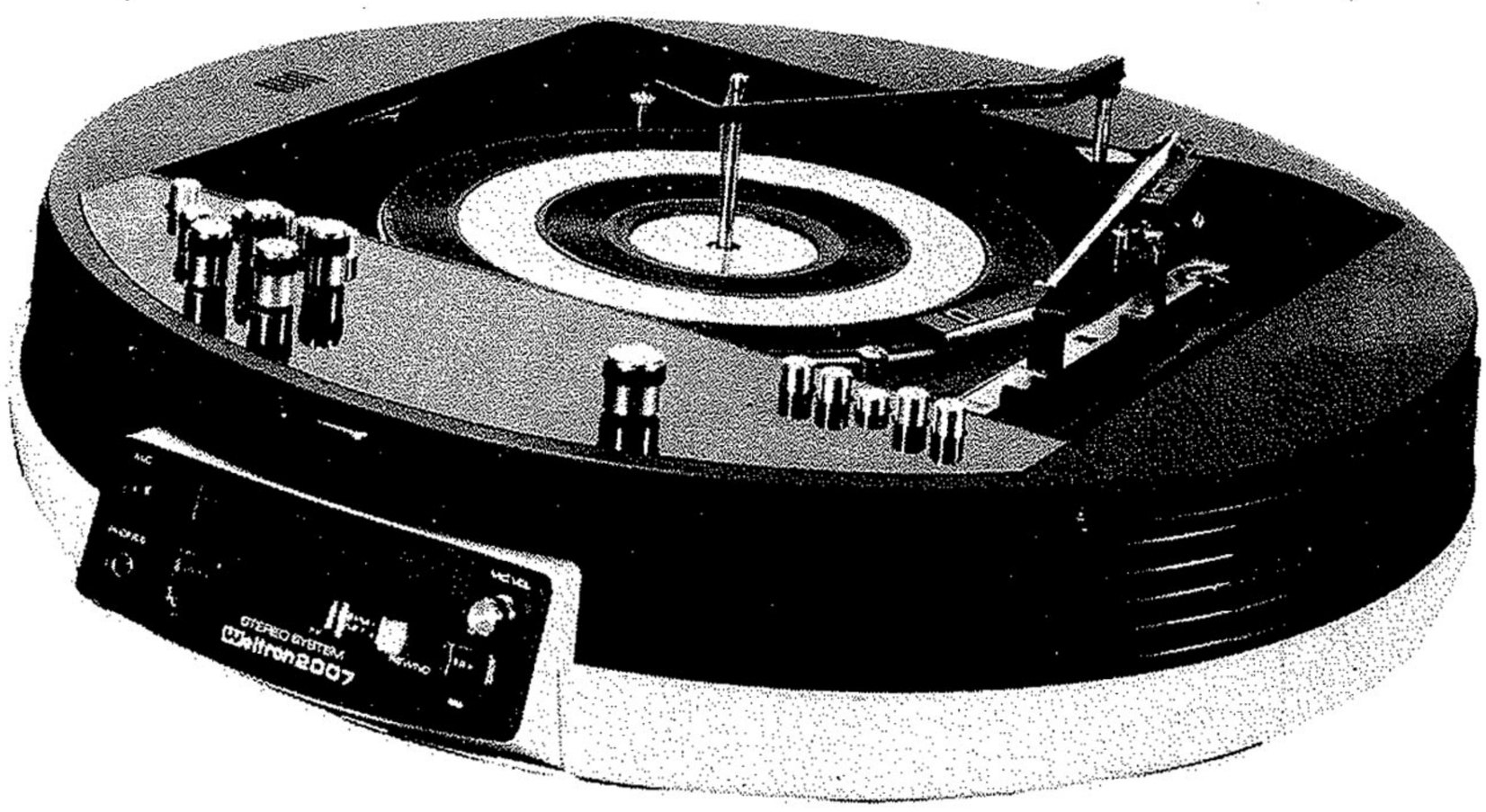


RECORD CHANGER SERVICING

RECORD CHANGER--BSR MODEL C141R1/A/1

ADJUSTMENTS

TONE ARM SETDOWN

Adjust screw B1 so the needle sets down in the center of the lead-in groove on a 12-inch record. Turning the screw clockwise moves the set-down point outward.

TONE ARM HEIGHT

Adjust B2 so the top of the tone arm clears a 12-inch record on the center spindle shelf during the change cycle. Turning B2 clockwise decreases the lift-up height.

ANTI-SKATE

Adjust B5 to correspond with the "Needle Pressure". (Minimum of 2)

CLEANING

Use a cloth dampened with isopropyl alcohol to clean the driving surfaces of the idler wheel, motor shaft and inside rim of the turntable.

LUBRICATION

Apply light nonhardening grease to sliding cam surfaces and pivot points, light machine oil on the tone arm lift rod, idler wheel bearings, and motor bearings.

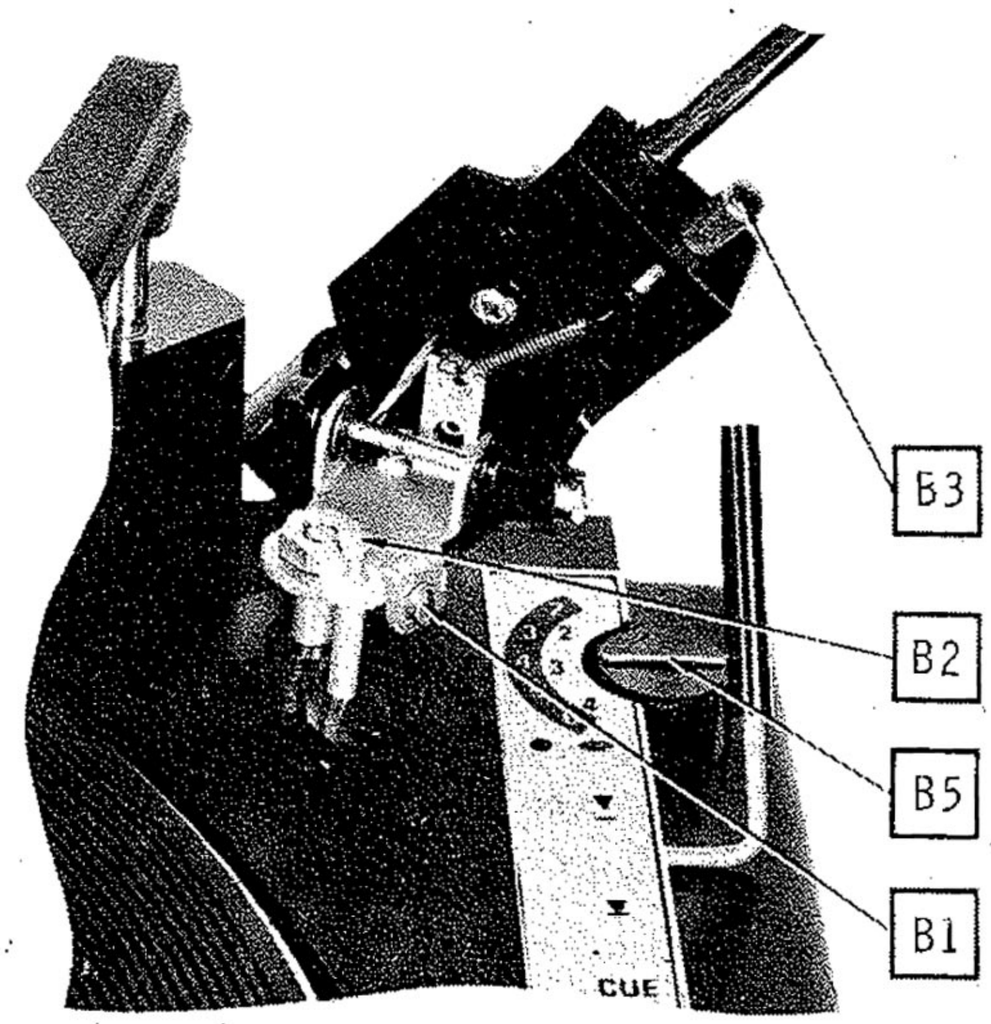
DO NOT lubricate turntable driving surface, the teeth on cycling gear or turntable hub.

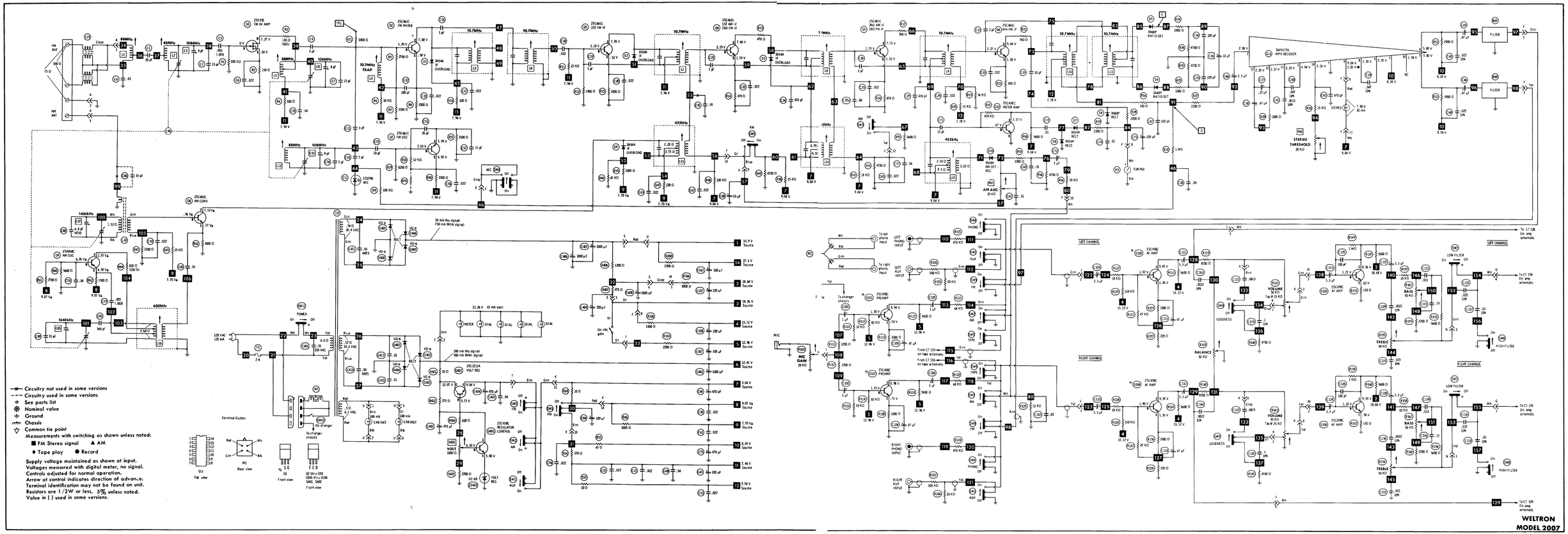
NEEDLE PRESSURE

Nominal pressure 3.5 grams. Adjust B3 to obtain correct needle pressure. Turning B3 clockwise decreases needle pressure.

DRIVE IDLER HEIGHT

Select 33 rpm and adjust the screw in the idler support arm so the idler wheel is in the center of the 33 rpm section of the motor shaft.





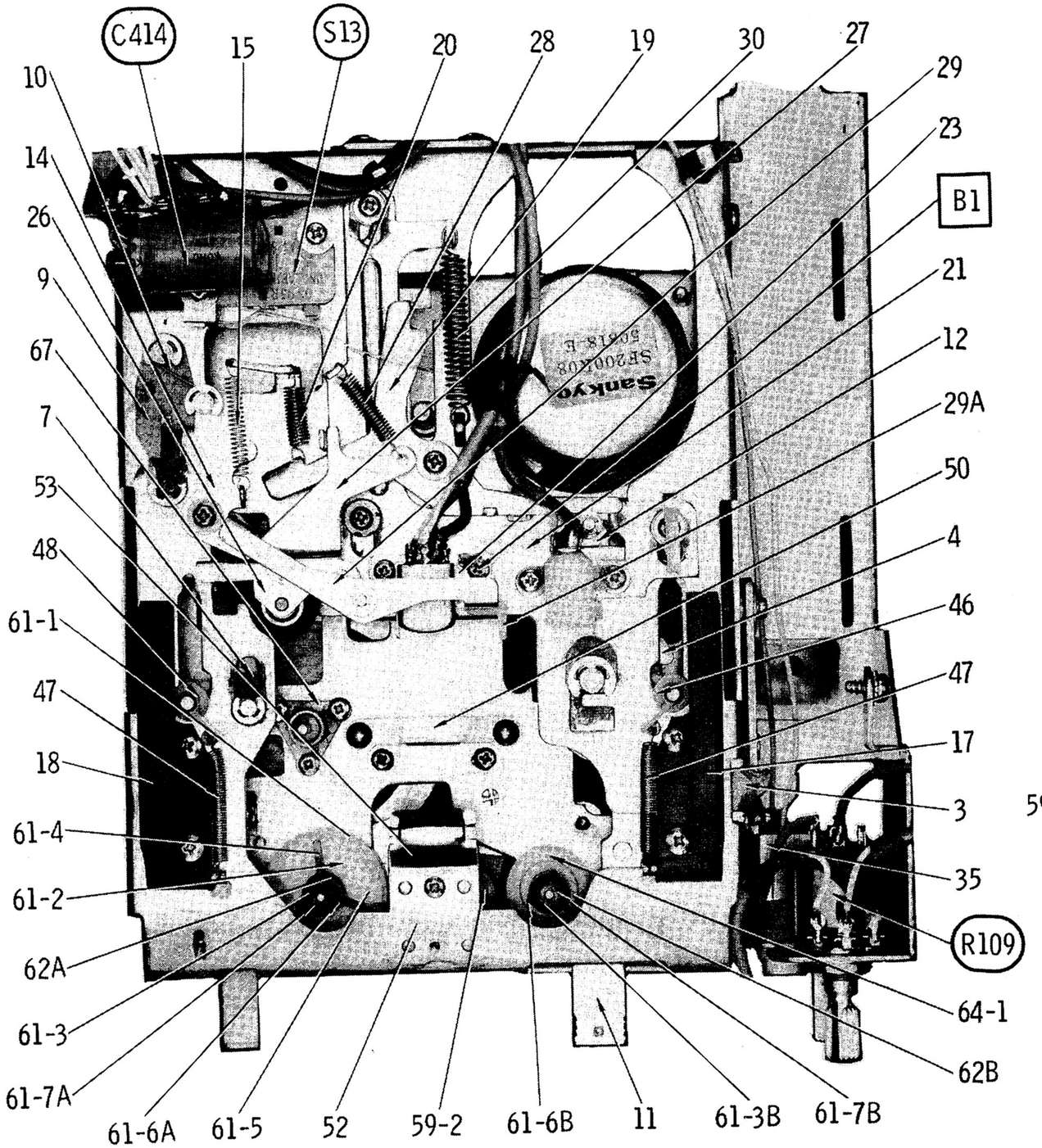
- Circuitry not used in some versions
- Circuitry used in some versions
- See parts list
- Nominal value
- Ground
- Chassis
- Common tie point

Measurements with switching as shown unless noted:

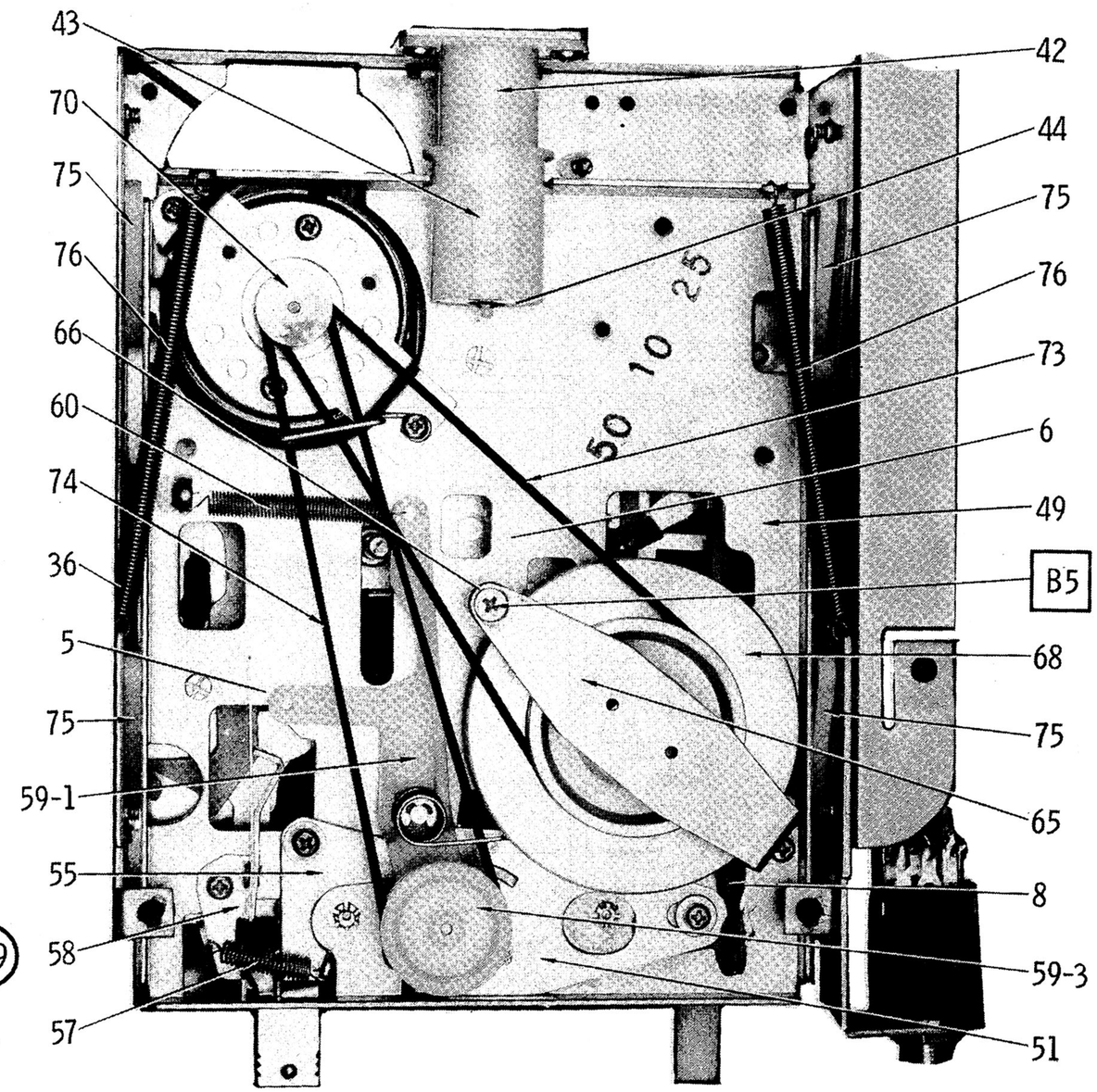
- ■ FM Stereo signal
- ▲ AM
- ♦ Tape play
- ● Record

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, 5% unless noted.
Value in ( ) used in some versions.

