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COLLINS

instruction book

Collins Radio Company

26U-3
Auto-Limiting Amplifier

BROADCAST EQUIPMENT GUARANTEE

The equipment described herein is sold under the following guarantee:

a. Except as set forth in paragraph b. of this section, Collins agrees with Buyer to repair or replace, without charge, any properly maintained equipment, parts or accessories which are defective as to design, materials, or workmanship and which are returned in accordance with Collins instructions by Buyer to Collins factory, transportation prepaid, provided:
   1. Notice of a claimed defect in the design, materials or workmanship of the equipment manufactured by Collins is given by Buyer to Collins within five (5) years from date of delivery, with exception of rotating machinery such as blowers, motors, and fans whereby notice must be given by Buyer to Collins within two (2) years from date of delivery.
   2. Notice of a claimed defect in the design, materials or workmanship of the following described Collins manufactured equipment is given by Buyer to Collins within two (2) years from the date of delivery:

20V-3	26U-2	81M	172G-2	216C-2	313T-4	642A-2	820F-1	830D-1	830F-2A
26J-1	42E-7	144A-1	212H-1	313T-1	356H-1	786M-1	A830-2	830E-1	830H-1A
26U-1	42E-8	172G-1	212Z-1	313T-3	564A-1	820E-1	830B-1	830F-1	830N-1A

b. The above guarantee does not extend to other equipment, accessories, tubes, lamps, fuses, and tape heads manufactured by others which are subject to only adjustment as Collins may obtain from the supplier thereof.

c. Collins further guarantees that any radio transmitter described herein will deliver full radio frequency power output at the antenna lead when connected to a suitable load, but such guarantee shall not be construed as a guarantee of any definite coverage or range of said apparatus.

d. The guarantee of this section is void if:
   1. The equipment malfunctions or becomes defective as a result of alterations or repairs by others than Collins or its authorized service center, or
   2. The equipment is exposed to environmental conditions more severe than specified by Collins in equipment manuals.

e. NO OTHER WARRANTIES, EXPRESSED OR IMPLIED, INCLUDING WARRANTIES OF MERCHANTABILITY OR FITNESS FOR INTENDED PURPOSE, SHALL BE APPLICABLE TO ANY EQUIPMENT SOLD HEREUNDER.

f. THE FOREGOING SHALL CONSTITUTE THE BUYER'S SOLE RIGHT AND REMEDY UNDER THE AGREEMENTS IN THESE SECTIONS. IN NO EVENT SHALL COLLINS HAVE ANY LIABILITY FOR CONSEQUENTIAL DAMAGES, OR FOR LOSS, DAMAGE OR EXPENSE DIRECTLY OR INDIRECTLY ARISING FROM THE USE OF THE PRODUCTS, OR ANY INABILITY TO USE THEM EITHER SEPARATELY OR IN COMBINATION WITH OTHER EQUIPMENT OR MATERIALS, OR FROM ANY OTHER CAUSE.

g. The guarantees of this section and limitations thereon will also accrue to the benefit of any purchaser of Buyer's F.C.C. license, provided:
   1. Notice of the sale of the F.C.C. license is given by Buyer to Collins in writing within thirty (30) days after the consummation of said sale; and
   2. No greater rights are granted to the purchaser of Buyer's F.C.C. license than are granted herein to Buyer.

How to Return Material or Equipment If, for any reason, you should wish to return material or equipment, whether under the guarantee or otherwise, you should notify us, giving full particulars including the details listed below, insofar as applicable. If the item is thought to be defective, such notice must give full information as to nature of defect and identification (including part number if possible) of part considered defective. (With respect to tubes we suggest that your adjustments can be speeded up if you give notice of defect directly to the tube manufacturer.) Upon receipt of such notice, Collins will promptly advise you respecting the return. Failure to secure our advice prior to the forwarding of the goods or failure to provide full particulars may cause unnecessary delay in the handling of your returned merchandise.

ADDRESS:

Collins Radio Company
Customer Returned Goods, 412-023
1225 North Alma Road
Richardson, Texas 75080

INFORMATION NEEDED:

(A) Type number, name and serial number of equipment
(B) Date of delivery of equipment
(C) Date placed in service
(D) Number of hours of service
(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
(H) Item or symbol number of same obtained from parts list or schematic
(I) Collins number (and name) of unit subassemblies involved in trouble
(J) Remarks

How to Order Replacement Parts When ordering replacement parts, you should direct your order as indicated below and furnish the following information insofar as applicable. To enable us to give you better replacement service, please be sure to give us complete information.

ADDRESS:

Collins Radio Company
Service Parts, 412-024
1225 North Alma Road
Richardson, Texas 75080

INFORMATION NEEDED:

(A) Quantity required
(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
(E) Unit subassembly number (where applicable)

1 December 1967

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15 April 1969

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instruction book

26U-3
Auto-Limiting Amplifier

Collins Radio Company | Dallas, Texas

table of contents

table of contents (cont)

list of illustrations

list of tables

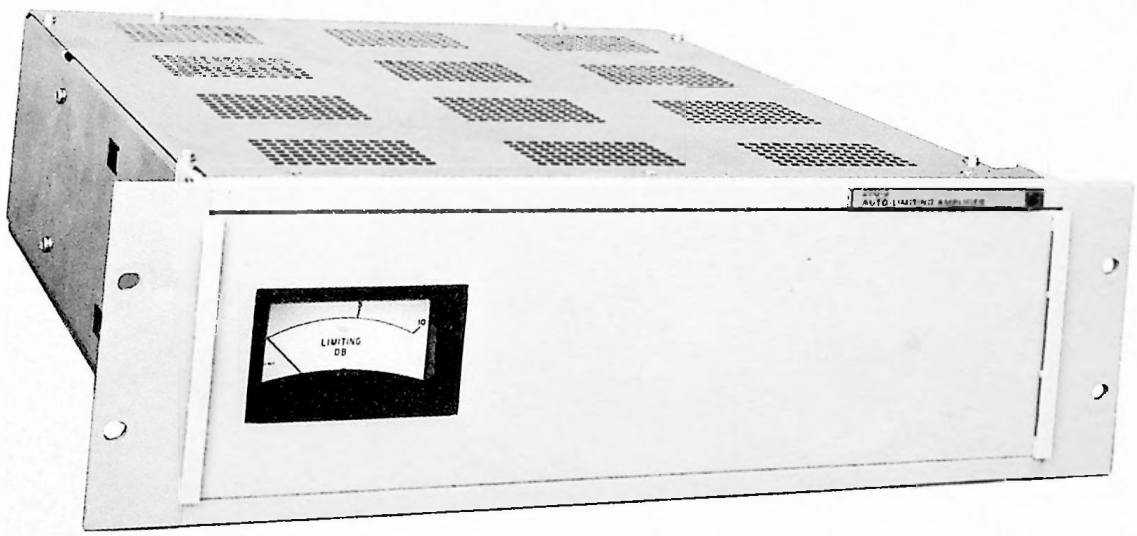

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Figure 1-1. 26U-3 Auto-Limiting Amplifier.

section 1
general description

1.1 PURPOSE OF INSTRUCTION BOOK

This instruction book provides information concerning installation, adjustment, operation, and maintenance of the 26U-3 Auto-Limiting Amplifier (figure 1-1).

1.2 PURPOSE OF EQUIPMENT

The 26U-3 Auto-Limiting Amplifier is for use in any am. or fm installation, where control of the amplitude of audio-frequency peaks is needed. In transmitter applications, this control will prevent overmodulation by limiting loud audio passages. This limiting permits a higher average modulation level resulting in an increase in the transmission range or service area of the transmitter. When used in conjunction with recording equipment or public address systems, this limiting raises the average audio level, thus improving the signal-to-noise ratio.

1.3 PHYSICAL DESCRIPTION

The amplifier is assembled in a metal case 5-1/4 inches high, 19 inches wide, 15-3/4 inches deep, and weighing approximately 15 pounds. The amplifier is of single circuit board construction with the power supply mounted between the circuit board and the rear of the chassis. The power connector, fuse, and terminal board for signal functions are on the rear panel.

1.4 FUNCTIONAL DESCRIPTION

The 26U-3 is a multi-stage amplifier using feedback to control the output level (figure 1-2). Adjustable clipping and the capability for operation in am. or fm installations are provided. With GAIN CONTROL in the AUTO position, the program peaks will be limited to a predetermined peak-to-average ratio. In the DISABLE position the 26U-3 functions as a straight amplifier except that adjustable absolute clipping is available.

INPUT LEVEL adjust attenuates the input signal and preemphasis is inserted if the 26U-3 is to be used in fm installations. Variable gain operational amplifierA1 amplifies the signal and transistors Q2 and Q16 provide gain and isolation.

With GAIN CONTROL in AUTO position, transistors Q11 and Q12 amplify the signal and diodes CR12 and CR13 provide full-wave rectification. The parallel combination of resistor R15 and capacitor C18 integrate this rectified dc voltage that varies with the input signal amplitude. Operational amplifier A2 amplifies this dc voltage and agc threshold adjustment R50 determines the point at which gain reduction will begin. Buffer transistor Q13 provides impedance matching and isolation. The voltage from Q13 is the agc voltage that controls the gain of A1. This voltage is displayed on the front panel meter as decibel limiting.

The gain of A1 is controlled by the amount of in-phase signal fed back into the (-) input terminal. The ratio of feedback resistor RF to the shunt resistance of MOS FET (Metal Oxide Semiconductor Field Effect Transistor) Q1 determines the amount of feedback. When program peaks exceed the level preset by agc threshold R50, the agc voltage increases, which results in increased shunt resistance of Q1. This increase of shunt resistance allows more feedback through RF, which lowers the gain of A1. The result is an audio output with a decreased peak-to-average amplitude ratio.

Adjustable clipping level control R70 determines the absolute peak-to-average ratio of a signal. A circuit board mounted switch selects symmetrical or negative peak clipping. Transistors Q3 and Q14 amplify this signal and OUTPUT LEVEL potentiometer A1R11 adjusts the signal level to the output amplifier. Output amplifier Q4 through Q9 provides gain, impedance matching, and switchable deemphasis. The output signal is transformer coupled to a rear-mounted terminal board.

