



356P-1 Program Amplifier

unit instructions

Collins Radio Company | Dallas, Texas

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1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 356P-1 Program Amplifier (figure 1) is a seven-stage, high-fidelity audio amplifier. The unit is normally used in an audio console as the program output source.

1.2 Unit Description

The 356P-1 (figure 3) consists of an input transformer, a nine-transistor amplifier with a level control, an input switch, and associated components on a plug-in, etched circuit card. It has two direct and two switched inputs. Remotely controlled photoconductive devices accomplish switching and level control. An external capacitor and transformer are required for proper operation. The capacitor and transformer are not supplied with the 356P-1, but are normally installed in the console.

Caution

Be sure the external capacitor and transformer are connected as shown in figure 3 before energizing the equipment. Otherwise, the amplifier may be damaged.

2. UNIT CHARACTERISTICS

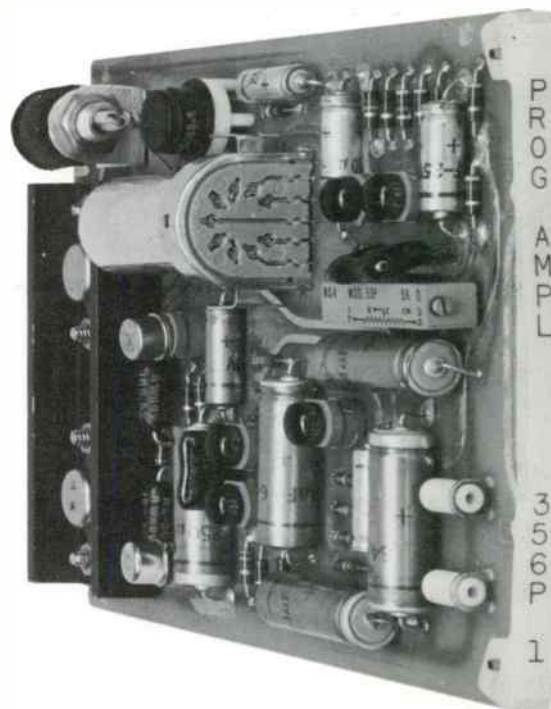
2.1 Physical Characteristics

Size:
4 by 6 by 1 inches

Weight:
9 ounces

Type of Construction:
Etched circuit card

Type of Mounting:
22-contact card receptacle
(CPN 372-7009-000)



B502-013-Pb

Figure 1. 356P-1 Program Amplifier

2.2 Operating Characteristics

Ambient Service Conditions:

Temperature
0° to 50°C (32° to 122°F)

Relative Humidity
Up to 95%

Altitude
Up to 10,000 feet above msl

Type of Service:
Continuous

2.3 Electrical Characteristics

Power Requirements:

47 volts dc at 150 ma, 5 mv pp maximum ripple
6 volts dc at 60 ma, regulated, 5 mv pp maximum ripple
4 volts dc at 40 ma, regulated, 5 mv pp maximum ripple

Input Impedance:

One 600 ohms, balanced
Two 600 ohms, unbalanced
One 150 ohms, unbalanced

Input Level:

-45 dbm nominal
-25 dbm, maximum

Output Impedance:

30 Ohms From Card
150/600 ohms with an external transformer and capacitor

Simulcast Output
5K, approximately

Output Level:

+24 dbm, maximum (with transformer and capacitor)

Simulcast Output
*-30 db, maximum

Gain:
63 db

*0 db = 0.775 volt across any impedance.

Frequency Response:

30 to 15,000 Hz ± 0.5 db (referred to 1,000 Hz)

Distortion:

0.5%, maximum

3. CIRCUIT DESCRIPTION

The 356P-1 (figure 3) consists of four input circuits and seven-stage amplifier with a photoconductive level control. An external output transformer and capacitor are required for proper operation.

Two direct and two switched inputs connect to transistor Q1. Photoconductive switch RV1 switches two of the inputs simultaneously.

Transistors Q1 and Q2 are class A amplifiers. Remotely controlled level control RV2 shunts the signal path. Cascaded emitter followers Q3 and Q4 match the input impedance of transistor Q5 which drives the phase inverter, Q6 and Q7. The phase inverter drives the class AB power amplifier, Q8 and Q9. Silicon diodes CR1, CR2, and CR3 provide the bias for transistors Q6 and Q7. The external capacitor charged by conduction through Q8 supplies the operating voltage for transistor Q9. The external transformer in series with the capacitor matches the impedance of the amplifier to the load.

The photoconductive level control consists of a photocell and a 6-volt lamp sealed in a can. The resistance of the photocell, shunting the signal path, decreases as the voltage applied to the lamp is increased. The photoconductive switch consists of a photocell and a 4-volt lamp sealed in a can. The resistance of the photocell is approximately 13 megohms when the lamp is off, and 380 ohms when the lamp is on.

4. MAINTENANCE

4.1 Troubleshooting

When trouble is suspected in the 356P-1, replace the card with a spare, if available. If the replacement card remedies the problem, visually inspect the defective card for loose connections and signs of component damage. If no faults are found, extend the card on the card extender and check for the dc voltages and ac signal levels indicated on the schematic diagram.

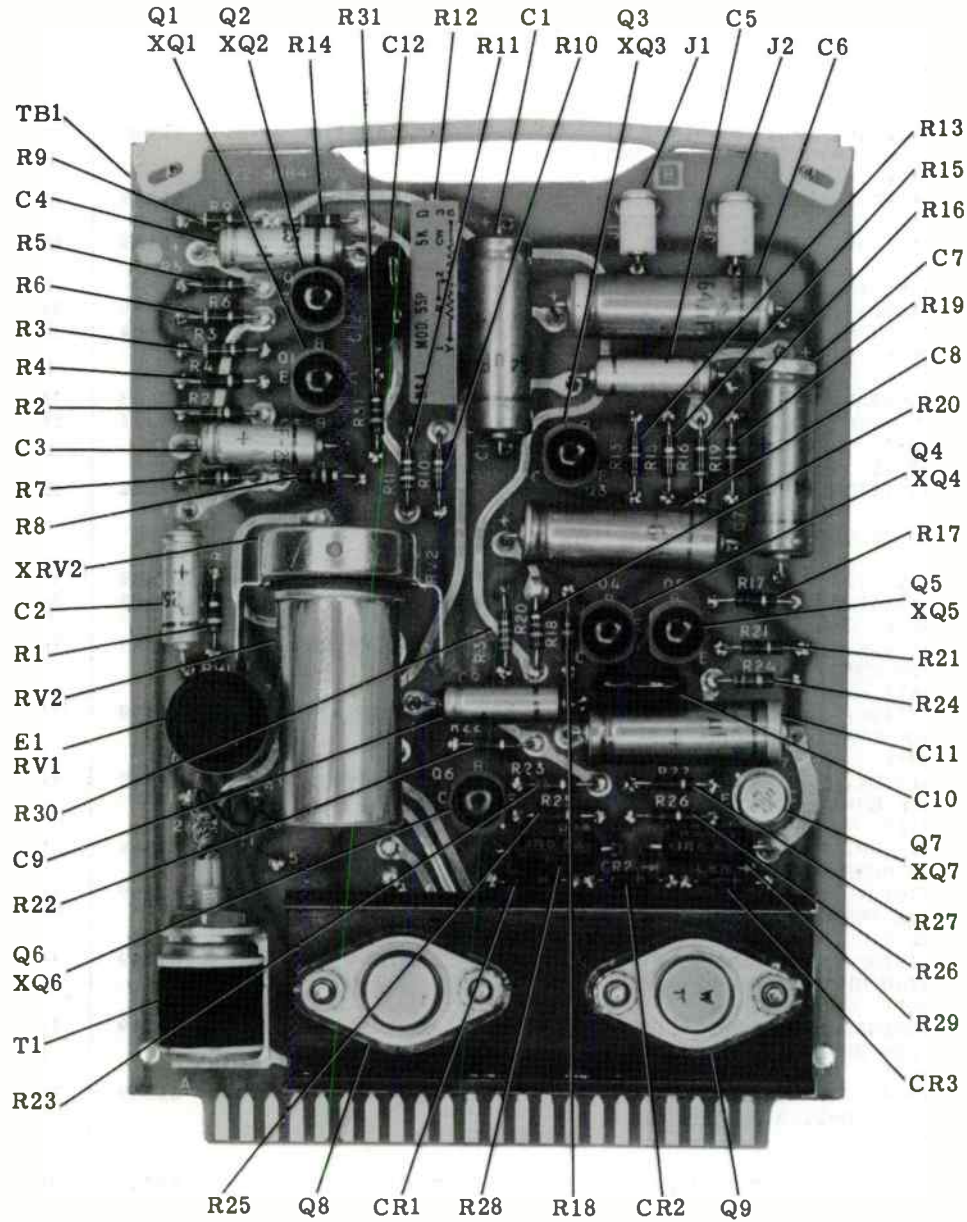
Caution

When making repairs, do not use a soldering iron rated at more than 40 watts. Do not jar the card to remove excess solder. Jarring the card may damage the lamp filaments in the photoconductive devices.

4.2 Spare Parts

Spare parts may be ordered from the following address:

Collins Radio Company
Service Parts Department
Dallas, Texas 75207



B502-031-Pb

Figure 2. 356P-1 Program Amplifier, Front View

PARTS LIST

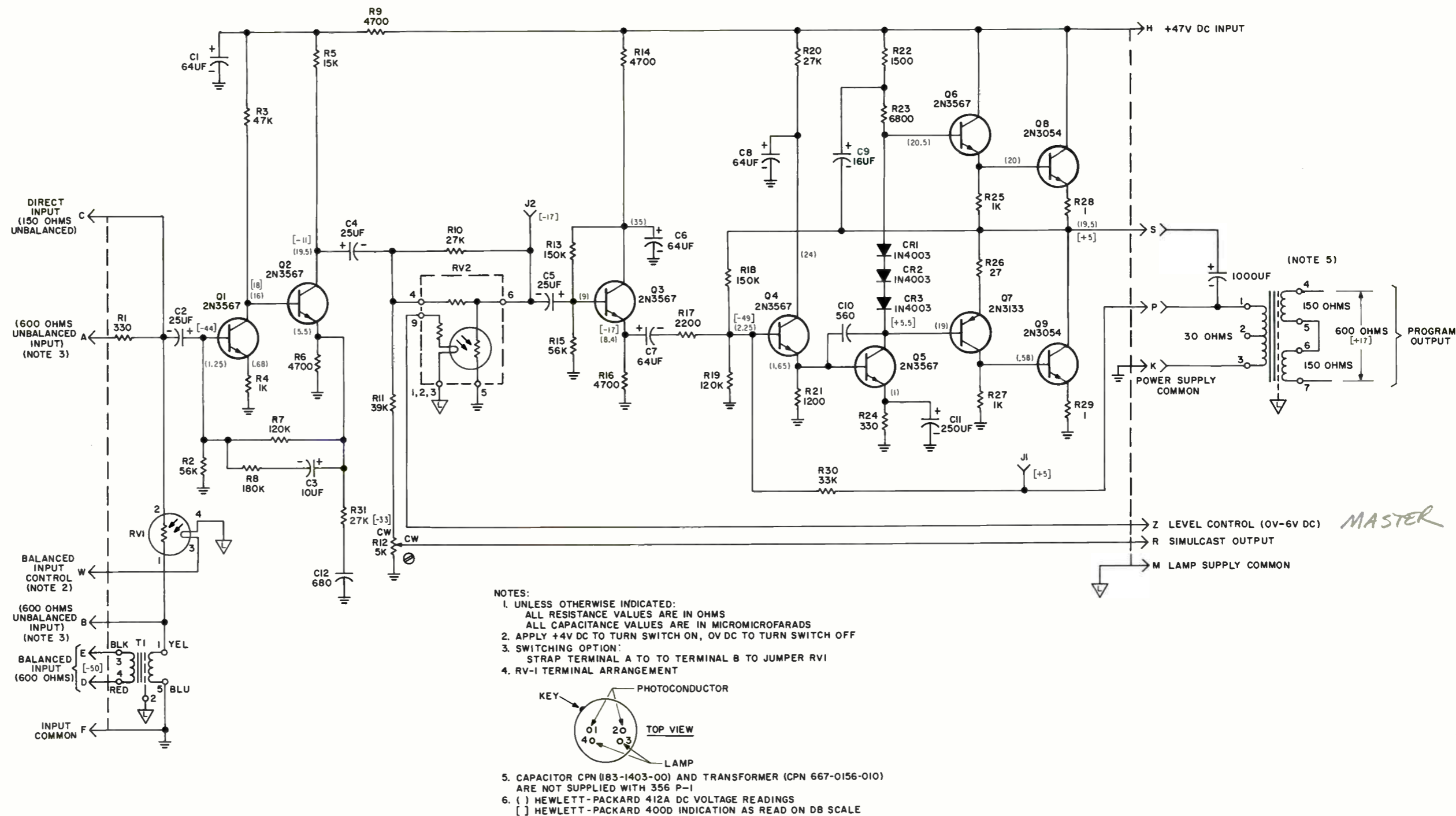
SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
356P-1 PROGRAM AMPLIFIER				522-3884-001
C1	CAPACITOR, FXD, ALUMINUM 64 UF, MINUS 10% PLUS 50%, 64 VDCW	C437ARH64	73445	183-2355-110
C2	CAPACITOR, FXD, ALUMINUM 25 UF, MINUS 10% PLUS 50%, 25 VDCW	C426ARF25	73445	183-2354-180
C3	CAPACITOR, FXD, ALUMINUM 10 UF, MINUS 10% PLUS 50%, 25 VDCW	C426ARF10	73445	183-2354-170
C4	SAME AS C2			
C5	SAME AS C2			
C6	SAME AS C1			
C7	SAME AS C1			
C8	SAME AS C1			
C9	CAPACITOR, FXD, ALUMINUM 16 UF, MINUS 10% PLUS 50%, 40 VDCW	C426ARG16	73445	183-2354-230
C10	CAPACITOR, FXD, MICA 560 UUF, 5% TOL, 500 VDCW	CM06F561J03	81349	912-2983-000
C11	CAPACITOR, FXD, ALUMINUM 250 UF, MINUS 10% PLUS 50%, 16 VDCW	C437ARE250	73445	183-2355-060
C12	CAPACITOR, FXD, MICA	CM06F681J03	81349	912-2989-000
CR1	SEMICONDUCTOR DEVICE, DIODE	1N4003	07688	353-6442-030
CR2	SAME AS CR1			
CR3	SAME AS CR1			
E1	INSULATOR, DISK	7720-4N	13103	352-9552-540
J1	JACK, TIP WHITE	SKT103PC	98291	360-0172-000
J2	SAME AS J1			
Q1	TRANSISTOR	2N3567	07688	352-0629-010
Q2				
THROUGH	SAME AS Q1			
Q6				
Q7	TRANSISTOR	2N3135	07688	352-0591-010
Q8	TRANSISTOR	2N3054	07688	352-0581-010
Q9	SAME AS Q8			
R1	RESISTOR, FXD, COMPOSITION 330 OHMS, 10% TOL, 1/4 WATT	RC07GF331K	81349	745-0731-000
R2	RESISTOR, FXD, COMPOSITION 56K OHMS, 10% TOL, 1/4 WATT	RC07GF563K	81349	745-0812-000
R3	RESISTOR, FXD, COMPOSITION 47K OHMS, 10% TOL, 1/4 WATT	RC07GF473K	81349	745-0809-000
R4	RESISTOR, FXD, COMPOSITION 1K OHMS, 10% TOL, 1/4 WATT	RC07GF102K	81349	745-0749-000
R5	RESISTOR, FXD, COMPOSITION 15K OHMS, 10% TOL, 1/4 WATT	RC07GF153K	81349	745-0791-000
R6	RESISTOR, FXD, COMPOSITION 4700 OHMS, 10% TOL, 1/4 WATT	RC07GF472K	81349	745-0773-000
R7	RESISTOR, FXD, COMPOSITION 120K OHMS, 10% TOL, 1/4 WATT	RC07GF124K	81349	745-0824-000
R8	RESISTOR, FXD, COMPOSITION 180K OHMS, 10% TOL, 1/4 WATT	RC07GF184K	81349	745-0830-000
R9	SAME AS R6			
R10	RESISTOR, FXD, COMPOSITION 27K OHMS, 10% TOL, 1/4 WATTS	RC07GF273K	81349	745-0800-001
R11	RESISTOR, FXD, COMPOSITION 39K OHMS, 10% TOL, 1/4	RC07GF393K	81349	745-0806-000

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
R12	WATT RESISTOR, VAR 5000 OHMS, 20% TOL, 3/4	75PR5K	80740	382-0004-270
R13	WATT RESISTOR, FXD, COMPOSITION 150K OHMS, 10% TOL, 1/4	RC07GF154K	81349	745-0827-000
R14	SAME AS R6			
R15	SAME AS R2			
R16	SAME AS R6			
R17	RESISTOR, FXD, COMPOSITION 2200 OHMS, 10% TOL, 1/4 WATT	RC07GF222K	81349	745-0761-000
R18	SAME AS R13			
R19	SAME AS R7			
R20	RESISTOR, FXD, COMPOSITION 27K OHMS, 10% TOL, 1/4 WATT	RC07GF273K	81349	745-0800-000
R21	RESISTOR, FXD, COMPOSITION 1200 OHMS, 10% TOL, 1/4 WATT	RC07GF122K	81349	745-0752-000
R22	RESISTOR, FXD, COMPOSITION 1500 OHMS, 10% TOL, 1/4 WATT	RC07GF152K	81349	745-0755-000
R23	RESISTOR, FXD, COMPOSITION 6800 OHMS, 10% TOL, 1/4 WATT	RC07GF682K	81349	745-0779-000
R24	SAME AS R1			
R25	SAME AS R4			
R26	RESISTOR, FXD, COMPOSITION 27 OHMS, 10% TOL, 1/4 WATT	RC07GF270K	81349	745-0692-000
R27	SAME AS R4			
R28	RESISTOR, FXD, WIRE WOUND 1 OHM, 5% TOL, 3 WATTS	710-2863-000	13499	710-2863-000
R29	SAME AS R28			
R30	RESISTOR, FXD, COMPOSITION 33K OHMS, 10% TOL, 1/4 WATT	RC07GF333K	81349	745-0803-000
RV1	RESISTOR, VOLTAGE SENSITIVE	PL5C1	33173	714-3218-010
RV2	RESISTOR, VOLTAGE SENSITIVE	764-9918-001	13499	764-9918-001
T1	TRANSFORMER, AF, INPUT LEAD BLACK TO RED 660 OHMS IMPEDANCE, LEAD GREEN TO RED 400 OHMS IMPEDANCE, LEAD GREEN TO BLUE 200 OHMS IMPEDANCE, LEAD WHITE CENTER TAP, LEAD BLUE TO RED 60 OHMS IMPEDANCE, LEAD YELLOW TO BLUE 2500 OHMS IMPEDANCE	BV35752	GOTHA	667-0155-010
TB1	TERMINAL BOARD			
XQ1	SOCKET, TRANSISTOR	05-3307-51	91662	764-7370-001 352-9903-000
XQ2				
THROUGH	SAME AS XQ1			
XQ7				
XRV1	NOT USED			
XRV2	SOCKET, ELECTRON TUBE	RA9AX	00656	220-1384-070
MANUFACTURERS CODES				
CODE	MANUFACTURER			
GOTHA	GOTHAM AUDIO CORP. NEW YORK, N. Y.			
00656	AEROVOX CORP. NEW BEDFORD, MASS.			
07688	MILITARY SPECIFICATIONS			
13103	LANGDON MFG. CO. MILITARY			

714-0013-010

356P-1 Program Amplifier

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
13499	DIVISION, WICHITA, KANS. COLLINS RADIO CO.			
33173	CEDAR RAPIDS, IOWA TUBE DEPARTMENT GECO			
73445	OWENSBORO, KY. AMPEREX ELECTRONIC CO.			
80740	DIVISION OF NORTH AMERICAN PHILIPS CO., INC.			
81349	HICKSVILLE, N. Y. BECKMAN INSTRUMENTS, INC.			
91662	FULLERTON, CALIF. MILITARY SPECIFICATIONS			
98291	ELCO CORP. WILLOW GROVE, PA.			
	SEAELECTRO CORP. MAMARDNECK, N. Y.			



B502-001-4

Figure 3. 356P-1 Program Amplifier, Schematic Diagram

For Shure carts use
439-5904-000 (10') or equip. (do not cut)
120pf total shunt cap.



356R-1 Microphone-Phonograph Preamplifier

unit instructions

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1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 356R-1 Microphone-Phonograph Preamplifier (figure 1) amplifies and equalizes audio from a magnetic pickup or amplifies audio from a microphone. Two remotely switched inputs, three remotely switched outputs, and one direct output are provided. The unit is normally used in an audio console.

1.2 Unit Description

The 356R-1 consists of an input transformer, eight transistors, and associated components on a plug-in, etched-circuit card. Remote controlled photoconductive devices accomplish switching and level control.

