

TROUBLE CHART (cont)

SYMPTOM	REMARKS
Take-up erratic or inoperative in fast forward.	Spindle (4) dirty, worn or binding. Idler (12), (13) dirty, worn or binding. Belt (3) dirty, worn or binding. Idler (11) dirty, worn or binding.
Rewind erratic or inoperative.	Spindle (5) dirty, worn or binding. Belt (3) dirty, worn, or binding. Idler (11), (13) dirty, worn or binding. Lever (14) bent or weak. Arm (19) binding.
Capstan does not rotate.	Belt (2) dirty, worn or broken. Flywheel binding. Motor defective or not supplied with power.
Tape rides up and down between capstan and pressure roller	Capstan bent. Roller (1) worn. Excessive take-up torque.
Wow or flutter.	Roller (1) dirty or worn. Belt (2) dirty or worn. Bearing (16) binding. Cassette defective. Motor defective. Excessive take-up torque.
Sound weak or distorted.	R/P head misadjusted, dirty or defective. Amplifier defective. Bias oscillator defective. Cassette defective. ARL defective. Spring (7) weak.
Erase weak or inoperative.	Erase head dirty or defective. Insufficient erase current.

MECHANICAL PARTS LIST

REF. NO.	PART NO.	DESCRIPTION	REF. NO.	PART NO.	DESCRIPTION
1*	*	Pressure Roller (Assembly)*	27		Subchassis Spring (2 used)
2*	*	Flywheel Drive Belt*	28		Record Interlock
3*	*	Tape Drive Belt*	29		Auto-Stop Sensor Tip
4		Take-up Spindle (Assembly)	30		Auto-Stop Sensor Arm
5		Supply Spindle (Assembly)	31		Record Interlock Spring
6		Take-up Felt Clutch	32		Auto-Stop Pawl
7		Head Plate Spring	33		Auto-Stop Pawl Spring
8		Pressure Roller Spring	34		Subchassis Latch
9		Take-up Shaft (Idler)	35		Subchassis Latch Spring
10		Flywheel	36		Switch Actuating Plate
11		Take-up Pulley (Idler)	37		Pause Lever
12		Fast Forward Idler	38		Pause Lever Spring
13		Fast Wind Idler (Pulley)	39		Pause Latch
14		Rewind Lever (Assembly)	40		Pause Latch Spring
15		Rewind Lever Spring	41		Clutch Spring
16		Capstan Bearing	42		Subchassis Pivot Arm (4 used)
17		Fast Forward Plate	43		Cassette Locator Plate (Ass'y.)
18		Take-up Spring	44		Record Latch
19		Fast Wind Idler Arm	45		Record Latch Spring
20		Flywheel Bracket	46		Function Lever
21		Motor Pulley	47		Fast Forward Lever
22		Head Plate	48		Left Cassette Guide
23		Record Lever	49		Right Cassette Guide
24		Record Lever Spring	50		Subchassis Guide Pin Bearing (2 used)
25		Azimuth Spring			
26		Subchassis			

*Pressure Roller E-V/GAME Replacement Number 1407-94.

WALSCO Replacement Number 1499-70.

*Flywheel Drive Belt E-V/GAME Replacement Number 1425-23.

WALSCO Replacement Number 1425-23.

*Tape Drive Belt E-V/GAME Replacement Number 1425-07.

WALSCO Replacement Number 1425-07.

SET 1525 FOLDER 3

PHOTOFACT® Folder

with CIRCUITRACE

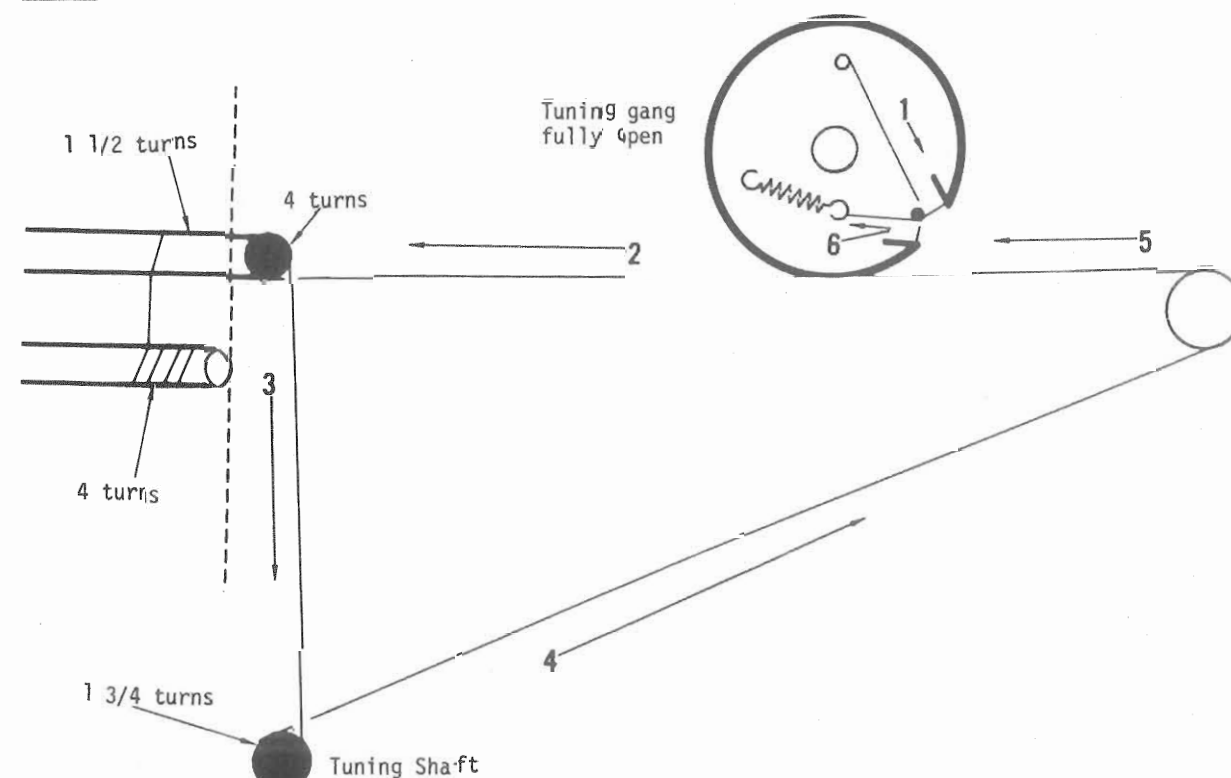
WELTRON
MODEL 2004

For Supplier Address See PHOTOFACT Index



MODEL 2004

DIAL CORD STRINGING



HOWARD W. SAMS & CO., INC. Indianapolis, Indiana 46206



The listing of any available replacement part herein does not constitute in any case a recommendation, warranty or guaranty by Howard W. Sams & Co., Inc., as to the quality and suitability of such replacement part. The numbers of these parts have been compiled from information furnished to Howard W. Sams & Co., Inc., by the manufacturers of the particular type of replacement part listed. 5PQ1359

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DATE 11-75

SET 1525 FOLDER 3

SEQUENCE OF OPERATION

PLAY

Pressing a cassette into the unit slides Bearings (50) to pivot Subchassis (26) on Arms (42). Subchassis (26), locked by Latch (34) and Spring (35), raises Spindles (4) and (5), and the capstan, into the cassette, allowing Spring (8) to press Roller (1) against the capstan.

Subchassis (26) also moves Plate (36) to actuate Switch (S12), and releases Arm (19), pivoted by Spring (18), to cause Idler (11) to press Idler (9) against Spindle (4).

The motor -- through Pulley (21), Belt (3), Pulley (13), Idler (11), Idler (9), and Clutch (6) -- drives Spindle (4). The motor also -- through Pulley (21) and Belt (2) -- drives Flywheel (10).

RECORD

The Record sequence is the same as Play. However, pressing the Record button, before inserting a cassette, moves Lever (23), locked by Latch (44) and Spring (45), to actuate Switch (S11).

FAST FORWARD

Moving the Function Selector to Fast Forward from Play/Record pivots Lever (46) to slide Plate (22), moving the heads from the tape and Roller (1) from the capstan. Lever (46) also moves Lever (47) to pivot Plate (17), pressing Idler (12) against Idler (11) and Spindle (4).

The motor -- through Pulley (21), Belt (3), Pulley (13), Idler (11), and Idler (12) -- drives Spindle (4).

REWIND

Moving the Function Selector to Rewind from Play/Record pivots Lever (46) to slide Plate (22), moving the heads from the tape and Roller (1) from the capstan. Lever (46) also moves Lever (14) to pivot Arm (19), pressing Idler (11) against Spindle (5).

The motor -- through Pulley (21), Belt (3), Pulley (13), and Idler (11) -- drives Spindle (5).

STOP

Releasing the Function Selector from Fast Forward or Rewind allows Springs (7) and (15) to return the mechanism to Play. Pressing the Function Selector moves Lever (46) to pivot Latch (34), releasing Subchassis (26) and allowing Springs (27) to pivot Subchassis (26) on Arms (42). Subchassis (26) moves Spindles (4) and (5), and the capstan, from the cassette, and also slides Bearings (50) to eject the cassette.

AUTO-STOP

At the end of the tape, when Spindle (5) stops rotating, increased tape tension pivots Arm (30) to move Pawl (32). The motor -- through Pulley (21) and Belt (2) -- drives Flywheel (10). A pin on Flywheel (10) engages and pivots Pawl (32) to move Latch (34), initiating the Stop sequence.

PAUSE

Pushing the Pause button in Play or Record moves Lever (37), locked by Latch (39) and Spring (40), to pivot Roller (1) from the capstan, and to slide Plate (17). Plate (17) moves Idler (9) from Spindle (4).

Pushing the Pause button in Pause moves Lever (37) to allow Spring (40) to fully pivot Latch (39), releasing the Pause button, and allowing Springs (8) and (18) to reverse the Pause sequence.

CLEANING

All head faces should be cleaned with head cleaner or methyl alcohol to remove dust and accumulated oxide. (An applicator may be fashioned from absorbent cotton.) Do not use a screwdriver or any metallic object near the head faces.

CAUTION: Avoid getting head cleaner on any plastic surface.

Clean the capstan, pressure roller, pressure pads and all tape guides with alcohol using a soft lintfree cloth. Also use alcohol to remove oil and grease from drive belts, idler wheels, brake drums and shoes, and all other driving surfaces.

LUBRICATING

Clean all surfaces before lubricating. Apply a few drops of #20 machine oil to all bearings and rotating bushings. Apply a thin film of

light nonhardening grease to all sliding surfaces and detent rollers. Always wipe excess oil or grease from parts that have been lubricated.

CAUTION: Oil and grease must be kept off all driving surfaces as well as any parts which may transfer oil or grease to them.

DEMAGNETIZING

Record-Play heads require demagnetizing at regular intervals to maintain high-frequency response, dynamic range, and low distortion. (Follow instructions included with the demagnetizing unit.) After demagnetizing the heads, keep all screwdrivers and other metallic objects away from the head faces. Tape guides may also require occasional demagnetizing.

IMPORTANT: Be sure to demagnetize the heads after making resistance measurements in the head circuits.

ADJUSTMENTS

IMPORTANT:	
1. All voltage measurements referred to in this chart are made at a tape speed of 1 7/8 ips with an AC-DC VTVM.	
2. All torque measurements are made at a tape speed of 1 7/8 ips with a spring scale applied to a point 1 inch from spindle center.	
3. All pressure measurements are made by using a spring scale to determine that point at which pressure is just removed.	
ADJUST	REMARKS
Play Takeup Torque	Nominal value 3/4 oz. Adjusted by moving Spring (41) from step to step.
Fast Forward Torque	Nominal value 1 1/2 oz. No adjustment provided.
Rewind Torque	Nominal value 1 1/4 oz. No adjustment provided.
Pressure Roller Pressure	Nominal value 19 oz. Controlled by Spring (8).
Flywheel Play	Adjust B2 for slight vertical play of flywheel.
Record/Play Head Azimuth	Connect AC VTVM across speaker, play an azimuth-test tape and adjust B1 for maximum output.
Bias Oscillator	Nominal frequency 50kHz. Controlled by adjustment of T12.
Erase Current	Nominal value 40.5mA (18.8V rms). No adjustment provided.
Record Bias	Nominal value 5.45V rms (.3mA). Adjust R202 for left channel and R203 for right channel.
Bias Oscillator Trap	Adjust L5 (L7) for MINIMUM on AC VTVM at point R (S).

TROUBLE CHART

SYMPTOM	REMARKS
Cassette fails to latch to unit.	Latch (34) worn or binding. Spring (35) weak or loose. Subchassis (26) binding or worn.
Take-up erratic or inoperative in play or record.	Spindle (4) dirty, worn or binding. Shaft (9) dirty, worn or binding. Clutch (6) dirty or worn. Pulley (11) dirty, worn or binding. Spring (18) weak or out of place. Belt (3) dirty, worn, or binding. Pulley (13) dirty or binding. Spring (41) defective or misplaced. Arm (19) binding. Plate (17) binding.

SYMPTOM

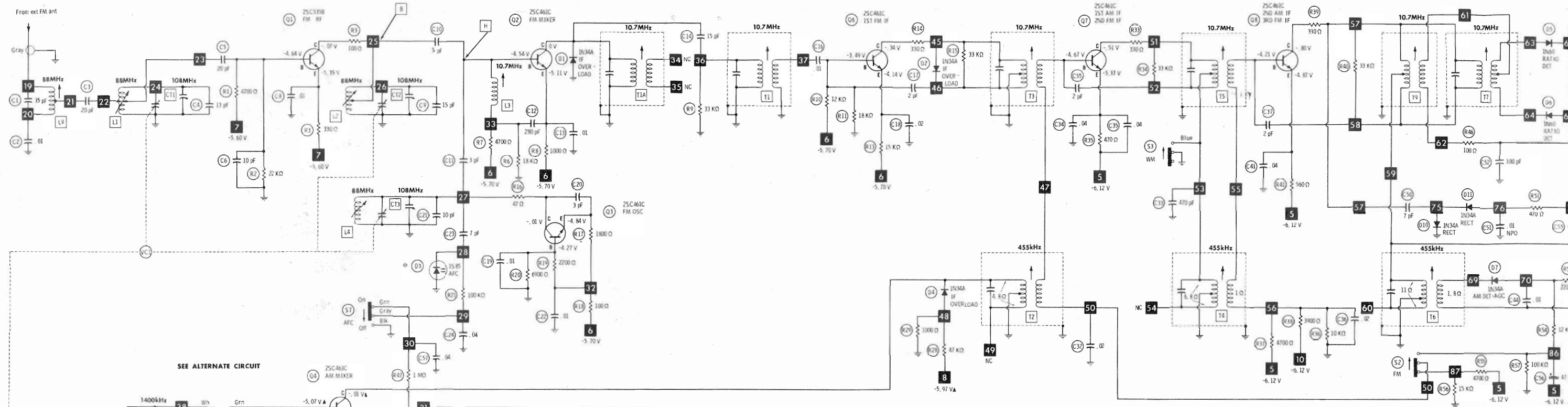
Take-up erratic or inoperative fast forward.
Rewind erratic or inoperative
Capstan does not rotate.
Tape rides up and down betw capstan and pressure roller
Wow or flutter.
Sound weak or distorted.
Erase weak or inoperative.

