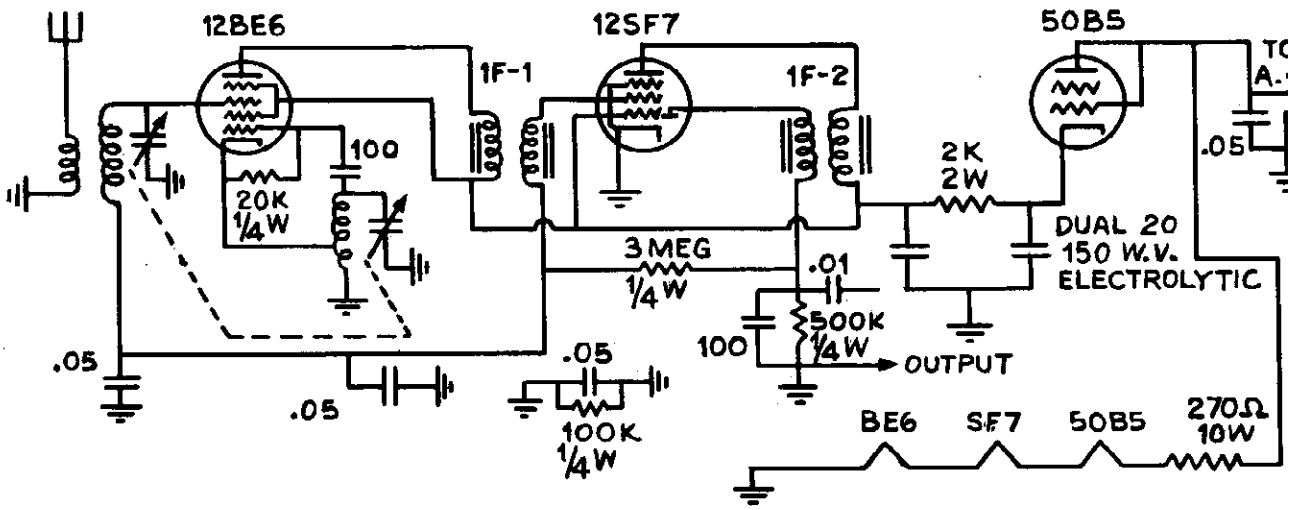


Adaptol CT-1 Miniature Superheterodyne Data

The following data will enable you to understand your tuner, and service with a minimum of test equipment.

The circuit is a straightforward superheterodyne of high efficiency, due to the employment of modern, best quality components and tubes. The 12BE is a dual purpose oscillator and mixer. The 12SF7 is used as a high gain I.F. stage, diode detector, and A.V.C. tube. The 50B5 is used as a rectifier because it does not open as readily as a conventional rectifier under overloads, and it permits a smaller value of dropping resistor, with lower dissipation below chassis.

The following voltages should appear under normal operation, with a strong Broadcast signal tuned in ...

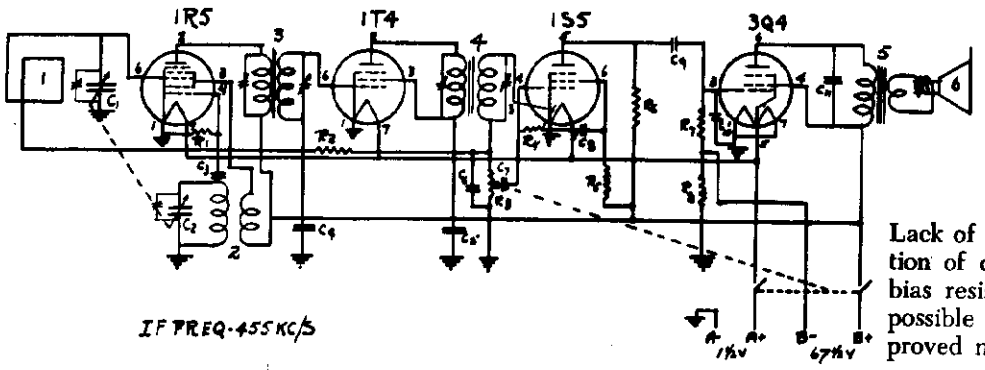
A.V.C. 3-6 volts
Plate at output of filter 100-120 volts
Total current 20-25 milliamperes
Oscillator grid bias 9-11 volts
Power consumption 20 watts 110 volts D.C. 60 cycle A.C.
All voltages measured with a VTVM with respect to B- (not chassis)

I.F. is 455 k.c. I.F.'s are permeability tuned, drift free units.

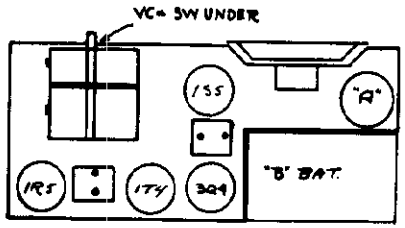
The following gain checks are approximate, depending on the equipment us line voltage, etc. Tuner set for 1000 kc.

Antenna to converter grid 4 to 5
Converter grid to IF grid 30
IF grid to diode 60
Audio Output on strong signal on five foot antenna .5 volt RMS
Selectivity 10 times down 8 kilocycles off resonance at 1000 k.c.

Note: Floating ground is used
⏚ Signifies B minus
⏚ Signifies chassis
Rotating tuning condenser to extreme counterclockwise position silences tuner for "standby", permits instant operation, thus eliminatin necessity for extra switch on amplifier.



TYPE - Four tube battery operated superheterodyne.
BATTERIES USED: "A" battery standard flashlight cell.
Eveready 950, Burgess 2R or equivalent.
"B" battery 67½ volt - Eveready 467, Burgess. XX45 or equivalent.
TUNING RANGE: 540 to 1700 KCS.
TUBES USED: 1R5 - 1T4 - 1S5 - 3Q4
WARRANTY: This receiver carries the standard RMA guarantee.



PARTS LIST			
PART NO.	Description	PART NO.	Description
R1	100,00 ohms	C1, C2	2 gang condenser
R2	2.2 meg	C3	50 UUF mica
R3	1 meg V.C. & D.P.S.T. switch	C4, C8	.02 paper condenser
R4	8.2 meg	C5	10 MFD 90 volt
R5	3.3 meg	C6, C10	100 UUF mica
R6	1 meg	C7, C9, C11	.005 paper condenser
R7	.5 meg		
R8	510 ohm	1. loop (in case)	
ALL RESISTORS ½ WATT AND ALL CONDENSERS 400 VOLT UNLESS OTHERWISE MARKED.		2. Oscillator Coil 3. 1st I.F. 455 KCS 4. 2nd I.F. 455 KCS 5. Output Transformer 6. 3" P.M. - 1 oz. Magnet	

SERVICE DATA

Lack of sensitivity and poor tone quality may be due to any one or a combination of causes such as weak or defective tubes or speaker, open or grounded bias resistor, bypass condenser, etc. Never attempt to realign set until other possible sources of trouble have been thoroughly investigated and definitely proved not to be the cause.

NOTE: IT IS ABSOLUTELY NECESSARY THAT AN ACCURATELY CALIBRATED OSCILLATOR WITH SOME TYPE OF OUTPUT MEASURING DEVICE BE USED WHEN ALIGNING THE RECEIVER AND THAT THE PROCEDURE BE CAREFULLY FOLLOWED. OTHERWISE THE RECEIVER WILL BE INSENSITIVE AND THE DIAL CALIBRATION WILL BE INCORRECT. THE TRIMMERS WILL BE REFERRED TO BY THEIR FUNCTION AS INDICATED ON THE PARTS DIAGRAM.

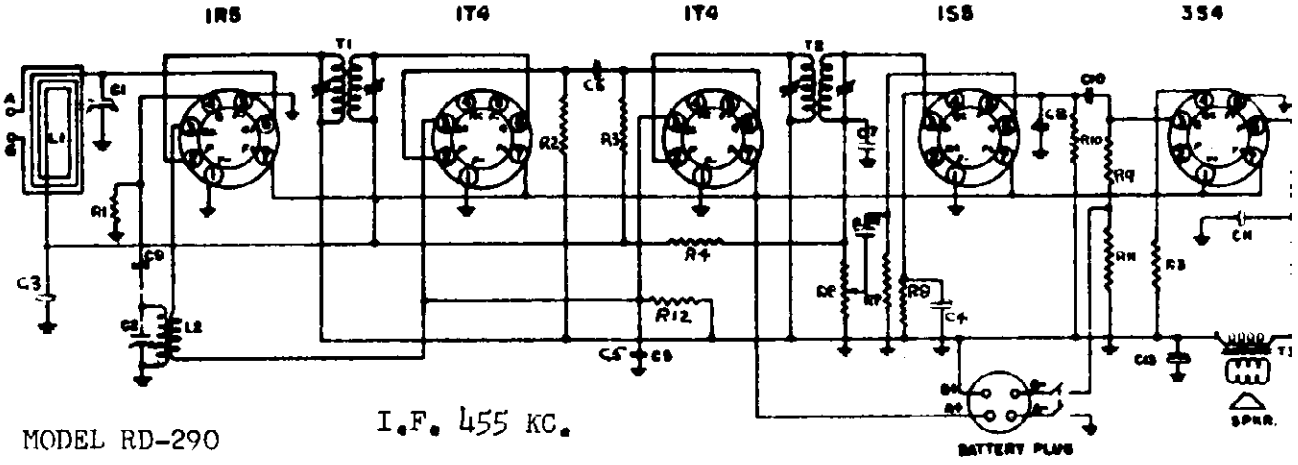
ALIGNMENT PROCEDURE

GENERAL DATA: The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 1400, 1700 KCS and an output meter to be connected across the primary or secondary of the output transformer. If possible all alignments should be made with the volume control on maximum and the test oscillator output as low as possible. For more accuracy a vacuum tube voltmeter should be used.