2. UNIT CHARACTERISTICS

2.1 Physical Characteristics

Size:
4-7/16 by 6-3/8 by 1 inch

Weight:
8 ounces

Type of Construction:
Etched circuit card

Type of Mounting:
22-contact card receptacle
(CPN 372-7009-000)

2.2 Operating Characteristics

Ambient Service Conditions:
Temperature
0° to 50°C (32° to 122°F)



B502-052-Pb

Figure 1. 356R-1 Microphone-Phonograph Preamplifier

Relative Humidity

Up to 90%

Altitude

Up to 10,000 feet above msl

Type of Service:

Continuous

2.3 Electrical Characteristics

Power Requirements:

30 volts dc at 10 ma, maximum (maximum ripple 1 mv)

6 volts dc at 130 ma, maximum (regulated)

4 volts dc at 120 ma, maximum (regulated)

Input Impedance:

Microphone

600/250/150/30 ohms, balanced
(factory wired for 150 ohms)

High Level 600 ohms (balanced) or
100K ohms (bridging)

Phonograph

50K ohms nominal at 1 kHz

Input Level:

Microphone

-65 dbm nominal

-26 dbm, maximum

High level +10 dbm, maximum

Phonograph

2 mv rms nominal

100 mv rms, maximum

Output Impedance (Unbalanced):

Program and Audition

Greater than 10K ohms

Direct

600 ohms, approximately

Cue

1K ohm, approximately

Output Level:

Program and Audition (into 600-ohm load)

-45 dbm nominal

-10 dbm, maximum

Direct (into 10K ohms load)

5 volts, maximum

Cue (into 2600-ohm load)

12 mv nominal

Frequency Response:

30 to 15,000 Hz ± 1.0 db (referred to 1000 Hz)

Total Harmonic Distortion:

0.5% maximum at rated output

Noise:

Equivalent Input Noise

-120 dbm (microphone input)

S/N Ratio

Greater than 60 db with 6-mv input signal
(phonograph input)

Equalization of Phonograph Input:

Strapping Allows

RIAA

RIAA with 3 db of high-frequency boost

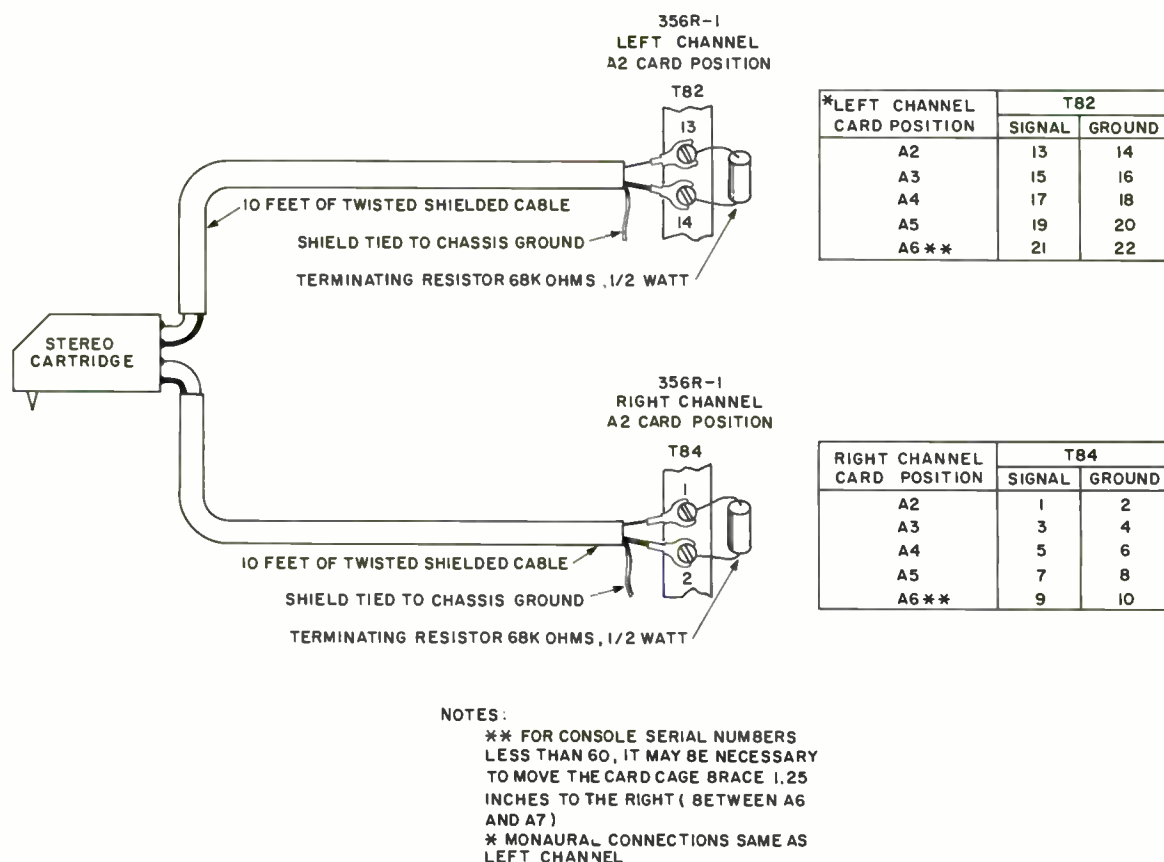
RIAA with 3 db of high-frequency rolloff

3. CIRCUIT DESCRIPTION

The 356R-1 Microphone-Phonograph Preamplifier (figure 4) consists of a microphone preamplifier, an RIAA equalized phonograph preamplifier, and an output amplifier. Remotely-controlled switches select one of the two inputs and one of the three outputs. A remotely controlled photoconductive device controls the output level.

The microphone input may be strapped for a high-level or a low-level input. Transformer T1 matches the microphone impedance to the input impedance of transistor Q1. Emitter-follower Q2 provides a low-output impedance to drive the level control attenuator. Photoconductive switch RV1 switches the output of the microphone preamplifier on and off.

The phonograph preamplifier is normally used with a magnetic cartridge. For optimum performance, a magnetic cartridge must be terminated in a specific impedance. The 356R-1 has no terminating impedance. An external impedance allows adjustment for various cartridges. For most 47K cartridges, the shunt cable capacity between the cartridge and the preamplifier should be about 500 pfd. Connect a 68K, 1/2-watt resistor across the terminals where the cartridge cable connects to the 356R-1. See figure 2. The cable between the cartridge and the 356R-1 should be a twisted, shielded pair approximately 10 feet long. The input impedance of the 356R-1, the 68K resistor, and the shunt capacity of the cable provide a near optimum load for a Shure M-44-7 cartridge.



B502-137-3

Figure 2. Connection Diagram for 356R-1 in 212S-1 or 212M-1 Broadcast Consoles

The phonograph input is unbalanced. Pin D must connect to signal ground.

Transistors Q3 and Q4 are cascade direct-coupled class A amplifiers. Transistor Q4 drives emitter-follower Q5. The frequency-sensitive feedback network from the collector of Q4 to the emitter of Q3 provides RIAA equalization. Strapping options allow ± 3 db of high-frequency compensation. PHONO LEVEL control R18 controls the output level from the preamplifier and allows balancing the system for stereo operation. Photoconductive switch RV3 switches the output of the preamplifier on and off.

Remotely controlled level control RV4 shunts the signal path at the input to the power amplifier. Potentiometer R35, in series with the lamp in the photoconductive level control, is a fine gain adjustment. Class-A driver Q6 drives the class AB output stage, transistors Q7 and Q8. Silicon diodes CR1, CR2, and CR3 provide bias for Q7 and Q8. Four outputs are provided: direct, program (controlled by RV5), and audition (controlled

by RV6). The cue output, controlled by RV6, is taken from the input to the power amplifier.

The photoconductive level control consists of a photocell and a 6-volt lamp sealed in a can. The resistance of the photocell, shunting the signal path, decreases as the voltage applied to the lamp is increased. Each photoconductive switch consists of a photocell and a 4-volt lamp sealed in a can. The resistance of the photocell is approximately 13 megohms when the lamp is off and 380 ohms when the lamp is on.

4. MAINTENANCE

4.1 Troubleshooting

When trouble is suspected in this card, replace the card with a spare, if available. If the replacement card remedies the problem, visually inspect the defective card for loose connections and signs of component damage. If no faults are found, extend the card on the card extender and check

for the dc voltages and ac signal levels indicated on the schematic diagram.

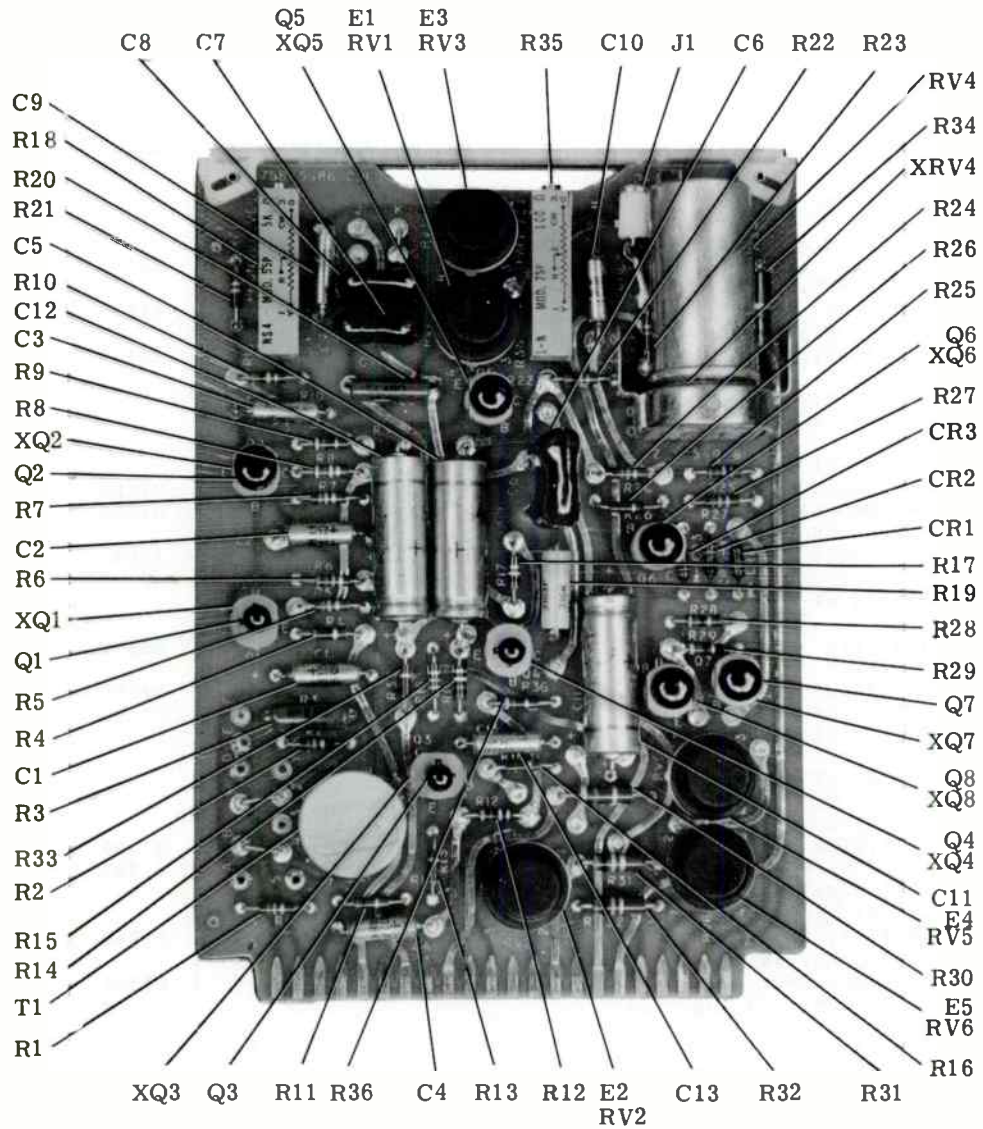
Caution

When making repairs, do not use a soldering iron rated at more than 40 watts. Do not jar the card to remove excess solder. Jarring the card may damage the lamp filaments in the photoconductive devices.

4.2 Spare Parts

Spare parts may be ordered from the following address:

Collins Radio Company
Service Parts Department
Dallas, Texas 75207



B502-055-Pb

Figure 3. 356R-1 Microphone-Phonograph Preamplifier, Front View

5. PARTS LIST

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
356R-1 MICROPHONE PHONOGRAPH PREAMPLIFIER				758-5486-001
C1	CAPACITOR, FXD, ELECTROLYTIC 6.8 UF, 20% TOL, 35 VDCW	CS138F685M	81349	184-6216-000
C2	SAME AS C1			
C3	SAME AS C1			
C4	SAME AS C1			
C5	CAPACITOR, FXD, ALUMINUM 64 UF, PLUS 50% MINUS 10%, 64 VDCW	C437ARH64	73445	183-2355-110
C6	CAPACITOR, FXD, MICA 0.015 UF, 5% TOL, 500 VDCW	CM07F153J03	81349	912-2741-000
C7	CAPACITOR, FXD, MICA 3300 UUF, 5% TOL, 500 VDCW	CM06F332J03	81349	912-3040-000
C8	CAPACITOR, FXD, MICA 4700 UUF, 5% TOL, 500 VDCW	CM06F472J03	81349	912-3052-000
C9	CAPACITOR, FXD, ELECTROLYTIC 0.47 UF, 20% TOL, 35 VDCW	CS138F474M	81349	184-6195-000
C10	SAME AS C1			
C11	SAME AS C5			
C12	SAME AS C5			
C13	SAME AS C1			
CR1	SEMICONDUCTOR DEVICE, DIODE	1N270	07688	353-2018-000
CR2	SEMICONDUCTOR DEVICE, DIODE	1N914	07688	353-2906-000
CR3	SAME AS CR2			
E1	INSULATOR, DISK	7720-4N	13103	352-9552-540
E2 THROUGH E5	SAME AS E1			
J1	JACK, TIP WHITE	SKT103PC	98291	360-0172-000
Q1	TRANSISTOR	2N3565	07688	352-0638-010
Q2	TRANSISTOR	2N3567	07688	352-0629-010
Q3	SAME AS Q1			
Q4	SAME AS Q1			
Q5	SAME AS Q2			
Q6	SAME AS Q2			
Q7	SAME AS Q2			
Q8	TRANSISTOR	2N3638	07688	352-0636-010
R1	RESISTOR, FXD, COMPOSITION 56K OHMS, 5% TOL, 1/4 WATT	RC07GF563J	81349	745-0811-000
R2	SAME AS R1			
R3	RESISTOR, FXD, FILM 619 OHMS, 1% TOL, 1/4 WATT	RN65C6190F	81349	705-4635-000
R4	RESISTOR, FXD, COMPOSITION 1500 OHMS, 5% TOL, 1/4 WATT <i>1200</i>	RC07GF152J	81349	745-0754-000
R5	SAME AS R1			
R6	RESISTOR, FXD, COMPOSITION 3300 OHMS, 5% TOL, 1/4 WATT <i>100K</i>	RC07GF683J	81349	745-0814-000
R7	SAME AS R6 <i>220K, 5%, 1/4 W.</i>			
R8	RESISTOR, FXD, COMPOSITION 0.47 MEGOHM, 5% TOL, 1/4 WATT	RC07GF474J	81349	745-0844-000
R9	RESISTOR, FXD, COMPOSITION 4700 OHMS, 10% TOL, 1/4 WATT	RC07GF472K	81349	745-0773-000
R10	RESISTOR, FXD, COMPOSITION 100K OHMS, 10% TOL, 1/4 WATT	RC07GF104K	81349	745-0821-000
R11	RESISTOR, FXD, COMPOSITION 1 MEGOHM, 10% TOL, 1/4 WATT	RC07GF105K	81349	745-0857-000
R12	RESISTOR, FXD, COMPOSITION 0.82 MEGOHM, 5% TOL, 1/4 WATT	RC07GF824J	81349	745-0853-000
R13	RESISTOR, FXD, COMPOSITION	RC07GF152J	81349	745-0754-000

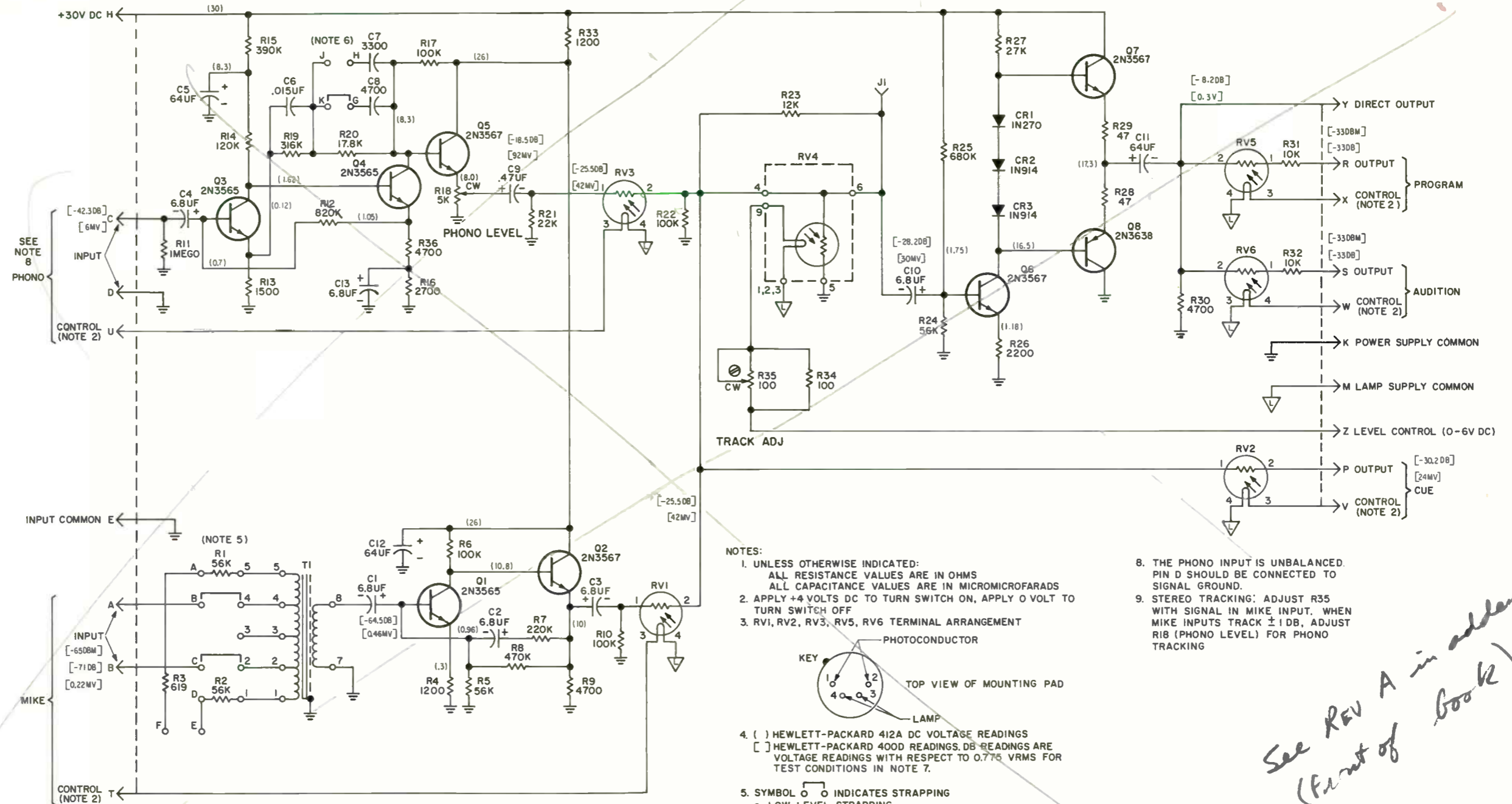
356R-1 Microphone-Phonograph Preamplifier

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
R14	1500 OHMS, 5% TOL, 1/4 WATT RESISTOR, FXD, COMPOSITION	RC07GF124J	81349	745-0823-000
R15	120K OHMS, 5% TOL, 1/4 WATT RESISTOR, FXD, COMPOSITION	RC07GF394J	81349	745-0841-000
R16	0.39 MEGOHM, 5% TOL, 1/4 WATT RESISTOR, FXD, COMPOSITION	RC07GF272K	81349	745-0764-000
R17	2700 OHMS, 10% TOL, 1/4 WATT SAME AS R10			
R18	RESISTOR, VAR 5000 OHMS, 20% TOL, 3/4 WATT	75PR5K	80740	382-0004-270
R19	RESISTOR, FXD, FILM 316K OHMS, 1% TOL, 1/4 WATT	RN60D3163F	81349	705-6716-000
R20	RESISTOR, FXD, FILM 17.8K OHMS, 1% TOL, 1/4 WATT	RN60D1782F	81349	705-6656-000
R21	RESISTOR, FXD, COMPOSITION 22K OHMS, 10% TOL, 1/4 WATT	RC07GF223K	81349	745-0797-000
R22	SAME AS R10			
R23	RESISTOR, FXD, COMPOSITION 12K OHMS, 5% TOL, 1/4 WATT	RC07GF123J	81349	745-0787-000
R24	SAME AS R1			
R25	RESISTOR, FXD, COMPOSITION 0.68 MEGOHM, 5% TOL, 1/4 WATT	RC07GF684J	81349	745-0850-000
R26	RESISTOR, FXD, COMPOSITION 2200 OHMS, 5% TOL, 1/4 WATT	RC07GF222J	81349	745-0760-000
R27	RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/4 WATT	RC07GF273J	81349	745-0799-000
R28	RESISTOR, FXD, COMPOSITION 47 OHMS, 10% TOL, 1/4 WATT	RC07GF470K	81349	745-0701-000
R29	SAME AS R28			
R30	RESISTOR, FXD, COMPOSITION 4700 OHMS, 10% TOL, 1/2 WATT	RC20GF472K	81349	745-1380-000
R31	RESISTOR, FXD, COMPOSITION 10K OHMS, 5% TOL, 1/2 WATT	RC20GF103J	81349	745-1393-000
R32	SAME AS R31			
R33	RESISTOR, FXD, COMPOSITION 1200 OHMS, 10% TOL, 1/4 WATT	RC07GF122K	81349	745-0752-000
R34	RESISTOR, FXD, COMPOSITION 100 OHMS, 10% TOL, 1 WATT	RC32GF101K	81349	745-3310-000
R35	RESISTOR, VAR 100 OHMS, 20% TOL, 3/4 WATT	75PR100	80740	382-0004-220
R36	SAME AS R9			
RV1	RESISTOR, VOLTAGE SENSITIVE	PL5C1	33173	714-3218-010
RV2	SAME AS RV1			
RV3	SAME AS RV1			
RV4	RESISTOR, VOLTAGE SENSITIVE	764-9918-001	13499	764-9918-001
RV5	SAME AS RV1			
RV6	SAME AS RV1			
T1	TRANSFORMER, AF, INPUT LEAD 1 TO 5 660 OHMS IMPEDANCE, LEAD 2 TO 5 400 OHMS IMPEDANCE, LEAD 2 TO 4 200 OHMS IMPEDANCE, LEAD 3 CENTER TAP, LEAD 4 TO 5 60 OHMS IMPEDANCE, LEAD 8 TO 7 2500 OHMS IMPEDANCE	8V38752	GOHA	667-0155-020
XQ1	SOCKET, TRANSISTOR	05-3307-51	91662	352-9903-000

714-0013-010

356R-1 Microphone-Phonograph Preamplifier

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
XQ2 THROUGH XQ8 XRV1 XRV2 XRV3 XRV4	3 CONTACTS SAME AS XQ1 NOT USED NOT USED NOT USED SOCKET, ELECTRON TUBE 9 CONTACTS	RA9AX	00656	220-1384-070
MANUFACTURERS CODES				
CODE	MANUFACTURER			
GOTHA	GOTHAM AUDIO CORP. NEW YORK, N. Y.			
00656	AERVOX CORP. NEW BEDFORD, MASS.			
07688	MILITARY SPECIFICATIONS			
13103	LANGDON MFG. CO. MILITARY DIVISION WICHITA, KANS.			
13499	COLLINS RADIO CO. CEDAR RAPIDS, IOWA			
33173	TUBE DEPARTMENT GECO OWENSBORO, KY.			
73445	AMPEREX ELECTRONIC CO. DIV. OF NORTH AMERICAN PHILIPS CO., INC. HICKSVILLE, N. Y.			
80740	BECKMAN INSTRUMENTS, INC. FULLERTON, CALIF.			
81349	MILITARY SPECIFICATIONS			
91662	ELCO CORP. WILLOW GROVE, PA.			
98291	SEAELECTRO CORP. MAMARONECK, N. Y.			



4. () HEWLETT-PACKARD 412A DC VOLTAGE READINGS
[] HEWLETT-PACKARD 400D READINGS. DB READINGS ARE VOLTAGE READINGS WITH RESPECT TO 0.775 VRMS FOR TEST CONDITIONS IN NOTE 7.
5. SYMBOL \square INDICATES STRAPPING
- LOW LEVEL STRAPPING
50 OHMS STRAP B TO 3 AND C TO 2
150 OHMS STRAP B TO 4 AND C TO 2
600 OHMS STRAP B TO 5 AND C TO 1
 - HIGH LEVEL STRAPPING
BRIDGING (100K) B TO A AND C TO D
TERMINATING (600 OHMS) B TO A AND C TO D AND F TO E
6. EQUALIZATION STRAPPING
RIAA - STRAP K TO G
+3DB HF - STRAP J TO H
-3DB HF - STRAP K TO G AND J TO H
7. TEST LEVEL CONDITIONS:
FREQUENCY 1000 CPS, ZERO VOLTS ON PIN Z, 4VDC ON PINS W, X AND V (ONE AT A TIME), PINS R AND S TERMINATED IN 600 OHMS, PIN P TERMINATED IN 2.61 K OHMS, CIRCUIT STRAPPED AS SHOWN ON SCHEMATIC. R18 ADJUSTED TO PROVIDE 42 MV AT PIN 1 OF RV3. DBM READINGS ARE DB BELOW ONE MILLIWATT

B502-037-4

Figure 4. 356R-1 Microphone-Phonograph Preamplifier, Schematic Diagram

See REV A in addendum (Front of book)



356T-1 Preamplifier

unit instructions

Collins Radio Company | Dallas, Texas

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523-0558093-102438

1 June 1968

1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 356T-1 Preamplifier (figure 1) is a four-stage high-fidelity audio preamplifier. It amplifies signals from microphones to program bus level. The unit is normally used in an audio console.

