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.

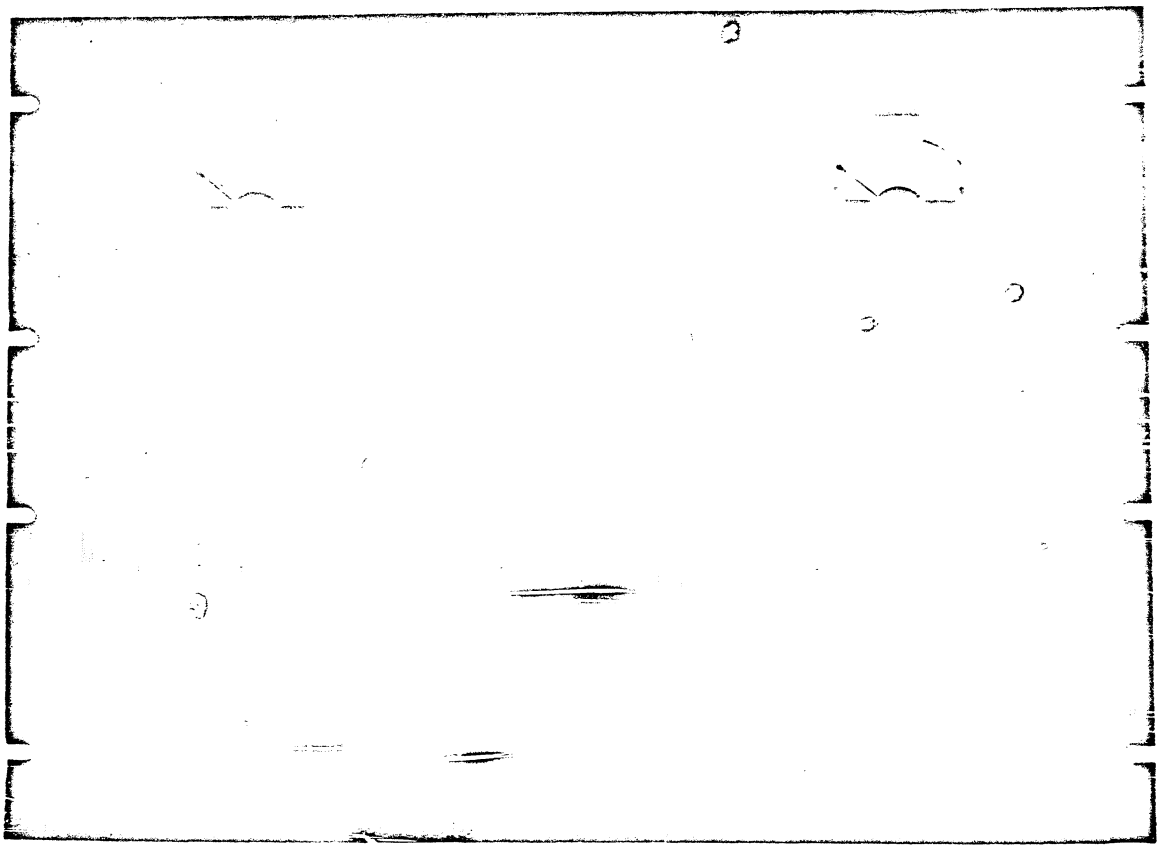

Figure 4-1. Operating Controls

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.

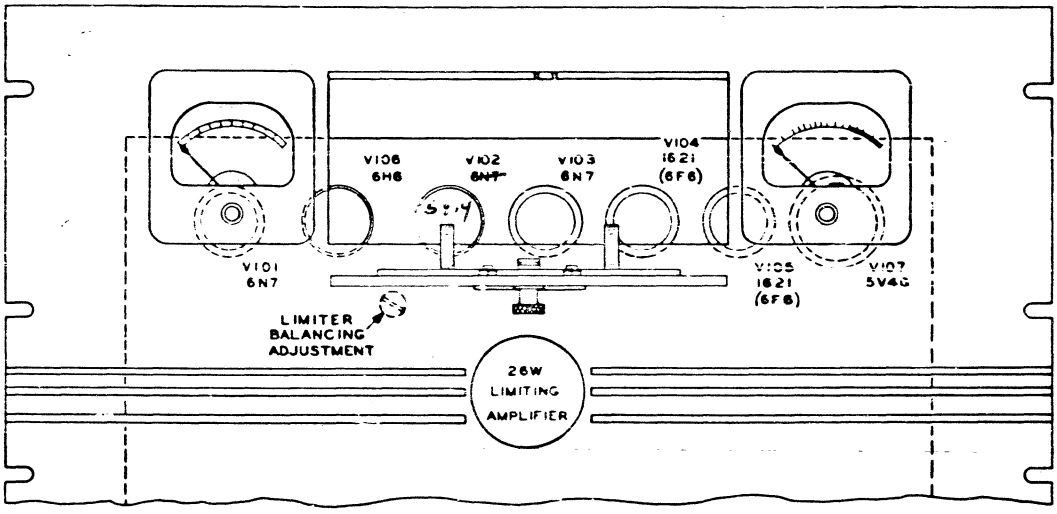

Figure 5-1. Tube Locating Diagram

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
	Plate No. 1 (pin No. 6)	125
V102	Plate No. 2 (pin No. 3)	125
	Plate supply voltage	
~~6N7~~ 5814A	Cathode (pin No. 8)	0
	Plate No. 1 (pin No. 6)	200
V103	Plate No. 2 (pin No. 3)	200
	Plate Decoupling Resistor	320
6N7	Cathode (pin No. 8)	4
V104	Plate (pin No. 4)	320
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~~ 5814A)	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.