

# PHOTOFACT<sup>®</sup> with

# CIRCUITRACE<sup>®</sup>

For Supplier Address See PHOTOFACT Index

NOTE: Manufacturer Part Numbers Shown Are MOTOROLA



BORG-WARNER MODEL 4000  
MARK II  
(P7MW)  
8-Track Stereo Player

## OPERATING INSTRUCTIONS

Insert cartridge until it locks and turns unit on.

Set operating controls as desired.

Press program selector to play desired tracks, or allow unit to select tracks automatically.

Remove cartridge to turn unit off.

## CLEANING

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

## LUBRICATING

Lubricate bearings and bushings lightly with #20 machine oil. Use a light film of non-hardening grease on cam surfaces.

## HEAD DEMAGNETIZING

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

## ADJUSTMENTS

ADJUST	REMARKS
Head Height	Play a test cartridge, follow instructions with cartridge, and adjust B1 for proper response.
Head Azimuth	Connect an AC VTVM across right output. Play a test cartridge and adjust B2 for maximum.
Indexing Solenoid	Press program selector to continuously cycle indexing mechanism, turn Screw B4 clockwise until cycling stops, and then turn screw counter-clockwise 1/4 turn past restart of cycling.

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

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# TROUBLE CHART

SYMPTOM	REMARKS
Capstan does not rotate	Belt (1) dirty, worn, or broken. Assembly (10) binding. Motor defective or not supplied with power.
Track-shift mechanism inoperative	Switch (S2) dirty. Cam (3) binding or worn. Pawls (4) and (5) worn. Arms (7) and (8) binding. Solenoid (M2) defective or not supplied with power. Cartridge defective.
Wow or Flutter	Belt (1) dirty or worn. Capstan dirty or binding. Cartridge defective. Motor defective. Speed regulator circuit defective.
Sound weak or distorted	Head dirty, misaligned, or defective. Cartridge defective. Amplifiers defective.
Tape is pulled from cartridge	Cartridge defective. Capstan dirty or scored.

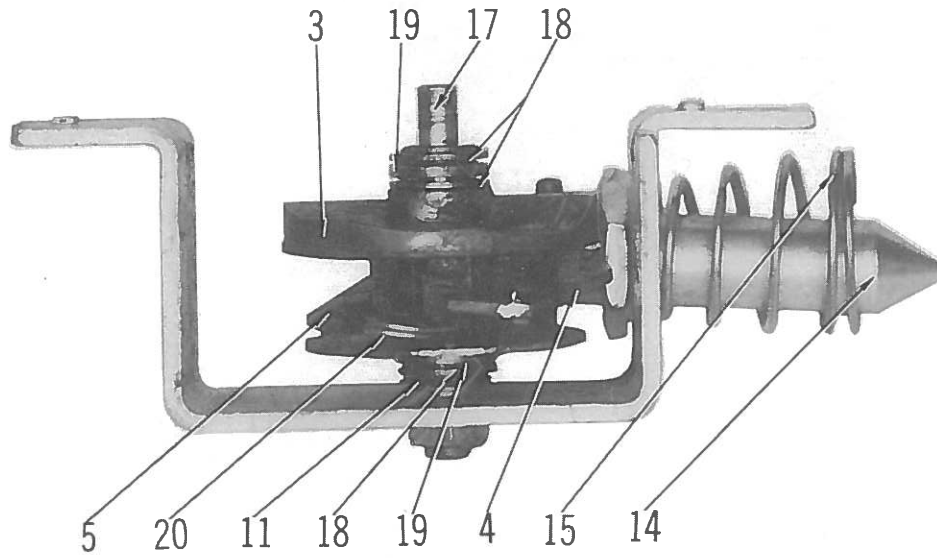
## MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	42-42683B01	Flat Belt	17	47-40714B01	Cam Shaft (.125 Dia.)
2	7-43576A01	Motor Support (2 used)		(3)	
3	45-40428B04	Ratchet Cam		47-42716B01	Cam Shaft (.185 Dia.)
	(1)			(3)	
	45-40428B09	Ratchet Cam	18	4-40409B02	Thrust Washer (3 used)
	(2)			(1)	
4	55-40605B01	Push Ratchet Pawl		4-40409B04	Thrust Washer (3 used)
5	55-40606B01	Pull Ratchet Pawl		(2)	
6	47-42056B01	Capstan Shaft	19	43-40411B01	Thrust Bearing (2 Used)
7	45-40708B01	Lower Radius Arm		(1)	
8	45-40708B02	Upper Radius Arm (2 used)		43-40411B03	Thrust Bearing (2 used)
				(2)	
9	49-40416B02	Flywheel	20	41-41328B01	Pawl Tension Spring
10	1-41500B19	Capstan Housing Assembly	21	46-40299B01	Solenoid Stop
11	4-40104A12	Spring Washer	22	7-40742B02	Tape Guide Bracket
	(1) (3)		23	46-40707B01	Head Block
12	4-40409B01	Thrust Washer (2 used)	24	41-41282B01	Head Tension Spring
13	43-40411B02	Thrust Bearing	25	41-40713B01	Keeper Spring
14	47-40298B01	Solenoid Plunger	26	49-41580B01	Retaining Roller (2 used)
15	41-40445B02	Solenoid Spring	27	2-40859B01	End Thrust Nut
16	45-40480B01	Motor Actuator Arm	28	41-40710B01	Azimuth Adjust Spring
			29	49-41281B01	Spring Roller
			30	22-40711B01	Transfer Pin

