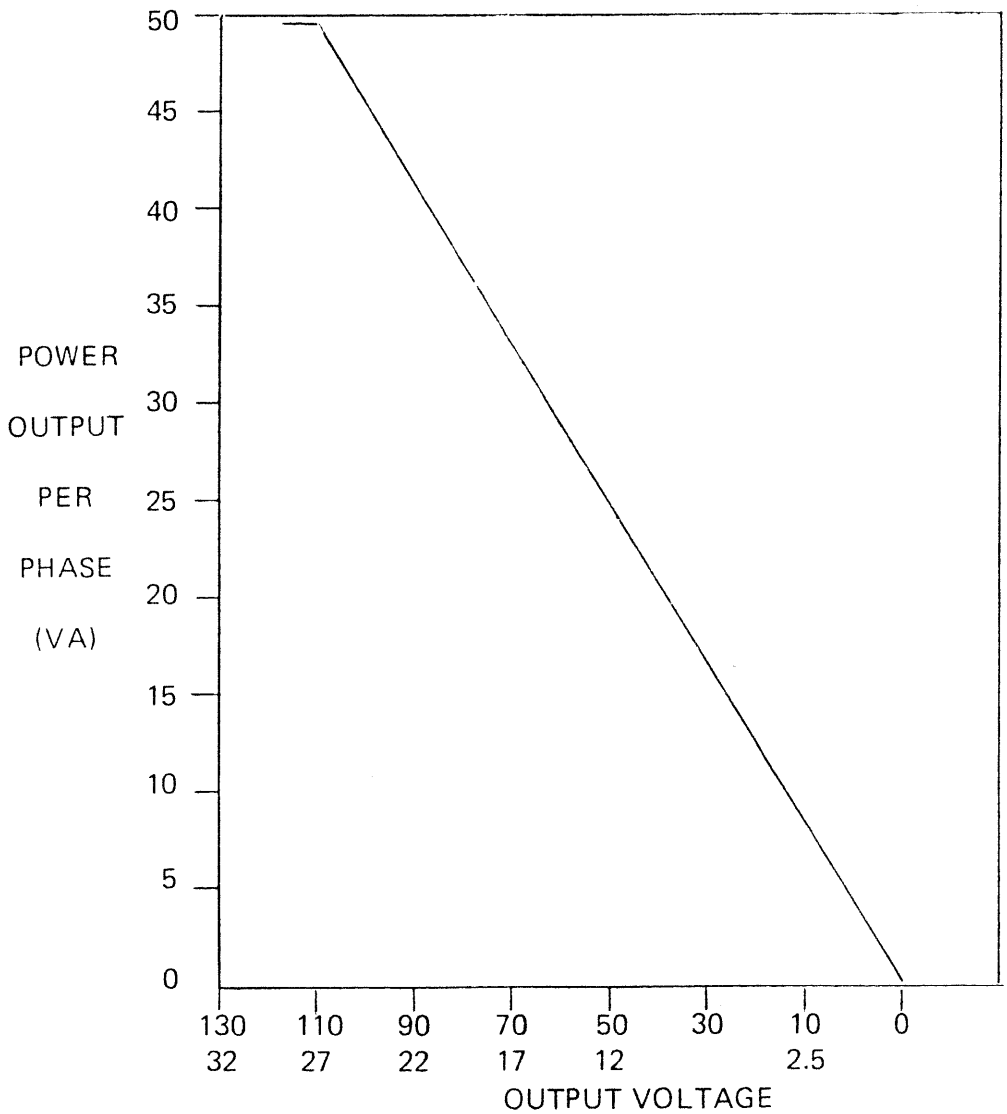

FIGURE 3-3. OUTPUT POWER DERATING

1. POWER ON
   Set the Power Switch-Circuit Breaker to the ON position. Observe that the Output Configuration Lamp remains ON and ensure that the fan is operational.

CAUTION

Do not continue to operate the Model 153A if the circuit breaker trips when power is applied or when the amplitude is increased. The Model 153A is protected against shorts at the output terminals and recovers immediately when the short is removed. Tripping of the circuit breaker indicates that the unit required adjustment or repair. In the event of failure refer to Section VI for further information.

2. FREQUENCY CONTROL
   Adjust the Elgar Plug-In Oscillator for the desired frequency between 45 and 5KHz. Refer to the oscillator's instruction manual for operating instructions.

NOTE

Certain Elgar Oscillators do not require the use of the front panel Amplitude Control and others are externally programmed, refer to the oscillator's instruction manual for special features of the Plug-In Oscillator.

3. AMPLITUDE CONTROL
   Adjust the front panel Amplitude Control to vary the "A", "B", or "C" phase output voltages. Rotate CW to increase the voltage and CCW to decrease the voltage.

