356H-1
Phono Equalizer

instruction sheet

Cedar Rapids Division | Collins Radio Company, Cedar Rapids, Iowa

523-0171000-002411
2nd Edition, 1 March 1964

1. Description.

1.1 PURPOSE OF THE MANUAL.

This manual provides information on the 356H-1 Phono Equalizer. Topics which are discussed include a general description of the equipment, installation, operation, principles of operation, maintenance and illustrated parts list.

1.2 PURPOSE OF THE EQUIPMENT.

The 356H-1 Phono Equalizer, Collins part number 522-2468-00, is used to equalize and amplify the output signal of a magnetic phone cartridge or microphone, see figure 1. The 356H-1 will replace passive equalizers and console or turntable preamplifiers.

1.3 TECHNICAL CHARACTERISTICS.

Frequency response . .	FLAT response, 20 to 20,000 cps ±1.5 db.
	RIAA response, RIAA (NAB) playback equalization curve.
	HI BOOST response, RIAA (NAB) normal response with a 4-db rise at 15,000 cps.

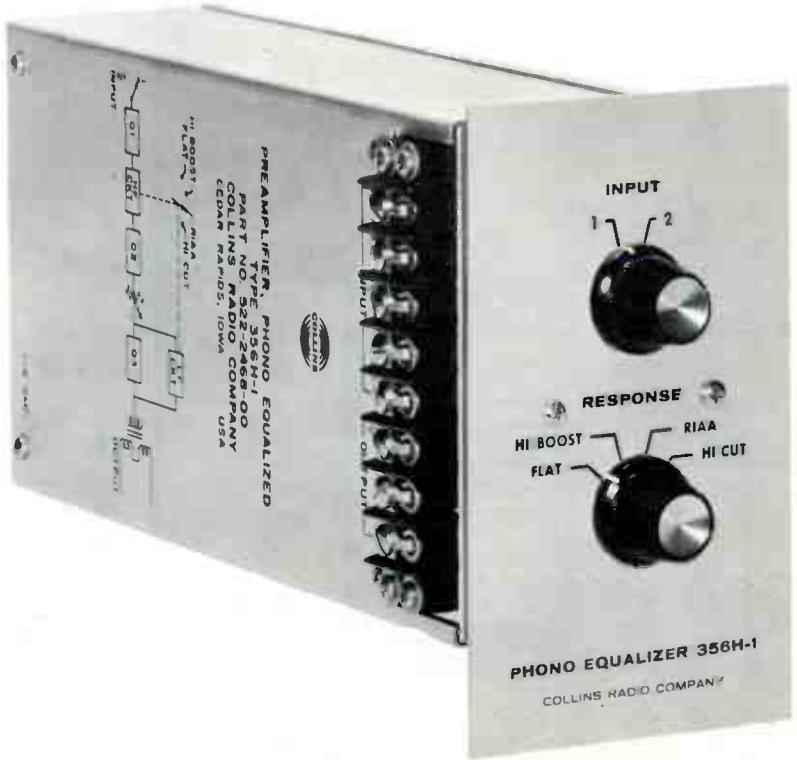

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Figure 1. 356H-1 Phono Equalizer, Over-all View

HI CUT response, RIAA (NAB) normal response with a 4-db drop at 15,000 cps.

Output level . . . . . -10 dbm, nominal.

Output impedance . . . 150/600 ohms, balanced or unbalanced.

Input impedance . . . . High impedance, unbalanced.

Distortion . . . . . 1.0 percent maximum, 30 to 15,000 cps at -10 dbm output.

Output noise . . . . . Signal-to-noise ratio 60 db with -50 dbm input.

Gain . . . . . 40 db minimum at 1000 cps.

Power source . . . . . 120/240 volts a-c, ±5 percent, 50/60 cps. (Shipped wired for 120-volt a-c operation.)

Ambient temperature . . +15°C to +45°C (+59°F to +113°F).

Ambient humidity . . . 95 percent.

Dimensions . . . . . 4 in. wide, 2 in. high, 7-3/4 in. deep.

Weight . . . . . 3-1/4 pounds.

1.4 TRANSISTOR, DIODE, AND FUSE COMPLEMENT.

Table 1 gives the transistors, fuse, and diode types used in the 356H-1.

TABLE 1
TRANSISTOR, FUSE, AND DIODE COMPLEMENT

REFERENCE SYMBOL	TYPE		
	1N1488	1/8 AMPERE	2N1175A
CR1, CR2	2		
F1		1	
Q1, Q2, Q3			3

2. Installation.

2.1 MOUNTING.

Figure 3 is an outline template of the 356H-1 and may be used directly when determining the location of the holes used for mounting the 356H-1 to a turntable cabinet or other surface. The dotted line is an outline of the chassis under the front plate. Refer to figure 2.

2.2 POWER INPUT.

Connect the black and white leads of the a-c power cord to 110 volts, 50/60 cps. If 230-volt operation is to be used, refer to figure 7 for instructions to revise power transformer T2.

CAUTION

Use the green wire only when no other ground is provided. If more than one ground is used, the ground loops may cause excessive noise.

3. Operation.

3.1 GENERAL.

The 356H-1 Phono Equalizer is controlled locally. Power is applied to the 356H-1 by correcting the input power cord to a 120-volt, 60-cps source. If 240-volt operation is required, refer to figure 7. Controls provide a choice between two inputs and between four response curves.

3.2 FUNCTION OF CONTROLS.

The 356H-1 controls and their functions are listed in table 2.

TABLE 2
356H-1 OPERATING CONTROLS

CONTROL	FUNCTION
INPUT selector (S2)	Selects one of the two inputs connected to the INPUT lugs on the 356H-1.
RESPONSE selector (S1)	Selects one of the following four responses: FLAT - Used for test purposes and mike preamplifier use. The frequency response is 20 to 20,000 cps, ±1.5 db. HI BOOST - Response has a 4-db rise above the RIAA (NAB) normal curve at 15,000 cps. RIAA - The RIAA (NAB) playback equalization response curve. HI CUT - Response has a 4-db drop below the RIAA (NAB) normal curve at 15,000 cps.