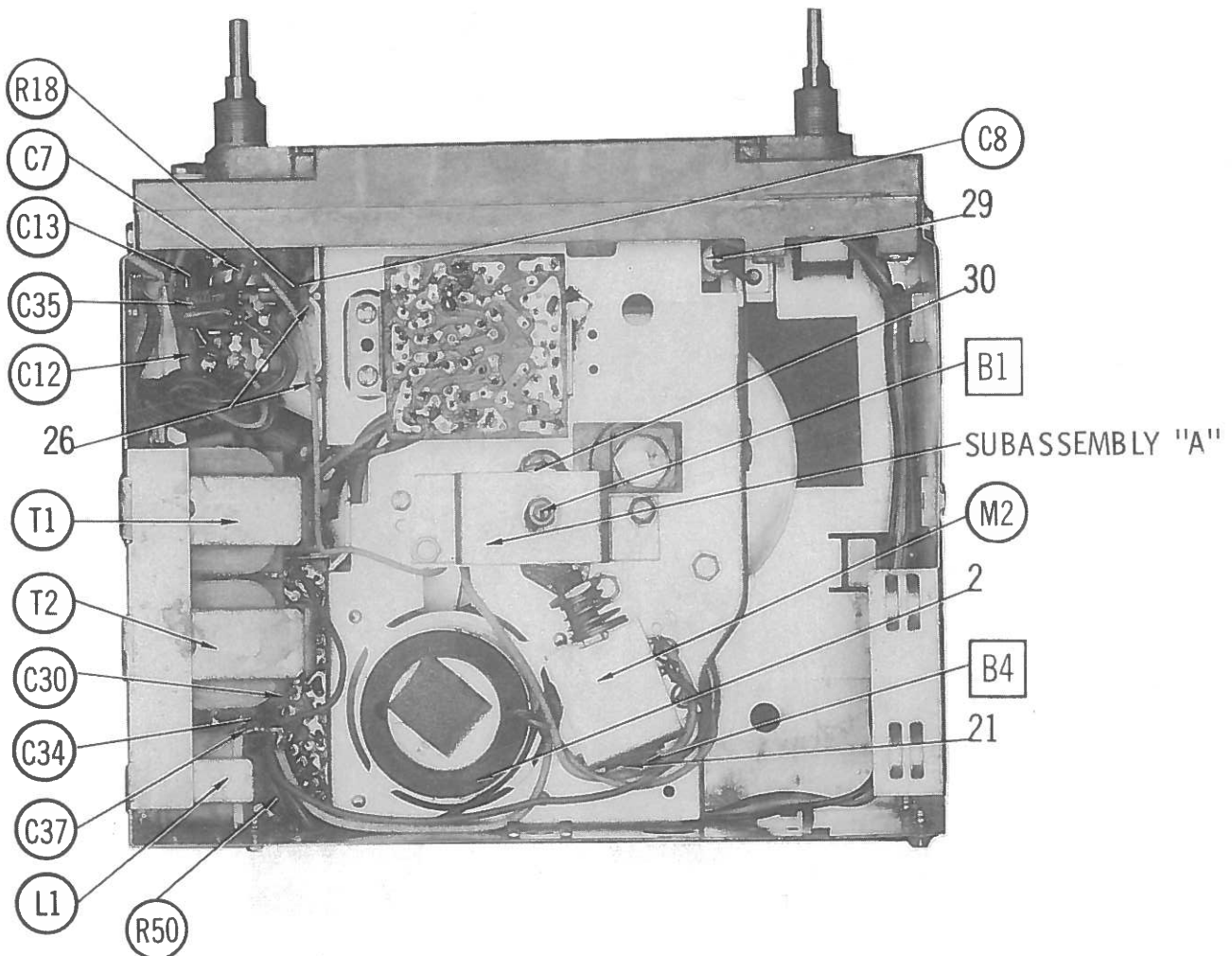
(1) Used with Shaft (17) .125 Dia.