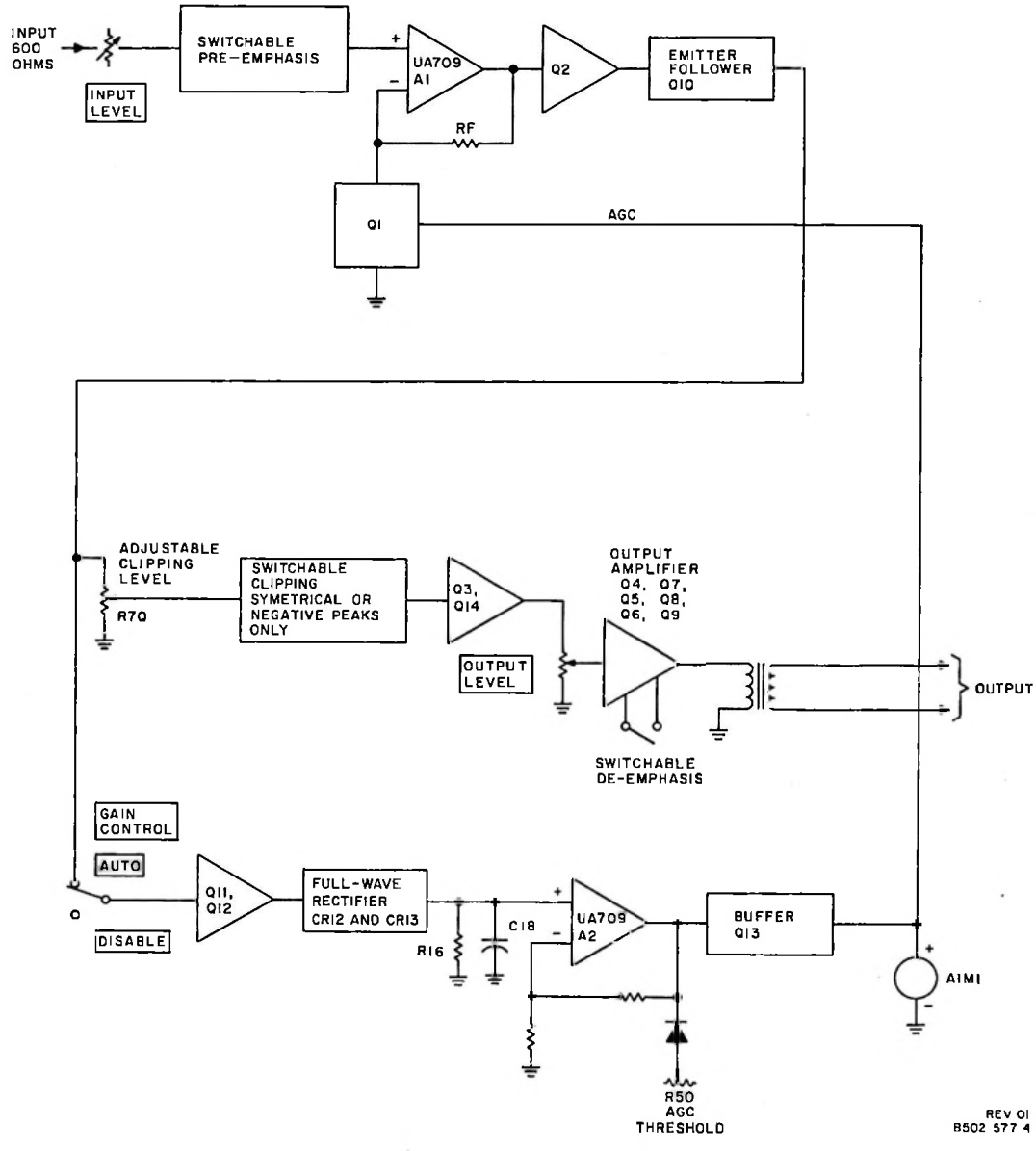

Figure 1-2. Functional Block Diagram.

1.5 TECHNICAL CHARACTERISTICS

Input Level:
5 dBm with input level control fully cw
10 dBm, normal operating level

Input Impedance:
600 ohms ±20% balanced

Compression Range:
10 dB minimum

Compression Ratio:
10:1 minimum (figure 1-3)

Attach Time:
2 milliseconds (AGC loop)
15 microseconds peak clipping

Release Time:
100 to 200 milliseconds

Frequency Response:
±1 dB 50 to 15,000 Hz (at normal gain)

Distortion:
1% maximum with output up to +20 dBm and limiting within the meter range

Noise Level:
-50 dBm under normal gain conditions (0 dB limiting) and output level control at normal level position (+10 dBm)

Output Level:
20 dBm maximum (reference 0 dBm = 1 mW
10 dBm normal

Output Impedance:
600 ohms ±20% balanced or unbalanced
150 ohms ±20% unbalanced

Power Requirements:
30 watts, 115 volts ac ±10% , 60 Hz

Ambient Temperature Range:
-25°C (10°F) to +55°C (+130°F)

Ambient Humidity Range:
0 to 95% relative humidity

Altitude Range:
Up to 10,000 feet

Shock and Vibration Conditions:
Normal handling and shipping

Type of Service:
Continuous

Fuse:
1/2 ampere, slow-blow

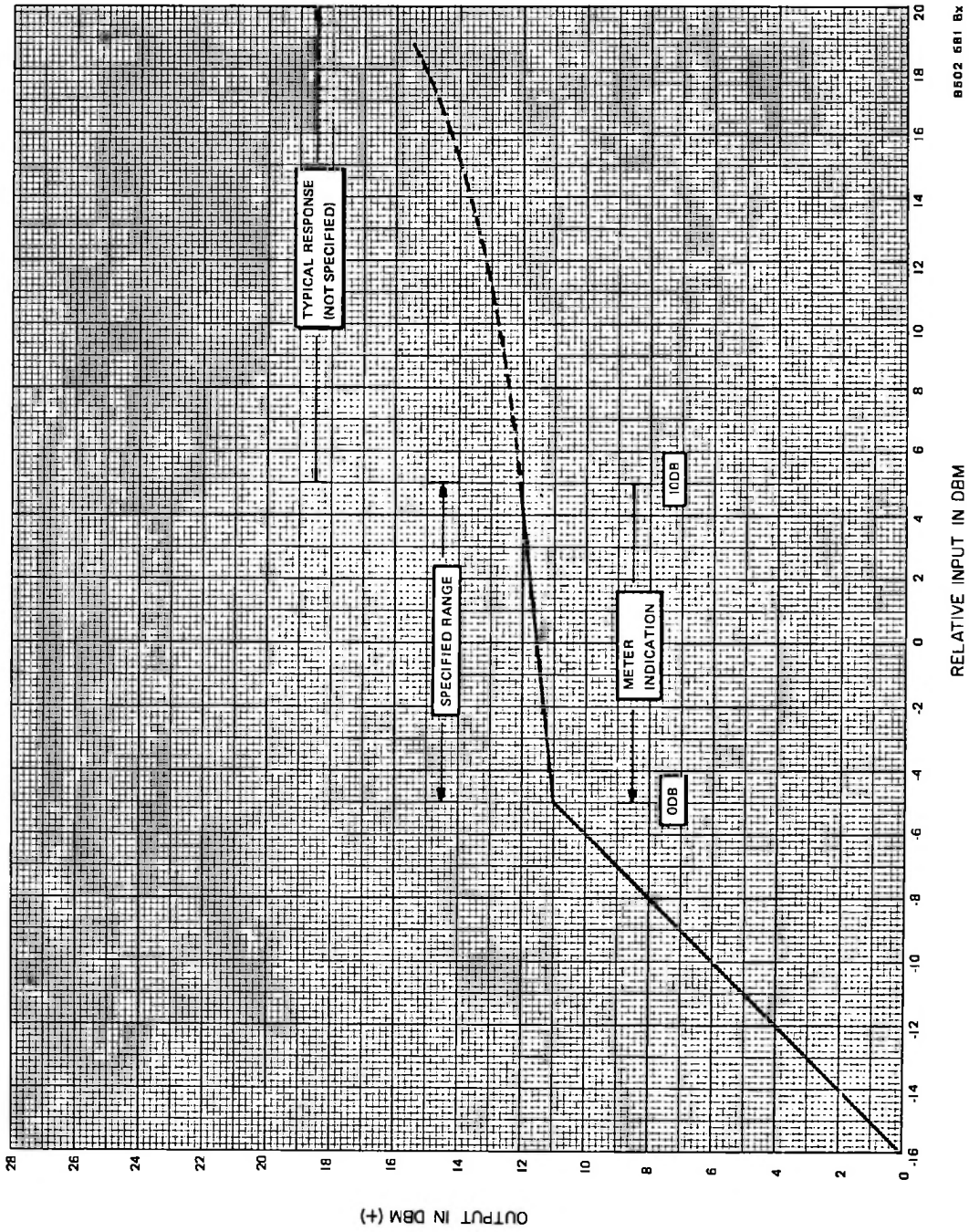

Figure 1-3. 26U-3 Limiting Characteristic Curve.

section 2
installation and adjustment

2.1 UNPACKING AND INSPECTING THE EQUIPMENT

Remove all packing material and carefully lift the unit from the package. Check the equipment against the packing slips. Visually inspect the units for damaged or missing components. Check for proper operation of controls. Any claims for damage should be filed promptly with the transportation agency. If such claims are to be filed, all packing material must be retained.

2.2 INSTALLATION

2.2.1 Mounting

Position the amplifier in a standard 19-inch rack or cabinet and secure.

2.2.2 Connections

Prior to connecting primary power and external inputs and outputs, set POWER switch to OFF (figure 2-1).

2.2.2.1 Input Connections

Audio from a 600-ohm balanced line is connected to the amplifier input through pins 1 and 3 of TB1 (rear panel). Shielded wire should be used to reduce stray hum pickup.

2.2.2.2 Output Connections

The 26U-3 Auto-Limiting Amplifier may be wired for a 600-ohm balanced or 150-ohm unbalanced output impedance by external connections to TB1 (rear panel). For a 600-ohm balanced, strap pins 5 and 6 and take output from pins 4 and 7. For a 150-ohm unbalanced, strap pin 4 to pin 6, and also strap pins 5, 7 and 8. The output may now be taken from pins 4 and 8 with pin 8 being the low or ground side.

2.2.2.3 Power Connections

Connect the monitor power cord to a 115-volt ac 50/60-Hz source.

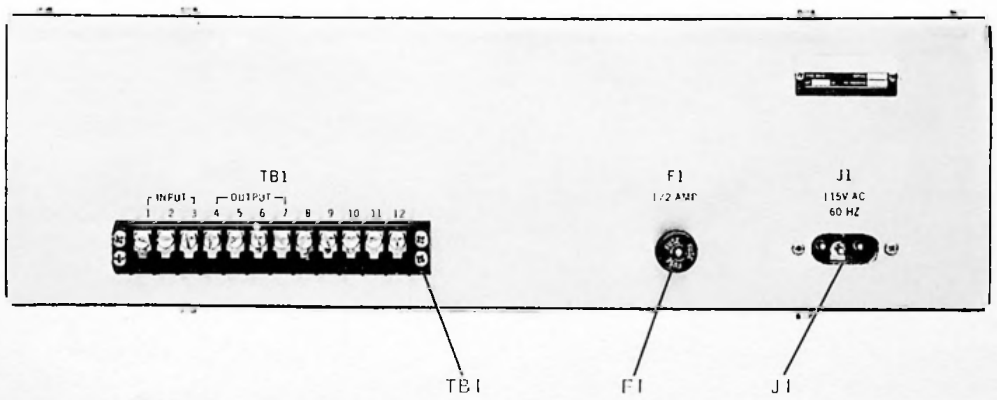

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Figure 2-1. Rear Panel Connections.

2.3 INITIAL ADJUSTMENTS

The 26U-3 is delivered for use in installations using frequency modulation. For use with am. or other applications, switches S4 and S5 located on the printed circuit board must be in the am. position. Switch S3 may be set in the (+ -) or (-) position depending on the polarity of absolute clipping desired. This allows the am. user to take full advantage of FCC regulations setting no limit on positive modulation peaks but restricting negative peaks only. Thus, the (-) position may be used for am. However, in fm, tv, and in recording work, it is necessary to restrict modulation in both directions equally, and therefore the (+ -) position is used. Refer to figure 6-2 for the physical location of these switches.