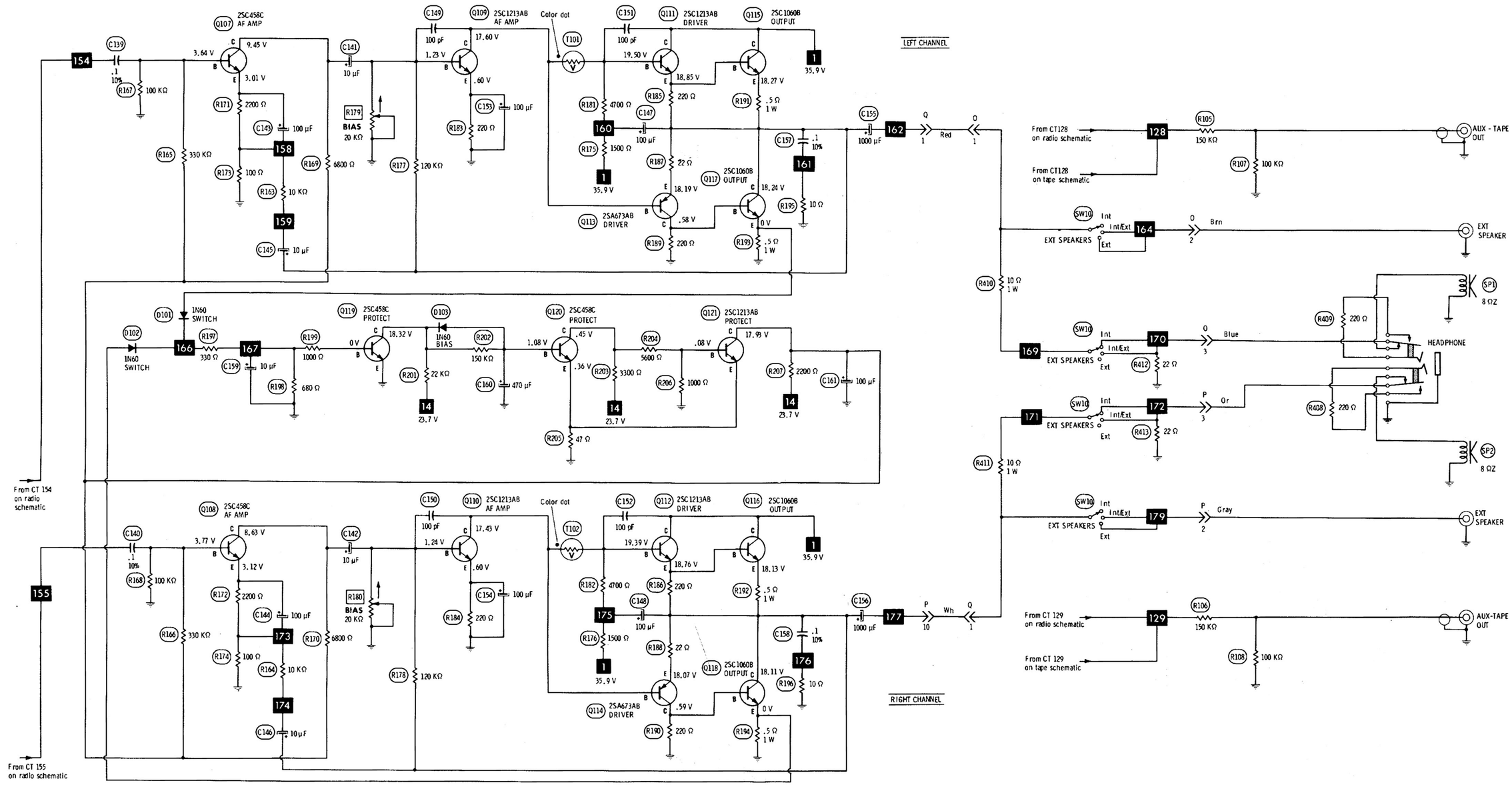
WELTRON MODEL 2007



TAPE CHASSIS



TAPE CHASSIS



- Circuitry not used in some versions
- Circuitry used in some versions
- See parts list
- Nominal value
- Ground
- Chassis
- Common tie point

Measurements with switching as shown unless noted:

■ FM Stereo signal ▲ AM

♦ Tape play ● Record

Supply voltage maintained as shown at input.
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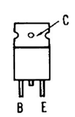
Value in ( ) used in some versions.

Terminal Guides



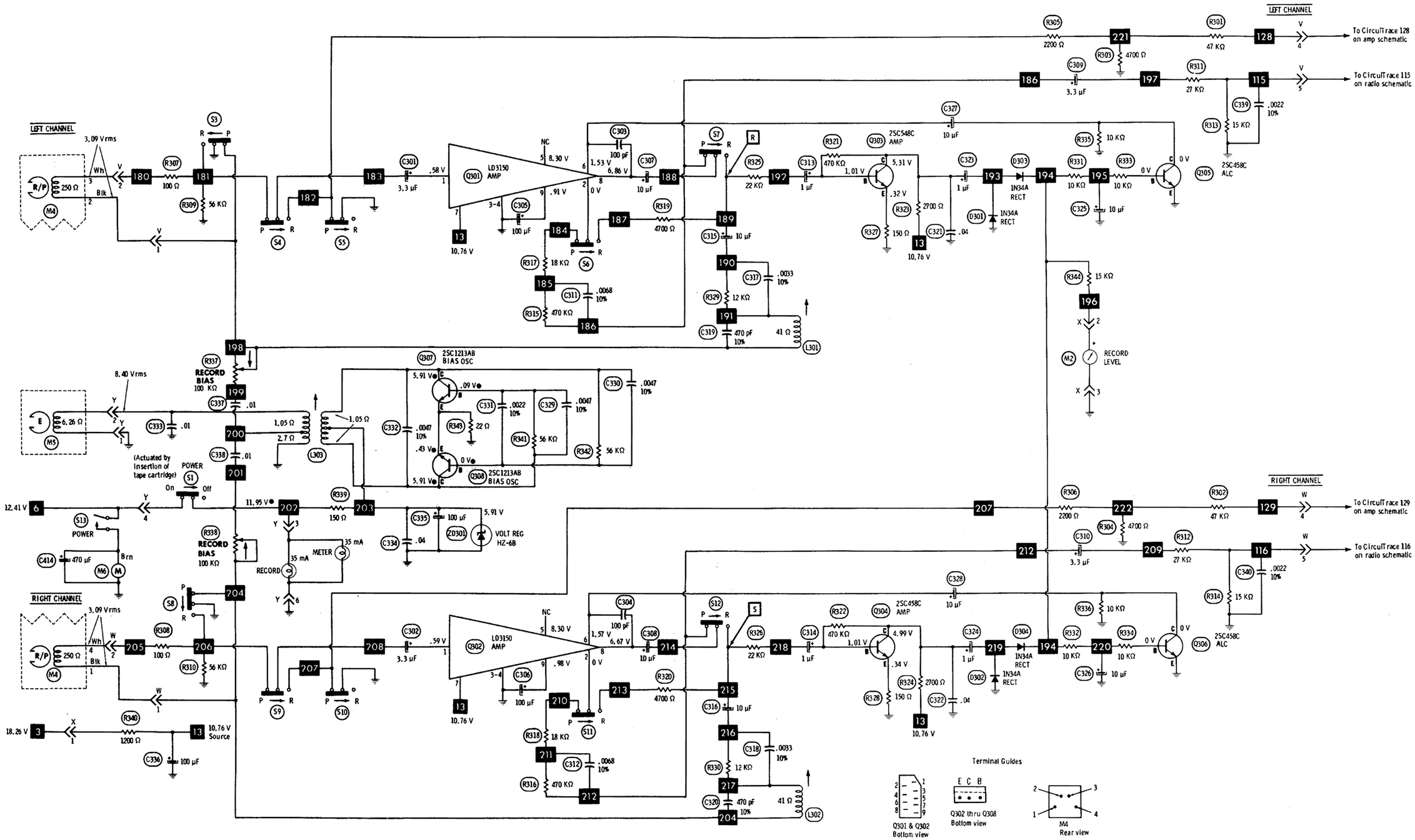
Q116 thru Q118
Front view

Q107 thru Q114
Q119, Q120
Front view

AMP SCHEMATIC

AMP SCHEMATIC

NOTE: DEMAGNETIZE HEADS AFTER SERVICING



- Circuitry not used in some versions
- Circuitry used in some versions
- See parts list
- Nominal value
- Ground
- Chassis
- Common tie point

Measurements with switching as shown unless noted:
■ FM Stereo signal ▲ AM
♦ Tape play ● Record

Supply voltage maintained as shown at input.
Voltages measured with digital meter, no signal.
Controls adjusted for normal operation.
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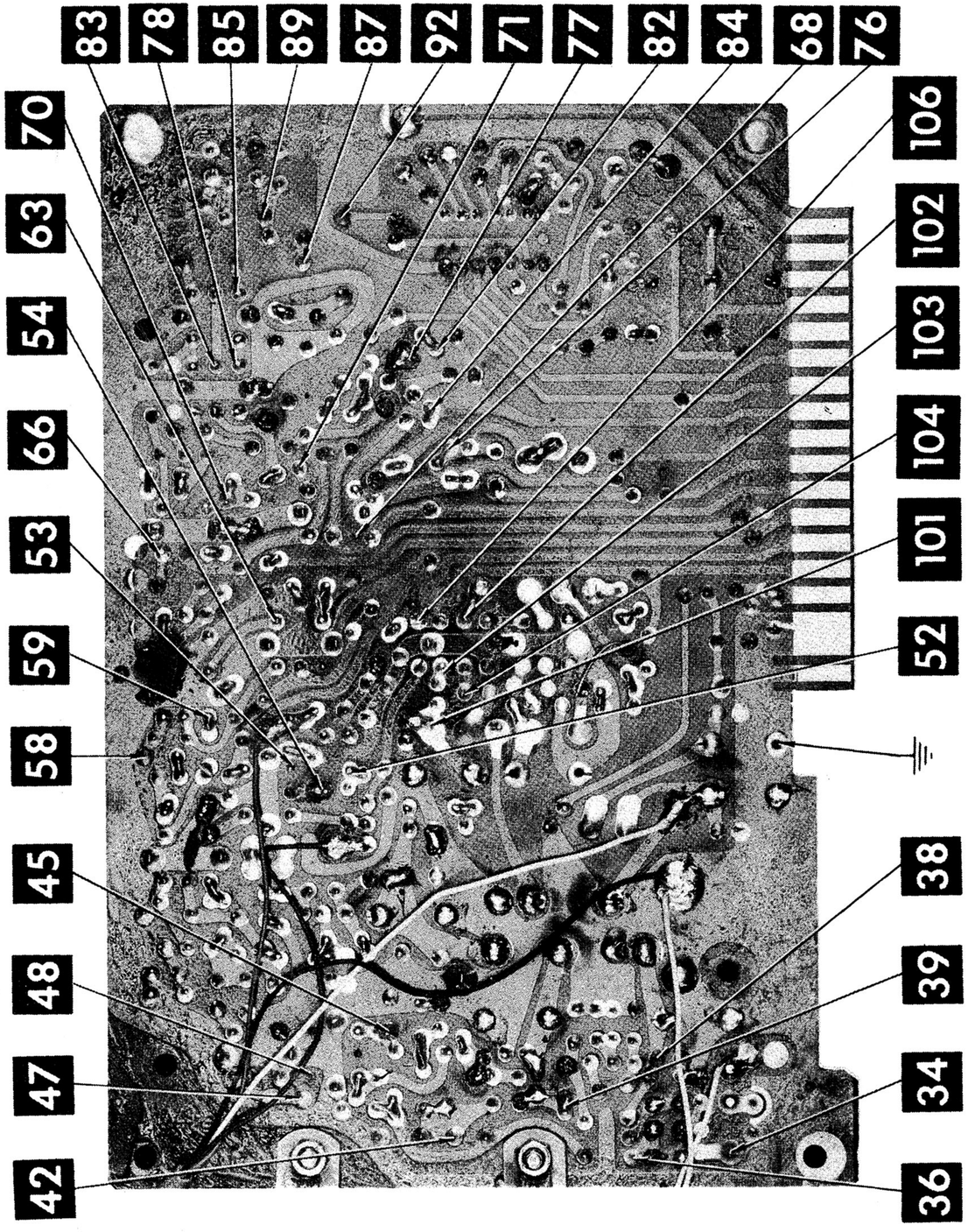
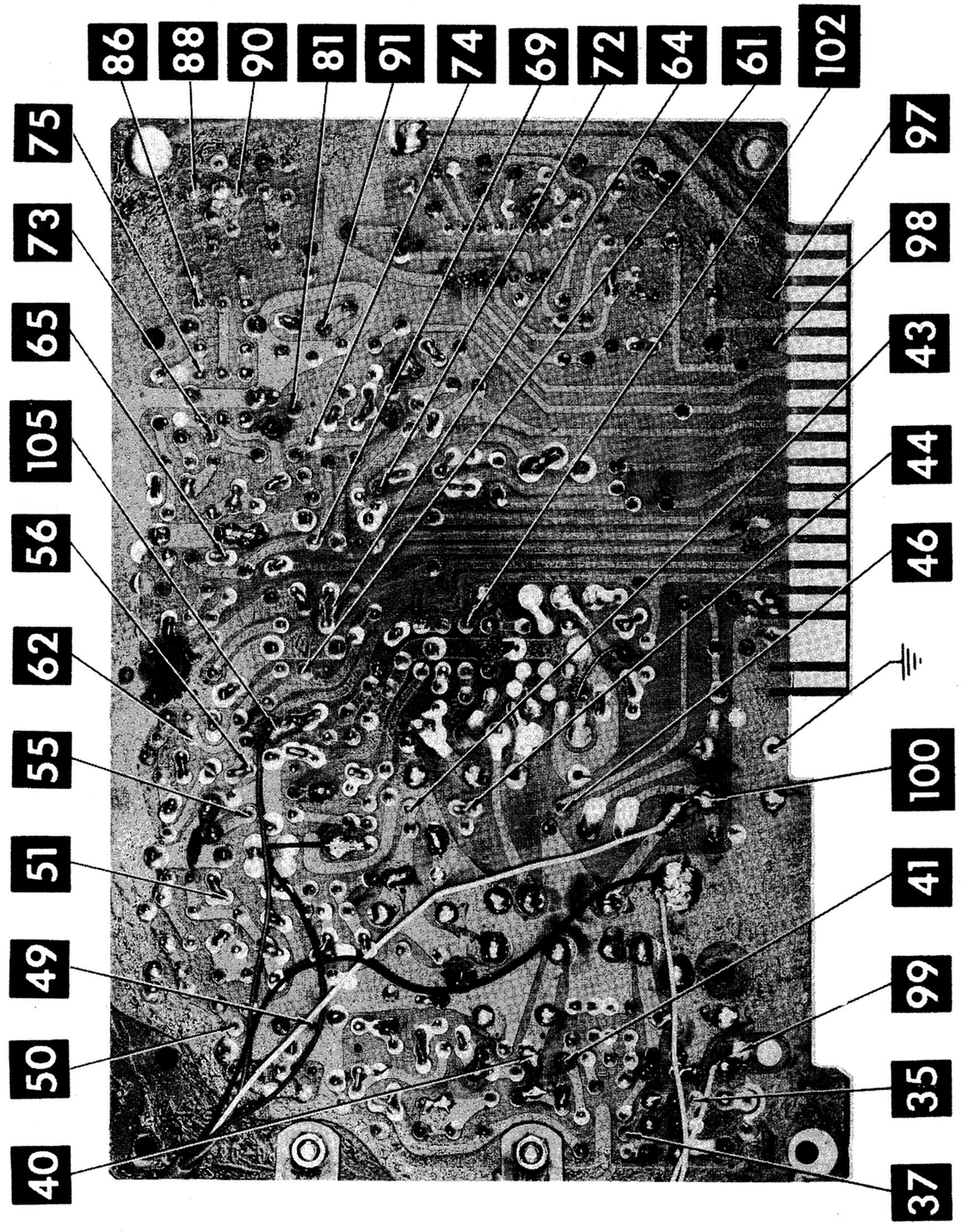
Value in ( ) used in some versions.