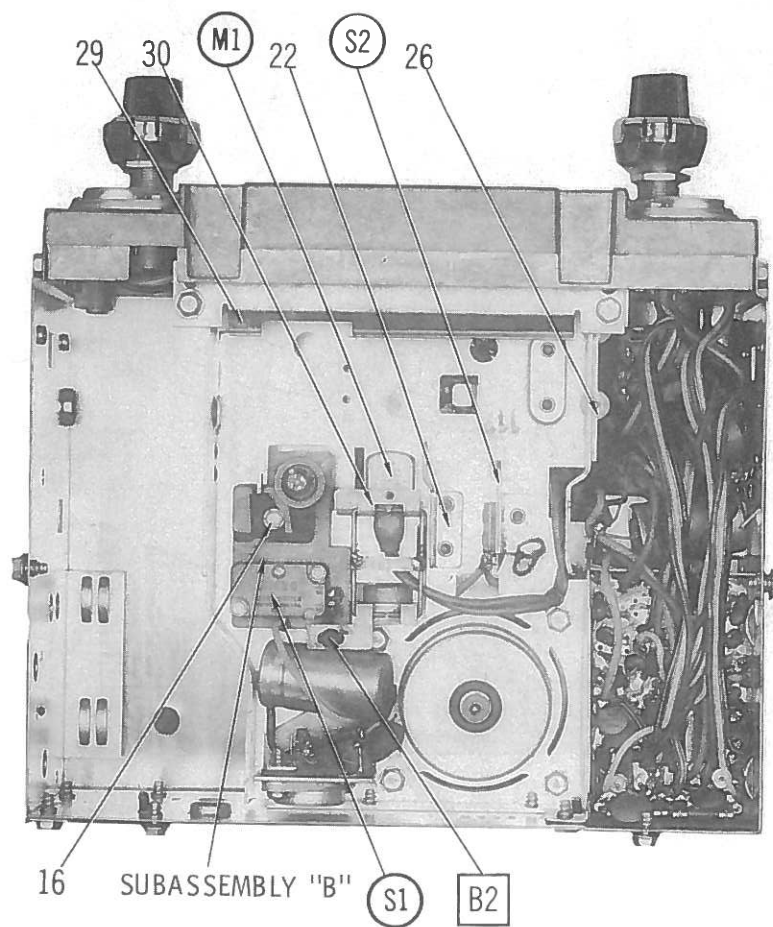
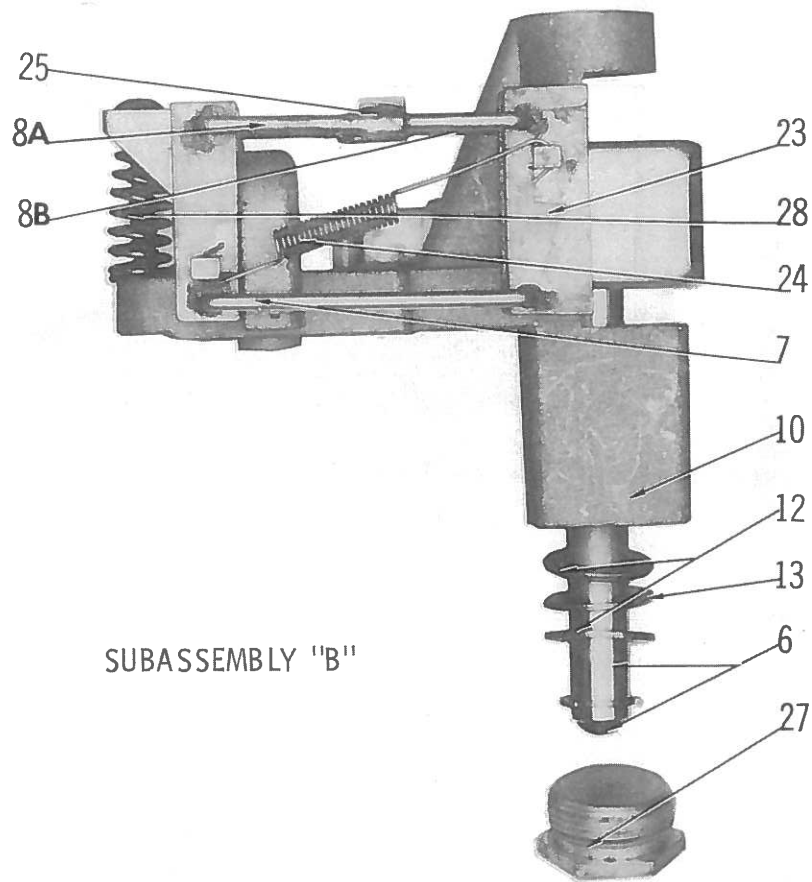
(2) Used with Shaft (17) .185 Dia.

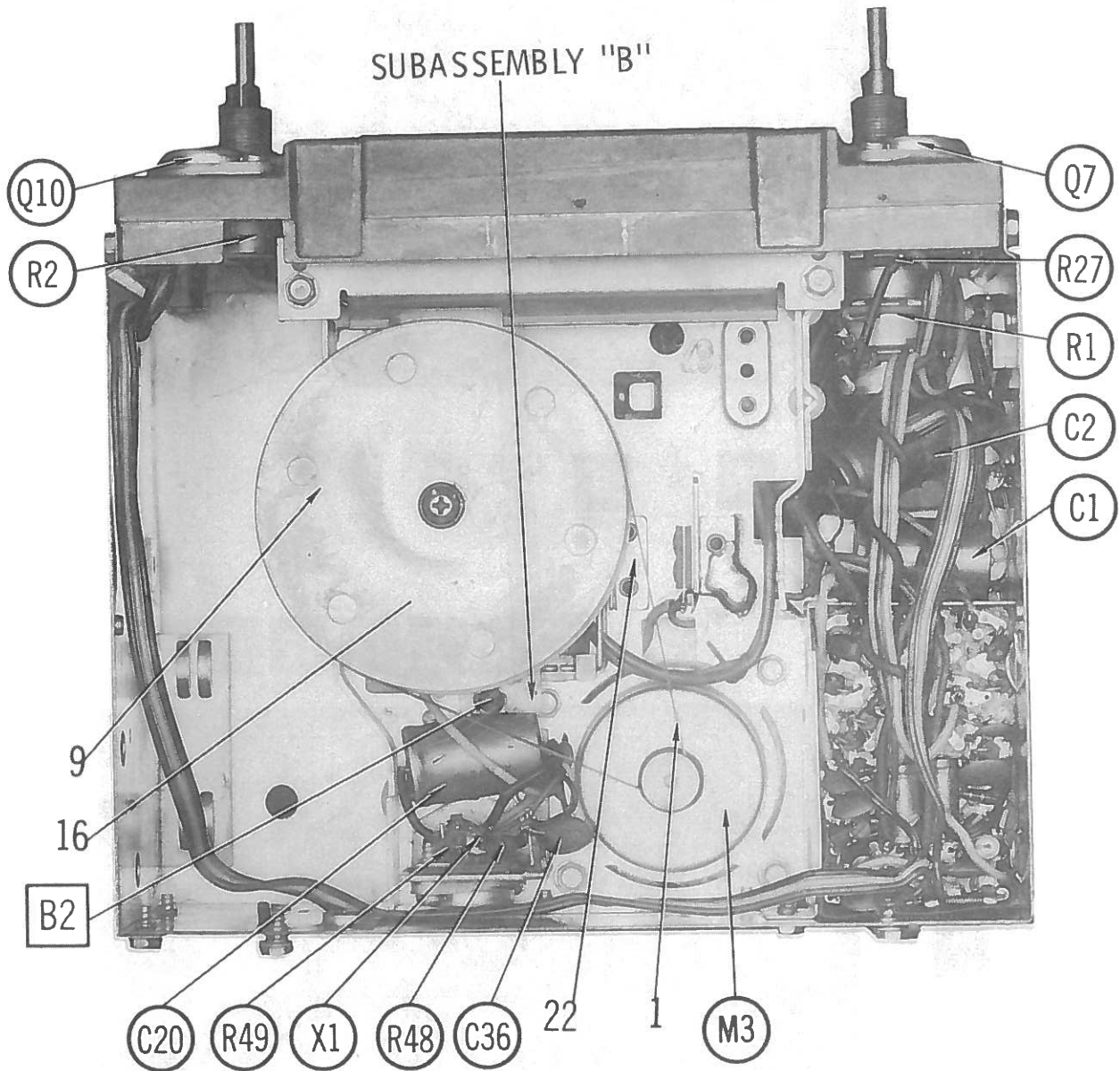
(3) Compression Spring, Part No.41-41251B03 is used with Shaft (17). 185 Dia., and is placed above Cam (3). Washer (11) is deleted.