REF. NO.	PART NO.	
1*	*	Pressu
2*	*	Flywhe
3*	*	Tape D
4		Take-u
5		Supply
6		Take-u
7		Head P
8		Pressu
9		Take-u
10		Flywhe
11		Take-u
12		Fast F
13		Fast W
14		Rewind
15		Rewind
16		Capsta
17		Fast F
18		Take-u
19		Fast W
20		Flywhe
21		Motor
22		Head P
23		Record
24		Record
25		Azimut
26		Subcha

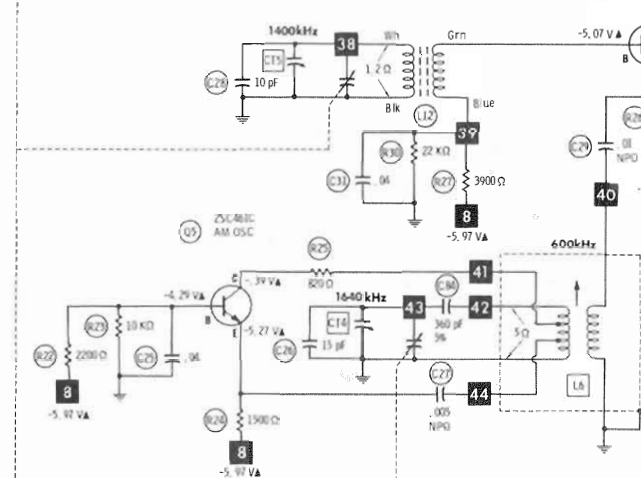
*Pressure Roller E-V/GAME Re
WALSCO Repl

*Flywheel Drive Belt E-V/GAM
WALSCO

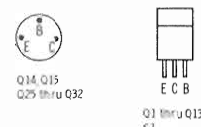
*Tape Drive Belt E-V/GAME Re
WALSCO Repl



SEE ALTERNATE CIRCUIT



Terminal Gullies



- Circuitry not used in some versions
- - - Circuitry used in some versions
- ⊖ See parts list
- ⊕ Ground

Measurements with switching as shown unless noted:

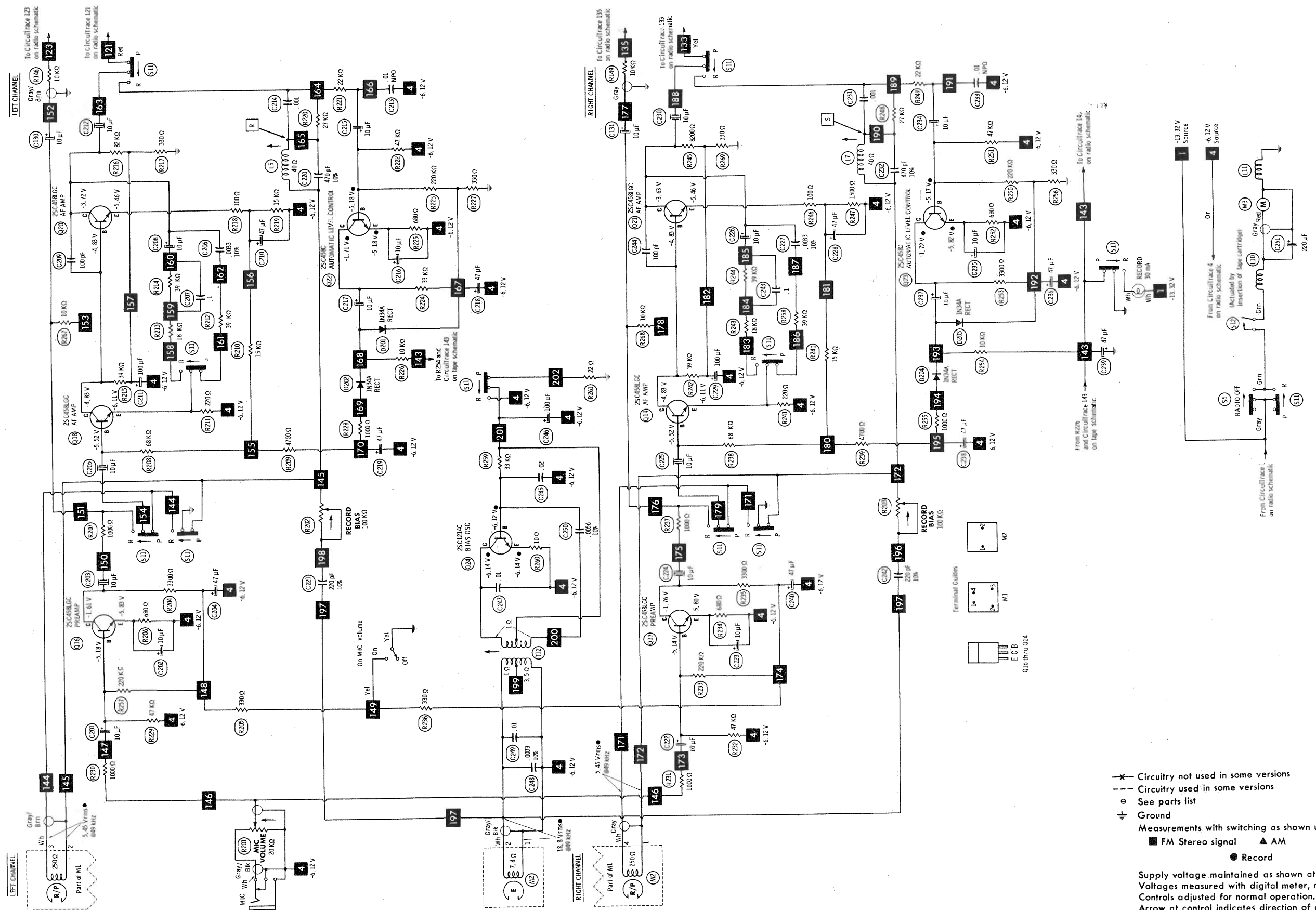
- FM Stereo signal ▲ AM
- Record

Supply voltage maintained as shown at input.
 Voltages measured with digital meter, no signal.
 Controls adjusted for normal operation.
 Arrow at control indicates direction of advance.
 Terminal identification may not be found on unit.
 Resistors are 1/2W or less, 10% unless noted.
 Value in () used in some versions.

A PHOTOFAC STANDARD NOTATION SCHEMATIC
 WITH CIRCUITRACE

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NOTE: DEMAGNETIZE HEADS AFTER SERVICING



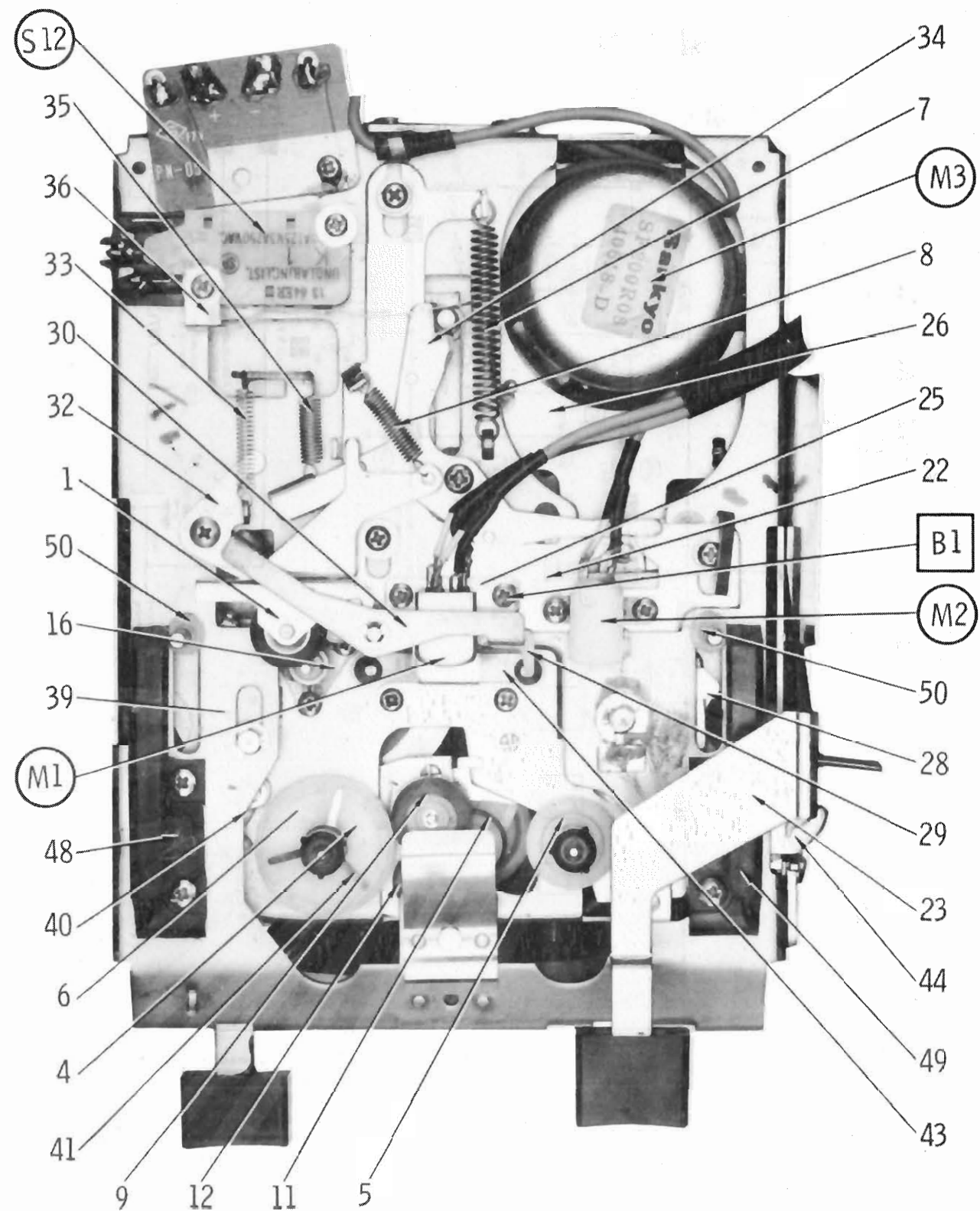
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WITH CIRCUITTRACE

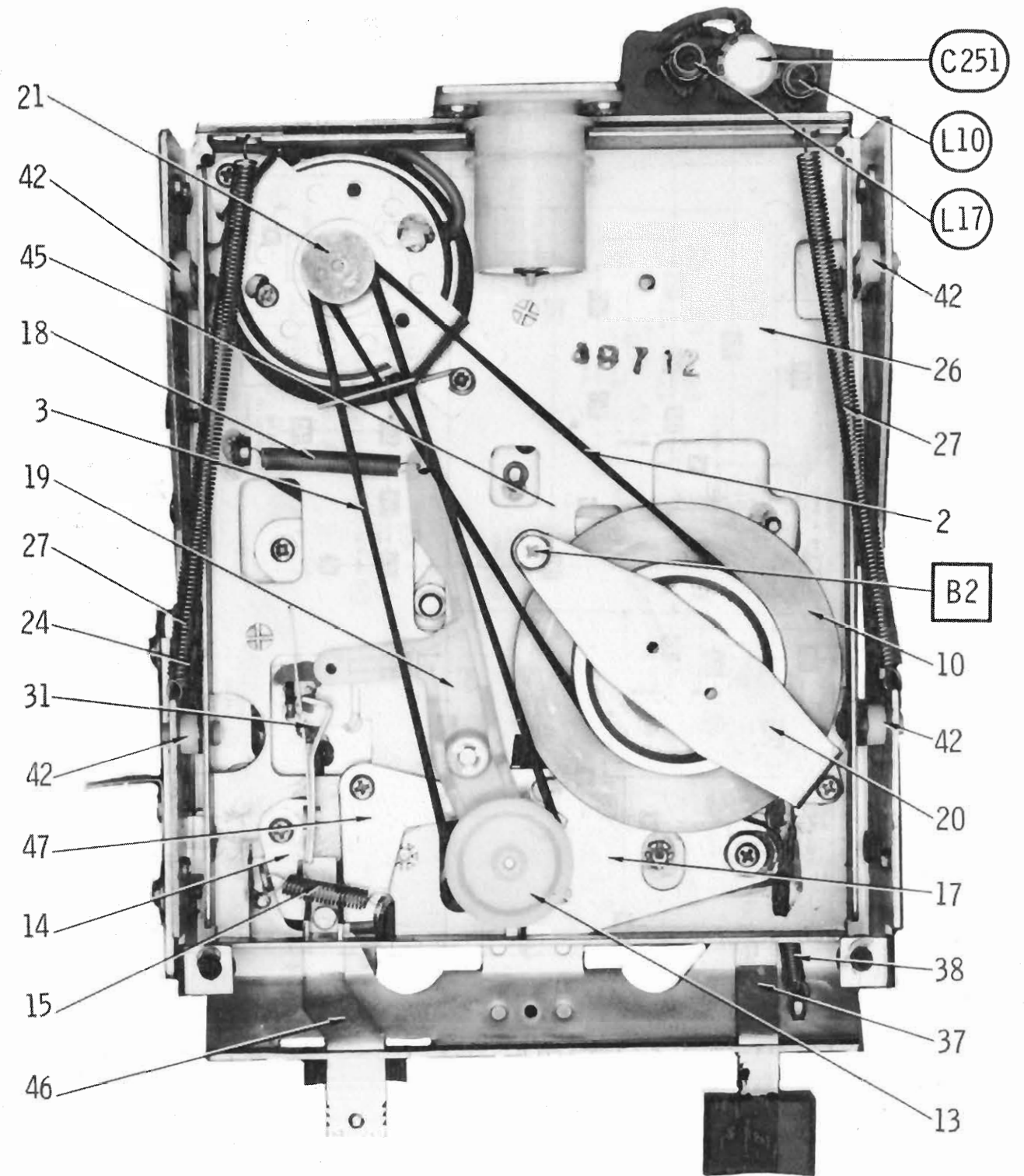
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WELTRON
MODEL 2004