TAPE SCHEMATIC

TAPE SCHEMATIC

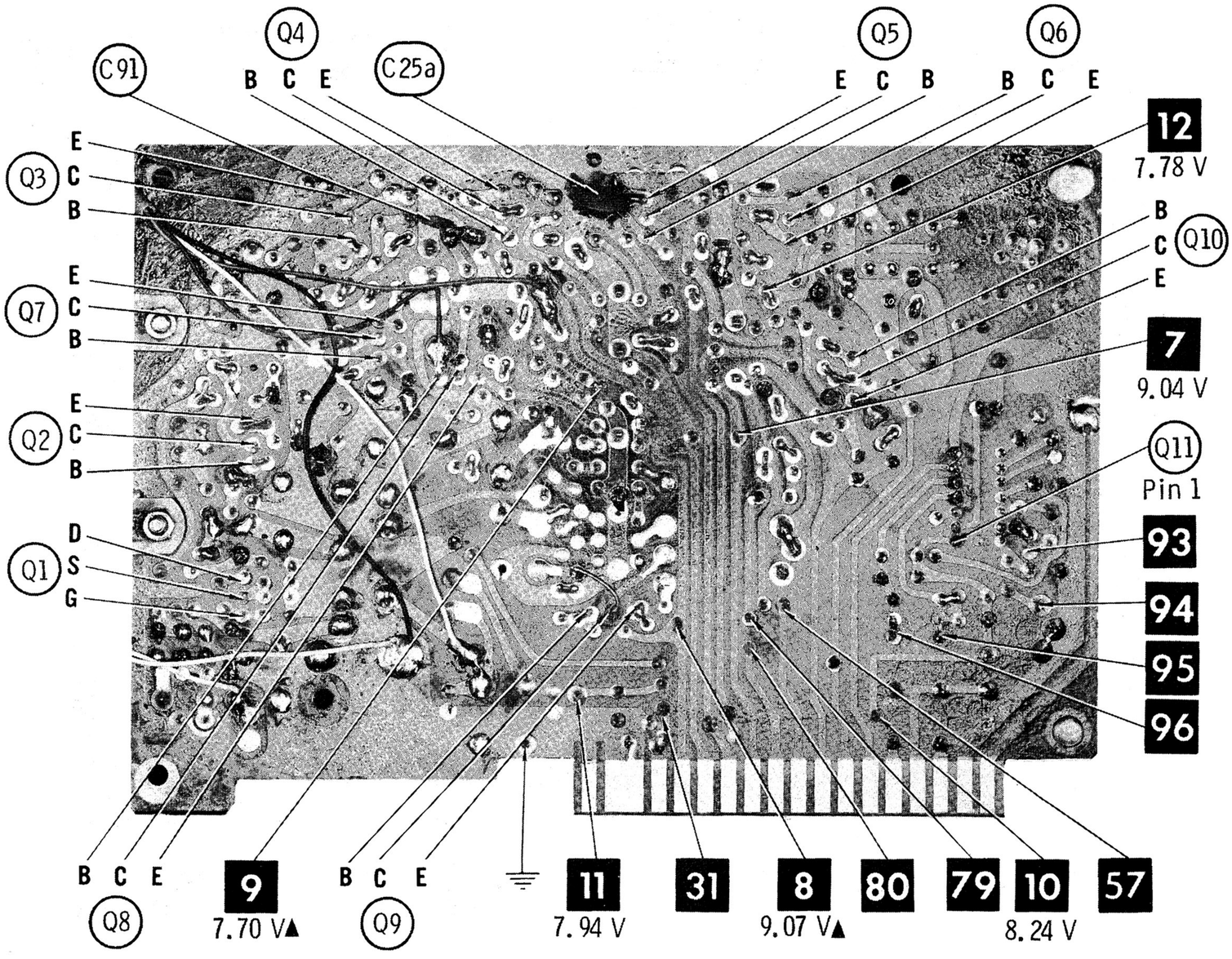


TUNER BOARD

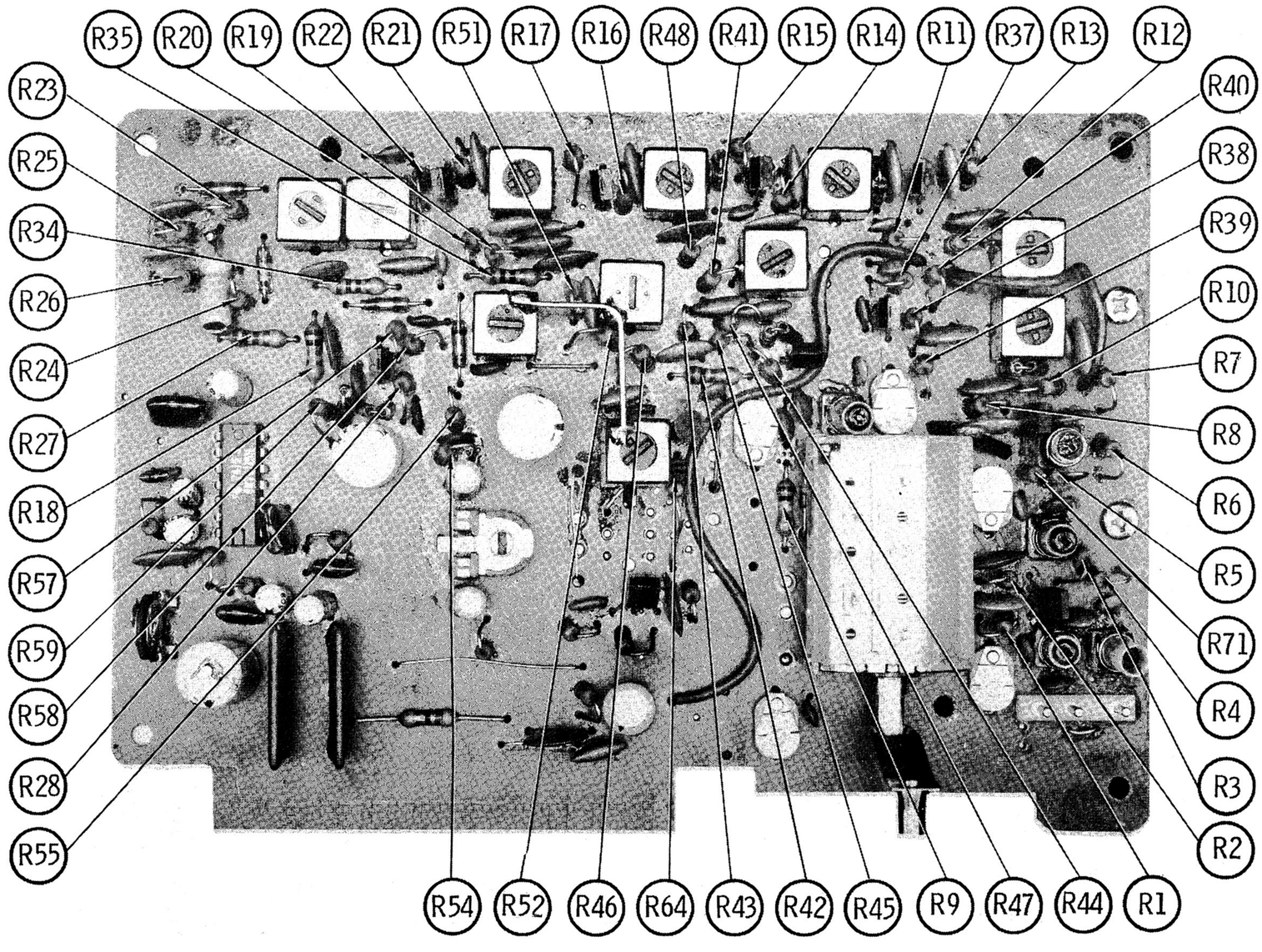


TUNER BOARD

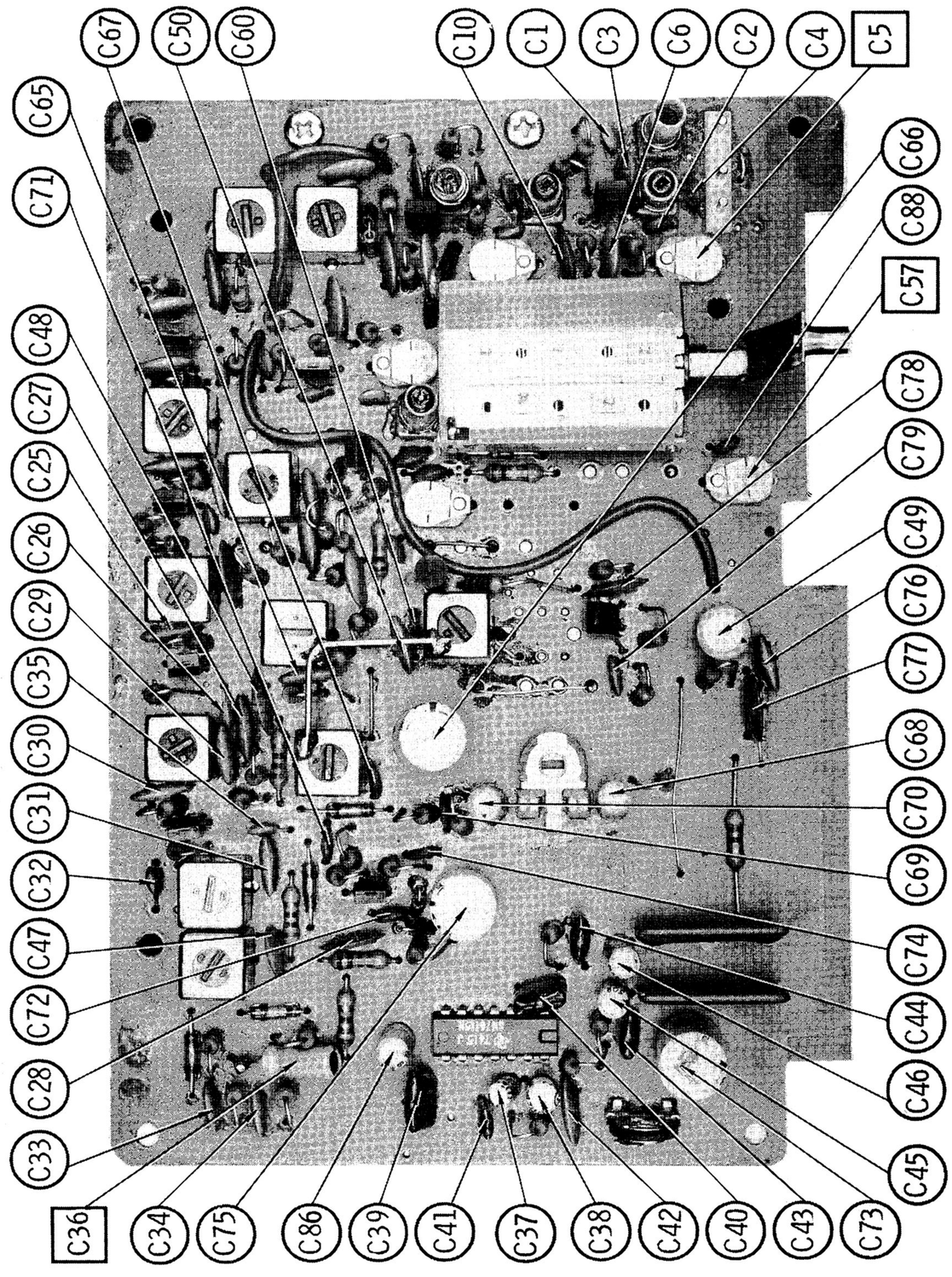
TUNER BOARD



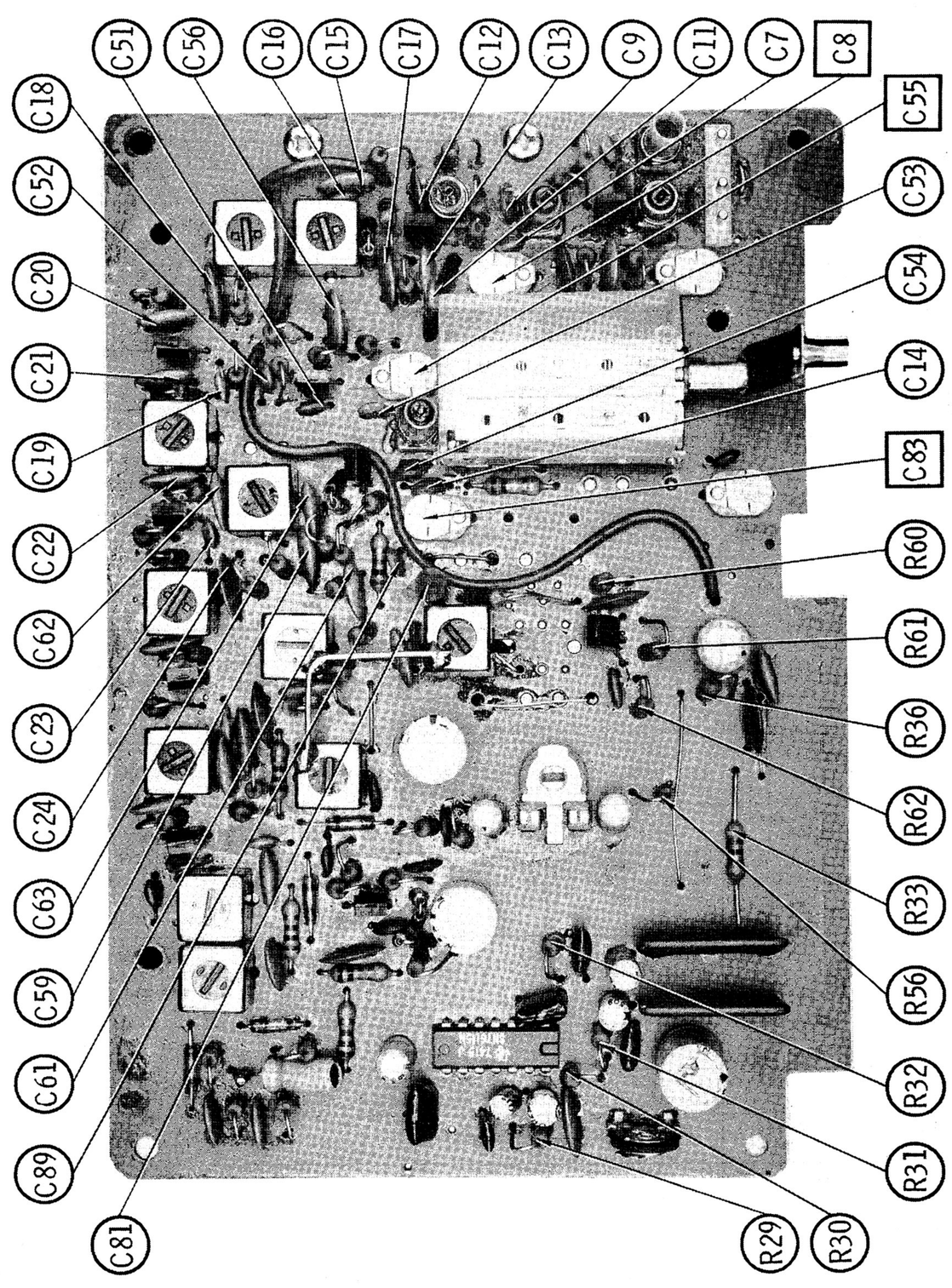
▲ Measured in AM Position.



TUNER BOARD



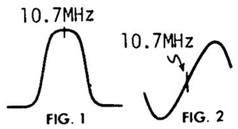
TUNER BOARD



TUNER BOARD

ALIGNMENT INSTRUCTIONS

CAUTION: Use isolation transformer or observe polarity when connecting test equipment.
Connect low sides of generator and indicator to ground unless specified otherwise.
Maintain line voltage at 120V AC. Allow a 15-minute warm-up period.
Use only enough generator output to obtain a suitable indication.
Suggested alignment Tools: GC ELECTRONICS:
L1, L2, L3, L12 9440
L5 thru L11, L13 thru L16 9293



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	L15,L14,L13	Adjust for maximum. Repeat until no further improvement is noted.
600kHz	600kHz	"	L16	Adjust for maximum.
1640kHz	1640kHz	"	C83	Adjust for maximum.
1400kHz	1400kHz	"	C57	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 TP1.

GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
10.7MHz Unmodulated	Point of non-interference	DC probe of VTVM to point C.	L10,L9,L8,L7, L6,L5	Adjust for maximum.
"	"	DC probe of VTVM to point D.	L11	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

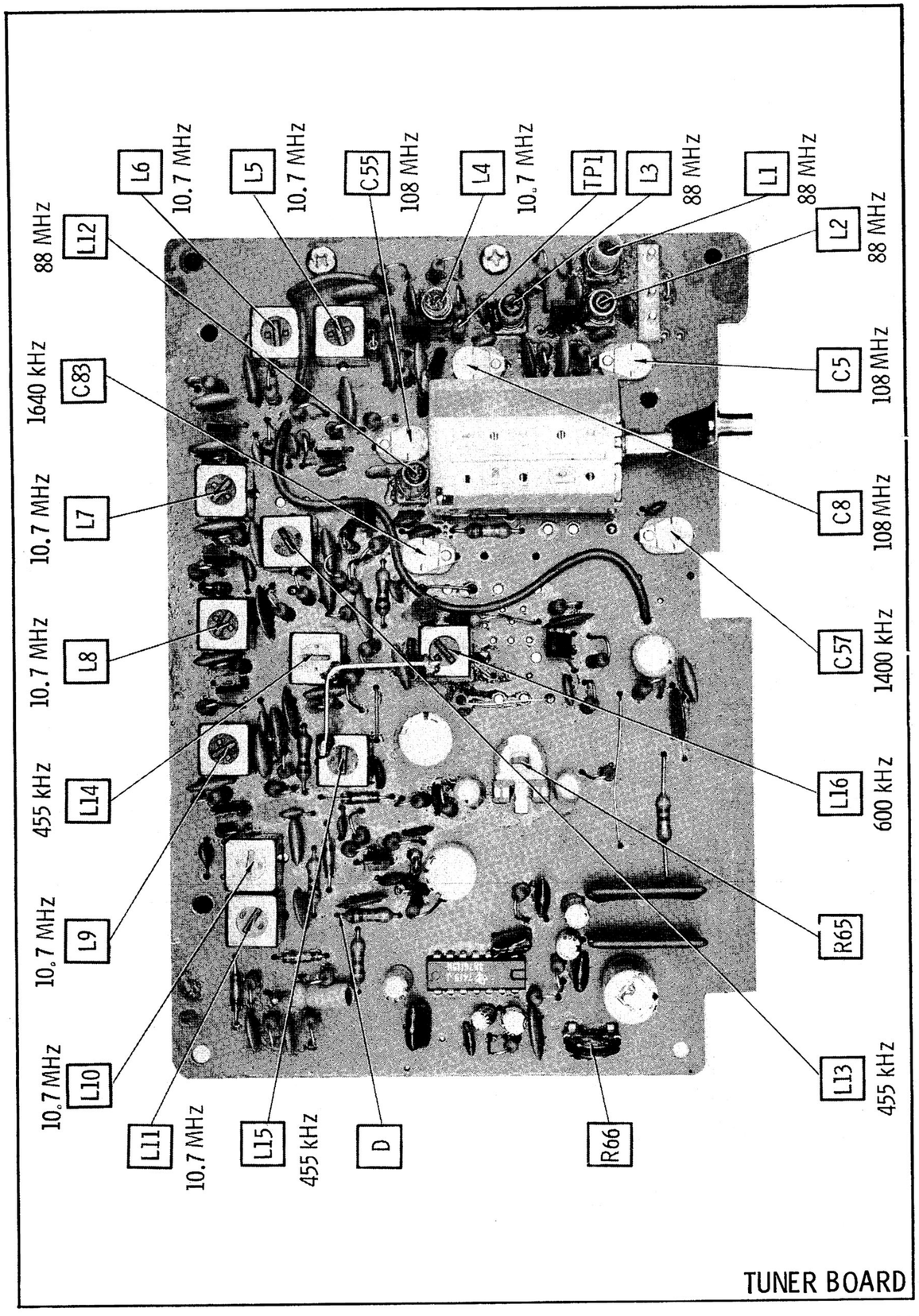
High side of generator thru .001uF to TP1.
Use only enough marker signal for indication. Use 60-hertz, frequency-modulated signal, 450kHz sweep.
Use 60-hertz sawtooth voltage in scope for horizontal deflection.

GENERATOR FREQUENCY	RADIO DIAL SETTING	INDICATOR	ADJUST	REMARKS
10.7MHz 450kHz Sweep	Point of non-interference	Vert input of scope to point C.	L10,L9,L8,L7, L6,L5	Disconnect stabilizing capacitor C36. Adjust for maximum gain and symmetry of response similar to Fig. 1 with markers as shown. Reconnect C36.
"	"	Vert input of scope to point D.	L11	Adjust L11 to place marker at center of S curve similar to Fig. 2. Readjust L10 for maximum amplitude and straightness of line.

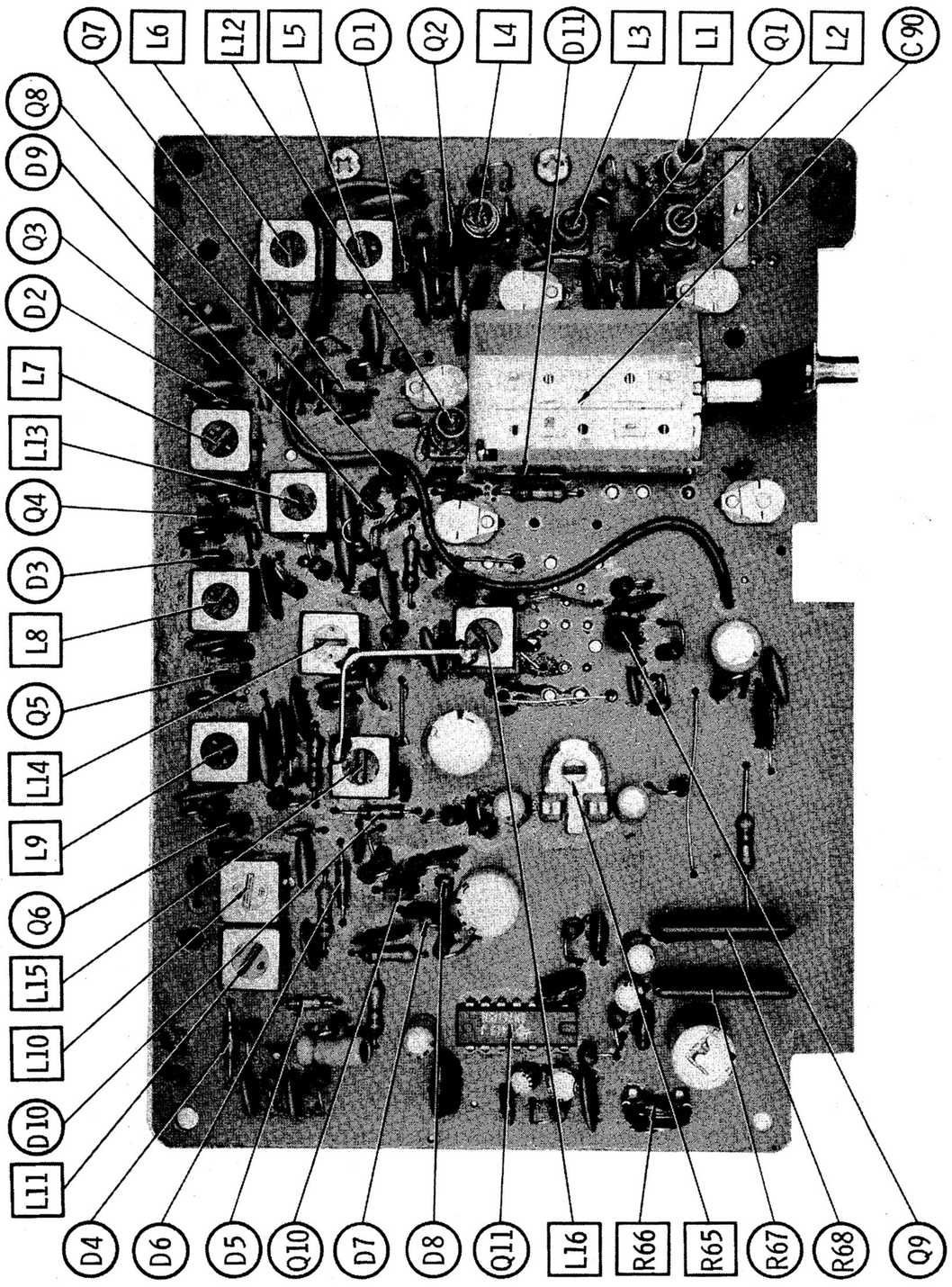
FM RF ALIGNMENT—SELECTOR IN FM POSITION

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.	L12,L3,L2,L1	Adjust for maximum.
108MHz Unmodulated	108MHz	"	C55,C8,C5	Adjust for maximum. Repeat FM RF steps until no further improvement is noted.



TUNER BOARD



TUNER BOARD

ALIGNMENT INSTRUCTIONS (Continued)

TRAP ALIGNMENT

10.7MHz TRAP ADJUSTMENT

Connect a signal generator and scope to TP1. Adjust L4 for MINIMUM at 10.7MHz.

This adjustment is made with the set turned off.

MISCELLANEOUS ADJUSTMENTS

AM AGC ADJUSTMENT

Tune to a weak AM signal and adjust R65 (AM AGC) for a useable output. Then check strong AM signals for overload and readjust if necessary.

VOLTAGE ADJUSTMENT

Adjust R403 for 9.04V DC (regulated) on the emitter of Q402.

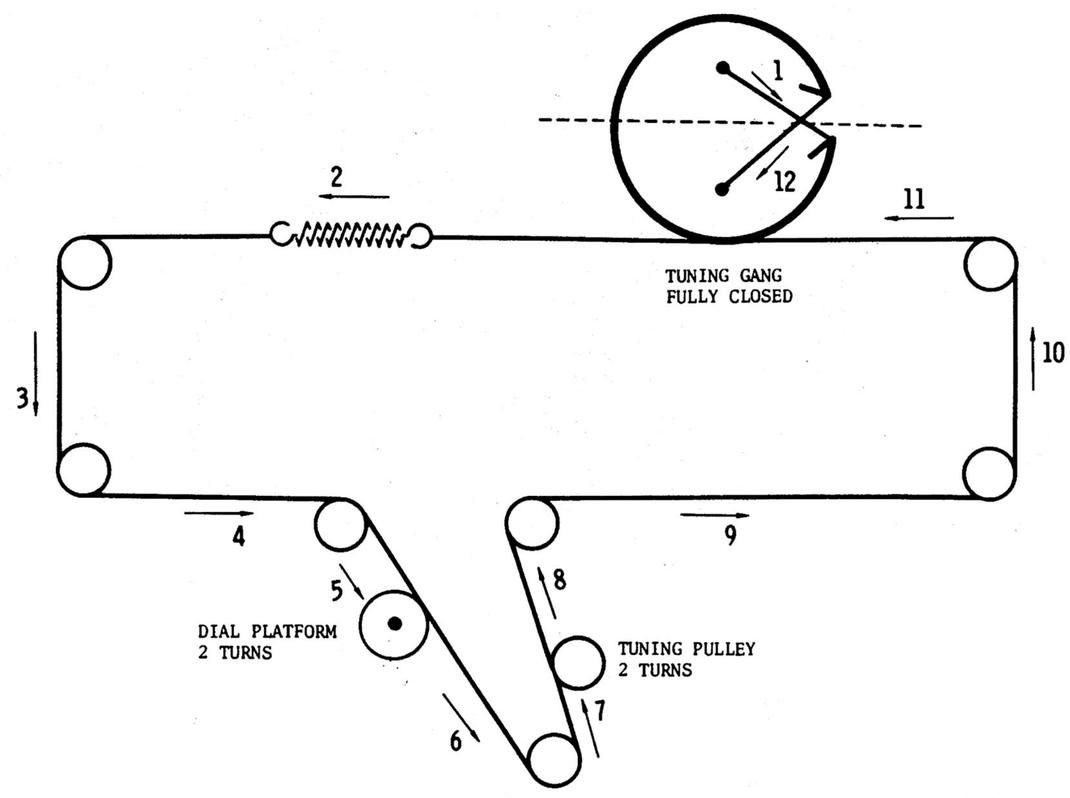
BIAS ADJUSTMENT

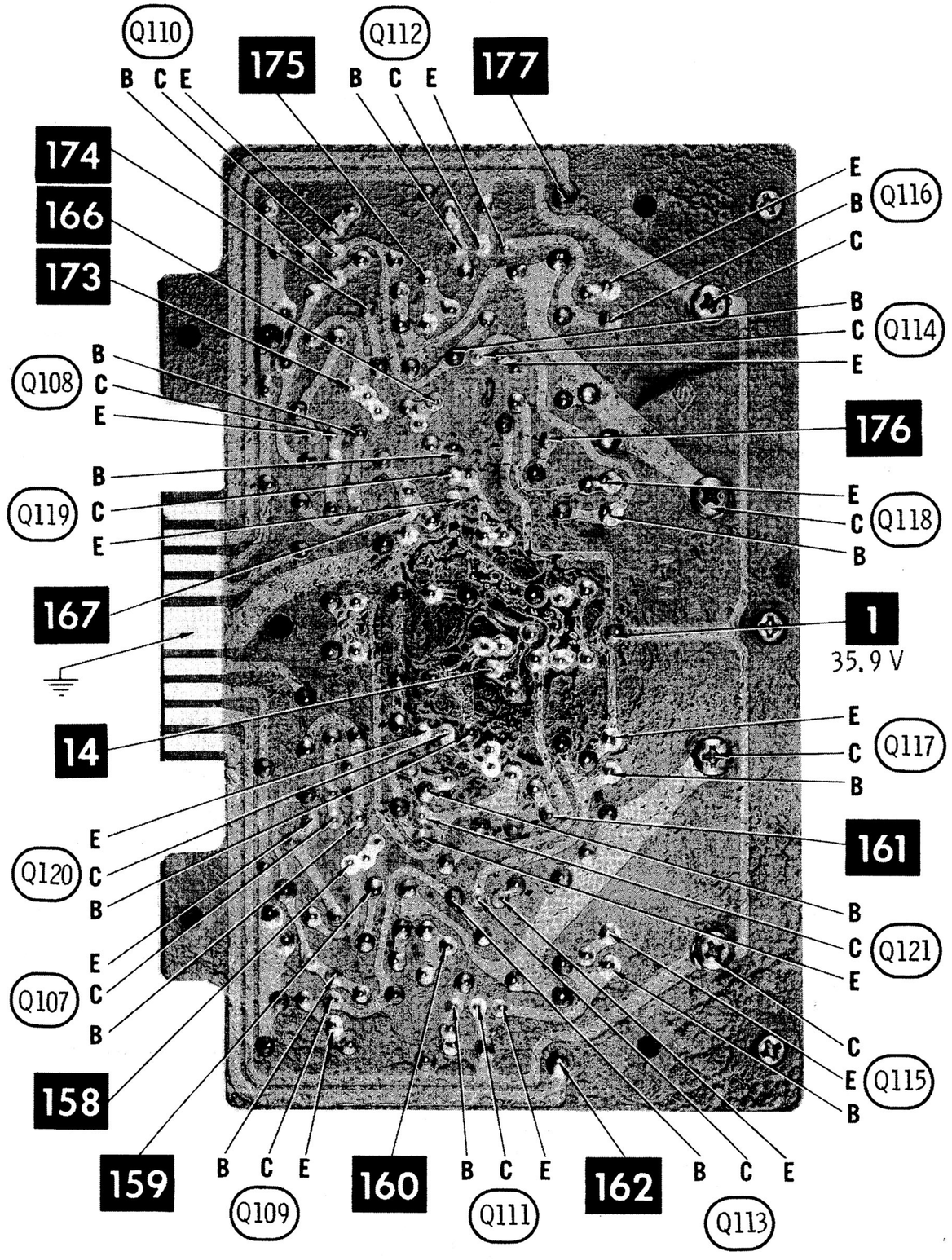
Factory preset. Field adjustment not recommended by manufacturer.

FM STEREO THRESHOLD ADJUSTMENT

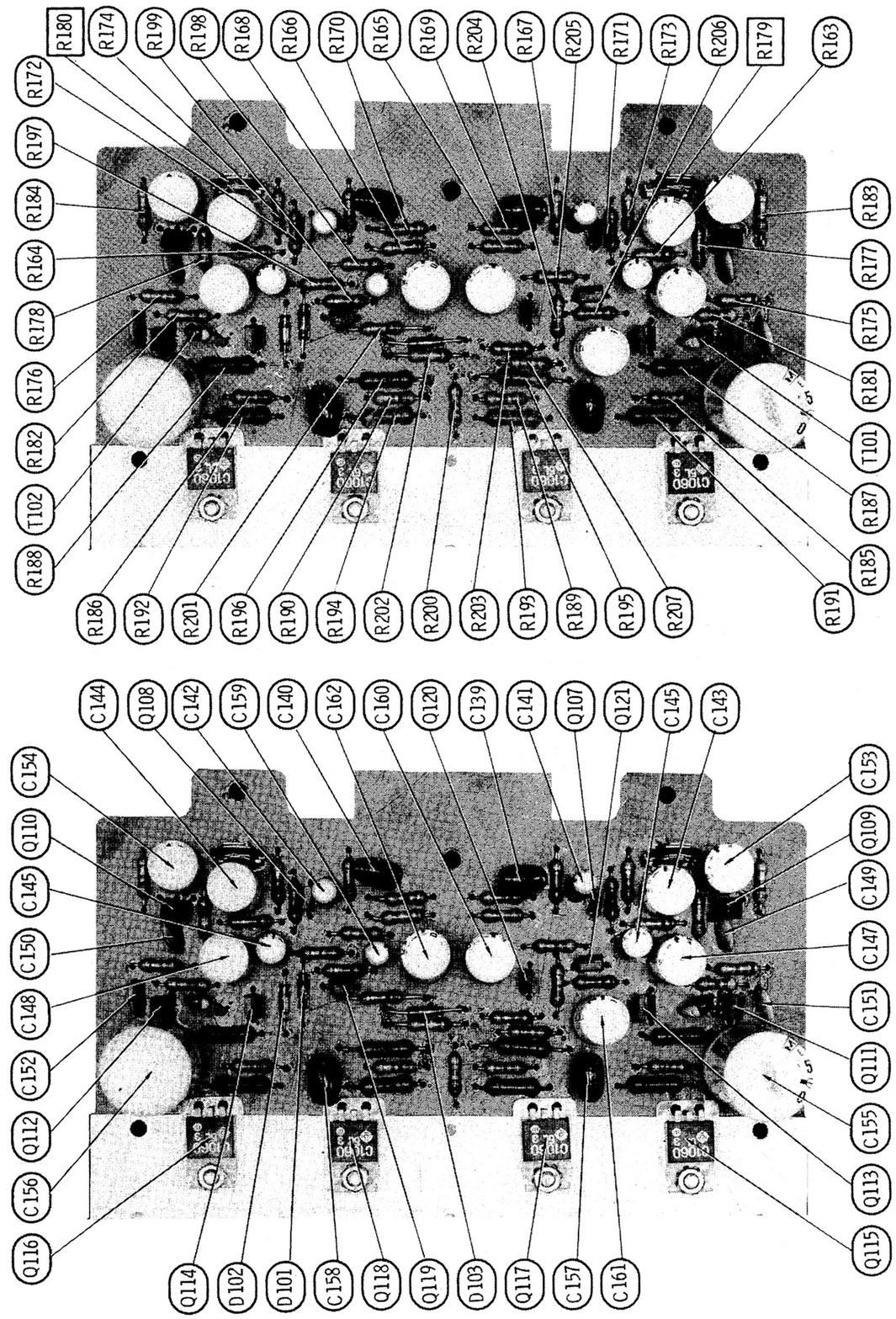
Tune unit for weak stereo signal and adjust R66 for immediate stereo lamp indication.