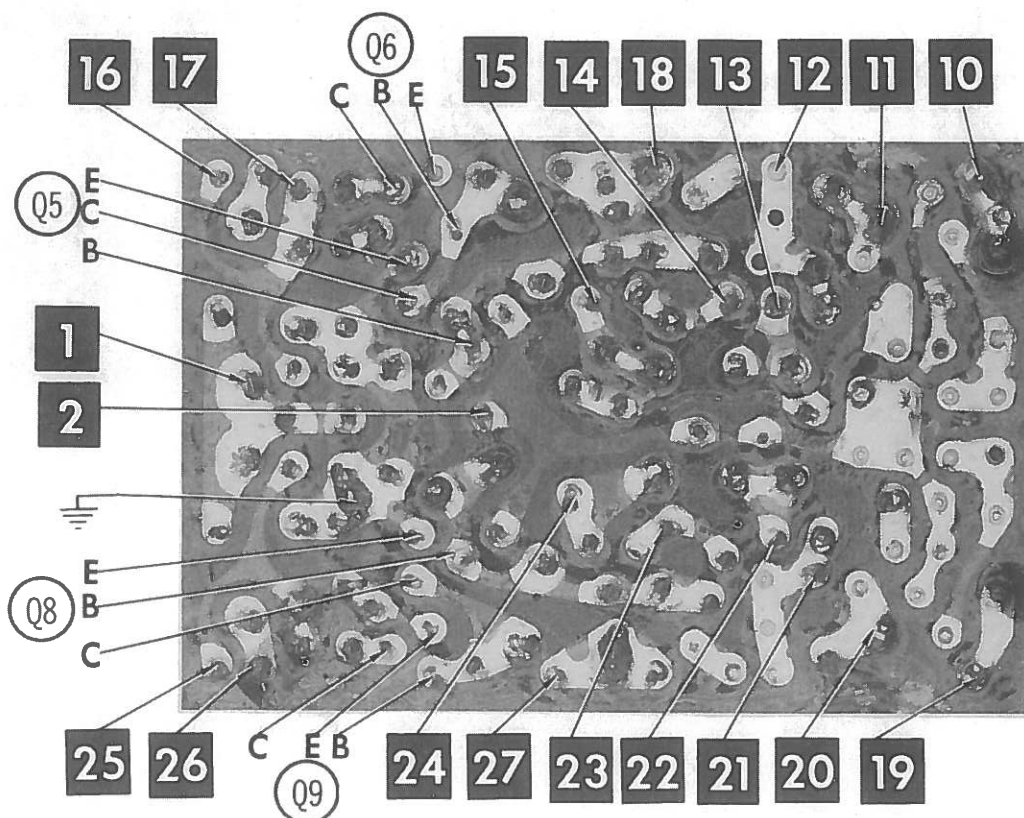
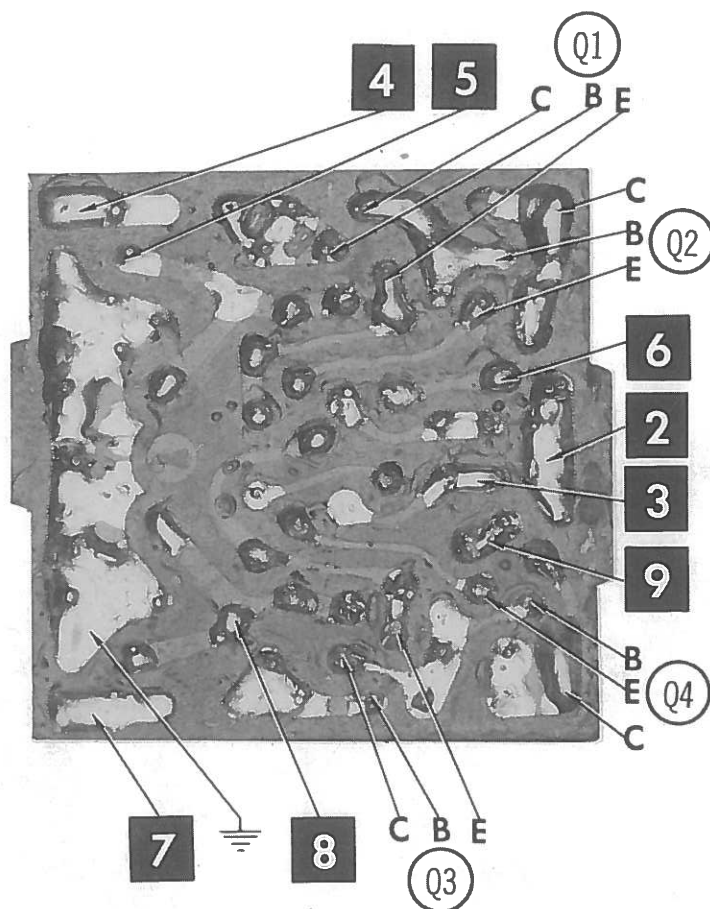