FOLDER 3

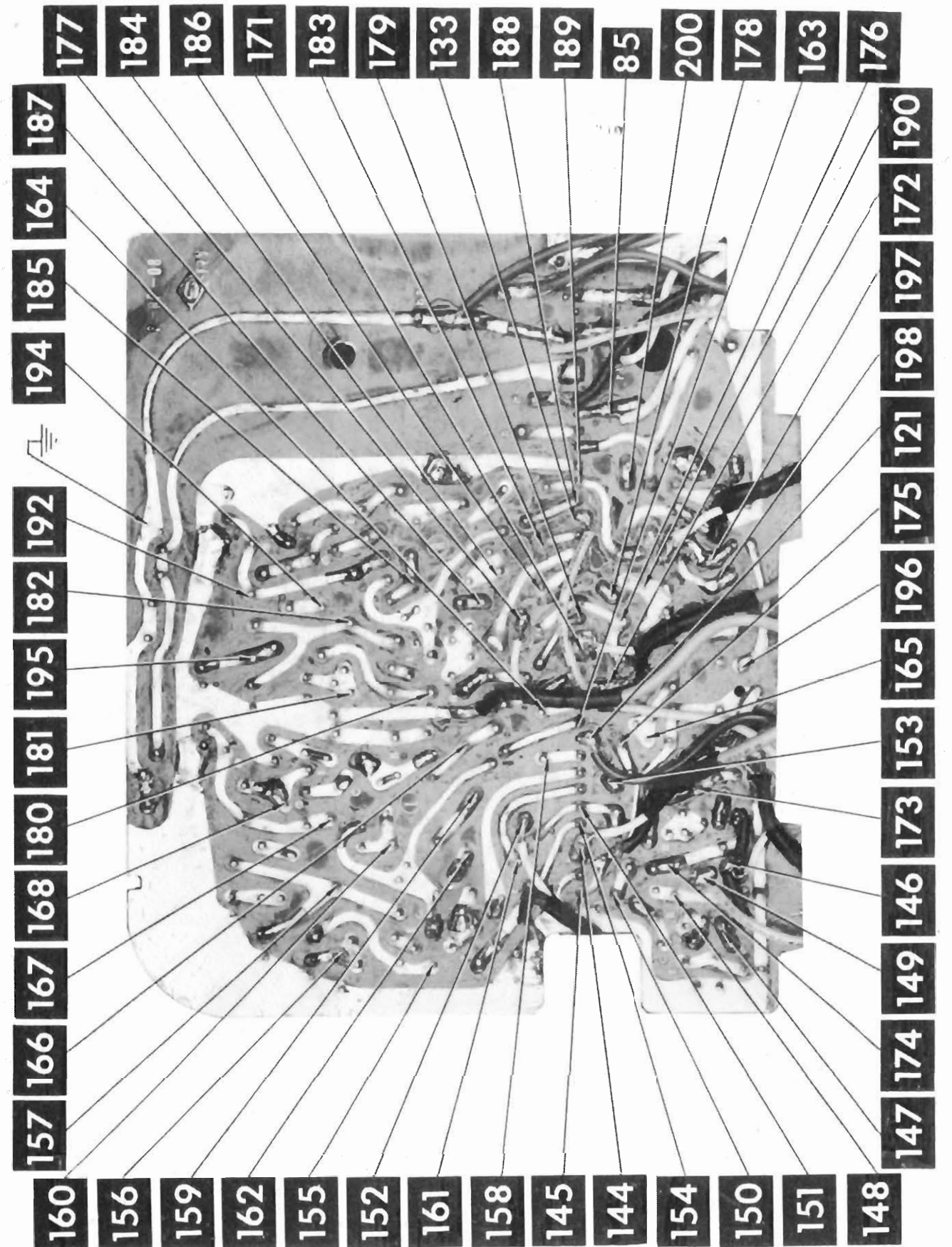
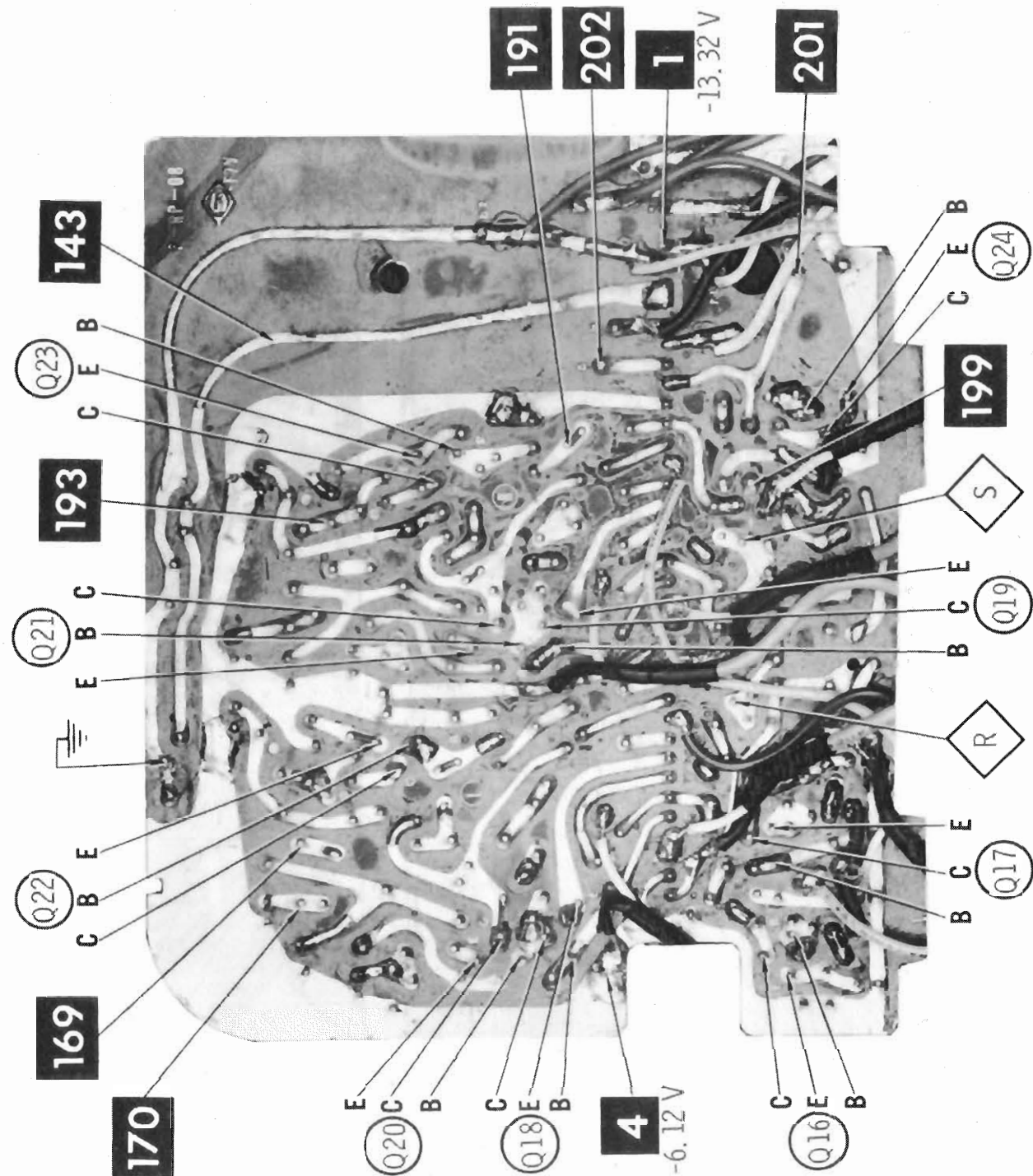


TAPE CHASSIS

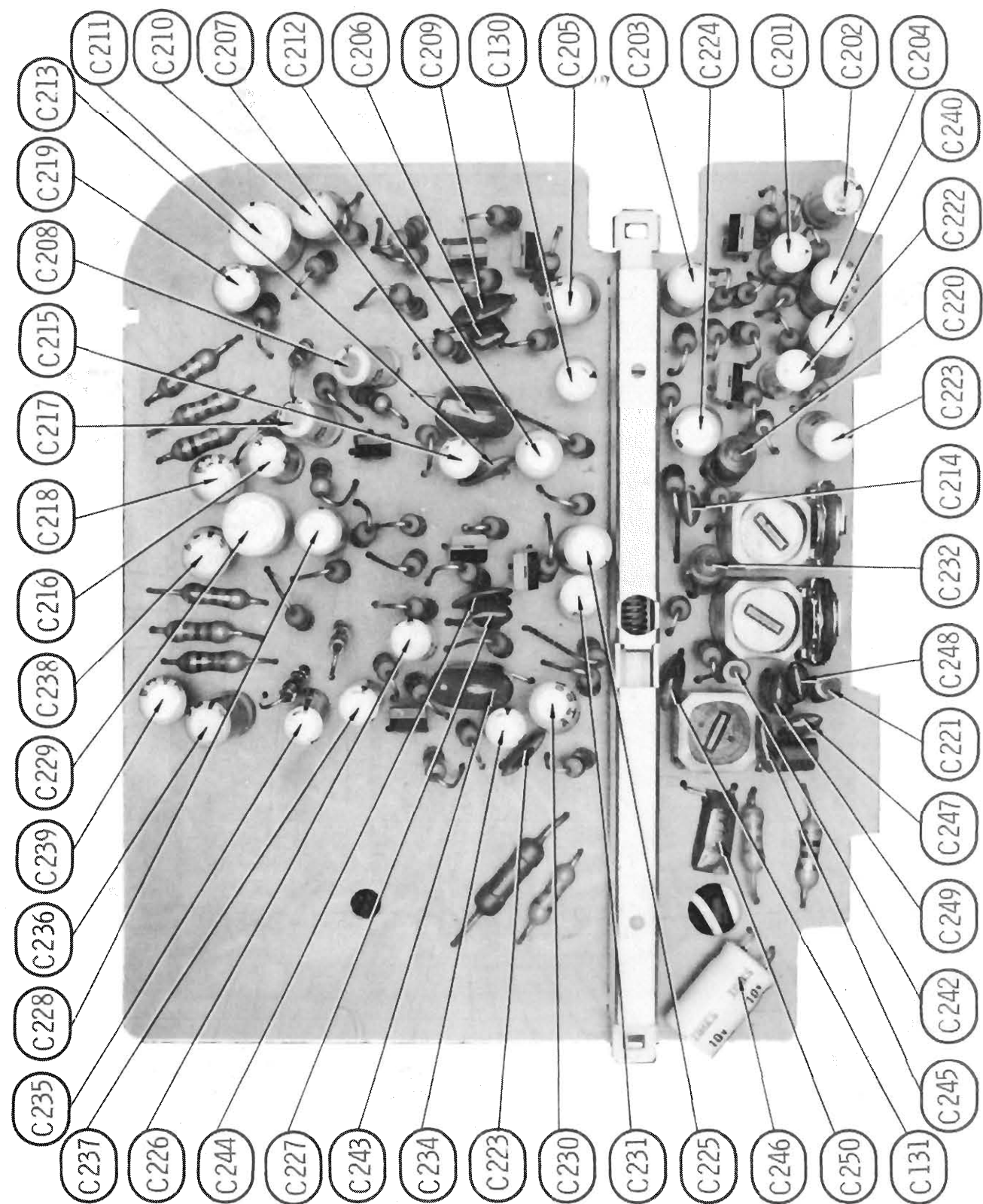
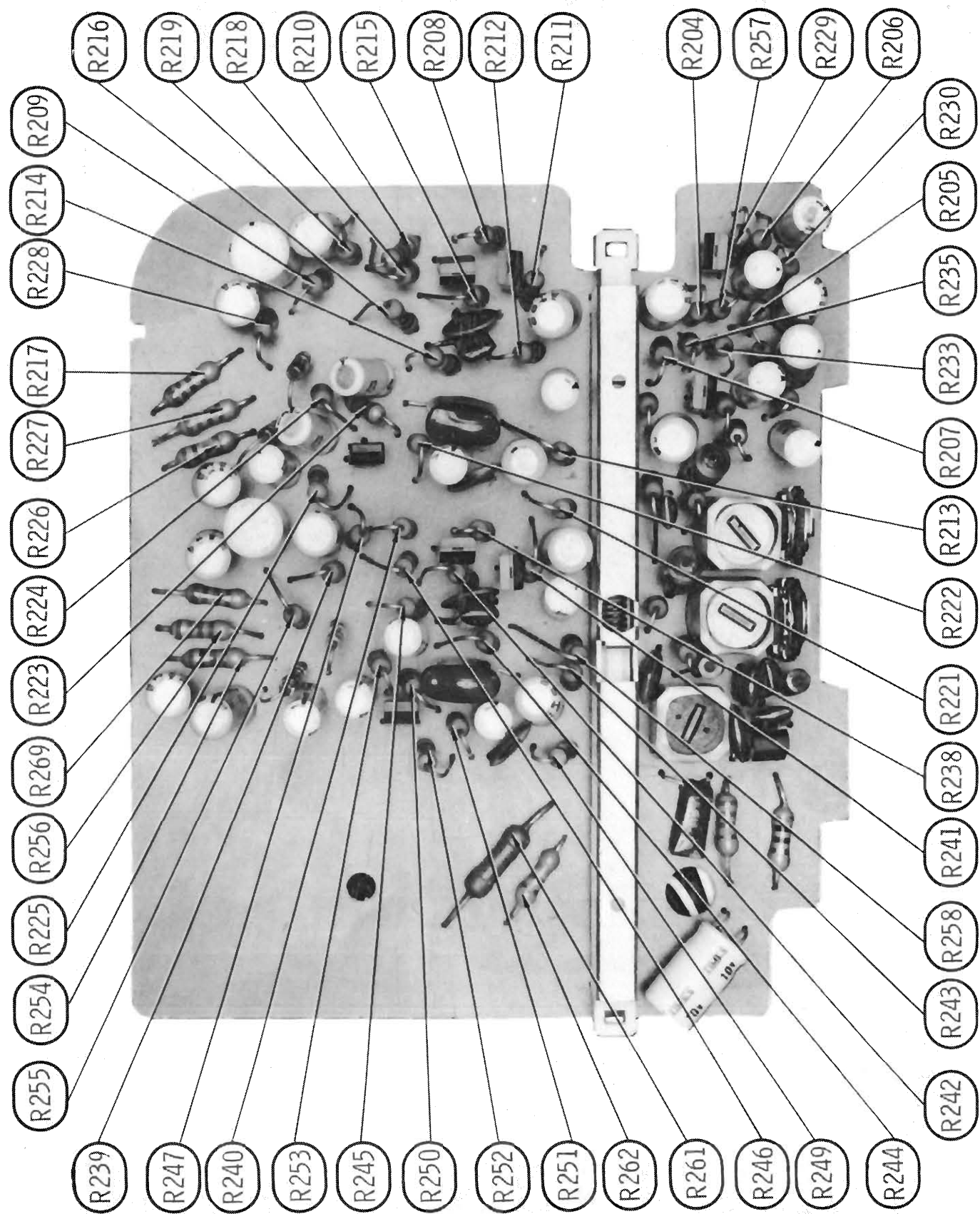


