h.h. Scott

OPERATING MANUAL

250 40 WATT POWER AMPLIFIER

111 POWDER MILL ROAD - MAYNARD, MASSACHUSETTS

D-250-1

Date Purchased _____ Type _____ Serial No. _____

WARRANTY REGISTRATION

This precision-made H. H. Scott instrument is guaranteed to be free from defective components (except vacuum tubes) for a period of 90 days from date of purchase.

Purchaser _____

Street _____ City and Zone _____ State _____

Dealer From Whom Purchased _____

What Advertising Prompted Purchase _____

Other Factors Influencing Purchase _____

_____

Any Comments _____

What Make and Type of FM (or FM-AM) Tuner Do You Own, If Any? _____

_____

Guarantee Effective Only If Card Is Mailed Within One Week Of Purchase

D-Gen-3-1 **see instruction book for complete statement of guarantee**

H. H. Scott, Inc.
111 Powder Mill Road
Maynard, Mass.

Operating Manual for the 250 Power Amplifier

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OPERATING MANUAL - 250 LABORATORY POWER AMPLIFIER

DESCRIPTION

The Type 250 Laboratory Power Amplifier is an extremely compact precision power amplifier designed for high quality audio and laboratory application. The 250 is designed to operate with a wide variety of components.

TECHNICAL SPECIFICATIONS

Maximum Power Output (on music waveforms)	40 watts
Maximum Power Output (steady state)	35 watts
Total Harmonic Distortion (at maximum output)	0.5%
First Order Intermodulation Distortion (CCIF at maximum output)	0.1%
Sensitivity for Rated Output	0.5 volts ± 1 db
Noise and Hum	85 db below rated output
Frequency Response (±1 db at Rated Power)	20 cps to 20,000 cps
Input Impedance, 1.5 volt terminal	0.5 megohms shunted by 20 mmfd
Input Impedance, 0.5 volt terminal	0.1 megohms shunted by 8 mmfd
Power Requirements	105-125 volts, 50-60 cycles
Power Consumption no output (at 117 volts 60 cps)	140 watts
Power Consumption rated output (at 117 volts 60 cps)	190 watts

NOTE: THIS IS A TRANSFORMER OPERATED DEVICE. DO NOT ATTEMPT TO PLUG THIS EQUIPMENT INTO A DIRECT CURRENT OUTLET.

UNPACKING AND WARRANTY REGISTRATION

Remove the amplifier from its carton carefully and inspect for shipping damage. If there is any damage to the amplifier, report it to the dealer from which it was purchased. If your dealer shipped it to you, the damage must be reported to the shipping company immediately. Failure to do this may void any claim against the shipping company. It is also necessary to send your warranty registration to the H. H. Scott Company so that your amplifier may be repaired under the warranty if that should be necessary.

INSTALLATION

This instrument requires adequate ventilation to dissipate the heat generated by it. Never enclose the amplifier completely. Should the amplifier be placed inside a cabinet, a clearance of at least two inches from any vertical surface and a clearance of four inches from the top of the cabinet must be provided to permit the hot air to escape. A port at the bottom is also necessary to permit the intake of cool air. If the cabinet is open at the back, allow a one inch clearance from the wall for proper motion of cooling air.

NOTE: FAILURE TO PROVIDE PROPER VENTILATION WILL MATERIALLY REDUCE THE LIFE OF THIS EQUIPMENT.

ELECTRICAL CONNECTIONS

1. Loudspeaker

The speaker is connected to the terminals at the right of the amplifier marked "Nominal Speaker Impedance". To determine which terminals to use, obtain the value of your speaker's impedance from its manufacturer or your dealer. This value is expressed in ohms. Select the proper terminal to use from chart below. If you intend to use more than one speaker, consult your dealer or the speaker manufacturer for proper instructions.

Speaker Impedance	Use Terminals
2 to 5 ohms	0 and 4
6 to 12 ohms	0 and 8
13 to 24 ohms	0 and 16

WARNING - DO NOT GROUND THE ZERO TAP OF THE SPEAKER TERMINALS TO THE AMPLIFIER CHASSIS OR TO ANY GROUND. Grounding of the tap will result in a large loss of power and a distorted signal. If the grounding is continued for any length of time when the amplifier is operating, the amplifier may be damaged. If grounding is necessary, use only the "G" terminal to connect the amplifier to ground.