1. Couple signal generator to loop loosely using one or two turns of wire connected to signal generator output.
2. Set signal generator of 455 KC and adjust the 4 I.F. trimmers on top of I.F. cans. An output meter may be connected across voice coil but we suggest for more accurate alignment that a vacuum tube voltmeter be connected between ground and tie lug connecting return lead of loop.
3. The oscillator trimmer should next be set so that a 1700 KC signal comes in at minimum setting of condenser. (Plates all out.)
4. The R.F. trimmer should be set at 1400 KC. It is suggested that it be adjusted with both batteries in case and chassis as near in the case as possible, and still adjust trimmer; as the chassis affects inductance of loop.

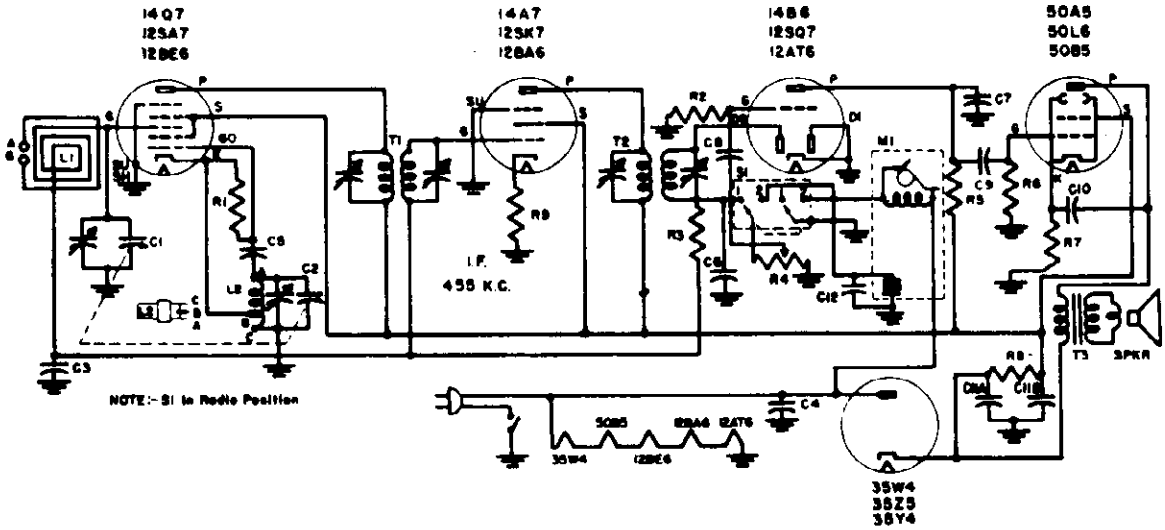
BUTLER BROTHERS

MODEL RD-29
MODEL RD-29



MODEL RD-290 I.F. 455 KC.

Circuit Symbol	Part Number	Description	Circuit Symbol	Part Number	Description
C1,C2	CV-10002-E	Condenser-Variable with pulley	R8,R9	RC-32004	Resistor-Carbon, 2 Meg ohms ½ watt
C3,C4,C5	CP-14502	Condenser-Paper, 0.05 mfd. 400 volt	R10	RC-31004	Resistor-Carbon, 1 Meg ohm ½ watt
C6,C7	CM-15251	Condenser-Mica, 250 mmfd. 500 volt	R11	RC-35002	Resistor-Carbon, 400 ohms ½ watt
C8,C9	CM-15500	Condenser-Mica, 50 mmfd. 500 volt	R12	RC-31002	Resistor-Carbon, 10,000 ohms ½ watt
C10,C11,C12	CP-14105	Condenser-Paper, 0.01 mfd. 400 volt	L1	AL-10004	Antenna-Loop
C13	CL-10002	Condenser-Electr. 12 to 20 mfd. 150 volt	L2	TRC-10001	Coil-Oscillator
R1	RC-31003	Resistor-Carbon, 100,000 ohms ½ watt	T1	T3-10000	Transformer-1st I.F.
R2,R3	RC-35001	Resistor-Carbon, 5,000 ohms ½ watt	T2	T3-10001	Transformer-2nd I.F.
R4,R5	RC-32004	Resistor-Carbon, 2 Meg ohms ½ watt	T3	TO-10002	Transformer-Output
R6	VC-20105	Control-Volume, 1 Meg ohm with d.p.s.t. switch	SPKR	SR-10002	Speaker-P.M. 5" round less output transformer
R7	RC-31505	Resistor-Carbon, 10 Meg ohms ½ watt			

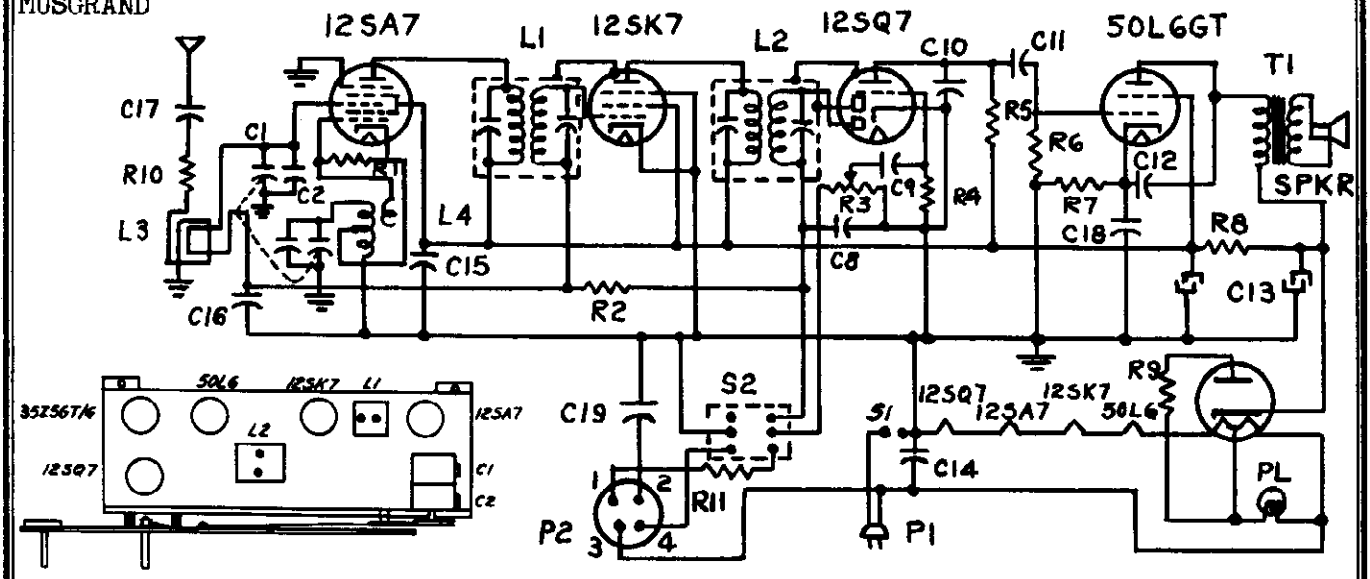


MODEL RD-291 I.F. 455 KC.

Circuit Symbol	Part Number	Description	Circuit Symbol	Part Number	Description
C1,C2	CV-10002-E	Condenser-Variable, with pulley	R6	RC-35005	Resistor-Carbon, 500,000 ohms ½ watt
C3	CP-12508	Condenser-Paper, 0.05 mfd., 200 volt	R7	RC-31500	Resistor-Carbon, 150 ohms ½ watt
C4,C10	CP-14503	Condenser-Paper, 0.05 mfd., 400 volt	R8	RC-32000	Resistor-Carbon, 200 ohms ½ watt
C5	CM-15500	Condenser-Mica, 0.00005 mfd., 500 volt	R9	RC-30680	Resistor-Carbon, 68 ohms ½ watt
C6,C7	CM-15251	Condenser-Mica, 0.00025 mfd., 500 volt	M1	PRA-10000	Changer Automatic
C8	CP-12103	Condenser-Paper, 0.01 mfd., 200 volt	L1	AL-10003	Loop-Antenna
C9	CP-14103	Condenser-Paper, 0.01 mfd., 400 volt	L2	TRC-10000-0	Coil-Oscillator
C11A,C11B	CL-10001	Condenser-Electrolytic 20/20/20 mfd., 150 volt	T1	T3-10000	Transformer-1st I.F.
R1	RC-32002	Resistor-Carbon, 20,000 ohms ½ watt	T2	T3-10001	Transformer-2nd I.F.
R2	RC-31005	Resistor-Carbon, 10 Megohms ½ watt	T3	TO-10000	Transformer-Output
R3	RC-32004	Resistor-Carbon, 2 Megohms ½ watt	SPKR	SR-10000	Speaker-P.M. 4" round less T3
R4	VC-10105	Control-Volume, with switch, 1 Megohm	S1	VS-10000	Switch-Radio Phono, s.p. three position
R5	RC-32503	Resistor-Carbon, 250,000 ohms ½ watt			

MODEL 100
MUSGRAND

ECKENROTH CO., INC.