4. OUTPUT VOLTAGE METER
   Monitors the output voltage of "A", "B", or "C" phases as selected by the Output Voltage Selector Switch. When operating at less than full-rated power refer to Figure 3-3 for output power derating information.

5. POWER OFF
   To turn off the Model 153A, place the Power Switch-Circuit Breaker to the OFF position.

SECTION IV
THEORY OF OPERATION

4-1. CIRCUIT DESCRIPTION (Refer to Figure 6-1)

4-2. DC Power Supplies

4-3. When the Power Switch-Circuit Breaker CB1 is energized the Output Configuration Lamp, either DS1 or DS2, will illuminate and the fan B1 will activate; at the same time the ±35 VDC internal power supplies will energize. The DC power supplies are derived from the secondary of transformer T1, which acts as a step-down transformer. The secondary winding of T1 is connected to a full-wave bridge rectifier BR1 which rectifies the AC voltage and produces a nominal ±35 VDC for the internal circuitry of the Model 153A. Capacitors C1 and C2 are used to filter the ±35 VDC for use as operating and bias supplies within the instrument.

4-4. Power Amplifiers

4-5. The power amplifiers employed in the Model 153A are RCA Model HC 2000 Hybrid Power Amplifiers and are used to drive the three output transformers, T2A, T2B, and T2C. These amplifiers, Z101, Z201, and Z301, have built-in, internal current limiting networks, which limit the output current delivered by the power transistors within the amplifier module. Because all three of these amplifier circuits are electrically identical, only the "A" phase amplifier circuit, Z101, will be discussed.

4-6. The "A" phase oscillator input to Z201 is connected to pin 7 of Z101. The output at pin 3 of Z101 provides an AC feedback through R105 to pin 9 of the amplifier. Across R105 is a high frequency stabilizing network consisting of R103 and C102. DC feedback is accomplished through the same path with the use of decoupling network R107 and C104.

4-7. Load regulation is accomplished by passing the pin 2 lead from the primary of T2A through T3A, thus forming a single turn primary current transformer. Positive current feedback from the secondary of T3A is then applied across loading resistor R109 and regulation adjustment potentiometer R108. From the wiper of R108 the positive current feedback is applied across R104 to pin 9 fo Z101. This portion of the circuit operates by sensing the current in the primary of T2A when a load is applied to the output of the Model 153A. The load on the output causes a voltage to be developed at the secondary of T3A. This voltage causes the output of Z101 to increase, thus maintaining the output voltage on the secondary of T2A to ±1%. The DC offset adjustments, R102 for the "A" phase, R202 for the "B" phase, and R302 for the "C" phase circuits, are used to set the output of each of the power amplifiers for zero DC offset.

4-8. OUTPUT VOLTAGE AND CONFIGURATION SELECTOR CARD

4-9. The output configuration card is located inside the Model 153A, (See Figure 5-1), and is used to select any one of four output voltage configurations. These four outputs are described in paragraph 1-4. To select a particular output voltage configuration unplug and rotate the card to the configuration desired. The configurations are identified on the face of the selector card.

SECTION V
MAINTENANCE

5-1. INTRODUCTION

5-2. Because the Model 153A has been completely tested at the factory it is unlikely that it will need any repairs during its lifetime. However, in the event a failure does occur, this section on maintenance has been incorporated to aid in locating any fault.

5-3. Also contained in this section are procedures for performing preventative and corrective maintenance on the Model 153A. A list of special tools and test equipment required for performing any maintenance is also included.

NOTE

Elgar Corporation is not responsible for instruments returned for repair without proper Elgar authorization. Please contact Elgar Corporation or its authorized representative to make the necessary arrangements for the return of an inoperative instrument. All correspondence should be made with the Elgar Corporation Customer Service Department, 8225 Mercury Court, San Diego, California 92111.

5-4. TEST EQUIPMENT

5-5. The test equipment required for performing maintenance of the Model 153A is shown in Table 5-1. Equivalent test equipment may be used if necessary.

WARNING

Remove power whenever performing maintenance on the Model 153A. Failure to comply may result in serious electrical shock.

5-6. PREVENTIVE MAINTENANCE

5-7. Preventive maintenance is comprised of cleaning and inspecting the Model 153A. The AC Power Source should be cleaned and inspected at regular periodic intervals (every six months). The top and bottom covers of the instrument are removable for easy access to the instruments interior. To clean and inspect the instrument the following list of instructions is provided:

1. Remove the top and bottom covers.
2. Inspect circuit board parts for evidence of overheating; such as burned or distorted resistors, capacitors, and charred insulation. Replace parts suspected of damage.
3. Inspect circuit board parts for evidence of physical damage; such as broken or cracked capacitors and resistors, broken solder joints and broken circuit board foil straps.
4. Inspect circuit board connectors for corrosion and obvious physical damage. Remove corrosion with clean lint-free cloth dampened in trychlorethylene; replace circuit board assembly if damaged.