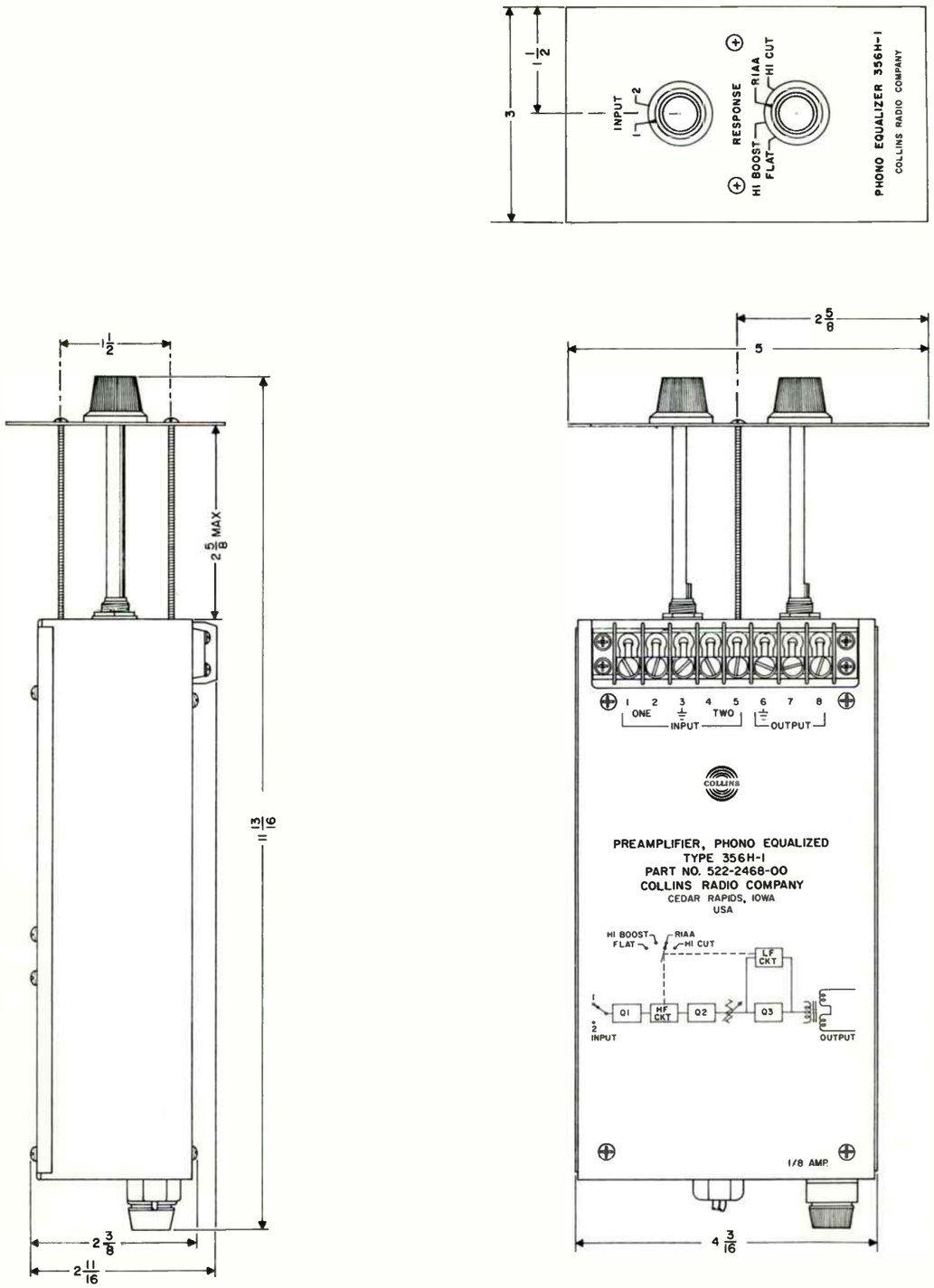

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Figure 2. 356H-1 Phono Equalizer, Outline and Mounting Dimensions

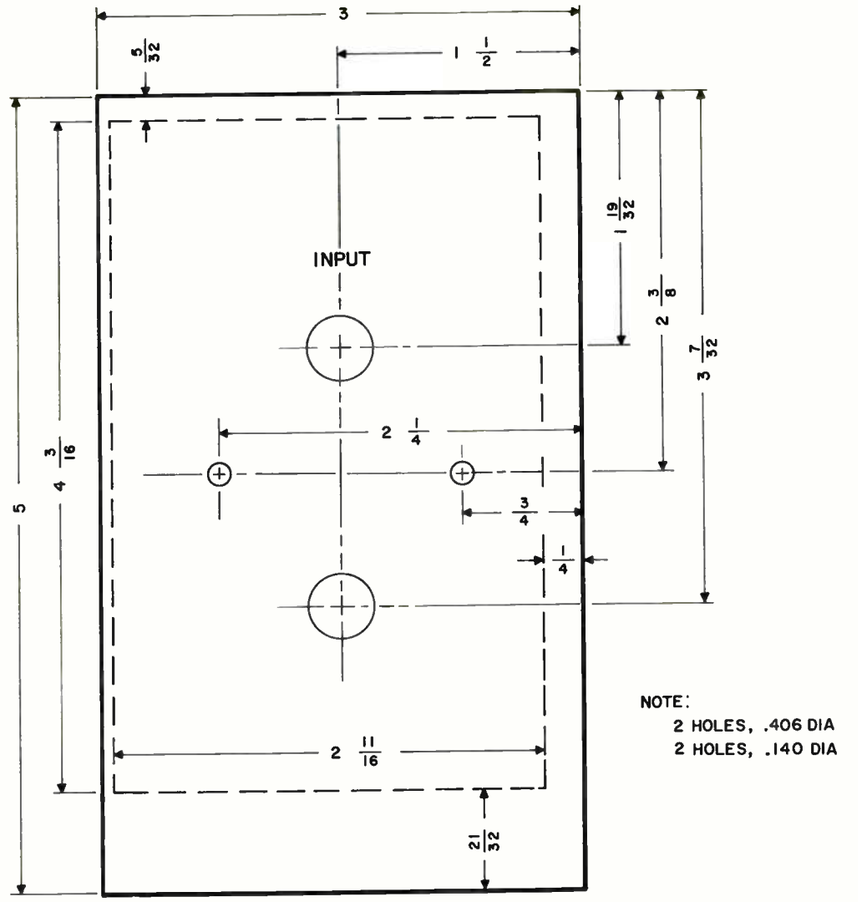

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Figure 3. Installation Template, 356H-1

ADDENDUM

STEREO CONSOLE	523-0558572-001439
MONAURAL CONSOLE	523-0558571-001439
PREAMPLIFIER CARD 356T-1	523-0558093-001438
HIGH-LEVEL INPUT CARD 356V-1	523-0558092-001438
MICROPHONE-PHONOGRAPH PREAMPLIFIER 356R-1	523-0558097-001438
PROGRAM AMPLIFIER 356P-1	523-0558094-001438
POWER SUPPLY 409Z-1	523-0558095-001438

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523-0558572-011439
523-0558571-011439
523-0558093-011438
523-0558092-011438
523-0558097-011438
523-0558094-011438
523-0558095-011438

Page 1-3/1-4
Change High-Level Input Level from -10 dbm to 0 dbm.