Parts Description List

C1	Ant. Trimmer cond.	L1	1st. I F transformer
C2	Osc. Trimmer cond.	L2	2nd. I F transformer
C8	220 mfd mica capacitor	L3	Antenna loop
C9	.005 mfd paper cap.	L4	Oscillator coil
C10	220 mfd mica cap.	PL	Pilot lamp
C11	.01 mfd paper cap.	T1	Output transformer
C12	.02 mfd paper cap.	P2	Phono plug
C13	Filter 50/30 mfd 150V	R1	22,000 ohm carbon resistor
C14	.05 mfd paper cap.	R2	2.2 megohm carbon resistor
C15	.05 mfd paper cap.	R3	Volume control 0.5 megohm
C16	.05 mfd paper cap.	R4	4.7 megohm carbon resistor
C17	.01 mfd paper cap.	R5	470,000 ohm carbon resistor
C18	25 mfd 25 volt elect.	R6	470,000 ohm carbon resistor
C19	.1 mfd paper cap.	R7	150 ohm carbon resistor
Spkr	Loudspeaker	R8	1200 ohm carbon resistor
S-1	Line switch on Vol. cont.	R9	18 ohm carbon resistor
S-2	Radio-Phone switch	R10	470 ohm carbon resistor
P-1	Line plug	R11	1.8 megohm carbon resistor

SERVICE NOTES

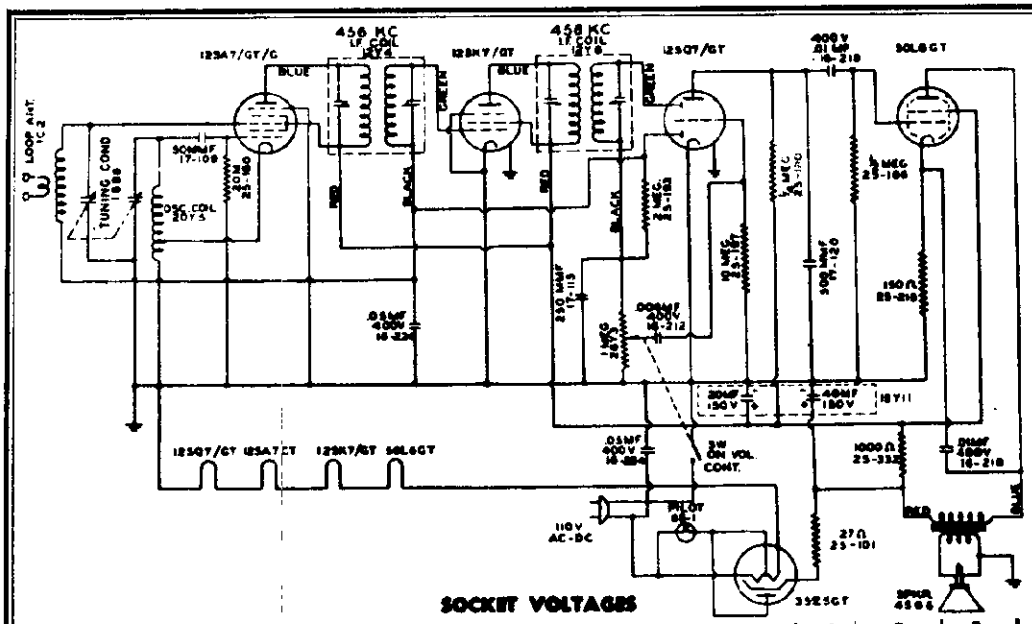
Rating:	105-125 volts 60 cycles AC
Tuning frequency range:	540-1720 Kilocycles
Intermediate frequency:	455 KC
Loudspeaker:	Alnico V Magnet Dynamic
Outside cone diameter	5-¼ inch diameter
Voice coil impedance (400 Cycles)	3.2 Ohms
Tubes: Converter and oscillator	12SA7
I.F. Amplifier	12SK7
Det., Audio, A.V.C.	12SQ7
Power Output	50L6GT
Rectifier	35Z5GT/G
Pilot Lamp	G.E. 47

ALIGNMENT PROCEDURE

I.F. Alignment: Connect an output meter across the voice coil. Turn the volume control to maximum. Set test oscillator to 455 KC. and keep the oscillator output as low as a readable meter reading will permit. Apply signal to the converter grid through a .05 mfd. capacitor and align progressively the trimmers in the second and first IF transformer cans.

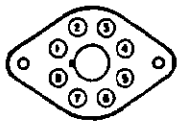
R.F. Alignemt : Apply the R.F. alignment signals through a standard I.R.E. dummy Ant. to the receiver antenna post. With the gang condenser wide open, align the oscillator trimmer on front section of gang to 1720 KC. Change the signal generator to 1500 KC., tune the receiver to the signal and peak the antenna trimmer on rear section of gang for maximum output on output meter.

Precaution: If the signal generator is AC operated, use an isolating transformer between the power supply and the radio receiver power input. The use of an isolating capacitor is not recommended, as A-C through the capacitor will introduce hum modulation and/or create the possibility of a burned out signal generator attenuator.



SOCKET VOLTAGES

TUBE	POSITION	1	2	3	4	5	6	7	8
12SA7GT	Osc. and Mixer	0	37.5 AC	99	99	-4.2	0	24.5 AC	0
12SK7GT	IF Amplifier	0	24.5 AC	0	0	0	99	12.5 AC	99
12SQ7GT	2nd Det.—1st Audio	0	0	0	0	0	16	12.5 AC	0
50L6GT	Power Output	0	85 AC	91.5	99	0	0	37.5 AC	5.9
35Z5GT	Rectifier	0	117 AC	112 AC	0	112 AC	0	85 AC	112



NOTE: All DC voltages measured with a 1000 ohm per volt meter from ON-OFF switch (—B) to socket contact indicated. All AC voltages are measured from ON-OFF switch (—B) to socket contact indicated.
All voltages are positive DC unless otherwise marked.
Volume control full on.
Line voltage 117 volts AC.

ALIGNMENT PROCEDURE

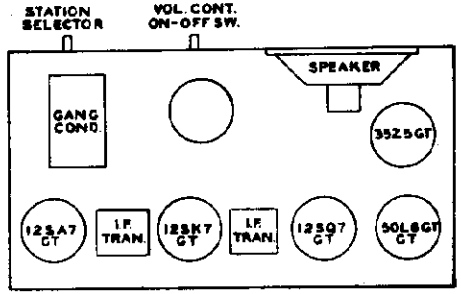
The following equipment is necessary to properly align this chassis:

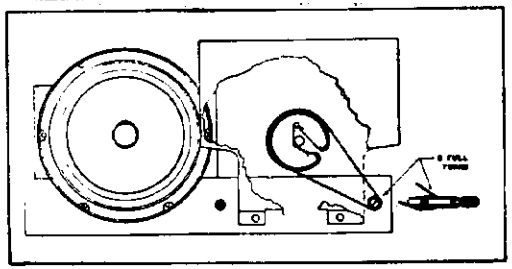
1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metallic screwdriver.
4. Dummy antenna: — .1 mfd., — 10 mmf.

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TO TUNE TRIMMERS	REMARKS
IF 455 kc.	12SA7GT grid	.1 mfd.	HF end	IF trimmers C D E F	Tune to max.
					Set limit of

PARTS LIST

PART NO.	DESCRIPTION
1C2	Loop antenna assembly
18B6	Tuning gang condenser
12Y4	1st I.F. transformer 456KC
12Y8	2nd I.F. transformer 456KC
15Y11	Two section electrolytic cond.
26Y3	Vol. cont. & Switch 1 megohm
20Y5	Oscillator coil
45B6	5" PM dynamic speaker
66-1	Pilot lamp 6-8 volt type 47