2. Input Connections

Two input terminals are provided. The input labeled "121, 1.5 volts" is a high level input for high gain preamplifiers which are capable of more than 1.5 volts output undistorted such as the H. H. Scott 121-C or 130, so that the LEVEL control adjustment is not too sensitive for these circuits. The 0.5 volt input is provided for lower gain preamplifiers or for those whose output undistorted is less than 1.5 volts. The LEVEL control operates with both these terminals. However, only one input should be used at one time.

3. Power Connections

Connect the power cord to any source of 110 to 120 volt, 50 or 60 cycle, alternating current. An unfused accessory outlet is provided next to the ON-OFF switch. This outlet may be used to connect your record player or tuner so that it will derive its power from the ON-OFF switch. In a similar manner, the 250 may be connected to the auxiliary outlets of other equipment such as those provided on the H. H. Scott 121-C or 130 Stereophonic Preamplifier so that one switch may control the whole power requirements of several components. With this type of connection the amplifier should be left on.

In other countries where other voltages and frequencies are used, we suggest you consult our Service Department for proper information concerning the use of our equipment with these differing conditions.

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SETTING THE CONTROLS

1. Level Control

It is essential that this control be properly set for operation of Loudness Controls on those preamplifiers that have them as well as the DYNAURAL NOISE SUPPRESSOR.

A. Choose a recording of high quality which has a good distribution of treble and bass sounds and is of fairly constant medium-loud volume. Orchestral music is best suited for this adjustment, and listening is best done with the loudspeaker and the listener in their normal placement.

B. Set the record compensator controls for proper equalization of the record selected, turn the treble and bass controls to flat response. (In the 121 series of preamplifiers, turn the DYNAURAL NOISE SUPPRESSOR off.)

C. Set the Volume-Loudness Switch to Volume and turn up both Level and Loudness controls so that the music is quite loud. Balance the speaker system treble-bass level controls if provided. This should be done on high quality multiple speaker systems before proceeding. If speaker system has no balance controls, disregard this paragraph.

D. Adjust the preamplifier level control to that position recommended by its manufacturer for use with your phonograph cartridge. If you do not know this position, request it of the preamplifier manufacturer. Turn the loudness-volume switch to loudness and set the LEVEL control to mid-scale.

E. Set the loudness control to 7 on the 120 and 121 series preamplifiers and note the tonal balance of the music, that is to say its treble-bass relationships.

F. Set the loudness control to 3 and note again the tonal balance. If there is no change in the balance and only a change in the volume, the LEVEL control is properly set. If there is too much bass the LEVEL control is set too high; and if there is a lack of bass, the LEVEL control is set too low.

G. Repeat steps D and E after resetting the LEVEL control until there is no change in tonal balance.

H. Repeat this operation for the second channel of a stereophonic system. If the loudspeakers used in the system differ, the settings of the level controls of both power amplifiers may not be identical. The difference is due to a variation of the efficiency in both loudspeaker systems and is not to be construed as a malfunction of the amplifiers.

2. Hum Adjustment

This control is set to minimize hum output and has been adjusted at the factory for the tubes supplied with the amplifier. When tubes are replaced or aging occurs, readjustment may be required if noticeable hum develops. Refer to the section on

maintenance if hum appears. Turn this control carefully until hum is minimized. For the laboratory, use the following procedure:

A. Turn the level control to zero and put a resistive load across the output terminals. Connect an oscilloscope in parallel with the load.

B. Adjust the hum control for minimum output on the oscilloscope.

3. Bias Voltage, DC Balance and AC Balance Controls

These controls are provided for laboratory adjustment of the amplifier. In normal use, adjustment of these controls is not necessary, and their effect on home music systems is not noticeable. They are factory set for proper operation of the amplifier.

To set these controls, proceed as follows:

A. Remove shorting links on the three point D.C. Balance terminal strip at the right of the chassis.

B. With DC Voltmeter across lugs 1 and 3 adjust DC Balance Potentiometer to read "0" volts.

C. With DC Voltmeter across lugs 1 and 2 adjust Bias Adjust Potentiometer voltage to read 1.5 volts. Check terminals 2 and 3 to read same voltage. Terminals 1 and 3 are positive with respect to 2.

D. Replace shorting links.

E. Balance Control Adjustment.

All H. H. Scott Laboratory Power Amplifiers and Complete Amplifiers contain a dynamic self-balancing phase inverter stage which automatically balances the output of the amplifier beyond the normal limits of audible detection. This is accomplished by the feedback developed in the plate to plate voltage divider from which the second grid of the phase inverter obtains its signal. For this reason, the adjustment of the balance control is not absolutely necessary for good performance, although such adjustment may improve performance at high signal levels.