1.2 Unit Description

The 356T-1 consists of two input transformers, a five-transistor amplifier with a level control, five switches, and associated components on a plug-in, etched circuit card. The unit has two remotely switched inputs, three remotely switched outputs and one direct output. Remotely controlled photoconductive devices accomplish switching and level control.

2. UNIT CHARACTERISTICS

2.1 Physical Characteristics

Size:

4 by 6 by 1 inches

Weight:

7 ounces

Type of Construction:

Etched circuit card

Type of Mounting:

22-contact card receptacle
(CPN 372-7009-000)

2.2 Operating Characteristics

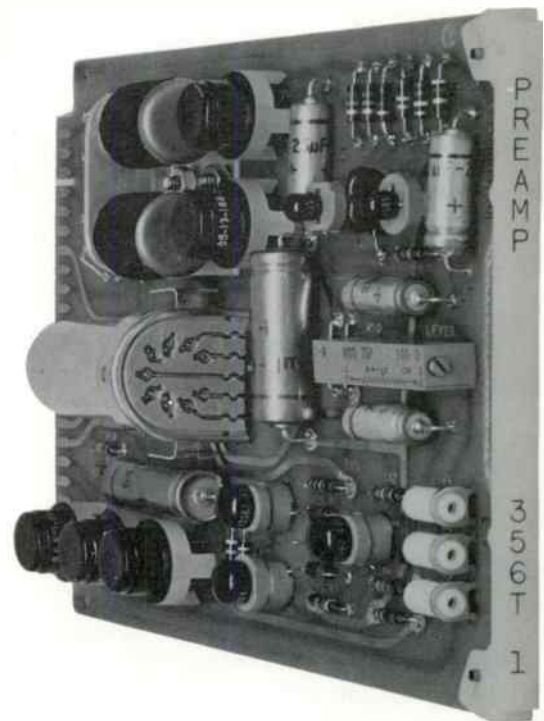
Ambient Service Conditions:

Temperature

0° to 50°C (32° to 122°F)

Relative Humidity

Up to 95%



B502-012-Pb

Figure 1. 356T-1 Preamplifier

Altitude

Up to 10,000 feet above msl

Type of Service:

Continuous

2.3 Electrical Characteristics

Power Requirements:

30 volts dc at 5 ma, 1 mv pp maximum ripple

4 volts dc at 120 ma, regulated

6 volts dc at 60 ma, regulated

Input Impedance:

600/250/150/30 ohms, balanced (factory strapped for 150 ohms)

Input Level:

-65 dbm nominal

-33 dbm, maximum

Output Impedance (Unbalanced):

Program and Audition

Greater than 10K

Direct

600 ohms, approximately

Cue

2200 ohms, approximately

Output Level:

Program and Audition (into 600-ohm load)

-45 dbm nominal

-10 dbm, maximum

Direct (into 600-ohm load)

+10 dbm

Cue (into 2600-ohm load)

12 mv

Frequency Response:

30 to 15,000 Hz, ± 1 db (referred to 1000 Hz)

Distortion:

0.5%, maximum

Noise:

Equivalent input noise -120 dbm

3. CIRCUIT DESCRIPTION

The 356T-1 (figure 3) consists of a five-transistor amplifier, two input transformers, a photoconductive level control, and five photoconductive switches.

Input A or B may be applied to the base of transistor Q1 by applying 4 volts to photoconductive

switch RV1 or RV2. Transistor Q1 is direct coupled to transistor Q2. The output of Q2 is connected, through photoconductive level control RV3, to the base of transistor Q3. Potentiometer R10, in series with the lamp in the photoconductive level control, is a fine gain control. Transistor Q3 is a class A driver for the output stage, transistors Q4 and Q5. Silicon diodes CR1, CR2, and CR3 provide bias for transistors Q4 and Q5. There is one direct (unswitched) output. Photoconductive switches RV4 and RV5 control the program and audition outputs. Photoconductive switch RV6 controls the cue output from the second stage. Feedback from the second to the first stage decreases distortion.

The photoconductive level control consists of a photocell and a 6-volt lamp sealed in a can. The resistance of the photocell, shunting the signal path, decreases as the voltage applied to the lamp is increased. Each photoconductive switch consists of a photocell and a 4-volt lamp sealed in a can. The resistance of the photocell is approximately 13 megohms when the lamp is off and 380 ohms when the lamp is on.

4. MAINTENANCE

4.1 Troubleshooting

When trouble is suspected in the 356T-1, replace the card with a spare, if available. If the replacement card remedies the problem, visually inspect the defective card for loose connections and signs of component damage. If no faults are found, extend the card on the card extender and check for the dc voltages and ac signal levels indicated on the schematic diagram.

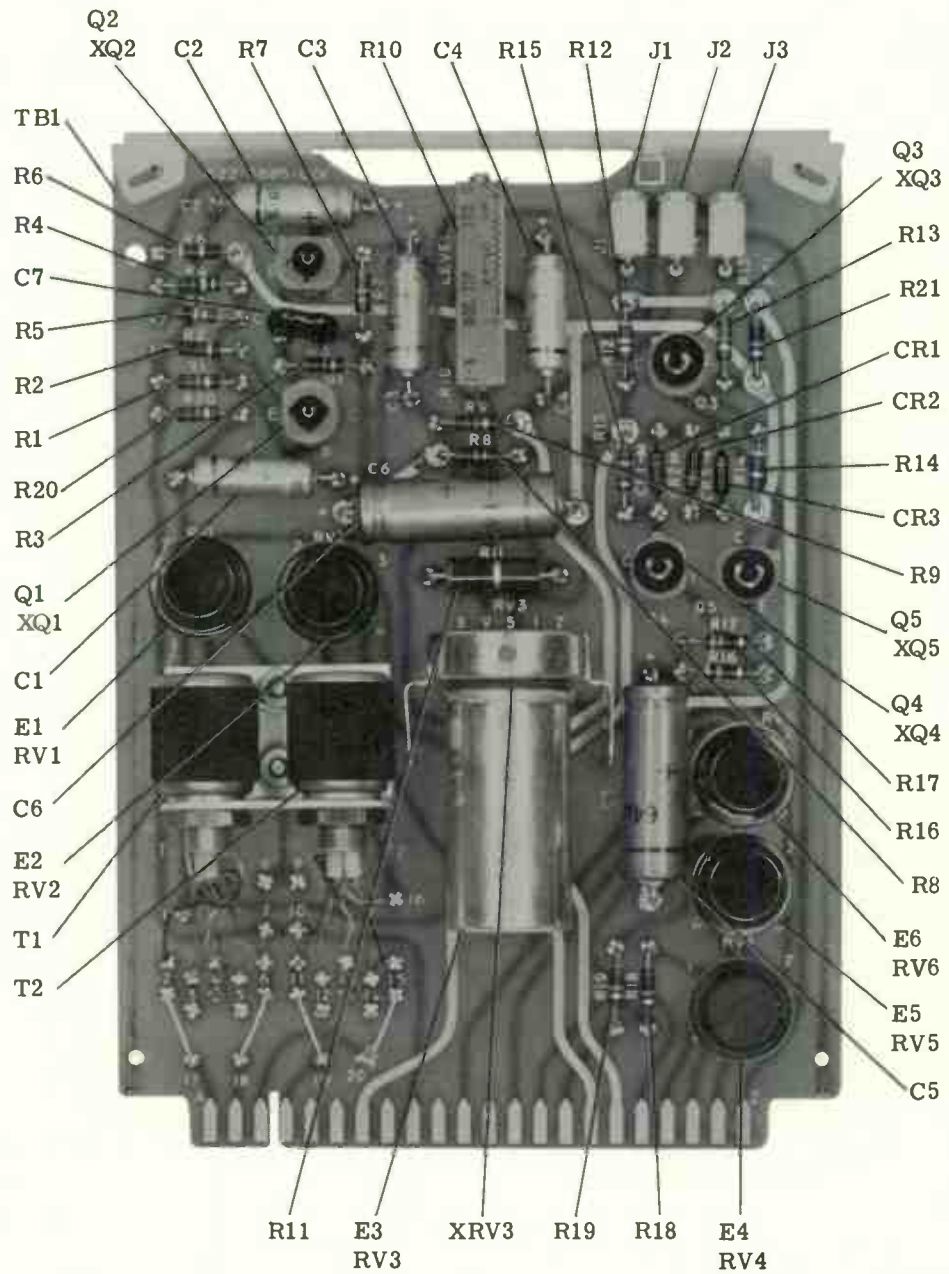
Caution

When making repairs, do not use a soldering iron rated at more than 40 watts. Do not jar the card to remove excess solder. Jarring the card may damage the lamp filaments in the photoconductive devices.

4.2 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



B502-035-Pb

Figure 2. 356T-1 Preamplifier, Front View

5. PARTS LIST

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
356T-1 PREAMPLIFIER				522-3885-001
C1	CAPACITOR, FXD, ALUMINUM 25 UF, PLUS 50% MINUS 10%, 25 VDCW	C426ARF25	73445	183-2354-180
C2	CAPACITOR, FXD, ALUMINUM 10 UF, PLUS 50% MINUS 10%, 25 VDCW	C426ARF10	73445	183-2354-170
C3	SAME AS C1			
C4	SAME AS C1			
C5	CAPACITOR, FXD, ALUMINUM 64 UF, PLUS 50% MINUS 10%, 64 VDCW	C437ARH64	73445	183-2355-110
C6	SAME AS C5			
C7	CAPACITOR, FXD, MICA 100 UUF, 5% TOL, 500 VDCW	CM05F101J03	81349	912-2816-000
CR1	SEMICONDUCTOR DEVICE, DIODE	1N914	07688	353-2906-000
CR2	SAME AS CR1			
CR3	SAME AS CR1			
E1	INSULATOR, DISK	7720-4N	13103	352-9552-540
E2	SAME AS E1			
E3	NOT USED			
E4	SAME AS E1			
E5	SAME AS E1			
E6	SAME AS E1			
J1	JACK, TIP WHITE	SKT103PC	98291	360-0172-000
J2	SAME AS J1			
J3	SAME AS J1			
Q1	TRANSISTOR	2N3565	07688	352-0638-010
Q2	SAME AS Q1			
Q3	TRANSISTOR	2N3567	07688	352-0629-010
Q4	SAME AS Q3			
Q5	TRANSISTOR	2N3638	07688	352-0636-010
R1	RESISTOR, FXD, COMPOSITION 56K OHMS, 10% TOL, 1/4 WATT	RC07GF563K	81349	745-0812-000
R2	RESISTOR, FXD, COMPOSITION 1K OHMS, 10% TOL, 1/4 WATT	RC07GF102K	81349	745-0749-000
R3	RESISTOR, FXD, COMPOSITION 68K OHMS, 10% TOL, 1/4 WATT	RC07GF683K	81349	745-0815-000
R4	RESISTOR, FXD, COMPOSITION 120K OHMS, 10% TOL, 1/4 WATT	RC07GF124K	81349	745-0824-000
R5	RESISTOR, FXD, COMPOSITION 100K OHMS, 10% TOL, 1/4 WATT	RC07GF104K	81349	745-0821-000
R6	RESISTOR, FXD, COMPOSITION 4700 OHMS, 10% TOL, 1/4 WATT	RC07GF472K	81349	745-0773-000
R7	RESISTOR, FXD, COMPOSITION 15K OHMS, 10% TOL, 1/4 WATT	RC07GF153K	81349	745-0791-000
R8	SAME AS R7			
R9	RESISTOR, FXD, COMPOSITION 12K OHMS, 5% TOL, 1/4 WATT	RC07GF123J	81349	745-0787-000
R10	RESISTOR, VAR 100 OHMS, 20% TOL, 3/4 WATT	75PR100	80740	382-0004-220
R11	RESISTOR, FXD, COMPOSITION 100 OHMS, 10% TOL, 1 WATT	RC32GF101K	81349	745-3310-000
R12	RESISTOR, FXD, COMPOSITION 680K OHMS, 5% TOL, 1/4 WATT	RC07GF684J	81349	745-0850-000
R13	SAME AS R1			
R14	RESISTOR, FXD, COMPOSITION 2200 OHMS, 5% TOL, 1/4	RC07GF222J	81349	745-0760-000

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
R15	RESISTOR, FXD, COMPOSITION 27K OHMS, 10% TOL, 1/4 WATT	RC07GF273K	81349	745-0800-000
R16	RESISTOR, FXD, COMPOSITION 47 OHMS, 10% TOL, 1/4 WATT	RC07GF470K	81349	745-0701-000
R17	SAME AS R16			
R18	RESISTOR, FXD, COMPOSITION 10K OHMS, 10% TOL, 1/4 WATT	RC07GF103K	81349	745-0785-000
R19	SAME AS R18			
R20	SAME AS R1			
R21	SAME AS R18			
RV1	RESISTOR, VOLTAGE SENSITIVE	PL5C1	33173	714-3218-010
RV2	SAME AS RV1			
RV3	RESISTOR, VOLTAGE SENSITIVE	764-9918-001	13499	764-9918-001
RV4	SAME AS RV1			
RV5	SAME AS RV1			
RV6	SAME AS RV1			
T1	TRANSFORMER, AF, INPUT LEAD BLACK TO RED 660 OHMS IMPEDANCE, LEAD GREEN TO RED 400 OHMS IMPEDANCE, LEAD GREEN TO BLUE 200 OHMS IMPEDANCE, LEAD WHITE CENTER TAP, LEAD BLUE TO RED 60 OHMS IMPEDANCE, LEAD YELLOW TO BLUE 2500 OHMS IMPEDANCE	BV35752	GOTHA	667-0155-010
T2	SAME AS T1			
TB1	TERMINAL BOARD			
XQ1	SOCKET, TRANSISTOR	05-3307-51	91662	764-7361-001 352-9903-000
XQ2				
THROUGH				
XQ5	SAME AS XQ1			
XRV1	NOT USED			
XRV2	NOT USED			
XRV3	SOCKET, ELECTRON TUBE	RA9AX	00656	220-1384-070
MANUFACTURERS CODES				
CODE	MANUFACTURER			
GOTHA	GOTHAM AUDIO CORP. NEW YORK, N. Y.			
00656	AEROVOX CORP. NEW BEDFORD, MASS.			
07688	MILITARY SPECIFICATIONS			
13103	LANGDON MFG. CO. MILITARY DIVISION, WICHITA, KANS.			
13499	COLLINS RADIO CO. CEDAR RAPIDS, IOWA			
33173	TUBE DEPARTMENT GECCO OWENSBORO, KY.			
73445	AMPEREX ELECTRONIC CO. DIVISION OF NORTH AMERICAN PHILIPS CO., INC. HICKSVILLE, N. Y.			
80740	BECKMAN INSTRUMENTS, INC. FULLERTON, CALIF.			
81349	MILITARY SPECIFICATIONS			
91662	ELCO CORP. WILLOW GROVE, PA.			
98291	SEAELECTRO CORP. MAMARONECK, N. Y.			

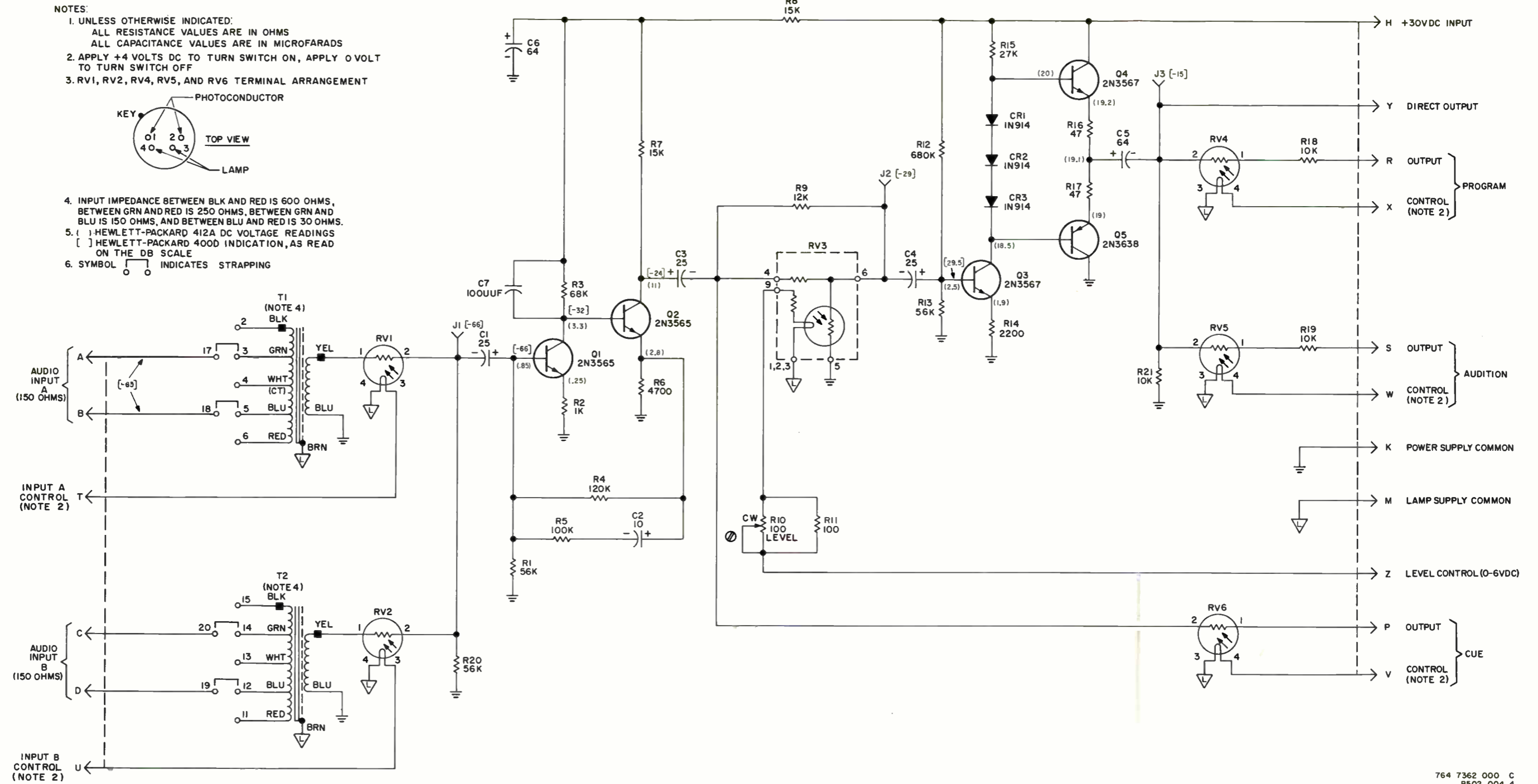


Figure 3. 356T-1 Preamplifier, Schematic Diagram





356U-1

Broadcast Audio Preamplifier

unit instructions

Collins Radio Company | Dallas, Texas

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Printed in United States of America

523-0559550-101438

1 February 1968

1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 356U-1 Broadcast Audio Preamplifier (figure 1) amplifies audio signals from two separate high- or low-level input devices. Remote switching is provided for the two inputs and three outputs. One direct output is also available. The unit is normally used for broadcast audio control.

1.2 Unit Description

The 356U-1 consists of two input transformers, nine transistors, and related circuit elements mounted on a plug-in type etched circuit card. Six remotely operated photoconductive devices control level and perform the switching. Strapping options permit input impedance selection. As delivered, the card is strapped for 150-ohms inputs.

2. UNIT CHARACTERISTICS

2.1 Physical Characteristics

Size:
4-7/16 by 6-3/8 by 1-1/16 inches

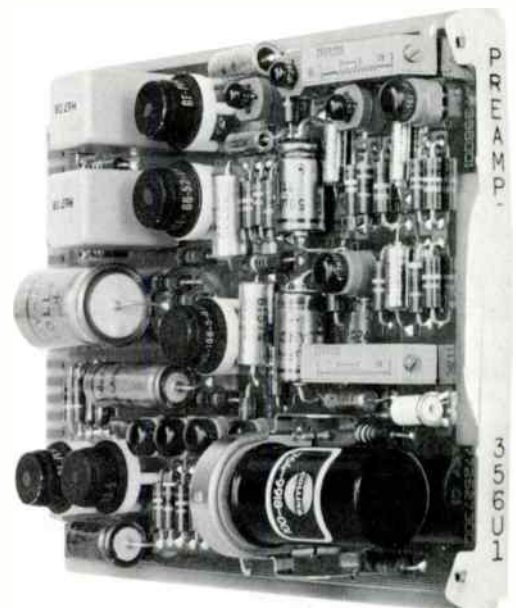
Weight:
1 pound

Type of Construction:
Etched circuit card

Type of Mounting:
22 contact card connector
(CPN 372-7009-000)

2.2 Operating Characteristics

Ambient Service Conditions:
Temperature
0° to 50°C (32° to 122°F)



B502-301-Pb

Figure 1. 356U-1 Broadcast Audio Preamplifier

Relative Humidity
Up to 95%

Altitude
Up to 10,000 feet above msl

Type of Service:
Continuous

2.3 Electrical Characteristics

Power Requirements:
+30 volts dc at 15 ma, 1 mv maximum ripple
+6 volts dc at 60 ma, regulated
+4 volts dc at 120 ma, regulated

Frequency Response:
±1.0 db, 30 Hz to 15,000 Hz with 1000 Hz as
reference level

Total Harmonic Distortion:
0.5%, maximum at rated output

Noise:
Equivalent Input Noise
-120 dbm at maximum gain

Signal-to-Noise Ratio (1000-Hz Signal/
Wideband Noise Level at Bus Output)
Minimum 60 db for -60-dbm input signal

Input Impedance:
Microphone input impedance available
through strapping options are 600, 250,
150, and 30 ohms. When strapped for high-
level input, the input impedance is 600 ohms
(terminated) or 100 kilohms (bridging).

Input Level:
-65 dbm nominal
-30 dbm, maximum
High level, +10 dbm, maximum

Output Impedance:
Program, Audition, and Cue outputs, greater
than 10 kilohms, unbalanced
Direct output 600 ohms, unbalanced

Output Levels:
Program and Audition (into 600 ohms)
-10 dbm, maximum
Cue (into 600 ohms) -40-dbm, -65-dbm
microphone input
Direct (into 10 kilohms) 5 volts peak-to-peak,
maximum

2.4 Strapping Options

Refer to the schematic diagram, figure 3, for
strapping connections.

3. CIRCUIT DESCRIPTION

The 356U-1 (figure 3) consists of a two-stage
preamplifier with two transformer coupled inputs,
and an output amplifier network. Remotely oper-
ated photoconductive switches select one or both
inputs and one or all of three outputs. A similar
remotely operated photoconductive attenuator
controls the output level.