Dial Mechanism

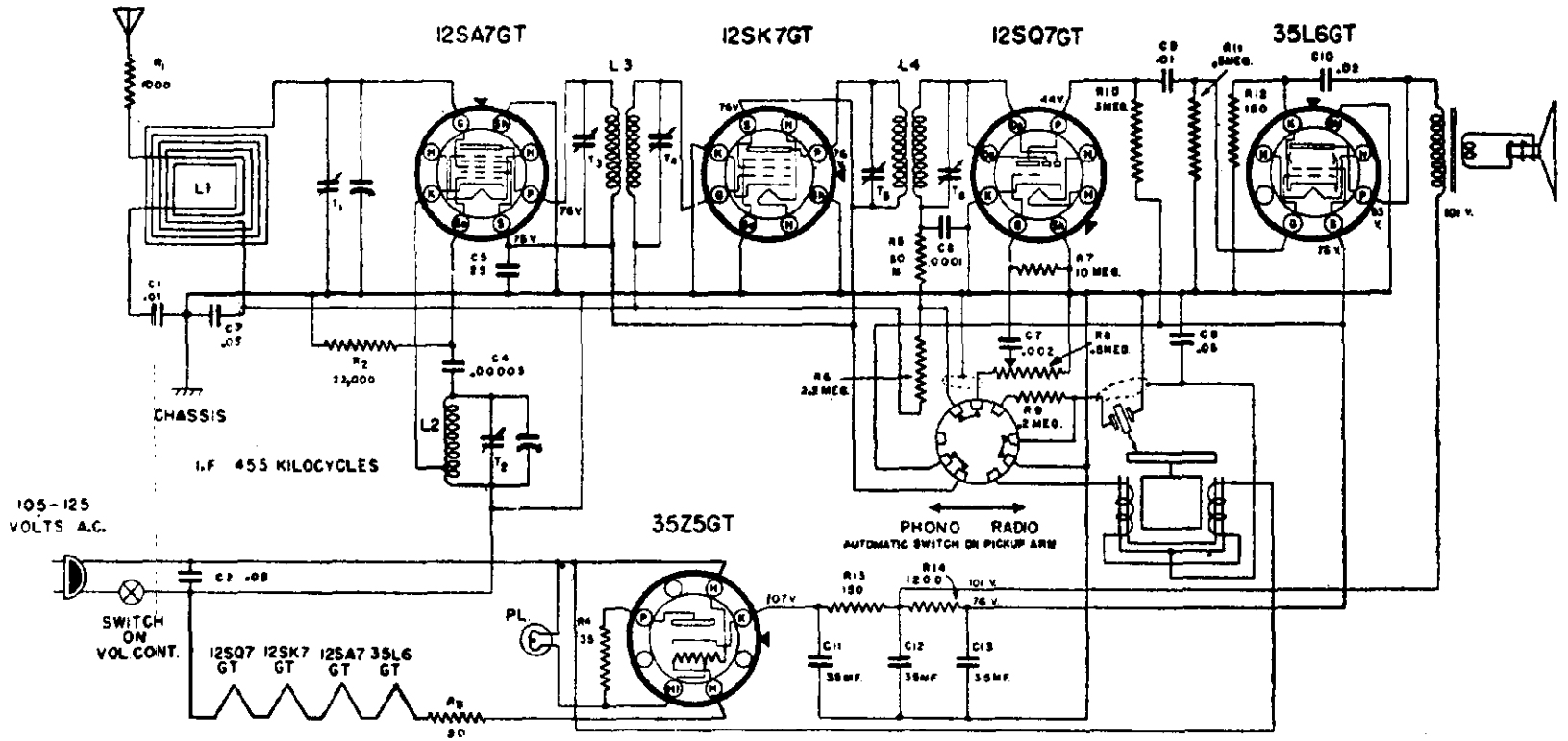
TUBE COMPLEMENT

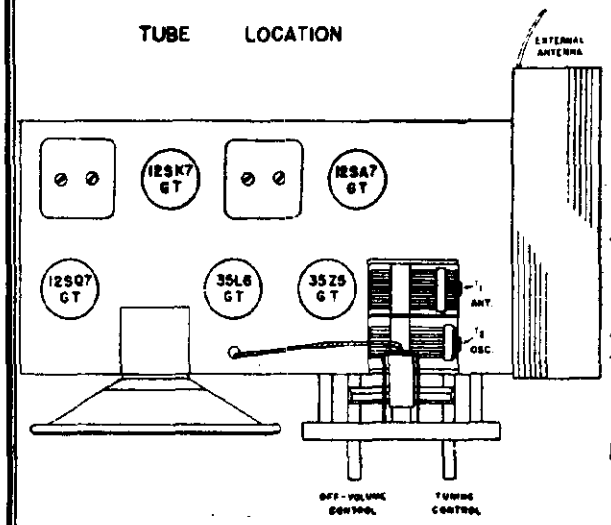
1—12SA7GT Oscillator and Mixer tube
1—12SK7GT IF Amplifier tube
1—50L6GT Power Output tube
1—35Z5GT Rectifier tube
1—12SQ7GT Second Detector and First Audio tube

NOTE: The above glass tubes are interchangeable with their metal equivalent.

Electrical and Mechanical Specifications

Frequency Range.....540-1700 kc.
Intermediate Frequency.....455 kc.
Power Supply.....105-125 volts AC-DC
Power Output (Undistorted) .75 watts
Power Output (Maximum)... 1.5 watts
Tuning Drive Ratio.....3 to 1





Alignment Frequencies:

I. F.	455 K.C.
R. F.	1500 K.C.

I. F. Alignment

Connect an output meter across the voice coil. Rotate the volume to maximum. Set test oscillator to 455 K.C. and apply signal to lug on stator of gang condenser to which loop is connected through a .05 Mfd. capacitor. Align the second I. F. transformer trimmers, next adjust the first I. F. transformer trimmers. Keep test oscillator output as low as a readable meter reading will permit.

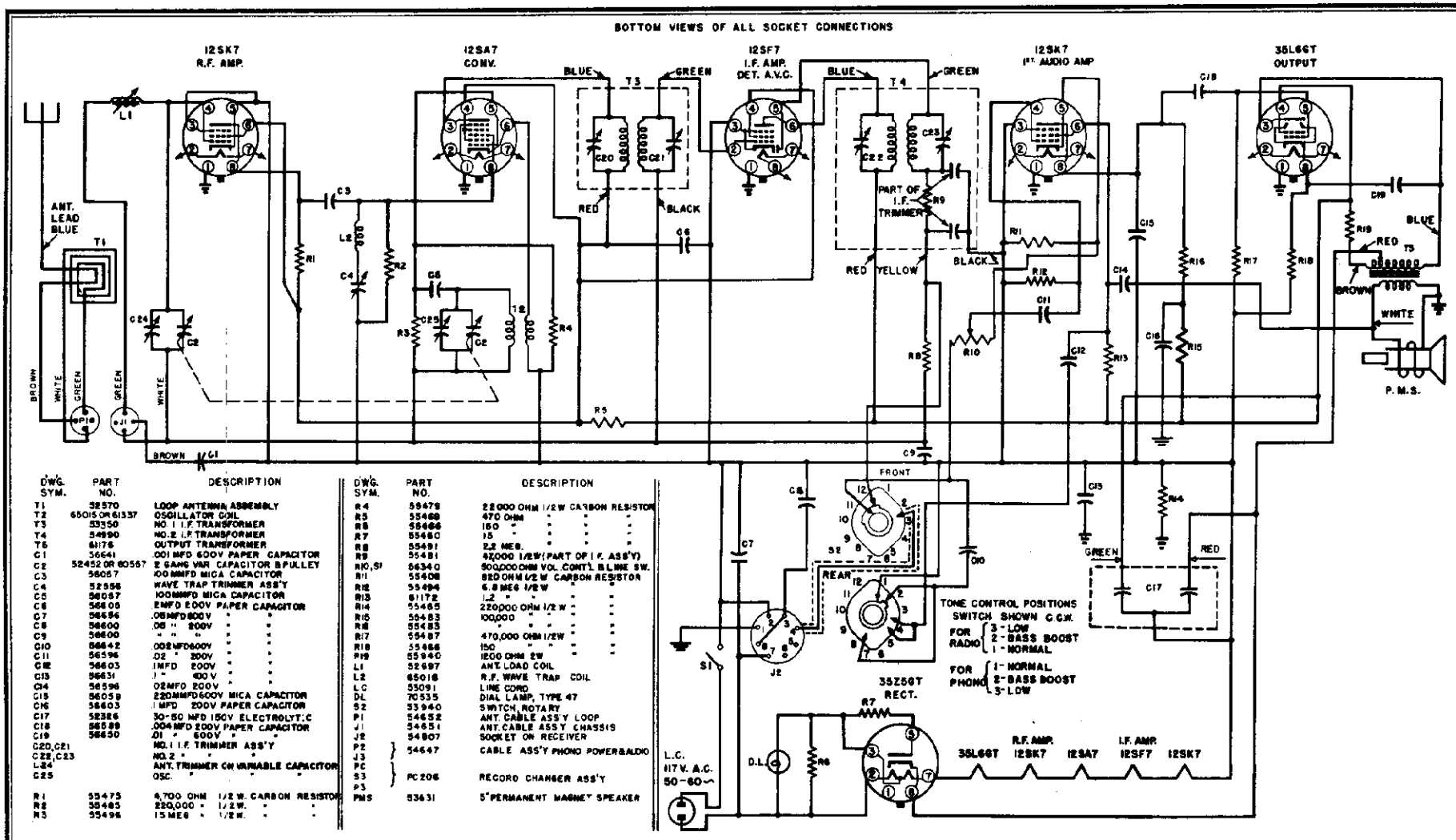
R. F. Alignment

Set the dial pointer and generator at 1500 K.C. Run wire from the output terminal of the generator, having it come near the receiver. However, no metallic connection is made between the signal generator and the receiver.

Peak the oscillator trimmer for maximum output and then the antenna trimmer.

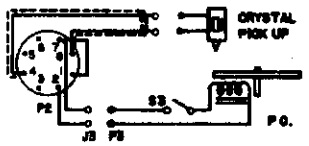
If the variable condenser plates have become bent or damaged, it may be necessary to adjust them for tracking, at 600 K.C. The oscillator plates are adjusted first, then the antenna plates are adjusted for maximum output at 600 K.C.

