

unit instructions

356P-1 Program Amplifier

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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.



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

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

Collins Radio Company | Dallas, Texas

523-0558094-002438 1 June 1967

World Radio History

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.

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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.

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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

356P-1 Program Amplifier

PARTS LIST

| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER |
|---------|---|-------------------------------|-------------|------------------------|
| | 52 2- 38 84- 001 | | | |
| C1 | CAPACITOR, FXD, ALUNINUM 64 UF, MINUS 10% PLUS 50%, | C437ARH64 | 73445 | 183-2355-110 |
| C2 | CAPACITOR, FXD, ALUHINUM 25 UF, MINUS 10% PLUS 50%, 25 VDCH | C426ARF25 | 73445 | 183-2354-180 |
| С3 | CAPACITOR, FXD, ALUMINUM 10 UF, MINUS 10% PLUS 50%, 25 VOCH | C426ARF10 | 73445 | 183-2354-170 |
| C4 | SAME AS C2 | | | |
| C5 | SAME AS C2 | | | |
| C6 | SAME AS CI | | | |
| 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, 509 VDCW | CM06F561J03 | 81349 | 912-2983-000 |
| C11 | CAPACITOR, FXD, ALUMINUM 250 UF, MINUS 10% PLUS 50% 16 VDCH | C437ARE250 | 73445 | 183-2355-060 |
| 612 | CAPACITOR, EXD. MICA | CN06E681.103 | 81349 | 912-2989-000 |
| CRI | SEMICONDUCTOR DEVICE, DIODE | 1 N4003 | 07688 | 353-6442-030 |
| CR2 | SAME AS CR1 | 1 | | 575 0112 050 |
| CR3 | SAME AS CR1 | | | |
| E1 | INSULATOR. DISK | 7720-4N | 13103 | 352-9552-540 |
| JI | JACK. TIP | SKT103PC | 98291 | 360-0172-000 |
| | WHITE | | | |
| J2 | SAME AS J1 | | | |
| 01 | TRANSISTOR | 2N3567 | 07688 | 352-0629-010 |
| 02 | | | | |
| THROUGH | SAME AS Q1 | | | |
| Q6 | | | | |
| 97 | TRANSISTOR | 2N3135 | 07688 | 352-0591-010 |
| Q8 | TRANSISTOR | 2N3054 | 07688 | 352-0581-010 |
| Q9 | SAME AS Q8 | | | |
| R1 | RESISTOR, FXD, COMPOSITION | RC07GF331K | 81349 | 745-0731-000 |
| | 330 UHMS; 10% TOL; 174 | | | |
| 0.2 | | 0007055434 | 91340 | 745-0812-000 |
| RZ. | 56K 04MS, 107 T01, 176 | RC070F303K | 01347 | 749-0812-000 |
| | WATT | | | |
| 83 | RESISTOR, EXD, COMPOSITION | BC07GE473K | 81349 | 745-0809-000 |
| | 47K OHMS. 10% TOL. 1/4 | | | |
| | WATT | | | |
| R4 | RESISTOR, FXD, COMPOSITION | RC07GF102K | 81349 | 745-0749-000 |
| | 1K OHMS, 10% TOL, 1/4 WATT | 1 | | |
| R5 | RESISTOR, FXD, COMPOSITION | RC07GF153K | 81349 | 745-0791-000 |
| | 15K OHMS, 10% TOL, 1/4 | | | |
| | WATT | | | |
| R6 | RESISTOR, FXD, COMPOSITION | RC07GF472K | 81349 | 745-0773-000 |
| | 4700 UHMS; 10% TUL; 174 | | 1 | |
| 07 | PESISTOR EVO COMPOSITION | 8C07CE124K | 81340 | 745-0824-000 |
| K/ | 120K 34MS. 10V TOL. 1/4 | KCOTOFIZ4K | 01343 | 143-0024 000 |
| | WATT | | | 1 |
| R 8 | RESISTOR, FXD, COMPOSITION 180K DHMS, 10% TOL, 1/4 | RC07GF184K | 81349 | 745-0830-000 |
| | WATT | | | |
| R9 | SAME AS R6 | | | |
| R10 | RESISTOR, FXD, COMPOSITION | RC07GF273K | 81349 | 745-0800-001 |
| | 27K OHMS, 10% TOL, 1/4 | | | |
| | WATTS | | | |
| RII | RESISTUR, FXD, COMPOSITION | RCU7GF393K | 61349 | (42-0800-000 |
| | 39K UHRS, 10% (OL, 1/4 | | | |
| | | | | |

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| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER | |
|-----------------------|---|---------------------------------------|-------------------------|---|-----|
| R12 | WATT RESISTOR, VAR 5000 DHMS, 20% TOL, 3/4 | 75PR5K | 80740 | 382-0004-270 | r |
| R13 | RESISTOR, FXD, COMPOSITION 150K OHMS, 10% TOL, 1/4 WATT | RCO7GF154K | 81349 | 745-0827-000 | |
| R14 R15 | SAME AS R6 Same as r2 | | | | |
| R16 | SAME AS R6 | | | | |
| R17 | RESISTOR, FXD, COMPOSETION 2200 OHMS, 10% TOL, 1/4 WATT SAME AS DI3 | RC07GF222K | 81349 | 745-0761-000 | |
| R19 | SAME AS RTS | | | | |
| R20 | RESISTOR, FXD, COMPOSITION 27K OHMS, 10% TOL, 1/4 Watt | RC07GF273K | 81349 | 745-0800-000 | |
| R21 | RESISTOR, FXD, COMPOSITION 1200 DHMS, 10% TOL, 1/4 WATT | RCO7GF122K | 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 R26 | SAME AS R4 Resistor, FXD, Composition 27 OHMS, 10% Tol, 1/4 Watt | RC07GF270K | 81349 | 745-0692-000 | |
| R27 R28 | SAME AS R4 RESISTOR, FXD, WIRE WOUND 1 OHM, 5% TOL, 3 WATTS | 710-2863-000 | 13499 | 710-2863-000 | |
| R29 R30 | SAME AS R28 RESISTOR, FXD, COMPOSITION 33K OHMS, 10% TOL, 1/4 WATT | RCO7GF333K | 81349 | 745-0803-090 | |
| RV1 RV2 T1 | RESISTOR, VOLTAGE SENSITIVE RESISTOR, VOLTAGE SENSITIVE 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 | PL5C1 764-9918-001 BV35752 | 33173 13499 GØTHA | 714-3218-010 744-9910-001 667-0155-010 7/4-0013- | 010 |
| TB1 X01 | TERMINAL BOARD SOCKET. TRANSISTOR | 05-3307-51 | 91662 | 764-7370-001 | |
| XQ2 THROUGH XQ7 | SAME AS XQ1 | | | | |
| XRV1 XRV2 | NOT USED Socket, electron tube | RA9AX | 00656 | 220-1384-070 | |
| | MANUFACTURERS CODES | · · · · · · · · · · · · · · · · · · · | I | J | |
| CODE | MANUFACTURER | | | | |
| GOTHA | GOTHAM AUDIO CORP. | | | | |
| 00656 | AEROVOX CORP. | | | | |
| 07688 13103 | MILITARY SPECIFICATIONS LANGDON MFG. CO. MILITARY | | | | |
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356P-1 Program Amplifier

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|---|--|-------------------------------|-------------|------------------------|
| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER |
| 13499 33173 73445 80740 81349 91662 98291 | DIVISION, WICHITA, KANS. COLLINS RADIO CO. CEDAR RAPIDS, IOWA TUBE DEPARTMENT GECO OWENSBORO, KY. AMPEREX ELECTRONIC CO. DIVISION DF NORTH AMERICAN PHILIPS CO., INC. HICSVILLE, N. Y. BECKMAN INSTRUMENTS, INC. FULLERTON, CALIF. MILITARY SPECIFICATIONS ELCO CORP. WILLOW GROVE, PA. SEALECTRO CORP. MAMARONECK, N. Y. | | | |
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356P-1 Program Amplifier

B502-001-4

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

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

356R-1 Microphone-Phonograph Preamplifier



unit instructions

Collins Radio Company | Dallas, Texas

523-0558097-002438

July 1, 1967

Coilins Radio Company 1966
Second Edition 1967
Printed in United States of America

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 ms1

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. Remotelycontrolled 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 highlevel 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.



NOTES: ** FOR CONSOLE SERIAL NUMBERS LESS THAN 60, IT MAY BE NECESSARY TO MOVE THE CARD CAGE BRACE 1.25 INCHES TO THE RIGHT (BETWEEN AG AND A7) * MONAURAL CONNECTIONS SAME AS LEFT CHANNEL

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 directcoupled 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

356R-1 Microphone-Phonograph Preamplifier 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 | 184-6216-090 |
| C2 C3 C4 | SAME AS CI SAME AS CI | | | |
| 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 |
| C 9 | CAPACITOR, FXD, ELECTROLYTIC 0.47 UF, 20% TOL, 35 VDCW | CS138F474M | 81349 | 184-6195-000 |
| C10 C11 C12 C13 | SAME AS C1 SAME AS C5 SAME AS C5 SAME AS C1 | | | |
| CR1 CR2 | SEMICONDUCTOR DEVICE, DIODE SEMICONDUCTOR DEVICE, DIODE | 1N270 1N914 | 07688 07688 | 35 3- 2018-000 353-2906-000 |
| CR3 E1 | SAME AS CR2 Insulator, disk | 7720-4N | 13103 | 352-9552-540 |
| THROUGH | SAME AS E1 | | | |
| JI | JACK, TIP White | SKT103PC | 98291 | 360-0172-000 |
| Q1 Q2 | TRANSISTOR TRANSISTOR | 2N3565 2N3567 | 07688 07688 | 352-0638-010 |
| Q3 Q4 Q5 | SAME AS Q1 SAME AS Q1 SAME AS Q2 SAME AS Q2 | | | |
| Q7 08 | SAME AS Q2 TRANSISTOP | 211263.8 | 07699 | 252-0626-010 |
| R1 | RESISTOR, FXD, COMPOSITION 56K DHMS, 5% TOL, 1/4 WATT SAME AS PI | 2N3636 RC07GF563J | 81349 | 745-0811-000 |
| R3 | RESISTOR, FXD, FILM | RN65C6190F | 81349 | 705-4635-000 |
| R4 | RESISTOR, FXD, COMPOSITION /200 | _RC076F152J | 81349 | 745-0754-000 |
| R5 R6 | SAME AS R1 RESISTOR, FXD, COMPOSITION 100K | RC076F683J | 81349 | -745-0814-000 |
| R7 R8 | RESISTOR, FXD, COMPOSITION 0.47 MEGOHM, 5% TOL, 1/4 | RCO7GF474J | 81349 | 745-0844-000 |
| R9 | WAIT RESISTOR, FXD, COMPOSITION 4700 OHMS, 10% TOL, 1/4 | RCO7GF472K | 81349 | 745-0773-000 |
| R10 | RESISTOR, FXD, COMPOSITION 100k OHMS, 10% TOL, 1/4 Watt | RCO7GF104K | 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 | RCO7GF824J | 81349 | 745-0853-000 |
| R13 | RESISTOR, FXD, COMPOSITION | RC07GF152J | 81349 | 745-0754-000 |

| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER |
|------------|---|-------------------------------|-------------|------------------------|
| | 1500 OHMS, 5% TOL, 1/4 | | | |
| R14 | WATT RESISTOR, FXD, COMPOSITION 120K OHMS, 5% TOL, 1/4 | RC07GF124J | 81349 | 745-0823-000 |
| R15 | WATT RESISTOR, FXD, COMPOSITION 0.39 MEGOHM, 5% TOL, 1/4 | RC07GF394J | 81349 | 745-0841-000 |
| R16 | WATT RESISTOR, FXD, COMPOSITION 2700 OHMS, 10% TOL, 1/4 | RC07GF272K | 81349 | 745-0764-000 |
| R17 | WATT SAME AS R10 | | | |
| R18 | RESISTOR, VAR 5000 DHMS, 20% TOL, 3/4 | 75 PR5 K | 80740 | 382-0004-270 |
| R19 | RESISTOR, FXD, FILM 316K DHMS, 1% TOL, 1/4 | RN60D3163F | 81349 | 705-6716-000 |
| R20 | RESISTOR, FXD, FILM 17.8K DHMS, 1% TOL, 1/4 | RN60D1782F | 81349 | 705-6656-090 |
| R21 | RESISTOR, FXD, COMPOSITION 22K OHMS, 10% TOL, 1/4 | RC07GF223K | 81349 | 745-0797-000 |
| R22 R23 | SAME AS R10 RESISTOR, FXD, COMPOSITION | RC07GF123J | 81349 | 745-0787-000 |
| R24 | SAME AS R1 | 200205/0// | | 7/5 0050 000 |
| R25 | RESISTOR, FXD, COMPOSITION 0.68 MEGOHM, 5% TOL, 1/4 | RC07GF684J | 81349 | 745-0850-000 |
| R26 | RESISTOR, FXD, COMPOSITION 2200 OHMS, 5% TOL, 1/4 | RC07GF222J | 81349 | 745-0760-000 |
| R27 | RESISTOR, FXD, COMPOSITION | RC07GF273J | 81349 | 745-0799-000 |
| R28 | RESISTOR, FXD, COMPOSITION 47 OHMS, 10% TOL, 1/4 WATT | RC07GF470K | 81349 | 745-0701-000 |
| R29 R30 | SAME AS R28 RESISTOR, FXD, COMPOSITION 4700 DHMS, 10% TOL, 1/2 | RC20GF472K | 81349 | 745-1380-000 |
| R31 | RESISTOR, FXD, COMPOSITION 10K OHMS, 5% TOL, 1/2 WATT | RC20GF103J | 81349 | 745-1393-000 |
| R32 R33 | SAME AS R31 RESISTOR, FXD, COMPOSITION 1200 JHNS, 10% TOL, 1/4 | RC07GF122K | 81349 | 745-0752-000 |
| R34 | RESISTOR, FXD, COMPOSITION | RC32GF101K | 81349 | 745-3310-000 |
| R35 | 100 DHMS, 10% TOL, 1 WATT RESISTOR, VAR 100 DHMS, 20% TOL, 3/4 | 75PR100 | 80740 | 382-0004-220 |
| R36 | SAME AS R9 | | | |
| RV1 RV2 | RESISTOR, VOLTAGE SENSITIVE | PL5C1 | 33173 | 714-3218-010 |
| RV3 | SAME AS RV1 | | | |
| RV4 | RESISTOR, VOLTAGE SENSITIVE | 764-9918-001 | 13499 | 764-9918-001 |
| RV5 | SAME AS RV1 | | | |
| T1 | TRANSFORMER, AF, INPUT LEAD 1 TO 5 660 OHMS IMPEDANCE, LEAD 2 TJ 5 400 OHMS IMPEDANCE, LEAD 2 TO 4 200 OHMS IMPEDANCE, LEAD 3 CENTER TAP, LEAD 4 TO 5 60 OHMS IMPEDANCE, LEAD 8 | 8v38752 | GOTHA | 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 |
|----------------|---|-------------------------------|-------------|------------------------|
| | 3 CONTACTS | | | |
| XQ2 THROUGH | SAME AS XQ1 | i. | | |
| XRV1 XRV2 | NOT USED NOT USED | | | |
| XRV4 | SDCKET, ELECTRON TUBE 9 CONTACTS | RA9AX | 00656 | 220-1384-070 |
| | MANUFACTURERS CODES | | | |
| CODE | MANUFACTURER | | | |
| GOTHA | GDTHAM AUDIO CORP. | | | |
| 00656 | AEROVOX CORP. | | | |
| 07688 | MILITARY SPECIFICATIONS | | | |
| 13103 | MILITARY DIVISION WICHITA, KANS. | | | |
| 13499 | CDLLINS RADIO CO. CEDAR RAPIDS, IDWA | | | |
| 33173 | TUBE DEPARTMENT GECO | | | |
| 73445 | AMPEREX ELECTRONIC CO. DIV. OF NORTH AMERICAN PHILIPS CO INC. | | | |
| 80740 | HICKSVILLE, N. Y. BECKMAN INSTRUMENTS, INC. | | | |
| 81349 | MILITARY SPECIFICATIONS | | | |
| 91002 | WILLOW GRDVE, PA. | | | |
| 98291 | SEALECTRO CORP. MAMARONECK, N. Y. | | | |
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356R-1 Microphone-Phonograph Preamplifier

07 2N3567 [-8.2DB] [0.3V] \rightarrow Y DIRECT OUTPUT [-3308M] RV5 R31 IOK 64UF [-33DB] +1/ →R OUTPUT ~~~ PROGRAM →x CONTROL (NOTE 2) 5 08 2N3638 [-3308M] RV6 R32 [-33D8] IOK ~~~ →s output X AUDITION R30 4700 W CONTROL (NOTE 2) \forall 늖 K POWER SUPPLY COMMON M LAMP SUPPLY COMMON \triangleleft >Z LEVEL CONTROL (0-6V DC) RV2 [-30.208] ~~~~ P OUTPUT [24MV] CUE CONTROL (NOTE 2) 8. THE PHONO INPUT IS UNBALANCED. PIN D SHOULD BE CONNECTED TO SIGNAL GROUND. 9. STEREO TRACKING: ADJUST R35 WITH SIGNAL IN MIKE INPUT. WHEN See REV A in and a MIKE INPUTS TRACK ± 1 DB, ADJUST RIB (PHONO LEVEL) FOR PHONO TRACKING B502-037-4 Figure 4. 356R-1 Microphone-Phonograph Preamplifier, Schematic Diagram

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World Radio History





356T-1 Preamplifier

unit instructions

Collins Radio Company | Dallas, Texas

523-0558093-102438

1 June 1968

Collins Radio Company 1966
Second Edition 1967
Second Printing June 1968
Printed in United States of America

1. GENERAL DESCRIPTION

1.1 Purpose of Unit

The 356T-1 Preamplifier (figure 1) is a fourstage 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 photo-conductive 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

World Radio History

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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



Figure 2. 356T-1 Preamplifier, Front View

<u>356T-1</u> Preamplifier

5. PARTS LIST

| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER |
|------------|--|-------------------------------|-------------|------------------------|
| | 522-3885-001 | | | |
| C1 | CAPACITOR, FXD, ALUMINUM 25 UF, PLUS 50% MINUS 10%, | C426ARF25 | 73445 | 183-2354-180 |
| C2 | 25 VDCW CAPACITOR, FXD, ALUMINUM 10 UF, PLUS 50% MINUS 10%, 25 VDCH | C426ARF10 | 73445 | 183-2354-170 |
| 63 | 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, MLCA | CM05F101J03 | 81349 | 912-2816-000 |
| | 100 UUF, 5% TOL, 500 VDCW | | | |
| CR1 | SEMICONDUCTOR DEVICE, DIODE | 1N914 | 07688 | 353-2906-000 |
| CR2 | SAME AS CR1 | | | |
| CR3 | SAME AS CRI | 7720-41 | 12102 | 362-0662-640 |
| E1 | INSULATUR, DISK | //20-4N | 19109 | 552-9552-540 |
| E2 | SAME AS E1 | | | |
| E 5 E 4 | | | | |
| E5 | SAME AS EI | | | |
| E6 | | | | |
| JI | JACK. TIP | SKT103PC | 98291 | 360-0172-000 |
| | WHITE | | | |
| J2 | SAME AS J1 | | | |
| J3 | SAME AS J1 | | | |
| Q1 | TRANSISTOR | 2N3565 | 07688 | 352-0638-010 |
| Q2 | SAME AS Q1 | 0.005 (7 | 07/00 | 252 0/20 010 |
| Q3 | TRANSISTOR | 2N3567 | 07688 | 352-0629-010 |
| Q4 05 | | 212639 | 07689 | 352-0636-010 |
| Q5 01 | RESISTOR, EXD, COMPOSITION | 8C07GE563K | 81349 | 745-0812-090 |
| N 4 | 56K DHMS + 10% TOL + 1/4 | | | |
| | WATT | | | |
| R2 | RESISTOR, FXD, COMPOSITION | RC07GF102K | 81349 | 745-0749-000 |
| | 1K OHMS, 10% TOL, 1/4 WATT | | | |
| R3 | RESISTOR, FXO, COMPOSITION | RC07GF683K | 81349 | 745-0815-000 |
| | 68K OHMS, 10% TOL, 174 | | | |
| R4 | RESISTOR, FXD, COMPOSETION 120K DHMS: 10% TOL: 1/4 | RC07GF124K | 81349 | 745-0824-000 |
| | WATT | | | |
| R5 | RESISTOR, FXD, COMPOSITION 100K DHMS, 10% TOL, 1/4 | RC07GF104K | 81349 | 745-0821-000 |
| R6 | RESISTOR, FXD, COMPOSITION 4700 DHMS, 10% TOL, 1/4 | RC07GF472K | 81349 | 745-0773-000 |
| R7 | RESISTOR, FXD, COMPOSITION 15K OHMS, 10% TOL, 1/4 | RC07GF153K | 81349 | 745-0791-000 |
| | WAIT CANE AS DZ | 1 | | |
| R8 | SAME AS KI Resistor, Eyr, Composition | PC076E1231 | 81340 | 745-0787-000 |
| K7 | 12K NHMS, 59 THL. 1/4 WATT | NUVIOI 1233 | 01347 | |
| R10 | RESISTOR, VAR | 75PR100 | 80740 | 382-0004-220 |
| | 100 DHMS, 20% TOL, 3/4 | | | |
| | WATT | | | |
| R11 | RESISTOR, FXD, COMPOSITION | RC32GF101K | 81349 | 745-3310-000 |
| | 100 DHMS, 10% TOL, 1 WATT | | | |
| R12 | RESISTOR, FXD, COMPOSITION 680K DHMS, 5% TOL, 1/4 Watt | RC07GF684J | 81349 | 745-0850-000 |
| R13 | SAME AS R1 | | | |
| R14 | RESISTOR, FXD, COMPOSITION 2200 DHMS, 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 | RC07GF273K | 81349 | 745-0800-000 |
| R16 | WATT RESISTOR, FXD, COMPOSITION 47 OHMS, 10% TOL, 1/4 WATT | RC07GF470K | 81349 | 745-0701-000 |
| R17 R18 | SAME AS R16 RESISTOR, FXD, COMPOSITION 10K OHMS, 10% TOL, 1/4 | RC07GF103K | 81349 | 745-0785-000 |
| R19 R20 | WATT SAME AS R18 SAME AS R1 | | | |
| RZI RV1 | SAME AS RIB RESISTOR, VOLTAGE SENSITIVE | PL5C1 | 33173 | 714-3218-010 |
| RV2 RV3 | RESISTOR, VOLTAGE SENSITIVE | -764-9918-001- | 13499 | -764-9918-001 |
| RV5 | SAME AS RV1 | | | 714-0013-010 |
| 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 | GOT HA | 667-0155-010 |
| T2 TB1 | SAME AS TI TERMINAL BOARD | | | 764-7361-001 |
| XQ1 XQ2 | SOCKET, TRANSISTOR | 05-3307-51 | 91662 | 352-9903-000 |
| THROUGH XQ5 | SAME AS XQ1 | | | |
| XRV1 XRV2 | | | | |
| XRV3 | SOCKET, ELECTRON TUBE | RA9AX | 00656 | 220-1384-070 |
| | MANUFACTURERS CODES | · | | |
| CODE | MANUFACTURER | | | |
| GOTHA | GOTHAM AUDIO CORP. New York, N. Y. | | | |
| 00656 | AEROVOX CORP. | | | |
| 07688 13103 | MILITARY SPECIFICATIONS LANGDON MFG. CO. MILITARY DIVISION, WICHITA, KANS. | | | |
| 13499 | COLLINS RADIO CO. CEDAR RAPIDS. IOWA | | | |
| 33173 | TUBE DEPARTMENT GECO | | 2 | |
| 73445 | AMPEREX ELECTRONIC CO. DIVISION OF NORTH AMERICAN PHILIPS CO., INC. HICKSVILLE, N. Y. | | | |
| 80740 | BECKMAN INSTRUMENTS, INC. FULLERTON, CALIF. | | | |
| 81349 91662 | MILITARY SPECIFICATIONS ELCO CDRP. | | | |
| 98291 | WILLOW GROVE, PA. SEALECTRO CORP. MAMARONECK, N. Y. | | | |
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Figure 3. 356T-1 Preamplifier, Schematic Diagram

