WCSD

RADIO KVLV

COLLINS

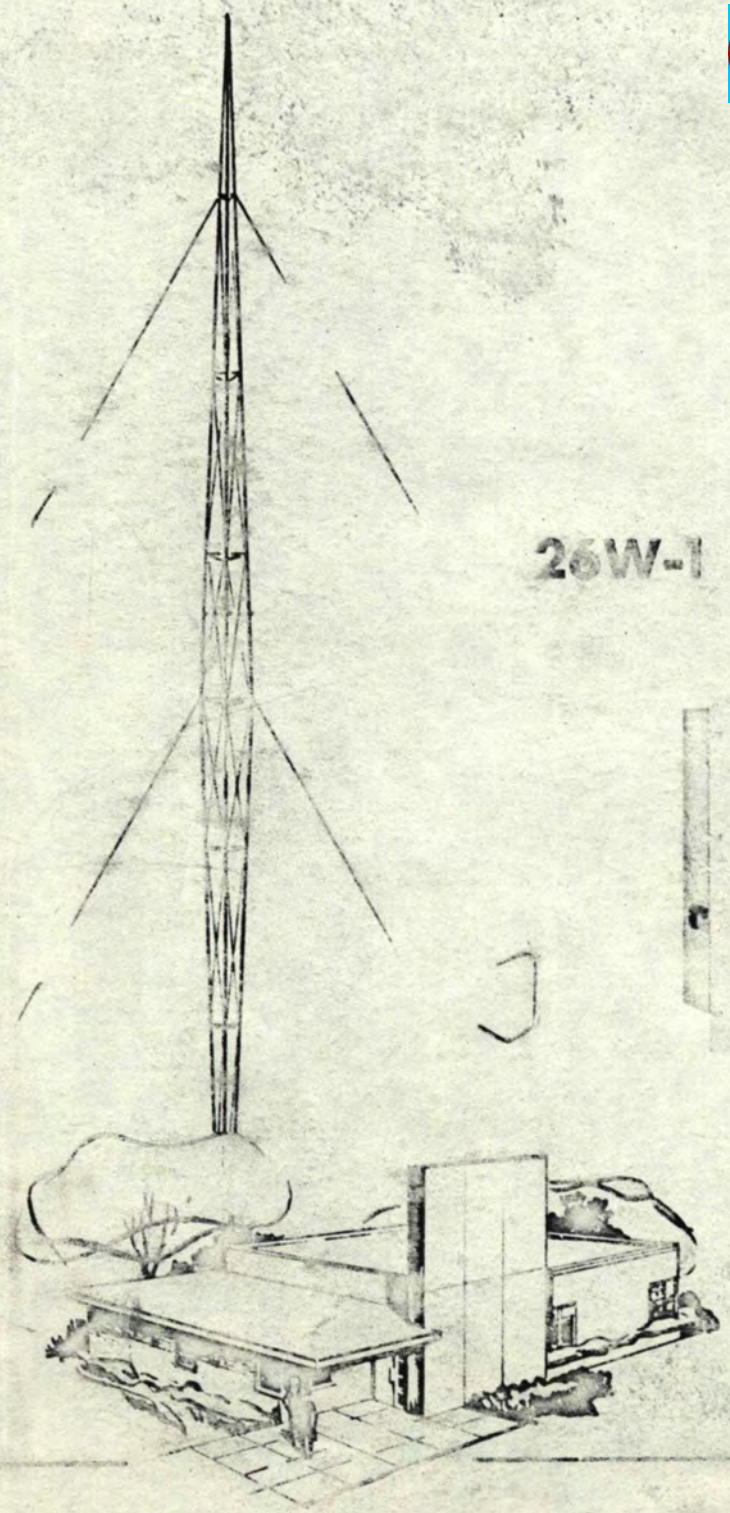
MODEL 26-W

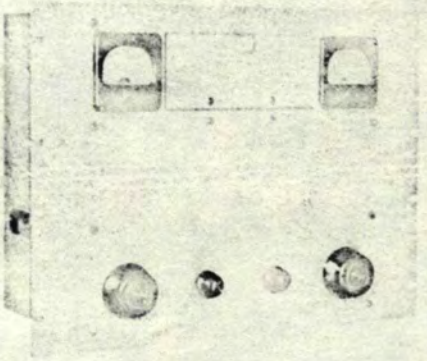
LIMITING AMPLIFIER

Collins

INSTRUCTION BOOK

26W-1 LIMITER AMPLIFIER





COLLINS RADIO COMPANY

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Collins agrees to repair or replace, without charge, any equipment, parts, or accessories which are defective as to design, workmanship or material, and which are returned to Collins at its factory, transportation prepaid, provided

(a) Notice of the claimed defect is given Collins within one (1) year from date of delivery and goods are returned in accordance with Collins' instructions.

(b) Equipment, accessories, tubes, and batteries not manufactured by Collins or from Collins' designs are subject to only such adjustments as Collins may obtain from the supplier thereof.

(c) No equipment or accessory shall be deemed to be defective if, due to exposure or excessive moisture in the atmosphere or otherwise after delivery, it shall fail to operate in a normal or proper manner.

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The guarantee of these paragraphs is void if equipment is altered or repaired by others than Collins or its authorized service center.

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(E) Nature of trouble
(F) Cause of trouble if known
(G) Part number (9 or 10 digit number) and name of part thought to be causing trouble
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(B) Collins' part number (9 or 10 digit number) and description
(C) Item or symbol number obtained from parts list or schematic
(D) Collins' type number, name, and serial number of principal equipment
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☆ **Your Name and Address**

☆ **The Type Number and Serial Number of your equipment**

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Date Purchased ..... Serial Number .....

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Addenda

26W-1 Limiting Amplifier Book
(520 9291 00)

DEC 19 1957

This addenda describes a recent tube type change along with several resistor changes. It also adds some Installation notes and an adjustment procedure. The adjustment procedure supersedes a procedure given in the instruction book.

In all equipments serial number 492 and higher, the tube V102 has been changed to a type 5814A. Several resistor changes have been made to accomodate this new tube. All parts lists changes and corrections are herewith shown:

Symbol	Function	Description	Part Number
M101	Current and Voltage	METER: 0-5; 0-50; 0-500; 50 scale divisions; 0-1 ma dc; 2% accuracy ±1%; 3" square case.	458 0053 00
R119	Limiter Bridge	RESISTOR: Fixed Composition; 6800 ohm ±10%; 2 watts.	745 5687 00
R120	Limiter Bridge	RESISTOR: Same as ref R119.	
R144	Limiter Time Constant	Deleted.	
R145	Limiter Time Constant	RESISTOR: Fixed Composition; 3.3 meg ±10%; 1 watt.	745 3499 00
R146	Limiter Time Constant	RESISTOR: Fixed Composition; 5.6 meg ±10%; 1 watt.	745 3510 00
R155	Transient Voltage Divider	RESISTOR: Fixed Composition; 4700 ohm ±10%; 1 watt.	745 3380 00
V102	Limiter	TUBE: Type 5814A; twin triode.	253 0013 00
X102	Socket for V102	SOCKET ASSEMBLY: Miniature nine pin socket and riveted plate assembly.	541 8172 002

The above tube change affects figures 2-3, 2-6, and 5-1. There is a new, up-to-date main schematic, figure 7-3, attached to this addenda. The tables on pages 2 and 20 should be corrected to show the above tube change.

Most of the following material is of supplemental nature, however, the BALANCING PROCEDURE shown here should be used in place of the one given in the instruction book on page 12.

1. INSTALLATION NOTES:

Ascertain the level of the audio signal being delivered to the input of the 26W-1 with the studio equipment in normal operation. The Collins 212A and 212B Consoles, as delivered, supply +16VU to the line when the console VU meter reads "Zero VU". The Collins 212E and 212F Consoles, as delivered, supply +8 VU to the line when the console VU meter reads "Zero VU". Normal studio program operation would be with the console VU meter peaking at "Zero VU" or 100 on the percent scale.

If the 26W-1, as delivered, is connected directly to the line from the console, as is sometimes common in stations where the studio and limiter are in the same building, it will result in lack of good control range on the input control of the 26W-1. With such a set-up the input control of the 26W-1 will have to be operated on the first step or nearly turned off to avoid unduly high limiting as evidenced by the limiting meter acting violently as the 26W-1 input gain control is just barely "cracked".

The above does not become a problem where the console is located in a studio remote from the 26W-1, where the input to the telephone lines must be held to "Zero to +8 VU".

The obvious need in the "one building" operation is to lower the console output level by adding an audio attenuating pad between the console and 26W-1 Limiter. Refer to the Type 26W-1 complete schematic, figure 7-3 and to figure 3-1, and note that a 20 db pad is built in but not connected as delivered. This can be connected to supply the needed adjustment of level. As an alternate, a small pad of 2 watt resistors can be inserted in the output lines of the console at the point where they connect to the main console terminal board. The 20DB pad will be required in most installations.

2. ROUTINE OPERATION:

The following procedure is based on these assumptions:

a. The limiter has just been delivered from the factory and installed per Section III of the instruction book.

b. The limiter has been previously installed and balanced per balancing procedure, as explained later in paragraph 3. of this addenda.

Start out by turning both OUTPUT and INPUT LEVEL controls of the limiter off (extreme counterclockwise positions). Set the METER SELECTOR switch on position "A" and the VOLUME UNITS switch on 10. Set the OPERATE TIME switch at 1.0 milliseconds and the "RELEASE TIME" switch at 2.5 seconds.

Feed program material or music from the console at the normal level that the control room operators will be using. This would be with the console VU meter peaking at 100 percent. Taking into consideration the previous installation items covered, the signal at the input to the 26W-1 will be peaking somewhere between -5 and +8 VU.

Gradually increase the 26W-1 INPUT LEVEL control until the 100 percent peaks on the console output meter result in 5 to 6 db of limiting, as indicated on left hand meter, (approximately 1/5 scale).

Leave the OUTPUT LEVEL of the 26W-1 turned off. Turn on the transmitter and adjust for normal RF output. Adjust the modulation monitor carrier input controls in the normal manner, being sure to adjust the tuning control accurately to a peak before carefully adjusting the straight monitor gain control for the index setting.

Set the "flasher control" dial on the monitor for 95 percent.

Gradually increase the OUTPUT LEVEL control of the 26W-1 until the modulation monitor "flasher" just lights with program peaks which result in the 5 to 6 db limiting peaks previously mentioned.

Adjust the VOLUME UNITS switch to the multiplier setting which results in comparable action of the 26W-1 output VU meter and the console VU meter at audio signals below the threshold of the limiter. This output meter operation can be adjusted otherwise to suit the individual likes of the station engineer.

The OPERATE TIME and RELEASE TIME controls can be experimented with as the engineer gets familiar with the equipment. Some engineers find by experiment that they like different settings, for their average type of program, than other engineers.

3. BALANCING PROCEDURE: (Use this procedure in place of the one given in paragraph d.(1) of page 12.)

The first thing that is necessary is to be sure that the static cathode currents (no signal) of the 6F6 or 1621 output tubes are equal within 2 ma. (two small meter divisions) as measured with the "METER SELECTOR" switch on positions "D" and "F" with the "TEST-NORMAL" switch in the "NORMAL" position. The engineer should go through his stock of output tubes and pair off tubes which meet this degree of uniformity for future use.

Before going further with the balancing procedure be sure the transmitter is turned off and that the output of the 26W-1 is terminated with the 600 ohm pad of the transmitter audio input circuit. In lieu of this, the line to the transmitter can be disconnected and a 600 ohm 10 watt resistor used as a terminating load for the 26W-1.

3.1. ADJUSTMENT OF BALANCE CONTROL (R-154)

If an AC voltage is applied to the grids of the limiter stage (V-102) the output from the amplifier should be zero because the inphase voltage on the grids will cancel out if the system is balanced. In actual practice the output will

drop as the balanced condition is reached, but will not fall to zero. A balancing procedure follows:

a. Turn the INPUT attenuator to OFF, and the OUTPUT attenuator to "0". Set the METER switch to "F", and the VOLUME UNITS switch to 4.

b. Apply an AC voltage to the grids of V-102. This can be easily done by jumpering one side of the 6.3 vac filament (V-104 pin #7) to the hot side of C-109. This applies 3.15 vac 60 cps to the grids of V-102.

c. Adjust R-154 for minimum output as shown on M-102. While adjusting R-154, turn up the OUTPUT attenuator so a sharp indication of the dip may be seen for accurate adjustment. If no dip, or one of 10 db or less is encountered, a new tube should be substituted for V-102.

4. CORRECTIONS TO INSTRUCTION BOOK.

4.1. Change Reference Data on page 2 to read as follows:

Under d. INPUT LEVEL: Change to read: -30 to +20 dbm.