Transformers T1 and T2 match the impedance of
the input signal sources to the input impedance of
Q1. Photoconductive switch RV1 switches input A
on or off. Input B, with photoconductive switch
RV2, is identical to input A. Transistor Q1 drives
emitter follower Q2. Potentiometer R17 adjusts
the drive applied to Q3 and allows balancing the
system for stereo operation. Transistor Q3 and
emitter follower Q4 provide an additional amplifi-
cation stage. Photoconductive level control RV3,
between Q4 and the first output amplifier, Q6
controls the output level of the card. Potentiometer
R24, in series with the lamp in the photoconductive
level control, is a fine gain adjustment. Transistor
Q7 drives the complementary symmetrical output
stage Q8 and Q9. Resistor R35 provides 100 percent
dc feed back. Diodes CR1, CR2, and CR3 establish
bias for the final output stage.

Capacitor coupled output channels 1 (PROGRAM)
and 2 (AUDITION) are switched on and off by
photoconductive switches RV5 and RV6, respec-
tively. A direct output, available at pin Y, is
taken from the output of the symmetrical power
amplifier. The cue output is taken from tran-
sistor Q4, prior to the level control. Isolation
for the cue output is provided by Q4, and on/off
switching of the cue is accomplished by photo-
conductive switch RV4.

The photoconductive level control consists of a
photocell and a 100,000-hour 6-volt lamp contained
in a plug-in type epoxy filled can. The resistance
of the photocell, shunting the signal path, decreases
as the voltage applied to the lamp increases.

Each photoconductive switch is housed in a sealed
container and contains a 4-volt lamp to activate
the photocell. The resistance of the photocell is

approximately 13 megohms when the lamp is off, and 380 ohms when the lamp is on.

4. MAINTENANCE

4.1 Troubleshooting

When trouble is suspected in the 356U-1, replace the circuit card with a spare. If the replacement card remedies the problem, visually inspect the defective card for loose connections, cracks in the circuit foil, or component damage. If no faults are apparent, reinsert the card into its former position, using a card extender, and check for the presence of dc voltages and ac signal levels indicated on the schematic diagram.

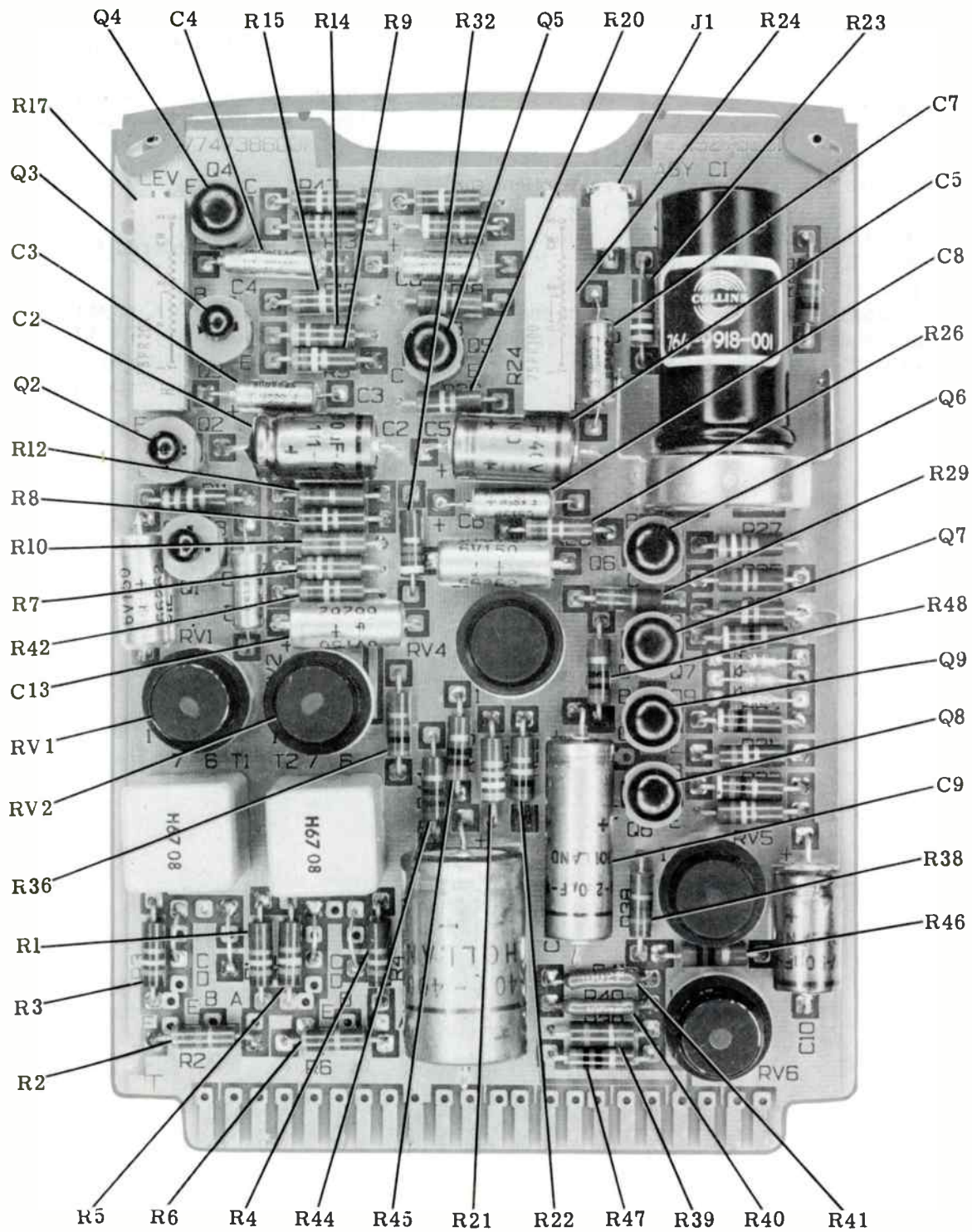
Caution

When making repairs, do not use a soldering iron rated at more than 40 watts. Do not jar the card to remove excess solder. Jarring may damage the lamp filaments in the photoconductive devices.

4.2 Spare Parts

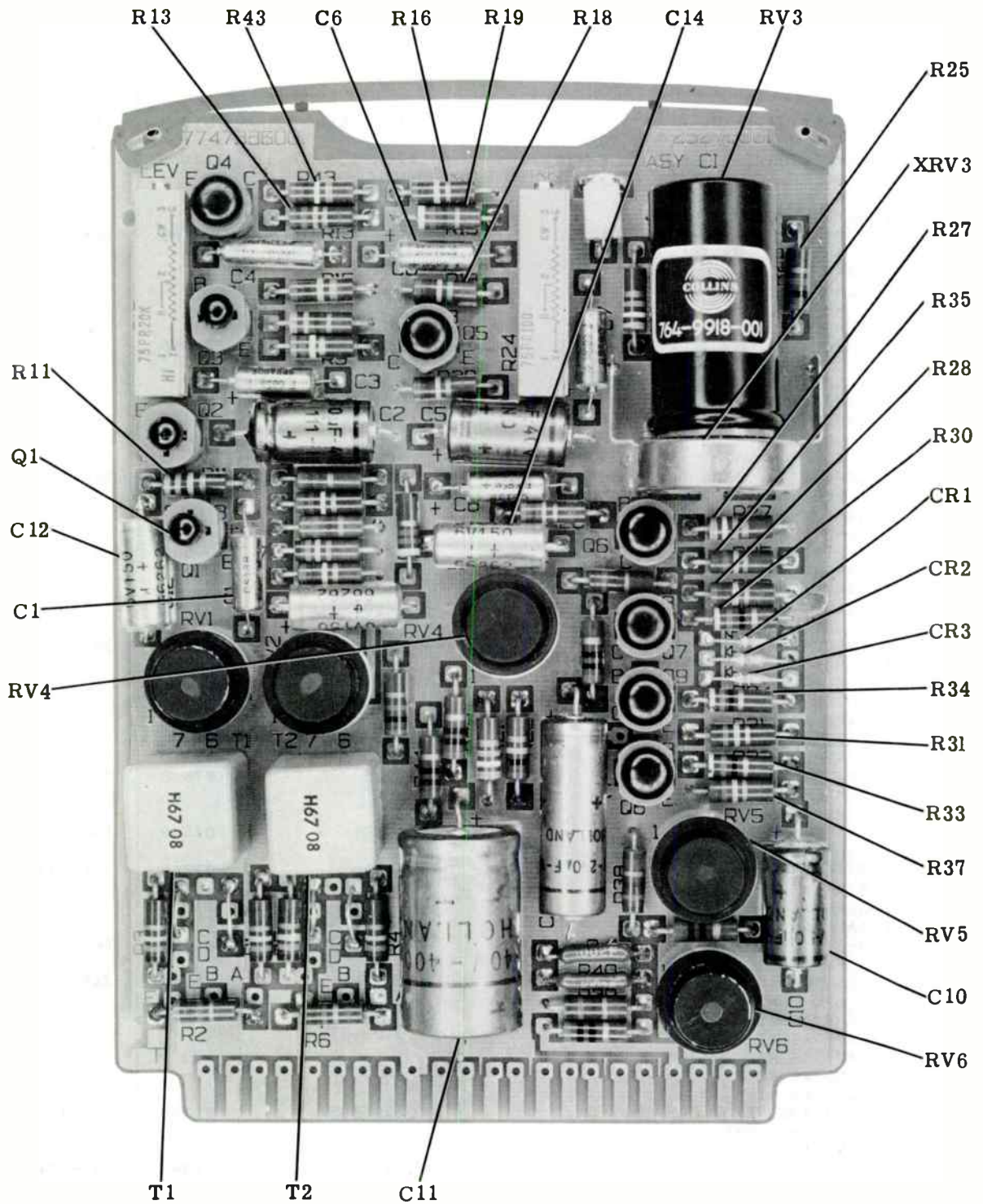
Spare parts may be ordered from the following address:

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



B502-310-Pb

Figure 2. 356U-1 Broadcast Audio Preamplifier, Parts Location (Sheet 1 of 2)



B502-311-Pb

Figure 3. 356U-1 Broadcast Audio Preampfier, Parts Location (Sheet 2 of 2)

5. PARTS LIST

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
356U-1 BROADCAST AUDIO PREAMPLIFIER			772-5273-001	
C1	CAPACITOR, FXD, ELECTROLYTIC 6.8 UF, 20% TOL, 35 VDCW	CS138F685M	81349	184-6216-000
C2	CAPACITOR, FXD, ELECTROLYTIC 50 UF, PLUS 50% MINUS 10), 40 VDCW	C426ARG50	73445	183-2354-240
C3	SAME AS C1			
C4	CAPACITOR, FXD, ELECTROLYTIC 1.1 UF, 10% TOL, 20 VDCW	151D115X9020W2	56289	184-8363-000
C5	SAME AS C2			
C6	SAME AS C1			
C7	SAME AS C1			
C8	SAME AS C1			
C9	CAPACITOR, FXD, ELECTROLYTIC 250 UF, PLUS 50% MINUS 10%, 16 VDCW	C437ARE250	73445	183-2355-060
C10	SAME AS C2			
C11	CAPACITOR, FXD, ELECTROLYTIC 400 UUF, PLUS 50% MINUS 10%, 40 VDCW	C437ARG400	73445	183-2355-160
C12	CAPACITOR, FXD, ELECTROLYTIC 150 UF, 20% TOL, 6 VDCW	CS138B157M	81349	184-6136-000
C13	SAME AS C12			
C14	SAME AS C12			
CR1	SEMICONDUCTOR DEVICE, DIODE	1N914	07688	353-2906-000
CR2	SAME AS CR1			
CR3	SAME AS CR1			
J1	JACK, TIP WHITE	SKT-103-PC	98291	360-0172-000
MP1	INSULATOR, DISK MOLDED PLASTIC	7720-4N	13103	352-9552-540
MP2	SAME AS MP1			
MP3	NOT USED			
MP4	SAME AS MP1			
MP5	SAME AS MP1			
MP6	SAME AS MP1			
Q1	TRANSISTOR	2N3565	07688	352-0638-010
Q2	SAME AS Q1			
Q3	SAME AS Q1			
Q4	TRANSISTOR	2N3567	07688	352-0629-010
Q5	SAME AS Q4			
Q6	TRANSISTOR	2N3645	07263	352-0732-020
Q7	SAME AS Q4			
Q8	SAME AS Q4			
Q9	SAME AS Q6			
R1	RESISTOR, FXD, COMPOSITION 56K OHMS, 5% TOL, 1/2 WATT	RC20GF563J	81349	745-1425-000
R2	RESISTOR, FXD, COMPOSITION 620 OHMS, 5% TOL, 1/2 WATT	RC20GF621J	81349	745-1343-000
R3	SAME AS R1			
R4	SAME AS R1			
R5	SAME AS R1			
R6	SAME AS R2			
R7	SAME AS R1			
R8	RESISTOR, FXD, COMPOSITION 3.3 MEGOHMS, 10% TOL, 1/2 WATT	RC20GF335K	81349	745-1499-000
R9	RESISTOR, FXD, COMPOSITION 680K OHMS, 5% TOL, 1/2 WATT	RC20GF684J	81349	745-1470-000
R10	RESISTOR, FXD, COMPOSITION 1800 OHMS, 5% TOL, 1/2 WATT	RC20GF182J	81349	745-1362-000
R11	RESISTOR, FXD, COMPOSITION 330K OHMS, 5% TOL, 1/2 WATT	RC20GF334J	81349	745-1456-000

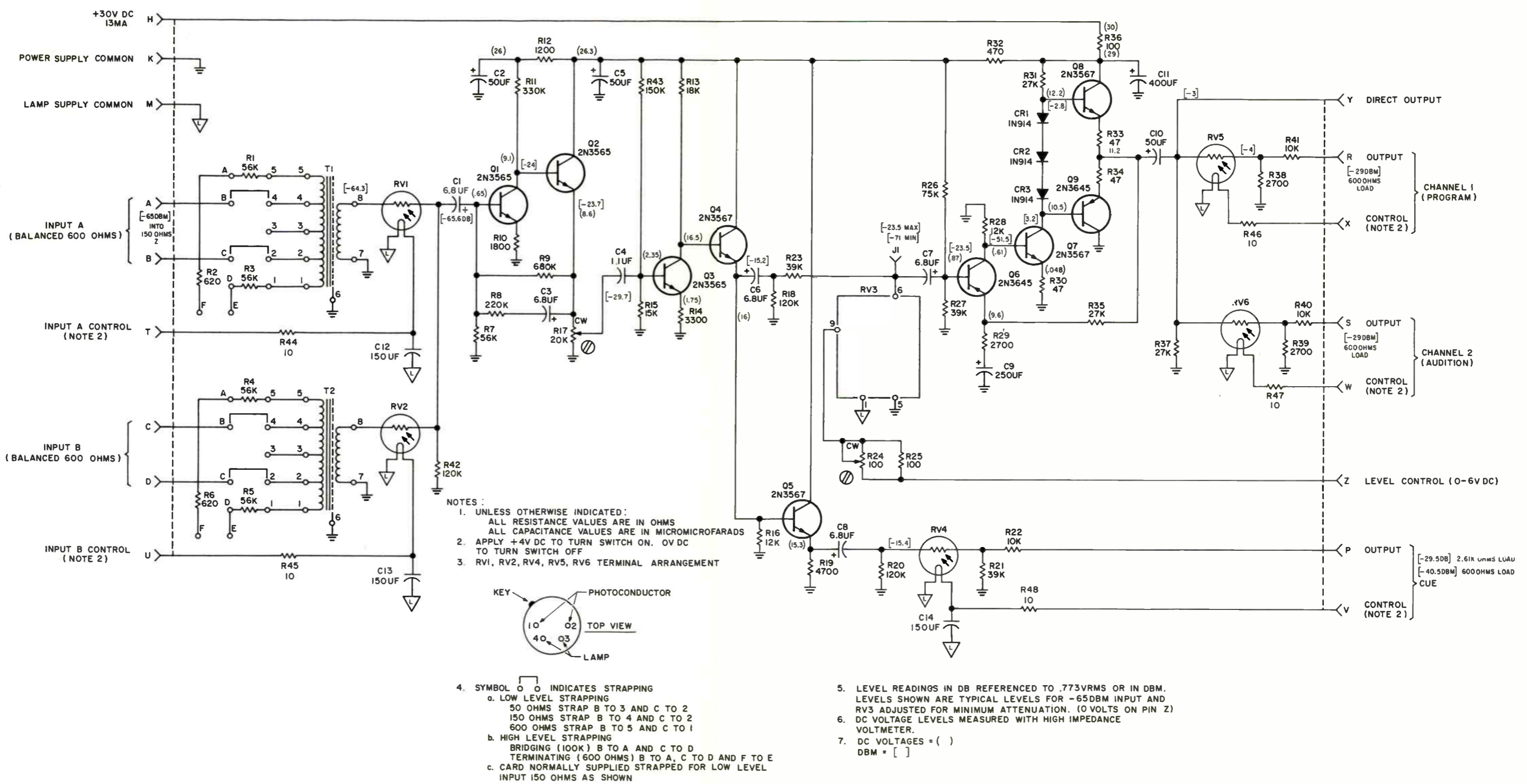
SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
R12	RESISTOR, FXD, COMPOSITION 1200 OHMS, 5% TOL, 1/2 WATT	RC20GF122J	81349	745-1355-000
R13	RESISTOR, FXD, COMPOSITION 18K OHMS, 5% TOL, 1/2 WATT	RC20GF183J	81349	745-1404-000
R14	RESISTOR, FXD, COMPOSITION 3300 OHMS, 5% TOL, 1/2 WATT	RC20GF332J	81349	745-1372-000
R15	RESISTOR, FXD, COMPOSITION 15K OHMS, 5% TOL, 1/2 WATT	RC20GF153J	81349	745-1400-000
R16	RESISTOR, FXD, COMPOSITION 12K OHMS, 5% TOL, 1/2 WATT	RC20GF123J	81349	745-1397-000
R17	RESISTOR, VAR, NON WIRE-WND 20K OHMS, 20% TOL, 3/4 WATT	75PR20K	80740	382-0004-290
R18	RESISTOR, FXD, COMPOSITION 120K OHMS, 5% TOL, 1/2 WATT	RC20GF124J	81349	745-1439-000
R19	SAME AS R16			
R20	SAME AS R18			
R21	RESISTOR, FXD, COMPOSITION 39K OHMS, 5% TOL, 1/2 WATT	RC20GF393J	81349	745-1418-000
R22	RESISTOR, FXD, COMPOSITION 10K OHMS, 5% TOL, 1/2 WATT	RC20GF103J	81349	745-1393-000
R23	SAME AS R21			
R24	RESISTOR, VAR, NON WIRE-WND 100 OHMS, 30% TOL, 3/4 WATT	75PR100	80740	382-0004-220
R25	RESISTOR, FXD, COMPOSITION 100 OHMS, 5% TOL, 1/2 WATT	RC20GF101J	81349	745-1309-000
R26	RESISTOR, FXD, COMPOSITION 75K OHMS, 5% TOL, 1/2 WATT	RC20GF753J	81349	745-1431-000
R27	SAME AS R21			
R28	SAME AS R16			
R29	RESISTOR, FXD, COMPOSITION 2700 OHMS, 5% TOL, 1/2 WATT	RC20GF272J	81349	745-1369-000
R30	RESISTOR, FXD, COMPOSITION 47 OHMS, 5% TOL, 1/2 WATT	RC20GF470J	81349	745-1295-000
R31	RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATT	RC20GF273J	81349	745-1411-000
R32	RESISTOR, FXD, COMPOSITION 470 OHMS, 5% TOL, 1/2 WATT	RC20GF471J	81349	745-1337-000
R33	SAME AS R30			
R34	SAME AS R30			
R35	SAME AS R31			
R36	SAME AS R25			
R37	SAME AS R31			
R38	SAME AS R29			
R39	SAME AS R29			
R40	RESISTOR, FXD, FILM 10K OHMS, 1% TOL, 1/4 WATT	RN60D1002F	81349	705-6644-000
R41	SAME AS R40			
R42	SAME AS R18			
R43	RESISTOR, FXD, COMPOSITION 150K OHMS, 5% TOL, 1/2 WATT	RC20GF154J	81349	745-1442-000
R44	RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATT	RC20GF100J	81349	745-1267-000
R45	SAME AS R44			
R46	SAME AS R44			
R47	SAME AS R44			
R48	SAME AS R44			
RV1	PHOTOCONDUCTIVE SWITCH	Y-1317	33173	714-3218-010
RV2	SAME AS RV1			
RV3	PHOTOCONDUCTIVE LEVEL CONTROL			764-9918-001
RV4	SAME AS RV1			714-0013-010
RV5	SAME AS RV1			

356U-1 Broadcast Audio Preamplifier

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
RV6 T1	SAME AS RV1 TRANSFORMER, AUDIO FREQUENCY 30-15,000 HZ FREQ RESPONSE 0.50 DB TOL	J8-204	80223	667-0174-010
T2 XQ1 XQ2 THROUGH XQ9	SAME AS T1 SOCKET, TRANSISTOR	05-3307-51	91662	352-9903-000
XRV1 XRV2 XRV3	SAME AS XQ1 NOT USED NOT USED SOCKET, ELECTRON TUBE 9 PIN SOCKET	RA9AX	00656	220-1384-070

MANUFACTURERS CODES

CODE	MANUFACTURER			
00656	AEROVOX CORP. 740 BELLEVILLE AVE. NEW BEDFORD, MASS.			
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP. SEMICONDUCTOR DIVISION 313 FRONTAGE RD. MOUNTAIN VIEW, CALIF.			
07688	JOINT ELECTRON DEVICE ENGINEERING COUNCIL WASHINGTON, D.C.			
13103	THERMALLOY CO. 8717 DIPLOMACY ROW DALLAS, TEX. 75247			
33173	GENERAL ELECTRIC CO. TUBE DEPT. 316 EAST 9TH ST. OWENSBORO, KY. 42301			
56289	SPRAGUE ELECTRIC CO. NORTH ADAMS, MASS.			
73445	AMPEREX ELECTRONIC CO. DIV. OF NORTH AMERICAN PHILIPS CO. INC. HICKSVILLE, N.Y.			
80223	UNITED TRANSFORMER CO. 150 VARICK ST. NEW YORK, N.Y.			
80740	BECKMAN INSTRUMENTS INC. 2500 HARBOR BLVD. FULLERTON, CALIF. 92634			
81349	MILITARY SPECIFICATIONS			
91662	ELCO CORP. WILLOW GROVE, PA.			
98291	SEAELECTRO COPP. 225 HOYT MAMARONECK, N.Y. 10544			



B502-203-6

Figure 4. 356U-1 Broadcast Audio Preampfier, Schematic Diagram



356U-1

Broadcast Audio Preamplifier

unit instructions

Collins Radio Company | Dallas, Texas

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Printed in United States of America

523-0559550-001438
August 1, 1967

1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 356U-1 Broadcast Audio Preamplifier (figure 1) amplifies audio signals from two separate high- or low-level input devices. Remote switching is provided for the two inputs and three outputs. One direct output is also available. The unit is normally used for broadcast audio control.

1.2 Unit Description

The 356U-1 consists of two input transformers, nine transistors, and related circuit elements mounted on a plug-in type etched circuit card. Six remotely operated photoconductive devices control level and perform the switching. Strapping options permit input impedance selection. As delivered, the card is strapped for 150-ohms inputs.