Table 5-1. Test Equipment Required

NAME	MANUFACTURER AND MODEL NUMBER	CHARACTERISTICS
Multimeter	Simpson Electric Co. Model 260	20,000 ohms/volt, AC/DC/OHMS ranges
Plug-in Oscillator	ELGAR Corporation Model 403-V	Adjustable 45 Hz to 10 KHz 3-phase outputs
Differential Voltmeter	John Fluke Mfg. Co. Model 931	RMS Volts Range to 1000VAC
Oscilloscope	Tektronix, Inc. Model 561 w/2B67 and 3A6 plug-ins	
Probe	Tektronix, Inc. Model P602B	X1 Probe
Distortion Analyzer	Hewlett-Packard, Model HP333A	
Resistance Load	Commercial	Capable of dissipating 1/2 ampere load at 120 VAC

5. Inspect chassis and front panel mounted components for broken connections, burned insulation or damaged parts.

6. Inspect transformers for evidence of overheating; such as discolored insulation.

7. Inspect rear panel connector and terminal blocks for damage; such as broken wire leads, cracked insulation and dirt.

8. Replace top and bottom covers.

5-8. CORRECTIVE MAINTENANCE

5-9. Corrective maintenance consists of checkout, troubleshooting, adjustments, and repair of the Model 153A

5-10. Checkout.

5-11. The Model 153A should be checked after initial installation and at periodic intervals to ensure that it is operating at optimum performance. Checkout consists of testing the DC power circuit, and

regulation and distortion checks, which should indicate whether the AC power source is operating within specifications or if it requires adjustment. Trouble-shooting procedures are presented in Paragraph 5-22.

WARNING

High voltages dangerous to life exist in the unit when energized. AC voltages are also present at the INPUT POWER terminals at any time the power cable is connected to the line voltage. Exercise extreme caution when performing maintenance checks in the unit. Always remove power when disconnecting circuit boards, performing continuity checks, or disassembling the unit.

5-12. Preliminary Procedures.

5-13. Before applying power, perform the following preliminary procedures.

1. Set POWER switch of unit to OFF.
2. Rotate AMPLITUDE control of unit completely CCW.
3. Remove top panel of unit.
4. Disconnect the heatsink plugs.

5-14. DC Power Circuit Check.

5-15. To check the outputs of the DC supplies, proceed as follows:

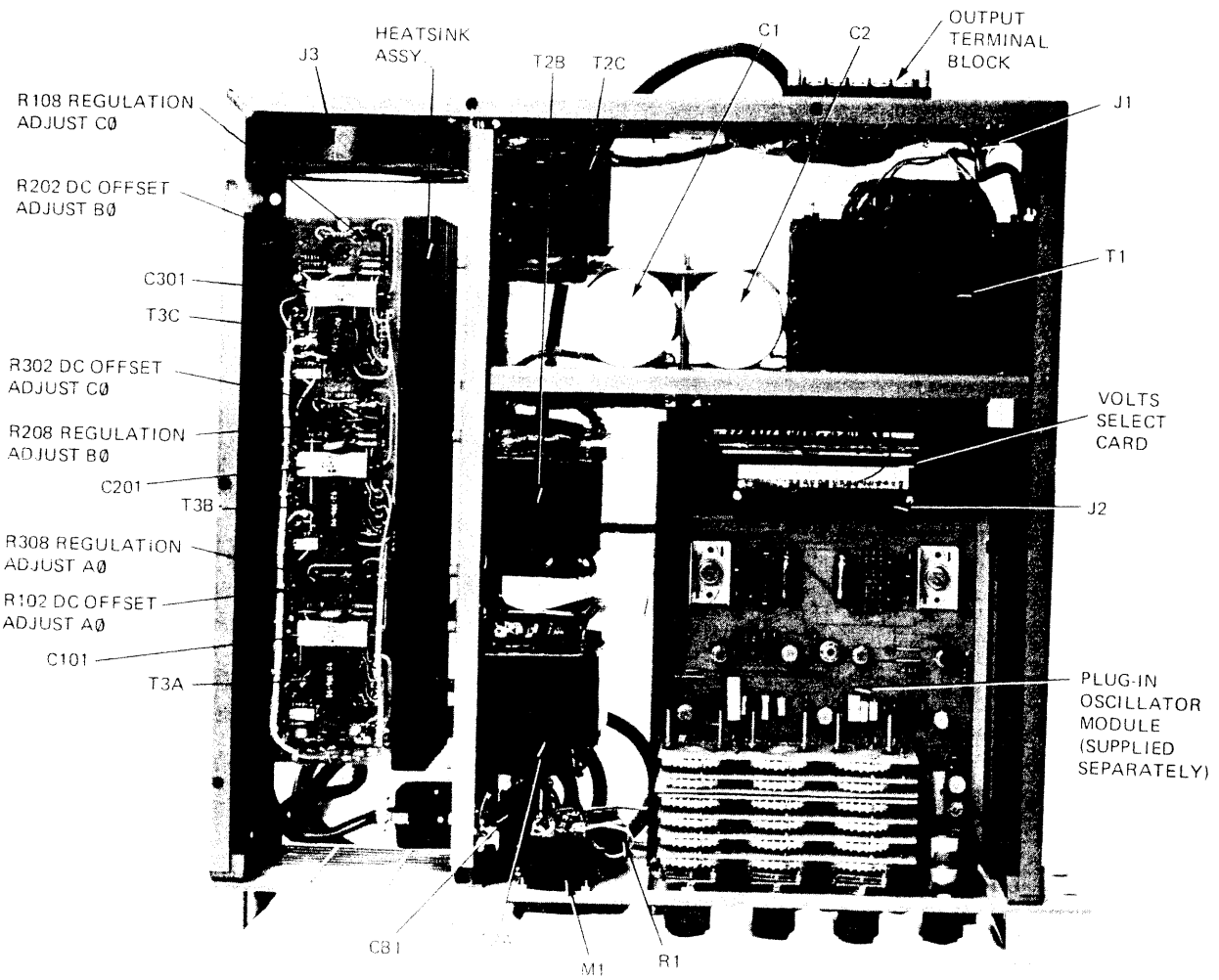

FIGURE 5-1. COMPONENT LAYOUT

1. Using multimeter, check that capacitors C1 and C2 in the unit are not shorted.

2. Apply line voltage to unit and set POWER switch on front panel to ON.

3. Using multimeter, measure +35VDC and −35VDC outputs of DC power circuit. The +35VDC is the red lead at C1 and the −35VDC is the green lead at C2. (See Figure 5-1.) Observe that the plus (+) and minus (−) 35 VDC busses are even readings of 37VDC nominal (no load) and are within 5% (2 to 3 volts) of each other. If not, discontinue the checkout and troubleshoot the unit to correct the problem. (See Paragraph 5-22.)

4. Set POWER switch of unit to OFF.

5-16. Output Amplitude Balance Check And Adjustment.

5-17. The output voltage is controlled by the front-panel AMPLITUDE control (for most plug-in oscillators). The B-phase and C-phase balance potentiometers (R2 and R3) are set to give B-phase and C-phase voltages equal to the A-phase voltages. No further adjustments should be required unless the plug-in oscillator is changed. The oscillator phase-angles must be adjusted to give equal line-to-line voltages after the phase-voltage amplitudes have been balanced. Phase angle controls are located on the plug-in oscillator. If the phase voltages are set to 120V, the proper value of line-to-line voltage is 207.84V. The B-phase angle control is used to set the A-B voltage and the C-phase angle control to set the A-C voltage. Serious misadjustment of either phase angle or phase voltage balance will cause circulating currents to flow between amplifiers which may actuate the current limiting circuits in the amplifier. To check the output and amplitude balance and adjust as needed, (See Figure 5-2), proceed as follows:

1. Reconnect the heatsink plug into the connector.

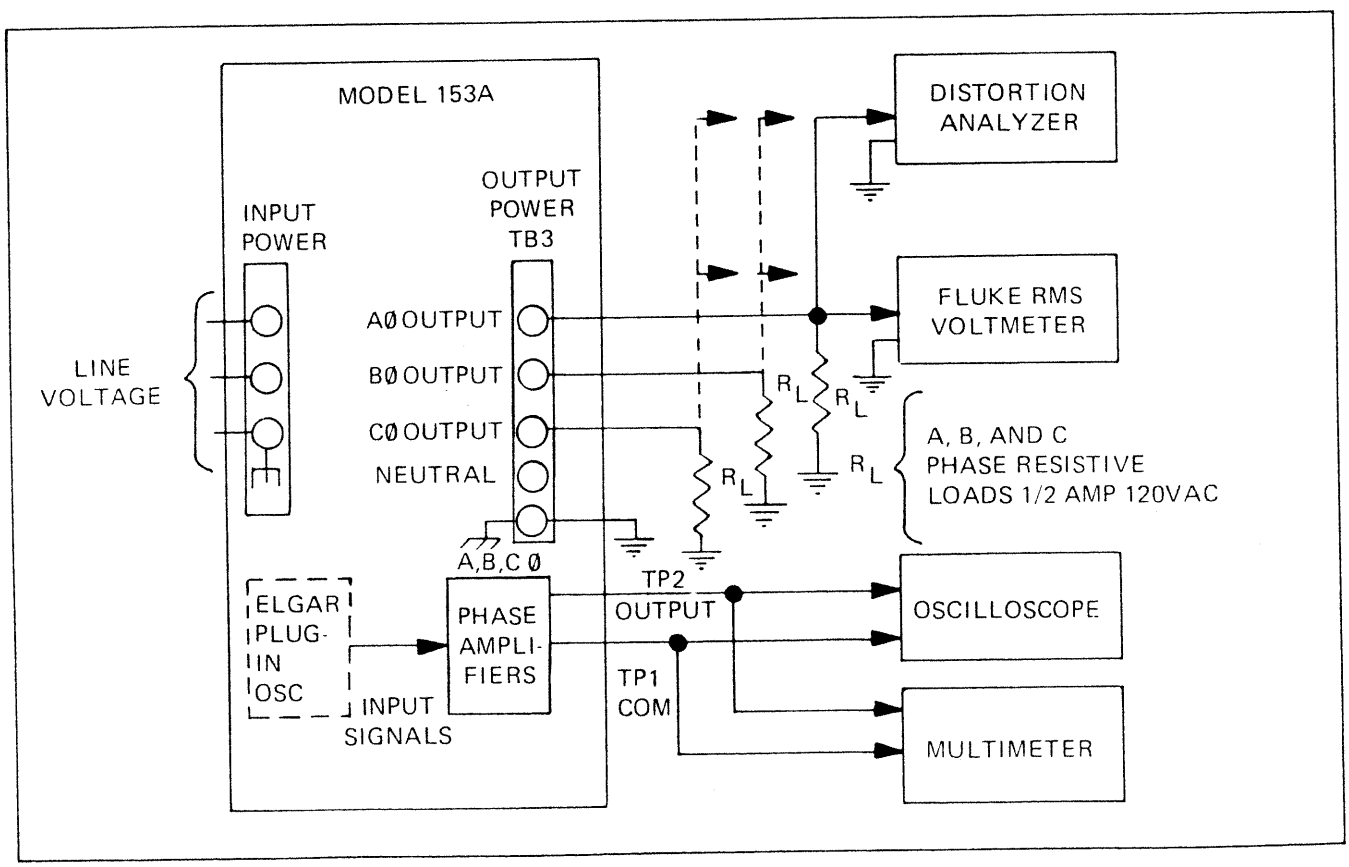

FIGURE 5-2. TEST SETUP

2. Connect RMS voltmeter to A phase output terminals of the unit. Set RMS voltmeter for 1000-volt range, 3%, 120 volts.

3. Set POWER switch of unit to ON.

4. Select position A on OUTPUT VOLTAGE selector and rotate AMPLITUDE control CW to increase output to 120 volts. The voltage can be read as 120 volts on the output voltage meter or null volts on the RMS voltmeter.

5. Select position B on OUTPUT VOLTAGE selector. Observe that the output voltage meter reads 120 volts. Using RMS voltmeter, measure B phase output voltage at terminal B of output terminals. Observe that reading is null volts. If not, adjust amplitude balance potentiometer R2 of B-phase amplifier circuit board for 120-volt output on meter (or null volts on RMS voltmeter).

6. Select position C on OUTPUT VOLTAGE selector. Observe that output voltage meter reads 120 volts. Using RMS voltmeter, measure C phase output voltage at terminal C of output terminals. Observe that reading is null volts. If not, adjust amplitude balance potentiometer R3 of C-phase amplifier circuit board for 120-volt output on meter (or null volts on RMS voltmeter).

5-18. Regulation Check And Adjustment.

5-19. Upon completion of output amplitude balance adjustment, perform a regulation check and adjustment as follows:

1. Set POWER switch of unit to OFF.

2. Connect three resistive loads each capable of dissipating 1/2 ampere. (See Figure 5-2.)

3. Set POWER switch of unit to ON.

4. Using RMS voltmeter (set at 1000-volt range, 3%, 120 volts), measure A phase output voltage at output terminal. Observe that output is null volts on meter. If not, adjust regulation potentiometer R108 on A-phase amplifier circuit board for 120 volt output as needed.

5. Repeat step 4 to check and adjust regulation of B and C phase outputs. Use respective output terminals and regulation adjust potentiometers on the B and C phase circuit boards.

6. Set POWER switch to OFF and remove the three resistive loads.

7. Repeat the output amplitude balance checkout and adjustment in Paragraph 5-16. Due to interaction between the phase regulation adjustments and the amplitude balance adjustments, it may be necessary to readjust the amplitude balance of the outputs. Repeat phase regulation and amplitude balance adjustments until no discernible difference is read on the RMS voltmeter as the loads are connected.