Under f. OUTPUT LEVEL: Change to read: -4 to +28 dbm.

Under k. HUM AND NOISE: Change to read: 63 db below +15 dbm output level.

INSTRUCTION BOOK

for

TYPE 26W LIMITER AMPLIFIER

COLLINS RADIO COMPANY
Cedar Rapids, Iowa

520 9291 00
1 January 1953

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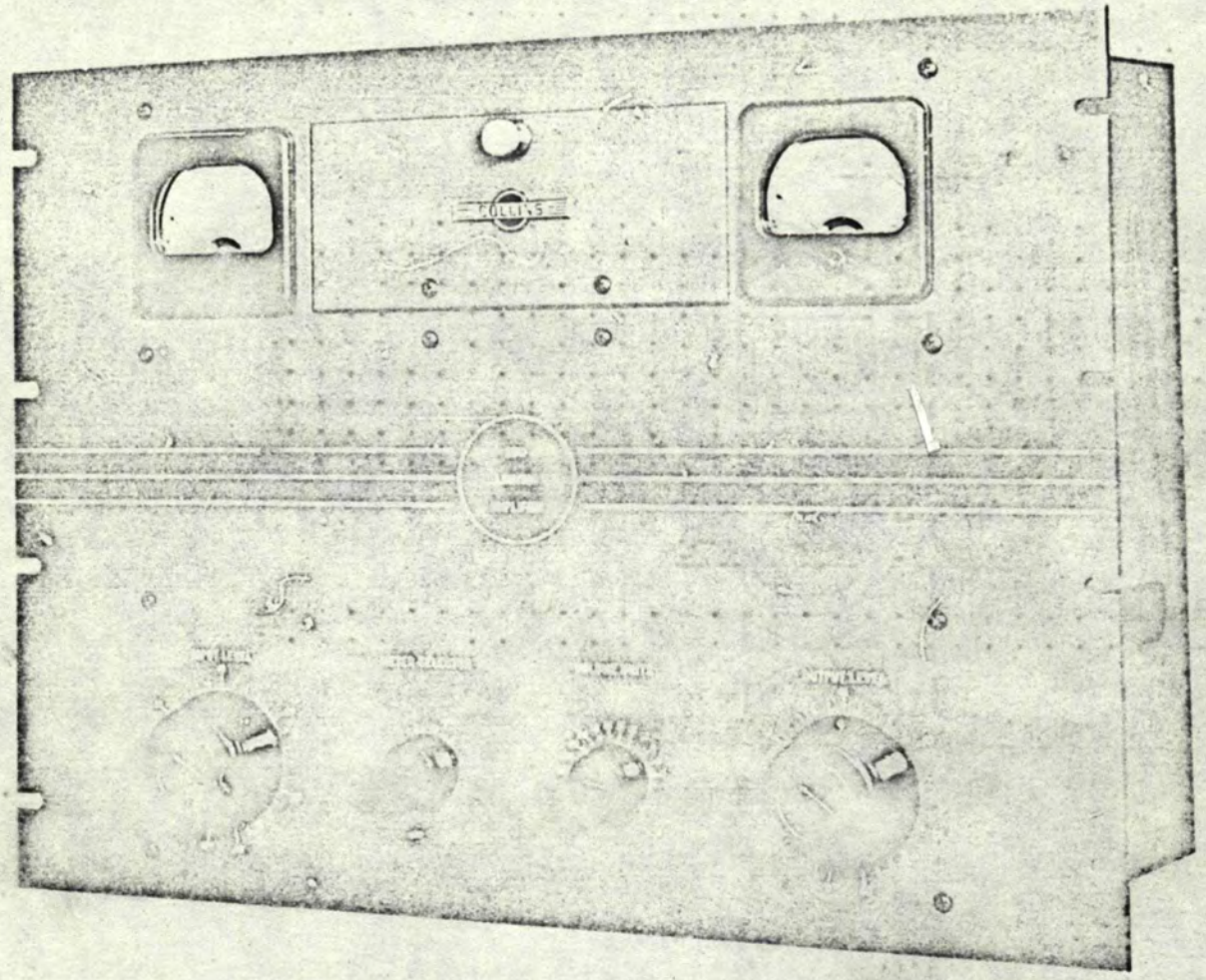


Figure 1-1. Type 26 W Limiting Amplifier

SECTION I

GENERAL DESCRIPTION

1. GENERAL.

a. This instruction book is to be used as a guide to the installation, adjustment, operation and maintenance of the Collins Type 26W Peak Limiting Amplifier. Refer to Figure 1-1.

b. The Collins Type 26W limiting amplifier is designed for use in any AM or FM installation where it is desired to control the amplitude of audio frequency peaks. In transmitter applications it will prevent overmodulation by limiting loud audio passages. This limiting action permits a higher average modulation level resulting in an increase in the transmission range or service area of the signal and an increase in the over-all efficiency of the transmitter. When used in conjunction with recording equipment or public address systems it prevents overloading and by raising the average audio level improves the signal to noise ratio.

c. EQUIPMENT DESCRIPTION.

(1) The Type 26 W is constructed to mount in any standard 19" relay rack or cabinet such as the Collins Type 19G-2 or 19G-3. A vertical mounting space of 14" is required. The equipment is assembled on a vertical chassis in such a manner that all wiring and circuit components are accessible by removing a dust cover at the rear of the chassis. A hinged door in the front panel provides access to the tubes. A chassis is open at top and bottom assuring ventilation of tubes and transformers.

(2) The Collins 26W is a general purpose program amplifier including means for preventing the peak output signal from exceeding a certain predetermined level. Metering facilities provide a continuous visual indication of operating conditions. A self contained power supply is included in the equipment.

2. REFERENCE DATA.

a. The following apparatus is included with each standard shipment.

Collins Type No.	Description	Overall Dimensions	Weight
26W	Limiting amplifier	14" x 19" x 9"	45 lbs.
520 9291 00	Instruction book		

b. FREQUENCY RESPONSE: 30-15,000 cps ±0.5 db.

c. INPUT IMPEDANCE: 200 ohms, 600 ohms or bridging input.

d. INPUT LEVEL: -30 to +20 VU.

e. OUTPUT IMPEDANCE: 600 ohms balanced or unbalanced to ground.

f. OUTPUT LEVEL: -4 to +26 VU.

g. COMPRESSION RATIO: 20/1 in db above verge of compression.

h. OPERATE TIME: adjustable 0.1, 0.3, 1.0, 3.0, 10.0 milliseconds.

i. RELEASE TIME (for 90% gain recovery): adjustable, 0.1, 0.5, 1.0, 2.5 or 5.0 seconds.

j. DISTORTION: Harmonic distortion below 1% rms at any frequency and input and output level within the above ranges, and with any degree of compression below 15 db.

k. HUM AND NOISE: 72 db below output level for all settings of input and output levels.

l. POWER SOURCE: 105-125 volts a-c, 50/60 cps, single phase.

3. VACUUM TUBE COMPLEMENT. - The vacuum tubes employed in the 26W Equipment are listed below.

Quantity	Tube Type	Function
1	6N7	Input Amplifier
1	6N7GT/G	Limiter
1	6H6GT/G	Limiter Control
1	6N7	Interstage Amplifier
2	1261 (6F6)	Output Amplifier
1	5V4G	Rectifier

SECTION II

THEORY OF OPERATION

1. MECHANICAL THEORY.

The type 26W Limiter Amplifier is constructed on a sturdy aluminum panel notched to fit any standard relay rack or cabinet. It requires fourteen inches of vertical mounting space. The components are mounted on a vertical chassis using an inside-out type of construction. All wiring and components are accessible upon removal of a rear dust cover. The dust cover is provided with snap fasteners and requires no tools for removal.

2. ELECTRICAL THEORY.

a. GENERAL. - The signal channel of the 26W is composed of an input voltage amplifier, a limiter circuit, an interstage voltage amplifier and a push-pull Class A output amplifier stage. Refer to Figure 2-1.

b. INPUT AMPLIFIER. - The input line is transformer coupled by T101 to a Type 6N7 tube V101 employed as a voltage amplifier. Bias is obtained by means of the voltage drop across a resistor R113 in the cathode circuit. Refer to Figure 2-2.

c. LIMITER CIRCUIT. - The limiter circuit employs a Type 6N7GT/G tube, V102, and a Type 6H6GT/G tube, V106. The Type 6N7GT/G tube is connected in a double resistance bridge circuit with the triode sections acting as the variable legs of the bridges. The double bridge circuit provides proper termination for the balanced output of the input amplifier. One bridge circuit consists of resistors, R118, R119, R123 and one triode section of V102. The second bridge consists of resistors R120, R121, R124 and the remaining triode section of V102. When the values of R123 x R119 = R118 x (the plate resistance of the vacuum tube leg of the bridge) and the values of R120 x R124 = R121 x (the plate resistance of the vacuum leg of the bridge), the loss across the bridge will be very high and only a very small portion of the output voltage of the input amplifier will be permitted to reach the primary windings of the coupling transformer T102. If, however, the resistance of one leg of the bridge is very high compared to the other three legs, the bridge will be unbalanced and the loss in the circuit will be small. The limiter control circuit employs a 6H6GT/G tube, V106, as a full wave rectifier connected in the primary circuit of T103. Voltage is applied to the plates of V106 through coupling condensers C107 and C108. As the audio level is increased, the voltage in the primary circuit of T103 increases, resulting in an increase of current flowing in the rectifier circuit. The current flowing through the rectifier, V106, develops a voltage across R152 which varies directly with the flow of current through the

rectifier and is opposite in polarity to the fixed bias that appears on the resistor. The sum of the fixed bias voltage and the developed voltage gives a voltage that is less negative than the fixed bias ordinarily applied to V102 and the result is a greater flow of current through the limiter tube. Increasing the flow of plate current through V102 results in a lower plate resistance and the resistance of the vacuum tube legs approaches the value that is necessary to balance the bridges. The loss across the bridge increases rapidly as balance is approached and as a result less voltage is permitted to reach the primary of the transformer T102.

The time required for the gain reduction to become effective upon application of a large input signal is determined by the charging rate of C109. A time interval of 0.1, 0.3, 1.0, 3.0, or 10 milliseconds may be selected by the operation of S101, which connects a resistance of the proper value, R138, R139, R140, or R141, in series with C109.

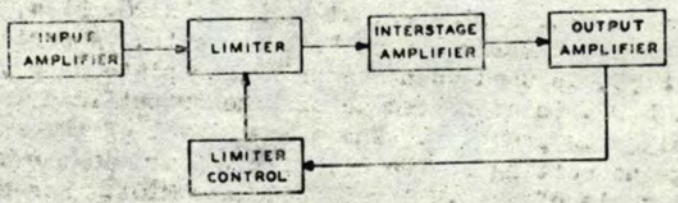


Figure 2-1. Functional Block Diagram

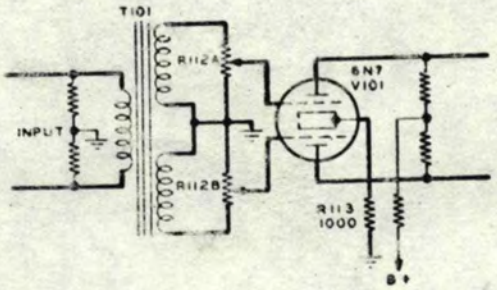


Figure 2-2. Input Amplifier Circuit

The time required for the gain to return to normal after the input signal level has been reduced is determined by the discharge time of C109 through resistors R142, and/or R143, R144, R145 and R146. The proper resistance value to give a release time delay of 0.1, 0.5, 1, 2.5 or 5 seconds may be selected by the operation of S102.

d. OUTPUT AMPLIFIER STAGES. - Refer to Figure 2-4. An interstage transformer, T102, couples the limiter to an interstage voltage amplifier using a 6N7 tube, V103. Bias for this stage is obtained by means of a voltage drop across resistor R125 in the cathode circuit.

The output amplifier stage uses two 1621 tubes, V104 and V105, connected as triodes in push-pull Class A operation. The input is resistance coupled through a transformer T103 to the output load terminals. Taps on the primary windings of T103 provide a source of voltage for the limiter control circuits.

e. METERING CIRCUITS. - The arrangement of the metering circuits provides a continuous visual indication of operating conditions. Refer to Figure 2-6. The meter, M101, may be connected to measure any one of the following by the operation of the metering selector switch S103, (A) amount of compression, (B) input amplifier cathode current, (C) interstage amplifier cathode current, (D) V104 cathode current, (E) V105 cathode current and (F) plate supply voltage. The resistors, R114, R122, R126, R134, R135, are used as meter shunts when measuring the cathode currents. A series multiplier resistor, R150, is used when measuring the plate supply voltage. A VU level indicator, M102, is connected across the output load terminals. A range multiplier, R137, is provided. The output level of the amplifier is obtained by adding the setting of the OUTPUT LEVEL attenuator algebraically to the reading of the scale of the VU level indicator M101. For example, if the OUTPUT LEVEL attenuator is set on 10 and the meter swings up to -3 on its scale, the output level is plus 7 VU.

f. POWER SUPPLY CIRCUITS. - The power supply is self contained. Refer to Figure 2-5. A 5V4G tube, V107, is employed as a full wave rectifier. The filter system consists of L101, L102, C110, C111, C112. A fixed bias voltage for the limiter circuit is obtained from the voltage drop across R149 and filtered by R151 and C113.