2. UNIT CHARACTERISTICS

2.1 Physical Characteristics

Size:
4-7/16 by 6-3/8 by 1-1/16 inches

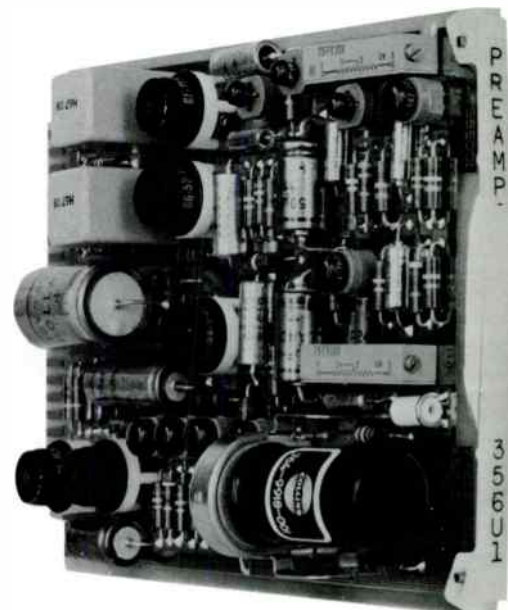
Weight:
1 pound

Type of Construction:
Etched circuit card

Type of Mounting:
22 contact card connector
(CPN 372-7009-000)

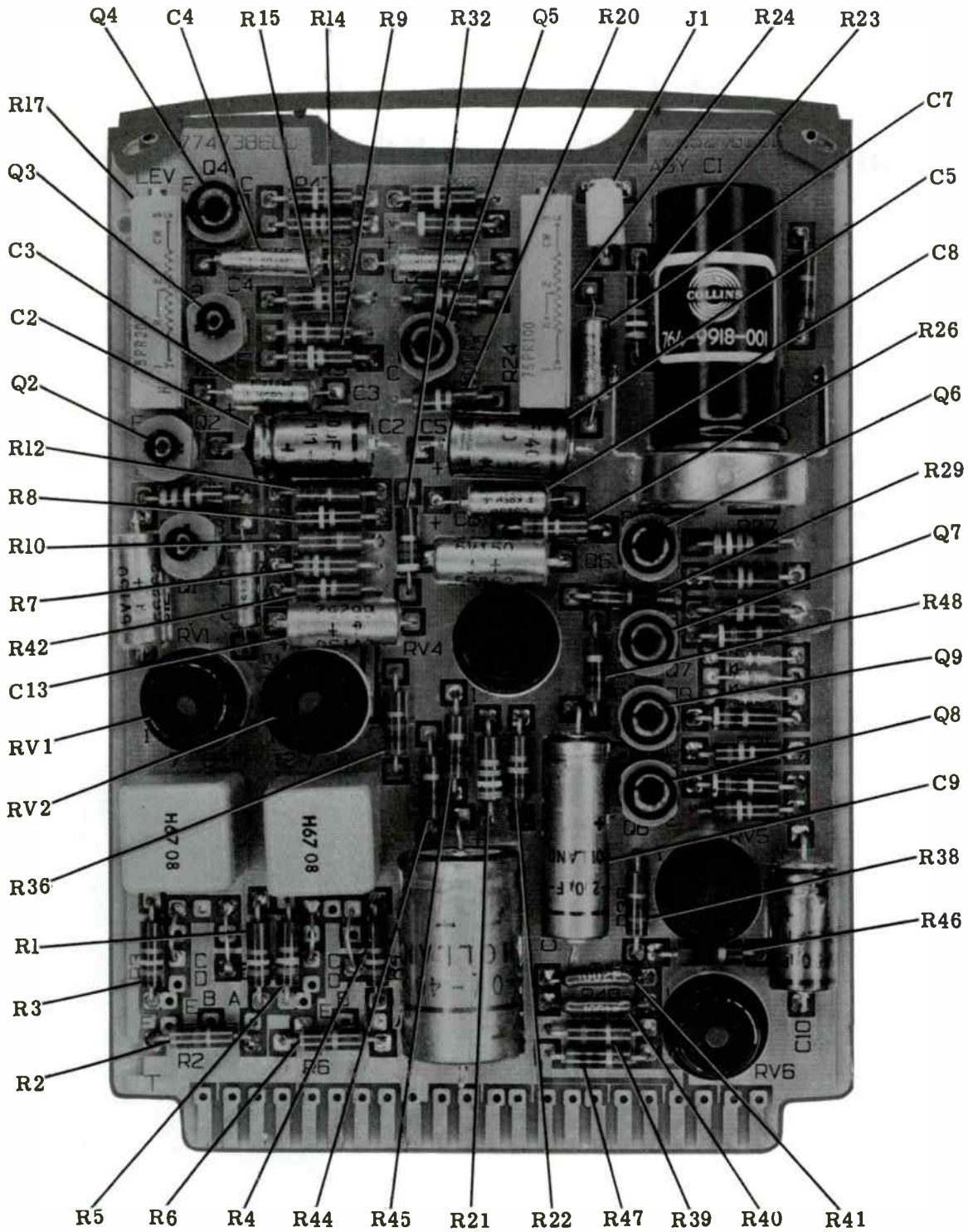
2.2 Operating Characteristics

Ambient Service Conditions:
Temperature
0° to 50°C (32° to 122°F)



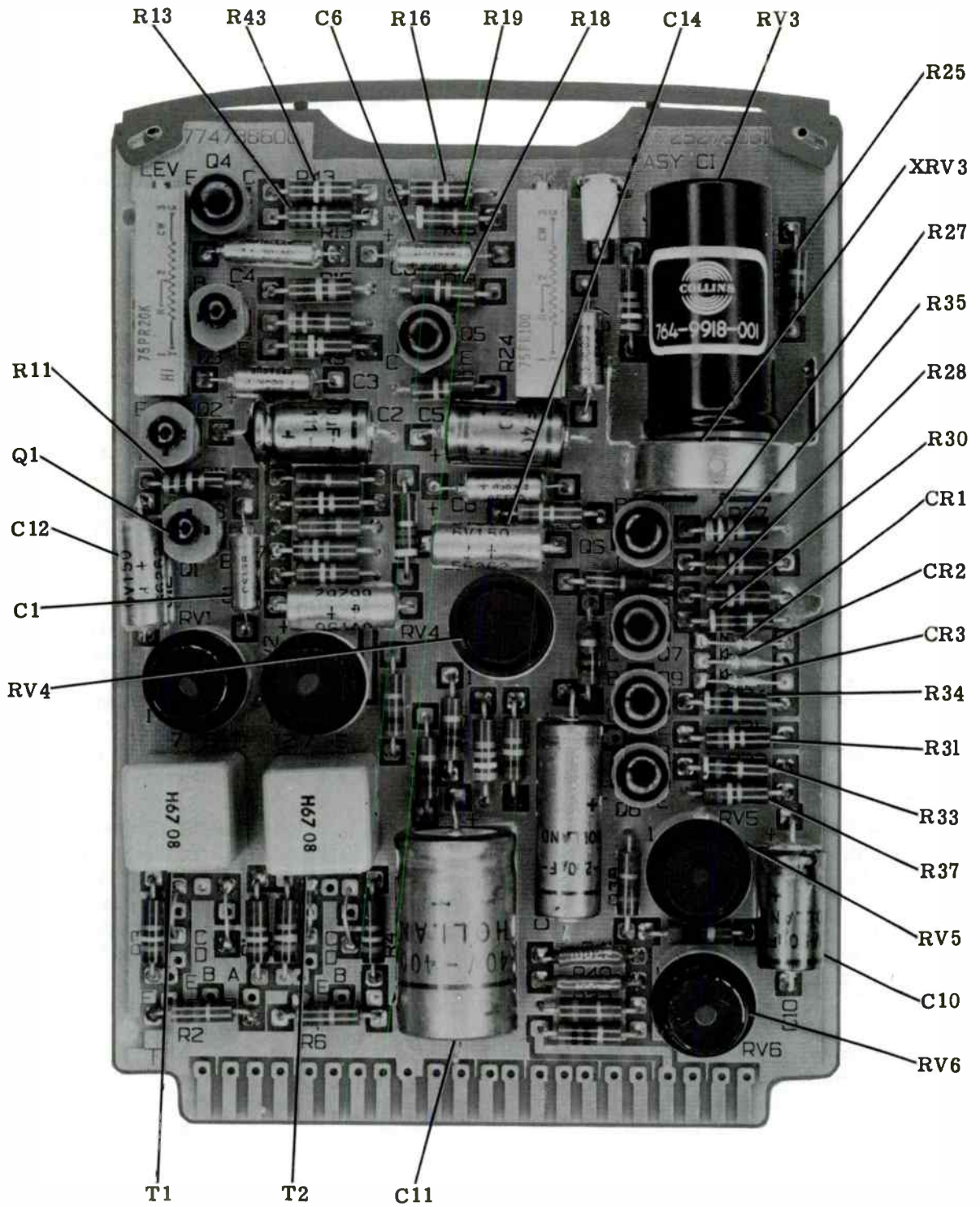
B502-301-Pb

Figure 1. 356U-1 Broadcast Audio Preamplifier



B502-310-Pb

Figure 1. 356U-1 Broadcast Audio Preamplifier (Sheet 1 of 2)



B502-311-Pb

Figure 2. 356U-1 Broadcast Audio Preamplifier (Sheet 2 of 2)

Relative Humidity
Up to 95%

Altitude
Up to 10,000 feet above msl

Type of Service:
Continuous

2.3 Electrical Characteristics

Power Requirements:
+30 volts dc at 15 ma, 1 mv maximum ripple
+6 volts dc at 60 ma, regulated
+4 volts dc at 120 ma, regulated

Frequency Response:
±1.0 db, 30 Hz to 15,000 Hz with 1000 Hz as
reference level

Total Harmonic Distortion:
0.5%, maximum at rated output

Noise:
Equivalent Input Noise
-120 dbm at maximum gain

Signal-to-Noise Ratio (1000-Hz Signal/
Wideband Noise Level at Bus Output)
Minimum 60 db for -60-dbm input signal

Input Impedance:
Microphone input impedance available
through strapping options are 600, 250,
150, and 30 ohms. When strapped for high-
level input, the input impedance is 600 ohms
(terminated) or 100 kilohms (bridging).

Input Level:
-65 dbm nominal
-30 dbm, maximum
High level, +10 dbm, maximum

Output Impedance:
Program, Audition, and Cue outputs, greater
than 10 kilohms, unbalanced
Direct output 600 ohms, unbalanced

Output Levels:
Program and Audition (into 600 ohms)
-10 dbm, maximum
Cue (into 600 ohms) -40-dbm, -65-dbm
microphone input
Direct (into 10 kilohms) 5 volts peak-to-peak,
maximum

2.4 Strapping Options

Refer to the schematic diagram, figure 3, for
strapping connections.

3. CIRCUIT DESCRIPTION

The 356U-1 (figure 3) consists of a two-stage
preamplifier with two transformer coupled inputs,
and an output amplifier network. Remotely oper-
ated photoconductive switches select one or both
inputs and one or all of three outputs. A similar
remotely operated photoconductive attenuator
controls the output level.

Transformers T1 and T2 match the impedance of
the input signal sources to the input impedance of
Q1. Photoconductive switch RV1 switches input A
on or off. Input B, with photoconductive switch
RV2, is identical to input A. Transistor Q1 drives
emitter follower Q2. Potentiometer R17 adjusts
the drive applied to Q3 and allows balancing the
system for stereo operation. Transistor Q3 and
emitter follower Q4 provide an additional ampli-
fication stage. Photoconductive level control RV3,
between Q4 and the first output amplifier, Q6
controls the output level of the card. Potentiometer
R24, in series with the lamp in the photoconductive
level control, is a fine gain adjustment. Transistor
Q7 drives the complementary symmetrical output
stage Q8 and Q9. Resistor R35 provides 100 percent
dc feed back. Diodes CR1, CR2, and CR3 establish
bias for the final output stage.

Capacitor coupled output channels 1 (PROGRAM)
and 2 (AUDITION) are switched on and off by
photoconductive switches RV5 and RV6, respec-
tively. A direct output, available at pin Y, is
taken from the output of the symmetrical power
amplifier. The cue output is taken from tran-
sistor Q4, prior to the level control. Isolation
for the cue output is provided by Q4, and on/off
switching of the cue is accomplished by photo-
conductive switch RV4.

The photoconductive level control consists of a
photocell and a 100,000-hour 6-volt lamp contained
in a plug-in type epoxy filled can. The resistance
of the photocell, shunting the signal path, decreases
as the voltage applied to the lamp increases.

Each photoconductive switch is housed in a sealed
container and contains a 4-volt lamp to activate
the photocell. The resistance of the photocell is

approximately 13 megohms when the lamp is off, and 380 ohms when the lamp is on.

4. MAINTENANCE

4.1 Troubleshooting

When trouble is suspected in the 356U-1, replace the circuit card with a spare. If the replacement card remedies the problem, visually inspect the defective card for loose connections, cracks in the circuit foil, or component damage. If no faults are apparent, reinsert the card into its former position, using a card extender, and check for the presence of dc voltages and ac signal levels indicated on the schematic diagram.

Caution

When making repairs, do not use a soldering iron rated at more than 40 watts. Do not jar the card to remove excess solder. Jarring may damage the lamp filaments in the photoconductive devices.

4.2 Spare Parts

Spare parts may be ordered from the following address:

Collins Radio Company
Service Parts Department
Dallas, Texas 75207

5. PARTS LIST

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
356U-1 BROADCAST AUDIO PREAMPLIFIER			772-5273-001	
C1	CAPACITOR, FXD, ELECTROLYTIC 6.8 UF, 20% TOL, 35 VDCW	CS138F685M	81349	184-6216-000
C2	CAPACITOR, FXD, ELECTROLYTIC 50 UF, PLUS 50% MINUS 10), 40 VDCW	C426ARG50	73445	183-2354-240
C3	SAME AS C1			
C4	CAPACITOR, FXD, ELECTROLYTIC 1.1 UF, 10% TOL, 20 VDCW	151D115X9020W2	56289	184-8363-000
C5	SAME AS C2			
C6	SAME AS C1			
C7	SAME AS C1			
C8	SAME AS C1			
C9	CAPACITOR, FXD, ELECTROLYTIC 250 UF, PLUS 50% MINUS 10%, 16 VDCW	C437ARE250	73445	183-2355-060
C10	SAME AS C2			
C11	CAPACITOR, FXD, ELECTROLYTIC 400 UUF, PLUS 50% MINUS 10%, 40 VDCW	C437ARG400	73445	183-2355-160
C12	CAPACITOR, FXD, ELECTROLYTIC 150 UF, 20% TOL, 6 VDCW	CS138B157M	81349	184-6136-000
C13	SAME AS C12			
C14	SAME AS C12			
CR1	SEMICONDUCTOR DEVICE, DIODE	1N914	07688	353-2906-000
CR2	SAME AS CR1			
CR3	SAME AS CR1			
J1	JACK, TIP WHITE	SKT-103-PC	98291	360-0172-000
MP1	INSULATOR, DISK MOLDED PLASTIC	7720-4N	13103	352-9552-540
MP2	SAME AS MP1			
MP3	NOT USED			
MP4	SAME AS MP1			
MP5	SAME AS MP1			
MP6	SAME AS MP1			
Q1	TRANSISTOR	2N3565	07688	352-0638-010
Q2	SAME AS Q1			
Q3	SAME AS Q1			
Q4	TRANSISTOR	2N3567	07688	352-0629-010
Q5	SAME AS Q4			
Q6	TRANSISTOR	2N3645	07263	352-0732-020
Q7	SAME AS Q4			
Q8	SAME AS Q4			
Q9	SAME AS Q6			
R1	RESISTOR, FXD, COMPOSITION 56K OHMS, 5% TOL, 1/2 WATT	RC20GF563J	81349	745-1425-000
R2	RESISTOR, FXD, COMPOSITION 620 OHMS, 5% TOL, 1/2 WATT	RC20GF621J	81349	745-1343-000
R3	SAME AS R1			
R4	SAME AS R1			
R5	SAME AS R1			
R6	SAME AS R2			
R7	SAME AS R1			
R8	RESISTOR, FXD, COMPOSITION 3.3 MEGOHMS, 10% TOL, 1/2 WATT	RC20GF335K	81349	745-1499-000
R9	RESISTOR, FXD, COMPOSITION 680K OHMS, 5% TOL, 1/2 WATT	RC20GF684J	81349	745-1470-000
R10	RESISTOR, FXD, COMPOSITION 1800 OHMS, 5% TOL, 1/2 WATT	RC20GF182J	81349	745-1362-000
R11	RESISTOR, FXD, COMPOSITION 330K OHMS, 5% TOL, 1/2 WATT	RC20GF334J	81349	745-1456-000

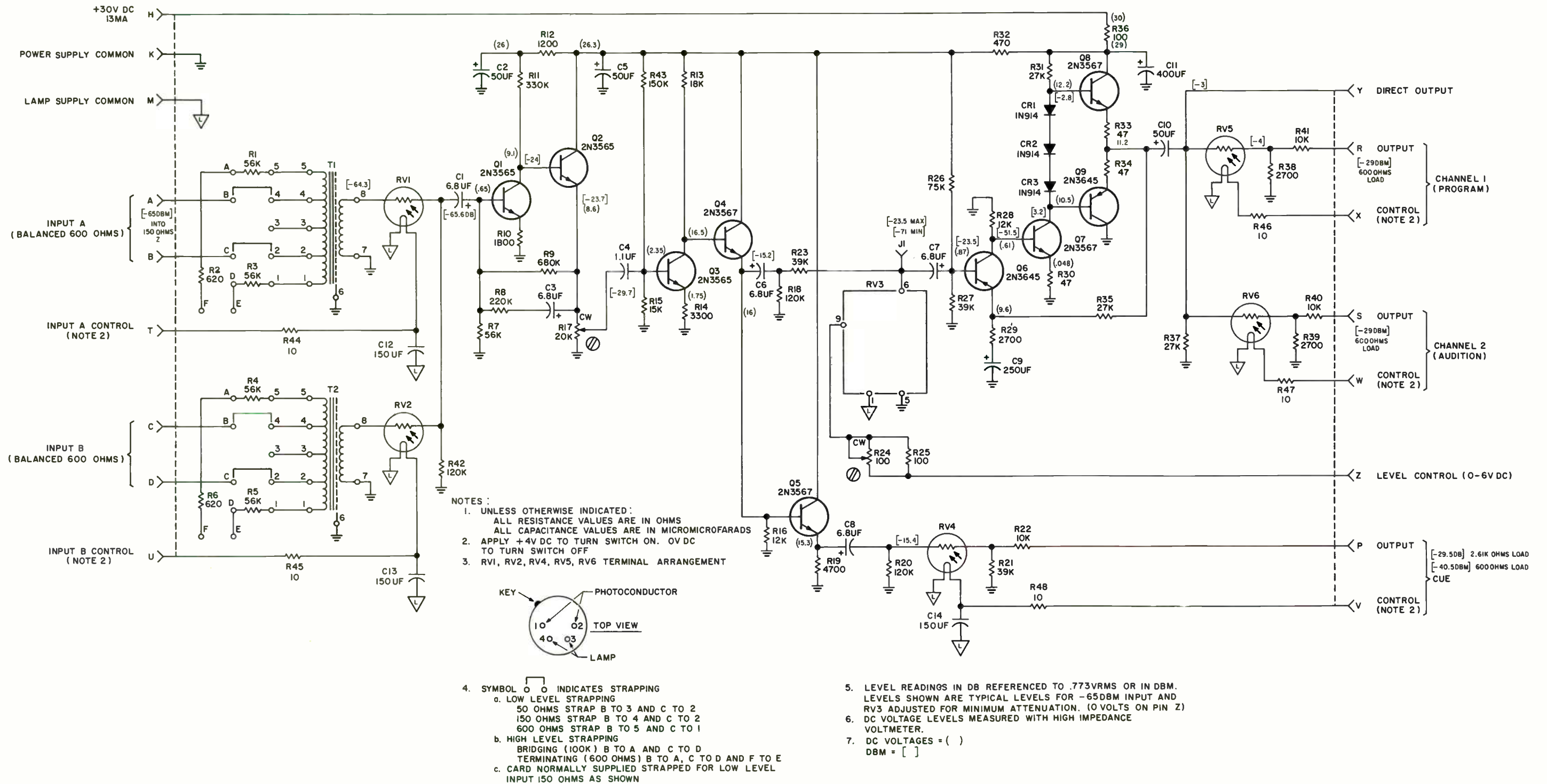
SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
R12	RESISTOR, FXD, COMPOSITION 1200 OHMS, 5% TOL, 1/2 WATT	RC20GF122J	81349	745-1355-000
R13	RESISTOR, FXD, COMPOSITION 18K OHMS, 5% TOL, 1/2 WATT	RC20GF183J	81349	745-1404-000
R14	RESISTOR, FXD, COMPOSITION 3300 OHMS, 5% TOL, 1/2 WATT	RC20GF332J	81349	745-1372-000
R15	RESISTOR, FXD, COMPOSITION 15K OHMS, 5% TOL, 1/2 WATT	RC20GF153J	81349	745-1400-000
R16	RESISTOR, FXD, COMPOSITION 12K OHMS, 5% TOL, 1/2 WATT	RC20GF123J	81349	745-1397-000
R17	RESISTOR, VAR, NON WIRE-WND 20K OHMS, 20% TOL, 3/4 WATT	75PR20K	80740	382-0004-290
R18	RESISTOR, FXD, COMPOSITION 120K OHMS, 5% TOL, 1/2 WATT	RC20GF124J	81349	745-1439-000
R19	SAME AS R16			
R20	SAME AS R18			
R21	RESISTOR, FXD, COMPOSITION 39K OHMS, 5% TOL, 1/2 WATT	RC20GF393J	81349	745-1418-000
R22	RESISTOR, FXD, COMPOSITION 10K OHMS, 5% TOL, 1/2 WATT	RC20GF103J	81349	745-1393-000
R23	SAME AS R21			
R24	RESISTOR, VAR, NON WIRE-WND 100 OHMS, 30% TOL, 3/4 WATT	75PR100	80740	382-0004-220
R25	RESISTOR, FXD, COMPOSITION 100 OHMS, 5% TOL, 1/2 WATT	RC20GF101J	81349	745-1309-000
R26	RESISTOR, FXD, COMPOSITION 75K OHMS, 5% TOL, 1/2 WATT	RC20GF753J	81349	745-1431-000
R27	SAME AS R21			
R28	SAME AS R16			
R29	RESISTOR, FXD, COMPOSITION 2700 OHMS, 5% TOL, 1/2 WATT	RC20GF272J	81349	745-1369-000
R30	RESISTOR, FXD, COMPOSITION 47 OHMS, 5% TOL, 1/2 WATT	RC20GF470J	81349	745-1295-000
R31	RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATT	RC20GF273J	81349	745-1411-000
R32	RESISTOR, FXD, COMPOSITION 470 OHMS, 5% TOL, 1/2 WATT	RC20GF471J	81349	745-1337-000
R33	SAME AS R30			
R34	SAME AS R30			
R35	SAME AS R31			
R36	SAME AS R25			
R37	SAME AS R31			
R38	SAME AS R29			
R39	SAME AS R29			
R40	RESISTOR, FXD, FILM 10K OHMS, 1% TOL, 1/4 WATT	RN60D1002F	81349	705-6644-000
R41	SAME AS R40			
R42	SAME AS R18			
R43	RESISTOR, FXD, COMPOSITION 150K OHMS, 5% TOL, 1/2 WATT	RC20GF154J	81349	745-1442-000
R44	RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATT	RC20GF100J	81349	745-1267-000
R45	SAME AS R44			
R46	SAME AS R44			
R47	SAME AS R44			
R48	SAME AS R44			
RV1	PHOTOCONDUCTIVE SWITCH	Y-1317	33173	714-3218-010
RV2	SAME AS RV1			
RV3	PHOTOCONDUCTIVE LEVEL CONTROL			764-9918-001
RV4	SAME AS RV1			714-0013-010
RV5	SAME AS RV1			

356U-1 Broadcast Audio Preamplifier

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
RV6 T1	SAME AS RV1 TRANSFORMER, AUDIO FREQUENCY 30-15,000 HZ FREQ RESPONSE 0.50 DB TOL	JB-204	80223	667-0174-010
T2 XQ1 XQ2 THROUGH XQ9	SAME AS T1 SOCKET, TRANSISTOR	05-3307-51	91662	352-9903-000
XRV1 XRV2 XRV3	SAME AS XQ1 NOT USED NOT USED SOCKET, ELECTRON TUBE 9 PIN SOCKET	RA9AX	00656	220-1384-070

MANUFACTURERS CODES

CODE	MANUFACTURER			
00656	AEROVOX CORP. 740 BELLEVILLE AVE. NEW BEDFORD, MASS.			
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP. SEMICONDUCTOR DIVISION 313 FRONTAGE RD. MOUNTAIN VIEW, CALIF.			
07688	JOINT ELECTRON DEVICE ENGINEERING COUNCIL WASHINGTON, D.C.			
13103	THERMALLOY CO. 8717 DIPLOMACY ROW DALLAS, TEX. 75247			
33173	GENERAL ELECTRIC CO. TUBE DEPT. 316 EAST 9TH ST. OWENSBORO, KY. 42301			
56289	SPRAGUE ELECTRIC CO. NORTH ADAMS, MASS.			
73445	AMPEREX ELECTRONIC CO. DIV. OF NORTH AMERICAN PHILIPS CO. INC. HICKSVILLE, N.Y.			
80223	UNITED TRANSFORMER CO. 150 VARICK ST. NEW YORK, N.Y.			
80740	BECKMAN INSTRUMENTS INC. 2500 HARBOR BLVD. FULLERTON, CALIF. 92634			
81349	MILITARY SPECIFICATIONS			
91662	ELCO CORP. WILLOW GROVE, PA.			
98291	SEAELECTRO COPP. 225 HOYT MAMARONECK, N.Y. 10544			



B502-203-6

Figure 3. 356U-1 Broadcast Audio Preamplifier, Schematic Diagram



356V-1 High-Level Input Card

unit instructions

Collins Radio Company | Dallas, Texas

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©Second Edition 1967
Second Printing June 1968
Printed in United States of America

523-0558092-102438
1 June 1968

1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 356V-1 High-Level Input Card (figure 1) is a four-stage high-fidelity audio amplifier with two balanced inputs. The unit accepts a nominal 0-dbm input signal and delivers an output at the program bus level. The unit is normally used in an audio console.