SUBASSEMBLY "A"

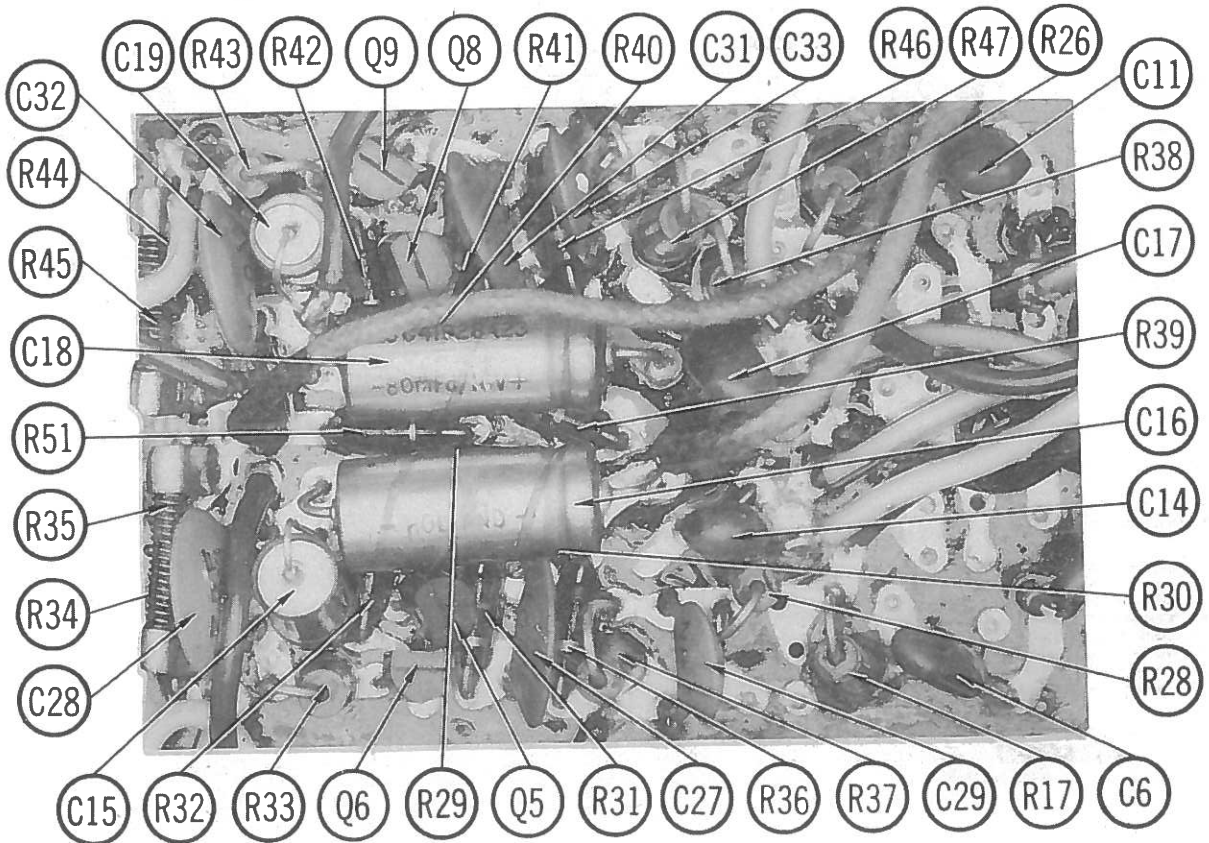
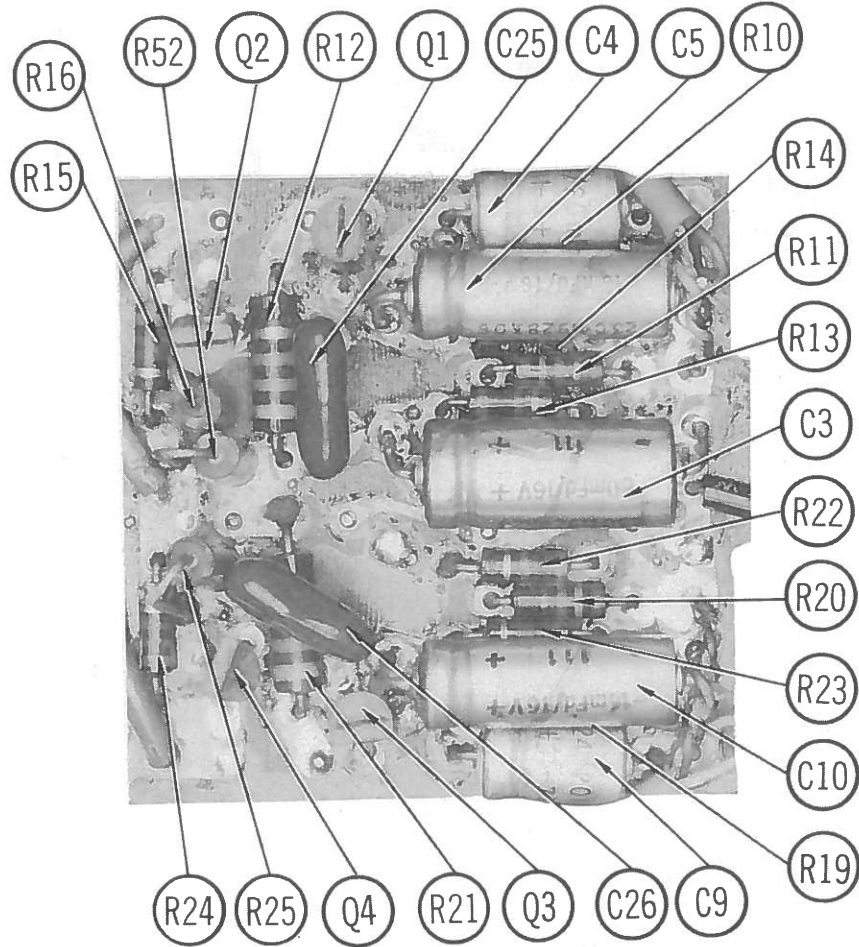