DIAL CORD STRINGING

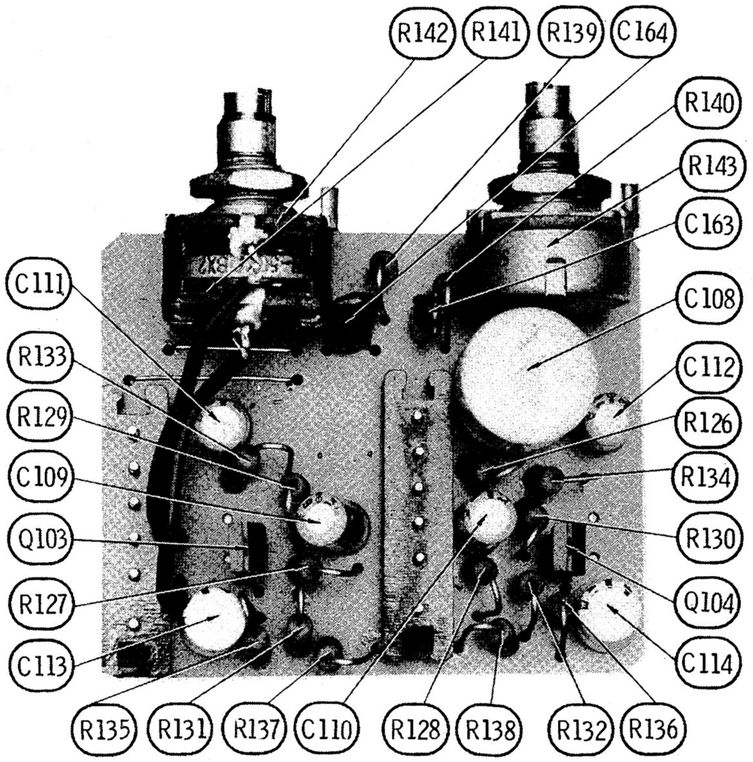


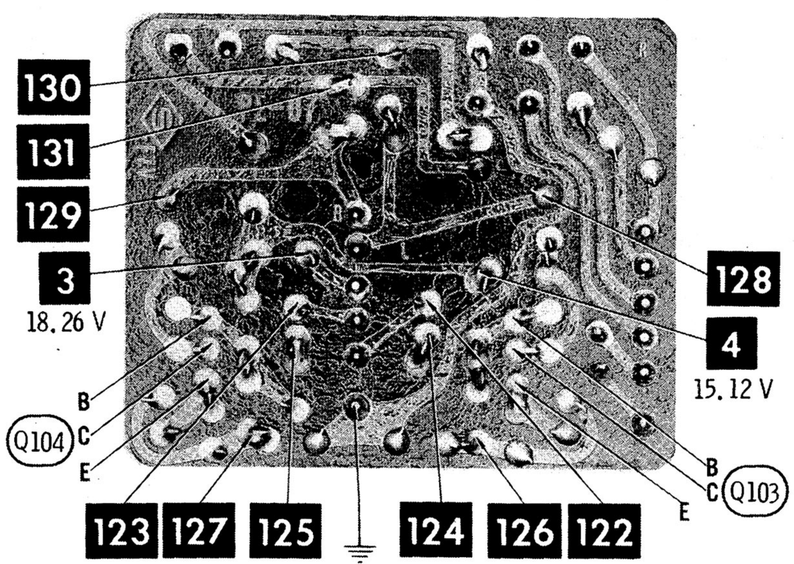


AUDIO AMP BOARD

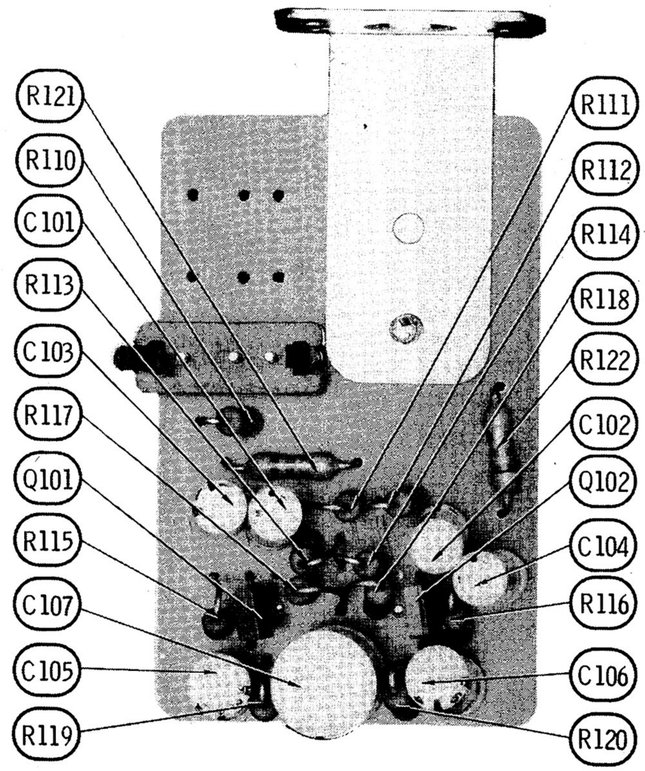


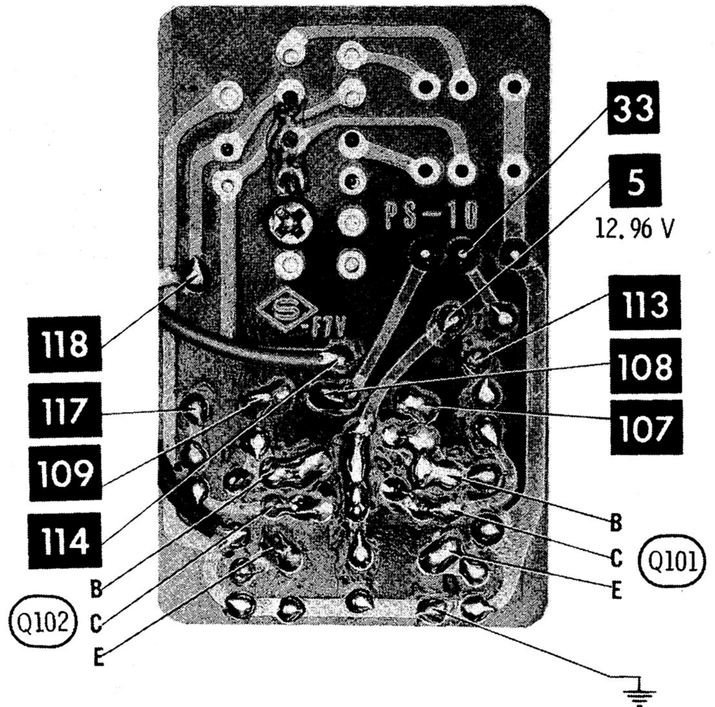
AUDIO AMP BOARD



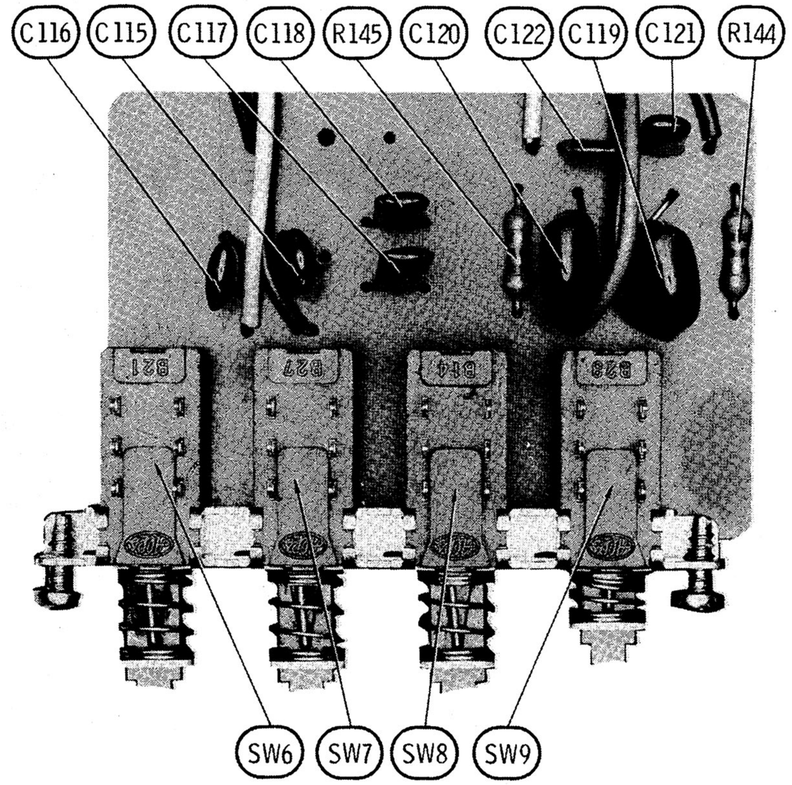


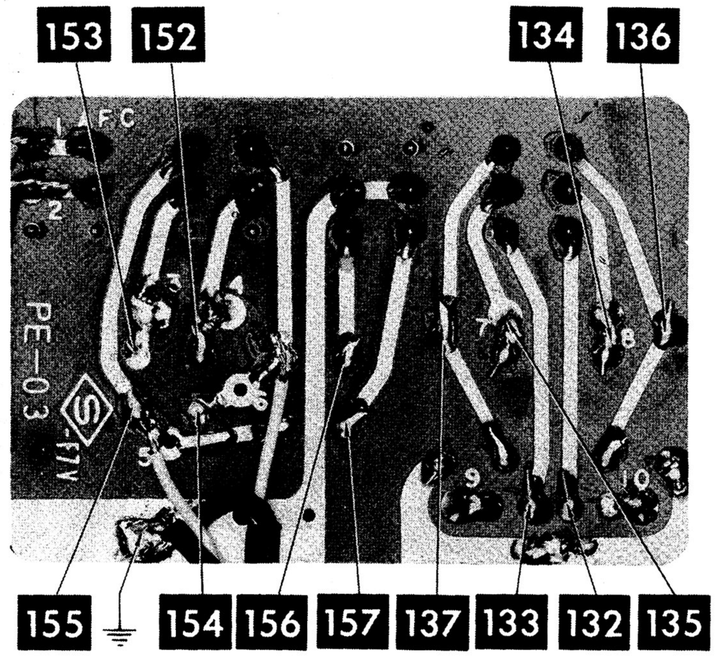
VOLUME BOARD



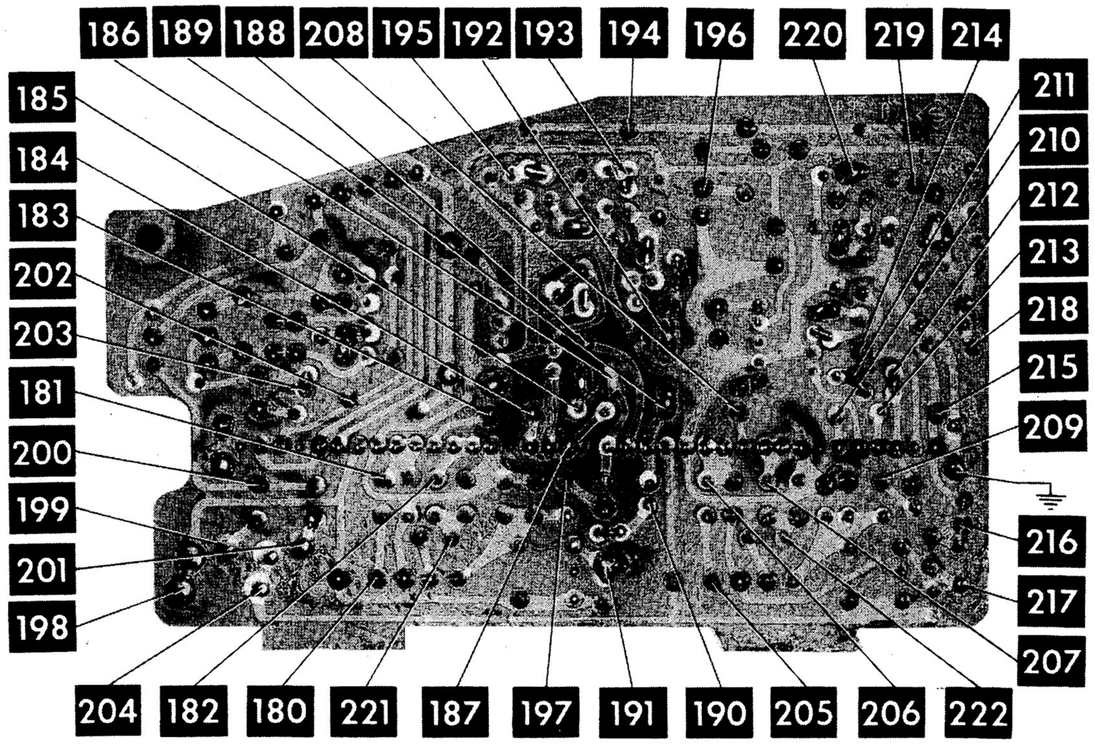


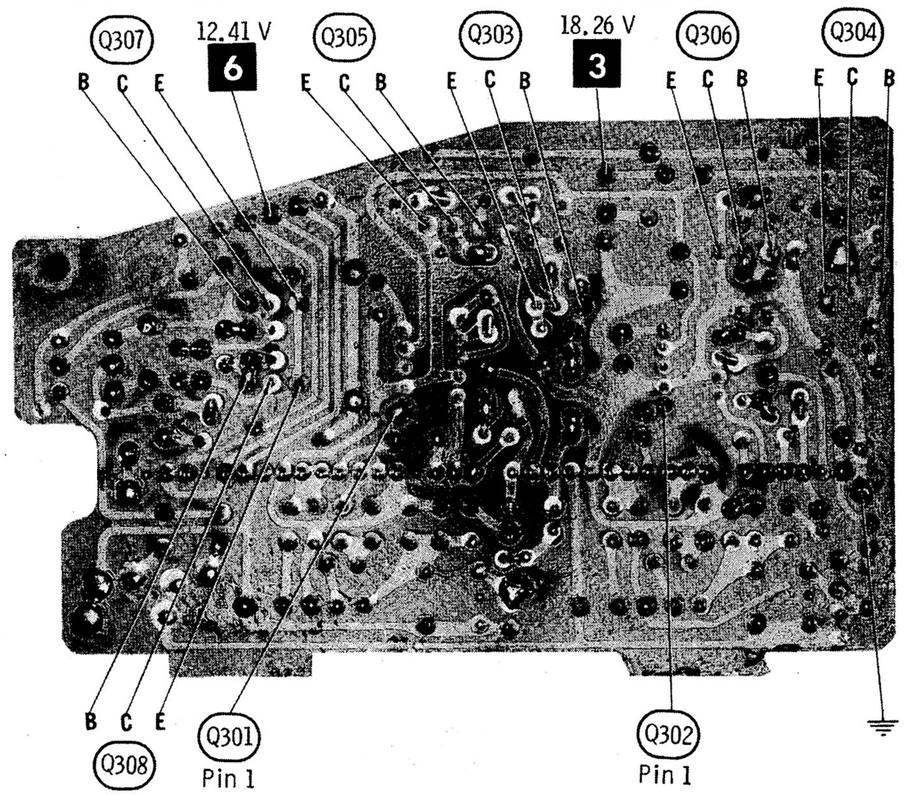
MICHROPHONE BOARD



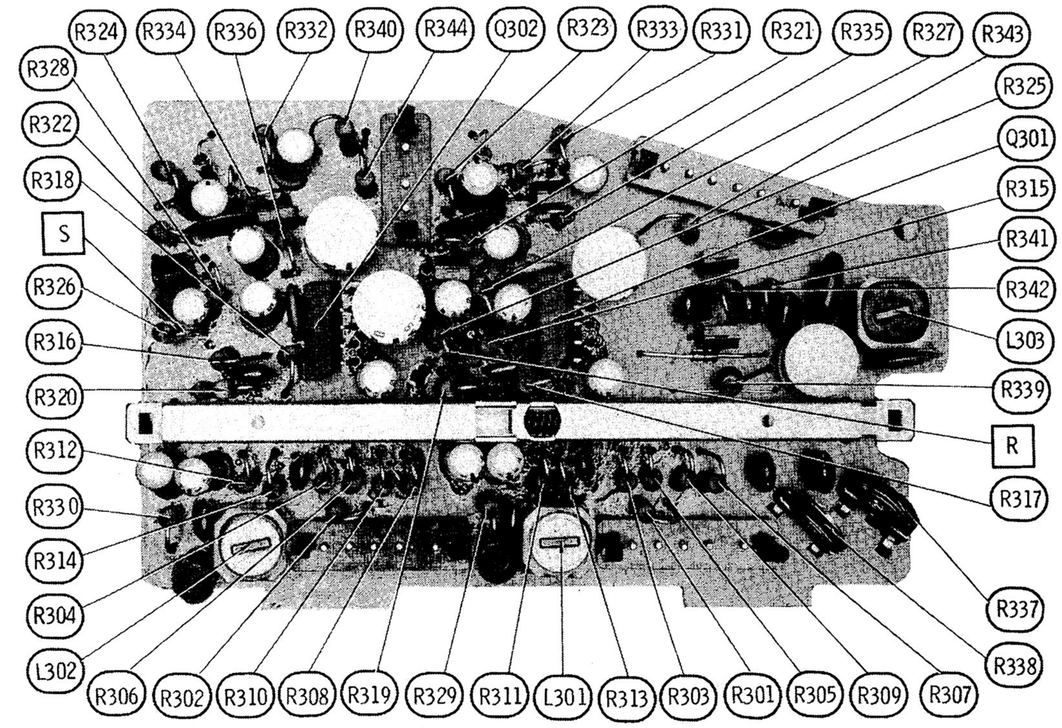


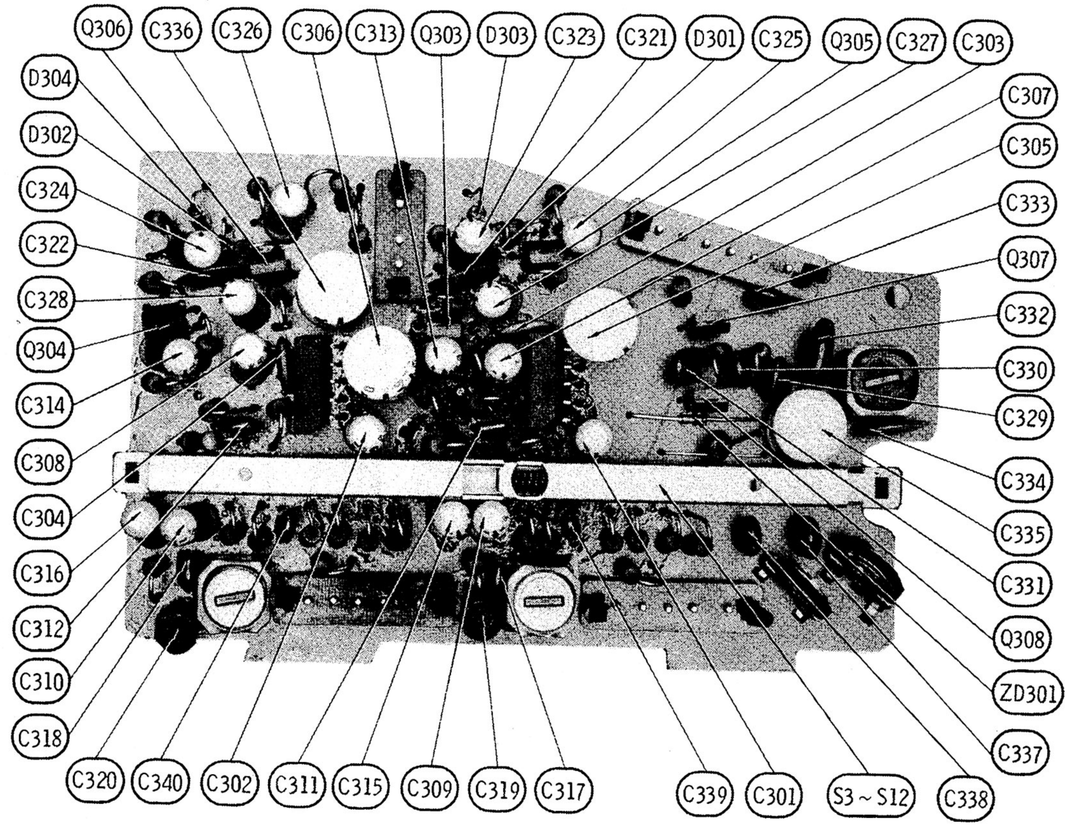
FILTER SWITCH BOARD



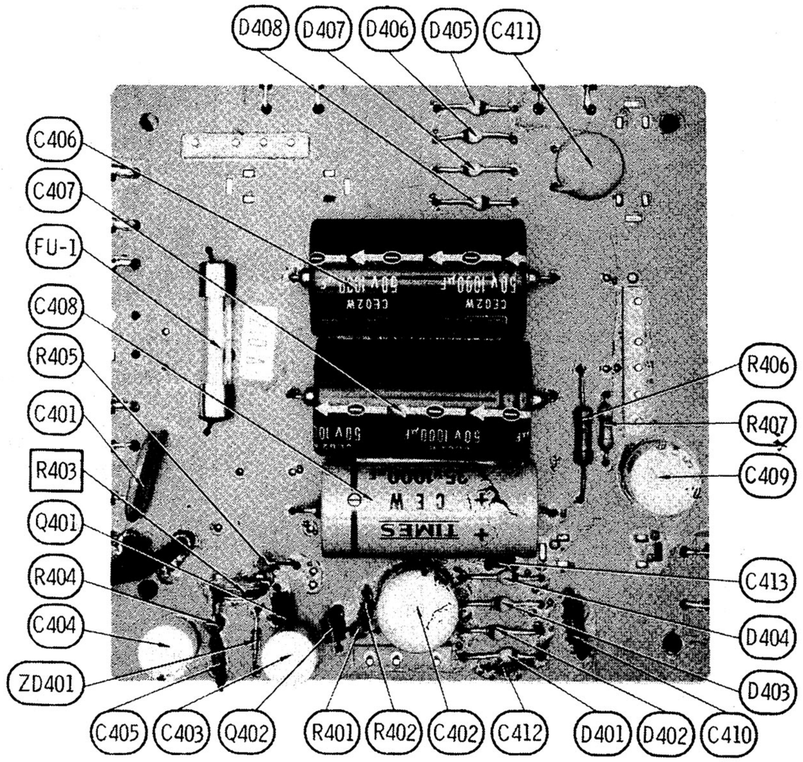


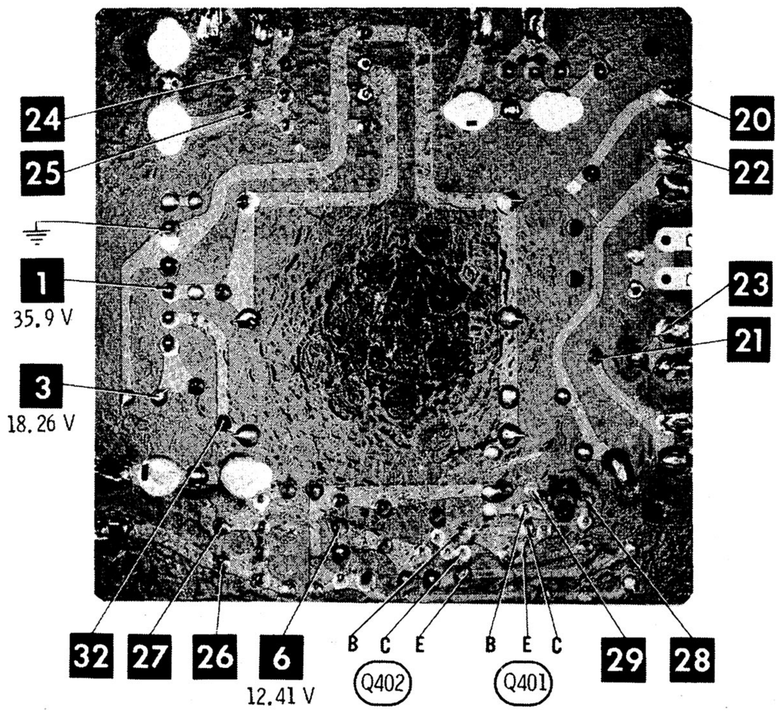
TAPE AMP BOARD



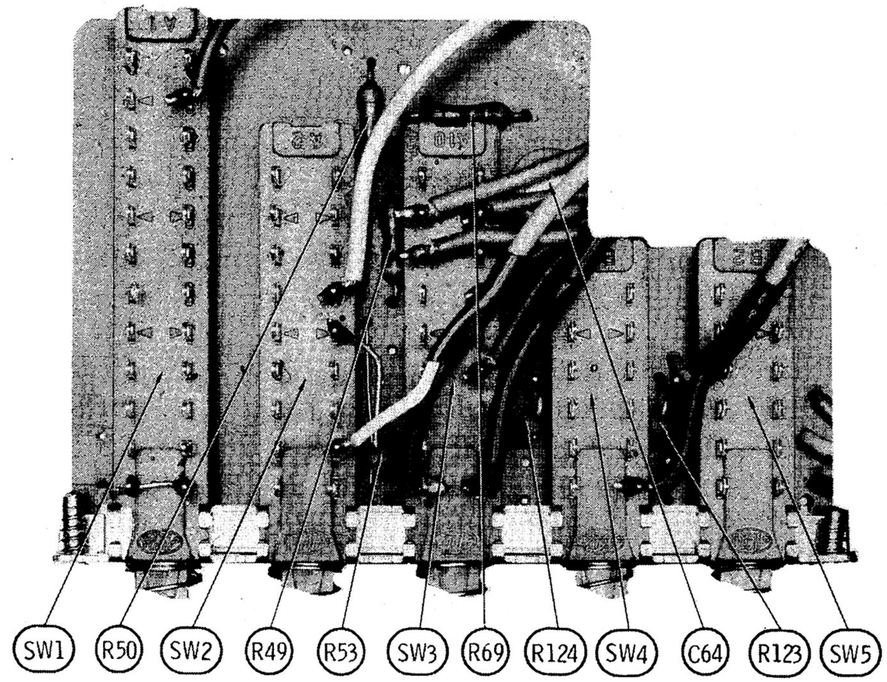


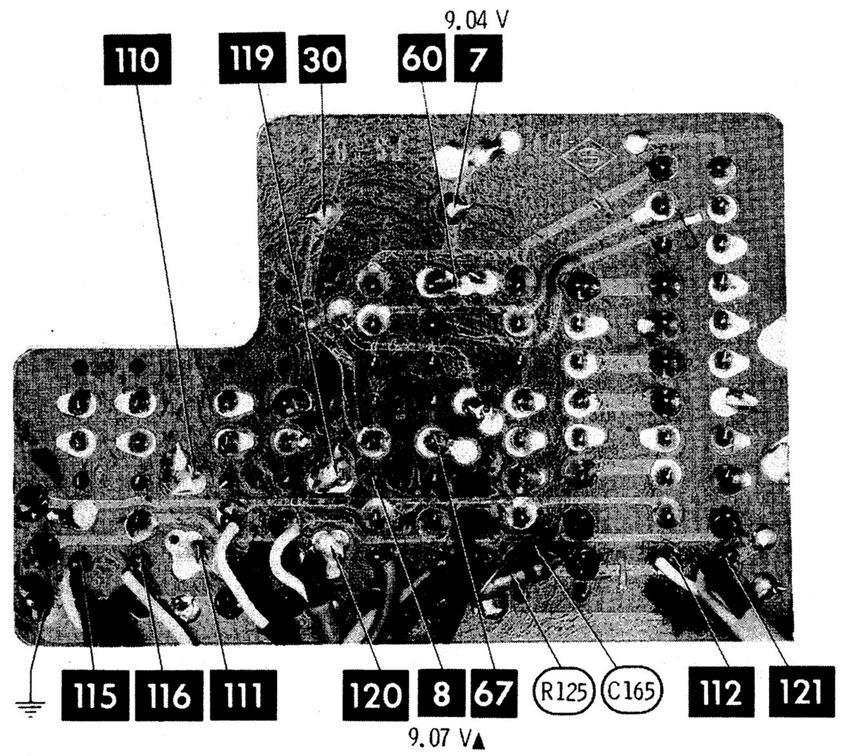
TAPE AMP BOARD





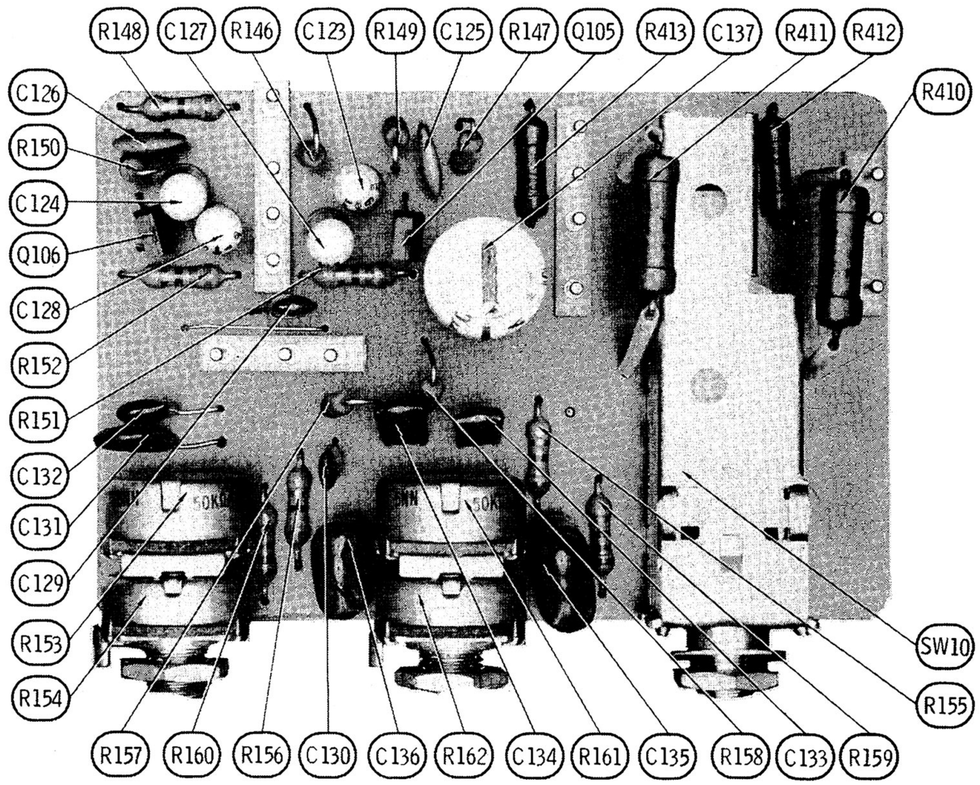
POWER SUPPLY BOARD

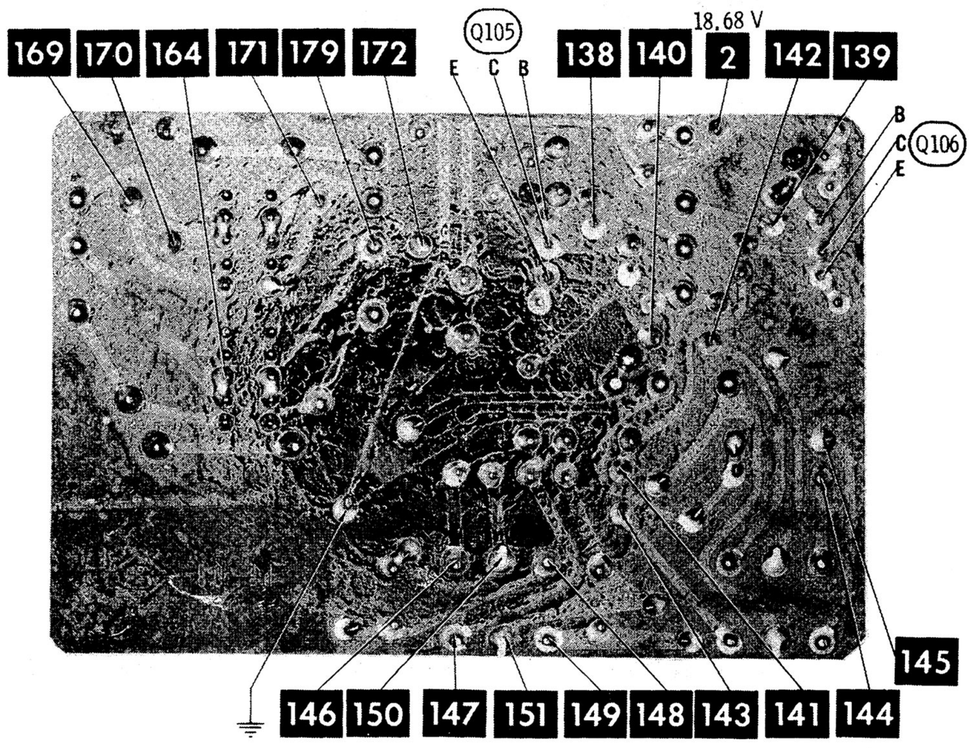




▲AM

FUNCTION SWITCH BOARD





TONE BOARD

MECHANICAL PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
3		Record Lock Arm
4		Record-off Piece (Interlock)
5		Record Interlock Spring
6		Record Lock Arm Spring
7		Pause Lever
8		Pause Lever Spring
9		Pause Step Arm
10		Step Arm Spring
11		Function Lever
12		Actuator Sleeve
14		Auto-stop Lever
15		Auto-stop Lever Spring
17		Right Cassette Guide
18		Left Cassette Guide
19		Lock Arm
20		Lock Arm Spring
21		Head Panel
23		Azimuth Spring
26*	*	Pinch Roller (Assembly)*
27		Pinch Roller Joint Arm