1.2 Unit Description

The 356V-1 consists of two input transformers with primary pads, a five-transistor amplifier with a level control, five switches and associated components on a plug-in, etched circuit card. The unit has two switched inputs, one direct output, and three switched outputs. Remotely controlled photoconductive devices accomplish switching and level control.

2. UNIT CHARACTERISTICS

2.1 Physical Characteristics

Size:
4-7/16 by 6-3/8 by 1 inches

Weight:
7 ounces

Type of Construction:
Etched circuit card

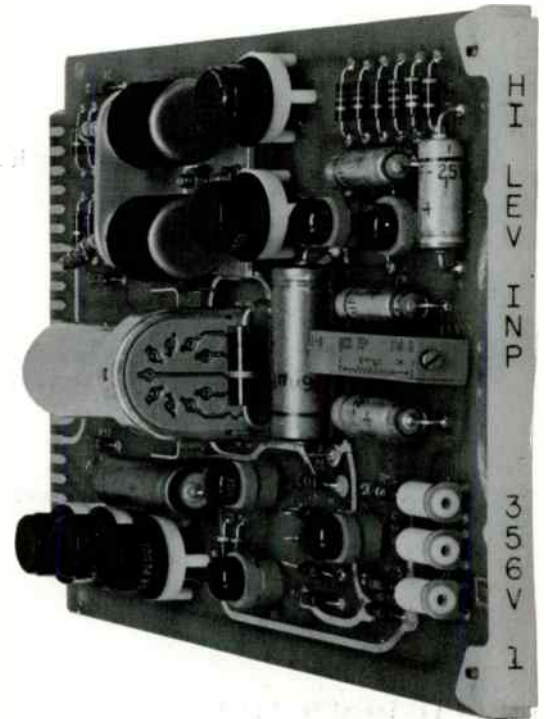
Type of Mounting:
22-contact card receptacle
(CPN 372-7009-000)

2.2 Operating Characteristics

Ambient Service Conditions:

Temperature
0° to 50°C (32° to 122°F)

Relative Humidity
Up to 95%



B502-010-Pb

Figure 1. 356V-1 High-Level Input Card

Altitude
Up to 10,000 feet above msl

Type of Service:
Continuous

2.3 Electrical Characteristics

Power Requirements:
30 volts dc at 5 ma, 1 mv maximum ripple
6 volts dc at 60 ma, regulated
4 volts dc at 120 ma, regulated

Input Impedance:
600 ohms, (balanced)

Input Level:
-10 dbm, minimum
0 dbm nominal
+10 dbm, maximum

Output Impedance (Unbalanced):
Program and Audition
Greater than 6.8K

Direct
600 ohms, approximately

Cue
2200 ohms, approximately

Output Level:
Program and Audition (into 600-ohm load)
-45 dbm nominal
-25 dbm, maximum

Direct (unloaded)
150 mv nominal

Cue (into 2200-ohm load)
12 mv nominal

Frequency Response:
30 to 15,000 Hz ± 0.5 db, minimum (referred
to 1000 Hz)

Distortion:
0.5%, maximum

3. CIRCUIT DESCRIPTION

The 356V-1 (figure 3) consists of two input transformers with primary pads, five transistors and

associated components, a photoconductive level control, and five photoconductive switches.

Resistors R1 through R6 constitute a 600-ohm attenuating pad for the input A signal. Transformer T1 matches the 600-ohm input line impedance to the high impedance at the base of transistor Q1. Photoconductive switch RV1 switches input A on and off.

Input B, consisting of resistors R7 through R12, transformer T2, and photoconductive switch RV2, is identical to input A.

Transistor Q1 is a class A amplifier that drives emitter-follower Q2. Transistor Q2 matches the output impedance of Q1 to the input impedance of transistor Q3. Photoconductive level control RV3, between transistors Q2 and Q3, controls the output level of the amplifier. Potentiometer R22, in series with the lamp in the photoconductive level control, is a fine gain adjustment. Transistor Q3 is a class A driver for the class AB output stage, transistors Q4 and Q5. Silicon diodes CR1, CR2, and CR3 provide bias for Q4 and Q5. A direct output is taken from the power amplifier. Photoconductive switches RV4 and RV5 switch the program and audition outputs, respectively. The cue output controlled by RV6 is taken from transistor Q2.

The photoconductive level control consists of a photocell and a 6-volt lamp sealed in a can. The resistance of the photocell shunting the signal path decreases as the voltage applied to the lamp is increased. Each photoconductive switch consists of a photocell and a 4-volt lamp sealed in a can. The resistance of the photocell is approximately 13 megohms when the lamp is off and 380 ohms when the lamp is on.

4. MAINTENANCE

4.1 Troubleshooting

When trouble is suspected in this card, replace the card with a spare, if available. If the replacement card remedies the problem, visually inspect the defective card for loose connections and signs of component damage. If no faults are found, extend the card on the card extender and check for the dc voltages and ac signal levels indicated on the schematic diagram.

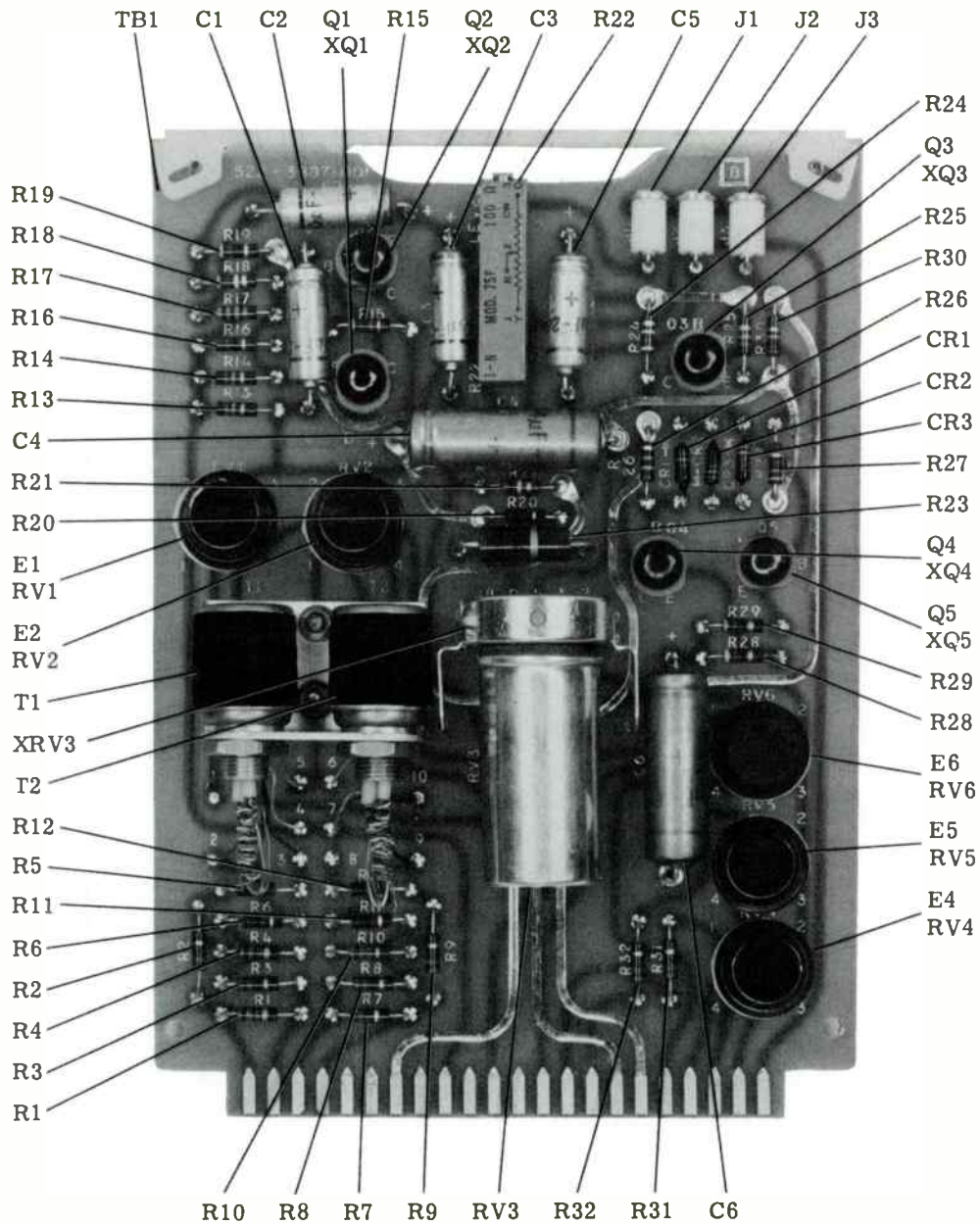
Caution

When making repairs, do not use a soldering iron rated at more than 40 watts. Do not jar the card to remove excess solder. Jarring the card may damage the lamp filaments in the photoconductive devices.

4.2 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



B502-033-Pb

Figure 2. 356V-1 High-Level Input Card, Front View

5. PARTS LIST

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
356V-1 HI-LEVEL INPUT				522-3887-001
C1	CAPACITOR, FXD, ALUMINUM 10 UF, PLUS 50% MINUS 10%, 25 VDCW	C426ARF10	73445	183-2354-170
C2	SAME AS C1			
C3	SAME AS C1			
C4	CAPACITOR, FXD, ALUMINUM 64 UF, PLUS 50% MINUS 10%, 64 VDCW	C437ARH64	73445	183-2355-110
C5	CAPACITOR, FXD, ALUMINUM 25 UF, PLUS 50% MINUS 10%, 25 VDCW	C426ARF25	73445	183-2354-180
C6	SAME AS C4			
CR1	SEMICONDUCTOR DEVICE, DIODE	1N270	07688	352-2036-000
CR2	SEMICONDUCTOR DEVICE, DIODE	1N914	07688	353-2906-000
CR3	SAME AS CR2			
E1	INSULATOR, DISK	7720-4N	13103	352-9552-540
E2	SAME AS E1			
E3	NOT USED			
E4	SAME AS E1			
E5	SAME AS E1			
E6	SAME AS E1			
J1	JACK, TIP WHITE	SKT103PC	98291	360-0172-000
J2	SAME AS J1			
J3	SAME AS J1			
Q1	TRANSISTOR	2N3565	07688	352-0638-010
Q2	TRANSISTOR	2N3567	07688	352-0629-010
Q3	SAME AS Q2			
Q4	SAME AS Q2			
Q5	TRANSISTOR	2N3638	07688	352-0636-010
R1	RESISTOR, FXD, COMPOSITION 680 OHMS, 5% TOL, 1/4 WATT	RC07GF681J	81349	745-0742-000
R2	RESISTOR, FXD, COMPOSITION 6800 OHMS, 5% TOL, 1/4 WATT	RC07GF682J	81349	745-0778-000
R3	SAME AS R2			
R4	SAME AS R1			
R5	RESISTOR, FXD, COMPOSITION 1K OHMS, 5% TOL, 1/4 WATT	RC07GF102J	81349	745-0748-000
R6	SAME AS R5			
R7	SAME AS R1			
R8	SAME AS R2			
R9	SAME AS R2			
R10	SAME AS R1			
R11	SAME AS R5			
R12	SAME AS R5			
R13	RESISTOR, FXD, COMPOSITION 56K OHMS, 10% TOL, 1/4 WATT	RC07GF563K	81349	745-0812-000
R14	SAME AS R13			
R15	RESISTOR, FXD, COMPOSITION 47K OHMS, 10% TOL, 1/4 WATT	RC07GF473K	81349	745-0809-000
R16	RESISTOR, FXD, COMPOSITION 1800 OHMS, 10% TOL, 1/4 WATT	RC07GF182K	81349	745-0758-000
R17	RESISTOR, FXD, COMPOSITION 33K OHMS, 10% TOL, 1/4 WATT	RC07GF333K	81349	745-0803-000
R18	RESISTOR, FXD, COMPOSITION 470K OHMS, 10% TOL, 1/4 WATT	RC07GF474K	81349	745-0845-000
R19	RESISTOR, FXD, COMPOSITION 4700 OHMS, 10% TOL, 1/4 WATT	RC07GF472K	81349	745-0773-000
R20	RESISTOR, FXD, COMPOSITION 1K OHMS, 10% TOL, 1/4 WATT	RC07GF102K	81349	745-0749-000

356V-1 High-Level Input Card

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
R21	RESISTOR, FXD, COMPOSITION 56K OHMS, 5% TOL, 1/4 WATT	RC07GF563J	81349	745-0811-000
R22	RESISTOR, VAR 100 OHMS, 20% TOL, 3/4 WATT	75PR100	80740	382-0004-220
R23	RESISTOR, FXD, COMPOSITION 100 OHMS, 10% TOL, 1 WATT	RC32GF101K	81349	745-3310-000
R24	RESISTOR, FXD, COMPOSITION 680K OHMS, 5% TOL, 1/4 WATT	RC07GF584J	81349	745-0850-000
R25	SAME AS R13			
R26	RESISTOR, FXD, COMPOSITION 27K OHMS, 10% TOL, 1/4 WATT	RC07GF273K	81349	745-0800-000
R27	RESISTOR, FXD, COMPOSITION 2200 OHMS, 5% TOL, 1/4 WATT	RC07GF222J	81349	745-0760-000
R28	RESISTOR, FXD, COMPOSITION 47 OHMS, 10% TOL, 1/4 WATT	RC07GF470K	81349	745-0701-000
R29	SAME AS R28			
R30	RESISTOR, FXD, COMPOSITION 10K OHMS, 10% TOL, 1/4 WATT	RC07GF103K	81349	745-0785-000
R31	RESISTOR, FXD, COMPOSITION 6800 OHMS, 10% TOL, 1/4 WATT	RC07GF582K	81349	745-0779-000
R32	SAME AS R31			
RV1	RESISTOR, VOLTAGE SENSITIVE	PL5C1	33173	714-3218-010
RV2	SAME AS RV1			
RV3	RESISTOR, VOLTAGE SENSITIVE	764-9918-001	13499	764-9918-001
RV4	SAME AS RV1			
RV5	SAME AS RV1			
RV6	SAME AS RV1			
T1	TRANSFORMER, AF, INPUT LEAD BLACK TO RED 660 OHMS IMPEDANCE, LEAD GREEN TO RED 400 OHMS IMPEDANCE, LEAD GREEN TO BLUE 200 OHMS IMPEDANCE, LEAD WHITE CENTER TAP, LEAD BLUE TO RED 60 OHMS IMPEDANCE, LEAD YELLOW TO BLUE 2500 OHMS IMPEDANCE	BV35752	GOTHA	667-0155-010
T2	SAME AS T1			
TB1	TERMINAL BOARD			764-7367-001
XQ1	SOCKET, TRANSISTOR	05-3307-51	91662	352-9903-000
XQ2				
THROUGH	SAME AS XQ1			
XQ5				
XRV1	NOT USED			
XRV2	NOT USED			
XRV3	SOCKET, ELECTRON TUBE	RA9AX	00656	220-1384-070
MANUFACTURERS CODES				
CODE	MANUFACTURER			
GOTHA	GOTHAM AUDIO CORP. NEW YORK, N. Y.			
00656	AERVOX CORP. NEW BEDFORD, MASS.			
07688	MILITARY SPECIFICATIONS			
13499	COLLINS RADIO CO. CEDAR RAPIDS, IOWA			
33173	TUBE DEPARTMENT GECC OWENSBORO, KY.			
73445	AMPEREX ELECTRONIC CO.			

714-0013-010

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
80740 81349 91652 98291	DIVISION OF NORTH AMERICAN PHILIPS CO., INC. HICKSVILLE, N. Y. BECKMAN INSTRUMENTS, INC. FULLERTON, CALIF. MILITARY SPECIFICATIONS ELCO CORP. WILLOW GROVE, PA. SEAELECTRO CORP. MAMARONECK, N. Y.			



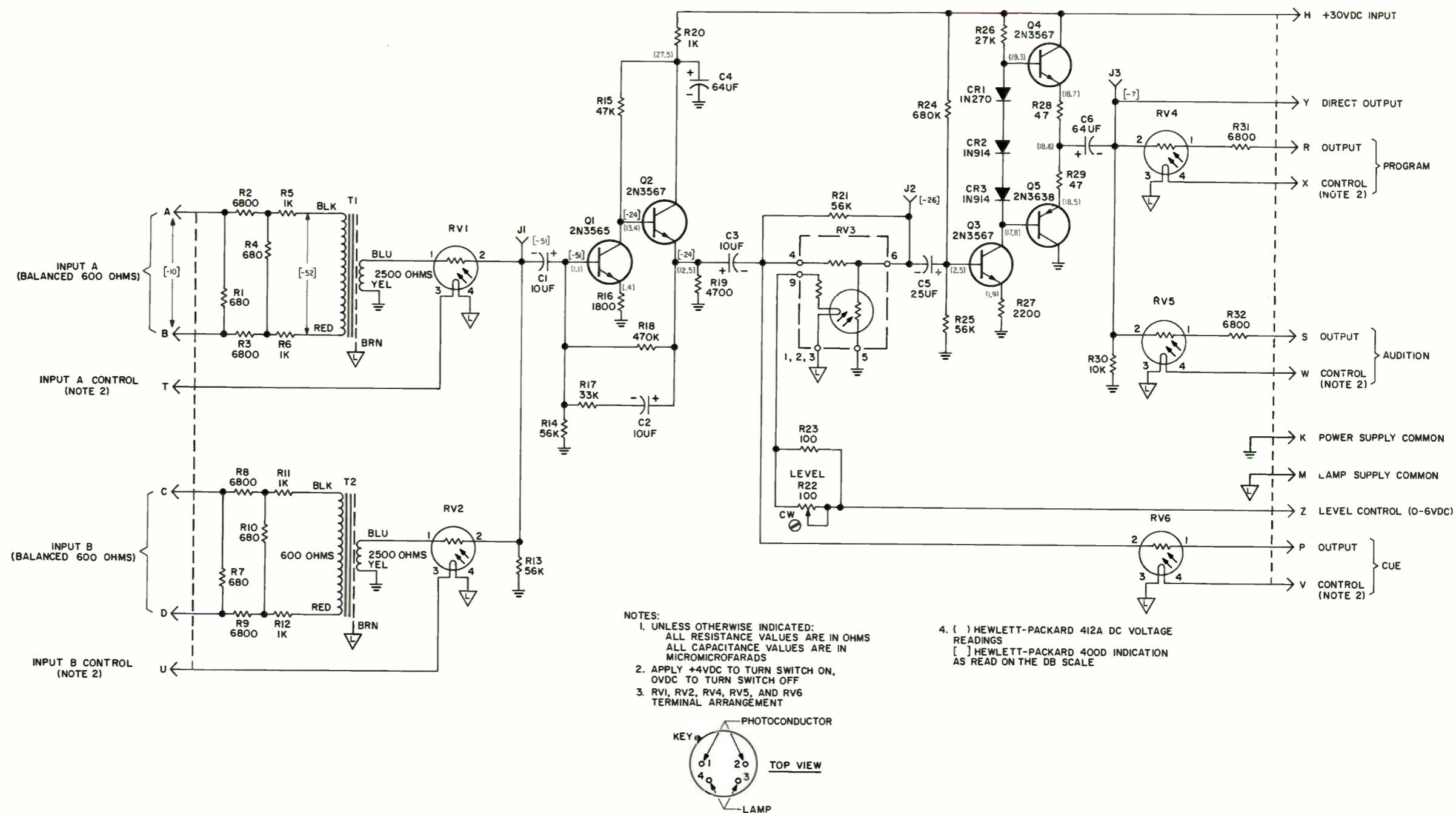


Figure 3. 356V-1 High-Level Input Card, Schematic Diagram

7





384D-1 Switch Matrix

unit instructions

Collins Radio Company | Dallas, Texas

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Printed in United States of America

523-0558098-002438

June 1, 1967

1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 384D-1 Switch Matrix (figure 1) switches one of four 600-ohm balanced input lines to one of two 10,000-ohm balanced output lines.

1.2 Unit Description

The 384D-1 is built on a plug-in, etched circuit card. The circuit consists of 16 photoconductive switches.