2.4 ADJUSTMENT PROCEDURES

The following procedures outline the adjustments required for normal installation of the 26U-3 Auto-Limiting Amplifier.

2.4.1 Absolute Peak Clipping

The 26U-3 is factory adjusted to clip peaks approximately 1 dB above continuous sine-wave amplitude. This clipping level can be altered to suit individual requirements. Two methods can be used to determine the clipping level: constant input and program input.

Note

The program input method should be used only by an experienced operator. There is a limit to the amount of clipping that can be tolerated by the average listener.

2.4.1.1 Constant Input

a. Connect a +10-dBm, 1-kHz signal source to the amplifier input terminals.
b. Monitor the amplifier output (terminated with 600 ohms) with an oscilloscope.
c. Set POWER SWITCH to ON and GAIN CONTROL to AUTO.
d. Adjust INPUT level control for 5 dB on the meter and the output for normal modulation level.
e. Observe output waveform and adjust R70 (refer to figure 6-2 for physical location) for the desired clipping point. Readjust the level to the normal modulation level.

2.4.1.2 Program Input

a. Feed program material at normal line levels into the 26U-3.
b. Monitor the 26U-3 output with phones or other audio equipment that will enable the operator to listen to the program output.
c. Set POWER SWITCH to ON and GAIN CONTROL to AUTO.
d. Adjust INPUT and OUTPUT level controls to the desired level.
e. Adjust R70 (refer to figure 6-2 for physical location) until the desired clipping level is reached.

Note

To maintain a constant peak modulation the output level control must be readjusted to compensate for the change in setting of R70.

2.4.2 Normal Operation, Peak-Limiting Adjustments

a. Rotate the INPUT and OUTPUT level controls fully ccw. Set the GAIN CONTROL switch to DISABLE.
b. Feed program material at normal operating levels into the 26U-3.
c. Set GAIN CONTROL to AUTO, and gradually advance the INPUT LEVEL control cw until 0- to 10-dB limiting is indicated on the front panel meter.
d. Adjust OUTPUT LEVEL control for the required output level.

2.4.3 Operation as an Audio Amplifier

The 26U-3 may be operated as a straight audio amplifier with the exception that adjustable absolute clipping is available (refer to paragraph 2.4.1).

a. Rotate INPUT and OUTPUT level controls fully ccw. Set GAIN CONTROL switch to DISABLE.
b. Adjust INPUT and OUTPUT level controls for the desired output level. In order not to overload the input stages of the 26U-3, adjust OUTPUT LEVEL control approximately half open and then adjust the INPUT LEVEL control for the desired output.

section 3
operation

3.1 PANEL CONTROLS AND INDICATORS

This section locates, illustrates, and describes the function of each front panel control (figure 3-1 and table 3-1).

3.2 OPERATING INSTRUCTIONS

To operate amplifier, set POWER switch to ON. There is no delay or warmup time required and no further adjustments should be necessary. Refer to paragraph 2.3 for instructions if requirements change or adjustments become necessary.

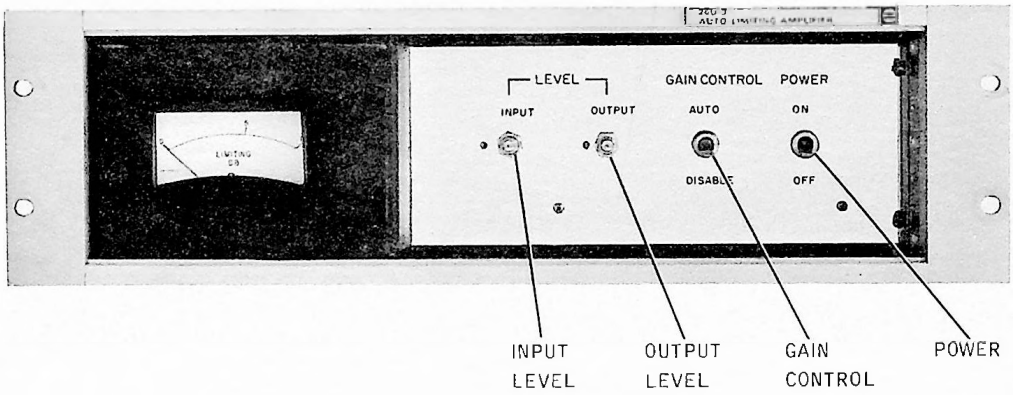

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Figure 3-1. Panel Controls and Indicators.

Table 3-1. Controls.

NAME	PANEL MARKING	FUNCTION
Power switch	POWER, ON/OFF	Turns amplifier on and off.
Gain control switch	GAIN CONTROL, AUTO/DISABLE	Selects automatic or manual control of amplifier gain.
Input level	INPUT LEVEL	Controls signal level to amplifier circuitry.
Output level	OUTPUT LEVEL	Controls amplifier output level.

section 4
theory of operation

4.1 INPUT CIRCUITS

Refer to figure 7-1. INPUT LEVEL adjust, a 600-ohm variable attenuator, controls the audio level across the primary of impedance-matching transformer T3. Switch S4 selects a 75-microsecond preemphasis network for the input circuit of operational amplifier A1. With GAIN CONTROL in DISABLE position, A1 functions as a straight amplifier. Amplifier Q2 and emitter follower Q10 provide gain and isolation.

4.2 AUTOMATIC GAIN CONTROL (AGC) CIRCUITS

With GAIN CONTROL switch A1S1 in the AUTO position, capacitor C16 couples part of the signal buffered by Q10 to CR12, one side of a full-wave rectifier. Unity gain inverter Q11 and Q12 shifts this signal 180° as required by CR13, the other side of the rectifier. Variable resistor R40 compensates for any imbalance in the input amplitudes to the rectifier. C18 and R45 determine attack time. C18 and R16 determine release time.

Operational amplifier A2 amplifies the dc voltage developed across the parallel combination of R16 and C18. Diodes CR15 and CR16 determine which is the most positive level, the output of A2 or the bias established by agc threshold adjustment R50. If the dc output from A2 exceeds the threshold point, emitter resistor R56 of emitter follower Q13 develops a positive dc voltage. This dc voltage is the agc voltage used for gain reduction. Front panel meter A1M1 indicates this voltage in terms of decibel limiting. When program peaks exceed the preset level established by R50, the positive dc bias increases the equivalent resistance of Q1. The gain of A1 is inversely proportional to the amount of feedback from pin 6 to pin 2. The ratio of R20 to the equivalent resistance of Q1 determines the amount of feedback. With increased shunt resistance, more feedback flows through R20 thus reducing the gain of A1.

4.3 OUTPUT CIRCUITS

The output amplifier circuits function the same regardless of the position of GAIN CONTROL switch A1S1. Variable clipping-level control R70 develops the audio voltage from emitter follower Q10. Diodes CR21 and CR22 clip the audio signal symmetrically or negative only, depending on the position of switch S3. The switch markings are opposite the electrical operation of the diodes, because phase inversion occurs before the output terminals. Transistors Q3 and Q14 buffer the limited signal. OUTPUT LEVEL potentiometer sets the input level to the output amplifier. Output amplifier Q4 through Q9 provides gain, impedance matching, and switchable deemphasis. Switch S5 places a 75-microsecond deemphasis network in the emitter circuit of Q4. Transistor Q5 drives push-pull output transistors Q6 through Q9. Capacitors C14 and C15 couple the low-impedance output to the primary of A3T4. The secondary terminals are brought out on A4TB1 located on the rear panel of the 26U-3.

4.4 POWER SUPPLY

The 26U-3 contains a 117-volt ac power supply. The ac supply voltage is full-wave rectified and RC filtered. Zener diode CR5 regulates the +20-volt dc supply while CR6 and CR7 regulate the positive and negative 12-volt dc supplies.

section 5
maintenance

5.1 GENERAL

The following paragraphs contain maintenance procedures for the 26U-3 Auto-Limiting Amplifier. Maintenance personnel should be familiar with the principles of operation before attempting to service the 26U-3.

5.2 PREVENTIVE MAINTENANCE

Many electronic equipment malfunctions are caused by accumulated dirt or corrosion. Inspect the equipment at regular intervals, depending upon environmental conditions. Remove the 26U-3 from its enclosure and use a soft brush and low-pressure air hose or vacuum cleaner to remove dirt and lint. The low-pressure air supplied should be dry and oil-free. Inspect all metal parts for rust, corrosion, and general deterioration. Check wiring and components for signs of overheating, and the power connector and terminal strip on the rear of the unit for broken or loose pins and terminals. Check all operating controls for smoothness of operation. In addition, check all connections and tighten any nuts, bolts, or screws that are loose.

5.3 SPARE PARTS

Spare parts may be ordered from the following address:

Collins Radio Company
Service Parts, 412-024
1225 North Alma Road
Richardson, Texas 75080

5.4 RECOMMENDED TEST EQUIPMENT

The test equipment recommended for the trouble analysis and adjustment procedures of the 26U-3 is listed in table 5-1. Test equipment having characteristics equivalent to those listed may be used.

5.5 TROUBLE ANALYSIS

Before starting troubleshooting, be sure that the amplifier is actually defective. Check the input level and operation of controls, a little time spent here could save a lot of trouble.

Trouble analysis procedures for the 26U-3 consist of isolating the trouble to a stage and then making resistance and/or voltage measurements until the trouble source is found. Table 5-2 shows signal levels at various points to aid trouble isolation. These voltages are typical and do not represent absolute values.

5.5.1 Preliminary Adjustments

Perform the following steps to prepare the monitor for troubleshooting.

a. Connect a -10 dBm, 1-kHz audio signal to the 26U-3 input terminals, TB1-1 and TB1-3 (ground).
b. Terminate the 600-ohm output terminals, TB1-4 and TB1-7, with a 619-ohm resistor.
c. Position amplifier controls as shown below:

POWER ON/OFF	ON
GAIN CONTROL	DISABLE
INPUT LEVEL	Fully cw
OUTPUT LEVEL	Fully cw

5.5.2 Troubleshooting Procedure

Using the schematic diagram (figure 7-1) and figure 6-2 for physical locations, perform the measurements listed in table 5-2. Once the trouble is located to a stage use the HP-410B as a volt/ohmmeter to locate the defective component.

Table 5-1. Recommended Test Equipment.

EQUIPMENT	MANUFACTURER AND TYPE
Wide-range oscillator	HP-200CD
Distortion analyzer	HP-331A
Oscilloscope	HP-130B
Attenuator set	HP-350B
Vtvm	HP-410B
Audio vtvm	HP-400L

Table 5-2. Measurements.