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World Radio History





356U-1

Broadcast Audio Preamplifier

©Collins Radio Gompany 1967 Second Printing February 1968 Printed in United States of America

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)



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unit instructions

Collins Radio Company | Dallas, Texas

523-0559550-101438 1 February 1968



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 highlevel 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 operated 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 amplification 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, respectively. A direct output, available at pin Y, is taken from the output of the symmetrical power amplifier. The cue output is taken from transistor 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 photoconductive 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





B502-311-Pb



World Radio History

356U-1 Broadcast Audio Preamplifier

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 | CS13BF685M | 81349 | 184-6216-000 |
| C2 | CAPACITOR, FXD, ELECTROLYTIC 50 UF, PLUS 50% MINUS 10), 40 VDCW | C426ARG50 | 73445 | 183-2354-240 |
| C3 C4 | SAME AS C1 CAPACITOR, FXD, ELECTROLYTIC 1.1 UF, 10% TOL, 20 VDCW SAME AS C2 | 151D115X9020W2 | 56289 | 184-8363-000 |
| C6 C7 C8 | SAME AS C1 SAME AS C1 SAME AS C1 | | | |
| C9 | CAPACITOR, FXD, ELECTROLYTIC 250 UF, PLUS 50% MINUS 10%, 16 VDCW | C437ARE250 | 73445 | 183-2355-060 |
| C10 C11 | SAME AS C2 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 |
| C14 | SAME AS CIZ SAME AS CIZ | | | |
| CR1 | SEMICONDUCTOR DEVICE, DIODE | 1N914 | 07688 | 353-2906-000 |
| CR2 | SAME AS CR1 | | | |
| CR3 | SAME AS CR1 | SKT 102 DC | 00201 | 240 0172 000 |
| 31 | WHITE | SK1-103-PC | 98291 | 360-0172-000 |
| MP1 | INSULATOR, DISK MOLDED PLASTIC | 7720-4N | 13103 | 352-9552-540 |
| MP2 MD2 | SAME AS MPI | | | |
| MP4 | SAME AS MP1 | | | |
| MP5 | SAME AS MP1 | | | |
| MP6 | SAME AS MP1 | | | |
| Q1 | TRANSISTOR | 2N3565 | 07688 | 352-0638-010 |
| Q2 | SAME AS Q1 | | | |
| 04 | JAME AS WI Transistar | 212567 | 07698 | 352-0629-010 |
| 05 | SAME AS 04 | 213507 | 01000 | 552-002,9-010 |
| Q6 | TRANSISTOR | 2N3645 | 07263 | 352-0732-020 |
| Q7 | SAME AS Q4 | | | |
| Q8 | SAME AS Q4 | | | |
| Q9 01 | SAME AS WO Resistor, EVD, composition | BC20CE5431 | 91240 | 745-1425-000 |
| R2 | 56K OHMS, 5% TOL, 1/2 WATT RESISTOR, FXD, COMPOSITION | RC20GF521J | 81349 | 745-1343-000 |
| | 620 OHMS, 5% TOL, 1/2 WATT | | | |
| R3 | SAME AS R1 | | | |
| R4 85 | SAME AS RI | | | |
| R6 | SAME AS R2 | | | |
| R7 | SAME AS R1 | | | |
| R8 | RESISTOR, FXD, COMPOSITION 3.3 MEGOHMS, 10% TOL, 1/2 MATT | 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 JHMS, 5% TOL, 1/2 WATT | RC20GF182J | 81349 | 745-1362-000 |
| R11 | RESISTOR, FXD, COMPOSITION 330K DHMS, 5% TOL, 1/2 WATT | RC20GF334J | 81349 | 745-1456-000 |
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| SYMBOLDESCRIPTIONMANUFACTURER'S PART NUMBERMFF CODR12RESISTOR, FXD, COMPOSITION 1200 OHMS, 53 TOL, 1/2 WATTRC206F183JB134R13RESISTOR, FXD, COMPOSITION 180 OHMS, 53 TOL, 1/2 MATTRC206F183JB134R14RESISTOR, FXD, COMPOSITION 30 AT DUMAS, 53 TOL, 1/2 MATTRC206F183JB134R15RESISTOR, FXD, COMPOSITION 180 OHMS, 53 TOL, 1/2RC206F133JB134R16RESISTOR, FXD, COMPOSITION 180 OHMS, 53 TOL, 1/2 MATTRC206F123JB134R17RESISTOR, FXD, COMPOSITION 1200 OHMS, 53 TOL, 1/2 WATT RC206F123JRC206F123JB134R18RESISTOR, FXD, COMPOSITION 1200 OHMS, 53 TOL, 1/2 WATT RC206F123JRC206F124JB134R19 R21SAME AS R16 RESISTOR, FXD, COMPOSITION RC206F124JRC206F124JB134R22 R25RESISTOR, FXD, COMPOSITION RC206F123JRC206F123JB134R21 R26 R25 R25 R25 R25 R26 R26RC206F123JB134R22 R25 R25 R25 R25 R26 R26 R26 R26RC206F123JB134R26 R29 R25 R25 R25 R26 R26 R26 R26 R26 R270 OHMS, 53 TOL, 1/2 WATT R270 OHMS, 53 TOL, 1/2 | | | | | |
|---|--------|---|-------------------------------|-------------|-----------------------|
| R12 RESISTOR, FXD, COMPOSITION 1200 DHMS, 5% TOL, 1/2 RC20GF122J B134 R13 RESISTOR, FXD, COMPOSITION 18K OMMS, 5% TOL, 1/2 WATT R14 RC20GF183J B134 R14 RESISTOR, FXD, COMPOSITION 3300 DHMS, 5% TOL, 1/2 WATT R15 RC20GF183J B134 R16 RESISTOR, FXD, COMPOSITION 3000 DHMS, 5% TOL, 1/2 WATT R16 RC20GF123J B134 R17 RESISTOR, FXD, COMPOSITION R16 RC20GF123J B134 R17 RESISTOR, FXD, COMPOSITION R12K OMMS, 5% TOL, 1/2 WATT R17 RC20GF124J B134 R18 RESISTOR, FXD, COMPOSITION AVT RC20GF124J B134 R19 SAME AS R16 R21 RESISTOR, FXD, COMPOSITION R220K OMMS, 5% TOL, 1/2 WATT R39K OMMS, 5% TOL, 1/2 WATT RC20GF103J B134 R23 SAME AS R16 R21 RESISTOR, FXD, COMPOSITION R220GF103J RC20GF103J B134 R24 RESISTOR, FXD, COMPOSITION R25 RC20GF103J B134 R134 R25 RC51STOR, FXD, COMPOSITION R26 RC20GF103J B134 R25 RC51STOR, FXD, COMPOSITION R270 OMMS, 5% TOL, 1/2 WATT RC20GF101J B134 R25 RC51STOR, FXD, COMPOSITION R270 OMMS, 5% TOL | SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBE |
| R13 R515TOR, FXD, COMPOSITION 18K OMMS, 5X TOL, 1/2 MATT R14 RC20GF183J 18K OMMS, 5X TOL, 1/2 30T OMMS, 5X TOL, 1/2 R15 R152 R15 RC20GF133J R16 R134 R15 R15 R61STOR, FXD, COMPOSITION RESISTOR, FXD, COMPOSITION R16 RC20GF123J R17 8134 R16 R18 R000MS, 5X TOL, 1/2 MATT RC20GF123J R17 8134 R16 R18 RESISTOR, FXD, COMPOSITION R25K OMMS, 5X TOL, 3/4 MATT RC20GF123J R120K OMMS, 5X TOL, 1/2 MATT 8134 R20 R18 RESISTOR, FXD, COMPOSITION R25X OMMS, 5X TOL, 1/2 MATT RC20GF124J R120K OMMS, 5X TOL, 1/2 MATT 8134 R22 R19 SAME AS R16 R20 SAME AS R16 R21 RC20GF103J R10K OMMS, 5X TOL, 1/2 WATT RC20GF103J R134 R23 8134 R24 R25 RESISTOR, FXD, COMPOSITION R200 MMS, 5X TOL, 1/2 WATT RC20GF103J R134 R25 8134 R26 R24 RESISTOR, FXD, COMPOSITION R200 MMS, 5X TOL, 1/2 WATT RC20GF103J R134 8134 R25 R25 RESISTOR, FXD, COMPOSITION R200 MMS, 5X TOL, 1/2 WATT R26 RC20GF103J R134 8134 R27 R26 RESISTOR, FXD, COMPOSITION R27 RC20GF173J R134 8134 R27 R27 SAME AS R10 R27 RC20GF173J R134 8134 R27 R30 RC20 | R12 | RESISTOR, FXD, COMPOSITION 1200 DHMS, 5% TOL, 1/2 | RC20GF122J | 81349 | 745-1355-000 |
| R14 RESISTOR, FX0, COMPOSITION 3300 DHHS, 5X TOL, 1/2 RC20GF332J 8134 R15 RESISTOR, FX0, COMPOSITION RESISTOR, FX0, COMPOSITION R16 RC20GF123J 8134 R16 RESISTOR, FX0, COMPOSITION RESISTOR, FX0, COMPOSITION R20 OHHS, 20X TOL, 3/4 RC20GF123J 8134 R17 RESISTOR, FX0, COMPOSITION RESISTOR, FX0, COMPOSITION R20 OHHS, 20X TOL, 3/4 RC20GF124J 8134 R18 RESISTOR, FX0, COMPOSITION R20 OHHS, 5X TOL, 1/2 MATT RC20GF124J 8134 R21 RESISTOR, FX0, COMPOSITION R21 OK OHHS, 5X TOL, 1/2 MATT RC20GF103J 8134 R21 RESISTOR, FX0, COMPOSITION R23 SAME AS R16 RC20GF103J 8134 R21 RESISTOR, FX0, COMPOSITION R23 SAME AS R21 RC20GF103J 8134 R23 SAME AS R21 RC20GF103J 8134 R24 RESISTOR, VAR, NON WIRE-WND 100 OHHS, 5X TOL, 1/2 WATT RC20GF101J 8134 R25 RESISTOR, FX0, COMPOSITION R27 RC20GF101J 8134 R26 RESISTOR, FXD, COMPOSITION R27 RC20GF101J 8134 R27 SAME AS R21 R27 RC20GF101J 8134 R28 SAME AS | R13 | RESISTOR, FXD, COMPOSITION | RC20GF183J | 81349 | 745-1404-000 |