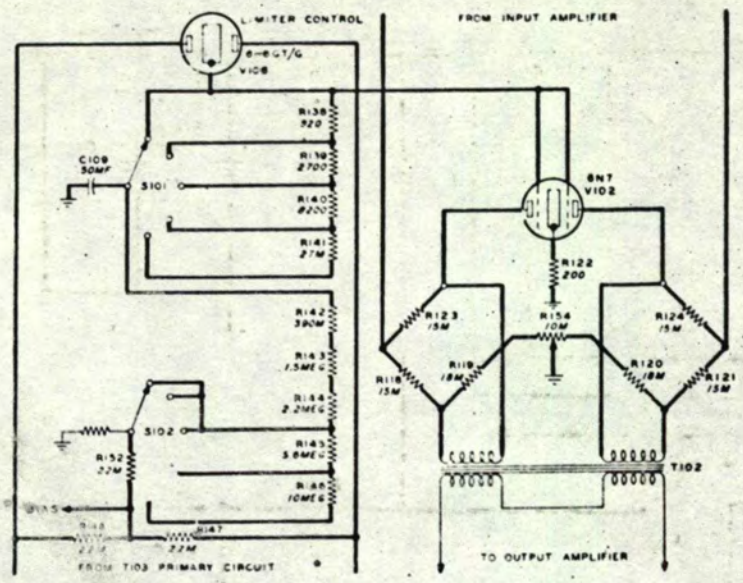


Figure 2-3.

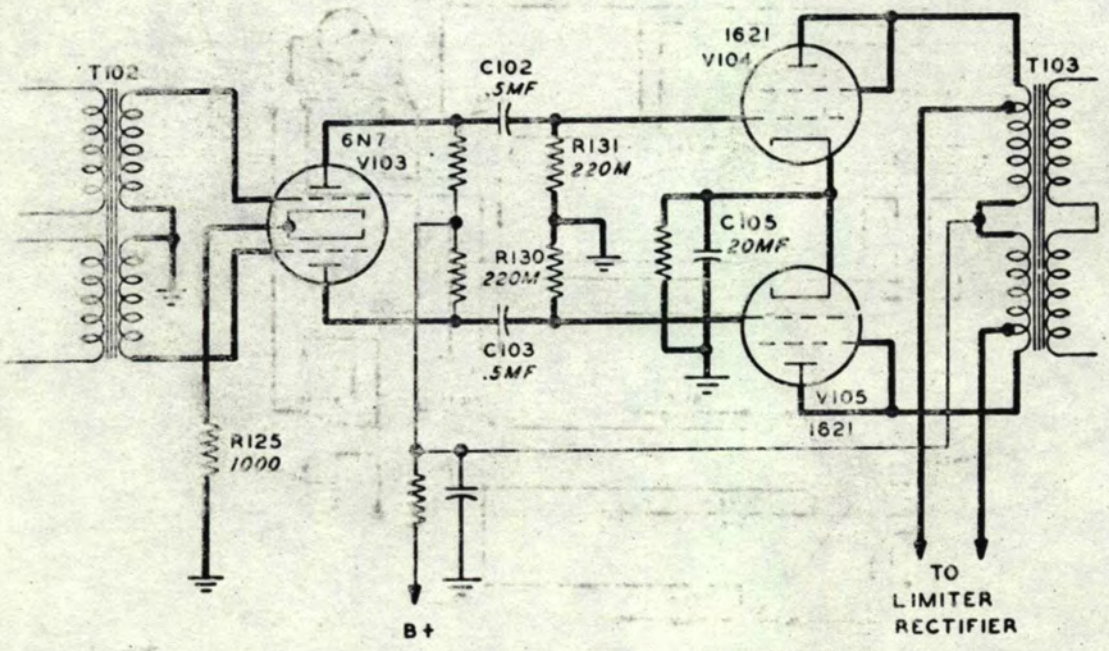


Figure 2-4. Output Amplifier Circuit

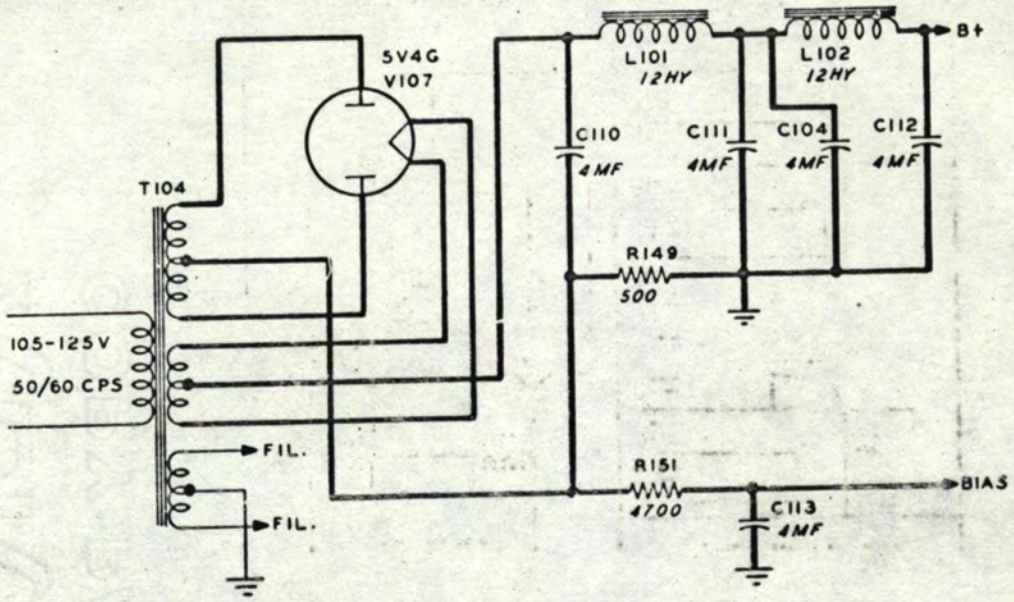


Figure 2-5. Power Supply Circuits

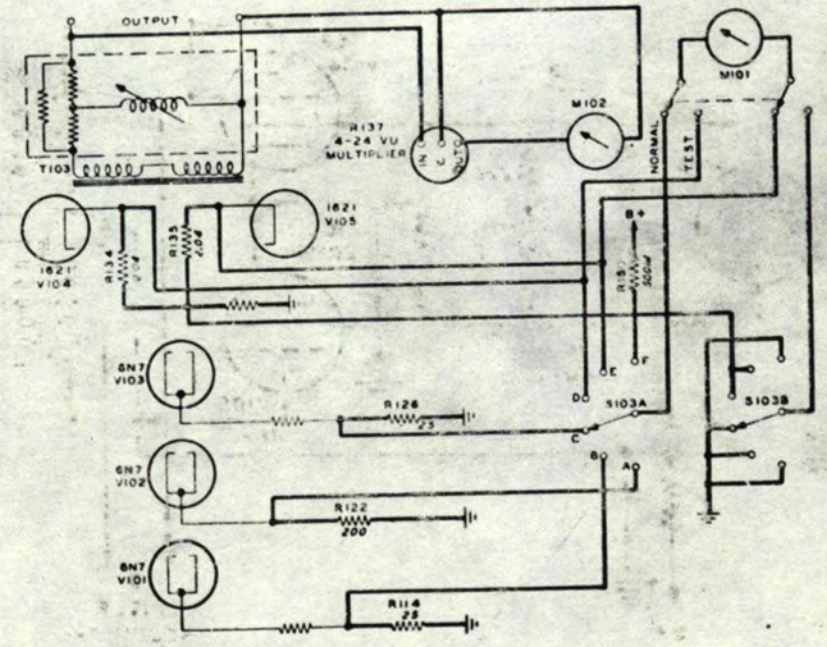


Figure 2-6. Metering Circuits

SECTION III

INSTALLATION AND INITIAL ADJUSTMENTS

1. INSTALLATION.

a. PRELIMINARY.

(1) UNPACKING. - All equipment supplied with the Type 26W unit is shipped in one crate. The crate is marked with arrows to indicate the upright position. Remove crate cover only. Use a nail puller to remove nails, a bar or hammer may damage the equipment within. Remove all packing material and lift unit out carefully. Inspect unit for loose screws or bolts. Be certain all controls, such as switches, dials, etc., work properly. All claims for damage should be filed promptly with the transportation company. If a claim for damage is to be filed, the original packing case and material must be preserved.

b. INSTALLATION PROCEDURE.

(1) MOUNTING. - Place the unit in position in a Collins Type 19G-3 cabinet or similar standard relay rack cabinet.

(a) Secure the unit with hexagon or round head screws and flat washers. The oval head screws and cupped washers often used, are not satisfactory.

(2) POWER AND AUDIO LINE CONNECTIONS. - The input, output and power source terminal strips are located at the rear lower edge of the chassis and are accessible upon removal of the dust cover.

(a) Remove rear dust cover. It is provided with snap fasteners and no tools are required.

(b) Connect the incoming line to the two terminals on the INPUT terminal strip. This line should be completely shielded to prevent hum pickup.

(c) Connect the outgoing line to the two terminals on the OUTPUT terminal strip.

(d) Connect the power leads to a 105 - 125 volt, 50/60 cycle, single phase power source. These leads should be at least equivalent to No. 16 B & S.

(e) An input attenuator strip located in the lower left-hand corner of the chassis provides three different input impedances. Refer to Figure 3-1. Interconnect the proper terminals to give the desired impedance.

(3) INSERTING TUBES. - Open the tube access door located in the front panel by turning the door button counterclockwise. Refer to the tube locating diagram Figure 5-1. Insert tubes in their proper sockets.

2. INITIAL ADJUSTMENTS.

a. GENERAL. - After power and audio line connections have been made, the equipment is ready for operational adjustments. The following paragraphs explain the functions of the controls and the adjustments necessary in placing the equipment in operating condition.

b. CONTROL FUNCTIONS. - The following operating controls are located on the front panel. Refer to Figure 4-1.

(1) INPUT LEVEL. - A step by step attenuator located in the grid circuit of V101. It is adjustable in 30 steps of 1 db each.

(2) METER SELECTOR. - Operation of the meter selector knob connects M101 in any one of the following circuits: (A) limiter cathode, (B) input amplifier cathode, (C) interstage amplifier cathode, (D) push-pull output amplifier cathode, (E) push-pull amplifier cathode, (F) plate voltage.

(3) VOLUME UNITS. - A 4-24 VU attenuator, R137, serves as a range multiplier for M102.

(4) OUTPUT LEVEL. - A step by step T network attenuator, R136, is located in the output circuit of the push-pull class A amplifier.

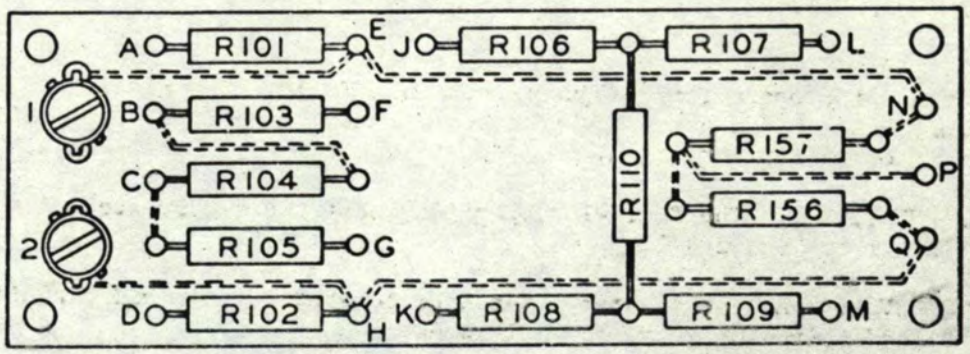
(5) The following adjustments are located at the rear of the chassis and are accessible upon removal of the dust cover. Refer to Figure 3-2 and Figure 3-3.

(a) LIMITER BALANCING. - This adjustment is a dual variable resistance located in the plate circuits of the limiter tube V102.

(b) OPERATE TIME. - The proper resistance - capacitance circuit is selected by S101. Operate time is adjustable in steps of 0.3, 1.0, 3.0, or 10.0 milliseconds.