5-20. 400 Hz Distortion Check.

5-21. The distortion check may be performed at 60 Hz, 400 Hz, or 5 KHz, depending on the type of plug-in oscillator used. The checks are performed identically except for changes in frequency and the specified distortion. Only one distortion check will be described as follows:

1. Set POWER switch of unit to OFF.

2. Connect resistive load to A phase output terminals.

3. Connect distortion analyzer to A phase output terminals. (See Figure 5-2.)

4. Adjust input signal of plug-in oscillator to 400 Hz.

5. Set POWER switch to ON and adjust AMPLITUDE control for 120 volts output. Observe that distortion is less than 0.5% at 400 Hz.

6. Repeat steps 1 thru 5 to check distortion and B and C phase voltages in same manner.

5-22. Troubleshooting.

5-23. Troubleshooting should be accomplished only after checkout procedures indicate a malfunction. The troubleshooting procedures are presented in Table 5-2. General troubleshooting techniques are as described in the following paragraphs.

5-24. Adjustments.

5-25. The power source is delivered fully adjusted and calibrated; therefore, adjustment is not normally required unless a malfunction occurs or parts are replaced. Adjustments should not be attempted unless indicated by troubleshooting. The A, B, and C phase amplifiers are all identical, and the output amplitudes are all controlled by R1 located on the front panel of the power source.

5-26. Factory Repair.

5-27. Do not replace factory selected parts. 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.

Table 5-2. Troubleshooting Chart

Trouble	Probable Cause	Remedy
a. Power lamp fails to light when POWER switch is turned on. Fan fails to operate	1. Power cord not plugged into line voltage	1 Plug cable into AC source.
	2. Lamp burned out	2. Replace defective lamp.
	3. Fan defective	3. Replace fan.
	4. Defective switch-circuit breaker	4. Replace switch-circuit breaker CB1
b. POWER switch-circuit breaker trips when turned on or when amplitude of output voltage is increased	Continual tripping of POWER switch-circuit breaker indicates failure of the dc supply or a power amplifier in the heatsink assembly	Disconnect the heatsink plug from the unit. Set the POWER switch to ON. If it trips again, test the ±35 VDC supply and filter capacitors C1 and C2 for defective components. Reference Paragraph 5-14. If it does not trip, check the power amplifiers on the heatsink assembly for shorts, collector to emitter. Replace defective components as needed.
c. Front panel meter fails to indicate phase voltage selected at OUTPUT VOLTAGE switch	The following causes could lead to a lack of output voltage indication. 1. AMPLITUDE control completely CCW or defective 2. Plug-in oscillator not properly seated or malfunctioned 3. Front panel OUTPUT VOLTAGE meter or selector defective 4. Output power transformer T2, A, B, or C defective	Rotate AMPLITUDE control CW to increase output voltage to full output. Using multimeter, measure phase A, B, C voltages at output terminals. If normal, front panel OUTPUT VOLTAGE switch or meter is defective. If absent, measure signal output at TP2 of A, B, and C phase amplifiers. Using oscilloscope, observe the sine wave outputs. If normal, output transformer T2 is defective. If below normal, measure input signal at TP3 of A, B, C phase amplifiers and determine if plug-in oscillator is supplying correct phase and amplitude input signals. Reference Paragraph 5-16.

Table 5-2. Troubleshooting Chart (Continued)

Trouble	Probable Cause	Remedy
d. Phase A, B, or C outputs change significantly when output load connected	Overload causing current limiting	Remove overload condition.
	Output regulation not set properly	Adjust output amplitude balance and regulation as instructed in Paragraphs 5-16 and 5-18.
e. One or more phase output voltages differes from the other, For example, phase B output is low, whereas, phase A and C are normal	Overload causing current limiting	Remove overload condition
	Respective amplifier not properly adjusted	Using oscilloscope, observe output signal at TP2 of suspected phase amplifier circuit board. If clipping is observed, perform current limit checks and adjustments as instructed in Paragraph 5-24.
f. One or all A, B, C outputs fail to meet specified output	DC balance adjustment improperly adjusted	Check dc balance as needed. Reference Paragraph 4-4.

SECTION VI
DIAGRAMS

6-1. GENERAL

6-2. This section contains the schematic diagrams and parts layout for the AC power source. The schematic diagram 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. Components identified as "trim" are factory-selected parts whose values are determined at the time of final check-out.