| R15 RESISTOR, FXD, COMPOSITION RC20GF153J 8134 R16 RESISTOR, FXD, COMPOSITION RC20GF123J 8134 R17 RESISTOR, FXD, COMPOSITION RC20GF123J 8134 R17 RESISTOR, FXD, COMPOSITION RC20GF123J 8134 R18 RESISTOR, FXD, COMPOSITION RC20GF124J 8134 R18 RESISTOR, FXD, COMPOSITION RC20GF124J 8134 R19 SAME AS R16 RC20GF124J 8134 R20 SAME AS R16 RC20GF103J 8134 R21 RESISTOR, FXD, COMPOSITION RC20GF103J 8134 R22 RESISTOR, FXD, COMPOSITION RC20GF103J 8134 R23 SAME AS R21 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R24 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R25 RESISTOR, FXD, COMPOSITION RC20GF73J 8134 R26 RESISTOR, FXD, COMPOSITION RC20GF73J 8134 R27 SAME AS R16 RC20GF73J 8134 R28 SAME AS R20 | R14 | RESISTOR, FXO, COMPOSITION 3300 OHMS, 5% TOL, 1/2 | RC20GF332J | 81349 | 745-1372-000 |
| R16 RESISTOR, FX0, COMPOSITION RC20GF123J 8134 R17 RESISTOR, VAR, NON WIRE-WND 20K OMMS, 203 TOL, 3/4 75PR20K 8074 R18 RESISTOR, FX0, COMPOSITION WATT RC20GF124J 8134 R19 SAME AS R16 RC20GF124J 8134 R21 RESISTOR, FX0, COMPOSITION WATT RC20GF124J 8134 R22 SAME AS R16 RC20GF124J 8134 R21 RESISTOR, FX0, COMPOSITION WATT RC20GF123J 8134 R22 RESISTOR, FX0, COMPOSITION TOK OMMS, 5% TOL, 1/2 WATT RC20GF103J 8134 R23 SAME AS R21 RC20GF101J 8134 R24 RESISTOR, FX0, COMPOSITION TOK OMMS, 5% TOL, 1/2 WATT RC20GF101J 8134 R25 RESISTOR, FX0, COMPOSITION TOK OMMS, 5% TOL, 1/2 WATT RC20GF101J 8134 R26 RESISTOR, FX0, COMPOSITION TOK OMMS, 5% TOL, 1/2 WATT RC20GF272J 8134 R26 RESISTOR, FX0, COMPOSITION RESISTOR, FX0, COMPOSITION RC20GF273J 8134 8134 R27 SAME AS R16 RC20GF470J 8134 R28 RESISTOR, | R15 | RESISTOR, FXD, COMPOSITION | RC20GF153J | 81349 | 745-1400-000 |
| R17 RESISTOR, VAR. NON WIRE-WND 75PR20K 8074 R18 RESISTOR, VAR. NON WIRE-WND 75PR20K 8074 R18 RESISTOR, FXD, COMPOSITION RC20GF124J 8134 R19 SAME AS R16 RC20GF393J 8134 R20 SAME AS R16 RC20GF103J 8134 R21 RESISTOR, FXD, COMPOSITION RC20GF103J 8134 R22 RESISTOR, FXD, COMPOSITION RC20GF103J 8134 R23 SAME AS R16 RC20GF103J 8134 R24 RESISTOR, FXD, COMPOSITION RC20GF103J 8134 R25 RESISTOR, FXD, COMPOSITION RC20GF103J 8134 R26 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R27 SAME AS R21 RC20GF753J 8134 R28 SAME AS R21 RC20GF272J 8134 R29 RESISTOR, FXD, COMPOSITION RC20GF273J 8134 R21 RC20GF273J 8134 4700MS, 53 TOL, 1/2 WATT RC20GF273J 8134 R31 RESISTOR, FXD, COMPOSIT | R16 | RESISTOR, FXD, COMPOSITION | RC20GF123J | 81349 | 745-1397-006 |
| R18 RESISTOR, FXD, COMPOSITION 120K OHHS, 5% TOL, 1/2 WATT RC20GF124J 8134 R19 SAME AS R16 R20 RC20GF393J 8134 R21 RESISTOR, FXD, COMPOSITION 39% OHMS, 5% TOL, 1/2 WATT RC20GF103J 8134 R22 RESISTOR, FXD, COMPOSITION 10% OHMS, 5% TOL, 1/2 WATT RC20GF103J 8134 R22 RESISTOR, FXD, COMPOSITION 100 OHMS, 30% TOL, 3/4 RC20GF101J 8134 R24 RESISTOR, FXD, COMPOSITION WATT RC20GF101J 8134 R25 RESISTOR, FXD, COMPOSITION NAT RC20GF101J 8134 R26 RESISTOR, FXD, COMPOSITION R27 RC20GF753J 8134 R27 SAME AS R16 R29 RC20GF470J 8134 R28 SAME AS R16 R29 RC20GF470J 8134 R30 RESISTOR, FXD, COMPOSITION ATT RC20GF470J 8134 R31 RESISTOR, FXD, COMPOSITION ATT RC20GF470J 8134 R33 SAME AS R30 R34 SAME AS R30 R236 R34 SAME AS R30 R34 SAME AS R29 R39 R34 R34 SAME AS R29 R39 | R17 | RESISTOR, VAR, NON WIRE-WND 20K OHMS, 20% TOL, 3/4 | 75 PR20K | 80740 | 382-0004-290 |
| R19 SAME AS R16 R20 SAME AS R16 R21 RESISTOR, FXD, COMPOSITION RC20GF393J 8134 39K OHMS, 5% TOL, 1/2 WATT RESISTOR, FXD, COMPOSITION RC20GF103J 8134 10K OHMS, 5% TOL, 1/2 WATT RSISTOR, FXD, COMPOSITION RC20GF103J 8134 R23 SAME AS R21 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R24 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R25 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R26 RSISTOR, FXD, COMPOSITION RC20GF101J 8134 R27 SAME AS R21 RSISTOR, FXD, COMPOSITION RC20GF272J 8134 R28 SAME AS R21 RSISTOR, FXD, COMPOSITION RC20GF470J 8134 R29 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 R32 RESISTOR, FXD, COMPOSITION RC20GF471J 8134 R33 SAME AS R30 R33 834 834 834 R34 SAME AS R30 R33 834 834 834 <td>R18</td> <td>RESISTOR, FXD, COMPOSITION 120K OHMS, 5% TOL, 1/2 WATT</td> <td>RC20GF124J</td> <td>81349</td> <td>745-1439-00</td> | R18 | RESISTOR, FXD, COMPOSITION 120K OHMS, 5% TOL, 1/2 WATT | RC20GF124J | 81349 | 745-1439-00 |
| R20 SAME AS R10 R21 RSISTOR, FXD, COMPOSITION RC20GF393J 8134 R21 RESISTOR, FXD, COMPOSITION RC20GF393J 8134 R22 RESISTOR, FXD, COMPOSITION RC20GF103J 8134 R23 SAME AS R21 RC1/2 WATT RC20GF103J 8134 R23 SAME AS R21 RC1/2 WATT RC20GF103J 8134 R24 RESISTOR, VAR, NON WIRE-WND 75PR100 8074 100 OHMS, 30X TOL, 3/4 MATT RC20GF101J 8134 R25 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R26 RESISTOR, FXD, COMPOSITION RC20GF753J 8134 R27 SAME AS R16 RC20GF272J 8134 R28 SAME AS R16 RC20GF470J 8134 R29 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 R32 RESISTOR, FXD, COMPOSITION RC20GF471J 8134 R33 SAME AS R30 R34 SAME AS R30 R | R19 | SAME AS RIG | | | |
| R21 RESISTOR, FXD, COMPOSITION 39K OHMS, 5X TOL, 1/2 WATT RESISTOR, FXD, COMPOSITION R22 RC20GF393J R23 8134 R21 RESISTOR, FXD, COMPOSITION 10K OHMS, 5X TOL, 1/2 WATT R23 RC20GF103J SAME AS R21 8134 R24 RESISTOR, FXD, COMPOSITION 100 OHMS, 5X TOL, 1/2 WATT R25 RC20GF101J R26 8134 R25 RESISTOR, FXD, COMPOSITION 100 OHMS, 5X TOL, 1/2 WATT R26 RC20GF101J R27 8134 R26 RESISTOR, FXD, COMPOSITION 75K OHMS, 5X TOL, 1/2 WATT R27 RC20GF753J SAME AS R21 8134 R29 RESISTOR, FXD, COMPOSITION R2700 OHMS, 5X TOL, 1/2 WATT R30 RC20GF272J R251STOR, FXD, COMPOSITION R2700 OHMS, 5X TOL, 1/2 WATT R31 RC20GF470J R134 8134 R31 RESISTOR, FXD, COMPOSITION R270 OHMS, 5X TOL, 1/2 WATT R33 RC20GF471J SAME AS R30 8134 R33 SAME AS R31 R34 SAME AS R31 R35 R34 SAME AS R31 R34 SAME AS R29 8134 R40 RESISTOR, FXD, COMPOSITION R41 RC20GF154J 8134 R43 SAME AS R31 R35 R44 SAME AS R44 RC20GF154J 8134 R44 RESISTOR, FXD, COMPOSITION R45 RC20GF100J 8134 R45 SAME AS R44 R44 | R20 | SAME AS R18 | | | |
| R22 RESISTOR, FXD, COMPOSITION RC20GF103J 8134 R23 SAME AS R21 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R24 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R25 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R26 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R26 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R27 SAME AS R21 RATT RC20GF101J 8134 R28 SAME AS R21 RC30 RC20GF101J 8134 R29 RESISTOR, FXD, COMPOSITION RC20GF272J 8134 R29 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF471J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF471J 8134 R33 SAME AS R30 RC30 RC30 RC30 R34 SAME AS R31 RC30 RC30 RC30 RC30 R35 SAME AS R40 RC20GF154J 81 | R21 | RESISTOR, FXD, COMPOSITION | RC20GF393J | 81349 | 745-1418-00 |
| R23 SAME AS R21 75PR100 8074 R24 RESISTOR, VAR, NON WIRE-WND 75PR100 8074 100 OHMS, 30% TOL, 3/4 MATT RC20GF101J 8134 R25 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R26 RESISTOR, FXD, COMPOSITION RC20GF753J 8134 R27 SAME AS R21 RC20GF753J 8134 R28 SAME AS R21 RC20GF753J 8134 R27 SAME AS R21 RC20GF753J 8134 R28 SAME AS R21 RC20GF272J 8134 R29 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 R47 NMAT RC20GF470J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF471J 8134 R33 SAME AS R30 R34 SAME AS R30 833 R34 SAME AS R30 R34 SAME AS R31 8134 R35 SAME AS R30 R25 8134 8134 R40 RESISTOR, FXD, FUH RC20GF154J 8134 <td>R22</td> <td>RESISTOR, FXD, COMPOSITION 10K OHMS, 5% TOL, 1/2 WATT</td> <td>RC20GF103J</td> <td>81349</td> <td>745-1393-00</td> | R22 | RESISTOR, FXD, COMPOSITION 10K OHMS, 5% TOL, 1/2 WATT | RC20GF103J | 81349 | 745-1393-00 |