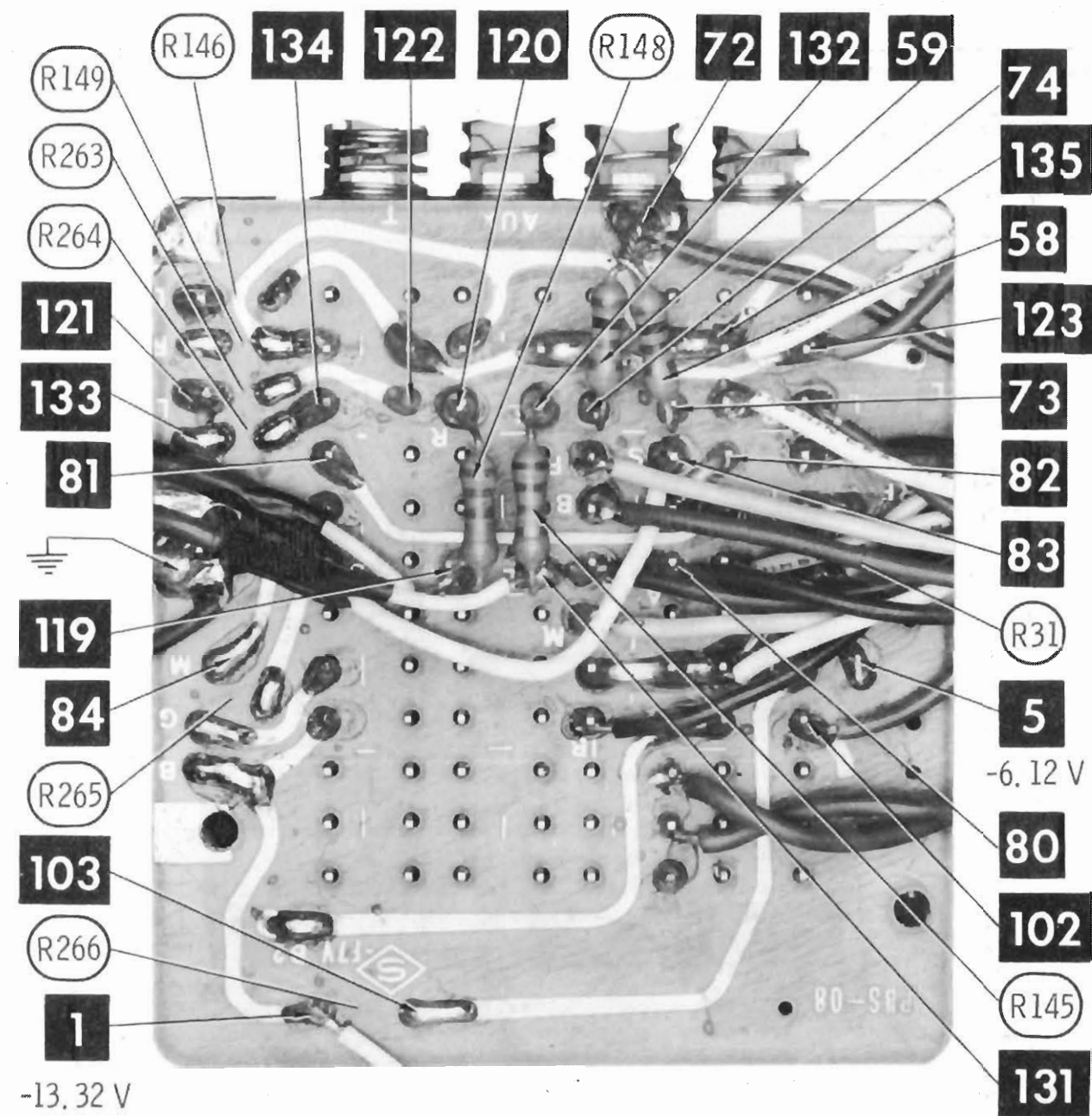
TAPE CHASSIS

TAPE BOARD

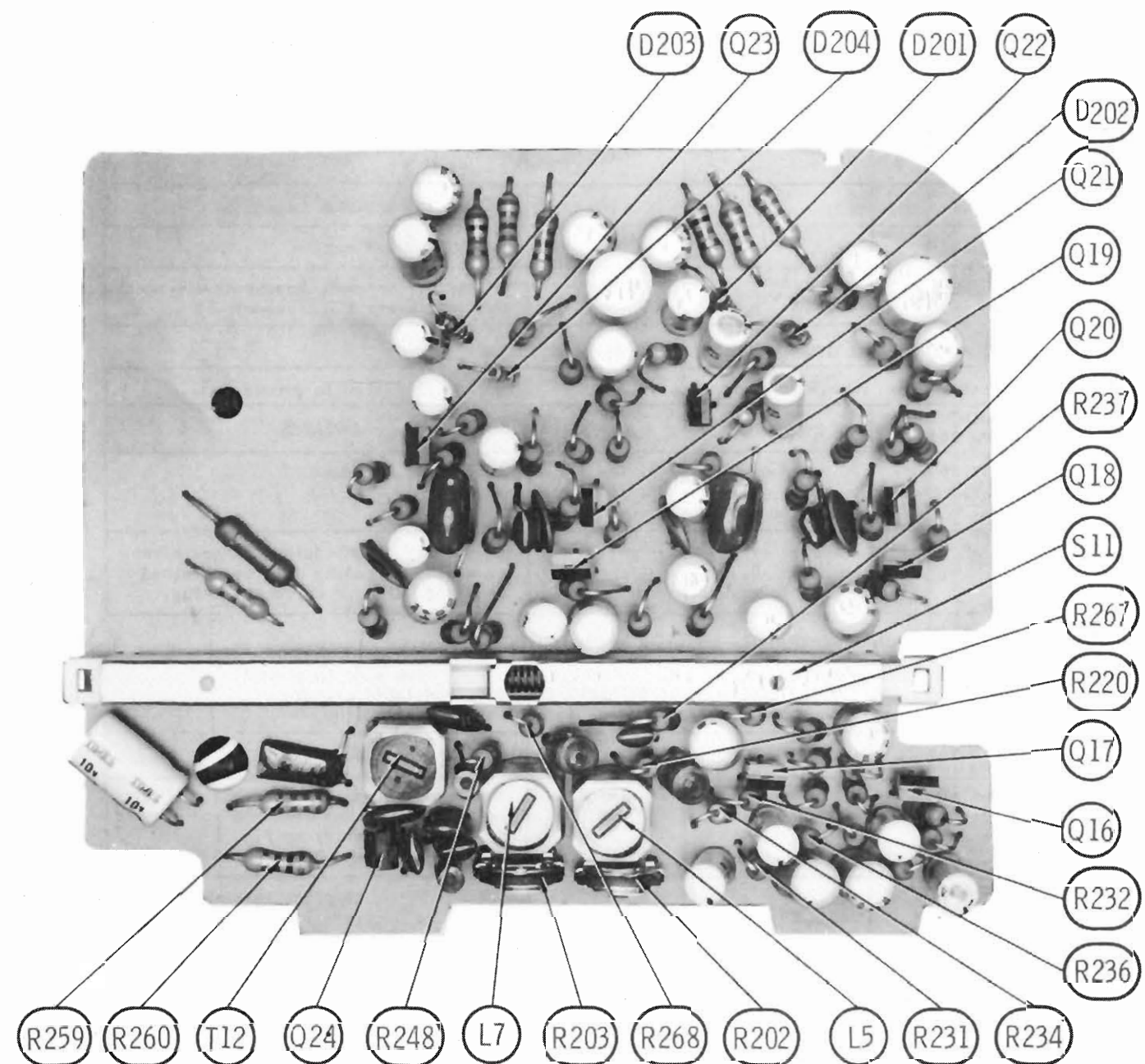


A Howard W. Sams CIRCUITRACE® Photo TAPE BOARD





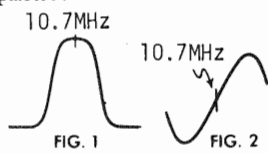
SWITCHBOARD A Howard W. Sams CIRCUITRACE Photo



TAPE BOARD

ALIGNMENT INSTRUCTIONS

CAUTION: Use isolation transformer or observe polarity when connecting test equipment. Maintain line voltage at 120VAC. Allow a 15-minute warm-up period. Use only enough generator output to obtain a suitable indication. Suggested Alignment Tools: GC ELECTRONICS L6, L8, T1A, T1 thru T118728 L1, L2, L3, L4, L99440



AM ALIGNMENT—SELECTOR IN AM POSITION

Connect generator across loop fashioned of several turns of wire. Set volume at maximum.

GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
455kHz 400-hertz Modulation	Tuning gang fully open	Output meter across voice coil	T6, T4, T2	Adjust for maximum. Repeat until no further improvement is noted.
600kHz	600kHz	"	L6	Adjust for maximum.
1640kHz	1640kHz	"	CT4	Adjust for maximum.
1400kHz	1400kHz	"	CT5	Adjust for maximum. Repeat AM alignment until no further improvement is noted.

FM IF ALIGNMENT USING AM SIGNAL GENERATOR—SELECTOR IN FM POSITION

High side of generator thru .001uF to point B, low side to ground.

GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
10.7MHz Unmodulated	Point of non-interference	DC probe of VTVM to point C, common to ground.	T9, T5, T3, T1, T1A	Adjust for maximum.
"	"	DC probe of VTVM to point D, common to ground.	T7	Adjust for zero reading. A positive or negative reading will be obtained on either side of correct setting.

FM IF ALIGNMENT USING FM SIGNAL GENERATOR—SELECTOR IN FM POSITION

High side of generator thru .001uF to point B, low side to ground. Use only enough marker signal for indication. Use 60-hertz frequency modulated signal with 450kHz sweep. Use 60-hertz sawtooth voltage in scope for horizontal deflection.

GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
10.7MHz 450kHz Sweep	Point of non-interference	Vert input of scope to point C, low side to ground.	T9, T5, T3, T1, T1A	Disconnect stabilizing capacitor C 54 Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown. Reconnect C 54
"	"	Vert input of scope to point D, low side to ground.	T7	Adjust T7 to place marker at center of S curve similar to Fig. 2. Readjust T9 for maximum amplitude and straightness of line.

FM RF ALIGNMENT—SELECTOR IN FM POSITION

Connect generator across antenna terminals with 120-ohm carbon resistor in series with each lead. Adjustment of coils by bending should not be attempted unless the coil is deformed or replaced.

GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
88MHz Unmodulated	88MHz	DC probe of VTVM to point C, common to ground.	L1, L2, L4, L9	Adjust for maximum.
108MHz Unmodulated	108MHz	"	CT1, CT2, CT3	Adjust for maximum. Repeat FM RF steps until no further improvement is noted.

ALIGNMENT INSTRUCTIONS (Continued)

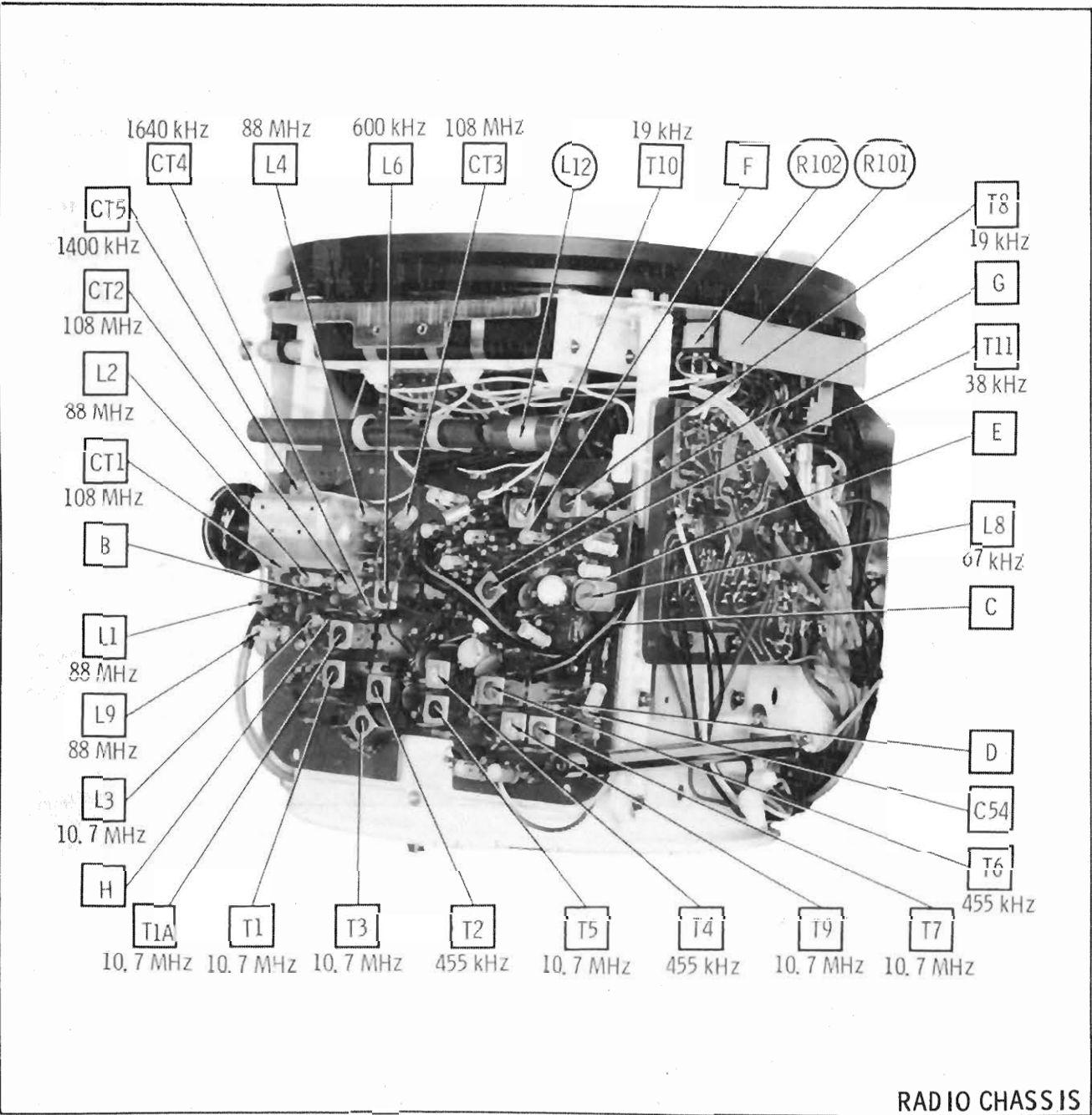
FM STEREO MULTIPLEX ALIGNMENT USING FM STEREO SIGNAL GENERATOR (± .0001% ACCURACY)