(c) RELEASE TIME. - The limiter release time is adjustable in steps of 0.1, 0.5, 1.0, 2.5 or 5 seconds by operation of switch S102.

(d) NORMAL - TEST SWITCH. - Operation of switch, S104, produces a transient current for checking the limiter balance.



INPUT CONNECTIONS

A. FOR 200 OHM LINE
   (1) REMOVE STRAP FROM 1 TO E, 2 TO H.
   (2) CONNECT 1 TO B, 2 TO C, F TO E, G TO H.
   (3) CONNECT E TO F, G TO H.

B. FOR 600 OHM LINE – USE AS FURNISHED.

C. FOR 10,000 OHM BRIDGING.
   (1) REMOVE STRAP FROM 1 TO E, 2 TO H.
   (2) CONNECT 1 TO A, 2 TO D.

D. FOR LEVELS EXCEEDING OVU.
   (1) REMOVE STRAP FROM E TO N, H TO Q.
   (2) CONNECT N TO L, E TO J, H TO K, M TO Q.

Figure 3-1. Input Attenuator Connections

c. PRINCIPLE OF OPERATION. - The Type 26W equipment is a general purpose program amplifier incorporating a means of peak amplitude control. It is designed for use in any AM or FM speech input installation.

d. ENERGIZING THE EQUIPMENT. - The initial electrical adjustments are outlined in the following paragraphs.

(1) LIMITER BALANCE. - The limiter balance adjustment and NORMAL - TEST switch are located at the rear of the chassis. The rear dust cover should be removed.

(a) Apply power to the amplifier.

(b) Place the INPUT LEVEL control in the OFF position.

(c) Set OUTPUT LEVEL control to 30 (maximum clockwise position).

(d) Set VOLUME UNITS CONTROL to 4.

(e) Adjust OPERATE-TIME control to the 0.1 millisecond position.

(f) Adjust RELEASE TIME control to the 0.1 second position.

(g) Snap the NORMAL-TEST switch several times, while rotating the limiter balance control, a position should be found where the OUTPUT LEVEL meter needle will indicate a minimum deflection when the switch is operated.

NOTE

Some selection of tubes V101 and V102 may be necessary for best results in balancing.

(2) GAIN CONTROLS. - Because two gain controls are provided and since the input-output relation is not linear over part of the operating range, the method of adjusting the controls differs from that of the conventional amplifiers. The following is a convenient method which may be used if desired.

(a) Turn INPUT LEVEL to the OFF extreme, extreme counterclockwise position.

(b) Turn OUTPUT LEVEL to maximum, extreme clockwise position.

(c) Apply power to amplifier.

(d) Turn meter selector knob to position A, limiter cathode current.

(e) With the audio signal applied to input terminals of amplifier, advance input control until there is a slight indication on meter, M101. The amount of cathode current depends on the amount of gain reduction in effect. This can be controlled with the INPUT LEVEL control.

(f) Advance OUTPUT LEVEL until the desired output is obtained, as indicated by the volume indicator meter, modulator meter, etc.

3. AMOUNT OF CONTROL.

The maximum amount of automatic control which the Type 26W amplifier can provide is equivalent to about 20 db reduction in gain. This limit gives a wide margin of safety under practically any condition of operation.

In voice or communication service, it may be found desirable to use a high degree of control with a short release time. In high quality broadcast service, however, a slow release time is desirable. The recommended setting of the timing controls is 0.3 millisecond LIMITER OPERATE time and 2.5 seconds for the LIMITER RELEASE time. The compression should be held to 5 db or less under typical program conditions.

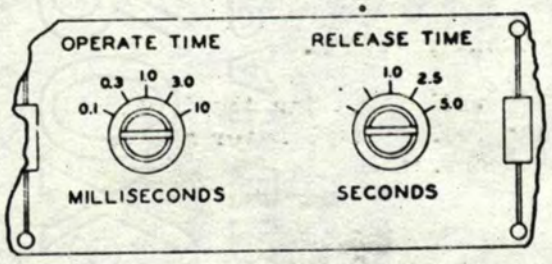


Figure 3-2. Operate and Release Time Controls

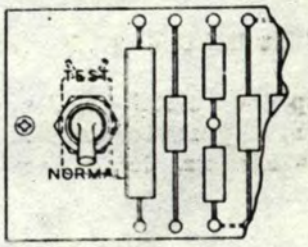


Figure 3-3. Normal Test Switch

It should be clearly understood that the Type 26W Limiting Amplifier cannot replace the control operator in broadcast service. The Type 26W does supplement his efforts, and makes for a better regulated program by reducing the bad effects of sudden high signal amplitudes which the operator cannot control. If the OPERATE TIME is set at the 0.1 millisecond position, the limiting action of the amplifier is fast enough so that outages caused by modulator overload should be almost completely eliminated.

SECTION IV

OPERATION

1. GENERAL.

The steps outlined in this section may be used as a guide to the routine operation of the equipment, subsequent to completion of the initial adjustments. It is suggested that the operator refer to the Theory of Operation section of this book for a more detailed explanation of the limiter amplifier circuits. The location of the meters and operating controls is shown in Figure 4-1.

2. ROUTINE OPERATION.

a. GAIN CONTROL. - Because two gain controls are provided and since the input-output relation is not linear over part of the operating range, the method of gain control adjustment differs from that of conventional amplifiers. The following is a convenient method which may be used if desired.

(1) Turn INPUT LEVEL to the OFF extreme counterclockwise position.

(2) Turn OUTPUT LEVEL to maximum, extreme clockwise.

(3) Apply power to amplifier.

(4) Turn meter selector knob on position A, limiter cathode current.

(5) With the audio signal applied to input terminals of amplifier, advance input control until the meter, M101, indicates the desired amount of gain reduction. This level will determine the frequency of recurrent limiter operation and is dependent upon the type of audio signal.

(6) Advance output level until the desired output is obtained, as indicated by the volume indicator meter, modulator meter, etc.

3. METERING.

The meter circuits provided permit a check on the operation of all amplifier tubes and measurements of plate voltage. The operating currents and plate voltage are read on the meter, M101, located in the upper left hand corner of the panel. Individual readings are made by operating the METER SELECTOR switch. The following table lists approximate values of meter readings for typical operation.

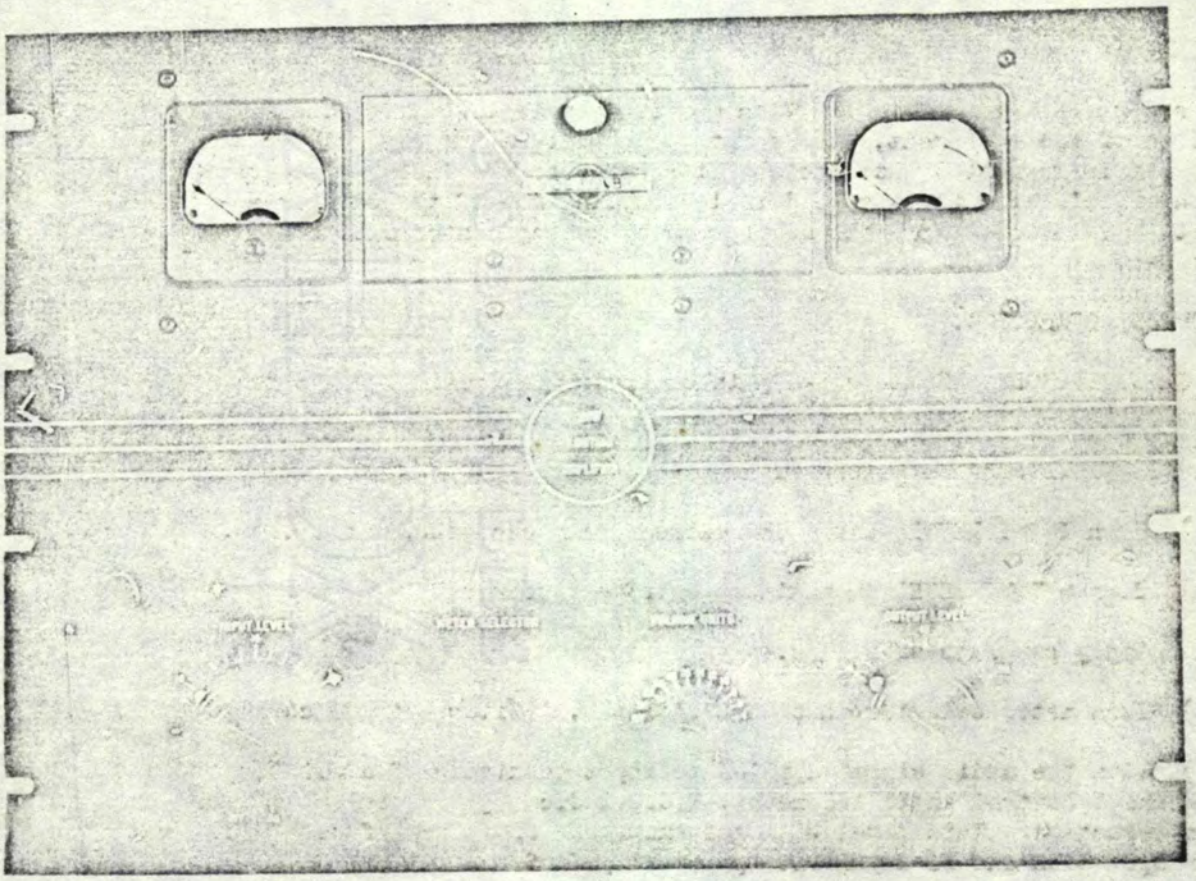


Figure 4-1. Operating Controls

Meter Selector Switch	Circuit	Meter Scale	Meter Reading
A	V102 Cathode	0-15 db	0 to 5 db
B	V101 Cathode	0-5 ma	3 ma
C	V103 Cathode	0-5 ma	4.3 ma
D	V104 Cathode	0-50 ma	25 ma
E	V105 Cathode	0-50 ma	25 ma
F	Plate Voltage	0-500 v.	325 v.

4. USE WITHOUT LIMITER ACTION.

If it is desired to operate the Type 26 W as a program amplifier without limiting action, the INPUT LEVEL Control should be adjusted about 5 db below the verge of compression and the OUTPUT LEVEL Control should be raised about 5 db. Removal of V-102 will accomplish the same purpose.

SECTION V

MAINTENANCE

This radio equipment has been constructed of materials considered to be the best obtainable for the purpose and is carefully inspected and adjusted at the factory. Sealed capacitors and transformers are used throughout. The use of electrolytic capacitors has been restricted to the cathode circuits with less than 50 volts potential. A minimum amount of maintenance will be required.

1. FUSE REPLACEMENT.

The supply line fuse, F101, a 1 amp. slo-blow, is located at the rear lower left corner of the chassis.

2. TUBE REPLACEMENT.

The performance of the Type 26W amplifier depends to some extent on the characteristics of the tubes used. Each amplifier is shipped (unless otherwise ordered) with two sets of tubes which have been tested and found to operate satisfactorily in the amplifier. Replacement tubes can be obtained at any time from the Collins Radio Company or can be obtained from any tube dealer. In the latter case it is advisable to try several tubes, retaining the one having the lowest noise level in each position.

The output stage is designed for use with 1621 tubes, triode connected. However, 6F6's may be substituted. The 1621 offers a longer continuity of service.

3. TROUBLE SHOOTING.

a. GENERAL. - In case of failure or improper operation of the amplifier, an attempt should be made to localize the fault. In many cases the defect will result in abnormal plate current or voltage measurements, and these readings may give a clue to the source of trouble. By means of systematic checking, the trouble can be narrowed down to a single stage, after which inspection and localized checking with test instruments can be used to isolate the fault.

b. DISTORTION. - Excessive amplitude distortion can be caused by a defective tube or by improper operating voltages. All tubes accompanying the amplifier are checked for proper operation before leaving the factory. Over a period of time the characteristics may change; it is therefore advisable to check the condition of the tubes occasionally to insure correct operation.