This radio is a compact, table model phono-radio superheterodyne receiver using six tubes and operates from an A.C. source of power. This receiver tunes the broadcast band of frequencies, covering the range of 540-1720 kilocycles.



DWG. SYM.	PART NO.	DESCRIPTION
T1	32570	LOOP ANTENNA ASSEMBLY
T2	65015 OR 61337	OSCILLATOR COIL
T3	53350	NO. 1 I.F. TRANSFORMER
T4	54990	NO. 2 I.F. TRANSFORMER
T5	61176	OUTPUT TRANSFORMER
C1	56641	.001 MFD 600V PAPER CAPACITOR
C2	52452 OR 60567	2 GANG VAR. CAPACITOR W/PULLEY
C3	56057	100 MMFD MICA CAPACITOR
C4	52556	WAVE TRAP TRIMMER ASS'Y
C5	56057	100MMFD MICA CAPACITOR
C6	56606	2MFD 600V PAPER CAPACITOR
C7	56656	.05MFD 600V " "
C8	56600	.05 " 200V " "
C9	56600	" " " " "
C10	56642	.002MFD 600V " "
C11	56596	.02 " 200V " "
C12	56603	.1MFD 200V " "
C13	56631	.1 " 400V " "
C14	56596	.02MFD 200V " "
C15	56059	220MMFD 600V MICA CAPACITOR
C16	56603	.1 MFD 200V PAPER CAPACITOR
C17	52386	30-50 MFD 150V ELECTROLYTIC
C18	56589	.004 MFD 200V PAPER CAPACITOR
C19	56650	.01 " 600V " "
C20,C21		NO. 1 I.F. TRIMMER ASS'Y
C22,C23		NO. 2 " " " "
L24		ANT. TRIMMER OR VARIABLE CAPACITOR
C25		OSC. " " " "
R1	55475	4,700 OHM 1/2 W. CARBON RESISTOR
R2	55485	220,000 " 1/2 W. " "
R3	55496	1.5 MEG " 1/2 W. " "

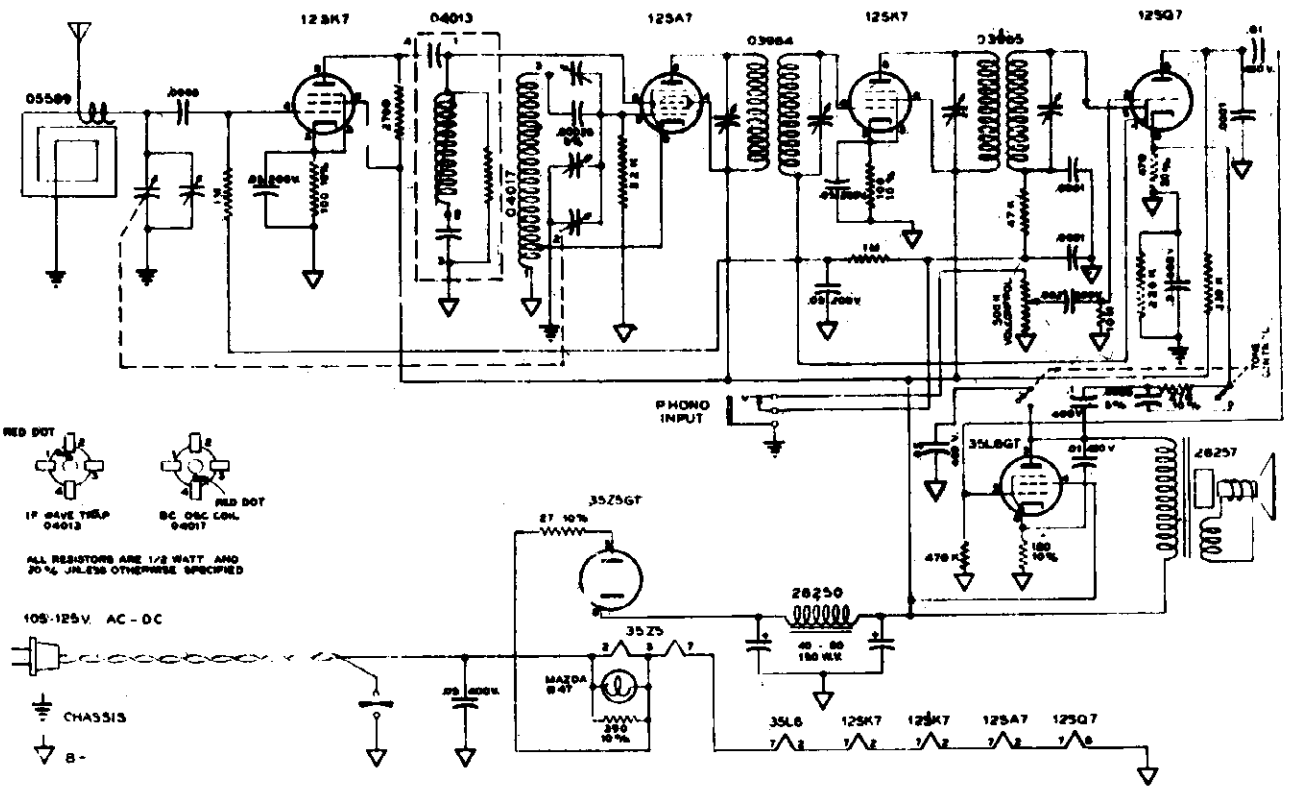
DWG. SYM.	PART NO.	DESCRIPTION
R4	55479	22,000 OHM 1/2 W CARBON RESISTOR
R5	55468	470 OHM " " " "
R6	55466	150 " " " "
R7	55460	15 " " " "
R8	55491	2.2 MEG. " " "
R9	55481	47,000 1/2 W (PART OF I.F. ASS'Y)
R10,S1	56340	500,000 OHM VOL. CONT'L. & LINE SW.
R11	55408	820 OHM 1/2 W CARBON RESISTOR
R12	55494	6.8 MEG 1/2 W " "
R13	61172	1.2 " " " "
R14	55465	220,000 OHM 1/2 W " "
R15	55483	100,000 " " " "
R16	55483	" " " " "
R17	55487	470,000 OHM 1/2 W " "
R18	55466	150 " " " "
R19	55940	1200 OHM 2 W " "
L1	52697	ANT. LOAD COIL
L2	65016	R.F. WAVE TRAP COIL
LC	55091	LINE CORD
DL	70535	DIAL LAMP, TYPE 47
S2	53940	SWITCH, ROTARY
P1	54652	ANT. CABLE ASS'Y LOOP
J1	54651	ANT. CABLE ASS'Y CHASSIS
J2	54907	SOCKET ON RECEIVER
P2 J3 PC	54647	CABLE ASS'Y PHONO POWER & AUDIO
P3 S3	PC 206	RECORD CHANGER ASS'Y
PMS	53631	5" PERMANENT MAGNET SPEAKER

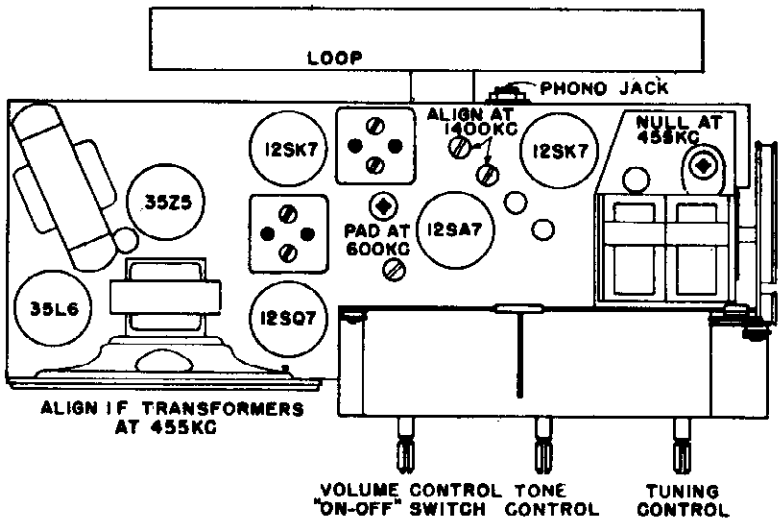


B.C. BAND 540 - 1730 KC.
INTERMEDIATE FREQUENCY 455 KC.
- - - - - - SHIELDED
— CHASSIS

MODEL 6K

MAGUIRE INDUSTRIES, INC.





TUBE LAYOUT

This is a 6-tube superheterodyne radio receiver, with provision for phonograph input, for operation on 105-125 volt AC or DC power supply. The tubes used are a 12SK7 as an R.F. amplifier, a 12SA7 as an oscillator-converter, a 12SK7 as an I.F. amplifier, a 12SQ7 as an AVC, detector, and 1st audio amplifier, a 35L6 as an output, and a 35Z5 as a power rectifier.

The broadcast band covers a frequency range from 535 to 1620 kilocycles. The dial is calibrated in kilocycles (KC) (less the final zero).