| R24 RESISTOR, VAR, VON WIRE-WND 75PR100 8074 100 OHMS, 30% TOL, 3/4 WATT R25 RESISTOR, FXD, COMPOSITION RC20GF101J 8134 R25 RESISTOR, FXD, COMPOSITION RC20GF753J 8134 R26 RESISTOR, FXD, COMPOSITION RC20GF753J 8134 R27 SAME AS R21 R28 SAME AS R16 R29 R28 SAME AS R16 RC20GF272J 8134 R29 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 47 OHMS, 5% TOL, 1/2 WATT RC20GF273J 8134 R30 RESISTOR, FXD, COMPOSITION RC20GF273J 8134 47 OHMS, 5% TOL, 1/2 WATT RC20GF273J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF471J 8134 R32 RESISTOR, FXD, COMPOSITION RC20GF471J 8134 R33 SAME AS R30 SAME AS R30 SAME AS R30 SAME AS R30 R34 SAME AS R31 SAME AS R29 SAME AS R44 SAME AS R45 SAME AS R45 <td< td=""><td>R23 </td><td>SAME AS R21</td><td></td><td></td><td></td></td<> | R23 | SAME AS R21 | | | |
| R25RESISTOR, FXD, COMPOSITION 100 OHMS, 5% TOL, 1/2 WATT R26RC20GF101J8134R26RESISTOR, FXD, COMPOSITION 75K OHMS, 5% TOL, 1/2 WATTRC20GF753J8134R27SAME AS R21 2700 OHMS, 5% TOL, 1/2 WATTRC20GF272J8134R28SAME AS R16 2700 OHMS, 5% TOL, 1/2 WATTRC20GF470J8134R30RESISTOR, FXD, COMPOSITION 47 OHMS, 5% TOL, 1/2 WATTRC20GF470J8134R31RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATTRC20GF470J8134R31RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATTRC20GF471J8134R33SAME AS R30 SAME AS R30S% COMPOSITION 27K OHMS, 5% TOL, 1/2 WATTRC20GF471J8134R34SAME AS R30 R35SAME AS R30RC20GF471J8134R44SAME AS R30 R36SAME AS R29RAME AS R30RC20GF154J8134R441SAME AS R29 R400RC10K OHMS, 5% TOL, 1/4 WATTRN60D1002F8134R44RESISTOR, FXD, COMPOSITION 150K OHMS, 5% TOL, 1/2 WATTRC20GF154J8134R44RESISTOR, FXD, COMPOSITION 150K OHMS, 5% TOL, 1/2 WATTRC20GF100J8134R44RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATTRC20GF100J8134R45SAME AS R44 R46 R46SAME AS R44Y-13173317R44RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATTY-13173317R44RAS R44 R46 R46SAME AS R44Y-13173317R45SAME AS R44 R47SAME AS R44 | R24 | RESISTOR, VAR, NON WIRE-WND 100 OHMS, 30% TOL, 3/4 WATT | 75PR100 | 80740 | 382-0004-22 |
| R26RESISTON, FXD, COMPOSITION TSK OHMS, 5% TOL, 1/2 WATT R27RC20GF753J8134R27SAME AS R21 R28SAME AS R16 R29RC20GF272J8134R30RESISTOR, FXD, COMPOSITION WATTRC20GF470J8134R31RESISTOR, FXD, COMPOSITION WATTRC20GF470J8134R31RESISTOR, FXD, COMPOSITION VMHS, 5% TOL, 1/2 WATTRC20GF470J8134R31RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATTRC20GF470J8134R33SAME AS R30 SAME AS R30RC20GF471J8134R33SAME AS R30 SAME AS R30RC20GF471J8134R41SAME AS R30 SAME AS R29RK60D1002F8134R42SAME AS R29 R39SAME AS R29RC20GF154J8134R43RESISTOR, FXD, COMPOSITION IOK OHMS, 5% TOL, 1/2 WATTRC20GF154J8134R44RESISTOR, FXD, COMPOSITION IOK OHMS, 5% TOL, 1/2RC20GF154J8134R44RESISTOR, FXD, COMPOSITION IO OHMS, 5% TOL, 1/2RC20GF100J8134R44RESISTOR, FXD, COMPOSITION IO OHMS, 5% TOL, 1/2RC20GF100J8134R45SAME AS R44 R46SAME AS R44R46 R47SAME AS R44R46SAME AS R44 R47SAME AS R44Y-13173317RV2SAME AS RV1 PHOTOCONDUCTIVE LEVELY-13173317 | R25 | RESISTOR, FXD, COMPOSITION 100 DHMS, 5% TOL, 1/2 WATT | RC20GF101J | 81349 | 745-1309-00 |
| R27 SAME AS R21 R28 SAME AS R16 R29 RESISTOR, FXD, COMPOSITION R29 RESISTOR, FXD, COMPOSITION R30 RESISTOR, FXD, COMPOSITION R31 RESISTOR, FXD, COMPOSITION R29 RESISTOR, FXD, COMPOSITION R31 RESISTOR, FXD, COMPOSITION R29 RESISTOR, FXD, COMPOSITION R21 RESISTOR, FXD, COMPOSITION R22 RESISTOR, FXD, COMPOSITION R21 RESISTOR, FXD, COMPOSITION R22 RESISTOR, FXD, COMPOSITION R32 RESISTOR, FXD, COMPOSITION R40 RESISTOR, FXD, COMPOSITION R33 SAME AS R29 R34 SAME AS R29 R35 SAME AS R29 R40 RESISTOR, FXD, FILM 10K OHMS, 1% TOL, 1/4 WATT R41 SAME AS R18 R43 RESISTOR, FXD, COMPOSITION R44 RESISTOR, FXD, COMPOSITION R44 RESISTOR, FXD, COMPOSITION R45 SAME AS R40 R44 RESISTOR, FXD, COMPOSITION R45 SAME AS R44 R | R26 | RESISTOR, FXD, COMPOSITION 75K OHMS, 5% TOL, 1/2 WATT | RC20GF753J | 81349 | 745-1431-00 |
| R28 SAME AS R16 RC20GF272J 8134 R29 RESISTOR, FXD, COMPOSITION RC20GF272J 8134 R30 RESISTOR, FXD, COMPOSITION RC20GF470J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF273J 8134 R31 RESISTOR, FXD, COMPOSITION RC20GF471J 8134 R33 SAME AS R30 RSISTOR, FXD, COMPOSITION RC20GF471J 8134 R33 SAME AS R30 R35 SAME AS R30 R37 SAME AS R31 R34 SAME AS R29 R39 SAME AS R29 R40 RESISTOR, FXD, COMPOSITION RC20GF154J 8134 R41 SAME AS R40 R42 SAME AS R18 R44 150K OHMS, 5% TOL, 1/2 RC20GF154J 8134 R44 RESISTOR, FXD, COMPOSITION RC20GF154J 8134 134 R45 SAME AS R44 R44 R620GF100J 8134 R45 <td>R27</td> <td>SAME AS R21</td> <td></td> <td></td> <td></td> | R27 | SAME AS R21 | | | |
| R29RESISTOR, FXD, COMPOSITION 2700 OHMS, 5% TOL, 1/2 WATTRC20GF272J8134R30RESISTOR, FXD, COMPOSITION 47 OHMS, 5% TOL, 1/2 WATTRC20GF470J8134R31RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATTRC20GF273J8134R32RESISTOR, FXD, COMPOSITION 470 OHMS, 5% TOL, 1/2 WATTRC20GF471J8134R33SAME AS R30 R34SAME AS R30R2358134R36SAME AS R30 R37SAME AS R258134R38SAME AS R29 R39SAME AS R298134R41SAME AS R40 I SOK OHMS, 5% TOL, 1/4 WATTRN60D1002F8134R41SAME AS R18 R43RESISTOR, FXD, COMPOSITION I SOK OHMS, 5% TOL, 1/2RC20GF154J8134R44RESISTOR, FXD, COMPOSITION I O OHMS, 5% TOL, 1/2RC20GF100J8134R45SAME AS R40 R45SAME AS R44 R46SAME AS R448134R44RESISTOR, FXD, COMPOSITION I O OHMS, 5% TOL, 1/2 WATTRC20GF100J8134R45SAME AS R44 R46SAME AS R44848 R48844R48SAME AS R44 R46SAME AS R44847 R48317 R443317RV2SAME AS R44 RV1PHOTOCONDUCTIVE LEVELY-13173317 | R28 | SAME AS R16 | | | |
| R30RESISTOR, FXD, COMPOSITION 47 OHMS, 5% TOL, 1/2 WATT RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATTRC20GF470J8134R31RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATTRC20GF273J8134R32RESISTOR, FXD, COMPOSITION 470 OHMS, 5% TOL, 1/2 WATTRC20GF471J8134R33SAME AS R30 R34SAME AS R30RC20GF471J8134R34SAME AS R30 R35SAME AS R31RC20GF471J8134R36SAME AS R30 R37SAME AS R25R37SAME AS R29R39SAME AS R29 R39SAME AS R29R40RESISTOR, FXD, FILM 10K OHMS, 1% TOL, 1/4 WATTRN60D1002F8134R41SAME AS R40 10K OHMS, 5% TOL, 1/2 WATTRC20GF154J8134R42SAME AS R18 R43RC20GF154J8134R44RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATTRC20GF100J8134R45SAME AS R44 R46 SAME AS R44Y-13173317R48SAME AS R44 R48SAME AS R44 R48Y-13173317RV2SAME AS RV1 RV3PHOTOCONDUCTIVE LEVELY-13173317 | K29 | 2700 OHMS, 5% TOL, 1/2 WATT | RC20GF272J | 81349 | 745-1369-00 |
| R31RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATTRC20GF273J8134R32RESISTOR, FXD, COMPOSITION 470 OHMS, 5% TOL, 1/2 WATTRC20GF471J8134R33SAME AS R30 R34SAME AS R30R36SAME AS R30R34SAME AS R30 R35SAME AS R31R36SAME AS R25R37SAME AS R25R37SAME AS R29R39R40RESISTOR, FXD, FILM 10K OHMS, 1% TOL, 1/4 WATTRN60D1002F8134R41SAME AS R40 R42SAME AS R40RC20GF154J8134R43RESISTOR, FXD, COMPOSITION 150K OHMS, 5% TOL, 1/2 WATTRC20GF154J8134R44RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATTRC20GF100J8134R45SAME AS R44 R46SAME AS R44R47SAME AS R44R48SAME AS R44 R47SAME AS R44 R48SAME AS R44 R46SAME AS R44 R47Y-13173317RV2SAME AS RV1 RV3PHOTOCONDUCTIVE LEVELY-13173317 | R30 | RESISTOR, FXD, COMPOSITION 47 OHMS, 5% TOL, 1/2 WATT | RC20GF470J | 81349 | 745-1295-00 |