6-3. DIAGRAMS AND PARTS LOCATION

6-4. Diagrams included in this section are as follows:

a. AC Power Source, Schematic Diagram

b. Phase Amplifier Circuit Board Assembly, Parts Layout

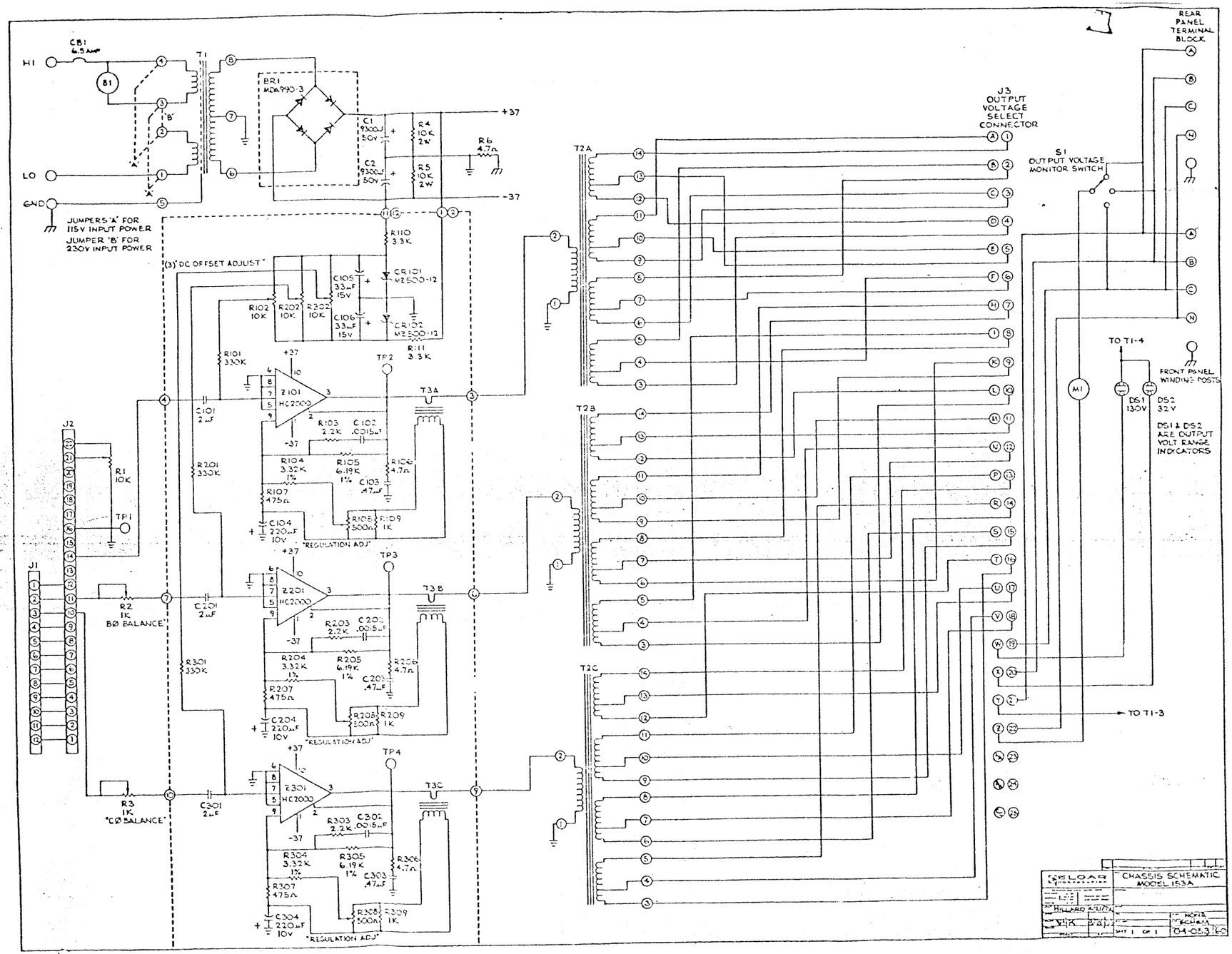

FIGURE 6-1. AC POWER SOURCE, SCHEMATIC DIAGRAM

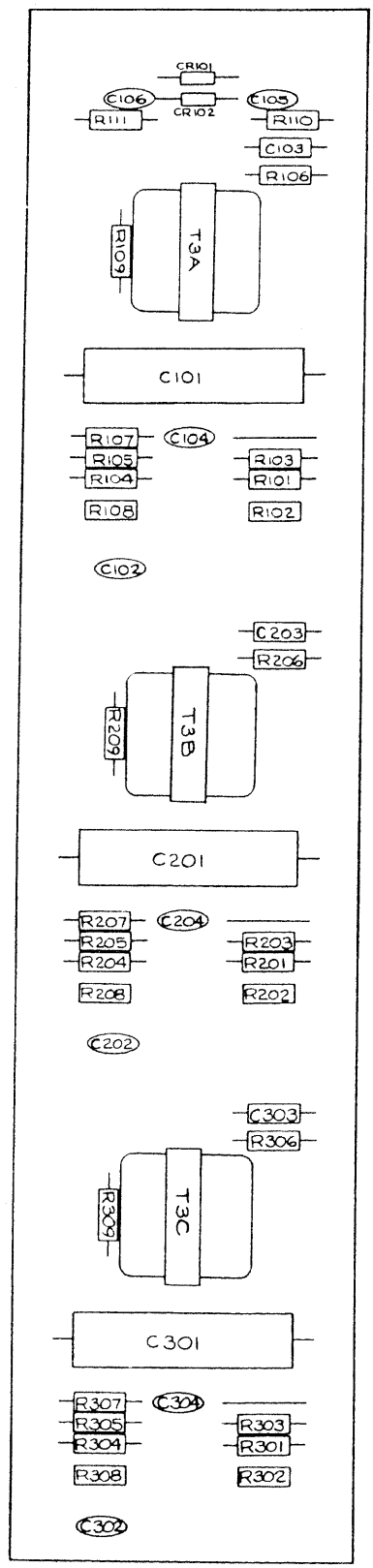

FIGURE 6-2. AMPLIFIER CIRCUIT BOARD ASSEMBLY, PARTS LAYOUT

SECTION VII
PARTS LIST

AMPLIFIERS

SCHEMATIC DESIGNATION	VALUE	DESCRIPTION OR TYPE	RATING	ELGAR PART NO.	MANUFACTURER	
					NAME	PART NUMBER
CAPACITORS						
C101,201,302	2.0 uf	Mylar	200V	822-205-53	IMB	ZA2C205J
C102,202,302	.0015uf	Ceramic Disc	100V	821-152-00	Centralab	DDM152
C103,203,303	0.047 uf	Mylar	200V	822-473-53	IMB	ZA2C473J
C104,204,304	220 uf	Tantalum	10V	823-227-61	Sprague	196D227X001MAS
C105,106	33 uf	Tantalum	25V	823-336-51	Sprague	196D336X0025LA3
RESISTORS						
R101,201,301	330K	Carb. Comp	½W 5%	802-334-05	Speer	RC20GF334J
R102,202,302	10K	Potentiometer		819-103-32	Bourns	3255W-1-103
R103,203,303	2.2K	Carb. Comp	½W 5%	802-222-05	Speer	RC20GF222J
R104,204,304	3.32K	Met Film	1/8W 1%	813-332-1F	Dale	RN60C3321F
R105,205,305	6.19K	Met Film	1/8W 1%	813-619-1F	Dale	RN60C6191F