28		Pinch Roller Spring
29		Auto-stop Sensing Arm(Assembly)
29A	(1)	Auto-stop Sensing Tip
30		Head Panel Spring
35		Record Lever
36		Record Lever Spring
42		Damper (A)
43		Damper (B)
44		Air Controlling Washer
46		Right Push Arm
47		Push Arm Spring (2 used)
48		Left Push Arm

REF. NO.	PART NO.	DESCRIPTION
49		Sub-chassis
50		Guide Spring (Assembly)
51		Idler Plate
52		Fast Forward Idler
53		Take-up Roller (Idler)
55		Fast Forward Actuator Lever
57		Fast Forward Actuator Spring
58		Rewind Actuator
59-1		Take-up Arm
59-2		Upper Take-up Idler
59-3		Lower Take-up Idler (Pulley)
60		Take-up Arm Spring
61-1		Take-up Reel Table (Spindle)
61-2		Clutch Cap (Idler)
61-3		Reel Post Cap (Sleeve) (2 used)
61-4		Clutch Spring
61-5		Felt Clutch
61-6		Reel Vanes (2 used)
61-7		Vane Thrust Spring (2 used)
62		Back Tension Spring (2 used)
64-1		Supply Reel (Spindle)
65		Flywheel Holder (Assembly)
66		Flywheel Holder Spring
67		Flywheel Metal (Bearing)
68		Capstan/Flywheel (Assembly)
70		Motor Pulley
73*	*	Main Belt*
74*	*	Tape Drive Belt*
75		Slide Shift Arm (4 used)
76		Sub-chassis Spring (2 used)

(1) Part of Arm (29).
* Pinch Roller - E-V/GAME Replacement Number 1407-179.
WALSCO Replacement Number 1499-70.
* Main Belt - E-V/GAME Replacement Number 1407-56.
WALSCO Replacement Number 1425-23.
* Tape Drive Belt - E-V/GAME Replacement Number 1425-07.
WALSCO Replacement Number 1425-07.