| R32RESISTOR, FXD, COMPOSITION 470 OHMS, 5% TOL, 1/2 WATTRC20GF471J8134R33SAME AS R30S% TOL, 1/2 WATTR338134R34SAME AS R30S% TOL, 1/2 WATT8134R35SAME AS R30S% TOL, 1/2 WATT8134R36SAME AS R31S% TOL, 1/2 WATT8134R37SAME AS R29S% TOL, 1/4 WATT8134R38SAME AS R29S% TOL, 1/4 WATT8134R40RESISTOR, FXD, FILMRN60D1002F813410K OHMS, 1% TOL, 1/4 WATTRC20GF154J8134R41SAME AS R40S% TOL, 1/28134R42SAME AS R18RC20GF154J8134R43RESISTOR, FXD, COMPOSITIONRC20GF154J8134R44RESISTOR, FXD, COMPOSITIONRC20GF100J8134R45SAME AS R4410 OHMS, 5% TOL, 1/2 WATT8134R46SAME AS R44S% TOL, 1/2 WATT8134R47SAME AS R44S% TOL, 1/2 WATT8134R48SAME AS R44S% TOL, 1/2 WATT7-1317RV2SAME AS R44S% TOLY-13173317RV3PHOTOCONDUCTIVE SWITCHY-13173317 | R31 | RESISTOR, FXD, COMPOSITION 27K OHMS, 5% TOL, 1/2 WATT | RC20GF273J | 81349 | 745-1411-00 |
| R33 SAME AS R30 R34 SAME AS R30 R35 SAME AS R31 R36 SAME AS R25 R37 SAME AS R25 R37 SAME AS R29 R38 SAME AS R29 R40 RESISTOR, FXD, FILM R41 SAME AS R29 R42 SAME AS R18 R43 RESISTOR, FXD, COMPOSITION R42 SAME AS R18 R43 RESISTOR, FXD, COMPOSITION R44 RESISTOR, FXD, COMPOSITION R45 SAME AS R44 10 OHMS, 5% TOL, 1/2 MATT R45 SAME AS R44 R46 SAME AS R44 R47 SAME AS R44 R48 SAME AS R44 R47 SAME AS R44 R48 SAME AS R44 R47 SAME AS R44 R48 SAME AS R44 R48 SAME AS R44 R48 SAME AS R44 R47 SAME AS R44 R48 SAME AS R44 RV1 PHOTOCONDUCTIVE SWITCH Y-1317 RV3 PHOTOCONDUCTIVE | R32 | RESISTOR, FXD, COMPOSITION 470 OHMS, 5% TOL, 1/2 WATT | RC20GF471J | 81349 | 745-1337-00 |
| R34SAME AS R30R35SAME AS R31R36SAME AS R25R37SAME AS R29R38SAME AS R29R39SAME AS R29R40RESISTOR, FXD, FILMIOK OHMS, 1% TOL, 1/4 WATTR41SAME AS R40R42SAME AS R18R43RESISTOR, FXD, COMPOSITIONR44RESISTOR, FXD, COMPOSITIONR45SAME AS R4410 OHMS, 5% TOL, 1/2WATTR46SAME AS R44R47SAME AS R44R48SAME AS R44R48SAME AS R44RV1PHOTOCONDUCTIVE SWITCHRV3PHOTOCONDUCTIVE LEVEL | R33 | SAME AS R30 | | | |
| R35SAME AS R31R36SAME AS R25R37SAME AS R31R38SAME AS R29R39SAME AS R29R40RESISTOR, FXD, FILMIOK OHMS, 1% TOL, 1/4 WATTR41SAME AS R40R42SAME AS R40R43RESISTOR, FXD, COMPOSITIONR44RESISTOR, FXD, COMPOSITIONR45SAME AS R4410 OHMS, 5% TOL, 1/2WATTR44RESISTOR, FXD, COMPOSITIONR45SAME AS R44R46SAME AS R44R47SAME AS R44R48SAME AS R44R41PHOTOCONDUCTIVE SWITCHRV1PHOTOCONDUCTIVE LEVEL | R34 | SAME AS R30 | | | |
| R36SAME AS R25R37SAME AS R31R38SAME AS R29R39SAME AS R29R40RESISTOR, FXD, FILM10K OHMS, 1% TOL, 1/4 WATTR41SAME AS R40R42SAME AS R18R43RESISTOR, FXD, COMPOSITIONR44RESISTOR, FXD, COMPOSITIONR45SAME AS R4410 OHMS, 5% TOL, 1/2WATTR44RESISTOR, FXD, COMPOSITIONR45SAME AS R44R46SAME AS R44R47SAME AS R44R48SAME AS R44R41PHOTOCONDUCTIVE SWITCHRV1PHOTOCONDUCTIVE LEVEL | R35 | SAME AS R31 | | | |
| R37SAME AS R31R38SAME AS R29R39SAME AS R29R40RESISTOR, FXD, FILMIOK OHMS, 1% TOL, 1/4 WATTR41SAME AS R40R42SAME AS R18R43RESISTOR, FXD, COMPOSITIONR44RESISTOR, FXD, COMPOSITIONR45SAME AS R44R46SAME AS R44R47SAME AS R44R48SAME AS R44R41PHOTOCONDUCTIVE SWITCHRV1PHOTOCONDUCTIVE LEVEL | R36 | SAME AS R25 | | | |
| R38 R39SAME AS R29 SAME AS R29R14RN60D1002F8134R40RESISTOR, FXD, FILM 10K OHMS, 1% TOL, 1/4 WATTRN60D1002F8134R41SAME AS R40 R42SAME AS R18RC20GF154J8134R43RESISTOR, FXD, COMPOSITION 150K OHMS, 5% TOL, 1/2 WATTRC20GF154J8134R44RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATTRC20GF100J8134R45SAME AS R44 R46SAME AS R44848844R48SAME AS R44 R47SAME AS R44 R48Y-13173317RV2SAME AS RV1 RV3PHOTOCONDUCTIVE LEVELY-13173317 | R37 | SAME AS R31 | | | |
| R39SAME AS R29RN60D1002F8134R40RESISTOR, FXD, FILMRN60D1002F813410K 0HMS, 1% TOL, 1/4 WATTSAME AS R40R42SAME AS R18R43RESISTOR, FXD, COMPOSITIONRC20GF154J8134150K 0HMS, 5% TOL, 1/2WATTR44RESISTOR, FXD, COMPOSITIONRC20GF100JR44RESISTOR, FXD, COMPOSITIONRC20GF100J8134R45SAME AS R4410 0HMS, 5% TOL, 1/2 WATTR46SAME AS R44R46SAME AS R44R47SAME AS R447-13173317RV1PHOTOCONDUCTIVE SWITCHY-13173317RV3PHOTOCONDUCTIVE LEVELY-1317Y-1317Y-1317 | R38 | SAME AS R29 | | | |
| R40RESISTOR, FXD, FILMRN60D1002F813410K 0HMS, 1% TOL, 1/4 WATTRA1SAME AS R408134R41SAME AS R18RESISTOR, FXD, COMPOSITIONRC20GF154J8134R43RESISTOR, FXD, COMPOSITIONRC20GF154J8134150K 0HMS, 5% TOL, 1/2WATTR44RESISTOR, FXD, COMPOSITIONRC20GF100JR44RESISTOR, FXD, COMPOSITIONRC20GF100J8134R45SAME AS R44R46SAME AS R44848R48SAME AS R44Y-13173317RV1PHOTOCONDUCTIVE SWITCHY-13173317RV3PHOTOCONDUCTIVE LEVELY-1317Y | R39 | SAME AS R29 | | | |
| IOK OHMS, 1% TOL, 1/4 WATTR41SAME AS R40R42SAME AS R18R43RESISTOR, FXD, COMPOSITIONR44ISOK OHMS, 5% TOL, 1/2WATTR44RESISTOR, FXD, COMPOSITIONR45SAME AS R4410 OHMS, 5% TOL, 1/2 WATTR46SAME AS R44R47SAME AS R44R48SAME AS R44R48SAME AS R44R49PHOTOCONDUCTIVE SWITCHY1PHOTOCONDUCTIVE LEVEL | R40 | RESISTOR, FXD, FILM | RN60D1002F | 81349 | 705-6644-00 |
| R41SAME AS R40R42SAME AS R18R43RESISTOR, FXD, COMPOSITIONL50K OHMS, 5% TOL, 1/2WATTR44RESISTOR, FXD, COMPOSITIONR45SAME AS R44L0 OHMS, 5% TOL, 1/2 WATTR46SAME AS R44R47SAME AS R44R48SAME AS R44R48SAME AS R44R49PHOTOCONDUCTIVE SWITCHRV1PHOTOCONDUCTIVE LEVEL | 1 49 | IUK UHMS, IX IUL, I/4 WAIT | | | |
| R42SAME AS R10RC20GF154J8134R43RESISTOR, FXD, COMPOSITIONRC20GF154J8134WATTWATTR44RESISTOR, FXD, COMPOSITIONRC20GF100J813410 OHMS, 5% TOL, 1/2 WATTR45SAME AS R448134R46SAME AS R44R46SAME AS R44844R47SAME AS R44844848844R48SAME AS R44Y-13173317RV1PHOTOCONDUCTIVE SWITCHY-13173317RV3PHOTOCONDUCTIVE LEVELYY | P42 | SAME AS RAU | | | |
| R44RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATTRC20GF100J8134R45SAME AS R44R46SAME AS R448134R46SAME AS R44848848844R48SAME AS R449H0TOCONDUCTIVE SWITCHY-13173317RV2SAME AS RV1RV3PHOTOCONDUCTIVE LEVEL1000000000000000000000000000000000000 | R43 | RESISTOR, FXD, COMPOSITION 150K OHMS, 5% TOL, 1/2 WATT | RC20GF154J | 81349 | 745-1442-00 |
| R45SAME AS R44R46SAME AS R44R47SAME AS R44R48SAME AS R44RV1PHOTOCONDUCTIVE SWITCHRV2SAME AS RV1RV3PHOTOCONDUCTIVE LEVEL | R44 | RESISTOR, FXD, COMPOSITION 10 OHMS, 5% TOL, 1/2 WATT | RC20GF100J | 81349 | 74 5- 1267-00 |
| R46SAME AS R44R47SAME AS R44R48SAME AS R44RV1PHOTOCONDUCTIVE SWITCHRV2SAME AS RV1RV3PHOTOCONDUCTIVE LEVEL | R45 | SAME AS R44 | | | |
| R47SAME AS R44R48SAME AS R44RV1PHOTOCONDUCTIVE SWITCHRV2SAME AS RV1RV3PHOTOCONDUCTIVE LEVEL | R46 | SAME AS R44 | | | |
| R48 SAME AS R44 RV1 PHOTOCONDUCTIVE SWITCH Y-1317 RV2 SAME AS RV1 RV3 PHOTOCONDUCTIVE LEVEL | R47 | SAME AS R44 | | | |
| RV1 PHOTOCONDUCTIVE SWITCH Y-1317 3317 RV2 SAME AS RV1 RV3 PHOTOCONDUCTIVE LEVEL 3317 | R48 | SAME AS R44 | | | |
| RV2 SAME AS RV1 RV3 PHOTOCONDUCTIVE LEVEL | | PHOTOCONDUCTIVE SWITCH | Y-1317 | 33173 | 714-3218-01 |
| | | SAME AS RVI | | | |
| CONTROL RV4 SAME AS RV1 | RV 3 | CONTROL SAME AS BY1 | | | 764-9918-00 |
| RVT SAME AS RVI | 215 | SAME AS RAT | | | 77 |