R106,206,306	4.7 ohm	Carb. Comp	½W 5%	802-4R7-05	Speer	RC20GF4R7J
R107,207,307	475 ohm	Met Film	1/8W 1%	813-475-0F	Dale	RN60C4750F
R108,208,308	500 ohm	Potentiometer		819-501-32	Bourns	3255W-1-501
R109,209,309	1K	Carb. Comp	½W 5%	802-102-05	Speer	RC20GF102J
R110,111	3.3K	Carb. Comp	½W 5%	802-332-05	Speer	RC20GF332J
MISC.						
CR101,102		Zener	6.2V	843-500-12	Motorola	MZ500-12
Z101,201,301		Hybrid Power Amplifier		842-HC2-00	RCA	HC2000
T3A,T3B,T3C		Current Trans.		990-306-90	Aztec	12481

CHASSIS

R1	10K	Potentiometer		819-103-53	Spectrol	534-9561-10
R2,R3	1K	Potentiometer		819-102-78	Helipot	78PR1K
R4,R5	10K	Carb. Comp	2W 5%	804-103-05	Speer	RC42GF103J
R6	4.7 ohm	Carb. Comp	½W 5%	802-4R7-05	Speer	RC20GF4R7J
B1		Fan		853-450-01	Pamotor	4500
BR1		Rectifier Bridge	200V	847-990-3X	Motorola	MDA990-3
C1,C2	9300 uf	Electrolytic	50V	826-9[illegible]8-12	G.E.	86F168M1
CB1		Circuit Breaker	6.5A	852-652-51	Airpax	UPG1-1-6-1-652
DS1,DS2		Lamp		854-68K-22	Eldema	BG02-RCS-A1C-68K
S1		Switch		860-145-4X	Centralab	1454
M1		Meter	857-259-17	~~990-259-90~~	~~Ammon Jewell~~	AM1
T1		Power Trans.		990-308-90	Aztec	12383
T2A,T2B,T2C		Output Trans.		990-305-90	Aztec	12499