2. UNIT CHARACTERISTICS

2.1 Physical Characteristics

Size:
6-3/8 by 4-7/16 by 13/16 inches

Weight:
4 ounces

Type of Construction:
Etched circuit card

Type of Mounting:
22-contact card receptacle
(CPN 372-7009-000)

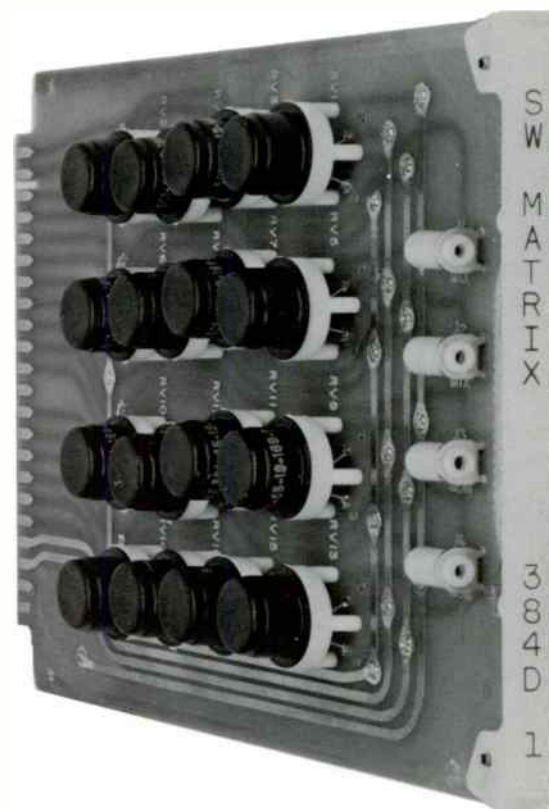
2.2 Operating Characteristics

Ambient Service Conditions:
Temperature
0° to 50°C (32° to 122°F)

Relative Humidity
Up to 95%

Altitude
Up to 10,000 feet above msl

Type of Service:
Continuous



B502-046-Pb

Figure 1. 384D-1 Switch Matrix

2.3 Electrical Characteristics

Power Requirements:

4 volts dc at 200 ma nominal
800 ma, maximum

Input Impedance:

600 ohms balanced nominal

Output Impedance:

10K balanced nominal

Input Level:

+10 dbm, maximum

Insertion Loss:

Switch on, not more than 1 db
Switch off, not less than 60 db

3. CIRCUIT DESCRIPTION

The 384D-1 (figure 3) consists of 16 photoconductive switches. Each switch consists of a photo-cell and a 4-volt lamp sealed in a can. The resistance of the photocell is approximately 13 megohms when the lamp is off, and 380 ohms when the lamp is on.

Because inputs 1 through 4 are identical, only input 1 will be discussed. Input 1, terminals A and D on the card, connects to a 600-ohm line. Terminals W and X are output A and terminals Y and Z are output B. The application of 4 volts to terminals C and M turns on RV1 and RV2 to connect input 1 to output A. The application of

4 volts to terminals B and M turns on RV3 and RV4 to connect input 1 to output B.

4. MAINTENANCE

4.1 Troubleshooting

When trouble is suspected in the 384D-1, replace the card with a spare, if available. If the replacement card remedies the problem, visually inspect the defective card for loose connections and signs of component damage. If no faults are found, extend the card on the card extender and check the suspected switches for a high resistance with the associated lamp off and a low resistance with the lamp on.

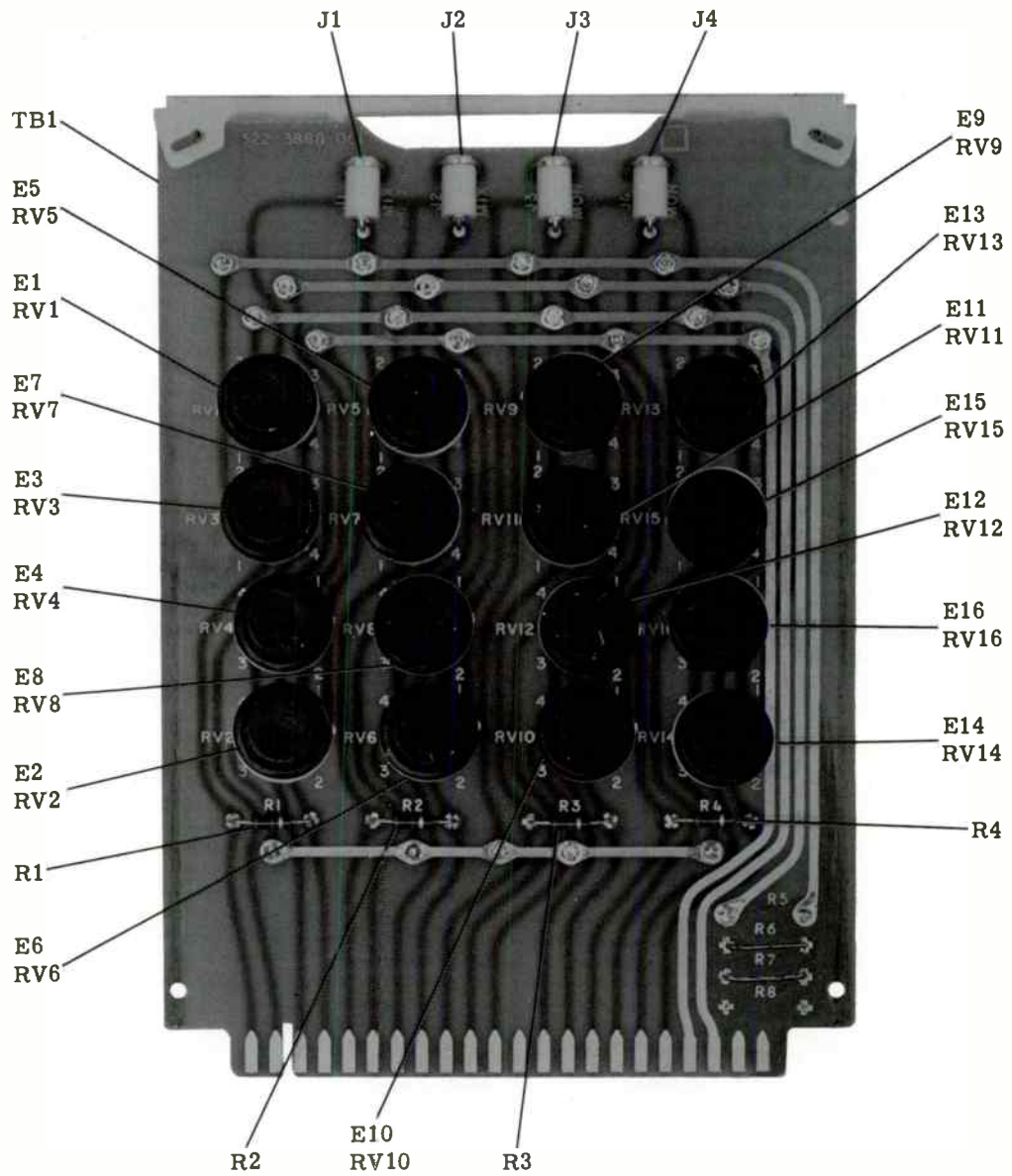
Caution

When making repairs, do not use a soldering iron rated at more than 40 watts. Do not jar the card to remove excess solder. Jarring the card may damage the lamp filaments in the photoconductive devices.

4.2 Spare Parts

Spare parts may be ordered from the following address:

Collins Radio Company
Service Parts Department
Dallas, Texas 75207



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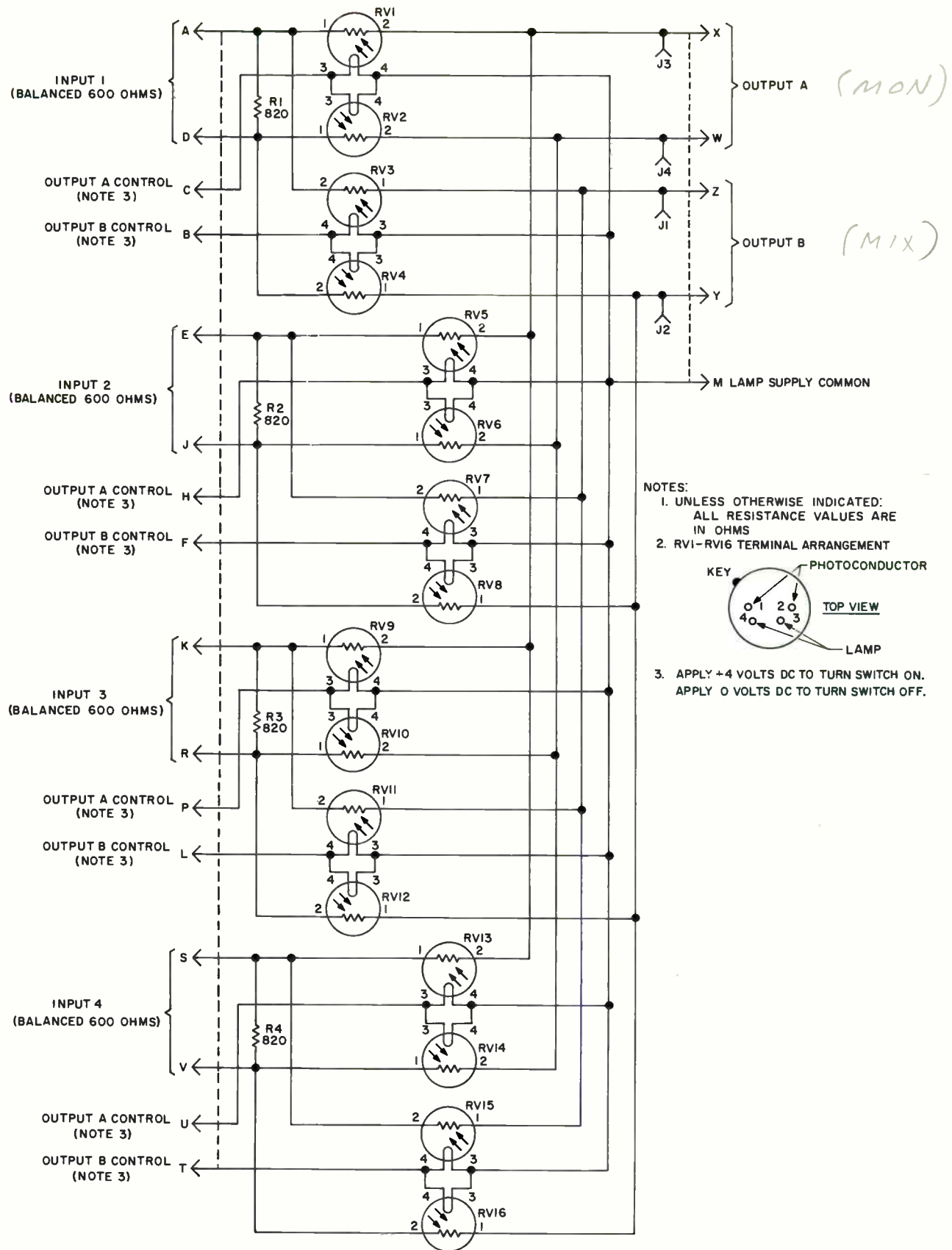
Figure 2. 384D-1 Switch Matrix, Front View

5. PARTS LIST

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
REMOTE SWITCHING CARD 384D-1				522-3888-001
E1 E2 THROUGH E16	INSULATOR, DISK SAME AS E1	7720-4N	13103	352-9552-540
J1	JACK, TIP WHITE	SKT103PC	98291	360-0172-000
J2	SAME AS J1			
J3	SAME AS J1			
J4	SAME AS J1			
R1	RESISTOR, FXD, COMPOSITION 10K OHMS, 10% TOL, 1/4 WATT	RC07GF103K	81349	745-0785-000
R2	SAME AS R1			
R3	SAME AS R1			
R4	SAME AS R1			
RV1	RESISTOR, VOLTAGE SENSITIVE	PL5C1	33173	714-3218-010
RV2 THROUGH RV16	SAME AS RV1			
TB1	TERMINAL BOARD			764-7364-001
MANUFACTURERS CODES				
CODE	MANUFACTURER			
13103	LANGDON MFG. CO. MILITARY DIVISION, WICHITA, KANS.			
33173	TUBE DEPARTMENT GECD OWENSBORO, KY.			
81349	MILITARY SPECIFICATIONS			
98291	SEAELECTRO CORP. MAMARONECK, N. Y.			

B502-005-4

Figure 3. 384D-1 Switch Matrix, Schematic Diagram



384D-1 Switch Matrix



409Z-1

Power Supply

unit instructions

Collins Radio Company | Dallas, Texas

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1 February 1968

1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 409Z-1 Power Supply (figure 1) is a low voltage, high-current power supply suitable for transistorized audio equipment. Eight regulated output voltages are provided.

1.2 Unit Description

The 409Z-1 is built on an aluminum chassis with the one 27-contact connector and all test points and fuses on top.

2. UNIT CHARACTERISTICS

2.1 Physical Characteristics

Size:
13 by 8 by 8-1/2 inches

Weight:
30 pounds

Type of Construction:
Chassis mounted

Type of Connector:
27-contact Cinch-Jones plug

2.2 Operating Characteristics

Ambient Service Conditions:
Temperature
0° to 50°C (32 to 122°F)

Relative Humidity
Up to 95%

Altitude
Up to 10,000 feet above msl

Type of Service:
Continuous

2.3 Electrical Characteristics

Power Requirements:
115 volts ac $\pm 10\%$, single phase, 50/60 Hz or
220 volts ac $\pm 10\%$, single phase, 50/60 Hz

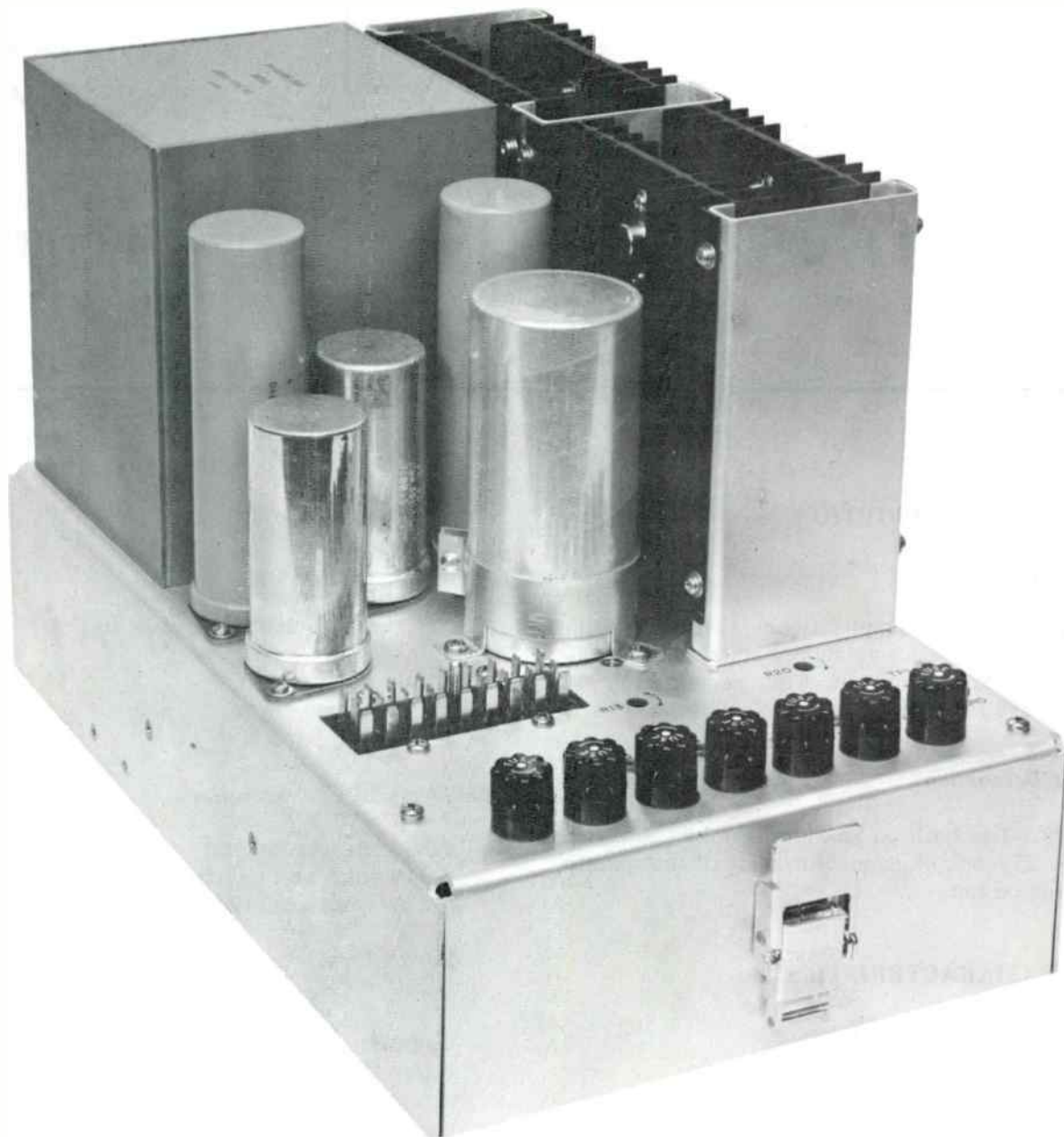
Power Input:
230 watts, maximum

Outputs:
See table 1

3. CIRCUIT DESCRIPTION

The 409Z-1 (figure 6) consists of a step-down transformer with a split primary and two secondaries, one full-wave bridge rectifier composed of diodes CR1 through CR4, one full-wave rectifier composed of diodes CR5 and CR6, four transistor voltage-regulator circuits, and two Zener diode voltage regulators. The following regulated outputs are provided: four 47-volt, two 30-volt, one 6-volt, and one 4-volt.

One transformer secondary delivers ac voltage to the full-wave bridge rectifier for the 47- and 30-volt outputs. One 47-volt transistor regulator,



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Figure 1. 409Z-1 Power Supply

composed of transistors Q1 and Q2, Zener diode CR7, and associated components, regulates and filters the bridge output. Two isolated +47-volt outputs appear at pins 16 and 20 of J1. The second 47-volt regulator, composed of transistors Q9 and Q10, Zener diode CR11, and associated components, regulates and filters the bridge output. Two isolated +47-volt outputs appear at pins 11 and 13 of J1.

Zener diodes CR8 and CR12 and their associated RC filters regulate and filter the output of the bridge rectifier at +30 volts dc. These two outputs appear at pins 7 and 9 of J1.

The 4-volt dc regulator, composed of transistors Q3, Q4, Q5, and associated components, regulates the output of the full-wave rectifier. The +4-volt regulated output appears at pin 22 of J1. Variable

Table 1. Output Voltages

VOLTAGE	LOAD CURRENT	REGULATION	MAXIMUM RIPPLE (mv)
30±5%	120 ma	5%	2.5 pp
30±5%	120 ma	5%	2.5 pp
47±5%	250 ma	3%	5 pp
47±5%	250 ma	3%	5 pp
47±5%	500 ma	3%	5 pp
47±5%	500 ma	3%	5 pp
*6	1.2 amp	1%	5 pp
*4	2 amp	1%	5 pp

*Adjustable, +3, -2 volts

resistor R13 adjusts the output voltage to exactly 4 volts.

The 6-volt dc regulator, composed of transistors Q6, Q7, Q8 and associated components, regulates the output of the full-wave rectifier. The +6-volt regulated output appears at pin 25 of J1. Variable resistor R20 adjusts the output voltage to exactly 6 volts. Relay K1 disables the +4-volt output if the +6-volt output fails.

All connections to the 409Z-1 are made through J1 on top of the chassis.

Caution

Before operating the 409Z-1, ensure that the plug which mates with J1 on the 409Z-1 is wired correctly. (See figure 6, note 3.)

4. MAINTENANCE

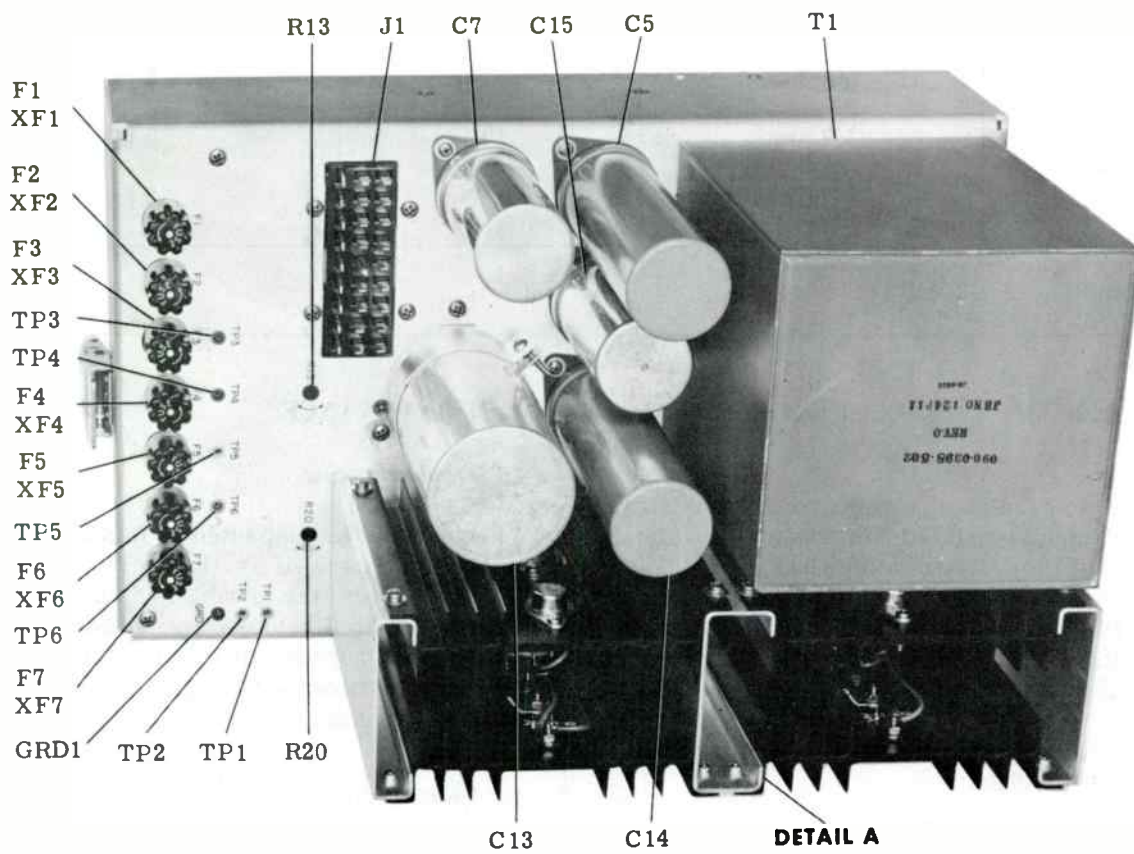
4.1 Troubleshooting

When trouble is suspected in this unit, replace the unit with a spare, if available. If the replacement unit remedies the trouble, visually inspect the defective unit for loose connections and signs of component damage. If no fault is found, make voltage measurements using the schematic diagram as a guide.