STEP	TEST EQUIPMENT	LOCATION OF TEST	INDICATION	NOTES
1	HP-400L	Across 619-ohm termination resistor TB1-7 ground	9.5 vrms	If this indication is correct, the fault probably lies in the automatic gain control circuitry. Proceed to step 10. If incorrect, proceed to step 2.
2	HP-410B	Cathode CR5	+20 vdc	
3	HP-410B	Cathode CR6	+12 vdc	
4	HP-410B	Anode CR7	-12 vdc	
5	HP-410B	Anode CR14	-9 vdc	
6	HP-400L	Terminal 5 of T3	0.36 vrms	
7	HP-400L	Collector Q2	1.2 vrms	
8	HP-400L	Base Q4	0.26 vrms	
9	HP-400L	Terminal 1, A3T2	8.0 vrms	
10				Place GAIN CONTROL in AUTO position. Increase generator output to -3 dBm.
11	HP-400L	Emitter Q12	1.6 vrms	
12	HP-410B	Emitter Q13	4.6 vdc	

After a repair is made check the amplifier in operation before attempting any realignment. In most cases replacement of a defective component will not necessitate realignment.

5.5.3 Repair for Planar Process Boards

Caution

Exercise extreme care during component replacement to avoid damage to the circuit board. Heat applied for more than 5 seconds may cause the plated thru holes to become loose or broken and severely damage the board. Do not attempt to repair a damaged board. Return the damaged board to the factory for repair.

a. Replace components with accessible leads (resistors, capacitors, etc.) in accordance with the following procedures.
   1. Cut the component lead beyond the bend (nearest the board). Make sure the cut lead is straight.
   2. Remove all burrs by rounding or squeezing the lead with the long-nosed pliers.
   3. Apply heat (5 seconds, maximum) to the lead on the backside of the board and remove the molten solder with a solder sipper (Collins part number 024-0676-010).
   4. Allow the board to cool completely between heatings and repeat step 3 as necessary.
   5. Carefully break the lead loose from the hole, and gently remove the cold lead. If necessary, slightly heat the lead from the component side of the board while carefully removing the lead from the bottom.
   6. Carefully insert the lead of the replacement component into the hole. Be sure the lead is straight.
   7. Apply heat to the lead on the backside of the board (5 seconds, maximum) and allow fresh solder to flow into the hole. Cut off any excess lead. Do not bend the lead.

b. Replace components without accessible leads (transistors, relays, board-mounted potentiometers, etc.) as follows:
   1. Apply heat (5 seconds, maximum) to the component lead on the backside of the board and remove the molten solder with a solder sipper.

2. Allow the board to cool completely between heatings and repeat step 1 as necessary.
3. Use long-nosed pliers to gently straighten the lead if it is bent. The lead must be as straight as possible.
4. If possible, cut the lead and remove all burrs by rounding or squeezing the lead with the long-nosed pliers.
5. Repeat steps 1 and 2 until the lead can be carefully broken loose from the hole.
6. Slowly and very gently remove the component from the board.
7. Carefully insert the replacement component. Be sure the lead is straight.
8. Apply heat (5 seconds, maximum) to the lead on the backside of the board and allow fresh solder to flow into the hole. Cut off any excess lead. Do not bend the lead.

5.6 ALIGNMENT PROCEDURES

Note

The following procedures tell how to change or reset adjustments R40, R59, R60, and R70. The adjustments have been made at the factory to optimize the performance of the amplifier. Under no circumstances should the following adjustments be made without first determining that the source of trouble is positively one of these adjustments. Indiscriminate adjustment or adjustment without the test equipment recommended will result in serious loss of equipment performance.

5.6.1 Initial Adjustments

Place the panel controls in the following positions:

INPUT LEVEL	Fully ccw
OUTPUT LEVEL	Fully ccw
GAIN CONTROL	AUTO
R60, R70	Maximum ccw
R40, R59	Approximately midposition
S3	(+ -) position
S4, S5	AM. position

Connect the equipment as shown in figure 5-1. Adjust the oscillator frequency to 1 kHz. With the attenuator set at 0 dB, adjust the oscillator output to +5 dB on the ac vtvm. Now adjust R10 and R11 of the 26U-3 fully cw.

Note

The output level of the oscillator is +5 dBm throughout these adjustments.

5.6.2 Distortion Alignment

Adjust R70 cw for +18 to +20 dBm at the output of the 26U-3. Adjust R69 for minimum distortion. Change the oscillator frequency to 50 Hz and adjust R40 for minimum distortion.

Note

A brief check should be made to be certain that the distortion null is obtained at the maximum output level, i.e., the output level will decrease when R40 is adjusted on either side of the distortion null. Return the oscillator to 1 kHz.

5.6.3 Clipping Threshold Adjust

Adjust R11 ccw for +10 dBm output. Now adjust R70 cw until both positive and negative peak clipping are just visible. Note this level on either the ac vtvm or the oscilloscope and reduce the output 1 dB by adjusting R70 ccw. Adjust the attenuator to 10 dB.

5.6.4 Meter Alignment

a. Adjust R59 so that the meter on the 26U-3 is approximately 10 percent of full scale.

Note

If prior to this adjustment the meter is reading completely downscale, adjust CR59 cw for 10 percent of full scale. If the meter is reading full scale, R59 must be rotated ccw for 10 percent of full scale.

b. Adjust R60 fully cw and readjust R59 for 0 dB reading on the meter.
c. Adjust R60 fully ccw. Adjust the attenuator to 0 dB. Adjust R60 cw for full scale reading.

5.6.5 Maximum Gain Adjustment

Adjust the attenuator to 10 dB. Place the GAIN CONTROL switch, S1, in the DISABLE position. Adjust R50 so that the meter reads zero scale. Return the GAIN CONTROL switch to the AUTO position.

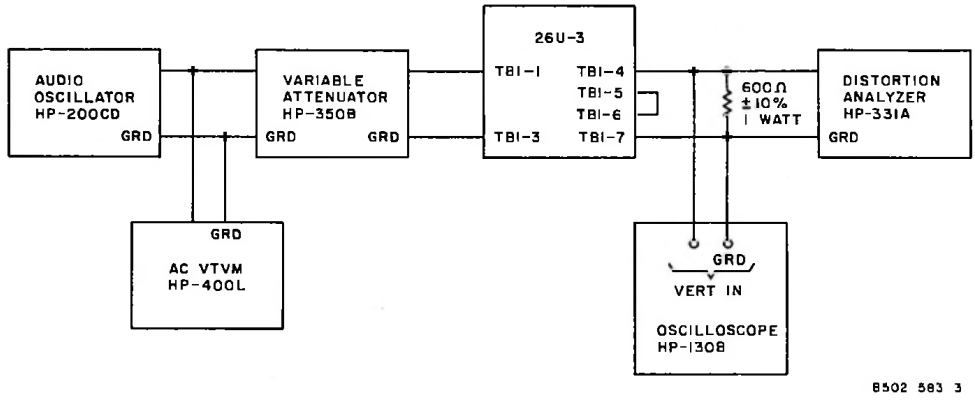


Figure 5-1. Test Equipment Setups.

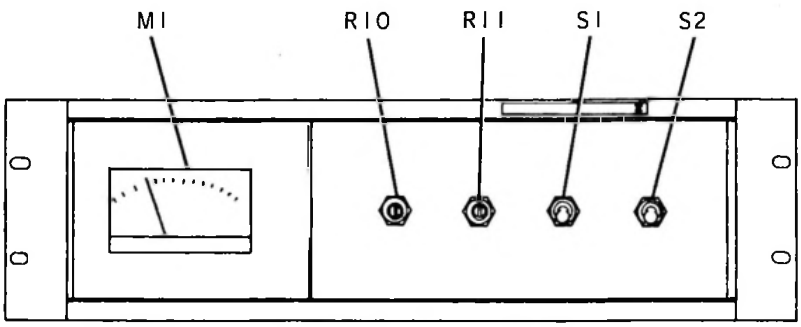
section 6
parts list

6.1 GENERAL

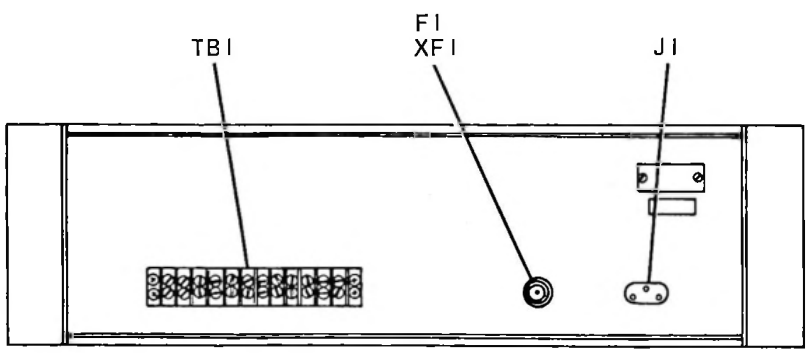
This section contains a list of all replaceable electrical, electronic, and critical mechanical parts for the 26U-3 Auto-Limiting Amplifier.

The manufacturers' codes appearing in the Mfr Code column of the parts list are listed in numerical order at the end of the parts list. The code list provides the manufacturer's name and address as shown in the Federal Supply Code for Manufacturers' Handbook H4-1. Manufacturers not listed in Handbook H4-1 are assigned a 5-letter code and appear first in the code list.

6.2 LIST OF EQUIPMENT



FRONT VIEW



REAR VIEW

B502 591 Bx

Figure 6-1. 26U-3 Auto-Limiting Amplifier (Sheet 1 of 2).