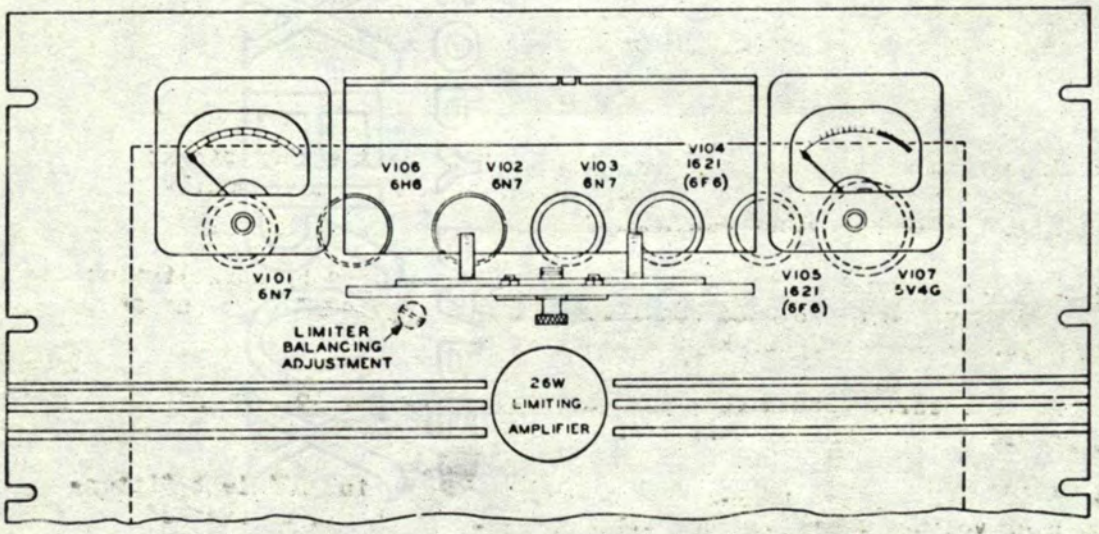


Figure 5-1. Tube Locating Diagram

If the push-pull output amplifier stage tubes, cathode currents are not matched within one ma, distortion in the range of 50 to 100 cycles will result. However, the amount of distortion is not objectionable.

Practically every trouble which results in amplitude distortion will cause a change in meter reading in one or more tubes, and hence can be located by the metering system in the amplifier.

c. NOISE. - Noise in the Type 26W Amplifier can be divided into three classes: (1) Hum, (2) Hiss, (3) Intermittent noises other than the two just listed. The first two are usually present to some degree in any amplifying system. Their magnitude depends upon circuit design and unit construction. In the Type 26W these undesirable effects have been reduced to a negligible value, even at full gain.

(1) HUM.

(a) Induction will occur only when the unit is near a very strong alternating magnetic field. For this reason, the amplifier may usually be located adjacent to any other equipment.

(b) Hum caused by defective tubes can best be located by substitution of other tubes known to be in good condition. It is suggested that one or more spare tubes of each type be kept available.

(c) No difficulty should be experienced with hum due to improper grounding provided the 26W unit itself is grounded.

(d) A defective power supply can cause hum due to insufficient filtering of the high voltage supply. The filter condensers should be checked to determine whether they are open circuited if hum from this source is suspected.

(2) HISS. - Hiss can be caused by defective tubes as well as by an open circuit in a low level stage. In either case, it is not likely that a signal will pass through the defective stage and this point should be checked first. The defective stage can be located most easily by progressively checking the output of each stage. Defective resistors in the lower level stages can also cause hiss.

(3) INTERMITTENT NOISE. - Intermittent noises are usually caused by faulty connections either in circuit wiring or in any circuit component. A good procedure to follow in locating such trouble is to listen to the noise in headphones while removing first the input connections, then the first tube, then each tube in turn until the noise stops. It is quite likely that the noise is associated with the apparatus or wiring connected with the tube last removed. The associated apparatus and wiring should be checked closely and if necessary, parts thought to be defective should be replaced with others known to be in good working order.

d. VOLTAGE MEASUREMENTS. - The following table lists typical voltages measured in the circuit during normal operation. All voltages were measured between ground, chassis and the point indicated using the highest readable range of a 1000 ohm per volt voltmeter. The supply line voltage was 115 volts. Readings must be corrected for other values of line voltage.

Tube	Point of Test	Voltage
V101	Plate No. 1 (pin No. 6)	160
	Plate No. 2 (pin No. 3)	160
6N7	Plate Decoupling Resistor	320
	Cathode No. 1 (pin No. 8)	2.6 3.2
	Plate No. 1 (pin No. 6)	125 175
V102	Plate No. 2 (pin No. 3)	125 180
	Plate supply voltage	
6N7	Cathode (pin No. 8)	0
	Plate No. 1 (pin No. 6)	200 230
V103	Plate No. 2 (pin No. 3)	200 220
	Plate Decoupling Resistor	320 250
6N7	Cathode (pin No. 8)	4 -5
V104	Plate (pin No. 4)	320 250
1621	Cathode (pin No. 8)	28
(6F6)		
V105	Plate	320
1621	Cathode (pin No. 8)	28
(6F6)		
V106	(pin No. 3)	-30
6H6GT/G	(pin No. 5)	-30
V107	Filter input	355
5V4G or	Filter output	340
5T4		

e. RESISTANCE MEASUREMENTS. - The following table lists typical resistance measurements. All measurements are between tube socket terminal and ground.

Pin No.	V101 (6N7)	V102 (6N7)	V103 (6N7)	V104 (1621)	V105 (1621)	V106 (6H6GT/G)	V107 (5V4G)
1	gnd	gnd	gnd	gnd	gnd	gnd	gnd
2	.65	.65	.65	.65	.65	.65	25,000
3	210,000	50,000	450,000	25,000	25,000	4 meg	---
4	6,000	900	4 meg	25,000	25,000	4 meg	550
5	6,000	510,000	4 meg	200,000	200,000	210,000	---
6	210,000	60,000	20,000	-----	-----	-----	550
7	.65	.65	.65	.65	.65	.65	---
8	1,000	500	200	500	500	4 meg	25,000

4. REPLACEMENT PARTS.

The detailed parts list which follows in the next section of the book will aid in the choice of correct replacement parts. Should the Type 26W amplifier develop difficulties which cannot be handled in the field, the factory should be notified. However, it is difficult to suggest possible solutions unless complete information is given as to the symptoms and behavior of the equipment.

SECTION VI

PARTS LIST

1. INTRODUCTION.

Component parts of the Type 26W Limiter Amplifier are identified by means of symbol designations. Wherever it is required to reference a component, the same symbol designation is used. Thus, a part appearing on a simplified schematic, a complete circuit diagram, a wiring diagram, photograph or layout drawing, will always be identified by means of the same symbol designation. These symbol designations identify the various component parts which appear in the following parts lists.

Only one Symbol Designation is assigned to cover component parts with multiple electrical or mechanical characteristics. However, since at times it is desirable to identify certain electrical or mechanical sections of these component parts, suffix letters are added when necessary. Thus, C-121A, C-121B, and C-121C identify each section of triple capacitor C-121.

The alphabetical portion of symbol designations have been selected from the following list in accordance with the classification of the component parts concerned.

(A) Structural parts, panels, frames, castings, etc.
(B) Motors and other prime movers, self-synchronous motors, etc.
(C) Capacitors of all types.
(CR) Dry disc rectifiers.
(D) Dynamotors.
(E) Miscellaneous electrical parts: Insulators, Knobs, brushes, etc.
(F) Fuses.
(G) Generators, exciters, etc.
(H) Hardware, screws, bolts, studs, pins, snapslides, etc.
(I) Indicating devices (except meters and thermometers), pilot lamps, etc.
(J) Jacks and receptacles (stationary).
(K) Contactors, relays, circuit breakers, etc.
(L) Inductors, RF, and AF.

(M) Meters of all types, gauges, thermometers, etc.
(N) Nameplates, dials, charts, etc.
(O) Mechanical parts, bearings, shafts, couplings, gears, ferrules, flexible shafts, housings, etc.
(P) Plugs.
(Q) Diaphrams, (microphone, telephone, projector, etc.).
(R) Resistors, fixed and variable, potentiometers, etc.
(S) Switches, interlocks, thermostats.
(T) Transformers, RF, AF and power.
(U) Hydraulic parts.
(V) Vacuum and gaseous discharge tubes.
(W) Wires, interconnecting cables, without plugs.
(X) Sockets.
(Y) Mechanical oscillators, crystals, magnetestriction tubes, etc.
(Z) Filters, IF transformers, compound tuned circuit assemblies, etc., in a common container.