CLEANING

Clean all tape contact surfaces with a soft, lint-free material and head cleaner or methyl alcohol. Use alcohol to remove oil and grease from all driving surfaces.

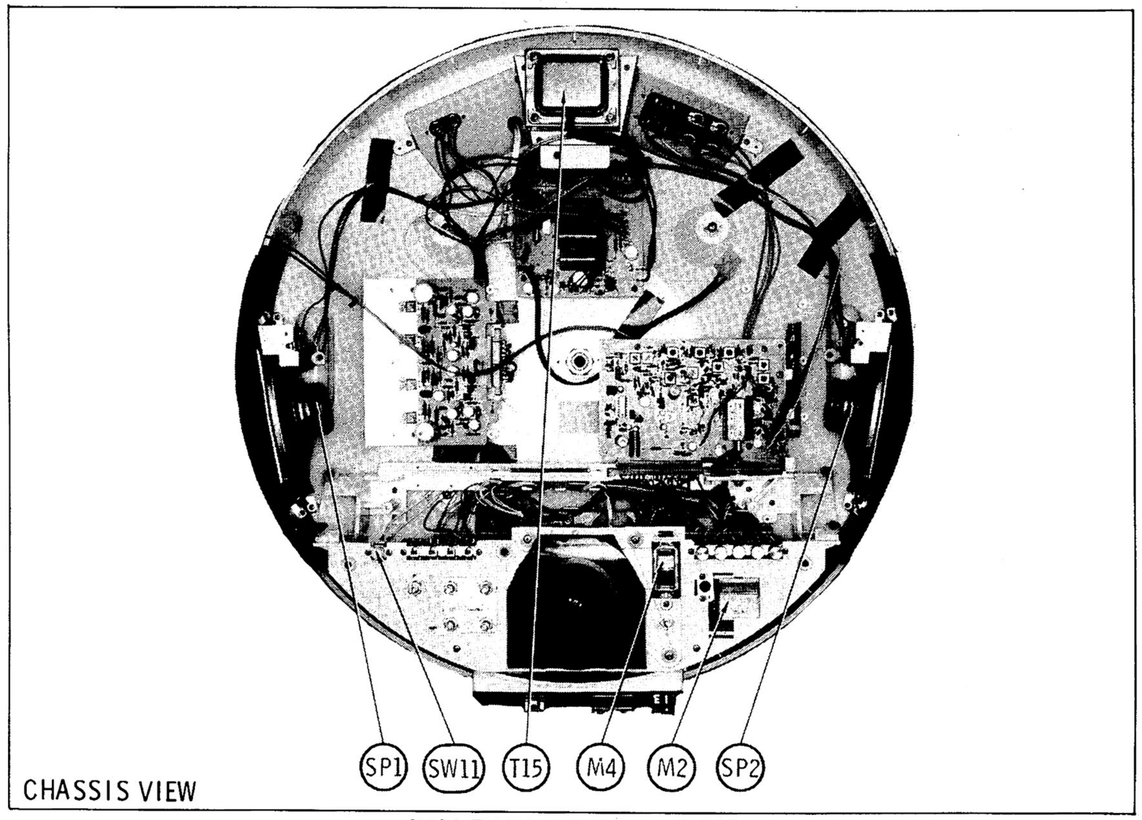
CAUTION: Avoid getting head cleaner on any plastic surface.

LUBRICATING

Bearings are oil-less type and do not need lubrication. Lubricate bushings lightly with #20 machine oil. Use a light film of nonhardening grease on cam surfaces.

HEAD DEMAGNETIZING

Demagnetize head when unit is serviced. Avoid using magnetic materials near head.



CHASSIS VIEW

SEQUENCE OF OPERATION

PLAY

Pressing the cassette into Guides (17) and (18) causes Arms (46) and (48) to release the chassis and swing Sub-chassis (49) up on Arm (75). Sub-chassis (49), locked by Arm (19) and Spring (20), actuates Switch (S13) and raises Spring (50), Vanes (61-6A) and (61-6B), and the capstan into the cassette. The capstan presses Roller (26), pulled by Spring (28), and the cassette moves over the heads.

Sub-chassis (49) also moves Arm (59-1) from the chassis. Arm (59-1), pulled by Spring (60), causes Idler (59-2) to press Idler (53) against Idler (61-2).

The motor -- through Pulley (70), Belt (74), Pulley (59-3), Idler (59-2), Idler (53), Idler (61-2), Clutch (61-5), Spindle (61-1) and Sleeve (61-3A) -- drives Vanes (61-6A).

RECORD

The Record sequence is the same as Play. Pressing the Record button causes Lever (35), locked by Arm (3) and Spring (6), to actuate Switch (S3-S12).

FAST FORWARD (FROM PLAY)

Moving the Function Selector to Fast Forward causes Lever (11) to move Sleeve (12) and pivot Lever (55). Lever (55) causes Plate (51) to press Idler (52) against Idler (59-2) and Table (61-1). Sleeve (12) causes Panel (21) to move Roller (26) from the capstan and the heads from the tape.

The motor -- through Pulley (70), Belt (74), Pulley (59-3), Idler (59-2), Idler (52), Table (61-1) and Sleeve (61-3A) -- drives Vanes (61-6A).

Releasing the Function Selector allows Springs (6, 30, 57 & 60) to reverse the Fast Forward sequence.

REWIND

Moving the Function Selector to Rewind causes Lever (11) to move Sleeve (12) and pivot Actuator (58). Actuator (58) causes Arm (59-1) to press Idler (59-2) against Reel (64-1). Sleeve (12) causes Panel (21) to move Roller (26) from the capstan and the heads from the tape.

The motor -- through Pulley (70), Belt (74), Pulley (59-3), Idler (59-2) and Spindle (64-1) -- drives Vanes (61-6B).

Releasing the Function Selector allows Springs (6, 30, 57 & 60) to reverse the Rewind sequence.

STOP/EJECT

Pressing the Function Selector causes Sleeve (12) to pivot Arm (19), releasing Sub-chassis (49). Springs (47A), (47B) and (76) reverse the Play sequence and cause Arms (46) and (48) to push the cassette from the unit.

RADIO PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA							
			GENERAL ELECTRIC PART No.	IR WORKMAN 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	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109
D4	1N60P		1N60(7)	1N60 (7)	PTC206M(6)	HEPR9135(7)	RE 86(6)	SK3088(7)	RT-263(7)	ECG110(6)
D5	1N60P									
D6	1N60P		1N60	1N60	PTC206	HEPR9135	RE 47	SK3088	RT-263	ECG109
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	1S2790		GE-90	0201		HEPR2503	RE 195	SK3126	RT-262	
D101	1N60		1N60	1N60	PTC206	HEPR9135	RE 47	SK3088	RT-263	ECG109
D102	1N60		1N60	1N60	PTC206	HEPR9135	RE 47	SK3088	RT-263	ECG109
D103	1N60		1N60	1N60	PTC206	HEPR9135	RE 47	SK3088	RT-263	ECG109
D401	V06		GE-504A	5A4D	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116
D402	V06		GE-504A	5A4D	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116
D402	V06		GE-504A	5A4D	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116
D404	V06		GE-504A	5A4D	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116
D405	V06		GE-504A	5A4D	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116
D406	V06		GE-504A	5A4D	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116
D407	V06		GE-504A	5A4D	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116
D408	V06		GE-504A	5A4D	PTC201	HEPR0052	RE 49	SK3030	RT-213	ECG116
Q1	2SK55E		GE-FET-2	FE-100	PTC161	HEPF0021	RE 45	SK3116	RT-175	ECG312
Q2	2SC461C		GE-61	(IR)2SC403B	PTC121	HEPS0014	RE 10	SK3018	RT-107A	ECG108
Q3	2SC461C		GE-61	(IR)2SC403B	PTC121	HEPS0014	RE 10	SK3018	RT-107A	ECG108
Q4	2SC461C		GE-61	(IR)2SC403B	PTC121	HEPS0014	RE 10	SK3018	RT-107A	ECG108
Q5	2SC461C		GE-61	(IR)2SC403B	PTC121	HEPS0014	RE 10	SK3018	RT-107A	ECG108
Q6	2SC461C		GE-61	(IR)2SC403B	PTC121	HEPS0014	RE 10	SK3018	RT-107A	ECG108
Q7	2SC461C		GE-61	(IR)2SC403B	PTC121	HEPS0014	RE 10	SK3018	RT-107A	ECG108
Q8	2SC461C		GE-61	(IR)2SC403B	PTC121	HEPS0014	RE 10	SK3018	RT-107A	ECG108
Q9	2SA844C		GE-21	TR-54	PTC103	HEPS0019	RE 18	SK3114	RT-126A	ECG129
Q10	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q11	SN76115N		GEIC-35	IC513	PTC735	HEPC6096P		SK3160		ECG801
Q101	2SC458C, LG		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q102	2SC458C, LG		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q103	2SC458C, LG		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q104	2SC458C LG		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q105	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q106	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q107	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q108	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q109	2SC1213AB		GE-210	TR-25	PTC123	HEPS5014	RE 17	SK3024	RT-134	ECG289
Q110	2SC1213AB		GE-210	TR-25	PTC123	HEPS5014	RE 17	SK3024	RT-134	ECG289
Q111	2SC1213AB		GE-210	TR-25	PTC123	HEPS5014	RE 17	SK3024	RT-134	ECG289
Q112	2SC1213AB		GE-210	TR-25	PTC123	HEPS5014	RE 17	SK3024	RT-134	ECG289
Q113	2SA673AB		GE-67	TR-28	PTC177	HEPS3028	RE 197	SK3138	RT-115	ECG193
Q114	2SA673AB		GE-67	TR-28	PTC177	HEPS3028	RE 197	SK3138	RT-115	ECG193
Q115	2SC1060B		GE-66	TR-76	PTC167	HEPS5027		SK3054	RT-197	ECG152
Q116	2SC1060B		GE-66	TR-76	PTC167	HEPS5027		SK3054	RT-197	ECG152
Q117	2SC1060B		GE-66	TR-76	PTC167	HEPS5027		SK3054	RT-197	ECG152
Q118	2SC1060B		GE-66	TR-76	PTC167	HEPS5027		SK3054	RT-197	ECG152
Q119	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q120	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q121	2SC1213AB		GE-210	TR-25	PTC123	HEPS5014	RE 17	SK3024	RT-134	ECG289
Q401	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q402	2SC1213AB		GE-210	TR-25	PTC123	HEPS5014	RE 17	SK3024	RT-134	ECG289
T101	KB-365				PTC301					
T102	KB-365				PTC301					
ZD401	HZ-6B						RE 108			ECG5070

(6) Matched pair.
(7) Two required - select matched pair.

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA			
		MFGR. PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C36	10 10V		PC10-25	VTT10A25	EV-1222
C37	.22 16V			TDC224M050EL	S050-R229
C38	.47 10V		PC1-50	VTTR47B63	EV-1310
C45	.47 10V		PC1-50	VTTR47B63	EV-1310
C46	.47 10V		PC1-50	VTTR47B63	EV-1310
C49	100 10V		PC100-10	VTT100E10	EV-1130
C64	100 10V		PC100-10	VTT100E10	EV-1130
C66	470 10V		PC500-16	VTT470J16	EV-1150
C68	10 16V		PC10-25	VTT10A25	EV-1222
C70	1 16V		PC1-50	TT15X1	EV-1315
C73	470 10V		PC500-16	VTT470J16	EV-1150
C75	220 6.3V		PC250-10	VTT220F10	EV-1140
C86	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C101	1 10V		PC1-50	TT12X1	EV-1315

ELECTROLYTIC CAPACITORS (cont)

ITEM No.	RATING	REPLACEMENT DATA			
		MFGR. PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C102	1 10V		PC1-50	TT12X1	EV-1315
C103	1 10V		PC1-50	TT12X1	EV-1315
C104	1 10V		PC1-50	TT12X1	EV-1315
C105	47 6.3V		PC50-16	VTT47D16	EV-1226
C106	47 6.3V		PC50-16	VTT47D16	EV-1226
C107	100 16V		PC100-16	VTT100F16	EV-1230
C108	220 25V		PC250-25	VTT220H25	EV-1340
C109	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C110	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C111	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C112	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C113	47 6.3V		PC50-16	VTT47D16	EV-1226
C114	47 6.3V		PC50-16	VTT47D16	EV-1226
C123	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C124	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C127	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C128	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C137	220 25V		PC250-25	VTT220H25	EV-1340
C141	10 16V		PC10-25	VTT10A25	EV-1222
C142	10 16V		PC10-25	VTT10A25	EV-1222
C143	100 10V		PC100-10	VTT100E10	EV-1130
C144	100 10V		PC100-10	VTT100E10	EV-1130
C145	10 25V		PC10-25	VTT10A25	EV-1322
C146	10 25V		PC10-25	VTT10A25	EV-1322
C147	100 25V		PC100-25	VTT100G25	EV-1330
C148	100 25V		PC100-25	VTT100G25	EV-1330
C153	100 10V		PC100-10	VTT100E10	EV-1130
C154	100 10V		PC100-10	VTT100E10	EV-1130
C155	1000 25V		WBR1000-25	VTT1000M25	EV-1360
C156	1000 25V		WBR1000-25	VTT1000M25	EV-1360
C159	10 16V		PC10-25	VTT10A25	EV-1222
C160	470 10V		PC500-16	VTT470J16	EV-1150
C161	100 25V		PC100-25	VTT100G25	EV-1330
C162	100 25V		PC100-25	VTT100G25	EV-1330
C402	1000 16V		PC1000-16	VTT1000L16	EV-1260
C403	470 10V		PC500-16	VTT470J16	EV-1150
C404	470 10V		PC500-16	VTT470J16	EV-1150
C406	1000 50V		WBR1000-50	TC50100C	TVA-1316
C407	1000 50V		WBR1000-50	TC50100C	TVA-1316
C408	1000 35V		WBR1000-50	TC50100C	TVA-1316
C409	220 25V		PC250-25	VTT220H25	EV-1340
C414	470 16V		PC500-16	VTT470J16	EV-1250

CAPACITORS

ITEM No.	RATING	MFGR. PART No.	REPLACEMENT DATA			
			CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C1	20		DTZ-20	NP020	CN0420	10TCC-Q20
C2	15		DTZ-15	NP015	CN0415	10TCC-Q15
C3	.002		DD-202	GP2000	GP220	5GA-D20
C4	.01		UK50-103		MAG5011	
C5	8					
C6	.022		UK50-223		MAG5012	
C7	15		DTZ-15	NP015	CN0415	10TCC-Q15
C8	8					
C9	5		DTZ-4R7	NP04P7	CN0547	10TCC-V47
C10	.04		UK25-503		MAG2515	HY-735
C11	3		DTZ-3R3	NP03P3	CN0533	10TCC-V33
C12	280		DD-271	GP270	GP327	10TS-T27
C13	.022		UK50-223		MAG5012	
C14	7		DTZ-6R8	NP06P8	CN0568	10TCC-V68
C15	.022		UK50-223		MAG5012	
C16	1				CN0510	10TCC-V10
C17	.022		UK50-223		MAG5012	
C18	.022		UK50-223		MAG5012	
C19	1				CN0510	10TCC-V10
C20	.022		UK50-223		MAG5012	
C21	.022		UK50-223		MAG5012	
C22	.022		UK50-223		MAG5012	
C23	1				CN0510	10TCC-V10
C24	470		DD-471	GP470	GP347	10TS-T47
C25	.022		UK50-223		MAG5012	
C25a	.04		UK25-503		MAG2515	HY-735
C26	1				CN0510	10TCC-V10
C27	470		DD-471	GP470	GP347	10TS-T47
C28	.04		UK25-503		MAG2515	HY-735
C29	.022		UK50-223		MAG5012	
C30	.022		UK50-223		MAG5012	
C31	.022		UK50-223		MAG5012	
C32	2		DTZ-2R2	NP02P2	CN0522	10TCC-V22
C33	220		DD-221		GP322	10TS-T22
C34	220		DD-221		GP322	10TS-T22
C35	10		DTZ-10	NP010	CN0410	10TCC-Q10