4.2 Spare Parts

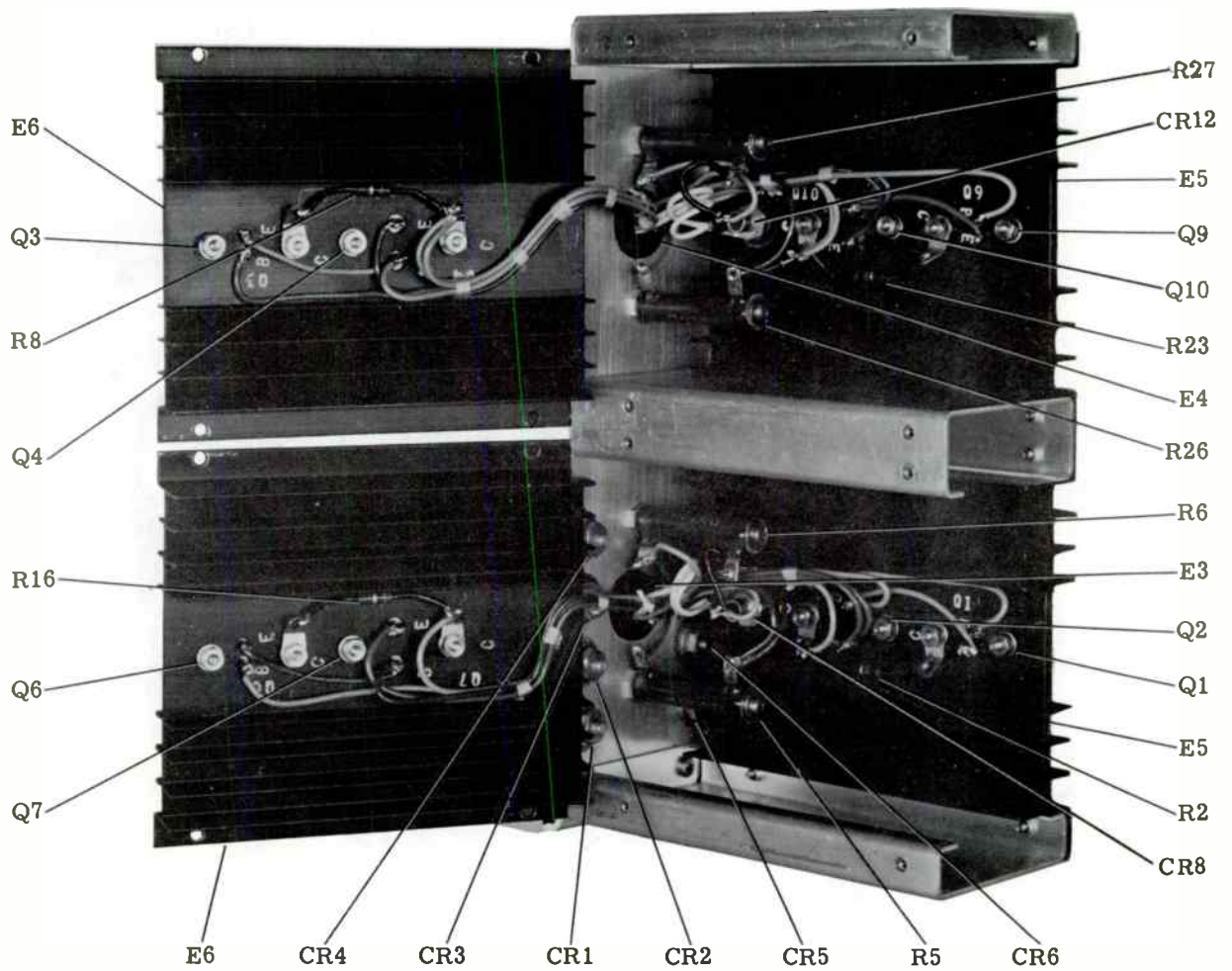
Spare parts may be ordered from the following address:

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



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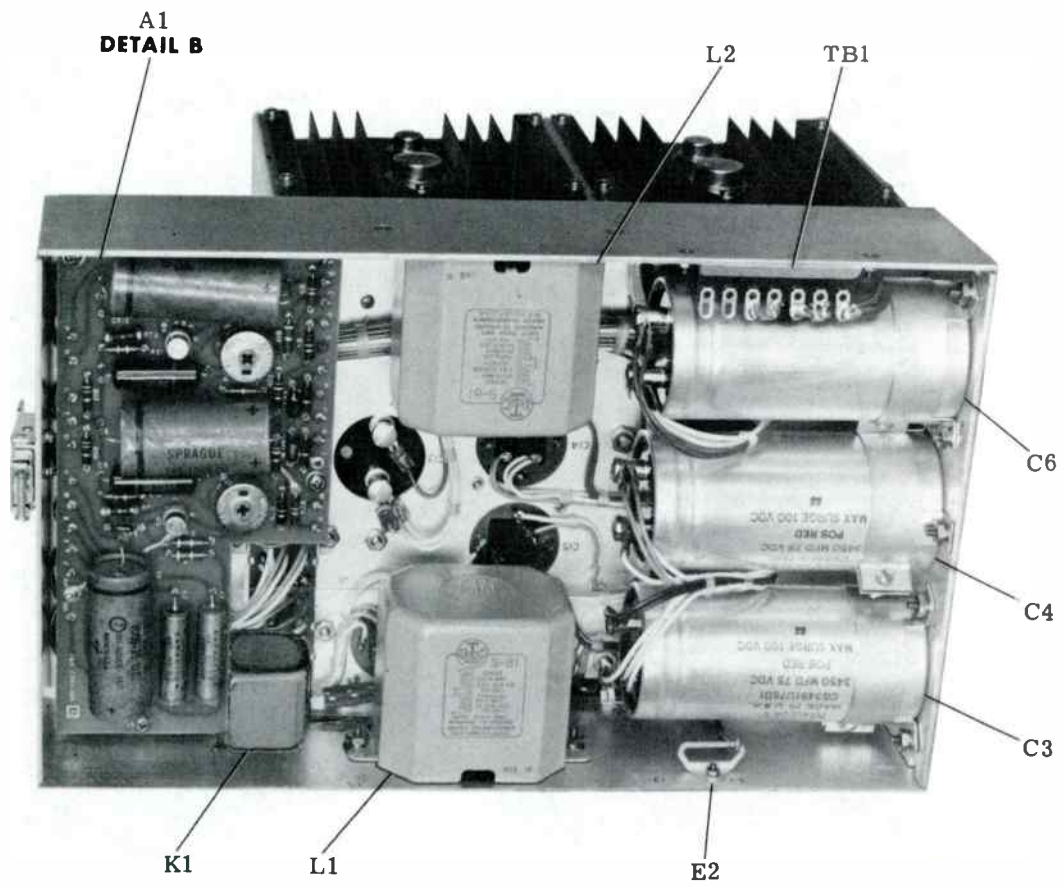
Figure 2. 409Z-1 Power Supply, Top View



DETAIL A

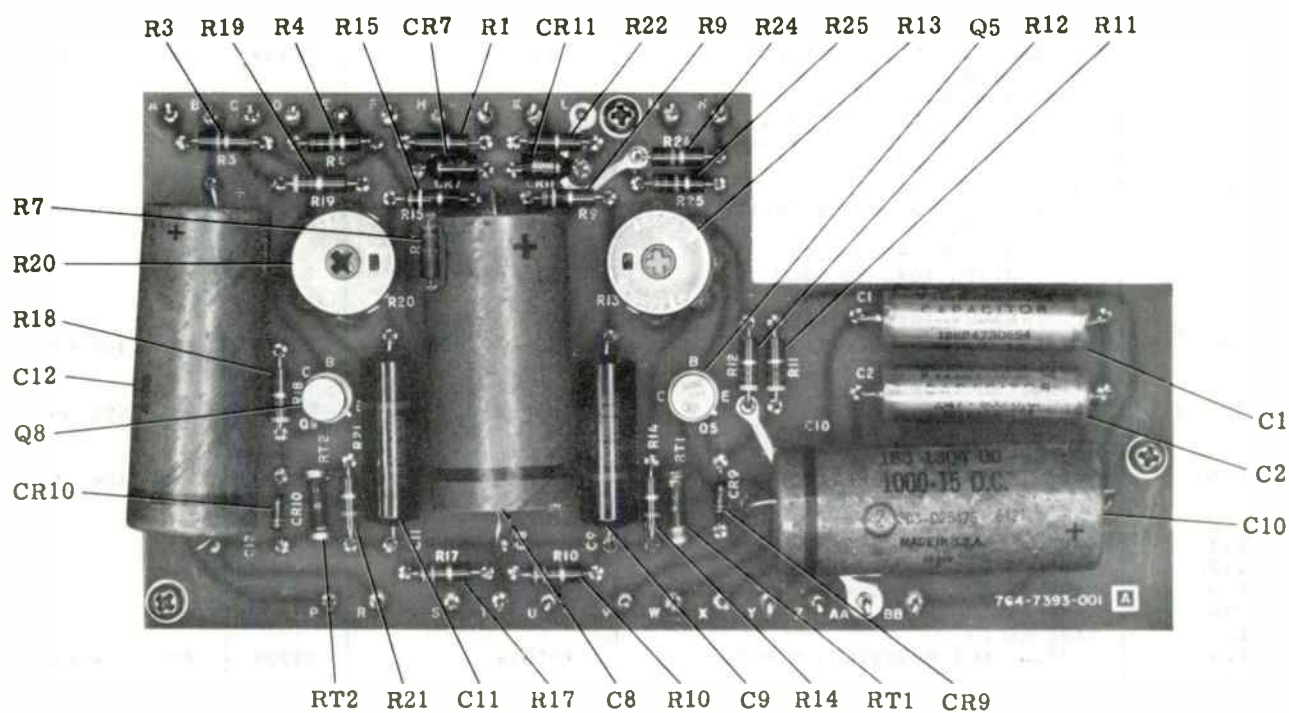
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Figure 3. 409Z-1 Power Supply, Detail A



B502-026-Pb

Figure 4. 409Z-1 Power Supply, Bottom View



DETAIL B

B502-032-Pb

Figure 5. 409Z-1 Power Supply, Detail B

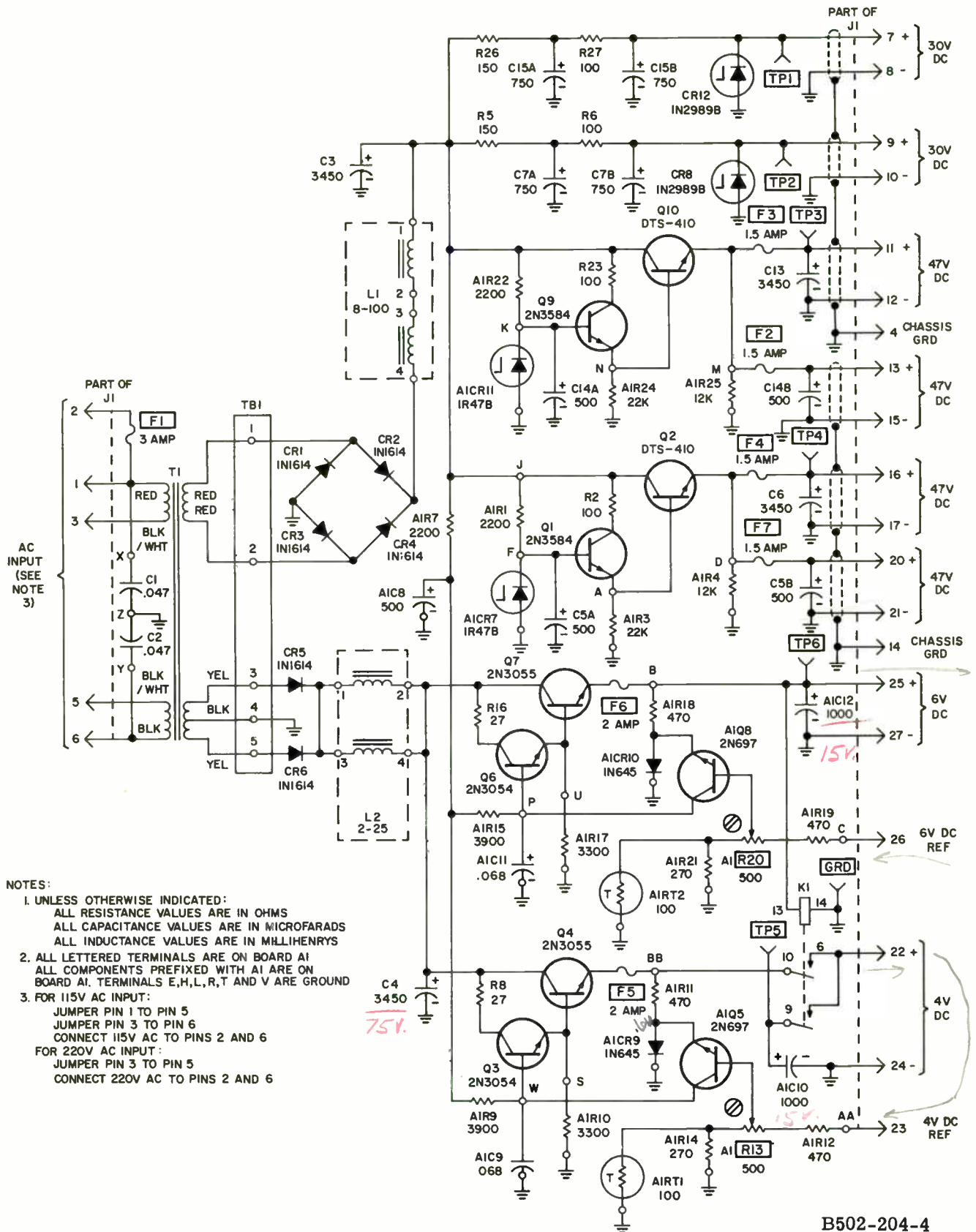
5. PARTS LIST

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
409Z-1 POWER SUPPLY			522-3886-001	
A1	POWER SUPPLY BOARD WITH COMPONENTS			764-7393-001
C1	CAPACITOR, FXD, PAPER 0.047 UF, 20% TOL, 600VDCW	SD81K06473M	53021	931-4580-000
C2	SAME AS C1			
C3	CAPACITOR, FXD, ELECTROLYTIC 3450 UF, PLUS 75% MINUS 10%, 75 VDCW	CG3451U75D1	97942	183-1265-010
C4	SAME AS C3			
C5	CAPACITOR, FXD, ELECTROLYTIC 2 SECTIONS 1- 500 UF, PLUS 125% MINUS 10%, 100 VDCW 2- 500 UF, PLUS 125% MINUS 10%, 100 VDCW	183-0345-000	56289	183-0345-000
C6	SAME AS C3			
C7	CAPACITOR, FXD, ELECTROLYTIC 2 SECTIONS 1- 750 UF, PLUS 100% MINUS 10%, 50 VDCW 2- 750 UF, PLUS 100% MINUS 10%, 50 VDCW	D29611	56289	183-1482-000
C8	CAPACITOR, FXD, ELECTROLYTIC 500 UF, PLUS 100% MINUS 10%, 50 VDCW	183-1309-000	13499	183-1309-000
C9	CAPACITOR, FXD, PAPER 0.068 UF, 20% TOL, 200 VDCW	160P68302	56289	931-5509-000
C10	CAPACITOR, FXD, ELECTROLYTIC 1000 UF, PLUS 100% MINUS 10%, 15 VDCW	D25475	56289	183-1304-000
C11	SAME AS C9			
C12	SAME AS C10			
C13	SAME AS C3			
C14	SAME AS C5			
C15	SAME AS C7			
CR1	SEMICONDUCTOR DEVICE, DIODE	1N1614	13209	353-1304-000
CR2	THROUGH			
CR6	SAME AS CR1			
CR7	SEMICONDUCTOR DEVICE, DIODE	1RP47B	13327	353-6396-000
CR8	SEMICONDUCTOR DEVICE, DIODE	1N2989B	07688	353-1369-000
CR9	SEMICONDUCTOR DEVICE, DIODE	1N645	07688	353-2607-000
CR10	SAME AS CR9			
CR11	SAME AS CR7			
CR12	SAME AS CR8			
E1	NOT USED			
E2	TERMINAL, LUG			547-5305-000
E3	GROMMET, RUBBER			201-0023-000
E4	SAME AS E1	MS35489-42	96906	
E5	HEATSINK NO. 1 -QTY 2-			764-7386-001
E6	HEATSINK NO. 2 -QTY 2-			
F1	FUSE, CARTRIDGE 3 AMPS	MDX3	71400	264-0306-000
F2	FUSE, CARTRIDGE 1-1/2 AMPS	AGC250-1 1-2	71400	264-0722-000
F3	SAME AS F2			
F4	SAME AS F2			
F5	FUSE, CARTRIDGE 2 AMPS	AGC250-2	71400	264-0723-000
F6	SAME AS F5			
F7	SAME AS F2			
GRD1	JACK, TIP BLACK	SKT10BLK	98291	360-0098-000
J1	CONNECTOR, ELECTRICAL	Q327ABW1	75173	365-2270-000

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
K1	27 CONTACTS RELAY, ARMATURE 4C CONTACT ARRANGEMENT	KH4531	77342	970-2427-070
L1	REACTOR, FILTER WINDINGS IN SERIES 8 TO 100 MH, WINDINGS IN PARALLEL 2 TO 25 MH	S81	80223	668-0076-010
L2	SAME AS L1			
Q1	TRANSISTOR	2N 3584	02735	352-0711-020
Q2	TRANSISTOR	DTS-410	16758	352-0807-010
Q3	TRANSISTOR	2N3054	07688	352-0581-010
Q4	TRANSISTOR	2N3055	07688	352-0583-010
Q5	TRANSISTOR	2N697	07263	352-0197-000
Q6	SAME AS Q3			
Q7	SAME AS Q4			
Q8	SAME AS Q5			
Q9	SAME AS Q1			
Q10	SAME AS Q2			
R1	RESISTOR, FXD, COMPOSITION 2200 OHMS, 10% TOL, 1/2 WATT	RC20GF222K	81349	745-1366-000
R2	RESISTOR, FXD, COMPOSITION 100 OHMS, 10% TOL, 1/2 WATT	RC20GF101K	81349	745-1310-000
R3	RESISTOR, FXD, COMPOSITION 22K OHMS, 10% TOL, 1/2 WATT	RC20GF223K	81349	745-1408-000
R4	RESISTOR, FXD, COMPOSITION 12K OHMS, 10% TOL, 1/2 WATT	RC20GF123K	81349	745-1398-000
R5	RESISTOR, FXD, WIRE WOUND 150 OHMS, 5% TOL, 10 WATTS	1 3-4D57F150PORM 5PCT	44655	710-2929-000
R6	RESISTOR, FXD, WIRE WOUND 100 OHMS, 5% TOL, 10 WATTS	1 3-4D57F100PORM 5PCT	44655	710-2900-000
R7	SAME AS R1			
R8	RESISTOR, FXD, COMPOSITION 27 OHMS, 10% TOL, 1/2 WATT	RC20GF270K	81349	745-1286-000
R9	RESISTOR, FXD, COMPOSITION 3900 OHMS, 10% TOL, 1/2 WATT	RC20GF392K	81349	745-1377-000
R10	RESISTOR, FXD, COMPOSITION 3300 OHMS, 10% TOL, 1/2 WATT	RC20GF332K	81349	745-1373-000
R11	RESISTOR, FXD, COMPOSITION 470 OHMS, 10% TOL, 1/2 WATT	RC20GF471K	71450	745-1338-000
R12	SAME AS R11			
R13	RESISTOR, VAR, WIRE WOUND 500 OHMS, 20% TOL, 2 WATTS	HHH2-500-20	08984	377-0715-010
R14	RESISTOR, FXD, COMPOSITION 270 OHMS, 10% TOL, 1/2 WATT	RC20GF271K	81349	745-1328-000
R15	SAME AS R9			
R16	SAME AS R8			
R17	SAME AS R10			
R18	SAME AS R11			
R19	SAME AS R11			
R20	SAME AS R13			
R21	SAME AS R14			
R22	SAME AS R1			
R23	SAME AS R2			
R24	SAME AS R3			
R25	SAME AS R4			
R26	SAME AS R5			
R27	SAME AS R6			
RT1	RESISTOR, THERMAL 100 OHMS, 10% TOL, 1 WATT	763F93	10646	714-1730-000
RT2	SAME AS RT1			
T1	TRANSFORMER, POWER	124P11	11700	662-0226-010

409Z-1 POWER SUPPLY

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
TB1	STEP DOWN TERMINAL STRIP 7 TERMINALS	2007	75173	367-0900-000
TP1	JACK, TIP ORANGE	SKT100RN	98291	360-0093-000
TP2	SAME AS TP1			
TP3	JACK, TIP RED	SKT10RED	98291	360-0092-000
TP4	SAME AS TP3			
TP5	JACK, TIP YELLOW	SKT10YEL	98291	360-0094-000
TP6	JACK, TIP BLUE	SKT10BLU	98291	360-0096-000
XF1	FUSEHOLDER 15 AMPS	265-1097-000	13499	265-1097-000
XF2 THROUGH XF7	SAME AS XF1			
MANUFACTURERS CODES				
CODE	MANUFACTURER			
07263	FAIRCHILD CAMERA AND INSTRUMENT CORP. SEMICONDUCTOR DIVISION MOUNTAIN VIEW, CALIF.			
07688 71450	MILITARY SPECIFICATIONS CTS CORP.			
10646	ELKHART, IND. CARBORUNDUM CO. NIAGARA FALLS, N. Y.			
11700	J B ELECTRONIC TRANSFORMERS, INC.			
13209	THE BENDIX CORP. SEMICONDUCTOR DIVISION HOLMDEL, N. J.			
13327	SOLITRON DEVICES, INC. NORWOOD, N. J.			
13499	COLLINS RADIO CO. CEDAR RAPIDS, IOWA			
37942	P R MALLORY AND CO., INC. INDIANAPOLIS, IND.			
44655	OHMITE MFG. CO. SKOKIE, ILL.			
53021	SANGAMO ELECTRIC CO. SPRINGFIELD, ILL.			
56289	SPRAGUE ELECTRIC CO. NORTH ADAMS, MASS.			
71400	BUSSMAN MFG. DIVISION OF MCGRAW-EDISON CO. ST. LOUIS, MO.			
75173	HOWARD B. JONES DIVISION OF CINCH MFG. CO. CHICAGO, ILL.			
77342	AMERICAN MACHINE AND FOUNDRY CO. POTTER AND BRUMFIELD DIVISION, PRINCETON, IND.			
80223	UNITED TRANSFORMER CO. NEW YORK, N. Y.			
81349 96906 98291	MILITARY SPECIFICATIONS MILITARY SPECIFICATIONS SEAELECTRO CORP. MAMARONECK, N. Y.			
16758	DELCO RADIO DIV. OF GM KOKOMO, IND. 46901			
02735	RCA SEMICONDUCTORS SOMMERVILLE, N.J.			



NOTES:

1. UNLESS OTHERWISE INDICATED:
 ALL RESISTANCE VALUES ARE IN OHMS
 ALL CAPACITANCE VALUES ARE IN MICROFARADS
 ALL INDUCTANCE VALUES ARE IN MILLIHENRYS
2. ALL LETTERED TERMINALS ARE ON BOARD AT ALL COMPONENTS PREFIXED WITH AI ARE ON BOARD. AI TERMINALS E,H,L,R,T AND V ARE GROUND
3. FOR 115V AC INPUT:
 JUMPER PIN 1 TO PIN 5
 JUMPER PIN 3 TO PIN 6
 CONNECT 115V AC TO PINS 2 AND 6
- FOR 220V AC INPUT:
 JUMPER PIN 3 TO PIN 5
 CONNECT 220V AC TO PINS 2 AND 6

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Figure 6. 409Z-1 Power Supply, Schematic Diagram