Page 2-8, paragraph 2.2.4.1
Change fourth sentence to:
Set resistor R20 for +6 volts at TP6.

Page 2-10, paragraph 2.3.1
Change step c. to:
c. Connect a 0.003-volt, 1-kc signal from an unbalanced, 600-ohm signal generator to TB8-2 and TB8-4 (common).

Page 2-10, paragraph 2.3.2
Change step f. to:
f. Connect a 0.003-volt, 1-kc signal from an unbalanced, 600-ohm signal generator to TB8-2 and TB8-4 (common).

Page 2-10, paragraph 2.3.3
Change step g. to:
g. Set the signal generator to 1 kc at 0 dbm.

Page 4-2, paragraph 4.5.2
Insert the following after 4.5.2 REVERSE CUE CIRCUITS:
Refer to figure 4-3. The MIXER 6 control, and the associated NET/RMT and AUD/PGM switches, and the REMOTE LINES switches can connect the program output to a remote line. With the switches properly arranged, the remote site operator can listen to the program being broadcast. The MIXER 6 control must not be in the CUE position. The NET/RMT switch must be in the RMT position. The AUD/PGM switch must be in the center off position. The desired REMOTE LINES switch must be in the MIX position. When the switches are set as stated above, the program output connects to the desired remote line through the reverse cue amplifier, the closed contacts on relay A1A1K1, and switch matrix A2A1.

Pages 6-19, 6-20, 6-21/6-22
Replace these pages with the enclosed pages.

Page 1-3/1-4
Change High-Level Input Level from -10 dbm to 0 dbm.

Page 2-3, paragraph 2.2.4.1
Change the fourth sentence to:
Set resistor R20 for +6 volts at TP6.

Page 2-12, paragraph 2.3.3
Change step h. to:
h. Set the signal generator to 1 kc at 0 dbm.

Page 2-12, paragraph 2.3.3
Insert after step k.:

Note

When both VU meters indicate 0 vu, the associated MIXER control must be near the 12-o'clock position. Otherwise, the two stereo channels will not track together.

Page 4-2, paragraph 4.5.2
Insert the following after 4.5.2 REVERSE CUE TO A REMOTE SITE.
The MIXER 6 control, and the associated NET/RMT and AUD/PGM switches, and the REMOTE LINES switches can connect the channel 1 program amplifier output to a remote line. With the switches properly set, the remote site operator can hear the program being broadcast. The MIXER 6 control must not be in the CUE position. The NET/RMT switch must be in the RMT position. The AUD/PGM switch must be in the center off position. The desired REMOTE LINES switch must be in the MIX position. When the switches are set as stated above, the channel 1 program output connects to the desired remote line through the reverse cue amplifier, the closed contacts on relay A1A1K1, and switch matrix A2A1.

Pages 6-19, 6-20, 6-21/6-22
Replace these pages with the enclosed pages.

PREAMPLIFIER CARD 356T-1

Change the schematic and parts list as follows:

COMPONENT	FROM	TO
RESISTOR R9	56K OHMS, 10% TOL, 1/4 WATT	12K OHMS, 5% TOL, 1/4 WATT
RESISTOR R12	470K OHMS, 10% TOL, 1/4 WATT	680K OHMS, 5% TOL, 1/4 WATT
RESISTOR R14	4700 OHMS, 10% TOL, 1/4 WATT	2200 OHMS, 5% TOL, 1/4 WATT

HIGH-LEVEL INPUT CARD 356V-1

Change input level in paragraph 2.3 as follows:

FROM	TO
-10 dbm, nominal +10 dbm, maximum	-10 dbm, minimum 0 dbm, nominal +10 dbm, maximum

MICROPHONE-PHONOGRAPH PREAMPLIFIER 356R-1

Change the parts list as shown:

COMPONENT	FROM	TO
RESISTOR R4	1500 OHMS, 5% TOL, 1/4 WATT	1200 OHMS, 5% TOL, 1/4 WATT
RESISTOR R6	68K OHMS, 5% TOL, 1/4 WATT	100K OHMS, 5% TOL, 1/4 WATT
RESISTOR R7	68K OHMS, 5% TOL, 1/4 WATT	220K OHMS, 5% TOL, 1/4 WATT

From paragraph 3., delete the following:

The phonograph preamplifier is normally used with a magnetic pickup. The shunt cable capacity between the pickup and the preamplifier input should normally be less than 300 pf to prevent the loss of high frequencies. Adjustment of this shunt capacity, and in some cases a shunt resistance, may be required to achieve optimum performance from a specific pickup.

Insert the following:

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,

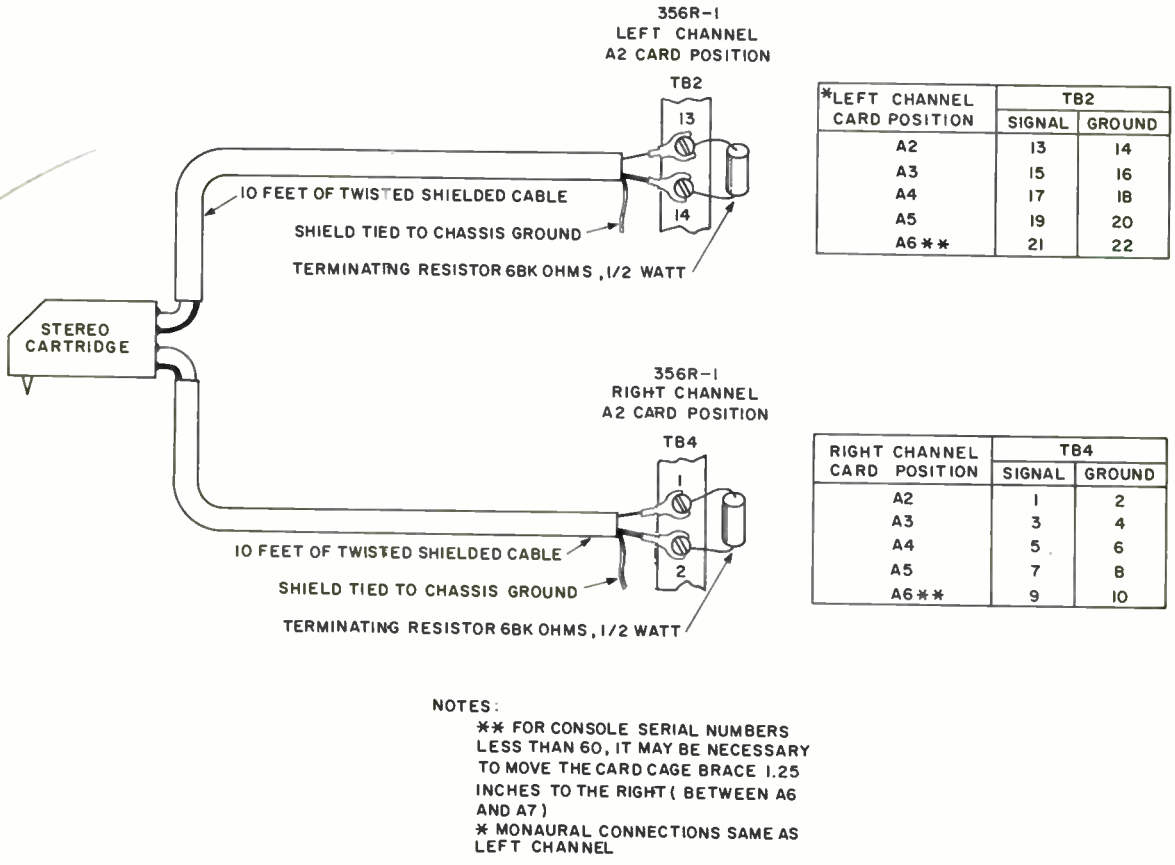
the shunt cable capacity between the cartridge and the preamplifier should be about 500 pfd. Connect a 68K, 1/2-watt resistor across the terminals where the cartridge cable connects to the 356R-1. See figure 1A. The cable between the cartridge and the 356R-1 should be a twisted, shielded pair approximately 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.

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

Change Input Level:

FROM	TO
-20 dbm, maximum	-26 dbm, maximum

Insert figure 1A at the bottom of page 3.



*LEFT CHANNEL CARD POSITION	TB2	
	SIGNAL	GROUND
A2	13	14
A3	15	16
A4	17	18
A5	19	20
A6**	21	22

RIGHT CHANNEL CARD POSITION	TB4	
	SIGNAL	GROUND
A2	1	2
A3	3	4
A4	5	6
A5	7	8
A6**	9	10

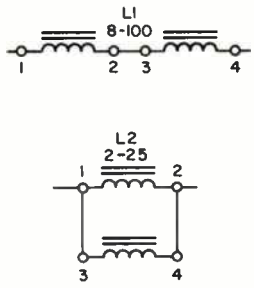
NOTES:
** FOR CONSOLE SERIAL NUMBERS LESS THAN 60, IT MAY BE NECESSARY TO MOVE THE CARD CAGE BRACE 1.25 INCHES TO THE RIGHT (BETWEEN A6 AND A7)
* MONAURAL CONNECTIONS SAME AS LEFT CHANNEL

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

Destroy the old schematic. Insert the enclosed schematic.

POWER SUPPLY 409Z-1

On the parts list, change the manufacturer's part number for CR7 from 1RP47B to 1R47B. On the schematic, change L1 and L2 as shown below:

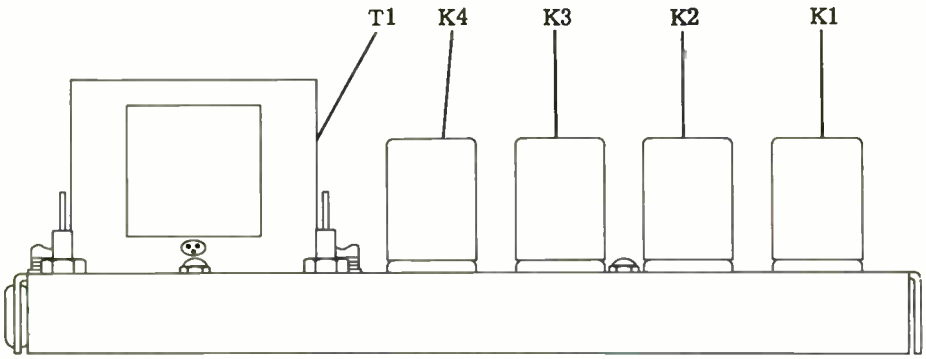


L1 and L2 in Power Supply 409Z-1

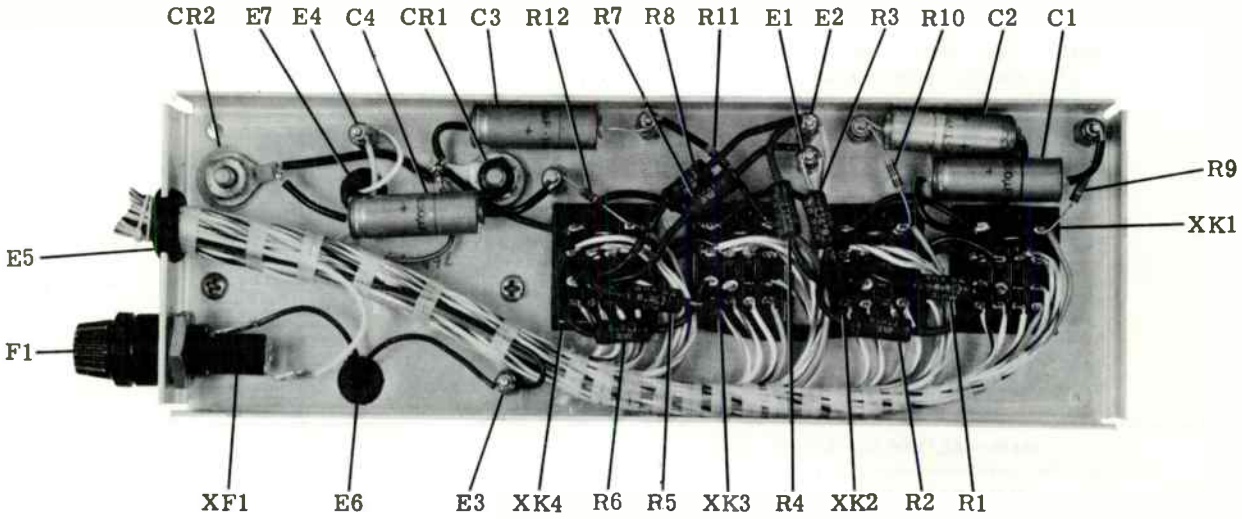
PROGRAM AMPLIFIER 356P-1

Change the schematic as follows:

COMPONENT	FROM	TO
RESISTOR R1	390 OHMS	330 OHMS
RESISTOR R21	1K	1200 OHMS
RESISTOR R30	27K	33K
CAPACITOR C10	390 PFD	560 PFD



Side View



Bottom View

Figure 6-7. Relay Unit

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
	RELAY UNIT			764-7429-001
C1	CAPACITOR, FXD, ELECTROLYTIC 250 UF, 16 VOLTS	C437ARE250	73445	183-2355-060
C2	SAME AS C1			
C3	SAME AS C1			
C4	SAME AS C1			
CR1	SEMICONDUCTOR DEVICE, DIODE	1N1612	01295	353-6449-010
CR2	SAME AS CR1			
E1	TERMINAL, STUD	RTMT12M	91663	306-0976-000
E2	SAME AS E1			
E3	SAME AS E1			
E4	SAME AS E1			
E5	GROMMET, RUBBER	43-104	74970	201-1080-000
E6	GROMMET, RUBBER	MS35489-4	96906	201-0001-000
E7	SAME AS E6			
F1	FUSE, CARTRIDGE 1/2 AMP CURRENT RATING	F02A250V1-2AS	81349	264-4030-000
K1	RELAY, ARMATURE 4C CONTACT ARRANGEMENT	KH4394	77342	970-2427-060
K2	SAME AS K1			
K3	SAME AS K1			
K4	SAME AS K1			
R1	RESISTOR, FXD, WIRE WOUND 8.2 OHMS, 5% TOL, 3 WATTS	RW69V8R2	81349	747-5318-000
R2 THROUGH R8	SAME AS R1			
R9	RESISTOR, FXD, COMPOSITION 470 OHMS, 10% TOL, 1/4 WATT	RC07GF471K	81349	745-0737-000
R10	SAME AS R9			
R11	SAME AS R9			
R12	SAME AS R9			
T1	TRANSFORMER, POWER OPEN FRAME	76331	81095	662-0245-010
XF1	FUSEHOLDER 15 AMP CURRENT RATING	265-1097-000	13499	265-1097-000
XK1	SOCKET, RELAY 14 CONTACTS	27E008	77342	220-1543-000
XK2	SAME AS XK1			
XK3	SAME AS XK1			
XK4	SAME AS XK1			

MANUFACTURERS CODES

CODE	MANUFACTURER
GOTHA	GOTHAM AUDIO CORP. NEW YORK, N. Y.
00348	MICROTRAN CO., INC. VALLEY STREAM, N. Y.
01295	TEXAS INSTRUMENTS, INC. SEMICONDUCTOR-COMPONENTS DIVISION, DALLAS, TEX.
01548	CAPITOL MACHINE CO. DANBURY, CONN.
01939	SPRAGUE ELECTRIC CO. OF WISCONSIN GRAFTON, WIS.
05574	VIKING INDUSTRIES, INC. CANOGA PARK, CALIF.
07688	MILITARY SPECIFICATIONS
07716	INTERNATIONAL RESISTANCE CO. BURLINGTON, IOWA
07933	RAYTHEON MFG. CO. SEMICONDUCTOR DIVISION MOUNTAIN VIEW, CALIF.

SYMBOL	DESCRIPTION	MANUFACTURER'S PART NUMBER	MFR CODE	COLLINS PART NUMBER
08806	MINIATURE LAMP DEPARTMENT GECO CLEVELAND, OHIO			
13499	COLLINS RADIO CO. CEDAR RAPIDS, IOWA			
33173	TUBE DEPARTMENT GECO OWENSBORO, KY.			
56289	SPRAGUE ELECTRIC CO. NORTH ADAMS, MASS.			
72619	DIALIGHT CORP. BROOKLYN, N. Y.			
73445	AMPEREX ELECTRONIC CO. DIVISION OF NORTH AMERICAN PHILIPS CO., INC. HICKSVILLE, N. Y.			
74199	QUAM NICHOLS CO. CHICAGO, ILL.			
74970	E.F. JOHNSON CO. WASECA, MINN.			
75173	HOWARD B. JONES DIVISION OF CINCH MFG. CO. CHICAGO, ILL.			
75382	KULKA ELECTRIC CORP. MT. VERNON, N. Y.			
76854	OAK MFG. CO. CRYSTAL LAKE, ILL.			
77342	AMERICAN MACHINE AND FOUNDRY CO. POTTER AND BRUMFIELD DIVISION, PRINCETON, IND.			
78189	SHAKEPROOF DIVISION OF ILLINOIS TOOL WORKS ELGIN, ILL.			
80223	UNITED TRANSFORMER CO. NEW YORK, N. Y.			
81095	TRIAD TRANSFORMER CORP. 4055 REDWOOD AVE. VENICE, CALIF. ZIP CODE 90293			
81349	MILITARY SPECIFICATIONS			
81450	ERCO RADIO LABORATORIES, INC.			
91662	ELCO CORP. WILLOW GROVE, PA.			
91663	ARMEL ELECTRONICS, INC. NORTH BERGEN, N. J.			
96256	THORDARSON-MEISSNER DIVISION OF MACGUIRE INDUSTRIES, INC., MT. CARMEL, ILL.			
96906	MILITARY SPECIFICATIONS			