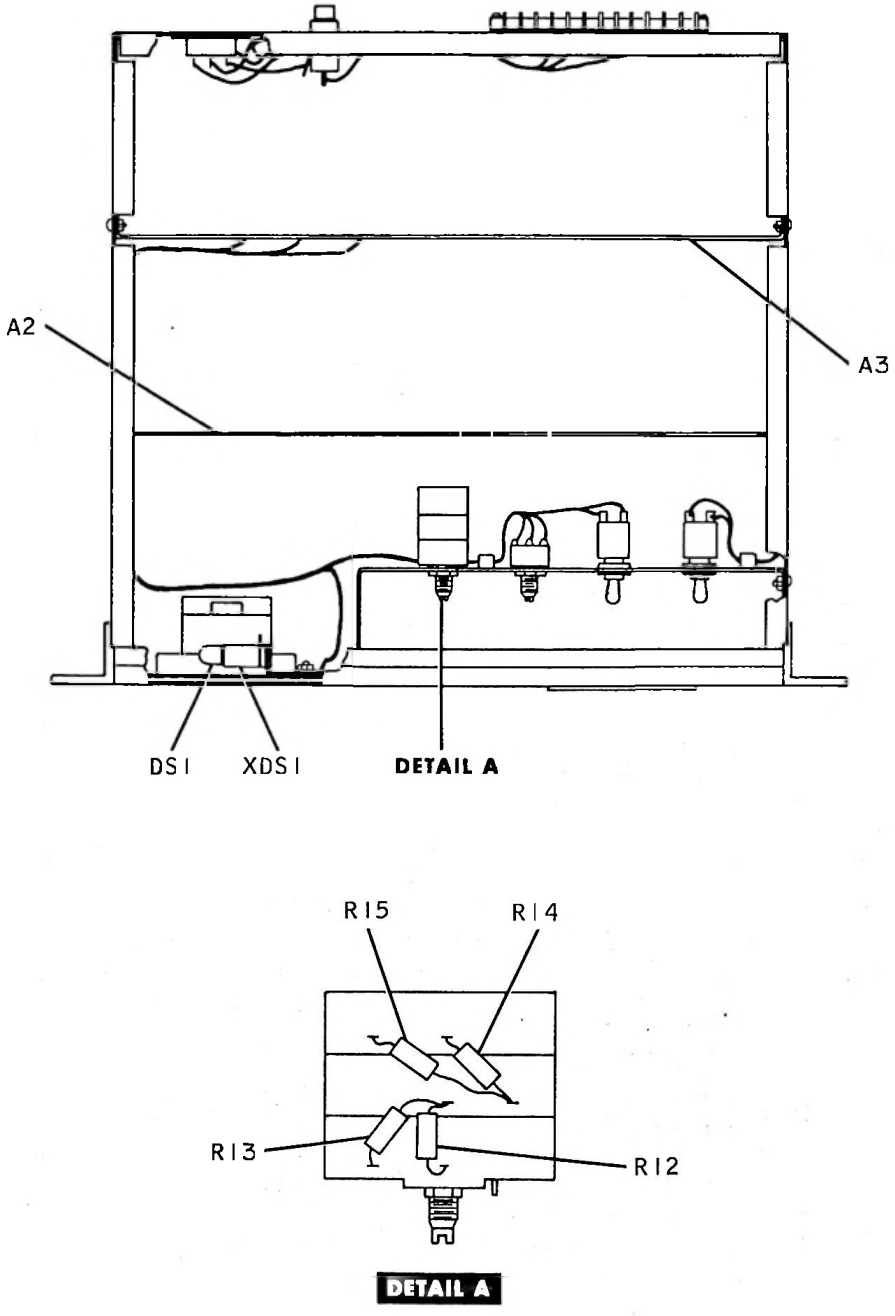
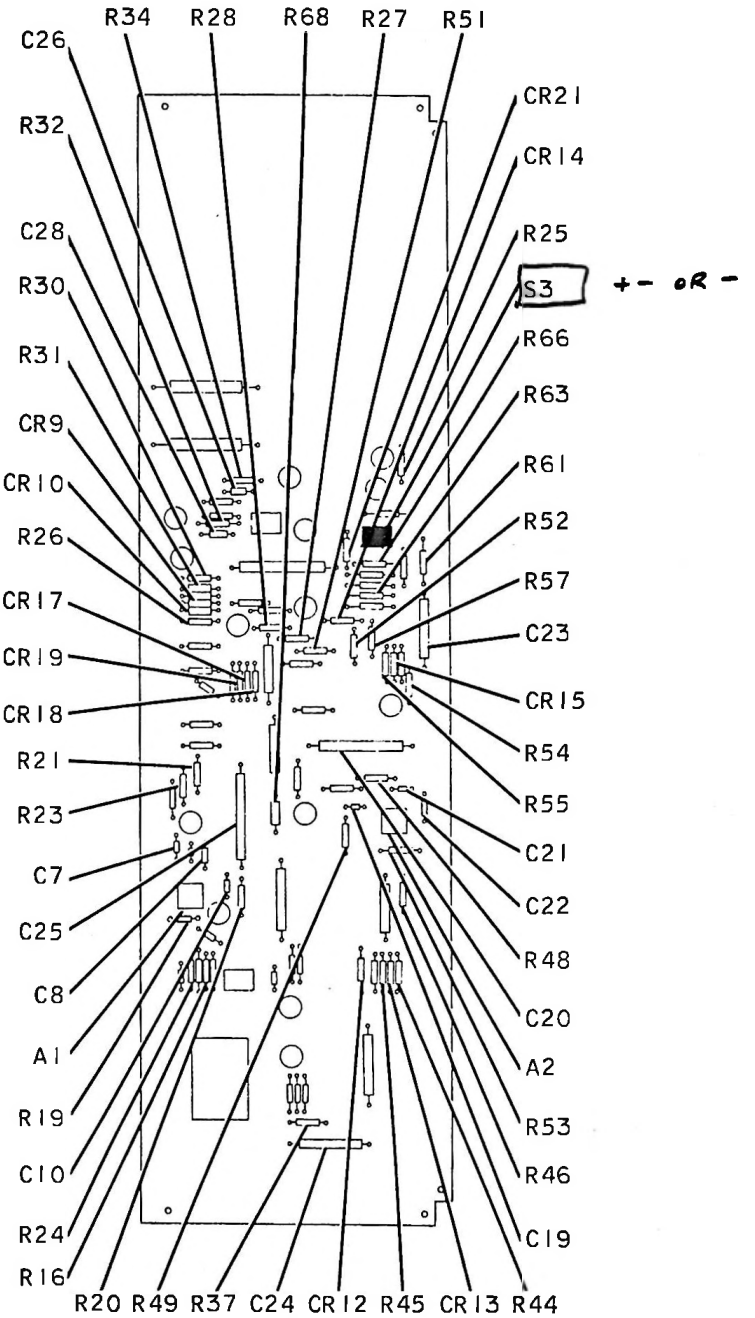


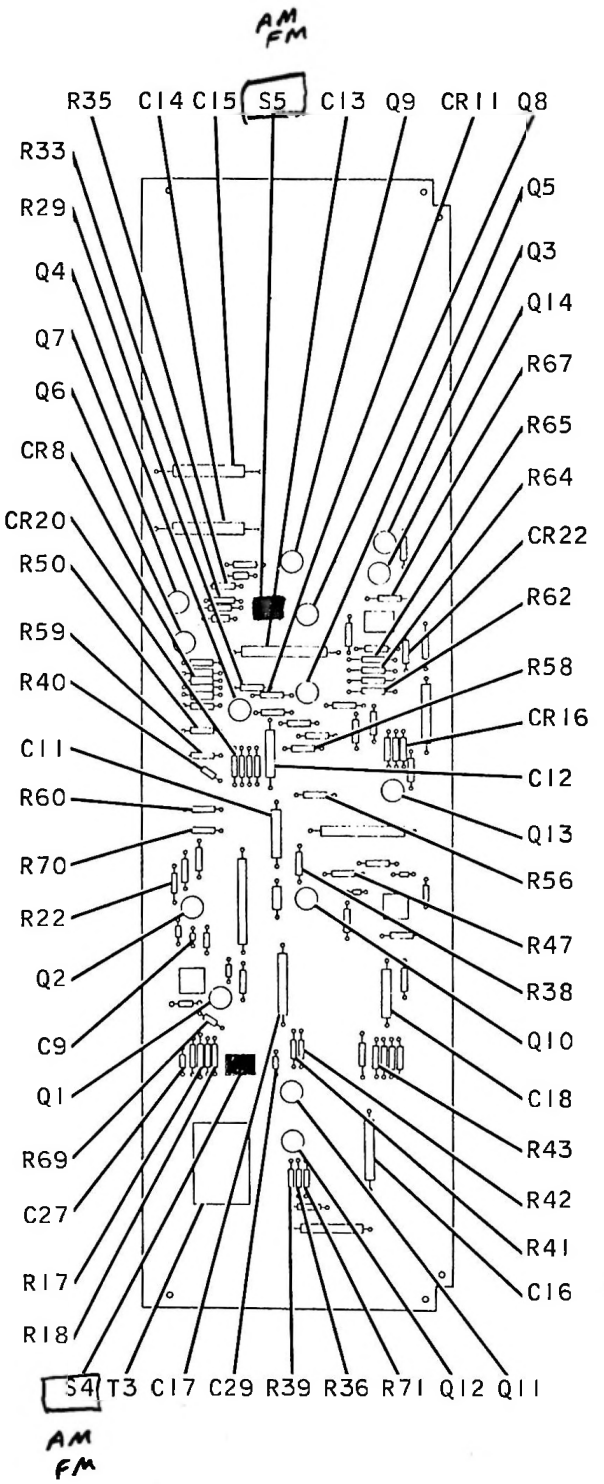
Figure 6-1. 26U-3 Auto-Limiting Amplifier (Sheet 2 of 2).

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
	26U-3 AUTO-LIMITING AMPLIFIER			758-5778-001
A1	NOT USED			
A2	PRINTED CIRCUIT BOARD SEE BREAKDOWN ON PAGE 6-5			786-1365-001
A3	POWER SUPPLY ASSEMBLY SEE BREAKDOWN ON PAGE 6-10			786-2719-001
DS1	LAMP, INCANDESCENT 0.04 AMP CURRENT RATING	MS25231-1819	96906	262-1863-000
F1	FUSE, CARTRIDGE 1/2 AMP CURRENT RATING	MDL1-2	71400	264-0293-000
J1	CONNECTOR, RECEPTACLE 3 CONTACTS	1061-1	87930	368-0207-000
M1	METER, AMP 0 TO 500 METER RANGE	37-6042-0000	80145	458-0379-020
R1 THROUGH R9	NOT USED			
R10	RESISTOR, VARIABLE 1K OHMS, 30% TOL, 1/4 WATT	LS9407	71450	376-4505-000
R11	ATTENUATOR, VARIABLE 600 OHMS, 15% TOL, 1 WATT	SP0-76-1987	76055	383-0069-000
R12	RESISTOR, FXD, COMPOSITION 300 OHMS, 5% TOL, 1/2 WATT	RC20GF301J	81349	745-1329-000
R13	SAME AS R12			
R14	SAME AS R12			
R15	SAME AS R12			
S1	SWITCH, TOGGLE SPDT CONTACT ARRANGEMENT	83053SF	04009	266-5171-000
S2	SAME AS S1			
TB1	TERMINAL BOARD 12 TERMINALS	670A3000-12	75382	367-1852-120
XDS1	LAMPHOLDER MINIATURE	LH22	81349	262-0913-000
XF1	FUSEHOLDER 30 AMP CURRENT RATING	HKPH	71400	265-1171-000



B502 613 Bx
A

Figure 6-2. Printed Circuit Board (Sheet 1 of 2).



B502 613 Bx
B

Figure 6-2. Printed Circuit Board (Sheet 2 of 2).