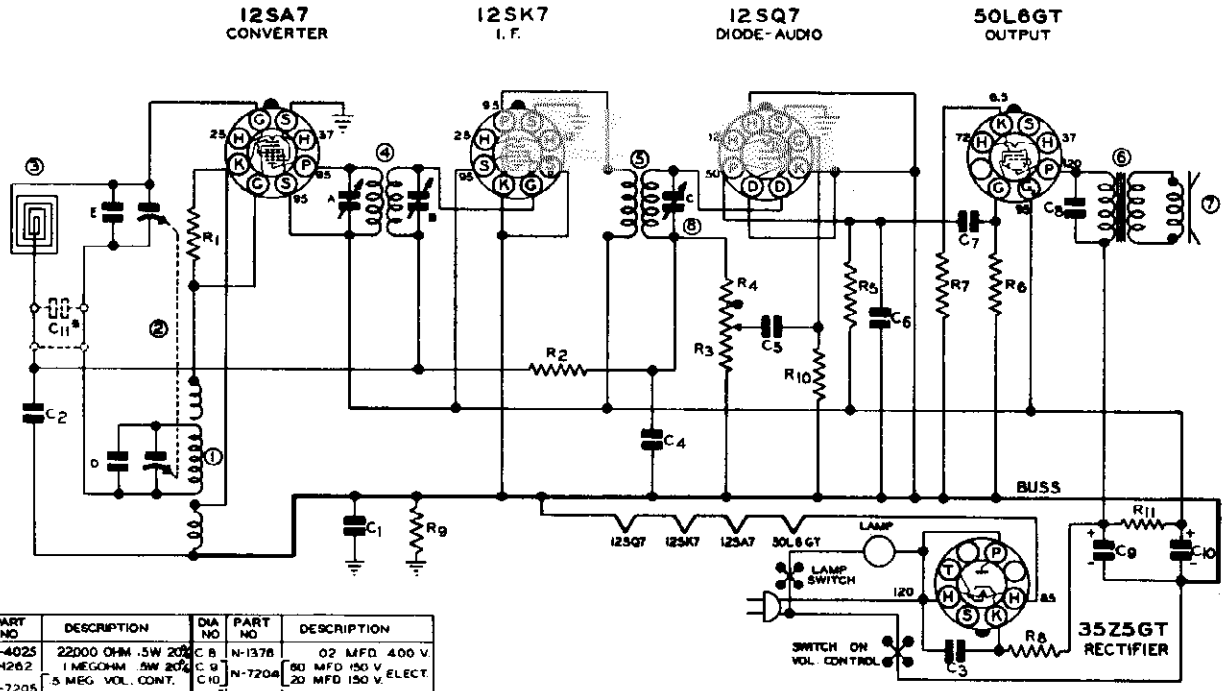
When using D.C. power supply, and after allowing sufficient time for tubes to warm up, if the receiver does not operate, remove the line cord plug from the socket and reverse. Replace the plug in the reverse position and allow tubes to warm up, at which time the receiver will operate.

When using A.C. power supply, it will be found that there will be less hum when the line cord is in the best position. Try both positions, leaving the plug in the position that produces the least hum.

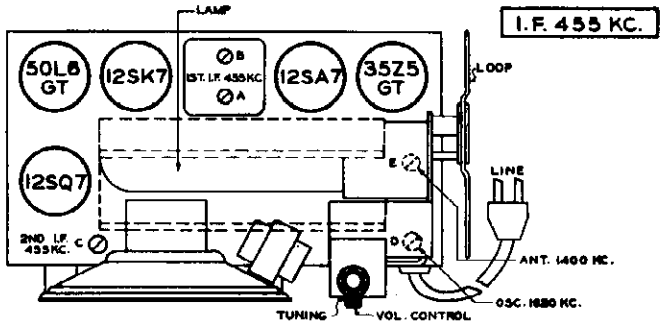
For reception of local stations no antenna is necessary, the built-in loop providing sufficient volume. If it is desired to listen to more distant stations, an antenna 50 to 100 feet long should be connected to the flexible lead protruding from the rear of the cabinet. **Do not use a ground with this receiver.**

MITCHELL MFG. CO.

MODEL LULLABY
BED-LAMP RADI



DIA NO	PART NO	DESCRIPTION	DIA NO	PART NO	DESCRIPTION
R1	N-4025	22000 OHM .5W 20%	C 8	N-1378	02 MFD 400 V.
R2	N-1262	1 MEGOHM .5W 20%	C 9	N-7204	60 MFD 150 V ELECT.
R3	N-7205	.5 MEG VOL. CONT.	C10		20 MFD 150 V.
R4		IN VOLUME CONTROL	C11	N-1345	.05 MFD. 200 V. USED IN SOME MODELS
R5	N-4026	220,000 OHM .5W 20%			
R6	N-4027	470,000 OHM .5W 20%			
R7	N-6244 OR N-4024	220 OHM .5W 10% 220 OHM .5W 10%			
R8	N-6256	47 OHM LOW 10%			
R9	N-4026	220,000 OHM .5W 20%		N-2084	LAMP SWITCH
R10	N-4028	6.8 MEGOHM .5W 20%		N-2585	25W. T-10 110V. LAMP
R11	N-4900	1200 OHM LOW 10%			
			1	N-7139	OSCILLATOR COIL
C1	N-1345	.05 MFD 200 V.	2	N-7203	2 GANG CONDENSER
C2	N-1345	.05 MFD 200 V.	3	N-7199	ANT. LOOP COIL
C3	N-1346	.05 MFD 400 V.	4	N-4813	IST. I.F.
C4	N-6015	100 MMFD CERAMIC	5	N-4846	2ND I.F.
C5	N-4894	005 MFD 600 V.	6	N-7197 OR	SPK'R & OUTPUT XFMR
C6	N-6135	250 MMFD CERAMIC	7	N-7198	
C7	N-1344	.01 MFD 400 V.	8	N-4985	2ND I.F. TRIMMER



This receiver is designed to operate over the standard broadcas band which extends from 535 to 1620 Kilocycles (KC) (185 to 56 Meters.)

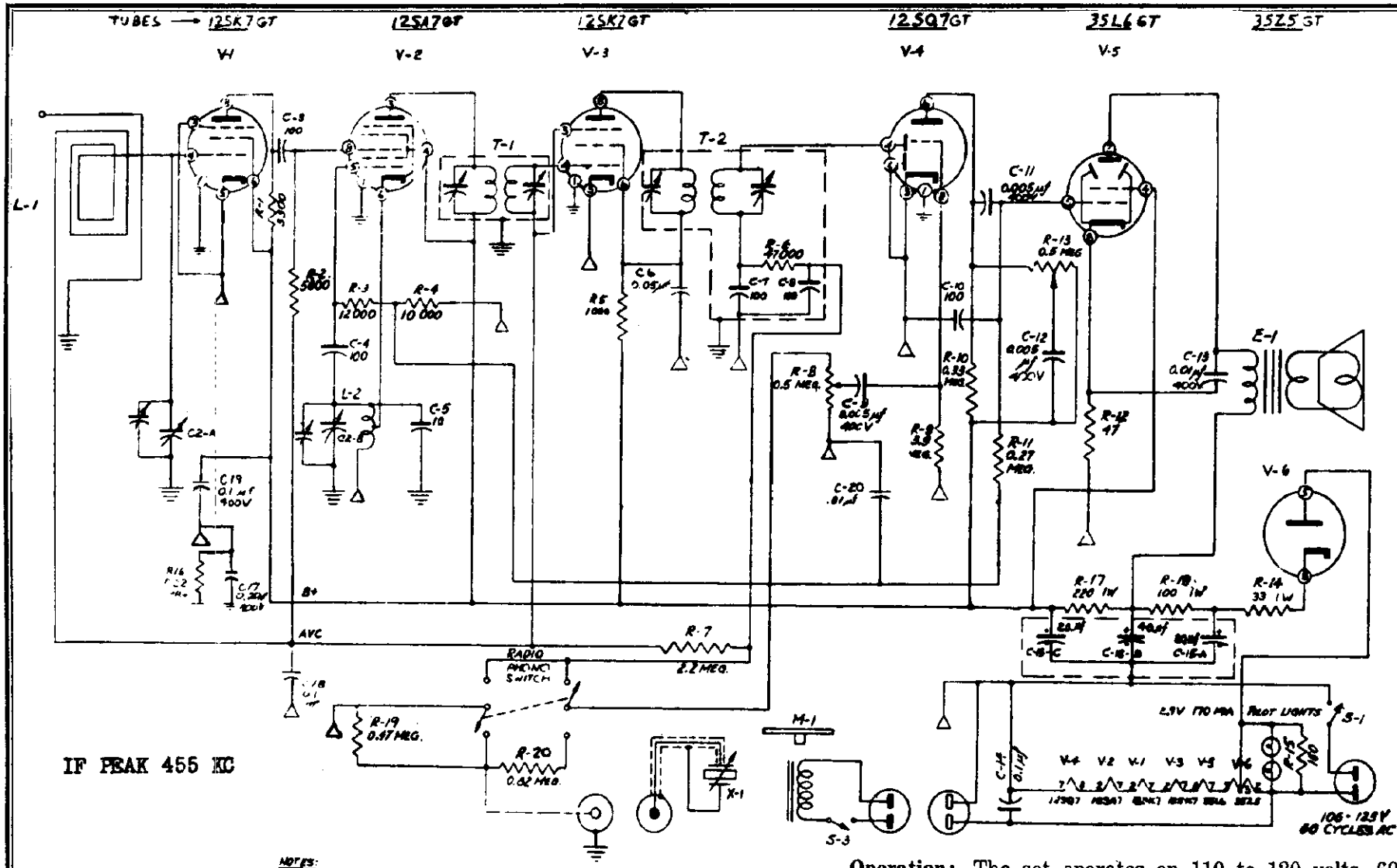
ALIGNMENT PROCEDURE

GENERAL DATA. The alignment of this receiver requires the use of a test oscillator that will cover the frequencies of 455, 600, 1400 and 1620 KC and an output meter to be connected across the primary or secondary of the output transformer. If possible, all alignments should be made with the volume control on maximum and the test oscillator output as low as possible to prevent the AVC from operating and giving false readings.