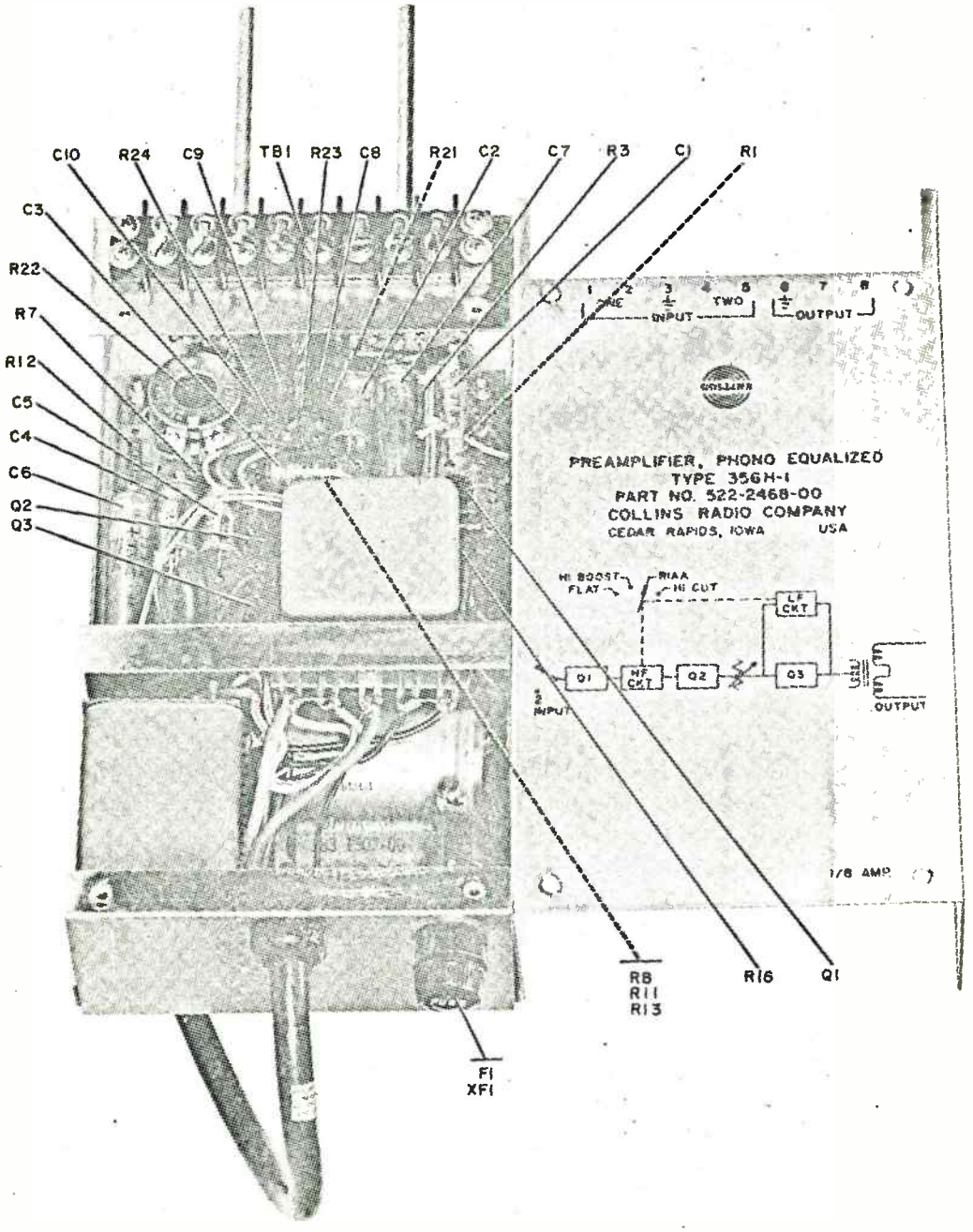


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Figure 4. 356H-1 Phono Equalizer, Top View, Cover Off

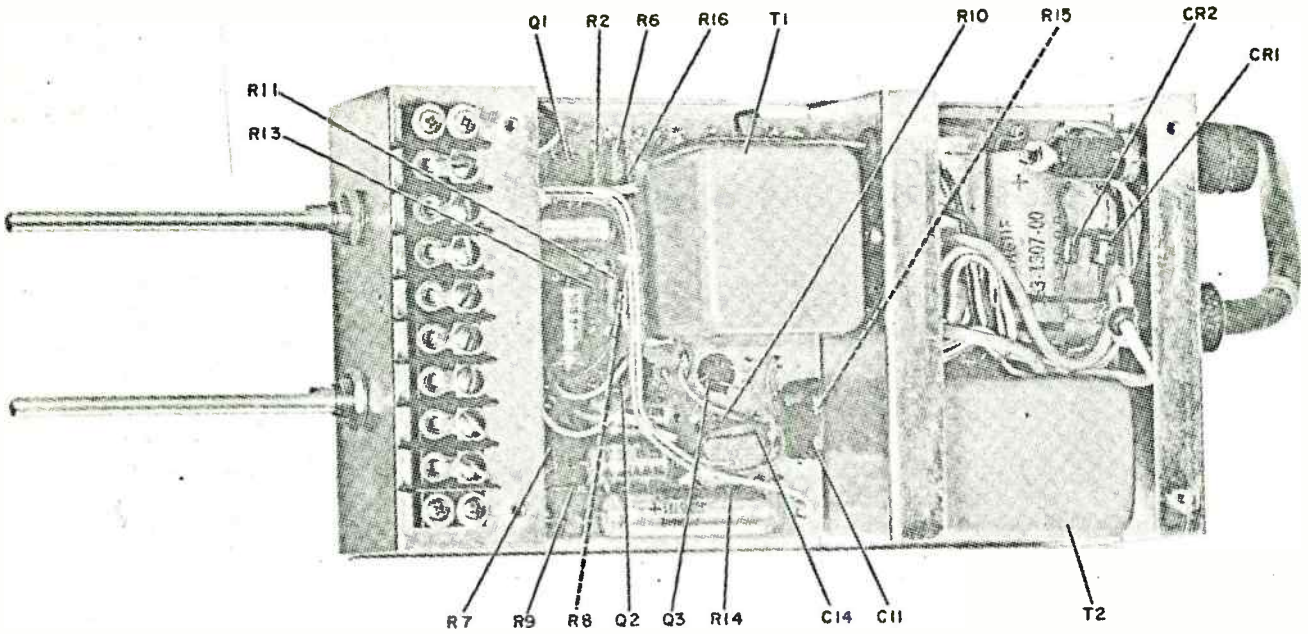

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Figure 5. 356H-1 Phono Equalizer, Top View, Cover Removed