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
	PRINTED CIRCUIT BOARD			786-1365-001
A1	OPERATIONAL AMPLIFIER, 709C	U5B770939X	07263	351-7140-010
A2	SAME AS A1			
C1 THROUGH C6	NOT USED			
C7	CAPACITOR, FXD, MICA 560 UUF, 5% TOL, 500 VDCW	CM06FD561JO3	81349	912-2983-000
C8	CAPACITOR, FXD, CERAMIC 0.1 UF, 20% TOL, 100 VDCW	5C067104X0101B3	56289	913-4240-050
C9	CAPACITOR, FXD, MICA 22 UUF, 5% TOL, 500 VDCW	CM05ED220J03	81349	912-2768-000
C10	CAPACITOR, FXD, MICA 8200 UUF, 5% TOL, 500 VDCW	CM05ED470J03	81349	912-2792-000
C11	CAPACITOR, FXD, ELECTROLYTIC 100 UF, PLUS 75% MINUS 10%, 6 VDCW	D29329	56289	183-1168-000
C12	CAPACITOR, FXD, ELECTROLYTIC 15 UF, PLUS 75% MINUS 10%, 25 VDCW	D31549	56289	183-1164-000
C13	CAPACITOR, FXD, ALUMINUM 640 UF, PLUS 50% MINUS 10%, 16 VDCW	C437ARE640	73445	183-2355-080
C14	CAPACITOR, FXD, ALUMINUM 400 UF, PLUS 50% MINUS 10%, 40 VDCW	C437ARG400	73445	183-2355-160
C15	SAME AS C14			
C16	CAPACITOR, FXD, ELECTROLYTIC 10 UF, 10% TOL, 50 VDCW	CSR13G106ML	81349	184-9084-620
C17	SAME AS C16			
C18	CAPACITOR, FXD, ELECTROLYTIC 68 UF, 20% TOL, 30 VDCW	CL65CH680MP3	81349	184-8670-000
C19	CAPACITOR, FXD, MICA 390 UUF, 5% TOL, 500 VDCW	CM05FD391J03	81349	912-2858-000
C20	CAPACITOR, FXD, ALUMINUM 1000 UF, PLUS 50% MINUS 10%, 16 VDCW	C437ARE1000	73445	183-2355-090
C21	SAME AS C10			
C22	SAME AS C8			
C23	SAME AS C16			
C24	SAME AS C16			
C25	SAME AS C14			
C26	SAME AS C8			
C27	CAPACITOR, FXD, MICA 470 UUF, 5% TOL, 500 VDCW	CM06FD471J03	81349	912-2974-000
C28	CAPACITOR, FXD, MICA 8200 UUF, 5% TOL, 500 VDCW	CM07FD822J03	81349	912-2729-000
C29	CAPACITOR, FXD, MICA 180 UUF, 5% TOL, 500 VDCW	CM05FD181J03	81349	912-2834-000
CR1 THROUGH CR7	NOT USED			
CR8	SEMICONDUCTOR DEVICE, DIODE	1N483B	07688	353-2652-000
CR9 THROUGH CR13	SAME AS CR8			
CR14	SEMICONDUCTOR DEVICE, DIODE	1N935A	07688	353-3157-000
CR15 THROUGH CR20	SAME AS CR8			
CR21	SEMICONDUCTOR DEVICE, DIODE	1N914	07688	353-2906-000
CR22	SAME AS CR21			
Q1	TRANSISTOR	2N4353	07688	352-0751-010
Q2	TRANSISTOR	2N3567	07688	352-0629-010
Q3	TRANSISTOR	2N3638A	07688	352-0636-010
Q4	SAME AS Q3			
Q5	SAME AS Q2			
Q6	SAME AS Q2			
Q7	TRANSISTOR	2N2218	07688	352-0433-000

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
Q8	SAME AS Q3			
Q9	TRANSISTOR	2N904	07688	352-0610-030
Q10	SAME AS Q9			
Q11	SAME AS Q3			
Q12	SAME AS Q2			
Q13	TRANSISTOR	2N4121	07688	352-0743-010
Q14	SAME AS Q13			
R1 THROUGH R15	NOT USED			
R16	RESISTOR, FXD, COMPOSITION 2200 OHMS, 10% TOL, 1/4 WATT	RC07GF222K	81349	745-0761-000
R17	RESISTOR, FXD, FILM 150K OHMS, 1% TOL, 1/4 WATT	RN60D1503F	81349	705-3601-080
R18	RESISTOR, FXD, COMPOSITION 1K OHMS, 10% TOL, 1/4 WATT	RC07GF102K	81349	745-0749-000
R19	RESISTOR, FXD, COMPOSITION 1500 OHMS, 10% TOL, 1/4 WATT	RC07GF152K	81349	745-0755-000
R20	RESISTOR, FXD, COMPOSITION 47K OHMS, 10% TOL, 1/4 WATT	RC07GF473K	81349	745-0809-000
R21	RESISTOR, FXD, COMPOSITION 4700 OHMS, 10% TOL, 1/4 WATT	RC07GF472K	81349	745-0773-000
R22	RESISTOR, FXD, COMPOSITION 470 OHMS, 10% TOL, 1/4 WATT	RC07GF471K	81349	745-0737-000
R23	SAME AS R21			
R24	RESISTOR, FXD, COMPOSITION 390K OHMS, 10% TOL, 1/4 WATT	RC07GF394K	81349	745-0842-000
R25	RESISTOR, FXD, COMPOSITION 3300 OHMS, 10% TOL, 1/4 WATT	RC07GF332K	81349	745-0767-000
R26	RESISTOR, FXD, COMPOSITION 56K OHMS, 10% TOL, 1/4 WATT	RC07GF563K	81349	745-0812-000
R27	RESISTOR, FXD, COMPOSITION 39K OHMS, 10% TOL, 1/4 WATT	RC07GF393K	81349	745-0806-000
R28	RESISTOR, FXD, COMPOSITION 12K OHMS, 10% TOL, 1/4 WATT	RC07GF123K	81349	745-0788-000
R29	SAME AS R18			
R30	SAME AS R16			
R31	RESISTOR, FXD, COMPOSITION 10 OHMS, 10% TOL, 1/4 WATT	RC07GF100K	81349	745-0677-000
R32	RESISTOR, FXD, FILM 12.1K OHMS, 1% TOL, 1/4 WATT	RN60D1212F	81349	705-6648-000
R33	SAME AS R31			
R34	SAME AS R31			
R35	RESISTOR, FXD, COMPOSITION 15 OHMS, 10% TOL, 1/4 WATT	RC07GF150K	81349	745-0683-000
R36	RESISTOR, FXD, COMPOSITION 27K OHMS, 10% TOL, 1/4 WATT	RC07GF273K	81349	745-0800-000
R37	RESISTOR, FXD, COMPOSITION 15K OHMS, 10% TOL, 1/4 WATT	RC07GF153K	81349	745-0791-000
R38	RESISTOR, FXD, COMPOSITION 820 OHMS, 10% TOL, 1/4 WATT	RC07GF821K	81349	745-0746-000
R39	SAME AS R21			
R40	RESISTOR, VARIABLE 10K OHMS, 10% TOL, 3/4 WATT	77PR10K	73138	382-0012-100
R41	SAME AS R21			
R42	SAME AS R19			
R43	RESISTOR, FXD, COMPOSITION 10K OHMS, 10% TOL, 1/4 WATT	RC07GF103K	81349	745-0785-000
R44	SAME AS R43			
R45	RESISTOR, FXD, COMPOSITION 680 OHMS, 10% TOL, 1/4 WATT		81349	745-0743-000
R46	RESISTOR, FXD, COMPOSITION 1.5 MEGOHM, 10% TOL, 1/4 WATT	RC07GF155K	81349	745-0863-000
R47	SAME AS R21			
R48	SAME AS R20			
R49	RESISTOR, FXD, COMPOSITION 3900 OHMS, 10% TOL, 1/4 WATT	RC07GF392K	81349	745-0770-000
R50	RESISTOR, VARIABLE 2K OHMS, 10% TOL, 3/4 WATT	77PR2K	73138	382-0012-080

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
R51	RESISTOR, FXD, COMPOSITION 1800 OHMS, 10% TOL, 1/4 WATT	RC07GF182K	81349	745-0758-000
R52	SAME AS R51			
R53	RESISTOR, FXD, COMPOSITION 180 OHMS, 10% TOL, 1/4 WATT	RC07GF181K	81349	745-0722-000
R54	SAME AS R20			
R55	RESISTOR, FXD, COMPOSITION 270 OHMS, 10% TOL, 1/4 WATT	RC07GF271K	81349	745-0728-000
R56	RESISTOR, FXD, COMPOSITION 1200 OHMS, 10% TOL, 1/4 WATT	RC07GF122K	81349	745-0752-000
R57	SAME AS R45			
R58	SAME AS R22			
R59	RESISTOR, VARIABLE 1K OHMS, 10% TOL, 3/4 WATT	77PR1K	73138	382-0012-070
R60	SAME AS R50			
R61	RESISTOR, FXD, FILM 51.1K OHMS, 1% TOL, 1/4 WATT	RN60D5112F	81349	705-6678-000
R62	SAME AS R61			
R63	RESISTOR, FXD, FILM 2.15K OHMS, 1% TOL, 1/4 WATT	RN60D2151F	81349	705-6612-000
R64	RESISTOR, FXD, FILM 825 OHMS, 1% TOL, 1/4 WATT	RN60D8250F	81349	705-6592-000
R65	SAME AS R64			
R66	SAME AS R63			
R67	RESISTOR, FXD, COMPOSITION 33K OHMS, 10% TOL, 1/4 WATT	RC07GF333K	81349	745-0803-000
R68	SAME AS R55			
R69	SAME AS R40			
R70	RESISTOR, VARIABLE 25K OHMS, 10% TOL, 3/4 WATT	77PR25K	73138	382-0012-120
R71	RESISTOR, FXD, COMPOSITION 2200 OHMS, 10% TOL, 1/4 WATT	RC07GF222K	81349	745-0761-000
S1	NOT USED			
S2	NOT USED			
S3	SWITCH, SLIDE DPDT CONTACT ARRANGEMENT	G126-1	79727	266-6941-000
S4	SAME AS S3			
S5	SAME AS S3			
T1	NOT USED			
T2	NOT USED			
T3	TRANSFORMER, AUDIO FREQUENCY 500 VOLTS, 50 Hz to 15 kHz	124A31	11700	667-0187-020

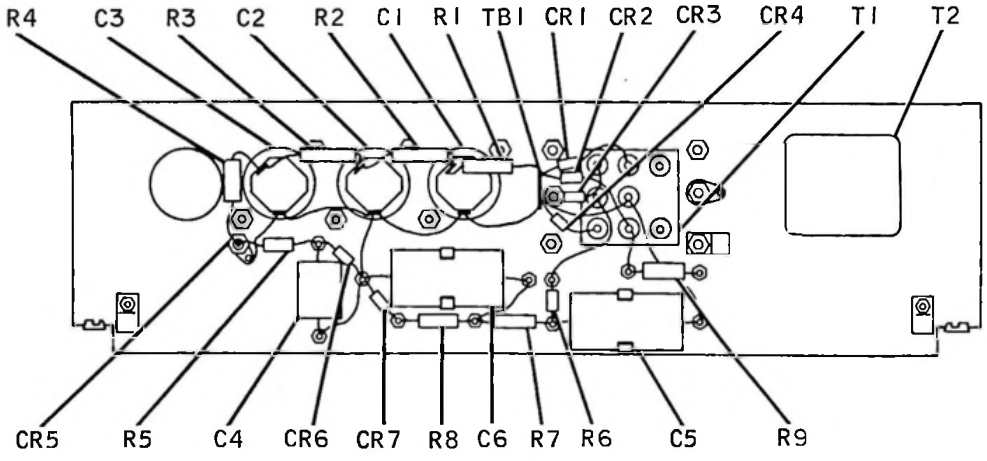


Figure 6-3. Power Supply Assembly.