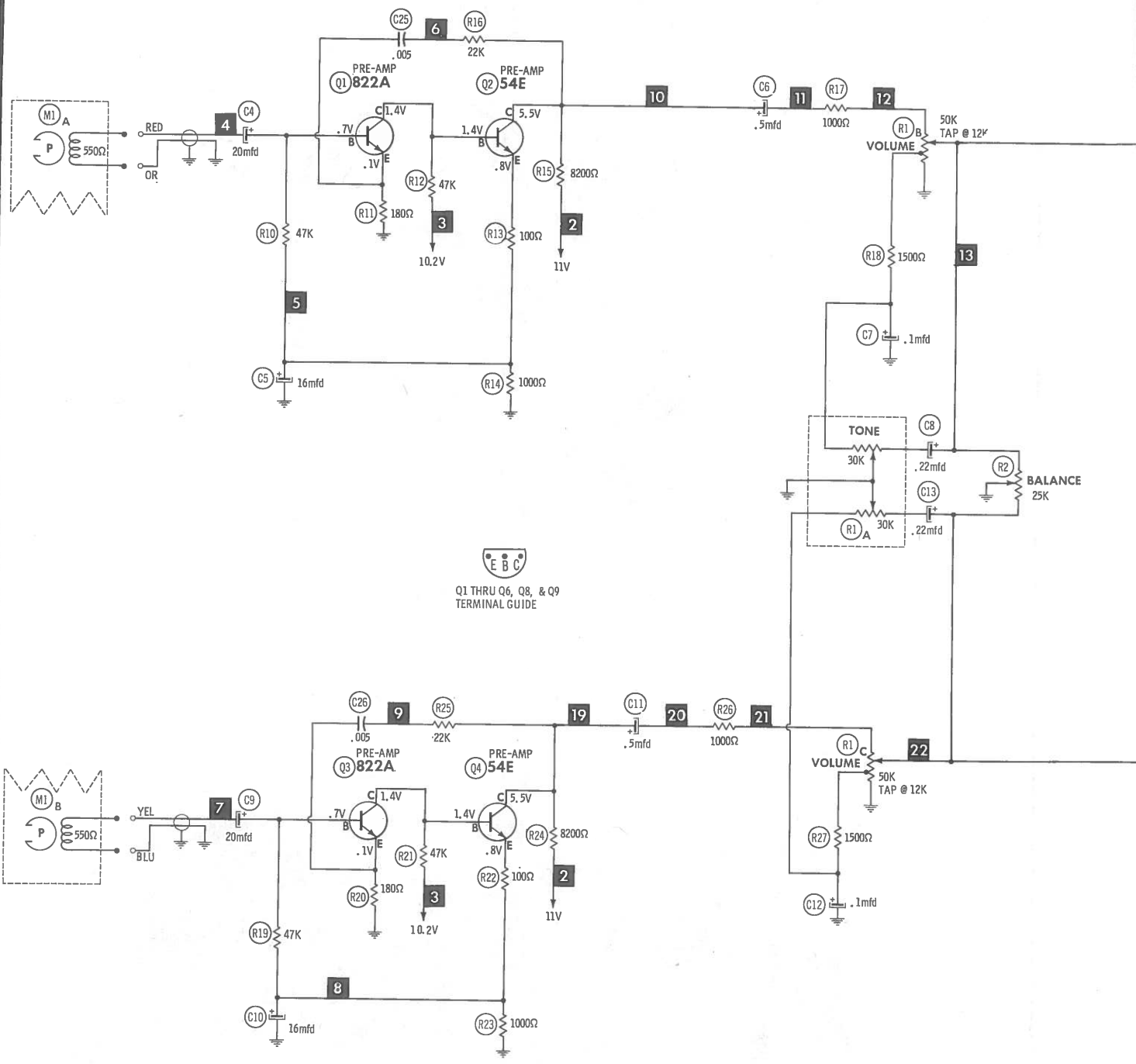








NOTE: DEMAGNETIZE HEADS AFTER SERVICING



Resistors are 1/2 watt or less and rated 10% or 20% unless otherwise indicated.