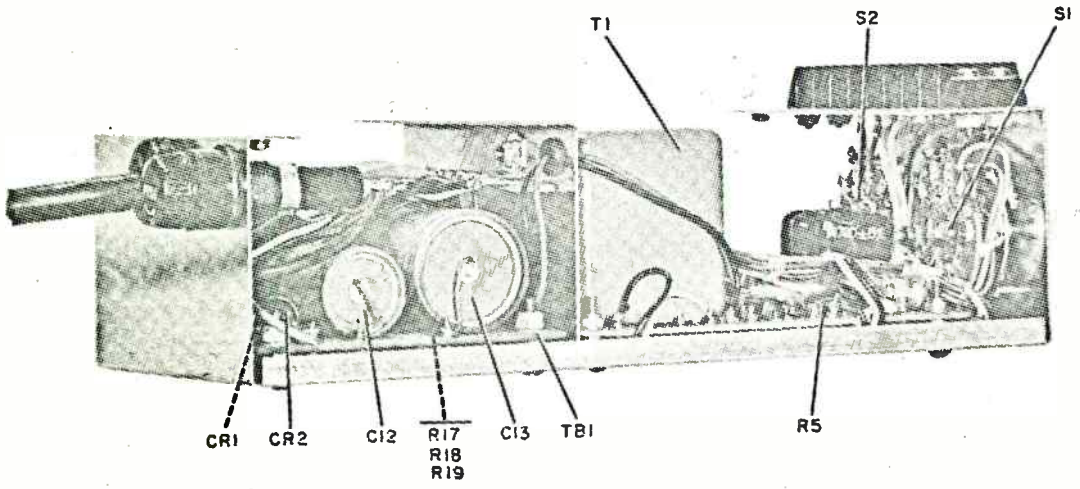

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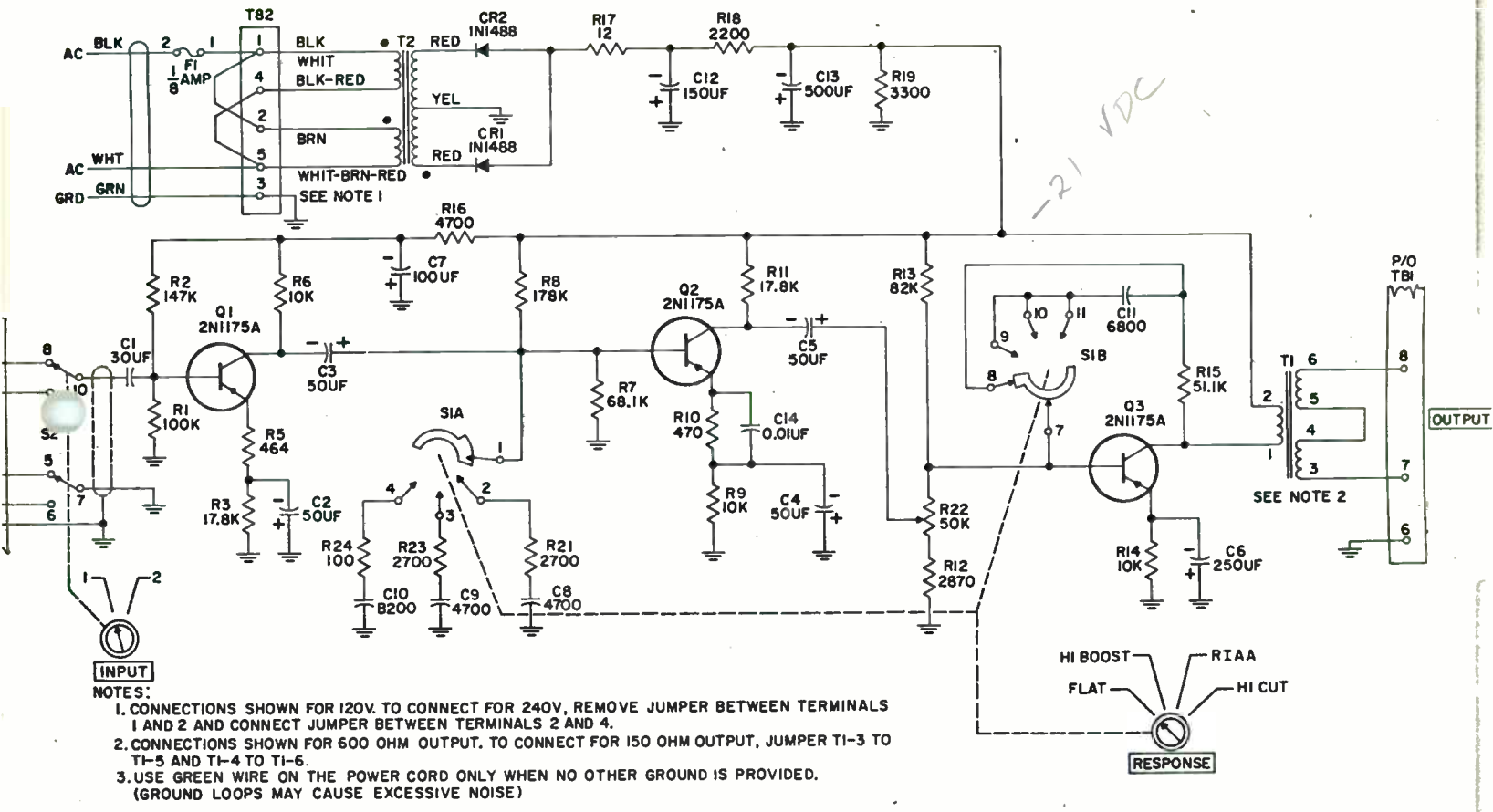
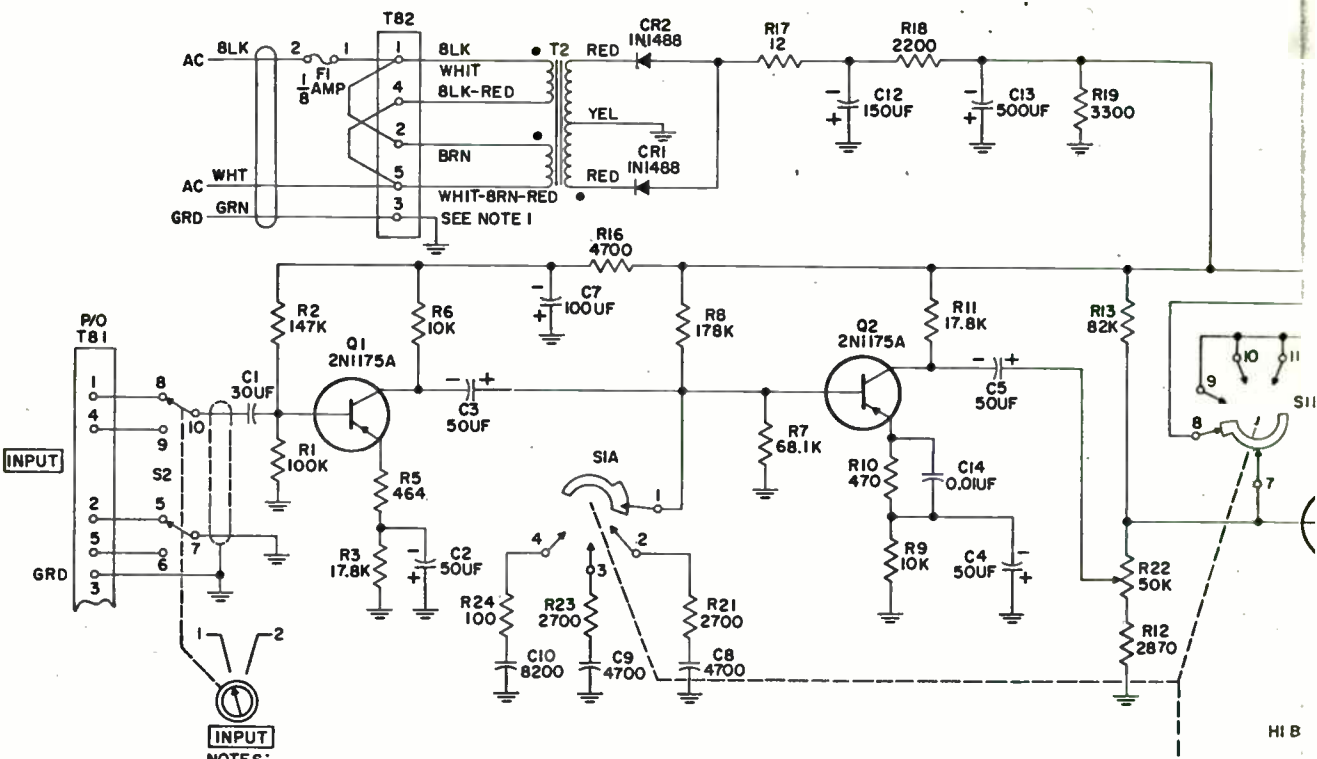
Figure 6. 356H-1 Phono Equalizer, Side View, Cover Removed