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
	POWER SUPPLY ASSEMBLY			786-2719-001
C1	CAPACITOR, FXD, ELECTROLYTIC 1000 UF, PLUS 100% MINUS 10%, 50 VDCW	D33643	56289	183-1403-000
C2	SAME AS C1			
C3	SAME AS C1			
C4	CAPACITOR, FXD, ALUMINUM 1000 UF, PLUS 50% MINUS 10%, 16 VDCW	C437ARE1000	73445	183-2355-090
C5	CAPACITOR, FXD, ELECTROLYTIC 500 UF, PLUS 100% MINUS 10%, 50 VDCW	DEE500-5	56289	183-1309-000
C6	SAME AS C5			
CR1	SEMICONDUCTOR DEVICE, DIODE	1N4003	07688	353-6442-030
CR2 THROUGH CR4	SAME AS CR1			
CR5	SEMICONDUCTOR DEVICE, DIODE	1N2984B	07688	353-1365-000
CR6	SEMICONDUCTOR DEVICE, DIODE	1N963B	07688	353-3174-000
CR7	SEMICONDUCTOR DEVICE, DIODE	1N3022B	07688	353-3127-000
R1	RESISTOR, FXD, WIREWOUND 10 OHMS, 10% TOL, 5 WATTS	PW5-10R0-10	07716	710-9106-000
R2	RESISTOR, FXD, WIREWOUND 20 OHMS, 10% TOL, 7 WATTS	PW7-20-10PCT	07716	710-9003-000
R3	SAME AS R2			
R4	SAME AS R1			
R5	RESISTOR, FXD, COMPOSITION 680 OHMS, 10% TOL, 1/2 WATT	RC20GF681K	81349	745-1345-000
R6	RESISTOR, FXD, COMPOSITION 10 OHMS, 10% TOL, 2 WATTS	RC42GF100K	81349	745-5568-000
R7	RESISTOR, FXD, COMPOSITION 68 OHMS, 10% TOL, 2 WATTS	RC42GF680K	81349	745-5603-000
R8	SAME AS R7			
R9	RESISTOR, FXD, COMPOSITION 1200 OHMS, 10% TOL, 2 WATTS	RC42GF122K	81349	745-5656-000
T1	TRANSFORMER, PWR, STEP-DOWN 50/60 HZ	36659	73386	662-0048-000
T2	TRANSFORMER, AUDIO FREQUENCY 20 HZ TO 15 KHZ RESPONSE	A17088	70674	667-0197-010
TB1	TERMINAL STRIP 2 TERMINALS	1513A	71785	306-2220-000

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
	MANUFACTURERS CODES			
CODE	MANUFACTURER			
04009	ARROW-HART AND HEGEMAN ELECTRIC CO HARTFORD CONN 06106			
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP SEMICONDUCTOR DIVISION MOUNTAIN VIEW, CALIF			
07688	JOINT ELECTRON DEVICE ENGINEERING COUNCIL WASHINGTON, D C			
07716	I R C INC. BURLINGTON, IOWA 52601			
56289	SPRAGEU ELECTRIC CO ADAMS, MASS 01247			
70674	ADC PRODUCTS, INC MINNEAPOLIS, MINN 55426			
71400	BUSSMANN MFG, DIVISION OF MCGRAW-EDISON CO ST LOUIS, MO 63017			
71450	CTS CORP ELKHART IND. 46514			
71785	CINCH MFG CO AND HOWARD B JONES DIV CHICAGO, ILL 60624			
73138	HELIPOT DIVISION OF BECKMAN INSTRUMENTS INC FULLERTON, CALIF 92634			
73386	FREED TRANSFORMER CO INC BROOKLYN, N.Y. 11227			
73445	AMPEREX ELECTRONIC CORP HICKSVILLE LONG ISLAND, N.Y. 11801			
75382	KULKA ELECTRIC CORP MT VERNON, N.Y. 10550			
76055	MALLORY CONTROLS, DIVISION OF MALLORY P R AND CO INC FRANKFORT IND			
79727	CONTINENTAL-WIRT ELECTRONICS CORP PHILADELPHIA, PA			
80145	ASSEMBLY PRODUCTS INC. CHESTERLAND, OHIO 44026			
81349	MILITARY SPECIFICATIONS			
87930	TOWER MFG CORP PROVIDENCE, R.I. 02903			
96906	MILITARY STANDARDS			

section 7
illustrations

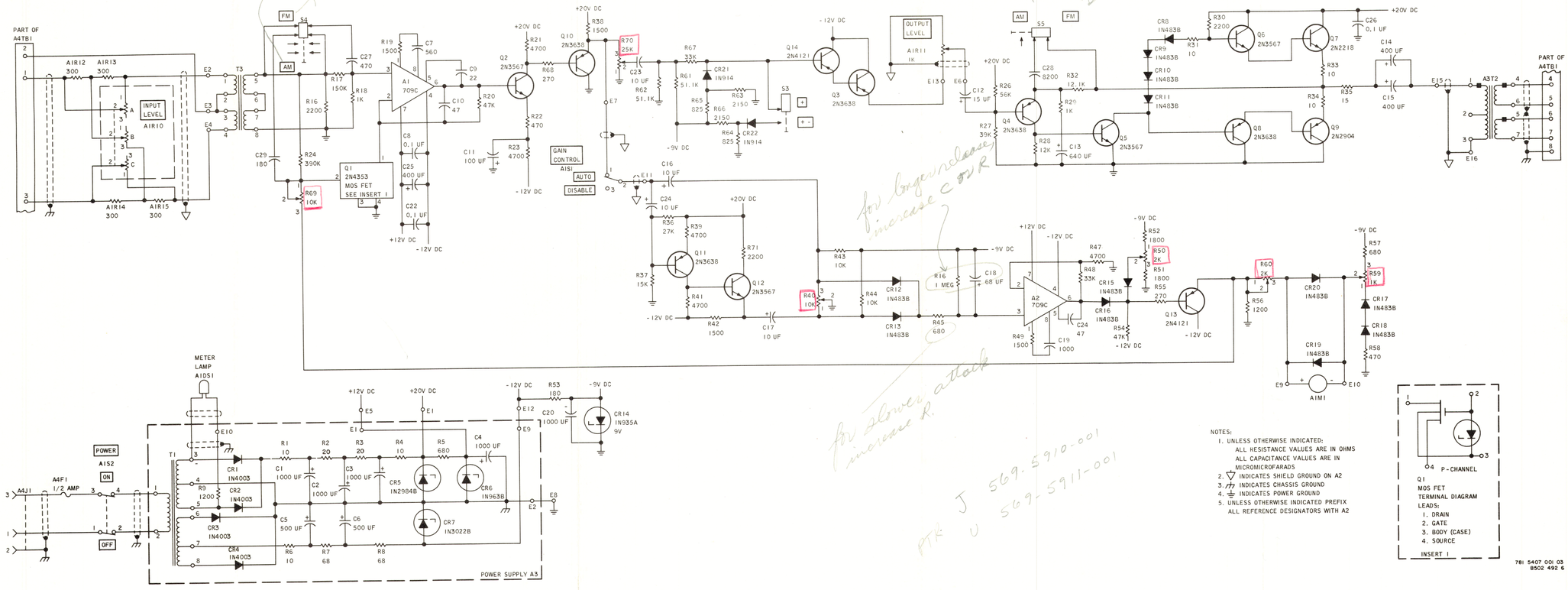


Figure 7-1. 26U-3 Auto-Limiting Amplifier, Schematic Diagram.

COLLINS

COLLINS RADIO COMPANY

CEDAR RAPIDS, IOWA - DALLAS DIVISION

PRODUCTION TEST SPECIFICATION

FOR

AUTO-LIMITING AMPLIFIER 26U-3

CPN 758-5778-001

26 U-3

APPROVED BY

PROJECT ENGINEER	T.B. Thiessen	DATE 7/3/68
ENGINEERING GROUP HEAD	E. Bowlen	DATE 7-4-68
QUALITY ASSURANCE	O.M. Wilcox	DATE 7-16-68
MANUFACTURING	L.R. Tapscott	DATE 7/22/68

		01 F. DATE		10 F. DATE		246525 F. DATE		F. DATE	
0		2 AUG 1968		Bpl					
A	T99102	6-18 69		HM					
SYM	REV.NO	DATE	SH.REV	APPD	SYM	REV.NO	DATE	SH.REV	APPD

REVISION DATA

CODE IDENT NO. 13499

569-5911-001

SHEET 1 OF 10

074-9618-300 (8-67)

1.0 SCOPE

These Production Test Specifications apply to the Collins Type 26U-3 Auto-Limiting Amplifier, Part No. 758-5778-001.

2.0 REFERENCE INFORMATION

2.1 Specifications:

Equipment Specification, CPN 568-5157-001
Type Test Specification, CPN 570-8329-001

2.2 Publications:

Instruction Book, CPN 523-0561449

2.3 Drawings:

Schematic Diagram, CPN 781-5407-001

2.4 Definitions:

(a) Attack Time: The time required for the output signal to recover to 125% of its original level from a step input of +6 db at 1 kHz.

(b) Release Time: The time required for the output to recover to 70% of its original level from a step input of - 6 db at 1 kHz.

(c) Maximum Gain: The fixed gain of the unit when the GAIN CONTROL switch is in the DISABLE position.

3.0 TEST EQUIPMENT REQUIRED

The following equipments or their equivalents are required to perform the specified tests:

1. Wide Range Oscillator, Hewlett Packard Model 200CD
2. Distortion Analyzer, Hewlett Packard Model 331A
3. Oscilloscope, Hewlett Packard Model 130B
4. Attenuator Set, Hewlett Packard Model 350B

DCN CONTROL

4.0 TEST CONDITIONS

Unless otherwise specified, all tests shall be performed under the following conditions.

4.1 Primary Power:

117 VAC ±10%, 50-60 Hz, single phase.

4.2 Ambient Temperature:

Normal factory ambient.

4.3 Ambient Humidity:

Normal factory ambient.

4.4 Ambient Atmospheric Pressure:

Normal factory ambient.

4.5 Shielding and Isolation Requirements:

None.

4.6 Operational Duty Cycle:

Continuous.

4.7 Warm-up Period:

Five (5) minutes.

5.0 PRELIMINARY TESTS

5.1 Visual Inspection:

The unit shall be visually inspected to insure that there are no damaged components or shorted or "cold" solder connections. Ascertain that all required markings are present.

5.2 Fusing:

Determine that F1 (1/2 amp) is in place.

5.3 Meter Protection:

Adjust R60, R70 maximum CCW.
Adjust R40 and R59 for approximate mid-position.
Adjust R10 (Input Level) and R11 (Out Level) to the maximum CCW position.
Place S1 (Gain Control) in the AUTO position.
Place S3 in the +- position.
Place S4, S5 in the AM position.

6.0 INITIAL ADJUSTMENTS

6.1 Initial Setup:

Connect the equipment as shown in Figure 1. (Note: S1 of Figure 1 will remain in the ATTENUATE position except for the test prescribed in paragraph 7.7.) Adjust the oscillator frequency to 1 kHz. With the attenuator set at 0 db adjust the oscillator output to +5 db on the ACVM of the HP 331A. Now adjust R10, 11, of the 26U-3 to the maximum CW position.

Note: The output level of the oscillator is +5 dbm throughout this specification.

6.2 Distortion Alignment:

Adjust R70 clockwise for +18-20 dbm at the output of the 26U-3. Adjust R69 for minimum distortion. Change the oscillator frequency to 50 Hz and adjust R40 for minimum distortion. Note: A brief check should be made to be certain that the "distortion null" is obtained at the maximum output level, i.e., the output level will decrease when R40 is adjusted on either side of the distortion null. Return the oscillator to 1 kHz.