1. Voltage measurements taken with vacuum tube voltmeter.
2. All controls set for normal operation, no signal applied.
3. Measured values are from socket pin or terminal to common ground.
4. All terminals viewed from bottom unless otherwise designated.
5. Numbers assigned to terminals may not be found on the unit.
6. Supply voltage maintained at rated value for voltage readings.
7. Resistance measurements not given because of the wide variation in internal resistance of transistor.

A PHOTOFAC STANDARD NOTATION SCHEMATIC

with **CIRCUITRACE**

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# PARTS LIST AND DESCRIPTION

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

Replacement parts shown may be superseded by the availability of newly introduced replacements.  
Have your local distributor check Sams COUNTER FACTS® for the most up-to-date replacement.

## WIRING DATA

General-use Unshielded Hook-up Wire .....	Use BELDEN No. 8530 (Solid) Available in 12 Colors 8524 (Stranded) Available in 12 Colors
Shielded Hook-up Wire .....	Use BELDEN No. 8885
Rear Seat Speaker Extension Cable .....	Use BELDEN No. 8782 (Stranded) Coded Parallel Leads
Bonding Strap .....	Use BELDEN No. 8661 (3/8 In.) or 8670 (3/4 In.)

## TRANSISTORS

ITEM No.	TYPE No.	FUNCTION	REPLACEMENT DATA						
			MFGR. PART No.	DELCO PART No.	GENERAL ELECTRIC PART No.	INTERNATIONAL RECTIFIER PART No.	MOTOROLA PART No.	RCA PART No.	SYLVANIA PART No.
Q1	822A	Preamp	48-134823	DS-76	GE-20	TR-21	HEP730	SK-3020	ECG 123
Q2	54E	Preamp	48-134846	DS-76	GE-20	TR-21	HEP724	SK-3020	ECG 123
Q3	822A	Preamp	48-134823	DS-76	GE-20	TR-21	HEP730	SK-3020	ECG 123
Q4	54E	Preamp	48-134846	DS-76	GE-20	TR-21	HEP724	SK-3020	ECG 123
Q5	54C	AF Amp	48-134810	DS-66	GE-20	TR-21	HEP725	SK-3020	ECG 123
Q6	54C	AF Amp	48-134810	DS-66	GE-20	TR-21	HEP725	SK-3020	ECG 123
Q7	2N176	Output *	48-134747	DS-520	GE-3	TR-01	HEP624	SK-3009	ECG 104
Q8	54C	AF Amp	48-134810	DS-66	GE-20	TR-21	HEP725	SK-3020	ECG 123
Q9	54C	AF Amp	48-134810	DS-66	GE-20	TR-21	HEP725	SK-3020	ECG 123
Q10	2N176	Output *	48-134747	DS-520	GE-3	TR-01	HEP624	SK-3009	ECG 104
Q11	2N176	Motor Regulator *	48-134747	DS-520	GE-3	TR-01	HEP624	SK-3009	ECG 104

\* When replacing, apply silicone grease to both sides of insulator. Tighten mounting screws securely.

## POWER RECTIFIERS & SIGNAL DIODES

ITEM No.	MFGR. PART OR TYPE No.	REPLACEMENT RECTIFIERS & DIODES			REPLACEMENT RECTIFIERS	NOTES
		GENERAL ELECTRIC PART No.	INTERNATIONAL RECTIFIER PART No.	SYLVANIA PART No.	RCA PART No.	
X1	48A41508A01	GE-504A	8D4	ECG 116	SK-3016	

## ELECTROLYTIC CAPACITORS

ITEM No.	RATING	REPLACEMENT DATA						
		PART No.	AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	GENERAL ELECTRIC PART No.	MALLORY PART No.	SPRAGUE PART No.
C1	1000 16V	23C41928A29	PRS1230	EA15-1000	WBR1000-16	Q11-32	TC1501A	TL-1166.5
C2	1000 16V	23C41928A29	PRS1230	EA15-1000	WBR1000-16	Q11-32	TC1501A	TL-1166.5
C3	80 16V	23C41928A23	CRE620A	EA15-100	NLW75-15	MT1-19	MTA80E15	TE-1161
C4	20 16V	23C41928A24	CRE611A	EA15-25	NLW20-25	MT1-10	MTA20D30	TL-1157
C5	16 16V	23C41928A06	CRE609A	EA15-15	NLW15-25	MT1-11	MTA15D35	TL-1156
C6	.5 15V	23C43280A21	CRE450A	UK10-474	TYR13BD474K	MT1-1	TAS474K050P0A	196D474X
C7	.1 15V	23C43280A14		UK20-104	TYR13BE104K	MT1-1	TAS104K035P0A	0035DB
C8	.22 15V	23C43280A19		UK20-204	TYR13BDR22K		TAS224M035P0A	196D104X
C9	20 16V	23C41928A24	CRE611A	EA15-25	NLW20-25	MT1-10	MTA20D30	0035DB
C10	16 16V	23C41928A06	CRE609A	EA15-15	NLW15-25	MT1-11	MTA15D35	196D224X
C11	.5 15V	23C43280A21	CRE450A	UK10-474	TYR13BD474K	MT1-1	TAS474K050P0A	0035DB
C12	.1 15V	23C43280A14		UK20-104	TYR13BE104K	MT1-1	TAS104K035P0A	196D104X
C13	.22 15V	23C43280A19		UK20-204	TYR13BDR22K		TAS224M035P0A	0035DB
C14	2 10V	23C43280A02	BCD12002	EP15-2	NLW2-50	MT1-1	MTV2CB50	196D224X
C15	80 16V	23C41928A23	CRE620A	EA15-100	NLW75-15	MT1-19	MTA80E15	0035DB
C16	32 10V	23C41928A33	CRE614A	EA15-25	NLW35-25	MT1-16	MTA35D15	TL-1121
C17	2 10V	23C43280A02	BCD12002	EP15-2	NLW2-50	MT1-1	MTV2CB50	TE-1161
C18	80 16V	23C41928A23	CRE620A	EA15-100	NLW75-15	MT1-19	MTA80E15	TL-1159
C19	32 10V	23C41928A33	CRE614A	EA15-25	NLW35-25	MT1-16	MTA35D15	TL-1121
C20	1000 16V	23S187A06	PRS1230	EA15-1000	WBR1000-16	Q11-32	TC1501A	TE-1161