If the amplifier is to be used for fixed frequency or other laboratory applications, however, readjustment of the balance control may be desirable for optimum results. The control is factory set for the original output tubes, but the characteristics of these tubes may change with use.

1. Equipment Necessary

A. Low distortion audio oscillator, sine wave. Note: Many oscillator kits are apt to have high distortion.

B. Resistive load of proper value (for instance, 16 ohms for the 16 ohm tap) and wattage. Note: Many commercial wirewound resistors have considerable residual inductance; care must be taken to avoid these.

C. Oscilloscope. Note: Many oscilloscope kits have nonlinear sweep circuits and are apt to give distorted displays.

2. Procedure

a. Connect audio oscillator to proper input jack. On the complete amplifiers a high level input is normally used. There are two reasons for this: First, the nonlinear characteristics of the recording equalizer circuits are avoided; second, better distortion measurements can be made with the lower noise level available. Connect audio oscillator to the 0.5 volt input in the power amplifier.

b. Adjust all tone controls to their FLAT position; all rumble and scratch filters, including the dynaural, OFF; and the loudness volume control to VOLUME.

c. Turn the loudness control on complete amplifiers or the level control on power amplifiers to their maximum position.

d. Turn dynamic power monitor (where included) to OFF, and set damping control (where provided) to normal operating position.

e. Connect resistive load to proper output terminals, and connect the oscilloscope input in parallel. Note: Make sure the oscilloscope ground is properly oriented. (See Figure 2.)

f. Turn all equipment on.

g. Set audio oscillator to frequency desired if the amplifier is to be used at a fixed frequency. Otherwise, set the audio oscillator to 1000 CPS.

h. Increase the output of the oscillator until the sine-wave just begins to clip. (See Figure 3.) With screwdriver, adjust balance control until clipping is symmetrical; that is when equal amounts are clipped off the top and bottom of the wave peaks. It may be necessary to increase the output slightly as the balance control is adjusted. Note: Do not overdrive the amplifier so that it clips most of the sine-wave; this adjustment should be done with the barest amount of clipping.

i. This completes the adjustment. If the clipping cannot be made symmetrical, check the output tubes in a transconductance tube tester. They may be seriously unmatched.

MAINTENANCE AND SERVICE

All electrical equipment requires maintenance. The 250 was designed to operate trouble-free for many years. Certain checks done at the end of every year, however, will help to keep the amplifier in good condition.

1. Check the tubes, particularly those in the power output stage and the rectifier every year. If the tubes are outside the manufacturer's ratings or show gas, they should be replaced. Gassy tubes may damage other components of the circuit.

2. If at any time the hum or noise increases noticeably, check the power tubes. This symptom is often an indication of gassy tubes. If both tubes check properly and the amplifier is without hum when the preamplifier is disconnected, then check the preamplifier. If the hum continues, have a service man check the amplifier.

WARNING - DO NOT USE TUBES OTHER THAN THOSE SPECIFIED FOR THIS AMPLIFIER. THE INTRODUCTION OF ANY UNSPECIFIED PART VOIDS YOUR WARRANTY.

We do not recommend tube substitution in any of our amplifiers or tuners except in rare cases. Our instruments are tailored to the vacuum tubes used, and the substitution of so-called equivalent types will not improve operation and may frequently impair it. Military tube types with similar characteristics as the commercial types have the disadvantage of increased cost without significant improvement in any quality except, perhaps, reliability. Such matters as vibration and shock resistance are not essential to sound equipment except in the low level voltage amplifier stages. The tubes we employ for these stages have been selected with these characteristics in mind and equal or exceed the performance of military preferred tube types.

We have seen advertisements that state that a particular power tube may be substituted for a type we use in our amplifiers. We have found upon testing that such matters as control grid to screen grid amplification factor, the plate dissipation, or the cathode emission capabilities, not to mention other characteristics, make these claims inaccurate. Modification of circuits to make use of these tubes is usually expensive and not effective in lowering distortion, raising power, or increasing efficiency to a significant degree.

3. If the amplifier blows fuses frequently, have a service man check the amplifier. If no trouble is apparent, check the line voltage. Should the line voltage rise above 125 volts, drop the line voltage by means of an auto transformer or place a voltage regulation transformer between the amplifier and the line.