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C101	Plate supply bypass	CAPACITOR: Fixed; paper dielectric; 4 mf +40% -15%; 600 WV; 1-1/2" diam x 4-1/2" long hermetically sealed metal case; no internal connections to case; mtg stud tapped 3/4-16 NF-2; two solder lug terminals.	961 3005 00
C102	Output amplifier coupling	CAPACITOR: Fixed; paper dielectric; .5 mf ±10%; 600 WV; 7/8" x 1" x 1-13/16" sealed metal case; two mtg lugs; each with 3/16" diam hole on 2-1/8" mtg/c; two solder lug terminals on side of case.	956 0006 00
C103	Output amplifier coupling	CAPACITOR: Fixed; paper dielectric; .5 mf ±10%; 600 WV; 7/8" x 1" x 1-13/16" sealed metal case; two mtg lugs; each with 3/16" diam hole on 2-1/8" mtg/c; two solder lug terminals on side of case.	956 0006 00
C104	Plate supply filter	CAPACITOR: Fixed; paper dielectric; 4 mf +40% -15%; 600 WV; 1-1/2" diam x 4-1/2" long hermetically sealed metal case; no internal connections to case; mtg stud tapped 3/4-16 NF-2; two solder lug terminals.	961 3005 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C105	Transient voltage filter	CAPACITOR: Fixed; electrolytic; 20 mf +100% -10%; 100 WV; 3/4" x 1" x 2-1/8" sealed metal case; two mtg lugs, each with 3/16" diam holes, on 2-1/8" mtg/c; two solder lug terminals on side of case.	183 3310 00
C106	Output amplifier bypass	CAPACITOR: Fixed; electrolytic; 20 mf +100% -10%; 100 WV; 3/4" x 1" x 2-1/8" sealed metal case; two mtg lugs, each with 3/16" diam holes, on 2-1/8" mtg/c; two solder lug terminals on side of case.	183 3310 00
C107	Limiter control coupling	CAPACITOR: Fixed; paper dielectric; 1 mf +40% -15%; 1200 TV; 600 WV; 41/64" x 1-5/16" x 2-1/4"; sealed metal case; mounted with external clamp; solder lug terminals.	930 0022 00
C108	Limiter control coupling	CAPACITOR: Fixed; paper dielectric; 1 mf +40% -15%; 1200 TV; 600 WV; 41/64" x 1-5/16" x 2-1/4"; sealed metal case; mounted with external clamp; solder lug terminals.	930 0022 00
C109	Limiter time constant	CAPACITOR: Fixed; paper dielectric; .25 mf ±20%; 600 WV; 3/4" x 1" x 1-13/16" sealed metal case; two mtg lugs, each with 3/16" diam holes, on 2-1/8" mtg/c; solder lug terminals on side of case.	956 2058 40
C110	Plate supply filter	CAPACITOR: Fixed; paper dielectric; 4 mf +40% -15%; 600 WV; 1-1/2" diam x 4-1/2" long hermetically sealed metal case; no internal connections to case; mtg stud tapped 3/4-16 NF-2; two solder lug terminals.	961 3005 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
C111	Plate supply filter	CAPACITOR: Fixed; paper dielectric; 4 mf +40% -15%; 600 WV; 1-1/2" diam x 4-1/2" long hermetically sealed metal case; no internal connections to case; mtg stud tapped 3/4-16 NF-2; two solder lug terminals.	961 3005 00
C112	Plate supply filter	CAPACITOR: Fixed; paper dielectric; 4 mf +40% -15%; 600 WV; 1-1/2" diam x 4-1/2" long hermetically sealed metal case; no internal connections to case; mtg stud tapped 3/4-16 NF-2; two solder lug terminals.	961 3005 00
C113	Bias supply filter	CAPACITOR: Fixed; paper dielectric; 4 mf +40% -15%; 600 WV; 1-1/2" diam x 4-1/2" long hermetically sealed metal case; no internal connections to case; mtg stud tapped 3/4-16 NF-2; two solder lug terminals.	961 3005 00
E101	V.U. multiplier knob	KNOB: Aluminum; 1-1/8" diam; 5/8" long.	507 4228 00
E102	Meter selector knob	KNOB: Aluminum; 1-1/8" diam; 5/8" long.	507 4227 00
E103	Input level knob	KNOB: Aluminum; 2-1/2" diam; 1-1/16" long.	507 3282 00
E104	Output level knob	KNOB: Aluminum; 2-1/2" diam; 1-1/16" long.	507 3282 00
E105	Tube access door knob	KNOB: Aluminum; 19/32" diam; 27/32" long.	502 7127 00
F101	Power source fuse	FUSE: 1 amp; 250 v; Slo-Blo; 1/4" diam; 1-1/4" long; glass enclosed; cartridge type	264 4280 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
L101	Plate supply filter	REACTOR: Filter choke; 12 hy; 110 ma at 10 v rms; 240 ohm dc resistance; sealed metal case 2.70" x 2.85" x 3.73" excluding terminals; 4 integral 8-32 NC-2 mtg studs on 1.88" x 2" mtg/c; solder post terminals.	678 0056 00
L102	Plate supply filter	REACTOR: Filter choke; 12 hy; 110 ma at 10 v rms; 240 ohm dc resistance; sealed metal case 2.70" x 2.85" x 3.73" excluding terminals; 4 integral 8-32 NC-2 mtg studs on 1.88" x 2" mtg/c; solder post terminals.	678 0056 00
M101	Current and voltage	METER: 0-5; 0-50; 0-500; 50 scale divisions; 0-1 ma dc; 2% accuracy; ±1%; 3" square case.	458 0413 20
M102	Audio level indicator	METER: Volume level indicator; "-20" to "0" to "+3"; "-20" to "0" in black; "0" to "+3" in red; 3" square.	455 1500 00
R101	Input pad	RESISTOR: Fixed composition; 4700 ohm ±10%; 1 w; 3/4" long 7/25" diam; two axial wire leads.	745 3114 00
R102	Input pad	RESISTOR: Fixed composition; 4700 ohm ±10%; 1 w; 3/4" long; 7/25" diam; two axial wire leads.	745 3114 00
R103	Input pad	RESISTOR: Fixed composition; 240 ohm ±5%; 1w; 3/4" long; 7/25" diam; two axial wire leads.	745 3060 00
R104	Input pad	RESISTOR: Fixed composition; 240 ohm ±5%; 1 w; 3/4" long; 7/25" diam; two axial wire leads.	745 3060 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R105	Input pad	RESISTOR: Fixed composition; 240 ohm ±5%; 1 w; 3/4" long; 7/25" diam; two axial wire leads.	745 3060 00
R106	Input pad	RESISTOR: Fixed composition; 240 ohm ±5%; 1w; 3/4" long; 7/25" diam; two axial wire leads.	745 3060 00
R107	Input pad	RESISTOR: Fixed composition; 240 ohm ±5%; 1 w, 3/4" long; 7/25" diam; two axial wire leads.	745 3060 00
R108	Input pad	RESISTOR: Fixed composition; 240 ohm ±5%; 1 w; 3/4" long; 7/25" diam; two axial wire leads.	745 3060 00
R109	Input pad	RESISTOR: Fixed composition; 240 ohm ±5%; 1 w; 3/4" long; 7/25" diam; two axial wire leads.	745 3060 00
R110	Input pad	RESISTOR: Fixed composition; 120 ohm ±5%; 1 w; 3/4" long; 7/25" diam; two axial wire leads.	745 3047 00
R111			
R112	Input level control	RESISTOR: Attenuator, dual pot; 50,000 ohm per section; 1 db per step-attenuation; 30 steps; 2-3/4" diam; 3-3/32" long.	378 0001 00
R112A	Input level control	Section of R112.	
R112B	Input level control	Section of R112.	
R113	Input amplifier cathode	RESISTOR: Fixed composition; 1000 ohm ±10%; 1 watt; .28" diam; 3/4" long; two axial wire leads.	745 3086 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R114	Input amplifier cathode metering	RESISTOR: Fixed; precision; wire wound; 25 ohm ±1%; 1 watt; 5 v max; 200 ma max; 9/16" diam; 9/16" long; two axial wire leads.	721 2506 00
R115	Plate supply voltage dropping	RESISTOR: Fixed composition; 1000 ohm ±10%; 1 watt; .28" diam; 3/4" long; two axial wire leads.	745 3086 00
R116	Plate supply voltage dropping	RESISTOR: Fixed composition; 22,000 ohm ±5%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5141 00
R117	Plate supply voltage dropping	RESISTOR: Fixed Composition; 22,000 ohm ±5%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5141 00
R118	Limiter bridge	RESISTOR: Fixed composition; 15,000 ohm ±5%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5134 00
R119	Limiter bridge	RESISTOR: Fixed composition; 22,000 ohm ±5%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5141 00
R120	Limiter bridge	RESISTOR: Fixed composition; 22,000 ohm ±5%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5141 00
R121	Limiter bridge	RESISTOR: Fixed composition; 15,000 ohm ±5%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5134 00
R122	Limiter cathode	RESISTOR: Fixed; precision; wire wound; 200 ohm ±1%; 1 watt; 14.1 v max; 70.7 ma max; 9/16" diam; 9/16" long; two axial wire leads.	721 2006 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R123	Limiter bridge	RESISTOR: Fixed composition; 15,000 ohm ±5%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5134 00
R124	Limiter bridge	RESISTOR: Fixed composition; 15,000 ohm ±5%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5134 00
R125	Output amplifier V103 cathode	RESISTOR: Fixed composition; 1000 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3086 00
R126	Output amplifier V103 cathode metering	RESISTOR: Fixed; precision; wire wound; 25 ohm ±1%; 1 watt; 5 v max; 200 ma max; 9/16" diam; 9/16" long; two axial wire leads.	721 2506 00
R127	Output amplifier V103 plate voltage dropping	RESISTOR: Fixed; composition; 4700 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3114 00
R128	Output amplifier V103 plate	RESISTOR: Fixed composition; 47,000 ohm ±10%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5156 00
R129	Output amplifier V103 plate	RESISTOR: Fixed composition; 47,000 ohm ±10%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5156 00
R130	Output amplifier V105 grid	RESISTOR: Fixed composition; 0.22 megohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3184 00
R131	Output amplifier V104 grid	RESISTOR: Fixed composition; 0.22 megohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3184 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R132	Output amplifier cathode	RESISTOR: Fixed composition; 1000 ohm ±10%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5086 00
R133	Output amplifier cathode	RESISTOR: Fixed composition: 1000 ohm ±10%; 2 watts; 2/5" diam; 1-2/5" long; two axial wire leads.	745 5086 00
R134	Output amplifier V104 cathode metering	RESISTOR: Fixed; precision; wire wound; 2.04 ohm ±1%; 1 watt; 1.428 v max; 700 ma max; 9/16" diam; 9/16" long.	721 0007 00
R135	Output amplifier V105 cathode metering	RESISTOR: Fixed; precision; wire wound; 2.04 ohm ±1%; 1 watt; 1.428 v max; 700 ma max; 9/16" diam; 9/16" long.	721 0007 00
R136	Output level attenuator	RESISTOR: Attenuator; "T" network; variable; 1 db attenuation per step; 30 steps; 600 ohm; 2-3/4" diam; 3-3/32" long.	378 0002 00
R137	VU indicator multiplier	RESISTOR: Attenuator; variable; 7500 ohm input, 3900 ohm output; 2 VU attenuation per step; 12 contact points; 1-3/4" diam; 2-3/4" long.	378 4060 00
R138	Limiter time constant	RESISTOR: Fixed composition; 820 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3083 00
R139	Limiter time constant	RESISTOR: Fixed composition; 2700 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3104 00
R140	Limiter time constant	RESISTOR: Fixed composition; 8200 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3125 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R141	Limiter time constant	RESISTOR: Fixed composition; 27,000 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3146 00
R142	Limiter time constant	RESISTOR: Fixed composition; 0.39 megohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3195 00
R143	Limiter time constant	RESISTOR: Fixed composition; 1.5 megohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3219 00
R144	Limiter time constant	RESISTOR: Fixed composition; 2.2 megohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3226 00
R145	Limiter time constant	RESISTOR: Fixed composition; 5.6 megohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3244 00
R146	Limiter time constant	RESISTOR: Fixed composition; 10 megohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3254 00
R147	Bias Voltage	RESISTOR: Fixed composition; 22,000 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3142 00
R148	Bias Voltage	RESISTOR: Fixed composition: 22,000 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3142 00
R149	Bias supply voltage divider	RESISTOR: Fixed; wire wound; 500 ohm ±5%; 10 watts; 70 v max; 141 ma max; 13/32" diam; 1-3/4" long.	710 1500 00
R150	Meter multiplier	RESISTOR: Fixed; precision; wire wound; 500,000 ohm ±1%; 0.32 watts; 400 v max; 0.8 ma max; 9/16" diam; 1" long.	722 5004 60

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
R151	Bias supply voltage filter	RESISTOR: Fixed composition; 4700 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3114 00
R152	Limiter grid bias	RESISTOR: Fixed composition; 22,000 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3142 00
R153	Transient voltage divider	RESISTOR: Fixed composition; 4700 ohm, ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3114 00
R154	Limiter balance control	RESISTOR: Dual control pot; variable; wire wound; 2000 ohm ±10%; 1-3/5" diam; 1-13/16" long.	376 1002 00
R154A	Limiter balancing	Section of R154.	
R154B	Limiter balancing	Section of R154.	
R155	Transient voltage divider	RESISTOR: Fixed composition; 3300 ohm ±10%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3107 00
R156	Input pad	RESISTOR: Fixed composition; 470 ohm ±5%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3071 00
R157	Input pad	RESISTOR: Fixed composition; 470 ohm ±5%; 1 watt; 3/4" long; 7/25" diam; two axial wire leads.	745 3071 00
S101	Operate time adjustment	SWITCH: Tap, 1 pole; 5 position; 1 section; non-shorting; 1-1/4" diam; 1-9/16" long.	259 8410 00
S102	Release time adjustment	SWITCH: Tap; 1 pole; 5 position; 1 section; non-shorting; 1-1/4" diam; 1-9/16" long.	259 8410 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
S103	Meter selector switch	SWITCH: Tap; 2 pole; 6 position; 1 section; non-shorting; 30° detent with stop; 1-1/4" diam; 1-9/16" long.	259 1041 00
S103A	Meter selector switch	Section of S103.	
S103B	Meter selector switch	Section of S103.	
S104	Normal-test switch	SWITCH: Toggle; DPDP; 1 amp 250 v; 3 amps 125 v; 33/64" x 1-3/8" x 1-5/8".	266 0002 00
T101	Input audio coupling	TRANSFORMER: High fidelity audio; Pri; 600 ohm, CT; Sec: 30,000 ohm, CT; 1000 TV insulation; Freq response ±0.5 db 30 - 15,000 cps; sealed metal case 2.97" x 3.23" x 3.86" excluding terminals; 4 integral mtg studs tapped 8-32 NC-2 on 2.13" x 2.38" mtg/c; solder post terminals.	677 0057 00
T102	Interstage coupling	TRANSFORMER: Special balanced limiter interstage audio; Pri #1 and Sec #1 turns ratio 1 to 1, Pri #2 and Sec #2 turns ratio 1 to 1; 1000 TV insulation; Freq response ±0.5 db 30-15,000 cps; sealed metal case 2-9/16" diam x 3-3/8" overall, excluding terminals; Four .169" diam mtg holes on 2-3/32" x 2-3/32" mtg/c; solder post terminals.	677 0055 00
T103	Output audio coupling	TRANSFORMER: high fidelity audio Pri: 5000 ohm, tapped at 3000 ohm CT; Sec: 600 ohm CT; Freq response ±0.5 db 30 - 15,000 cps; 1500 TV; 3" x 3" x 3-3/3" excluding terminals; 4 mtg holes on 2-3/8" x 2-3/8" mtg/c; solder post terminals.	677 0054 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
T104	Power transformer	TRANSFORMER: Rectifier plate: filament and amplifier filaments; Pri: 105, 110, 115, 120 and 125 V. 50/60 cps; 2500 TV; Sec No. 1: 6.3 V at 5A, CT; Sec No. 2: 5 V at 2A, CT; Sec No. 3: 650 V at 1A, CT; sealed metal case, 3.280" x 3.650" x 4.670"; 4 integral 10-32 NF-2 mtg studs on 2.38" x 2.63" mtg/c; solder post terminals.	672 0053 00
V101	Input amplifier	TUBE: Type 6N7; twin triode.	255 0134 00
V102	Limiter	TUBE: Type 6N7GT/G; twin triode.	255 0134 00
V103	Output amplifier	TUBE: Type 6N7; twin triode.	255 0134 00
V104	Output amplifier	TUBE: Type 1621 (6F6); power amplifier pentode.	257 0039 00
V105	Output amplifier	TUBE: Type 1621 (6F6); power amplifier pentode.	257 0039 00
V106	Limiter control rectifier	TUBE: Type 6H6GT/G; twin diode, rectifier.	255 0180 00
V107	Plate supply rectifier	TUBE: Type 5V4G; full-wave high-vacuum rectifier.	255 0081 00
X101	Socket for V101	SOCKET, TUBE: Octal; one piece saddle mtg; two .156" diam holes on 1-5/16" mtg/c, round bakelite body 1-3/16" diam x 1/2 h excluding terminals, phosphor-bronze; cad plated contacts.	220 1850 00
X102	Socket for V102	SOCKET, TUBE: Octal; one piece saddle mtg; two .156" diam holes on 1-5/16" mtg/c, round bakelite body 1-3/16" diam x 1/2 h excluding terminals, phosphor-bronze; cad plated contacts.	220 1850 00