# PARTS LIST AND DESCRIPTION (CONTINUED)

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

Replacement parts shown may be superseded by the availability of newly introduced replacements.  
Have your local distributor check Sams COUNTER FACTS for the most up-to-date replacement.

## CAPACITORS

ITEM No.	RATING	REMARKS	REPLACEMENT DATA					
			AEROVOX PART No.	CENTRALAB PART No.	CORNELL-DUBILIER PART No.	ELMENCO PART No.	MALLORY PART No.	SPRAGUE PART No.
C25	.005 100V	#21-43539A01	DBE6D5	CPR-5000J	WMF1D5	1DP-1-502	PVC625	6PS-D50
C26	.005 100V		DBE6D5	CPR-5000J	WMF1D5	1DP-1-502	PVC625	6PS-D50
C27	.0015		GPD X5F152K	DD-152		CCD-152	GP215	10TS-D15
C28	.0015		GPD X5F152K	DD-152		CCD-152	GP215	10TS-D15
C29	22 N150					*	*	10TCP-Q22
C30	.01	#21-43539A01	TTP-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C31	.0015		GPD X5F152K	DD-152		CCD-152	GP215	10TS-D15
C32	.0015		GPD X5F152K	DD-152		CCD-152	GP215	10TS-D15
C33	22 N150					*	*	10TCP-Q22
C34	.01		TTP-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10
C35	.1 100V		DBE2P1		DMF1P1	1DP-2-104	PVC101	225P10491
C36	.1 100V		DBE2P1		DMF1P1	1DP-2-104	PVC101	225P10491
C37	.01		TTP-01	CK-103	HOY101ZV103P	CCD-103	TA110	TG-S10

# Borg-Warner Part Number.

\* Not normally in distributor's stock. Available thru distributor on order to manufacturer.

## 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.	CTS-IRC PART No.	MALLORY PART No.
R1A	Tone	50K	18C40483B02				
B	Switch (Track Sel.)						
C	Volume	40K Tap @ 12K					
D	Volume	40K Tap @ 12K					
R2	Balance	25K	18C40482B01				

## RESISTORS (Power and Special)

ITEM No.	RATING	REPLACEMENT DATA		
		IRC PART No.	WORKMAN PART No.	MFGR. PART No.
R35	.2			17-40756A06

ITEM No.	RATING	REPLACEMENT DATA		
		IRC PART No.	WORKMAN PART No.	MFGR. PART No.
R45	.2			17-40756A06

## FILTER CHOKE

ITEM No.	RATINGS			REPLACEMENT DATA					NOTES
	CURRENT (Measured)	DC RES.	INDUCTANCE (10 CURRENT 1000~)	PART No.	MERIT PART No.	STANCOR PART No.	THORDARSON PART No.	TRIAD PART No.	
L1	1.4 A	.4	11mh	25-43221A24	C-4095	TC-2	TR-154	TY17XT	

## TRANSFORMER (Audio Output)

TRANSFORMER (Audio Output)								
ITEM No.	IMPEDANCE		REPLACEMENT DATA					NOTES
			MFGR. PART No.	MERIT PART No.	STANCOR PART No.	THORDARSON PART No.	TRIAD PART No.	
	PRI.	SEC.						
T1	18 Tap@	8	25D41307B05					
T2	18 Tap@	8	25D41307B07					

## PARTS LIST AND DESCRIPTION (CONTINUED)

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

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### SPEAKER

ITEM No.	TYPE	REPLACEMENT DATA			NOTES
		PART No.	JENSEN PART No.	QUAM PART No.	
SP1	5 1/4" PM 8 ohms	50C40740B01	C525T8	52A1Z8	
SP2	5 1/4" PM 8 ohms	50C40740B01	C525T8	52A1Z8	

### 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	SFE 7 1/2 Amp	65R122346	9C41095A26	SFE 7 1/2	HHH	30707.5	150145	

### TAPE HEADS

ITEM No.	MEASURED			PART No.	NORTRONICS PART No.	DESCRIPTION
	INDUCTANCE	BIAS/ERASE VOLTS (RMS)	BIAS FREQ.			
M1	310mh			59-43641A02	5800 (1)	8-Track Stereo Play (1) Use Original Mounting

### MISCELLANEOUS

ITEM No.	PART NAME	PART No.	NOTES
M2	Solenoid	24-42064B03	
M3	Motor	59-43543A02	
S1	Switch, On-Off	40-41018B01	
S2	Switch, Automatic Track Selector	40-43642A01	

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

ITEM	PART No.	ITEM	PART No.
Door Escutcheon	15-40570B01 15-41768B01	Knob, Volume or Balance Knob, Tone or Dummy	36-543876 36-40039B01