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

ITEM No.	FUNCTION	RESIST-ANCE	REPLACEMENT DATA				
			MFGR. PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	MALLORY PART No.	TRW PART No.
R337	Record Bias-Left	100K		T-100K	C-104	MTC15L1	X201R104B
R338	Record Bias-Right	100K		T-100K	C-104	MTC15L1	X201R104B

COILS (RF-IF)

ITEM No.	FUNCTION	REPLACEMENT DATA			REMARKS
		PART No.	OTHER IDENTIFICATION	MILLER PART No.	
L301	Bias Trap	KT-14001			
L302	Bias Trap	KT-14001			
L303	Bias Oscillator	KT-12003			

MISCELLANEOUS

ITEM No.	PART NAME	PART No.	NOTES
M2	Meter	B-20A-60R	Record Level
M4	Tape Head		Play/Record
M5	Tape Head		Erase
M6	Motor		2000 RPM @ 12.18V DC, F.F. 2000 RPM @ 12.18V DC, Rewind 2000 RPM @ 12.18V DC.
S1	Switch		Power (Actuated by insertion of cartridge)
S3 thru S12	Switch	CL-112B	Play/Record
	Printed Circuit Board	PR-07	Tape Amp

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No.	8530 (Solid) Available in 13 Colors
		8524 (Stranded) Available in 13 Colors
Low-loss Shielded Lead (Interconnecting)	Use BELDEN No.	8401 or 8421
Tape Head Cable	Use BELDEN No.	8430 (Two-Conductor-Unshielded)
		8429 (Two-Conductor-Shielded)
		8419 (Three-Conductor-Shielded)

TAPE RECORDER PARTS LIST AND DESCRIPTION

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

SEMICONDUCTORS (Select replacement transistor for best results)

ITEM No.	TYPE No.	MFGR. PART No.	REPLACEMENT DATA							
			GENERAL ELECTRIC PART No.	IR WORKMAN PART No.	MALLORY PART No.	MOTOROLA PART No.	RAYTHEON PART No.	RCA PART No.	SPRAGUE PART No.	SYLVANIA PART No.
D301	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109
D302	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109
D303	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109
D304	1N34A		1N34AS	1N34A	PTC207	HEPR9134	RE 47	SK3087	RT-200	ECG109
Q301	LD3150									ECG1021
Q302	LD3150									ECG1021
Q303	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q304	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q305	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q306	2SC458C		GE-210	(IR)2SC372	PTC121	HEPS0015	RE 13	SK3124	RT-187	ECG123A
Q307	2SC1213AB		GE-210	TR-25	PTC123	HEPS5014	RE 17	SK3024	RT-134	ECG289
Q308	2SC1213AB		GE-210	TR-25	PTC123	HEPS5014	RE 17	SK3024	RT-134	ECG289
ZD301	HZ-6B						RE 108			ECG5070

ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA			
		MFGR. PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C301	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C302	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C305	100 6.3V		PC100-10	VTT100E10	EV-1130
C306	100 6.3V		PC100-10	VTT100E10	EV-1130
C307	10 16V		PC10-25	VTT10A25	EV-1222
C308	10 16V		PC10-25	VTT10A25	EV-1222
C309	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C310	3.3 16V		PC5-50	VTT3R3A50	EV-1318
C313	1 16V		PC1-50	TT15X1	EV-1315
C314	1 16V		PC1-50	TT15X1	EV-1315
C315	10 16V		PC10-25	VTT10A25	EV-1222
C316	10 16V		PC10-25	VTT10A25	EV-1222
C323	1 16V		PC1-50	TT15X1	EV-1315
C324	1 16V		PC1-50	TT15X1	EV-1315
C325	10 16V		PC10-25	VTT10A25	EV-1222
C326	10 16V		PC10-25	VTT10A25	EV-1222
C327	10 16V		PC10-25	VTT10A25	EV-1222
C328	10 16V		PC10-25	VTT10A25	EV-1222
C335	100 10V		PC100-10	VTT100E10	EV-1130
C336	100 16V		PC100-16	VTT100F16	EV-1230

CAPACITORS

ITEM No.	RATING	MFGR. PART No.	REPLACEMENT DATA			
			CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C303	100		DD-101	GP100	GP310	10TS-T10
C304	100		DD-101	GP100	GP310	10TS-T10
C311	.0068 10%			WMF1D68	EWF1A268	1PB-D68
C312	.0068 10%			WMF1D68	EWF1A268	1PB-D68
C317	.0033 10%				M192P3329R8	192P3329R8
C318	.0033 10%				M192P3329R8	192P3329R8
C319	470 10%			CD15FD471J03	SX347	MWA-471
C320	470 10%			CD15FD471J03	SX347	MWA-471
C321	.04		UK25-503		MAG2515	HY-735
C322	.04		UK25-503		MAG2515	HY-735
C329	.0047 10%				M192P4729R8	192P4729R8
C330	.0047 10%				M192P4729R8	192P4729R8
C331	.0022 10%				M192P2229R8	192P2229R8
C332	.0047 10%				M192P2229R8	192P2229R8
C333	.01			WMF1S1	EWF1A110	1PB-S10
C334	.04		UK25-503		MAG2515	HY-735
C337	.01			WMF1S1	EWF1A110	1PB-S10
C338	.01			WMF1S1	EWF1A110	1PB-S10
C339	.0022 10%				M192P2229R8	192P2229R8
C340	.0022 10%				M192P2229R8	192P2229R8

RADIO PARTS LIST AND DESCRIPTION (CONTINUED)

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

CAPACITORS

ITEM No.	RATING	MFGR. PART No.	REPLACEMENT DATA			
			CENTRALAB PART No.	CORNELL-DUBILIER PART No.	MALLORY PART No.	SPRAGUE PART No.
C39	.047 10%					1PB-S47
C40	.047 10%					1PB-S47
C41	.0015 10%					
C42	470		DD-471	GP470	GP347	10TS-T47
C43	.022 10%				M192P2239R8	192P2239R8
C44	.022 10%				M192P2239R8	192P2239R8
C47	220		DD-221		GP322	10TS-T22
C48	.04		UK25-503		MAG2515	HY-735
C50	.022		UK50-223		MAG5012	
C51	20		DTZ-20	NP020	CN0420	10TCC-Q20
C52	15		DTZ-15	NP015	CN0415	10TCC-Q15
C53	10		DTZ-10	NP010	CN0410	10TCC-Q10
C54	7		DTZ-6R8	NP06P8	CN0568	10TCC-V68
C55	8					
C56	.022		UK50-223		MAG5012	
C57	15					
C59	.022		UK50-223		MAG5012	
C60	.01		UK50-103		MAG5011	
C61	.022		UK50-223		MAG5012	
C62	.022		UK50-223		MAG5012	
C63	.022		UK50-223		MAG5012	
C65	.022		UK50-223		MAG5012	
C67	.01		UK50-103		MAG5011	
C69	.01		UK50-103		MAG5011	
C71	13				CN0412	10TCC-Q12
C72	.01		UK50-103		MAG5011	
C74	.01		UK50-103		MAG5011	
C76	.022		UK50-223		MAG5012	
C77	.04		UK25-503		MAG2515	HY-735
C78	.04		UK25-503		MAG2515	HY-735
C79	.005		DC-502	MGP005	TA250	TG-D50
C80	35	(1)				
C81	360 5%			CD15FD361J03	SX336	MWA-361
C83	15					
C88	6.8 N750				CN7568	10TCU-V68
C89	15		DTZ-15	NP015	CN0415	10TCC-Q15
C90	Tuning Gang	CY-51C121				
C91	.01		UK50-103		MAG5011	
C115	.022 10%				M192P2239R8	192P2239R8
C116	.022 10%				M192P2239R8	192P2239R8
C117	.01 10%			WMF1S1	EWF1A110	1PB-S10
C118	.01 10%			WMF1S1	EWF1A110	1PB-S10
C119	.1 10%			WMF05P1	EWF05010	431P1049R5
C120	.1 10%			WMF05P1	EWF05010	431P1049R5
C121	.0015			DPMS6D15	EWF6215	6PS-D15
C122	.0015			DPMS6D15	EWF6215	6PS-D15
C125	100		DD-101	GP100	GP310	10TS-T10
C126	100		DD-101	GP100	GP310	10TS-T10
C129	.0022 10%				M192P2229R8	192P2229R8
C130	.0022 10%				M192P2229R8	192P2229R8
C131	.015 10%				M192P1539R8	192P1539R8
C132	.015 10%				M192P1539R8	192P1539R8
C133	.015				M192P1539R8	192P1539R8
C134	.015				M192P1539R8	192P1539R8
C135	.15			WMF05P15	EWF05015	431P1549R5
C136	.15			WMF05P15	EWF05015	431P1549R5
C139	.1 10%			WMF05P1	EWF05010	431P1049R5
C140	.1 10%			WMF05P1	EWF05010	431P1049R5
C149	100		DD-101	GP100	GP310	10TS-T10
C150	100		DD-101	GP100	GP310	10TS-T10
C151	100		DD-101	GP100	GP310	10TS-T10
C152	100		DD-101	GP100	GP310	10TS-T10
C157	.1 10%			WMF05P1	EWF05010	431P1049R5
C158	.1 10%			WMF05P1	EWF05010	431P1049R5
C163	.0022 10%				M192P2229R8	192P2229R8
C164	.0022 10%				M192P2229R8	192P2229R8
C165	.01		UK50-103		MAG5011	
C401	.01 250VAC					
C405	.04		UK25-503		MAG2515	HY-735
C410	.04 N075					
C411	.04 N075					
C412	.01		UK50-103		MAG5011	
C413	.01		UK50-103		MAG5011	

(1) Used in some versions.

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

ITEM No.	FUNCTION	RESIST-ANCE	REPLACEMENT DATA				
			MFGR. PART No.	CENTRALAB PART No.	CLAROSTAT PART No.	MALLORY PART No.	TRW PART No.
R65	AM AGC	20K		T-20K (3)	C-253 (3)	MTC24L1 (3)	X201R253B (3)
R66	Stereo Threshold	20K		T-20K	C-253	MTC24L1	X201R253B
R141	Volume-Left	50K Tap @ 25K					
R142	Volume-Right	50K Tap @ 25K					
R143	Balance	50K					
R153	Treble-Left	50K					
R154	Treble-Right	50K					
R161	Bass-Left	50K					
R162	Bass-Right	50K					
R179	Bias-Left	20K		T-20K	C-253	MTC24L1	X201R253B
R180	Bias-Right	20K		T-20K	C-253	MTC24L1	X201R253B
R403	Voltage	1000		T-1000	C-102	MTC13L1	X201R102B

(3) For horizontal mounting, bend the two outside terminals to fit PC board. Use jumper to connect center terminal to PC board.

COILS (RF-IF)

ITEM No.	FUNCTION	REPLACEMENT DATA			REMARKS
		PART No.	OTHER IDENTIFICATION	MILLER PART No.	
L1	FM Antenna (Pri.)	F-11007			
L2	FM Antenna (Sec.)	F-11015			
L3	FM RF	F-11015			
L4	10.7MHz Trap	F-14001			
L5	Mixer Output IF	KF-13017A			
L6	FM Input IF	KF-13017A			
L7	FM Interstage	KF-13017B			
L8	FM Interstage	KF-13017B			
L9	FM Interstage	KF-13017B			
L10	Radio Detector (Pri.)	KF-13017DA			
L11	Radio Detector (Sec.)	KF-13017DB			
L12	FM Oscillator	F-12002			
L13	AM Input IF	KA-13017A	A-39A		
L14	AM Interstage	KA-13017B	A-37B		
L15	AM Output IF	KA-13017C			
L16	AM Oscillator	KA-12123			
L18	Loopstick	A-11211			
L19	FM Balun	C-3101			

TRANSFORMER (Power)

ITEM No.	RATING		REPLACEMENT DATA			NOTES
	PRI.	SEC. 1	MFGR. PART No.	THORDARSON PART No.	TRIAD PART No.	
T15	120V AC @ .45A AC	26.4V AC @ .75A DC	T-15B (1)			(1) Number on unit.
	SEC. 2	SEC. 3				
	10.47V AC @ .5A DC	6.10V AC @ .2A AC				

SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA		NOTES
		MFGR. PART No.	QUAM PART No.	
SP1	4" X 6" PM, 8 Ohms	151-56 151-603 (1)		(1) Number on unit.
SP2	4" X 6" PM, 8 Ohms	151-56 151-603 (1)		

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, Quick Acting Pigtail			GJV2		318002		

PHONO CARTRIDGE & NEEDLES

ITEM No.	REPLACEMENT DATA						NOTES
	MFGR. PART No.		ASTATIC PART No.		ELECTRO-VOICE PART No.		
	CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	CARTRIDGE	NEEDLE	
M1 M2	SC12M	ST-17	429d	N164-sd (1) N164-sd	5572D	2428DS (1) 2428DS	(1) For respective replacement cartridge.

MISCELLANEOUS

ITEM No.	PART NAME	PART No.	NOTES
M3	Meter	HN-40(H)	Tuning
M7	Motor		Changer
R67	Filter Block		19kHz
R68	Filter Block		19kHz
SW1	Switch	(1)	Aux
SW2	Switch	(1)	AM
SW3	Switch	(1)	FM
SW4	Switch	(1)	Phono
SW5	Switch	(1)	Tape
SW6	Switch	(2)	AFC
SW7	Switch	(2)	Low Filter
SW8	Switch	(2)	High Filter
SW9	Switch	(2)	Loudness
SW10	Switch	SRZ-V043W	Internal/External Speakers
SW11	Switch	SUB12298	Power (On-Off)
SW12	Switch		On Changer
	45 RPM Adaptor		
	Idler Wheel	A101623	E-V/GAME Replacement Number 1499-34. WALSCO Replacement Number 1499-34.
	Hold Down Arm		
	Tone Arm		
	Microphone	UD-878	
	Printed Circuit Board	PG-06D	Tuner
	Printed Circuit Board	PA-07	Audio Amp
	Printed Circuit Board	PB-07	Power Supply
	Printed Circuit Board	PE-08	Tone
	Printed Circuit Board	PE-07	Volume
	Printed Circuit Board	PS-09	Function Switch
	Printed Circuit Board	PE-03	Filter Switch
	Printed Circuit Board	PS-10	Microphone Amp

(1) Part of switch assembly part number SUB52092.
(2) Part of switch assembly part number SUB42036.

CABINETS & CABINET PARTS (When ordering specify model, chassis & color)

ITEM	PART No.
Cabinet Top	M-2046
Cabinet Main	M-2049
Cabinet Bottom	M-2051
Dust Cover	M-2048
Knob, Tuning	M-2078
Knob, Volume	M-2079

ITEM	PART No.
Knob, Eject	M-3099C
Knob, Speaker	M-3101
Knob, MIC Volume	M-3101
Pushbutton	M-2080
Pushbutton, Pause	M-3098B
Pushbutton, Record	M-3100D

WIRING DATA

General-use Unshielded Hook-up Wire	Use BELDEN No.	8528 (Solid) Available in 12 Colors 8522 (Stranded) Available in 12 Colors
Power Cord	Use BELDEN No.	17106 (Plastic) or 17126 (Rubber) - 6 Ft. 17109 (Plastic) or 17129 (Rubber) - 9 Ft.
Low-loss Shielded Lead (Interconnecting) .	Use BELDEN No.	8401 or 8421
Phono Pick-up Arm Cable	Use BELDEN No.	8430 (Two-Conductor-Unshielded) 8429 (Two-Conductor-Shielded) 8419 (Three-Conductor-Shielded)

ADJUSTMENTS

1. All voltage measurements referred to in this chart are made at a tape speed of 1 7/8 ips with a digital meter.

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 Take-up Torque	Nominal value 3/4 oz. Adjust by moving Spring (61-4).
Fast Forward Torque	Nominal value 1 3/4 oz. No adjustment provided.
Rewind Torque	Nominal value 1 3/4 oz. No adjustment provided.
Pressure Roller Pressure	Nominal value 17 oz. No adjustment provided.
Flywheel Play	Adjust B5 for slight vertical play of flywheel.
Record/Play Head Azimuth	Connect AC meter across speaker; play an azimuth-test tape and adjust B1 for maximum output.
Bias Oscillator Trap	Adjust L301 (L302) for MINIMUM on meter at point R (S).

TROUBLE CHART

SYMPTOM	REMARKS
Take-up erratic or inoperative in play or record	Spindle (61-1) dirty, worn or binding. Clutch (61-5) dirty or worn. Pulley (59-3) dirty, worn or binding. Belt (74) dirty, worn or broken. Idler (59-2), (53), (61-2) dirty, worn or binding. Spring (60), (61-4) weak or out of place. Arm (59-1) binding.
Take-up erratic or inoperative in fast forward	Spindle (61-1) dirty, worn or binding. Idler (59-2), (52) dirty, worn or binding. Belt (74) dirty or worn. Lever (55) worn. Pulley (59-3) dirty or binding.
Rewind erratic or inoperative	Spindle (64-1) dirty, worn or binding. Idler (59-2) dirty, worn or binding. Actuator (58) weak. Belt (74) dirty or worn. Pulley (59-3) dirty or binding.
Capstan does not rotate	Belt (73) 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 (26) worn. Excessive take-up torque.
Wow or flutter	Roller (26) dirty or worn. Belt (73) dirty or worn. Bearing (67) binding. Cassette defective. Motor defective. Excessive take-up torque.