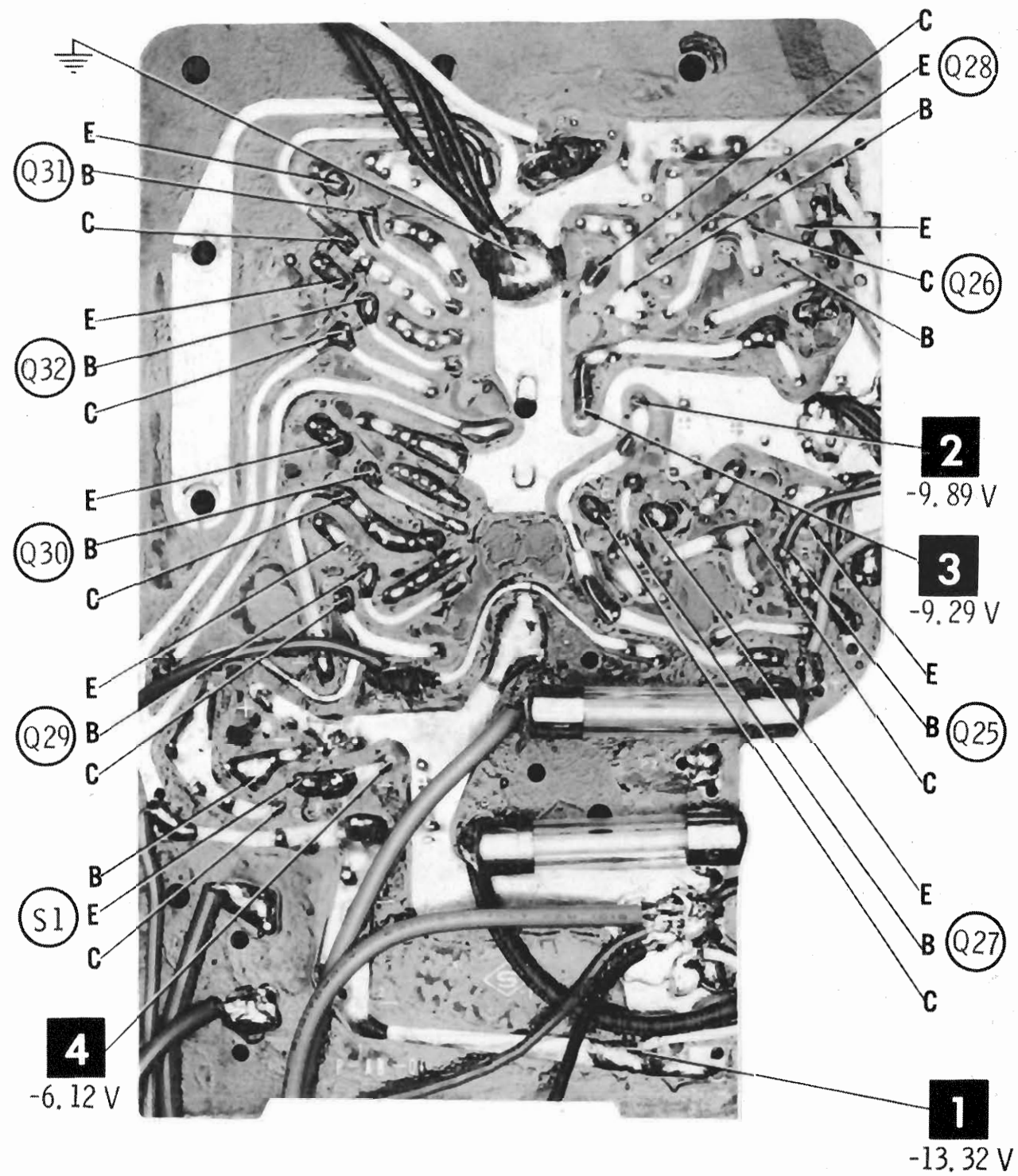
High side of generator thru 47K to point D, low side to ground.

GENERATOR FREQUENCY	INDICATOR	ADJUST	REMARKS
67kHz	Vert input of scope thru 47K to point E, low side to ground.	L8	Adjust for MINIMUM.
19kHz	Vert input of scope thru 47K to point F, low side to ground.	T8, T10	Adjust for maximum.
19kHz	Vert input of scope thru 47K to point G, low side to ground.	T11	Adjust for maximum 38kHz response.

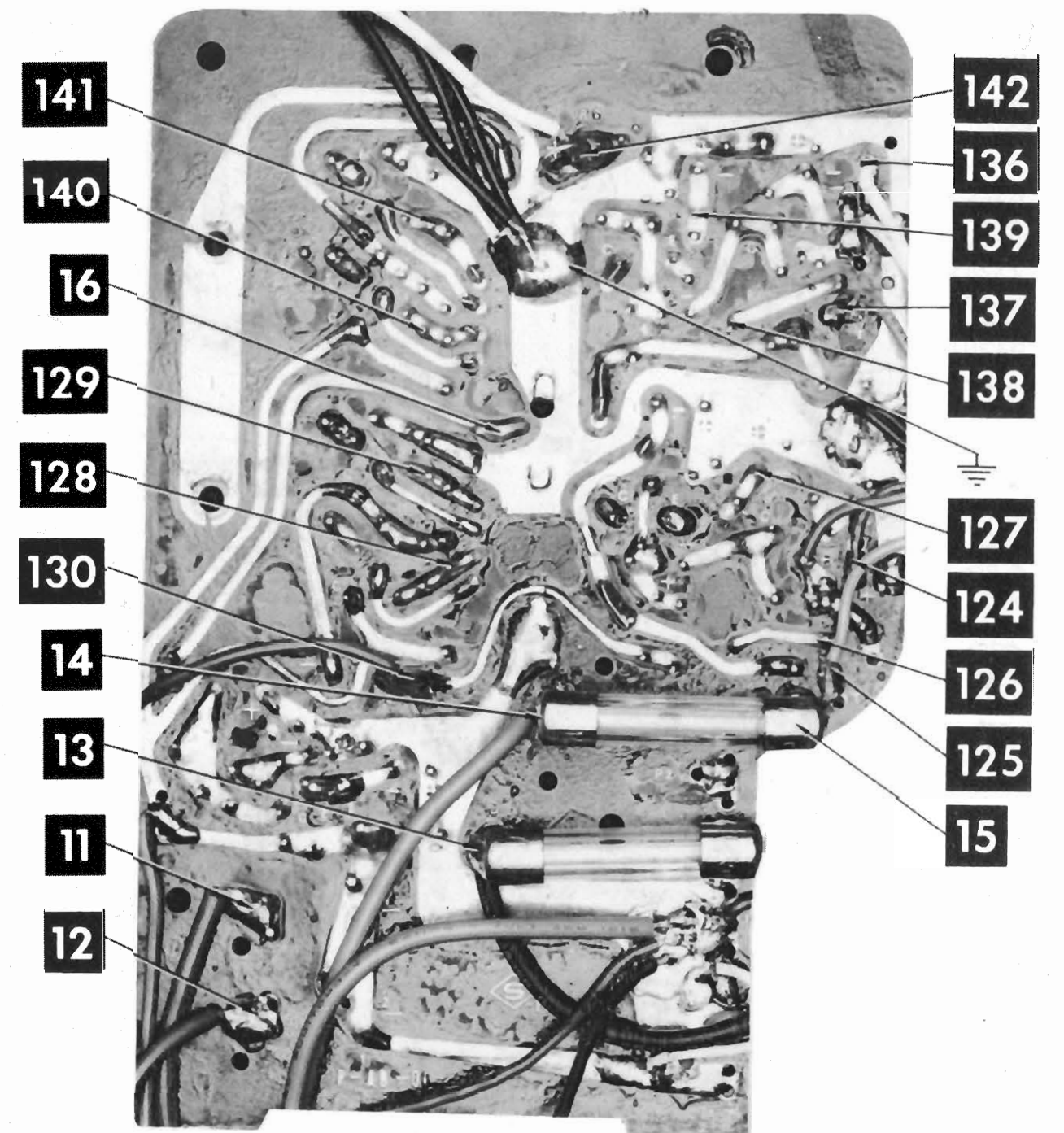
"10.7MHz TRAP ADJUSTMENT"

With Set off, connect signal generator and vertical input of scope to Point H, low side to ground. Adjust L3 for MINIMUM at 10.7MHz.