WARNING - DO NOT USE FUSE SIZES OTHER THAN THE FUSE SIZE SPECIFIED. TO DO OTHERWISE MAY RESULT IN PERMANENT AND COSTLY DAMAGE TO THE AMPLIFIER IF THE FUSE IS TOO LARGE AND WILL REQUIRE FREQUENT REPLACEMENT OF FUSES IF THE FUSE SIZE IS TOO SMALL.

4. WHEN THE AMPLIFIER IS BEING CHECKED YEARLY, clean the tubes of dust so that they may radiate their heat more effectively.

APPENDIX

1. PHASING THE LOUDSPEAKERS IN STEREOPHONIC SYSTEMS.

Proper phasing of loudspeakers is necessary in stereophonic systems in order to prevent cancellation of low frequency sounds which occur when the loudspeakers are working in opposition with each other. Out of phase loudspeakers may be recognized by an attenuation of the very lowest notes and a peculiar feeling that the sound is being produced by two discrete sources rather than the expected stereophonic effect. Use the following procedure to phase the loudspeakers.

A. Place both loudspeakers face to face a few inches apart.

B. If the stereophonic preamplifier used with the system has a phase reversal switch, place this switch in the normal position.

C. Put a monaural signal through both loudspeakers and listen for a balanced sound. If the bass frequencies are severely attenuated, reverse one of the loudspeaker connections to its power amplifier. The bass should then sound full and natural.

D. Mark the connections for future reference, and return the loudspeakers to their proper normal listening position.

An alternate method of speaker phase adjustment is described in the Operation Manual for the Model 130 Stereophonic Preamplifier. This method must be used if the loudspeakers are too cumbersome to move about the room.

WARRANTY

We are interested in your instrument. Equipment is no better than the manufacturer standing behind it. If you have difficulty, we would appreciate the opportunity to help you obtain the sort of superior performance which you have every right to expect. If trouble ever develops with your unit, please do not hesitate to ask our advice or assistance. Please write to: Service Department, Hermon Hosmer Scott, Inc., 111 Powder Mill Road, Maynard, Mass.

This equipment is warranted to be free from defective material and workmanship and repair or replacement will be made of any part which under normal installation, use and service, discloses defect, provided the unit is delivered by the owner to the manufacturer or through the authorized dealer from whom purchased, intact, for examination, with all transportation charges prepaid to the factory within 90 days, and provided that such examination discloses in the manufacturer's judgment that it is thus defective.

This warranty does not extend to any radio products which have been subjected to misuse, neglect, accident, improper installation, or to use in violation of instructions furnished by the manufacturer, nor extend to units which have been repaired or altered outside of the factory except by authorized service agencies, nor to cases where the serial number had been removed, defaced or changed. The guarantee does not extend to fuses, batteries, tubes, phonograph styli and piezo-electric crystals.

In case of older instruments, no longer within the guarantee period, nominal service charges will be made at our actual cost for labor and at distributors net prices for parts.

Registering Guarantee: The guarantee tag attached to the instrument must be returned to us within one week of purchase in order for the guarantee to become effective.