NOTES:

1. CONNECTIONS SHOWN FOR 120V. TO CONNECT FOR 240V, REMOVE JUMPER BETWEEN TERMINALS 1 AND 2 AND CONNECT JUMPER BETWEEN TERMINALS 2 AND 4.
2. CONNECTIONS SHOWN FOR 600 OHM OUTPUT. TO CONNECT FOR 150 OHM OUTPUT, JUMPER T1-3 TO T1-5 AND T1-4 TO T1-6.
3. USE GREEN WIRE ON THE POWER CORD ONLY WHEN NO OTHER GROUND IS PROVIDED. (GROUND LOOPS MAY CAUSE EXCESSIVE NOISE)

Figure 7. 356H-1 Phono Equalizer, Schematic Diagr



NOTES:

1. CONNECTIONS SHOWN FOR 120V. TO CONNECT FOR 240V, REMOVE JUMPER BETWEEN TERMINALS 1 AND 2 AND CONNECT JUMPER BETWEEN TERMINALS 2 AND 4.
2. CONNECTIONS SHOWN FOR 600 OHM OUTPUT. TO CONNECT FOR 150 OHM OUTPUT, JUMPER T1-3 TO T1-5 AND T1-4 TO T1-6.
3. USE GREEN WIRE ON THE POWER CORD ONLY WHEN NO OTHER GROUND IS PROVIDED. (GROUND LOOPS MAY CAUSE EXCESSIVE NOISE)

Figure 7. 356H-1

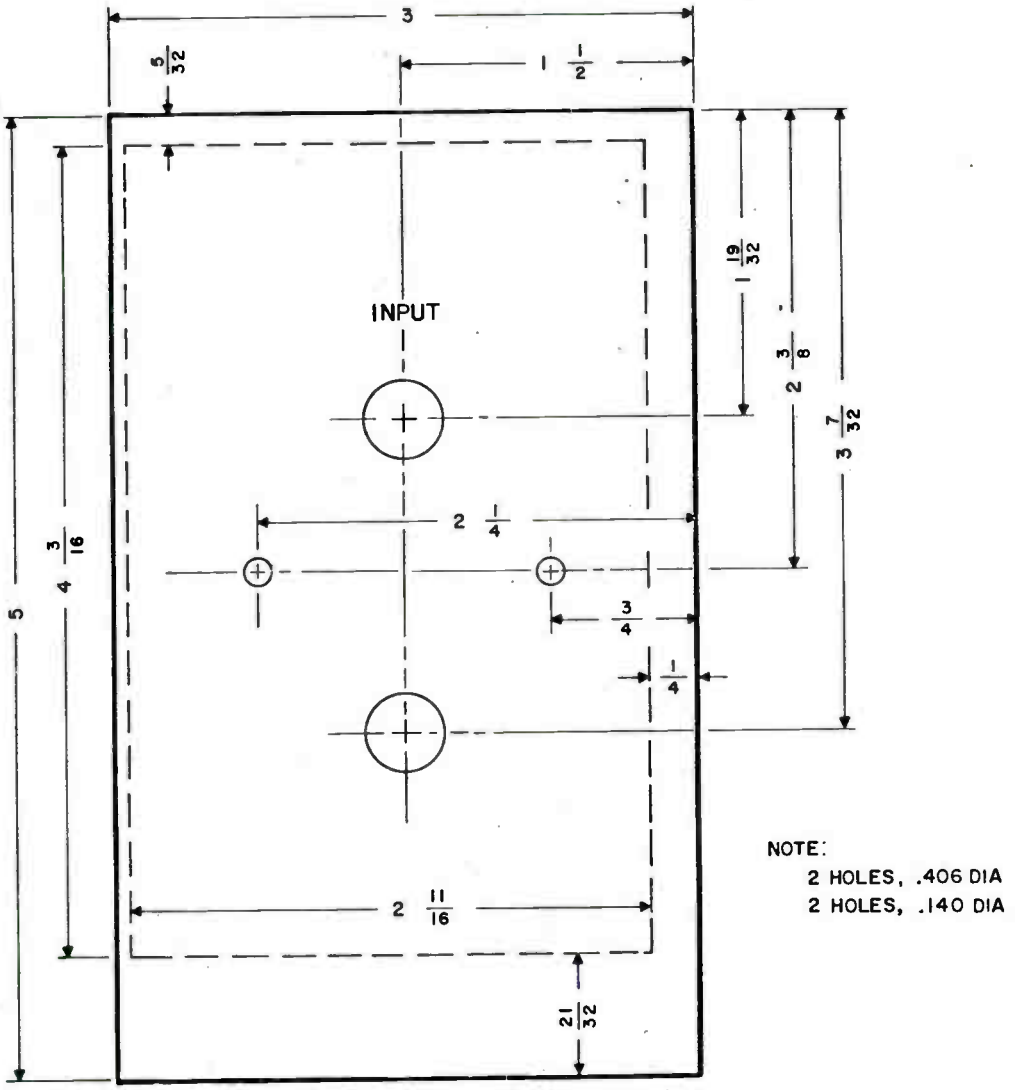


Figure 3. Installation Template, 356H-1