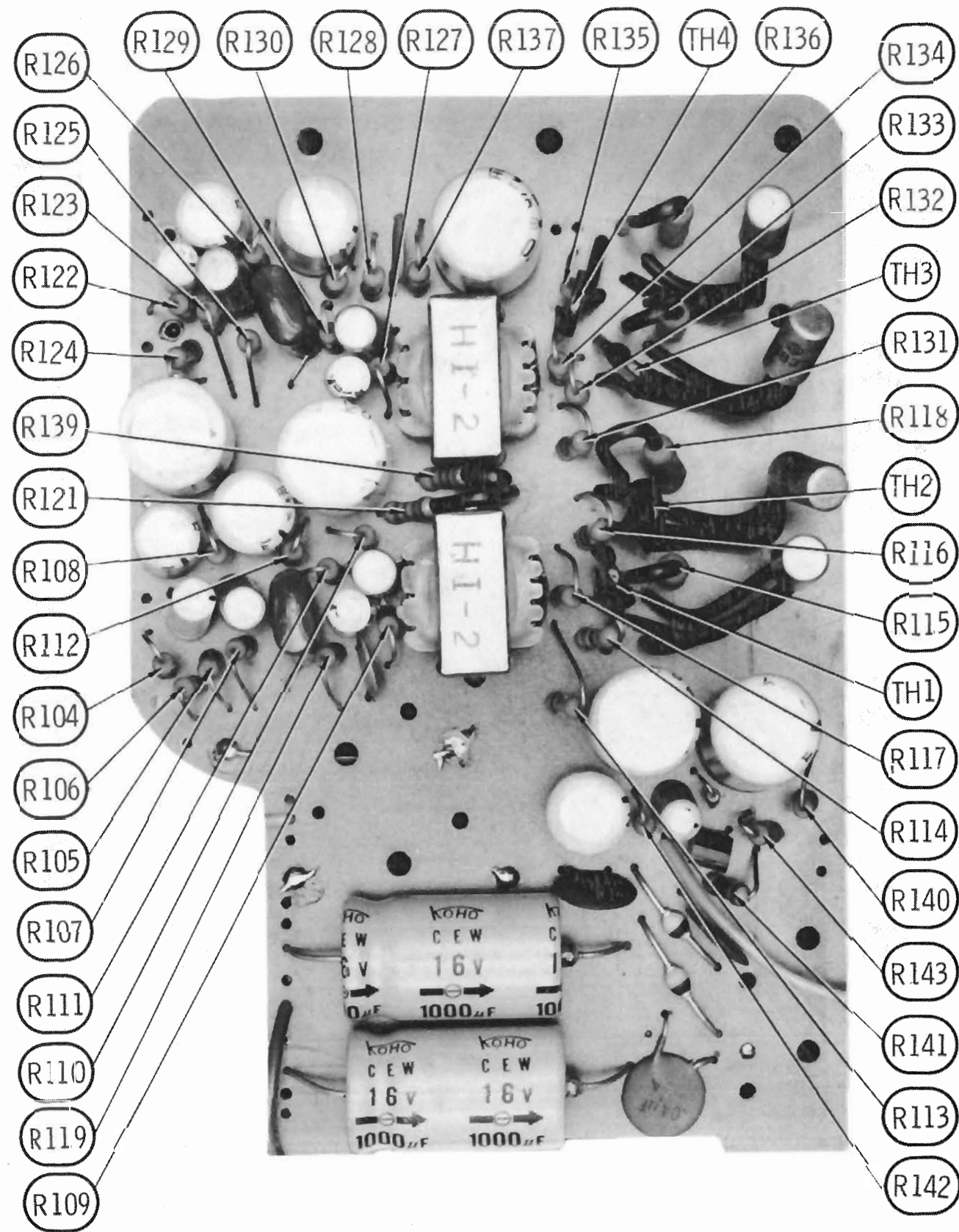




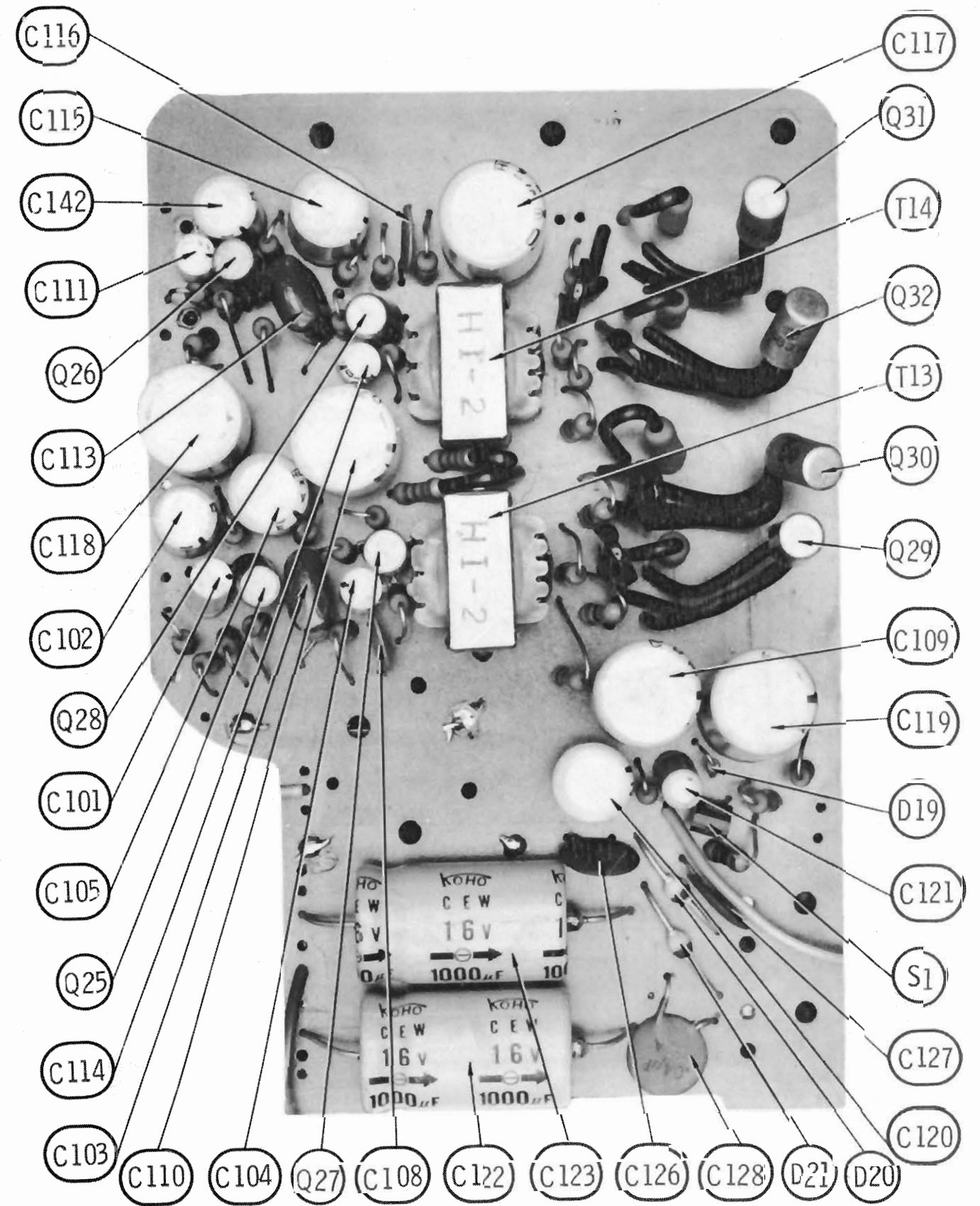
POWER SUPPLY-AMP BOARD



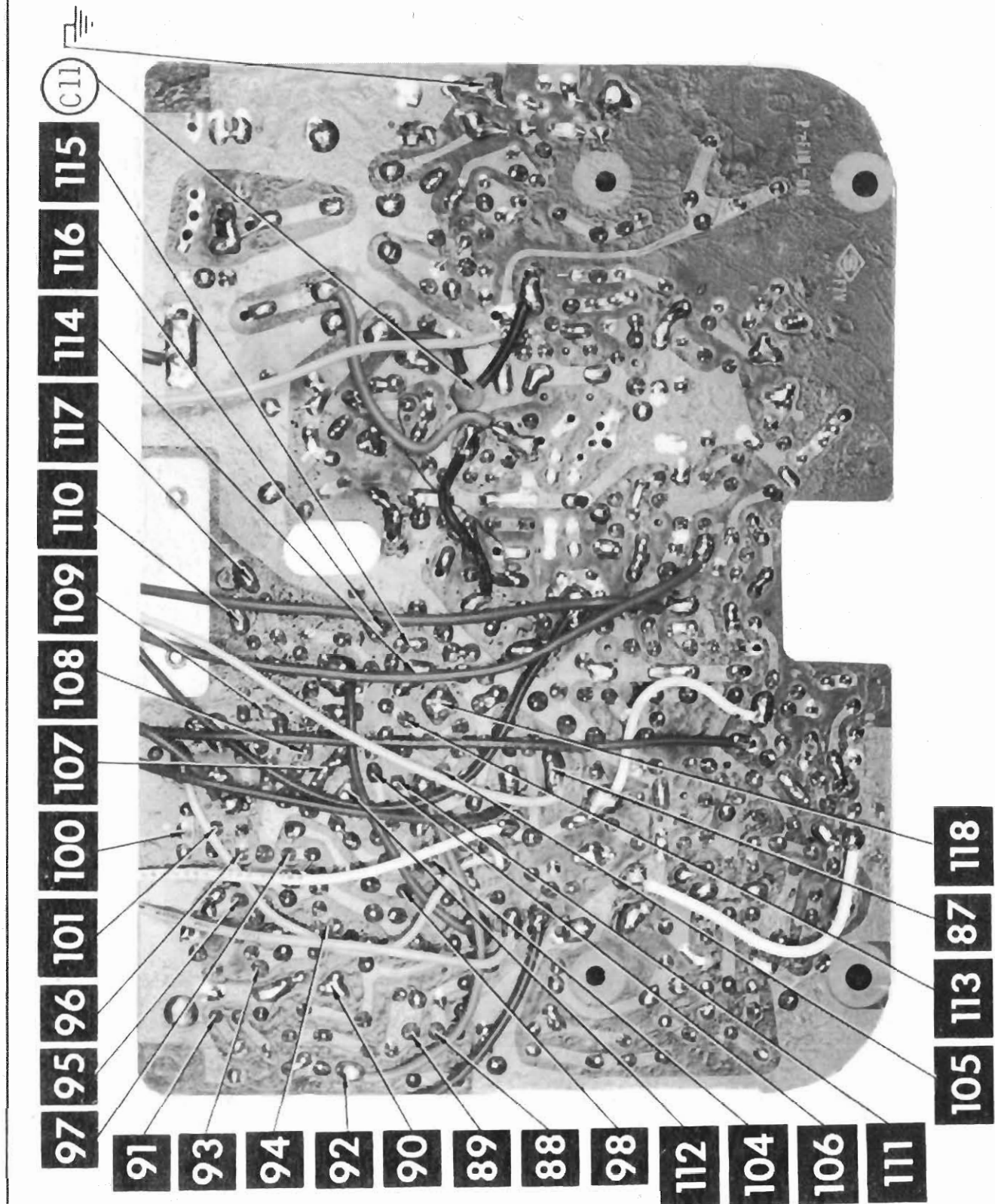
A Howard W. Sams CIRCUITRACE® Photo POWER SUPPLY-AMP BOARD