6.3 Clipping Threshold Adjust:

Adjust R11 CCW for +10 dbm output. Now adjust R70 CW until both positive and negative peak clipping are just visible. Note this level on either the ACVM or the oscilloscope and reduce the output 1 db by adjusting R70 CCW. Adjust the attenuator to 10 db.

6.4 Meter Alignment:

Step 1: Adjust R59 so that the meter on the 26U-3 is approximately 10% full scale. (Note: If prior to this adjustment the meter is reading completely down-scale adjust R59 CW for 10% full scale. If the meter is reading full scale R59 must be rotated CCW for 10% full scale.)

Step 2: Adjust R60 fully CW and readjust R59 for 0 db reading on the meter.

Step 3: Adjust R60 fully CCW. Adjust the attenuator to 0 db. Adjust R60 CW for full scale reading.

6.5 Maximum Gain Adjustment:

Adjust the attenuator to 10 db. Place the GAIN CONTROL switch, S1, in the DISABLE position. Adjust R50 so that the meter reads zero scale. Return the GAIN CONTROL switch to the AUTO position.

7.0 TEST REQUIREMENTS

Unless specified otherwise, all tests shall be performed with the INPUT LEVEL control in the maximum CW position.

7.1 Preliminary Test:

Preliminary tests as outlined in para. 5.

7.2 Initial Adjustments:

Initial adjustments as outlined in para. 6.

7.3 Frequency Response and Distortion (Fixed Gain):

Adjust the attenuator to 10 db. Adjust the oscillator to 1 kHz and a level of +5 dbm. Place the GAIN CONTROL switch in the DISABLE position. Adjust the OUTPUT LEVEL control for +20 dbm output. Keeping the Audio Oscillator output constant, measure the output level and the amount of harmonic distortion at the following frequencies: 50 Hz, 100 Hz, 1 kHz, 5 kHz, 10 kHz, 15 kHz. Return the GAIN CONTROL switch to the AUTO position.

7.4 Dynamic Distortion (AGC):

In performing the distortion tests as specified below, maintain a constant +20 dbm output from the 26U-3 by adjusting the OUTPUT LEVEL control as required. Measure the total harmonic distortion at the output with the attenuator set at 5 db and 0 db at each of the following frequencies: 50 Hz, 1 kHz, 10 kHz, 15 kHz.

7.5 Compression Ratio:

Adjust the Audio Oscillator to 1 kHz and the attenuator to 10 db. Adjust the OUTPUT LEVEL control of the 26U-3 for +10 dbm output. Adjust the attenuator to 0 db and measure the output of the 26U-3.

7.6 Noise Level:

Adjust the attenuator to 10 db. Place the GAIN CONTROL switch in the DISABLE position. Adjust the 26U-3 OUTPUT LEVEL control for +10 dbm. Disconnect the Audio Oscillator and measure the 26U-3 output level. Return the GAIN CONTROL switch to the AUTO position and reconnect the oscillator.

7.7 Release Time:

Adjust the attenuator to 6 db. With S1 in the BYPASS position adjust the vertical sensitivity of the oscilloscope so that the waveform occupies 10 cm on the screen. Adjust the oscilloscope trigger mode to EXT. NEG. Adjust the horizontal sweep rate to 50 ms/cm. Switch S1 to the ATTENUATE position and measure the time required for the waveform to reach 7 cm p-p.

7.8 FM Mode Frequency Response:

Adjust the attenuator to 30 db. Place S4, S5 in the FM position. Place the GAIN CONTROL switch, S1, in the DISABLE position. With the oscillator set at 1 kHz, adjust the OUTPUT LEVEL control of the 26U-3 for 0 dbm at the output of the 26U-3. Maintaining +5 dbm at the output of the oscillator, measure the output of the 26U-3 at the following frequencies: 50 Hz, 100 Hz, 500 Hz, 1 kHz, 5 kHz, 10 kHz, 15 kHz. Return the GAIN CONTROL switch to the AUTO position. Adjust both the INPUT and OUTPUT LEVEL controls to the maximum CCW position.

S/N _____
Date _____
Technician _____

8.0 TEST DATA FOR COLLINS 26J-3

		Test Results	Test Limits
8.1	Preliminary Tests:		
8.1.1	Visual Inspection:		
	No damaged components	_____	Check
	Soldering acceptable	_____	Check
	Required markings present	_____	Check
8.1.2	Fusing:		
	F1 (1/2 amp) in place	_____	Check
8.1.3	Meter Protection:		
	R60 max. CCW	_____	Check
	R40, R59 mid-position	_____	Check
	R10, R11 max. CCW	_____	Check
	S1 (Gain Control) in AUTO	_____	Check
8.2	Initial Adjustments:		
8.2.1	Initial Setup:		
	Para. 6.1 complete	_____	Check
8.2.2	Distortion Alignment:		
	R69 adjusted for min. dist.	_____	NMT 0.7%
	R40 adjusted for min. dist. (50 Hz)	_____	NMT 1.0%
8.2.3	Clipping Level Adjustment		
	R70 adjusted 1 db below clipping	_____	Check
8.2.4	Meter Alignment:		
	Meter zero at 10 db setting	_____	Check
	Meter full-scale at 0 db setting	_____	Check

S/N _____
Date _____
Technician _____

8.2.5 Maximum Gain Adjustment:

	Test Results	Test Limits
S1 in DISABLE position	_____	Check
R50 adjusted for zero meter scale	_____	Check

8.3 Frequency Response and Distortion (Fixed Gain):

Frequency	Test Results: Output Level	Test Results: Distortion	Test Limits: Output Level	Test Limits: Distortion
50 Hz	_____ dbm	_____ %	20 dbm ±1 db	1.0% max.
100 Hz	_____ dbm	_____ %	20 dbm ±1 db	1.0% max.
1 kHz	_____ dbm	_____ %	20 dbm ±1 db	1.0% max.
5 kHz	_____ dbm	_____ %	20 dbm ±1 db	1.0% max.
10 kHz	_____ dbm	_____ %	20 dbm ±1 db	1.0% max.
15 kHz	_____ dbm	_____ %	20 dbm ±1 db	1.0% max.

8.4 Dynamic Distortion:

Attenuator Setting	TEST RESULTS FREQUENCY 50 Hz	1 kHz	10 kHz	15 kHz	Test Limits
5	___ %	___ %	___ %	___ %	1.0% max.
0	___ %	___ %	___ %	___ %	1.0% max.

8.5 Compression Ratio:

Attenuator	Test Results	Test Limits
10 db	_____ ( )	+10 dbm (Ref)
0 db	_____ dbm	+10 to +11 dbm

8.6 Noise Level:

	Test Results	Test Limits
Output with atten. at 10 db	_____ ( )	+10 dbm
Output with osc. disconnected	_____ dbm	-50 dbm max.

S/N _____
Date _____
Technician _____

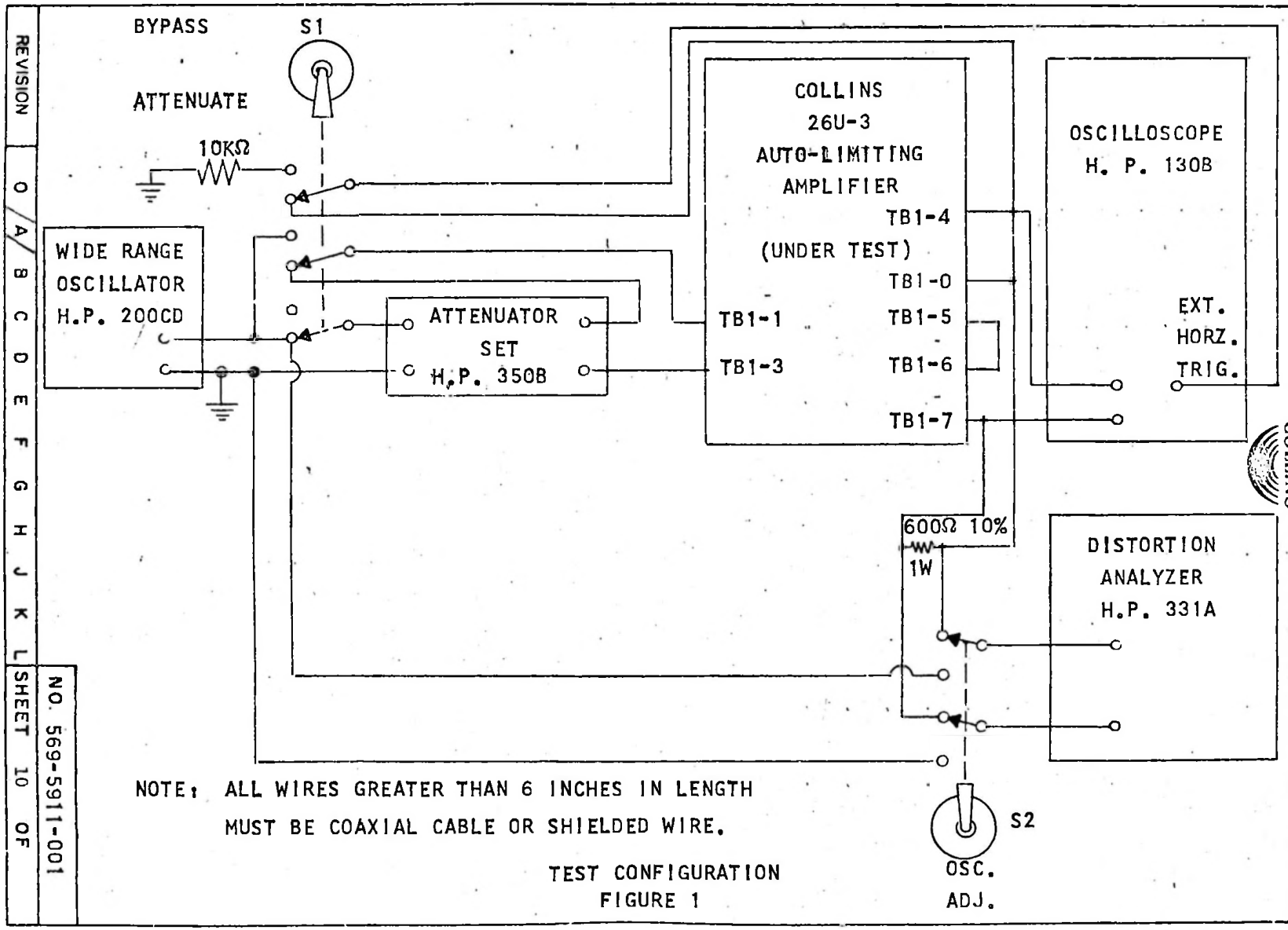
8.7	Release Time:	Test Results	Test Limits
	Elapsed time for 7 cm recovery	_____ ms	100-200 ms

8.8 FM Mode Frequency Response:

Frequency	Test Results
50 Hz	_____ dbm
100 Hz	_____ dbm
500 Hz	_____ dbm
1 kHz	_____ dbm
10 kHz	_____ dbm
15 kHz	_____ dbm

Test Limits

Maximum level _____ minus minimum level _____ = _____ NMT 1 db



NOTE: ALL WIRES GREATER THAN 6 INCHES IN LENGTH MUST BE COAXIAL CABLE OR SHIELDED WIRE.

TEST CONFIGURATION
FIGURE 1