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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 Same as XQ1 | 05-3307-51 | 91662 | 352-9903-000 |
| XRV1 XRV2 XRV3 | NDT USED NDT USED SDCKET, 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 | SEALECTRO COPP. 225 HOYT MAMARONECK, N.Y. 10544 | | | |
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356U-1 Broadcast Audio Preamplifier



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Broadcast Audio Preamplifier

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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)







Collins Radio Company | Dallas, Texas

523-0559550-001438

August 1, 1967

COLLINS





B502-310-Pb





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 highlevel 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 operated 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 amplification 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, respectively. A direct output, available at pin Y, is taken from the output of the symmetrical power amplifier. The cue output is taken from transistor 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 photoconductive 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.

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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

356U-1 Broadcast Audio Preamplifier

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 | CS13BF685M | 81349 | 184-6216-000 |
| C2 | CAPACITOR, FXD, ELECTROLYTIC 50 UF, PLUS 50% MINUS 10), 40 VDCW | C426ARG50 | 73445 | 183-2354-240 |
| C3 C4 | SAME AS C1 CAPACITOR, FXD, ELECTROLYTIC 1.1 UF, 10% TOL, 20 VDCW SAME AS C2 | 151D115X9020W2 | 56289 | 184-8363-000 |
| C6 C7 C8 | SAME AS C1 SAME AS C1 SAME AS C1 SAME AS C1 | | | |
| C9 C10 | CAPACITOR, FXD, ELECTROLYTIC 250 UF, PLUS 50% MINUS 10%, 16 VDCW Same as c2 | C437ARE250 | 73445 | 183-2355-060 |
| C11 | CAPACITOR, FXD, ELECTROLYTIC 400 UUF, PLUS 50% MENUS 10%, 40 VDCW | C437ARG400 | 73445 | 183-2355-160 |
| C12 | CAPACITOR, FXD, ELECTROLYTIC 150 UF, 20% TOL, 6 VDCW Same as 612 | CS1388157M | 81349 | 184-6136-000 |
| C14 | SAME AS C12 | | | |
| CR1 | SEMICONDUCTOR DEVICE, DIODE | 1N914 | 07688 | 353-2906-000 |
| | SAME AS UKI SAME AS CRI | | | |
| J1 | JACK, TIP | SKT-103-PC | 98291 | 360-0172-000 |
| MP1 | INSULATOR, DISK MOLDED PLASTIC | 7720-4N | 13103 | 352-9552-540 |
| MP2 | SAME AS MP1 | | | |
| MP4 | SAME AS MP1 | | | |
| MP5 | SAME AS MP1 | | | |
| MP6 | SAME AS MP1 | 2N3565 | 076.99 | 352-0638-010 |
| 02 | SAME AS Q1 | 20000 | 01000 | 552-0656-010 |
| Q3 | SAME AS Q1 | | | |
| Q4 05 | TRANSISTOR SAME AS 04 | 2N3567 | 07688 | 352-0629-010 |
| Q6 | TRANSISTOR | 2N3645 | 07263 | 352-0732-020 |
| Q7 | SAME AS Q4 | | | |
| Q8 09 | SAME AS Q4 SAME AS OG | | | |
| Rĺ | RESISTOR, FXD, COMPOSITION | RC20GF563J | 81349 | 745-1425-000 |
| R2 | RESISTOR, FXD, COMPOSITION 620 DHMS, 5% TOL, 1/2 WATT | RC20GF621J | 81349 | 745-1343-000 |
| R3 | SAME AS R1 | | | |
| R5 | SAME AS RI | | | |
| R6 | SAME AS R2 | | | |
| R7 R8 | SAME AS R1 RESISTOR, FXD, COMPOSITION 3.3 MEGOHMS, 10% TOL, 1/2 | 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 DHMS, 5% TOL, 1/2 WATT | RC20GF182J | 81349 | 745-1362-000 |
| R11 | RESISTOR, FXD, COMPOSITION 330K DHMS, 5% TOL, 1/2 WATT | RC20GF334J | 81349 | 745-1456-000 |
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| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER |
|------------|--|-------------------------------|--------------------|------------------------|
| R12 | RESISTOR, FXD, COMPOSITION 1200 DHMS, 5% TOL, 1/2 | RC20GF122J | 81349 | 745-1355-000 |
| R13 | RESISTOR, FXD, COMPOSITION | RC20GF183J | 81349 | 745-1404-000 |
| R14 | RESISTOR, FXD, COMPOSITION 3300 DHMS, 5% TOL, 1/2 | 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 | RC20GF123J | 81349 | 745-1397-000 |
| R17 | RESISTOR, VAR, NON WIRE-WND 20K DHMS, 20% TOL, 3/4 | 75PR20K | 807 4 0 | 382-0004-290 |
| R18 | RESISTOR, FXD, COMPOSITION 120K DHMS, 5% TOL, 1/2 WATT | RC20GF124J | 81349 | 745-1439-000 |
| R19 | SAME AS R16 | | | |
| R2D | 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 DHMS, 30% TDL, 3/4 | 75PR100 | 80740 | 382-0004-220 |
| R25 | RESISTOR, FXD, COMPOSITION | 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 DHMS, 5% TOL, 1/2 WATT | RC20GF272J | 81349 | 745-1369-000 |
| R 30 | RESISTOR, FXD, COMPOSITION 47 DHMS, 5% TOL, 1/2 WATT | RC20GF470J | 81349 | 745-1295-000 |
| R31 | RESISTOR, FXD, COMPOSITION 27K DHMS, 5% TOL, 1/2 WATT | RC20GF273J | 81349 | 745-1411-000 |
| R32 | RESISTOR, FXD, COMPOSITION 470 DHMS, 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 | | | |
| K37 | SAME AS R31 | | | |
| R 30 | SAME AS R29 | | 1 | |
| R40 | RESISTOR, FXD, FILM | RN60D1002F | 81349 | 705-6644-000 |
| R41 | SAME AS R40 | | | |
| R42 | SAME AS R18 | | | |
| R43 | RESISTOR, FXD, COMPOSITION 150K OHMS, 5% TOL, 1/2 | 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 | | | | -764-9918-001 |
| RV4 RV5 | SAME AS RV1 | | | 714-0013-0 |
| KV D | DAME NO KAT | | | |
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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 | SAME AS T1 SDCKET, TRANSISTOR | 05-3307-51 | 91662 | 352-9903-000 |
| THROUGH | SAME AS XQ1 | | | |
| XRV1 XRV2 XRV3 | NOT USED NOT USED Socket, Electron Tube 9 PIN Socket | RA9AX | 00656 | 220-1384-070 |
| | MANUFACTURERS CODES | | | L |
| 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 | SEALECTRO COPP. 225 HOYT MAMARONECK, N.Y. 10544 | | | |
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World Radio History

B502-203-6

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



World





unit instructions

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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.

356V-1

High-Level Input Card

Collins Radio Company | Dallas, Texas

523-0558092-102438 1 June 1968

2.2 Operating Characteristics

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

Relative Humidity Up to 95%

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)



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

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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



World Radio History

5. PARTS LIST

| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER |
|----------|--|---|-------------|------------------------|
| | 356V-1 HI-LEVEL INPUT | | | 522-3887-001 |
| Cl | CAPACITOR, FXD, ALUMINUM 10 UF, PLUS 50% MINUS 10%, | C426ARF10 | 73445 | 183-2354-170 |
| 6.2 | | | | |
| 13 | SAME AS CI | | | |
| C4 | CADACITOR, EYD ALUMINUM | 6(2740))(() | | |
| | 64 UF. PLUS 50% MINUS 10%. | C437ARH64 | /3445 | 183-2355-110 |
| | 64 VDCW | | | |
| C5 | CAPACITOR, FXD, ALUMINUM | C426ARE25 | 73445 | 183-2354-180 |
| • | 25 UF, PLUS 50% MINUS 10%, | | | 105 2754 100 |
| | 25 VDCW | | | |
| C6 | SAME AS C4 | | | |
| CR1 | SEMICONDUCTOR DEVICE, DIODE | 1N270 | 07688 | 352-2036-000 |
| CR2 | SEMICONDUCTOR DEVICE, DIODE | 1N914 | 07688 | 353-2906-000 |
| | SAME AS URZ | | | |
| F2 | | 7720-41 | 13103 | 352-9552-540 |
| F3 | NOT USED | | | |
| E4 | SAME AS E1 | | | |
| E5 | SAME AS E1 | | | 1 |
| E6 | SAME AS E1 | | | |
| J1 | JACK, TIP | SKT103PC | 98291 | 360-0172-000 |
| | WHITE | • . | | |
| J2 | SAME AS J1 | | | |
| J3 | SAME AS J1 | | | |
| Q1 02 | | 2N3565 | 07688 | 352-0638-010 |
| 03 | SAME AS OR | 2N3567 | 07688 | 352-0629-010 |
| 04 | SAME AS Q2 | | | |
| 05 | TRANSISTOR | 2112638 | 074.90 | 353.0(3) 010 |
| RI | RESISTOR. FXD. COMPOSITION | RC076F6811 | 91240 | 352-0636-010 |
| | 680 OHMS, 5% TOL, 1/4 WATT | Recordicatio | 01347 | 143-0142-000 |
| R2 | RESISTOR, FXD, COMPOSITION | RC07GF582J | 81349 | 745-0778-000 |
| | 6800 JHMS, 5% TOL, 1/4 | | 1 | |
| | WATT | 1. S. | | |
| R3 | SAME AS R2 | | | |
| K4 PE | SAME AS KI | | x . | |
| | TR OHMS SY TOL 174 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 | | | |
| | SAME AS K5 Resistor Exp. Composition | | | |
| | 56K DHMS, 10% TOL, 174 | KLU/GF563K | 81349 | 745-0812-000 |
| | WATT | | | |
| R14 | SAME AS R13 | | 2 | |
| R15 | RESISTOR, FXD, COMPOSITION | RC07GF473K | 81349 | 745-0809-000 |
| | 47K OHMS, 10% TOL, 1/4 | | ~ | |
| | WATT | | | |
| R16 | RESISTOR, FXD, COMPOSITION | RCO7GF182K | 81349 | 745-0758-000 |
| | 1800 JHMS, 10% TOL, 1/4 | | | |
| 917 | | | | |
| | | RC07GF333K | 81349 | 745-0803-000 |
| | WATT | | | |
| R18 | RESISTOR, FXD, COMPOSITION | BCOZGE474K | 81240 | 745-0945-000 |
| | 470K JHMS, 10% TOL, 1/4 | | 01343 | 173-0043-000 |
| | WATT | | | |
| R19 | RESISTOR, FXD, COMPOSITION | RC07GF472K | 81349 | 745-0773-000 |
| | 4700 JHMS, 10% TOL, 1/4 | | | |
| P 20 | | r | 1 | |
| N20 | TESISTUR, PAD, CUMPUSITION | RC07GF102K | 81349 | 745-0749-000 |
| | AN UNMOF ION IOLF 1/4 WALL | | | |

| SYMB | DL DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER | |
|----------------------|---|-------------------------------|---------------|------------------------------|----|
| | | | | | |
| R21 | RESISTOR, FXD, COMPOSITION 56K DHMS, 5% TOL, 1/4 WATT | RCO7GF563J | 81349 | 745-0811-000 | |
| R22 | RESISTOR, VAR 100 OHMS, 20% TOL, 3/4 | 75PR100 | 80740 | 382-0004-220 | |
| R23 | RESISTOR, FXD, COMPOSITION 100 DHMS, 10% TOL, 1 WATT | RC32GF101K | 81349 | 745-3310-000 | |
| R24 | RESISTOR, FXO, COMPOSITION 680K JHMS, 5% TOL, 1/4 | RC07GF584J | 81349 | 745-0850-000 | |
| R25 R26 | SAME AS R13 RESISTOR, FXD, COMPOSITION 27K JHMS, 10% TOL, 1/4 WATT | RC07GF273K | 81349 | 745-0800-000 | |
| R27 | RESISTOR, FXD, COMPOSITION 2200 JHMS, 5% TOL, 1/4 | RC07GF222J | 81349 | 745-0760-000 | |
| R28 | RESISTOR, FXD, COMPOSITION 47 OHMS, 10% TOL, 1/4 WATT | RC07GF470K | 81349 | 745-0701-000 | |
| R29 R30 | SAME AS R28 Resistor, FXO, Composition lok OHMS, 10% Tol, 1/4 | RCO7GF103K | 81349 | 745-0785-000 | |
| R31 | WATT RESISTOR, FXD, COMPOSITION 6800 JHMS, 10% TOL, 1/4 WATT | R CO7 G F 58 2 K | 81349 | 745-0779-000 | |
| R32 | SAME AS R31 | PI 5 C 1 | 22122 | 714-2219-010 | |
| RV L | SAME AS RV1 | PLSCI | 33173 | /14-3218-010 | |
| RV 3 | RESISTOR, VOLTAGE SENSITIVE | 764-9918-001 | 13499 | 764-9918-001 | |
| RV4 RV5 | SAME AS RV1 | | | 714-0012- | on |
| RV6 | SAME AS RVI | | | 111-0013 | |
| 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 | |
| T81 XQ1 XQ2 | TERMINAL BOARD SOCKET, TRANSISTOR | 05-3307-51 | 91662 | 764-7367-001 352-9903-000 | |
| THROU XQ5 XRV1 | GH SAME AS XQ1 NDT USED | | | | |
| XRV2 XRV3 | NOT USED Socket, electron tube | RA9AX | 0065 6 | 220-1384-070 | |
| | MANUFACTURERS CODES | L | l | | |
| CODE | MANUFACTURER | | | | |
| GOTH | GOTHAM AUDIO CORP. New York, N. Y. | | | | |
| 00655 | AEROVOX CORP. New Bedford, Mass. | | | | |
| 07688 13499 | MILITARY SPECIFICATIONS Collins Radio Co. Cedar Rapids. Idwa | | | | |
| 33173 | TUBE DEPARTMENT GECO | | | | |
| 7344 | AMPEREX ELECTRONIC CO. | | | | |

| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | C <mark>OLLINS</mark> 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. SEALECTRO CORP. MAMARONECK, N. Y. | | | |
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World Radio History

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TOP VIEW

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World Radio History

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





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unit instructions

Collins Radio Company | Dallas, Texas

523-0558098-002438 June 1, 1967

384D-1 Switch Matrix

C Collins Radio Company 1966 C Second Edition 1967 Printed in United States of America

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



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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 photo-conductive 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

384D-1 Switch Matrix

5. PARTS LIST

| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER |
|------------------------------|--|-------------------------------|-------------|------------------------|
| | 522-3888-001 | | | |
| E1 E2 THROUGH | INSULATOR, DISK SAME AS E1 | 7720-4N | 13103 | 352-9552-540 |
| E16 J1 | JACK, TIP WHITE | SKT103PC | 98291 | 360-0172-000 |
| J2 J3 J4 R1 | SAME AS J1 SAME AS J1 RESISTOR, FXD, COMPOSITION 10K OHMS, 10% TOL, 1/4 WATT | RC07GF103K | 81349 | 745-0785-000 |
| R2 R3 R4 RV1 RV2 | SAME AS R1 SAME AS R1 SAME AS R1 RESISTOR, VOLTAGE SENSITIVE | PL5C1 | 33173 | 714-3218-010 |
| THRUUGH RV16 TB1 | SAME AS RVI TERMINAL BOARD | | | 764-7364-001 |
| | MANUFACTURERS CODES | | | |
| CODE | MANUFACTURER | | | |
| 13103 | LANGDON MFG. CO. MILITARY | | | |
| 33173 | DIVISION, WICHITA, KANS. Tube department geco | | | |
| 81349 98291 | OWENSBORD, KY. MILITARY SPECIFICATIONS SEALECTRO CORP. MAMARGNECK, N. Y. | | | |
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Figure 3. 384D-1 Switch Matrix, Schematic Diagram



World Radio History
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409Z-1

Power Supply

©Collins Radio Company 1966 ©Second Edition 1967 Second Printing February 1968 Printed in United States of America

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)

Collins Radio Company | Dallas, Texas

unit instructions

523-0558095-102438 1 February 1968

Relative Humidity Up to 95%

Altitude Up to 10,000 feet above ms1

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.