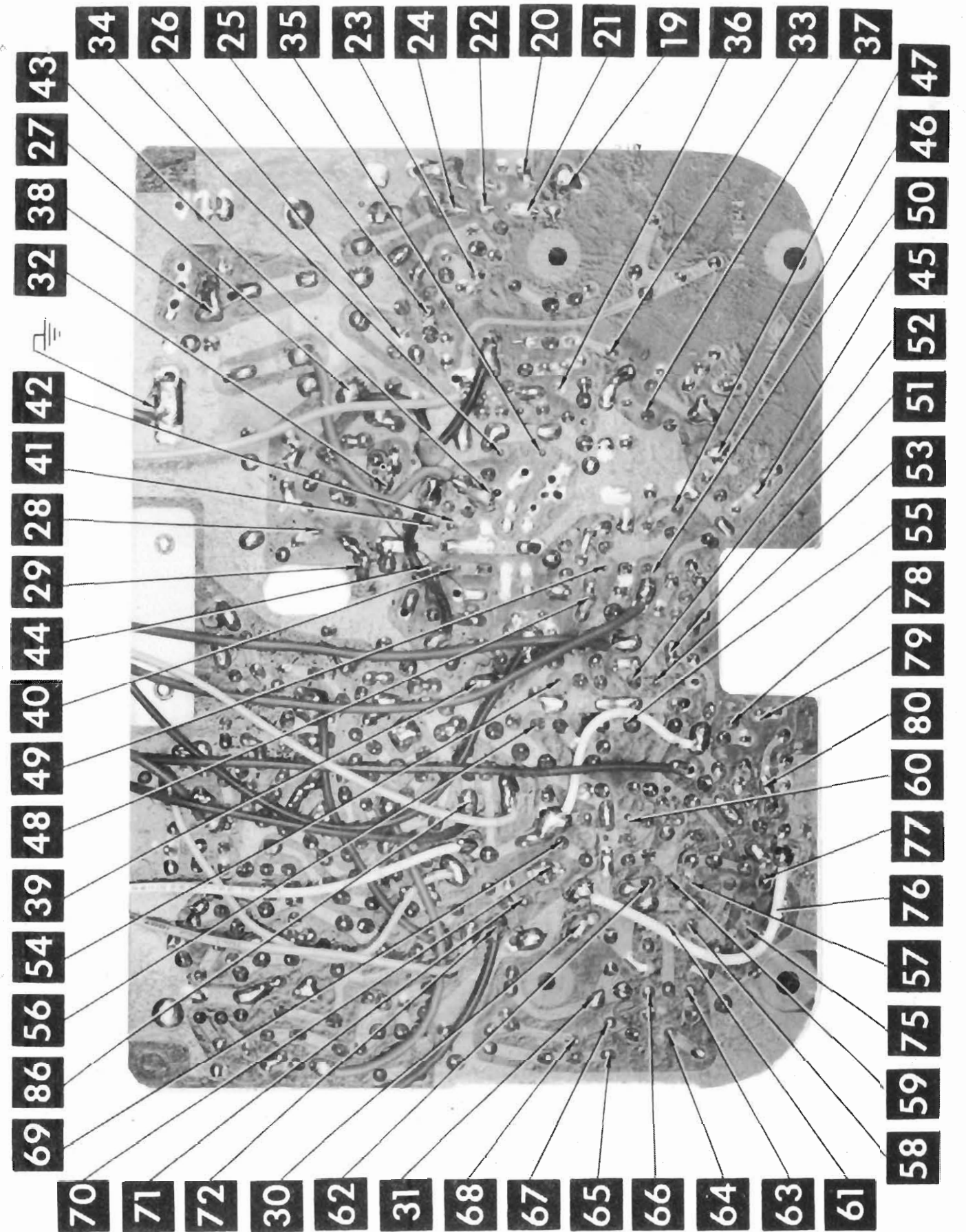
POWER SUPPLY-AMP BOARD



POWER SUPPLY-AMP BOARD

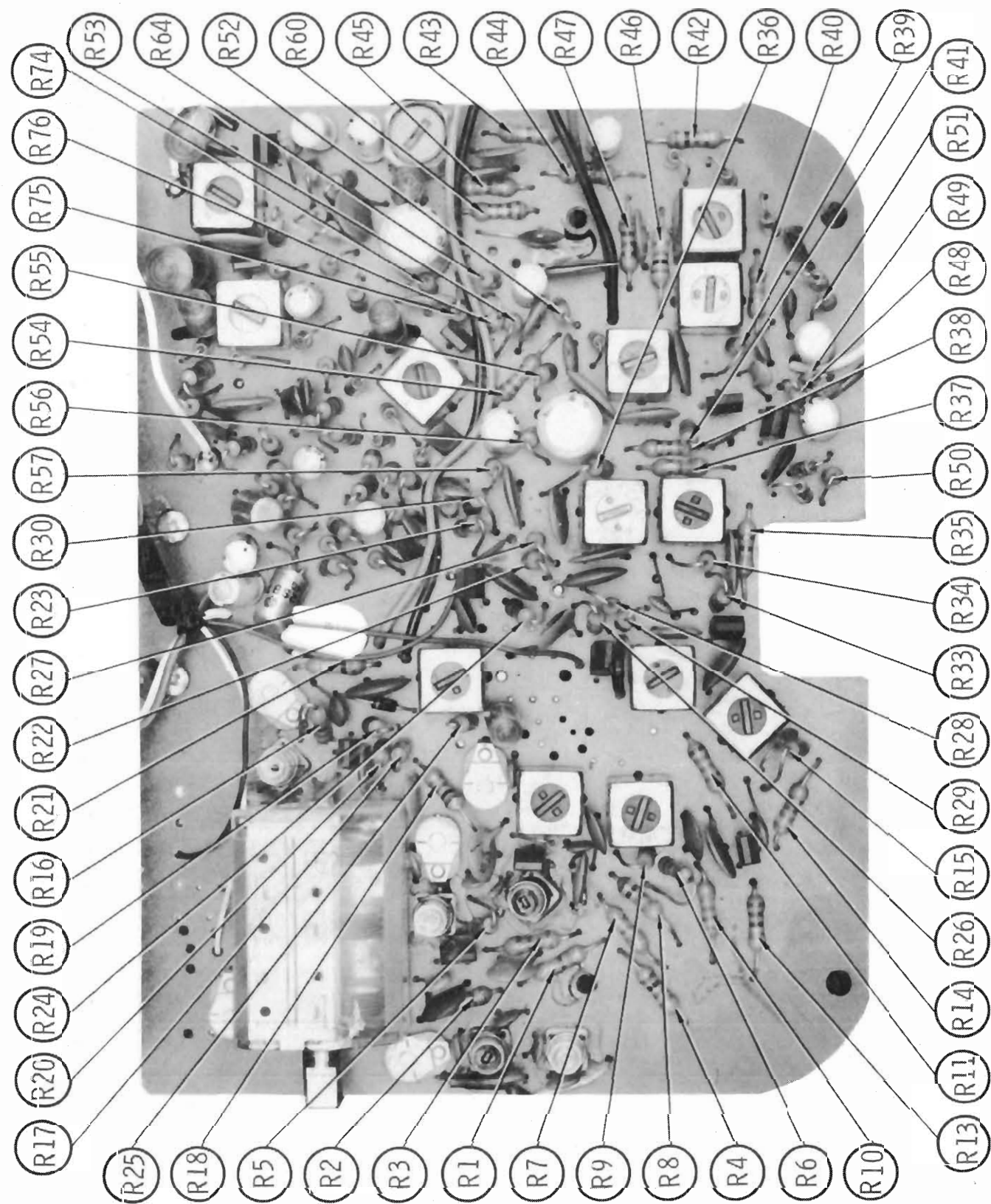


IF-MPX BOARD

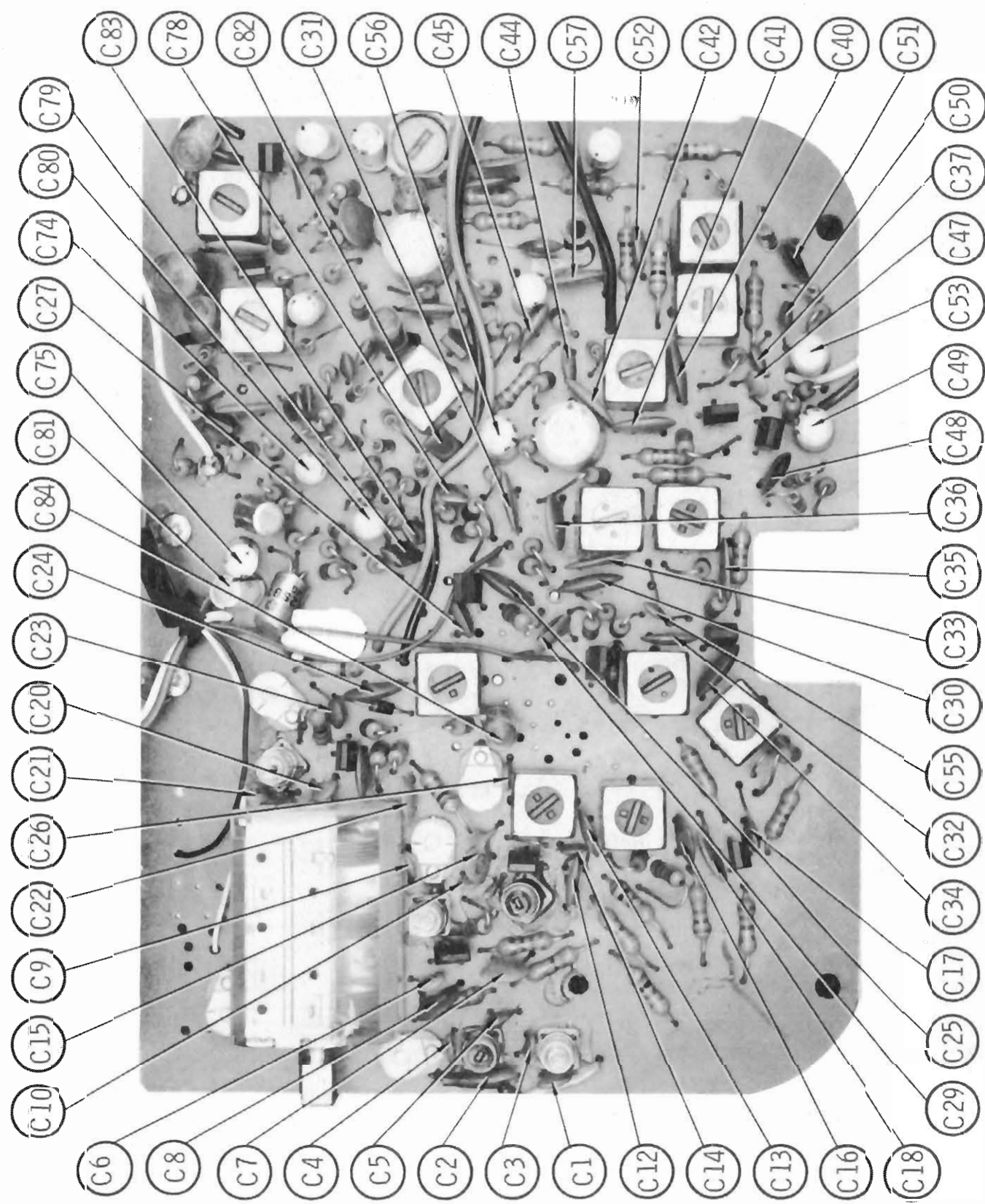


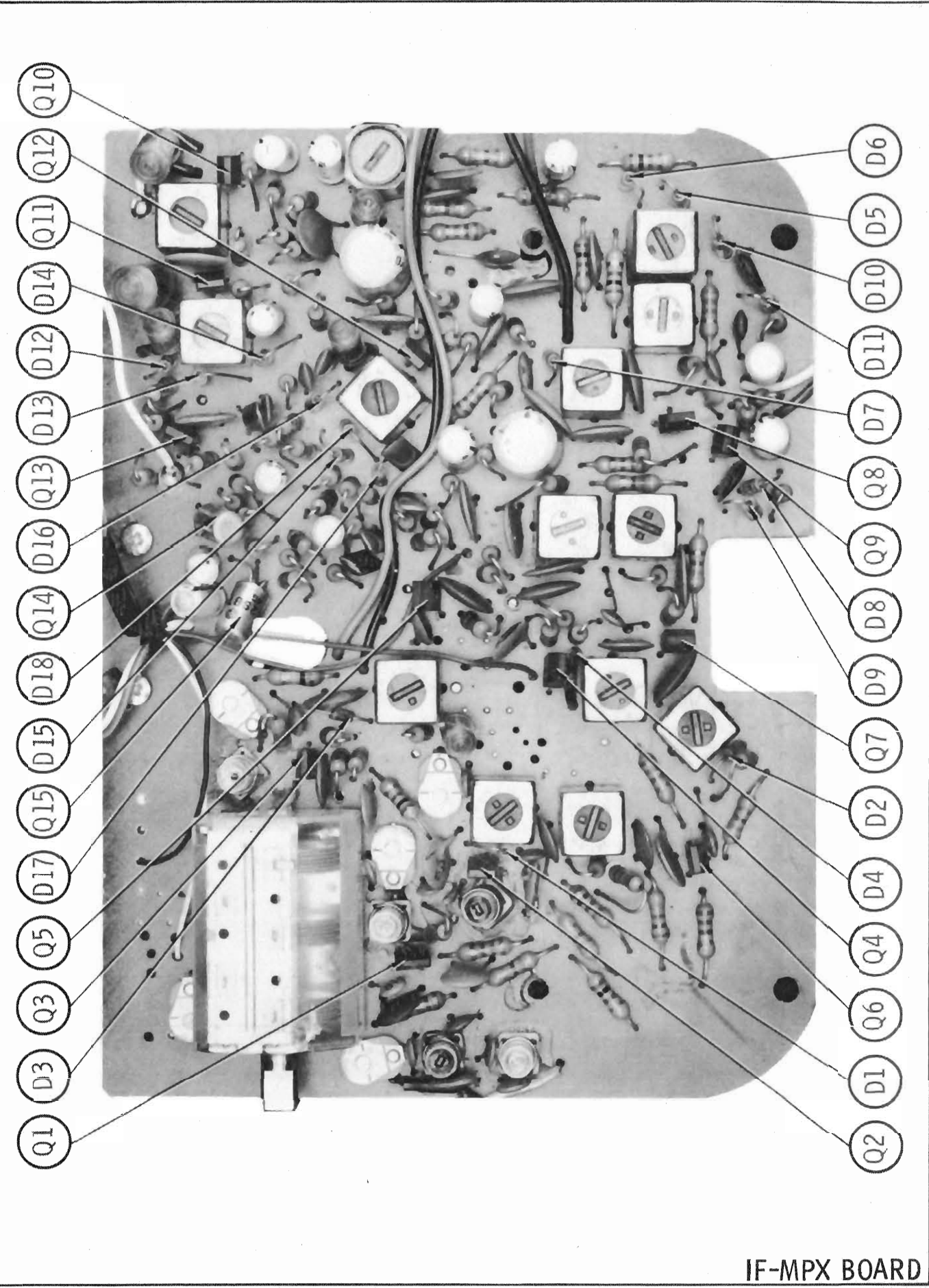
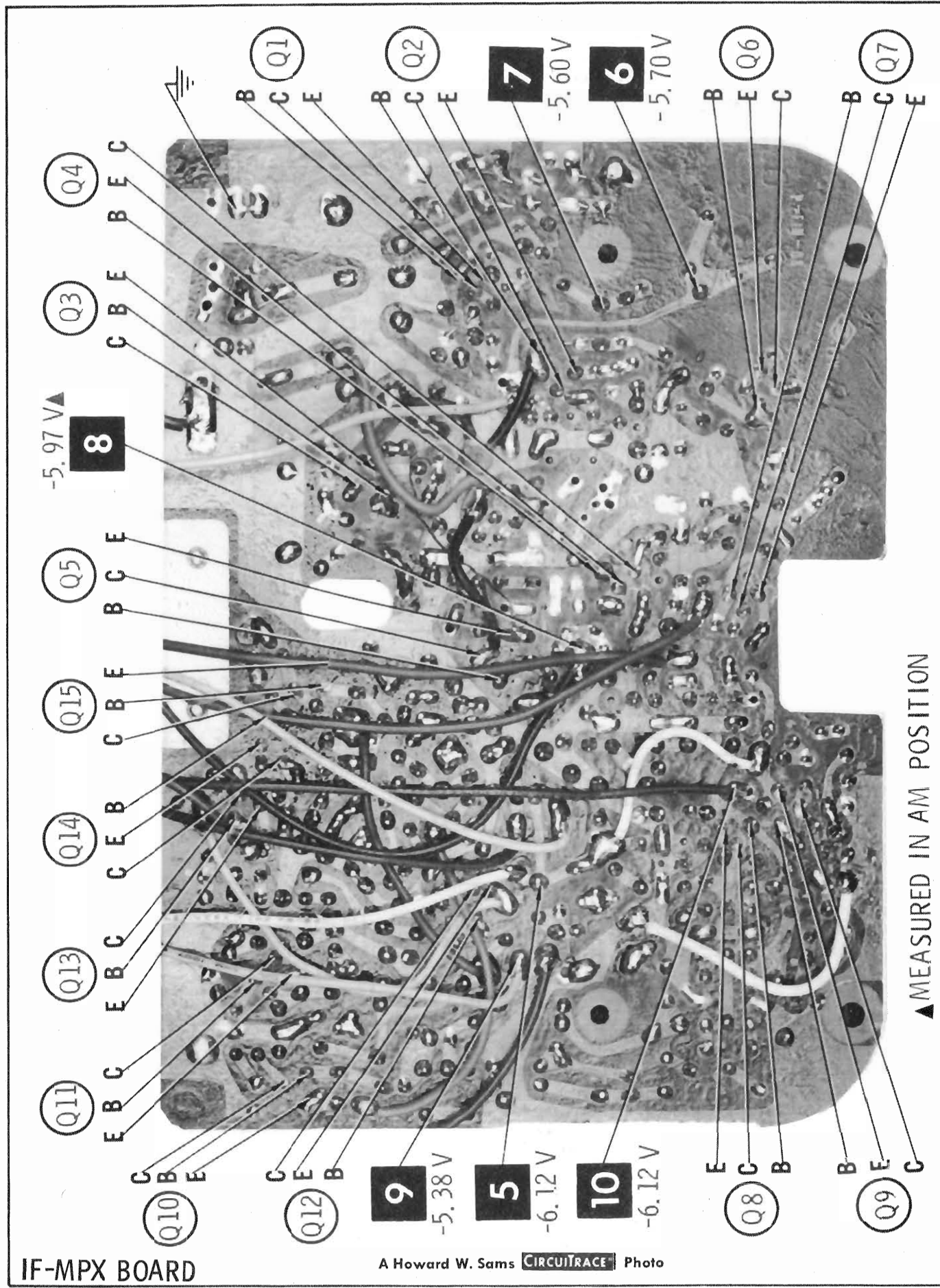
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IF-MPX BOARD



IF-MPX BOARD





PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

COILS (RF-IF)

ITEM No.	FUNCTION	REPLACEMENT DATA			REMARKS
		PART No.	OTHER IDENTIFICATION	MILLER PART No.	
L1	FM RF		KA12023		
L2	FM RF				
L3	10.7MHz Trap				
L4	FM Oscillator				
L5	Bias Trap				
L6	AM Oscillator				
L7	Bias Trap				
L8	67kHz Trap				
L9	FM Antenna				
L10	RF Choke				
L11	RF Choke				
L12	Loopstick				
T1A	FM Input IF		F017A		
T1	FM Interstage		F017A		
T2	AM Input IF		A-39A		
T3	FM Interstage		F017B		
T4	AM Interstage		A-38B		
T5	FM Interstage		F017B		
T6	AM Output		A-37C		
T7	Ratio Detector (Sec)				
T8	19kHz Input		KM-102		
T9	Ratio Detector (Pri)				
T10	19kHz Interstage		KM-203		
T11	38kHz Output		KM-104		
T12	Bias Oscillator Coil				

TRANSFORMER (Power)

ITEM No.	RATING			REPLACEMENT DATA			NOTES
	PRI.	SEC. 1	SEC. 2	MFGR. PART No.	THORDARSON PART No.	TRIAD PART No.	
T20	120V AC 0 .1A AC	20.6V AC CT 0 .41A AC	13.31V AC 0 .15A AC	T-11BP (1)			(1) Number on unit

TRANSFORMER (Driver)

ITEM No.	TURNS RATIO			REPLACEMENT DATA			NOTES
	PRI.	SEC. 1	SEC. 2	MFGR. PART No.	THORDARSON PART No.	TRIAD PART No.	
T13	2.5	1	1	H12 (1)			(1) Number on unit
T14	2.5	1	1	H12 (1)			

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
SP1	4" PM 8 ohms	10-56	4A05Z8	
SP2	4" PM 8 ohms	10-56	4A05Z8	

FUSE DEVICES

ITEM No.	DESCRIPTION	REPLACEMENT DATA							
		PART No.		BUSS PART No.		LITTELFUSE PART No.		WORKMAN PART No.	
		DEVICE	HOLDER	DEVICE	HOLDER	DEVICE	HOLDER	DEVICE	
F1	2A @ 250V Quickacting Pigtail			GJV2		318002			
F2	1A @ 250V Quickacting Pigtail			GJV1		318001			
F3	1A	(1)							
F4	1A	(1)							

(1) Used in some versions.

TAPE HEADS

ITEM No.	MEASURED			MFGR. PART No.	NORTRONICS PART No.	DESCRIPTION
	INDUCTANCE	BIAS/ERASE VOLTS (RMS)	BIAS FREQ.			
M1	120mH	5.45V rms @ .305mA	49kHz		5230A (1)	Cassette 4-Track Stereo Record/Play
M2	1.5mH	18.8V rms @ 40.5mA	49kHz			Cassette 2-Track Mono Erase

(1) Use original mounting.

MISCELLANEOUS

ITEM No.	PART NAME	PART No.	NOTES
M3	Motor		Tape Drive (2100 rpm @ 13,21V DC) FM AM Aux Radio-Tape Stereo-Mono AFC Dial Power On/Off AC-DC Play-Record Tape Power (actuated by insertion of cartridge)
S2	Switch		
S3	Switch		
S4	Switch		
S5	Switch		
S6	Switch		
S7	Switch		
S8	Switch		
S9	Switch		
S10	Switch		
S11	Switch		
S12	Switch		

PARTS LIST AND DESCRIPTION

(When ordering parts, state Model, Part Number, and Description.)

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No. 8528 (Solid) Available in 12 Colors
Low-loss Shielded Lead (Interconnecting) .	8522 (Stranded) Available in 12 Colors
	Use BELDEN No. 8401 or 8421

SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA									
			GENERAL ELECTRIC PART No.	INTERNATIONAL RECTIFIER PART No.	MALLORY PART No.	MOTOROLA PART No.	RAYTHEON PART No.	RCA PART No.	SPRAGUE PART No.	SYLVANIA PART No.		
D1	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D2	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D3	1S85		GE-90	D201		HEPR2503	RE195	SK3126	RT-262			
	1S2790(1)		GE-90	D201		HEPR2503	RE195	SK3126	RT-262			
D4	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D5	1N60		1N60(7)	1N60(7)	PTC206M(6)	HEPR9135(7)	RE 86(6)	SK3088(7)	RT-263(7)	ECG110(6)		
D6	1N60		1N60(7)	1N60(7)	PTC206M(6)	HEPR9135(7)	RE 86(6)	SK3088(7)	RT-263(7)	ECG110(6)		
D7	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D8	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D9	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D10	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D11	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D12	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D13	1N60		1N60(7)	1N60(7)	PTC206M(6)	HEPR9135(7)	RE 86(6)	SK3088(7)	RT-263(7)	ECG110(6)		
D14	1N60											
D15	1N60		1N60(7)	1N60(7)	PTC206M(6)	HEPR9135(7)	RE 86(6)	SK3088(7)	RT-263(7)	ECG110(6)		
D16	1N60											
D17	1N60		1N60(7)	1N60(7)	PTC206M(6)	HEPR9135(7)	RE 86(6)	SK3088(7)	RT-263(7)	ECG110(6)		
D18	1N60											
D19	HZ-7H		GEZD-7.5	Z1207	PTC504	HEPZ0410	RE 111	SK3059	RT-239	ECG138		
	7.1V Zener											
D20	W06C		GE-504A	8D4	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116		
D21	W06C		GE-504A	8D4	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116		
D201	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D202	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D203	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
D204	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109		
Q1	2SC535B		GE-20	(1R)2SC535B	PTC136	HEPS0016	RE 9	SK3018	RT-108	ECG107		
Q2	2SC461C		GE-20	TR-24	PTC115	HEPS0020	RE 10	SK3018	RT-107A	ECG108		
Q3	2SC461C		GE-20	TR-24	PTC115	HEPS0020	RE 10	SK3018	RT-107A	ECG108		
Q4	2SC461C		GE-20	TR-24	PTC115	HEPS0020	RE 10	SK3018	RT-107A	ECG108		
Q5	2SC461C		GE-20	TR-24	PTC115	HEPS0020	RE 10	SK3018	RT-107A	ECG108		
Q6	2SC461C		GE-20	TR-24	PTC115	HEPS0020	RE 10	SK3018	RT-107A	ECG108		
Q7	2SC461C		GE-20	TR-24	PTC115	HEPS0020	RE 10	SK3018	RT-107A	ECG108		
Q8	2SC461C		GE-20	TR-24	PTC115	HEPS0020	RE 10	SK3018	RT-107A	ECG108		
Q9	2SC458C		GE-20	TR-51	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A		
Q10	2SC458C		GE-20	TR-51	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A		
Q11	2SC458C		GE-20	TR-51	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A		
Q12	2SC458C		GE-20	TR-51	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A		
Q13	2SC458C		GE-20	TR-51	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A		
Q14	2SB75C		GE-52	TR-85	PTC109	HEPG0005	RE 4	SK3004	RT-123	ECG102A		
Q15	2SB75C		GE-52	TR-85	PTC109	HEPG0005	RE 4	SK3004	RT-123	ECG102A		
Q16	2SC458LGC		GE-20	TR-51	PTC121	HEPS0014	RE 13	SK3124	RT-102	ECG123A		
Q17	2SC458LGC		GE-20	TR-51	PTC121	HEPS0014	RE 13	SK3124	RT-102	ECG123A		
Q18	2SC458LGC		GE-20	TR-51	PTC121	HEPS0014	RE 13	SK3124	RT-102	ECG123A		
Q19	2SC458LGC		GE-20	TR-51	PTC121	HEPS0014	RE 13	SK3124	RT-102	ECG123A		
Q20	2SC458LGC		GE-20	TR-51	PTC121	HEPS0014	RE 13	SK3124	RT-102	ECG123A		
Q21	2SC458LGC		GE-20	TR-51	PTC121	HEPS0014	RE 13	SK3124	RT-102	ECG123A		
Q22	2SC458C		GE-20	TR-51	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A		
Q23	2SC458C		GE-20	TR-51	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A		
Q24	2SC1214C		GE-18	TR-87	PTC125	HEPS3002	RE 17	SK3044	RT-159	ECG128		
Q25	2SB75C		GE-52	TR-85	PTC109	HEPG0005	RE 4	SK3004	RT-123	ECG102A		
Q26	2SB75C		GE-52	TR-85	PTC109	HEPG0005	RE 4	SK3004	RT-123	ECG102A		
Q27	2SB75C		GE-52	TR-85	PTC109	HEPG0005	RE 4	SK3004	RT-123	ECG102A		
Q28	2SB75C	(8)	GE-52	TR-85	PTC109	HEPG0005	RE 4	SK3004	RT-123	ECG102A		
Q29	2SB370A	(8)	GE-53	TR-85	PTC135		RE 4	SK3004		ECG102A		
Q30	2SB370A	(8)	GE-53	TR-85	PTC135		RE 4	SK3004		ECG102A		
Q31	2SB370A	(8)	GE-53	TR-85	PTC135		RE 4	SK3004		ECG102A		
Q32	2SB370A	(8)	GE-53	TR-85	PTC135		RE 4	SK3004		ECG102A		
S1	2SA673C		GE-67	TR-88	PTC103	HEPS5013	RE 26	SK3114	RT-115	ECG159		

(1) Used in some versions.

(6) Matched pair.

(7) Two required - select matched pair.

(8) Half of matched pair (Q29 and Q30; Q31 and Q32).

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA					
		MFGR. PART No.	ARCO PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C43	220 10V		RME-G-D-250	EP15-250	PC250-10	VTT220F10	EV-1140
C46	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C49	47 6.3V		RME-E-E-050	EP15-50	PC50-16	VTT47D16	EV-1226
C53	47 6.3V		RME-E-E-050	EP15-50	PC50-16	VTT47D16	EV-1226
C54	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C56	47 6.3V		RME-E-E-050	EP15-50	PC50-16	VTT47D16	EV-1226
C61	220 10V		RME-G-D-250	EP15-250	PC250-10	VTT220F10	EV-1140
C62	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C64	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C69	1 10V		RME-A-J-001	EP15-1	PC1-50	TT12X1	EV-1315
C74	1 10V		RME-A-J-001	EP15-1	PC1-50	TT12X1	EV-1315
C75	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C80	1 10V		RME-A-J-001	EP15-1	PC1-50	TT12X1	EV-1315
C81	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C101	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222

PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

ELECTROLYTIC CAPACITORS (cont)

ITEM No.	RATING	REPLACEMENT DATA					
		MFGR. PART No.	ARCO PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C102	100 10V		RME-E-E-100	EP15-100	PC100-10	VTT100E10	EV-1130
C104	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C105	220 10V		RME-G-D-250	EP15-250	PC250-10	VTT220F10	EV-1140
C109	470 16V		RME-L-E-500	EP15-500	PC500-16	VTT470J16	EV-1250
C110	470 10V		RME-K-D-500	EP15-500	PC500-16	VTT470J16	EV-1150
C111	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C112	100 10V		RME-E-E-100	EP15-100	PC100-10	VTT100E10	EV-1130
C114	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C115	220 10V		RME-G-D-250	EP15-250	PC250-10	VTT220F10	EV-1140
C117	470 16V		RME-L-E-500	EP15-500	PC500-16	VTT470J16	EV-1250
C118	470 10V		RME-K-D-500	EP15-500	PC500-16	VTT470J16	EV-1150
C119	470 16V		RME-L-E-500	EP15-500	PC500-16	VTT470J16	EV-1250
C120	220 10V		RME-G-D-250	EP15-250	PC250-10	VTT220F10	EV-1140
C121	1 10V		RME-A-J-001	EP15-1	PC1-56	TT12X1	EV-1315
C122	1000 16V		RME-N-E-1000	EP15-1000	PC1000-16	VTT1000L16	EV-1260
C123	470 10V		RME-N-E-1000	EP15-1000	PC1000-16	VTT1000L16	EV-1260
C124	470 10V	(1)					
C125	470 10V	(1)					
C130	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C131	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C201	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C202	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C203	10 10V NP		CTA-7315	EN15-106	WNP10-50	TCN5010A	TVAN-1112.4
C204	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C205	10 10V NP		CTA-7315	EN15-106	WNP10-50	TCN5010A	TVAN-1112.4
C208	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C210	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C211	100 10V		RME-E-E-100	EP15-100	PC100-10	VTT100E10	EV-1130
C212	10 16V NP		CTA-7315	EN25-106	WNP10-50	TCN5010A	TVAN-1204.1
C215	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C216	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C217	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C218	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C219	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C222	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C223	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C224	10 10V NP		CTA-7315	EN15-106	WNP10-50	TCN5010A	TVAN-1112.4
C225	10 10V NP		CTA-7315	EN15-106	WNP10-50	TCN5010A	TVAN-1112.4
C226	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C228	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C229	100 10V		RME-E-E-100	EP15-100	PC100-10	VTT100E10	EV-1130
C230	10 10V NP		CTA-7315	EN15-106	WNP10-50	TCN5010A	TVAN-1112.4
C234	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C235	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C236	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C237	10 16V		RME-B-G-010	EP15-10	PC10-25	VTT10A25	EV-1222
C238	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C239	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C240	47 6.3V		RME-D-D-050	EP15-50	PC50-10	TT10X50A	TVA-1129.94
C246	100 10V		RME-E-E-100	EP15-100	PC100-10	VTT100E10	EV-1130
C251	220 16V		RME-J-E-250	EP15-250	PC250-25	VTT220G16	EV-1240

(1) Used in some versions.

CAPACITORS

ITEM No.	RATING	MFGR. PART No.	REPLACEMENT DATA				
			ARCO PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C1	35		CCT0-390			CN0439	10TCC-Q39
C2	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C3	20		CCT0-200	DTZ-15	NP020	CN0420	10TCC-Q20
C4	13		CCT0-150	DTZ-15	NP015	CN0415	10TCC-Q15
C5	20		CCT0-200	DTZ-15	NP020	CN0420	10TCC-Q20
C6	10		CCT0-100	DTZ-15	NP010	CN0410	10TCC-Q10
C7	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C8	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C9	15		CCT0-150	DTZ-15	NP015	CN0415	10TCC-Q15
C10	5		CCT0-50				10TCC-V50
C11	3		CCT0-3R3	DTZ-3R3	NP03P3	CN0533	10TCC-V33
C12	280		CCD-301	DD-301	GP300	GP330	10TS-T30
C13	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C14	15		CCT0-150	DTZ-15	NP015	CN0415	10TCC-Q15
C15	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C16	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C17	2		CCT0-2R2	DTZ-2R2	NP02P2	CN0521	10TCC-V22
C18	.02		CCD-203			GP120	5GA-S20
C19	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C20	3		CCT0-3R3	DTZ-3R3	NP03P3	CN0533	10TCC-V33
C21	10		CCT0-100	DTZ-10	NP010	CN0410	10TCC-Q10
C22	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C23	7		CCT0-100	DTZ-10	NP010	CN0410	10TCC-Q10
C24	.04		CCD-403			GP140	5GA-S40
C25	.04		CCD-403			GP140	5GA-S40
C26	15		CCT0-150	DTZ-15	NP015	CN0415	10TCC-Q15
C27	.005 NPO		CCD-502				10TS-D50
C28	10		CCT0-100	DTZ-10	NP010	CN0410	10TCC-Q10
C29	.01 NPO		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C30	.04		CCD-403			GP140	5GA-S40
C31	.04		CCD-403			GP140	5GA-S40
C32	.02		CCD-203			GP120	5GA-S20
C33	470		CCD-471	DD-471	GP470	GP347	10TS-T47
C34	.04		CCD-403			GP140	5GA-S40
C35	.04		CCD-403			GP140	5GA-S40
C36	.02		CCD-203			GP120	5GA-S20

PARTS LIST AND DESCRIPTION (CONTINUED)

(When ordering parts, state Model, Part Number, and Description.)

CAPACITORS (cont)

ITEM No.	RATING	MFGR. PART No.	REPLACEMENT DATA				
			ARCO PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C37	2		CCT0-2R2	DTZ-2R2	NP02P2	CN0522	10TCC-V22
C38	200		CCD-201	DD-201	GP200	GP320	10TS-T20
C39	200		CCD-201	DD-201	GP200	GP320	10TS-T20
C40	470		CCD-471	DD-471	GP470	GP347	10TS-T47
C41	.04		CCD-403			GP140	5GA-S40
C42	.04		CCD-403			GP140	5GA-S40
C44	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C45	.01		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C47	10		CCT0-100	DTZ-10	NP010	CN0410	10TCC-Q10
C48	.01 NPO		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C50	7		CCT0-100	DTZ-10	NP010	CN0410	10TCC-Q10
C51	.01 NPO		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C52	100		CCD-101	DD-101	GP100	GP310	10TS-T10
C55	2		CCT0-2R2	DTZ-2R2	NP02P2	CN0522	10TCC-V22
C57	.04		CCD-403			GP140	5GA-S40
C58	.001 10%		CCD-103	DD-1032	GP10000	GP110	10TS-S10
C59	470 10%		CCD-101	DD-101	GP100	GP310	10TS-T10
C60	100		CCD-101	DD-101	GP100	GP310	10TS-T10
C63	.0056 10%		CCD-403			GP140	5GA-S40
C65	.04		CCD-403			GP140	5GA-S40
C66	470 10%		CCD-403			GP140	5GA-S40
C67	.04		CCD-403			GP140	5GA-S40
C68	.0056 10%		CCD-403			GP140	5GA-S40
C70	.02		CCD-203			GP120	5GA-S20
C71	.0015 10%		CCD-203			GP120	5GA-S20
C72	.001 10%		CCD-203			GP120	5GA-S20
C73	.0047 10%		CCD-203			GP120	5GA-S20
C76	.001 10%		CCD-203			GP120	5GA-S20
C77	.0015		CCD-203			GP120	5GA-S20
C78	.001 10%		CCD-203			GP120	5GA-S20
C79	.0047 100V 10%		CCD-203			GP120	5GA-S20
C82	.001 10%		CCD-203			GP120	5GA-S20
C83	.0015		CCD-203			GP120	5GA-S20
C84	350 5V		CCD-203			GP120	5GA-S20
C103	.1 50V		CCD-203			GP120	5GA-S20
C108	150		CCD-203			GP120	5GA-S20
C113	.1 50V		CCD-203			GP120	5GA-S20
C116	150		CCD-203			GP120	5GA-S20
C126	.04		CCD-403			GP140	5GA-S40
C127	.04		CCD-403			GP140	5GA-S40
C128	.04		CCD-403			GP140	5GA-S40
C206	.0033 50V 10%		CCD-203			GP120	5GA-S20
C207	.1 60V		CCD-203			GP120	5GA-S20
C209	100		CCD-203			GP120	5GA-S20
C213	.01 NPO		CCD-203			GP120	5GA-S20
C220	470 10%		CCD-203			GP120	5GA-S20
C221	220 10%		CCD-203			GP120	5GA-S20
C227	.0033 50V 10%		CCD-203			GP120	5GA-S20
C232	470 10%		CCD-203			GP120	5GA-S20
C233	.01 NPO		CCD-203			GP120	5GA-S20
C242	220 10%		CCD-203			GP120	5GA-S20
C243	.1 50V		CCD-203			GP120	5GA-S20
C244	100		CCD-203			GP120	5GA-S20
C245	.02 50V		CCD-203			GP120	5GA-S20
C247	.01 50V		CCD-203			GP120	5GA-S20
C248	.0033 50V 10%		CCD-203			GP120	5GA-S20
C249	.01 50V		CCD-203			GP120	5GA-S20
C250	.0056 50V 10%		CCD-203			GP120	5GA-S20
CT1	Trimmer						
CT2	Trimmer						
CT3	Trimmer						
CT4	Trimmer						
CT5	Trimmer						
VC1	Tuning Gang						

(1) Part of tuning gang

CONTROLS (All wattages 1/2 watt, or less, unless listed)

ITEM No.	FUNCTION	RESISTANCE	REPLACEMENT DATA				
			MFGR. PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	MALLORY PART No.	TRW PART No.
R101	Volume (Left) (Slider)	20K					
R102	Volume (Right) (Slider)	20K					
R103a	Tone (Hi-Low) (Left) (Slider)	100K					
b	Tone (Hi-Low) (Right) (Slider)	100K					
R201	Mic Volume/ Mic Amp Switch	20K					
R202	Record Bias (Left)	100K					
R203	Record Bias (Right)	100K					