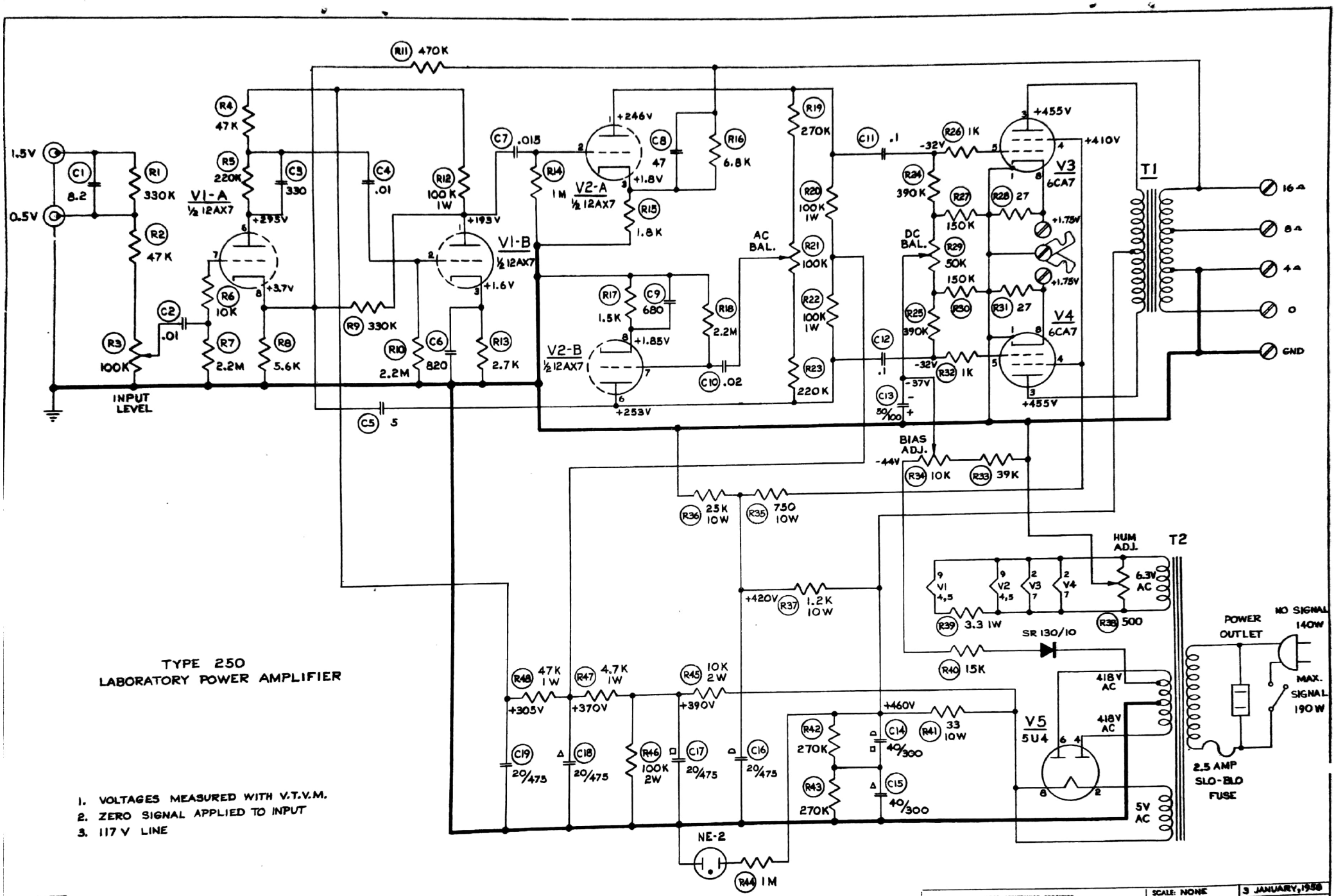
If Trouble Develops: Experience has shown that the procedure outlined below can save you needless shipping expense and/or unnecessary delay in service of your instrument. Please co-operate with us so that we may give you better service. Follow the instructions below. Unless this is done, THE GUARANTEE WILL BE VOID.

BEFORE RETURNING THE UNIT notify us, giving type and serial number of your instrument. Completely describe the defective operation. Describe the effects each operating control has upon the symptoms of trouble. Include details on electrical connections to associated equipment and list such equipment.

Upon receiving this information we will send you service information if the trouble may be simple, such as a bad vacuum tube, or if the trouble seems to be in connections or associated equipment. If the trouble requires factory servicing, we shall forward to you the name and address of one of our authorized service stations, if one is located near you, or we will instruct you to send your instrument to the factory.

When you receive shipping information, please follow the instructions below.

HOW TO SHIP: CAUTION — Take particular care to cushion and pack your instrument well, or serious damage may occur in shipment. Send the instrument to us by fully insured, prepaid railway express. DO NOT SHIP VIA PARCEL POST unless so instructed by us. Your instrument will receive prompt and careful attention in our service laboratory, and it will be returned by express collect.



HIGHEST R48 C19

REVISIONS

UNLESS OTHERWISE SPECIFIED
ALL DIMENSIONS ARE IN INCHES
TOLERANCE ON FRACTIONAL DIMENSIONS = 1/64
TOLERANCE ON DECIMAL DIMENSIONS = .005
TOLERANCE ON ANGULAR DIMENSIONS = ½°
BREAK SHARP CORNERS.

SCALE: NONE	3 JANUARY, 1958
250 CIRCUIT DIAGRAM	
HERMON HOSMER SCOTT, INC. CAMBRIDGE, MASS., U.S.A.	
DR: DYSZCZYK	ENG:
CH:	PROD:
DWG. NO. C-250-C1	SUB 0