ITEM	CIRCUIT FUNCTION	DESCRIPTION	PART NUMBER
X103	Socket for V103	SOCKET, TUBE: Octal; one piece saddle mtg; two .156" diam holes on 1-5/16" mtg/c, round bakelite body 1-3/16" diam x 1/2 h excluding terminals, phosphor-bronze; cad plated contacts.	220 1850 00
X104	Socket for V104	SOCKET, TUBE: Octal; one piece saddle mtg; two .156" diam holes on 1-5/16" mtg/c, round bakelite body 1-3/16" diam x 1/2 h excluding terminals, phosphor-bronze; cad plated contacts.	220 1850 00
X105	Socket for V105	SOCKET, TUBE: Octal; one piece saddle mtg; two .156" diam holes on 1-5/16" mtg/c, round bakelite body 1-3/16" diam x 1/2 h excluding terminals, phosphor-bronze; cad plated contacts.	220 1850 00
X106	Socket for V106	SOCKET, TUBE: Octal; one piece saddle mtg; two .156" diam holes on 1-5/16" mtg/c, round bakelite body 1-3/16" diam x 1/2 h excluding terminals, phosphor-bronze; cad plated contacts.	220 1850 00
X107	Socket for V107	SOCKET, TUBE: Octal; one piece saddle mtg; two .156" diam holes on 1-5/16" mtg/c, round bakelite body 1-3/16" diam x 1/2 h excluding terminals, phosphor-bronze; cad plated contacts.	220 1850 00

SECTION VII

MISCELLANEOUS DRAWINGS

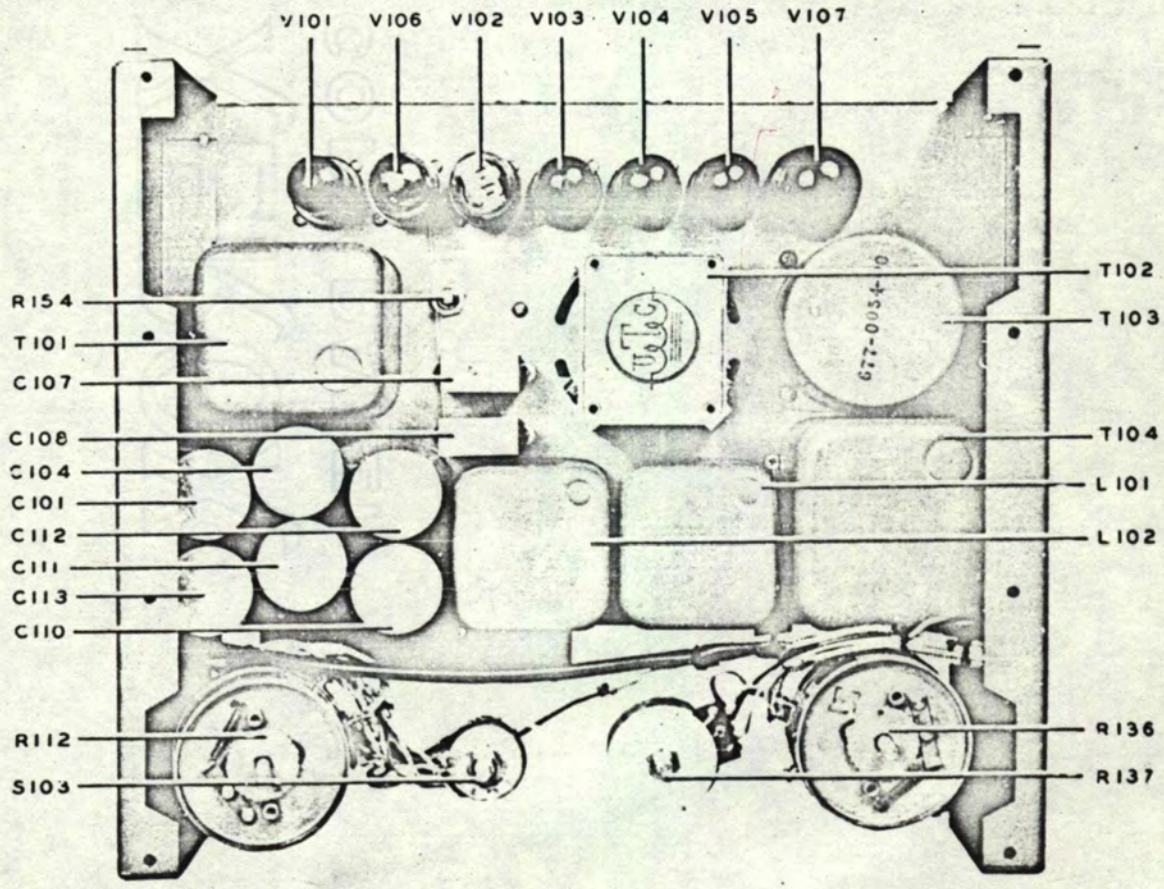


Figure 7-1. Parts Arrangement--Panel Removed

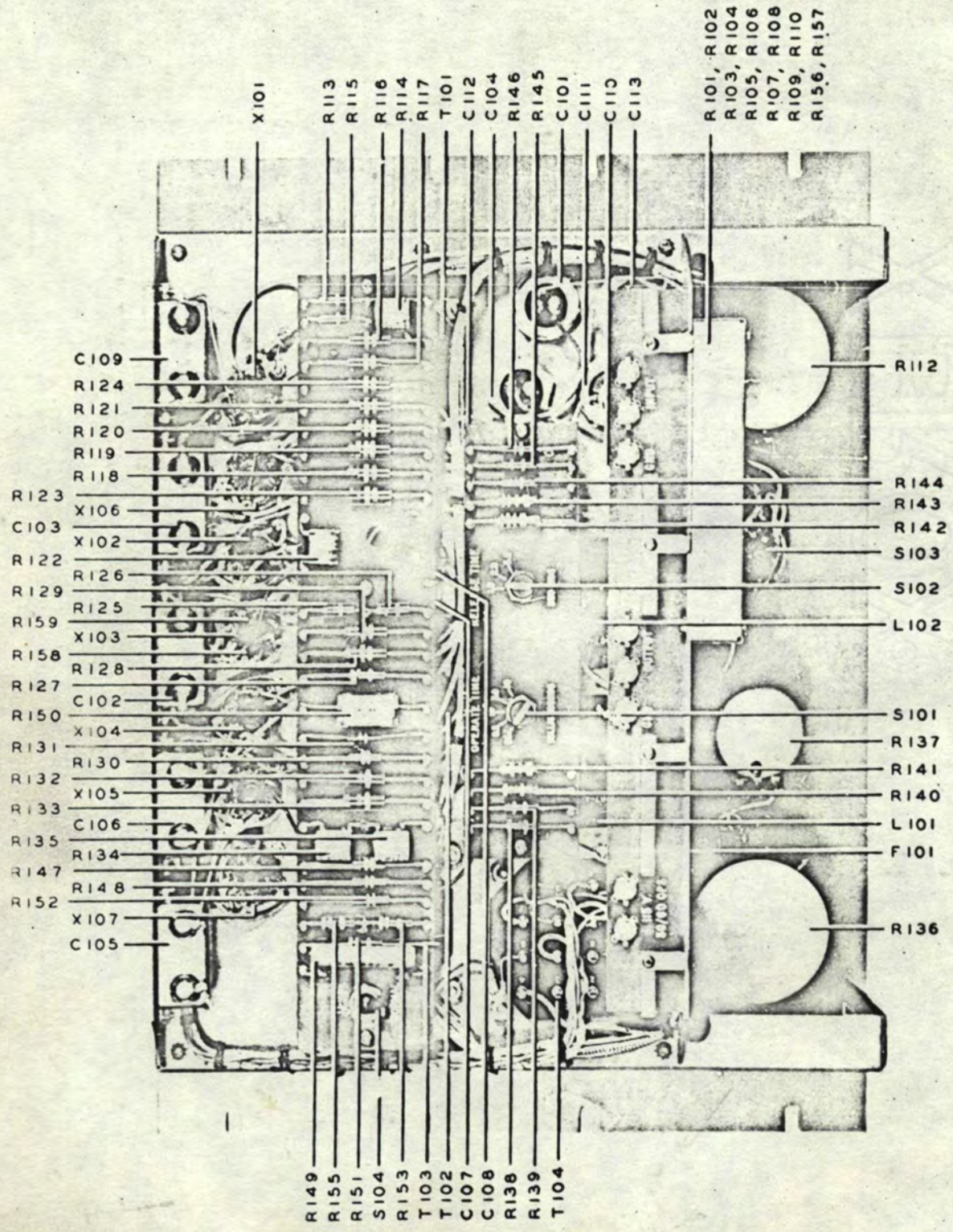
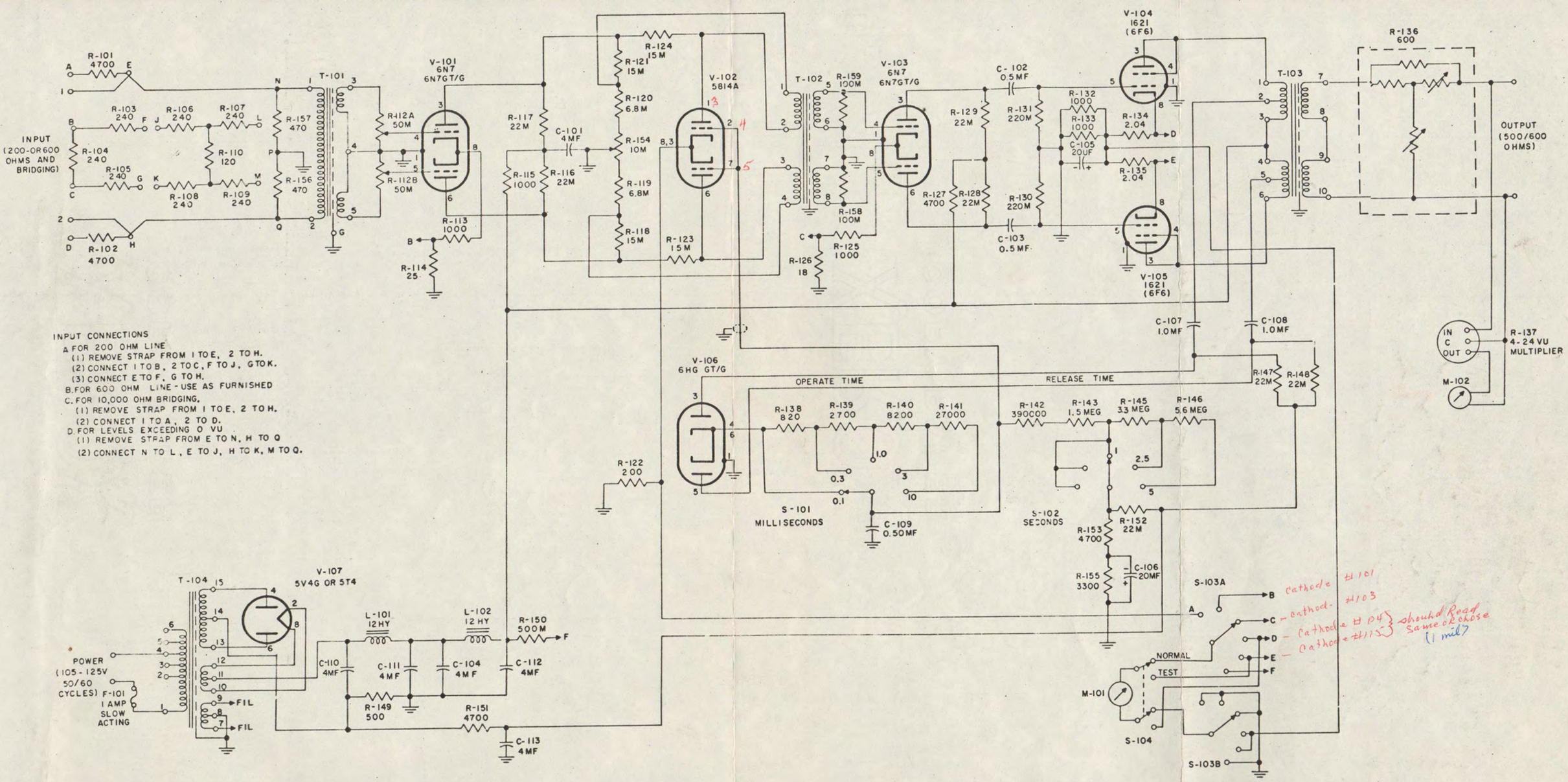


Figure 7-2. Parts Arrangement - Rear



INPUT CONNECTIONS

A. FOR 200 OHM LINE
(1) REMOVE STRAP FROM 1 TO E, 2 TO H.
(2) CONNECT 1 TO B, 2 TO C, F TO J, G TO K.
(3) CONNECT E TO F, G TO H.