CORRECT ALIGNMENT PROCEDURE. The intermediate frequency (I.F.) stages should be aligned properly as the first step. After the I.F. transformers have been properly adjusted and peaked, the broadcast band should be adjusted.

I.F. ALIGNMENT. Remove the chassis and loop antenna from the cabinet and set them up on the bench so that they occupy exactly the same respective positions on the bench as they did in the cobinet. Care should be taken to have no iron or other metal near the loop. Do not make this set-up on a metal bench. With t gang condenser set at minimum, adjust the test oscillator to 4 KC and connect the output to the grid of the converter tube (12SA through a .05 or .1 mfd. condenser. The ground on the test oscilla should be connected to the ground buss, indicated on the circ diagram. Align all three I.F. trimmers to peak or maximum readi on the output meter.

BROADCAST BAND ALIGNMENT. Connect the test oscillator to a dummy l which can be made by coiling 2 turns of hookup wire about 6" in diame Place this dummy loop about a foot from the loop on the receiver and in same plane as the receiver loop. With the gang condenser set at minim capacity, set the test oscillator at 1620 KC, and adjust the oscillator (or 1620 trimmer) on the gang condenser. Next—set the test oscillator at 1400 KC, tune in the signal on the gang condenser. Adjust the antenna trimmer (or 1 KC trimmer) for maximum signal. Next set the test oscillator at 600 KC, tune in signal on condenser to check alignment of coils.

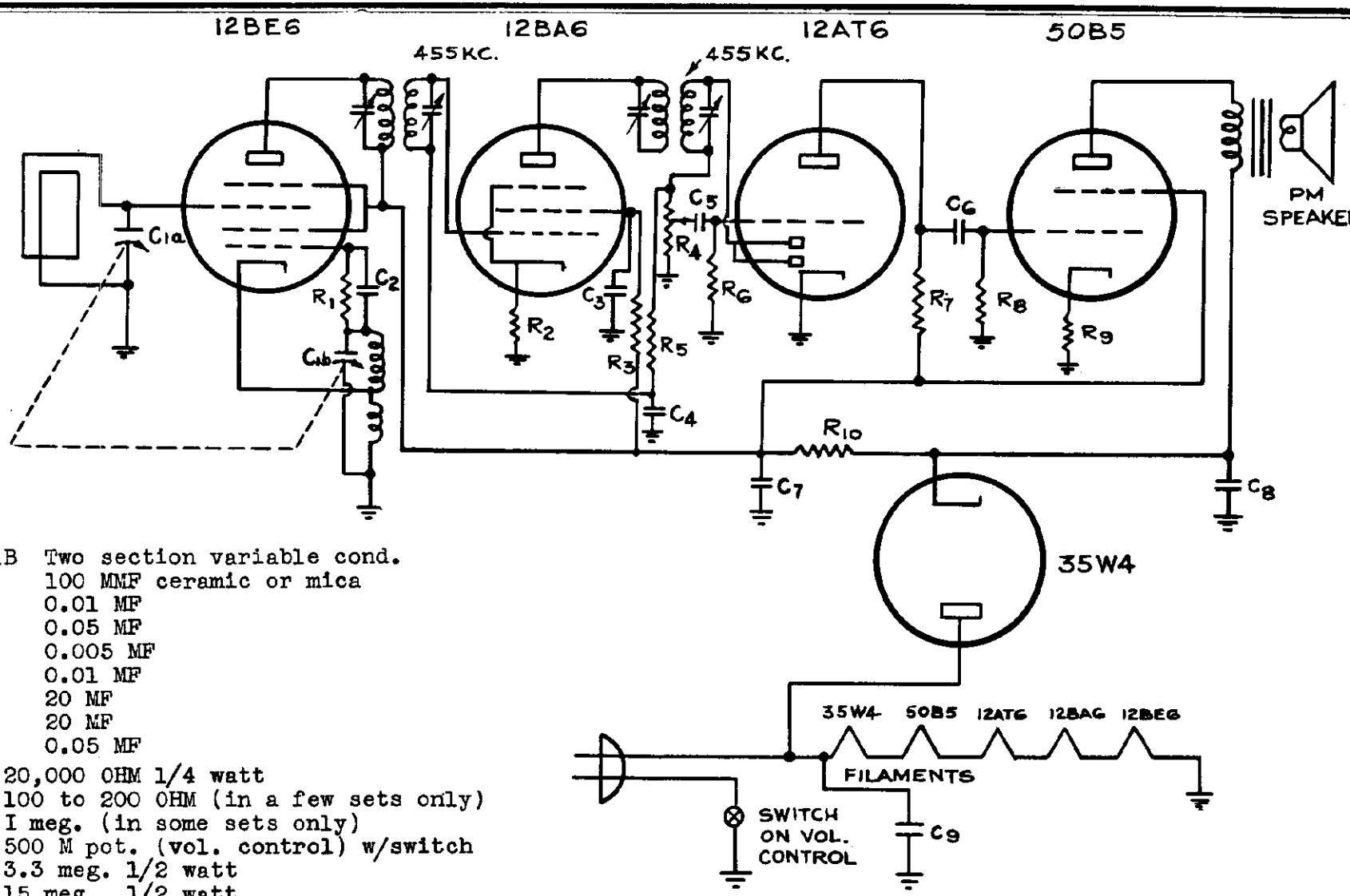


IF PEAK 455 KC

NOTES:
1. ALL RESISTORS IN OHMS, ALL CAPACITORS IN μμf, UNLESS OTHERWISE SPECIFIED
2. POWER SWITCH S-1 IS GANGED WITH VOLUME CONTROL R-8
3. RESISTOR R-6 AND CAPACITORS C-7, C-8 ARE CONTAINED WITHIN SECOND I.F. TRANSFORMER ASSEMBLY.
4. SWITCH S-3 IS MOUNTED ON RECORD CHANGER

Operation: The set operates on 110 to 120 volts, 60 cycles A.C. only. Power drain is approximately 25 watts for radio and 20 watts additional for the record changer.

Range: Model G-617-SN covers the broadcast band from 540 to 1600 kilocycles. Since the scale is calibrated 54 to 160, the actual frequency of the station received is obtained by adding a zero to the dial calibration.



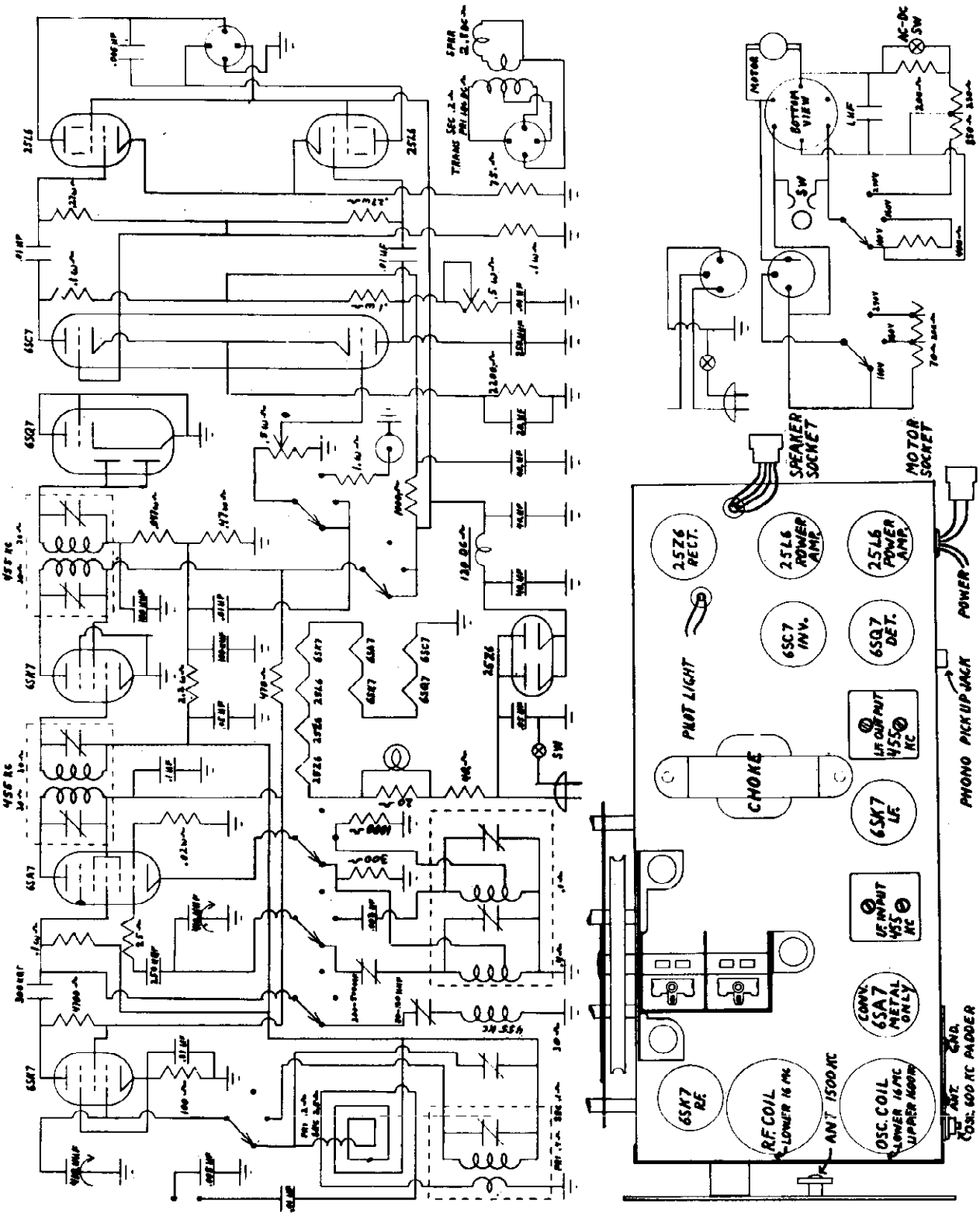
C1A, C1B Two section variable cond.
C2 100 MMF ceramic or mica
C3 0.01 MF
C4 0.05 MF
C5 0.005 MF
C6 0.01 MF
C7 20 MF
C8 20 MF
C9 0.05 MF