B502-011-Pb



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

| VOLTAGE | LOAD CURRENT | REGULATION | MAXIMUM RIPPLE (mv) |
|------------------|--------------|------------|---------------------|
| 30±5% | 120 ma | 5% | 2.5 pp |
| $30\pm5\%$ | 120 ma | 5% | 2.5 pp |
| 4 7 ±5% | 250 ma | 3% | 5 pp |
| 4 7 ±5% | 250 ma | 3% | 5 pp |
| 47±5% | 500 ma | 3% | 5 pp |
| 4 7 ±5% | 500 ma | 3% | 5 pp |
| *6 | 1.2 amp | 1% | 5 pp |
| *4 | 2 amp | 1% | 5 pp |
| *Adjustable, +3, | -2 volts |] | |

Table 1. Output Voltages

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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World Radio History



DETAIL A

B502-025-Pb

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



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



RT2 R21 C11 R17 C8 R10 C9 R14 RT1 CR9

DETAIL B

B502-032-Pb

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

409Z-1 POWER SUPPLY

5. PARTS LIST

| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER | |
|---|--|-------------------------------|-------------------------|--|--|
| | 409Z-1 POWER SUPPLY 522-3886-001 | | | | |
| A1 | PDWER SUPPLY BOARD WITH COMPONENTS | | | 764-7393-001 | |
| C1 | CAPACITOR, FXD, PAPER 0.047 UF, 20% TOL, 600 VDCW | SD81K06473M | 53021 | 931-4580-000 | |
| C3 | CAPACITOR, FXD, ELECTROLYTIC 3450 UF, PLUS 75% MINUS 10%, 75 VDCW | CG3451U75D1 | 37942 | 183-1265-010 | |
| C4 C5 | SAME AS C3 CAPACITOR, FXD, ELECTROLYTIC 2 SECTIONS 1-500 UF, PLUS 125% MINUS 10%, 100 %DCW 2-500 UF, PLUS 125% MINUS 10%, 100 %DCW | 183-0345-000 | 56289 | 183-0345-000 | |
| C6 C7 | SAME AS C3 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% MENUS 10%, 50 VDCW | 183-1309-000 | 13499 | 183-1309-000 | |
| C9 | CAPACITOR, FXD, PAPER 0.068 UF, 20% TOL, 200 VDCW | 160P68302 | 56289 | 931-550 9 -000 | |
| C10 | CAPACITOR, FXD, ELECTROLYTIC 1000 UF, PLUS 100% MINUS 10%, 15 VDCW | D25475 | 56289 | 183-1304-000 | |
| C11 C12 C13 C14 C15 | SAME AS C9 SAME AS C10 SAME AS C3 SAME AS C5 SAME AS C7 | | | | |
| CR1 CR2 THRDUGH CR6 | SEMICONDUCTOR DEVICE, DIDDE SAME AS CR1 | 1N1614 | 13209 | 353-1304-000 | |
| CR7 CR8 CR9 CR10 CR11 CR12 E1 | SEMICONDUCTOR DEVICE, DIODE SEMICONDUCTOR DEVICE, DIODE SEMICONDUCTOR DEVICE, DIODE SAME AS CR9 SAME AS CR7 SAME AS CR8 NOT USED | 1RP47B 1N2989B 1N645 | 13327 07688 07688 | 353-6396-000 353-1369-000 353-2607-000 | |
| E2 E3 E4 | TERMINAL, LUG GROMMET, RUBBER SAME AS El | MS35489-42 | 96906 | 547-5305-000 201-0023-000 | |
| E5 E6 | HEATSINK NO. 1 -QTY 2- HEATSINK NO. 2 -QTY 2- | | | 764-7386-001 | |
| F1 | FUSE, CARTRIDGE 3 AMPS | MDX3 | 71400 | 264-0306-000 | |
| F2 | FUSE, CARTRIDGE 1-1/2 AMPS SAME AS E2 | AGC250-1 1-2 | 71400 | 264-0722-000 | |
| F4 F5 F6 | SAME AS F2 FUSE, CARTRIDGE 2 AMPS SAME AS F5 | AGC250-2 | 71400 | 264-0723-000 | |
| F7 GRD1 | SAME AS F2 Jack, TIP | SKT10BLK | 98291 | 360-0098-000 | |
| JI | BLACK Connector, Electrical | Q327ABW1 | 75173 | 365-2270-000 | |

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| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMB |
|--------------------------|--|-------------------------------|-------------|----------------------|
| | 27 CONTACTS | | | |
| К1 | RELAY, ARMATURE | KH4531 | 77342 | 970-2427-0 |
| | 4C CONTACT ARRANGEMENT | | | |
| LI | REACTOR, FILTER WINDINGS IN SERIES 8 TO 100 MH, WINDINGS IN PARALLEL 2 TO 25 MH | \$81 | 80223 | 668-0076-0 |
| L2 | SAME AS L1 | | | |
| Q1 | TRANSISTOR | 2N 3584 | 02735 | 352-0711-0 |
| Q2 | TRANSISTOR | DT S-410 | 16758 | 352-0807-0 |
| Q3 | TRANSISTOR | 2N3054 | 07688 | 352-0581-0 |
| <u>4</u> | TANSISTUK | 203035 | 07000 | 352-0583-0 |
| 06 | SAME AS 03 | 21097 | 01205 | 352-0197-0 |
| 07 | | | | |
| 08 | | | | |
| 09 | SAME AS Q1 | | | - |
| 010 | SAME AS 02 | | | |
| R1 | RESISTOR, FXD, COMPOSITION | RC20GF222K | 81349 | 745-1366-0 |
| | 2200 DHMS, 10% TOL, 1/2 WATT | | | |
| R2 | RESISTOR, FXD, COMPOSITION 100 OHMS, 10% TOL, 1/2 WATT | RC20GF101K | 81349 | 745-1310-0 |
| R3 | RESISTOR, FXD, COMPOSITION 22K DHMS, 10% TOL, 1/2 | RC20GF223K | 81349 | 745-1408-0 |
| R4 | RESISTOR, FXD, COMPOSITION 12K OHMS, 10% TOL, 1/2 | RC20GF123K | 81349 | 745-1398-0 |
| R5 | WATT RESISTOR, FXD, WIRE WOUND | 1 3-4057F150PORM | 44655 | 710-2929-0 |
| R6 | RESISTOR, FXD, WIRE WOUND 100 OHMS, 5% TOL, 10 WATTS | 1 3-4057F100PORM 5PCT | 44655 | 710-2900-0 |
| R 7 | SAME AS R1 | | | |
| R8 | RESISTOR, FXD, COMPOSITION 27 DHMS, 10% TOL, 1/2 WATT | RC20GF270K | 81349 | 745-1286-0 |
| R9 | RESISTOR, FXD, COMPOSITION 3900 DHMS, 10% TOL, 1/2 | RC20GF392K | 81349 | 745-1377-0 |
| R10 | RESISTOR, FXD, COMPOSITION 3300 DHMS, 10% TOL, 1/2 | RC20GF332K | 81349 | 745-1373-0 |
| R11 | WATT RESISTOR, FXD, COMPOSITION 470 DHMS, 10% TOL, 1/2 | RC20GF471K | 71450 | 745-1338-0 |
| | WATT CANE ALL | | | |
| K12 013 | SAME AS KII | HUU2-600 00 | 00004 | 377.0716.0 |
| 412 | 500 0HMS, 20% TOL - 2 WATE | HHH2-200-20 | 08704 | 511-0115-0 |
| R14 | RESISTOR, FXD, COMPOSITION 270 OHMS, 10% TOL, 1/2 | RC20GF271K | 81349 | 745-1328-0 |
| 015 | | | | |
| 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 K4 | | | 1 |
| 0.01 | SAME AS KO | | | |
| R26 | JAME AS KO | | | |
| R26 R27 RT1 | RESISTOR, THERMAL | 763F93 | 10646 | 714-1730-0 |
| R26 R27 RT1 RT2 | RESISTOR, THERMAL 100 OHMS, 10% TOL, 1 WATT SAME AS RT1 | 763F93 | 10646 | 714-1730-0 |

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| SYMBOL | DESCRIPTION | MANUFACTURER'S PART NUMBER | MFR CODE | COLLINS PART NUMBER |
|-----------------------|--|-------------------------------|-------------|------------------------|
| TRI | | 2007 | 75173 | 347-0000-000 |
| 101 | 7 TERMINALS | 2001 | 19712 | 301-0900-000 |
| TP1 | JACK, TIP | SKT10ORN | 98291 | 360-0093-000 |
| TP2 | SAME AS TP1 | | | |
| TP3 | JACK, TIP | SKT10RED | 98291 | 360-0092-000 |
| TP4 | SAME AS TP3 | | | |
| TP5 | JACK, TIP | SKT10YEL | 98291 | 360-0094-000 |
| TP6 | JACK, TIP | SKT10BLU | 98291 | 360-0096-000 |
| XF1 | BLUE FUSEHOLDER | 265-1097-000 | 13499 | 265-1097-000 |
| | 15 AMPS | | | |
| XF2 THROUGH XF7 | SAME AS XF1 | | | |
| | MANUFACTURERS CODES | · | | · |
| CODE | MANUFACTURER | | | |
| 07263 | FAIRCHILD CAMERA AND | | | |
| | INSTRUMENT CORP. | | | |
| | MOUNTAIN VIEW, CALIF. | | | |
| 07688 | MILITARY SPECIFICATIONS | | | |
| 11430 | ELKHART, IND. | | | |
| 10646 | CARBORUNDUM CO. | / | | |
| 11700 | J B ELECTRONIC TRANSFORMERS, | | | |
| 13209 | INC. The bendix corp. | | | |
| | SEMICONDUCTOR DIVISION | | | |
| 13327 | HOLMDEL, N. J. Solitron devices, inc. | | | |
| 10/00 | NORWOOD, N. J. | | | |
| 13499 | CEDAR RAPIDS, IOWA | | | |
| 37942 | P R MALLORY AND CO., INC. | | | |
| 44655 | DHMITE MFG. CO. | | | |
| 5 2021 | SKOKIE, ILL. | | | |
| 22021 | SANGAMU ELECTRIC CU. SPRINGFIELD, ILL. | | | |
| 56289 | SPRAGUE ELECTRIC CO. | | | |
| 71400 | BUSSMAN MEG. DIVISION OF | | | |
| | MCGRAW-EDISON CO. | | | |
| 75173 | HOWARD B. JONES DIVISION OF | | | |
| | CINCH MFG. CD. | | | |
| 77342 | AMERICAN MACHINE AND FOUNDRY | | | |
| | CO. POTTER AND BRUNFIELD | | | |
| 80223 | UNITED TRANSFORMER CO. | | | |
| 81349 | NEW YORK, N. Y. MILITARY SPECIFICATIONS | | | |
| 96906 | MILITARY SPECIFICATIONS | | | |
| 98291 | SEALECTRO CORP. MAMARONECK. N. Y. | | | |
| 16758 | DELCO RADIO DIV. OF GM | | | 1 |
| 02735 | RUKURU; IND. 46901 RCA SEMICONNICTORS | | | |
| VETUU | SONMERVILLE, N.J. | | | |
| | | | | |



World Radio History