B. FOR 600 OHM LINE - USE AS FURNISHED

C. FOR 10,000 OHM BRIDGING.
(1) REMOVE STRAP FROM 1 TO E, 2 TO H.
(2) CONNECT 1 TO A, 2 TO D.

D. FOR LEVELS EXCEEDING 0 VU
(1) REMOVE STRAP FROM E TO N, H TO Q
(2) CONNECT N TO L, E TO J, H TO K, M TO Q.

Figure 7-3. Type 26W Complete Schematic

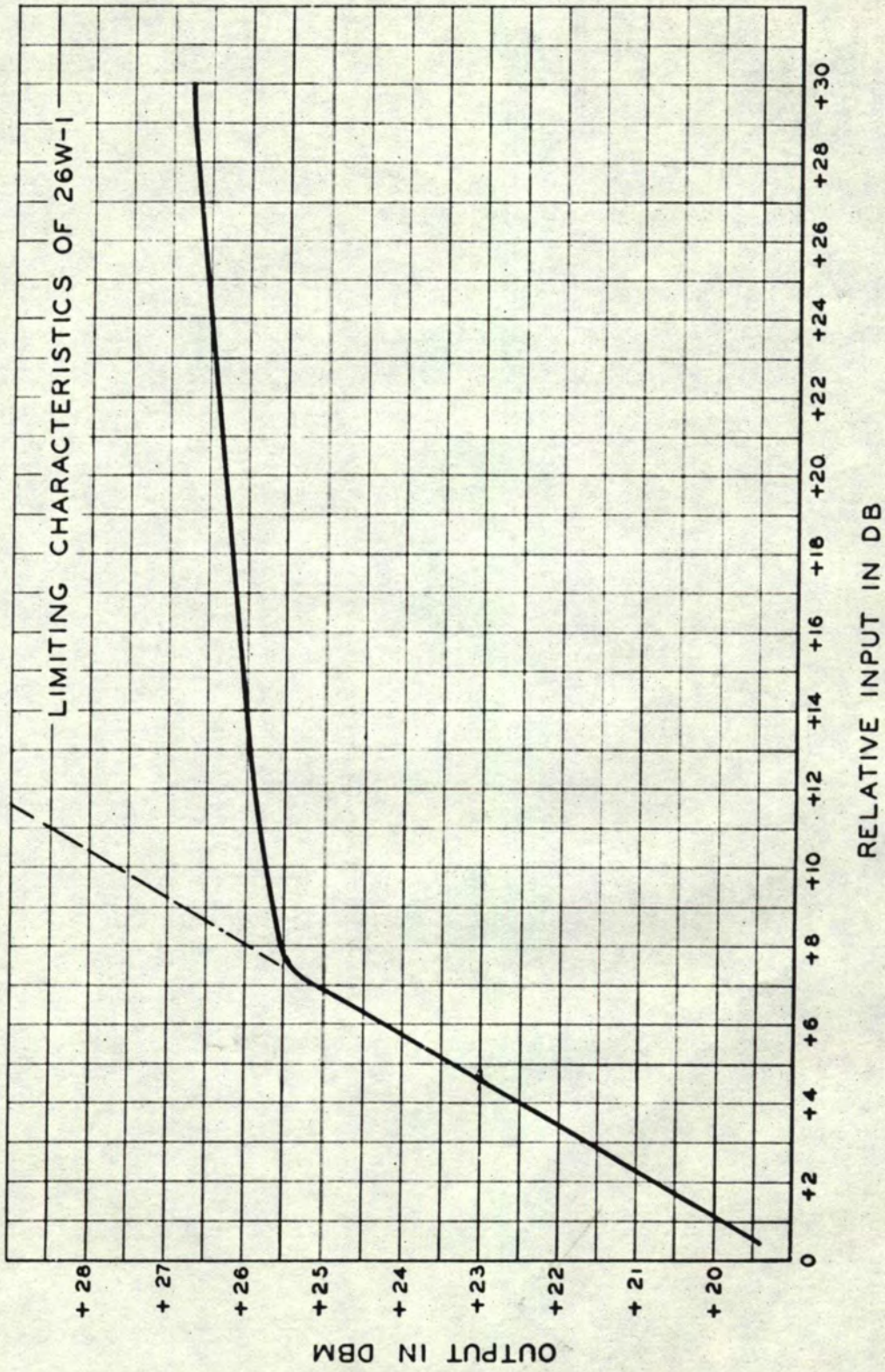
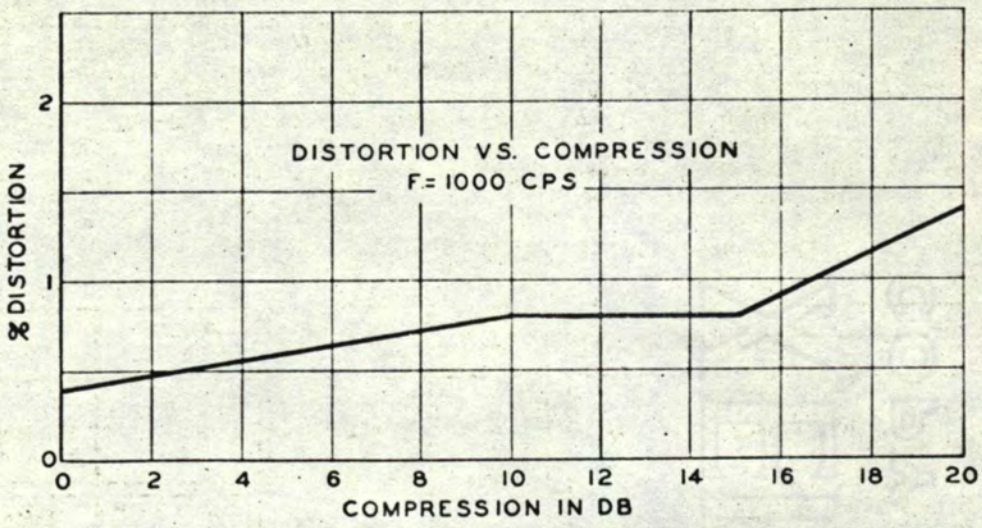


Figure 7-4. 26W Limiting Characteristics Curve



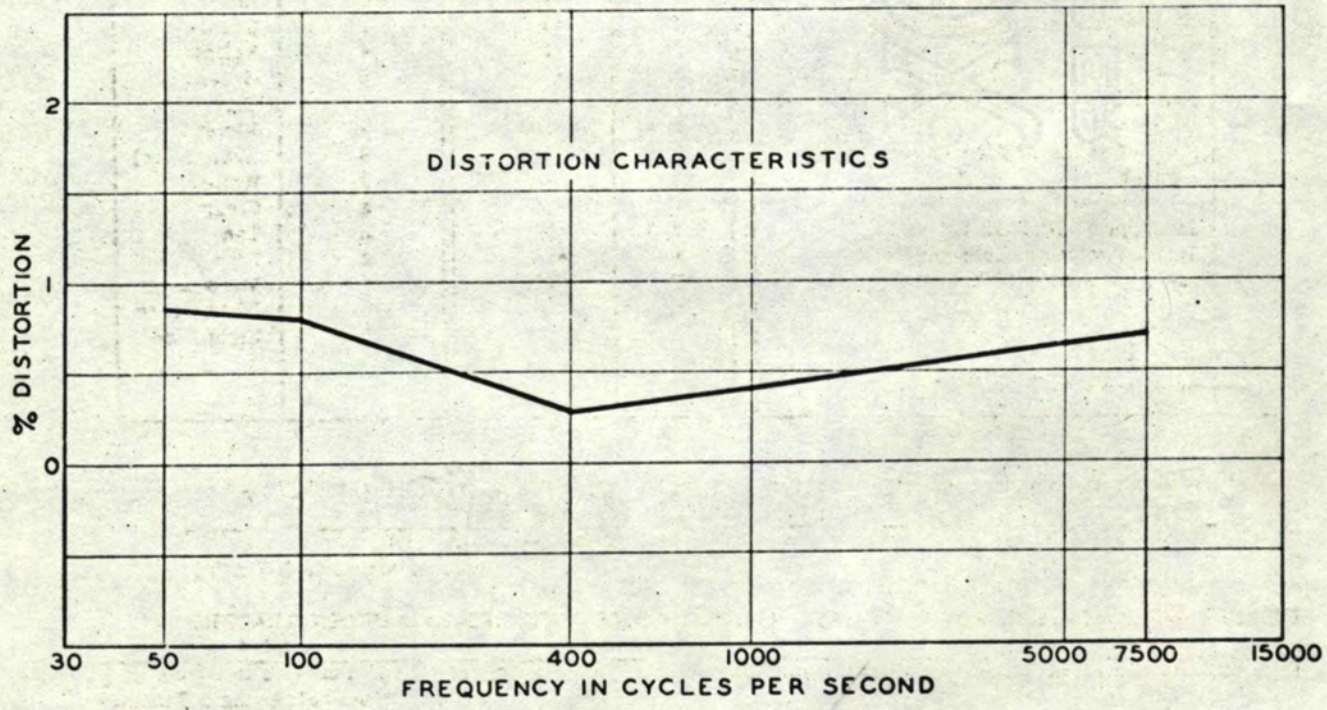


Figure 7-5. Distortion Characteristics Curves

HOOK-UP WIRE CODE

The characteristics of the hook-up wire used in this equipment are indicated by groups of symbols on the diagrams. Each symbol group consists of a maximum of three letters followed by a maximum of three numerals. When three letters are used the first indicates the type of wire, the second represents the size of wire, and the third is the letter "S", used only when the wire is shielded. When two letters are used, the first and second letters indicate either the type and size of wire or the size of wire and shielding, respectively. When one letter is used it indicates the wire size only. The first numeral indicates the color of the wire body and the second and third numerals, if any, represent the colors of tracers, all numerals being in accordance with the standard RTMA and JAN-C-76 color code.

The symbols are assigned according to the following table.

FIRST LETTER	TYPE OF WIRE
A	Cotton Braid Over Plastic (Formerly AN-J-C-48)
B	Busbar, Round Tinned
C	Jan Type WL(600 Volts)
D	Miniature Jan Wire
E	
F	Extra Flexible Varnished Cambric
G	General Electric Deltabeston
H	KEL-F (Monochlorotrifluoroethylene)
J	
K	Neon Sign Cable (15,000 Volts)
L	Silicone
M	
N	Single Conductor Stranded (Not Rubber Covered)
P	Single Conductor Stranded (Rubber Covered)
Q	
R	Jan Type SRIR(1000 Volts)
T	Teflon (Polytetrafluoroethylene)
V	Jan Type SRHV (2500 Volts)
W	
X	
Y	
Z	Acetate Yarn, Telephone Type

SECOND LETTER	AWG* WIRE SIZE
A	#22
B	#20
C	#18
D	#16
E	#14
F	#12
G	#10
H	#8
J	#6
K	#4
L	#2
M	#1
N	#0
P	#00
Q	#000
R	#0000
T	#28
V	#26
W	#24
X	#19
Y	#30
Z	

THIRD LETTER	
S	Shielded
None	Unshielded

NUMBER OR LETTER	BODY OR TRACER COLOR
0	Black
1	Brown
2	Red
3	Orange
4	Yellow
5	Green
6	Blue
7	Violet
8	Gray (Slate)
9	White
a	Clear
b	Tan
c	Pink
d	Maroon
e	Light Green
f	Light Blue

EXAMPLES

UNSHIELDED WIRE, JAN TYPE WL, #22AWG, WHITE WITH RED AND GREEN TRACERS:

C	A	9	25	--	4 1/4
Type of Wire	Size of Wire	Color of Body	Color of Tracers		Length of Wire in Inches (Includes Stripping & Tinning)

SHIELDED WIRE (SINGLE), JAN TYPE SPIR, #16AWG, WHITE WITH RED AND GREEN TRACERS:

R	D	S	9	25	--	4 1/4
Type of Wire	Size of Wire	Shielded	Color of Body	Color of Tracers		Length of Wire in Inches (Includes Stripping & Tinning)

SHIELDED WIRE (MULTIPLE), MINIATURE JAN, #22AWG, WHITE, AND WHITE WITH RED TRACER:

D	A	S	(9)	(92)	--	4 1/4
Type of Wire	Size of Wire	Shielded	First Conductor	Second Conductor		Length of Wire in Inches (Includes Stripping & Tinning)

COLLINS RADIO COMPANY