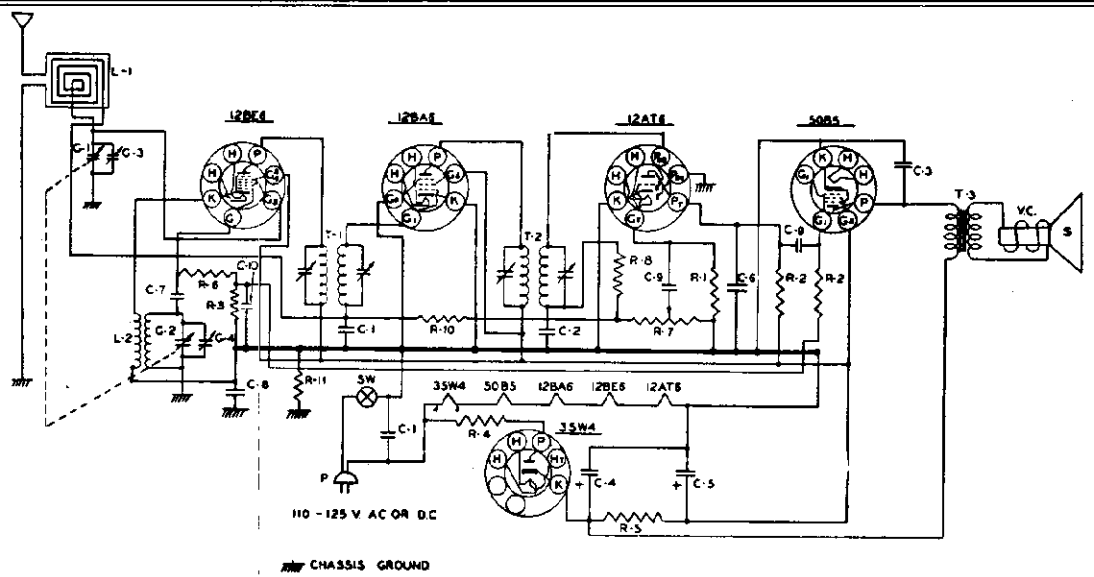
R1 20,000 OHM 1/4 watt
R2 100 to 200 OHM (in a few sets only)
R3 I meg. (in some sets only)
R4 500 M pot. (vol. control) w/switch
R5 3.3 meg. 1/2 watt
R6 15 meg. 1/2 watt
R7 470,000 OHM 1/2 watt - some sets have Couplate instead
R8 470,000 OHM 1/2 watt - some sets have Couplate instead
R9 150, 120, or 200 OHM 1/2 watt
R10 2000 OHM 1/2 or 1 watt

PIN-IT-UP RADIO CORP.

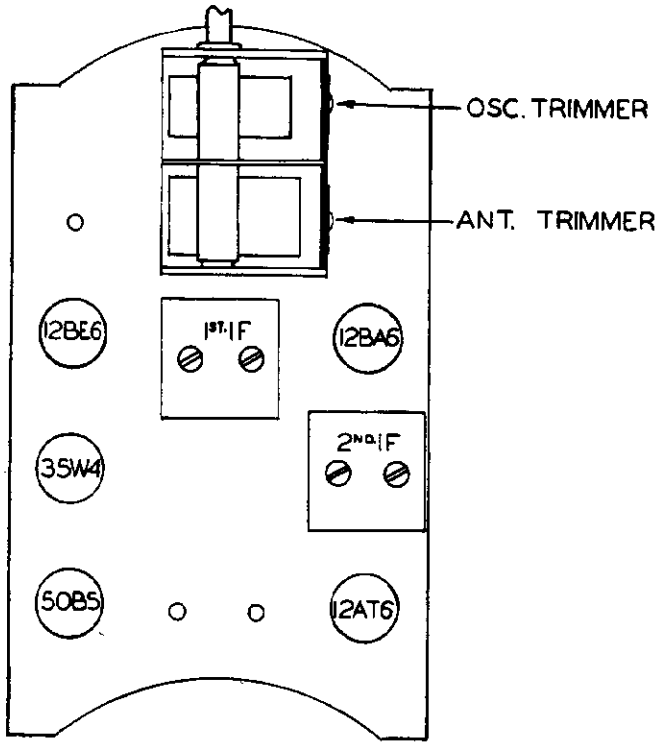
MODELS 400WA, 400WC,
U400GA, U400GC

THE PORT-O-MATIC CORP.





TUBE AND TRIMMER LOCATION



PART NO.		DESCRIPTION	PART NO.		DESCRIPTION	PART NO.		DESCRIPTION
IR-13	R-1	2.2 MEG. RESISTOR 1/2 W. 20%		G-4	OSC. TRIMMER COND.	LO-14	L-2	OSC. COIL
IR-11	R-2	470M RESISTOR 1/2 W. 20%	PC-5	C-1	.05 MFD. CONDENSER 400 V.	LI-6	T-1	INPUT TRANSFORMER
IR-10	R-3	47M RESISTOR 1/2 W. 20%	MC-2	C-2	.0001 MFD. MICA CONDENSER 20%	LI-7	T-2	OUTPUT TRANSFORMER
IR-17	R-4	33 RESISTOR 1/2 W. 20%	PC-7	C-3	.01 MFD. CONDENSER 400 V.		T-3	OUTPUT SPK. TRANFORMER
IR-25	R-5	2200 RESISTOR 1 W. 10%	EC-12	C-4	40 MFD. 150 V. ELECTROLYTIC CONDENSER	SPK-10X	VC	VOICE COIL
IR-9	R-6	22 M RESISTOR 1/2 W. 20%		C-5	20 MFD.		S	P.M. SPEAKER
VC-9	R-7	1 MEG. VOLUME CONTROL	MC-5	C-6	.0005 MFD. CONDENSER 20%	IR-20	R-11	220M RESISTOR 1/2 W. 20%
GC-9	G-1	GANG CONDENSER	MC-4	C-7	.000056 MFD. MICA 20%		SW	A.C. SW. ON VOLUME CONTROL
	G-2		PC-8	C-8	.1 MFD. CONDENSER 400 V.	CO-1	P	LINE CORD
	G-3	ANT. TRIMMER COND.	LL-21	L-1	LOOP ANTENNA	TU-18	—	12BE6 - 12BA6 - 12AT6
IR-19	R-8	100M RESISTOR 1/2 W. 20%	IR-23	R-10	3.3 MEG. RESISTOR 1/2 W. 20%			50B5 - 35W4
			PC-6	C-9	.005 MFD. CONDENSER 600 V.	PC-4	C-10	.25 CONDENSER 200 V.

ALIGNMENT PROCEDURE

The following equipment is necessary to properly align this chassis:

1. A signal generator which will provide an accurately calibrated signal at the frequencies listed.
2. An output meter.
3. A non-metalic screwdriver.
4. Dummy antenna: — .1 mfd., — 10 mmf.

GENERATOR	CONNECTION AT RADIO	DUMMY ANTENNA	DIAL	TO TUNE TRIMMERS	REMARKS
IF 455 kc.	12BE6 Grid	.1 mfd.	HF end	IF Trimmers C D E F	Tune to max.
535 kc.	12BE6 Grid	10 mmf.	LF end	Osc. Trimmer B	Set limit of band
1400 kc.	12BE6 Grid	10 mmf.	1400 kc.	Ant. trimmer A	Tune to max.

Frequency Range.....540-1700 kc.
Intermediate Frequency.....455 kc.
Power Supply.....105-125 volts AC-DC
Loudspeaker.....4 inch Dynamic
V.C. Impedance....3.5 ohms at 400 cycles

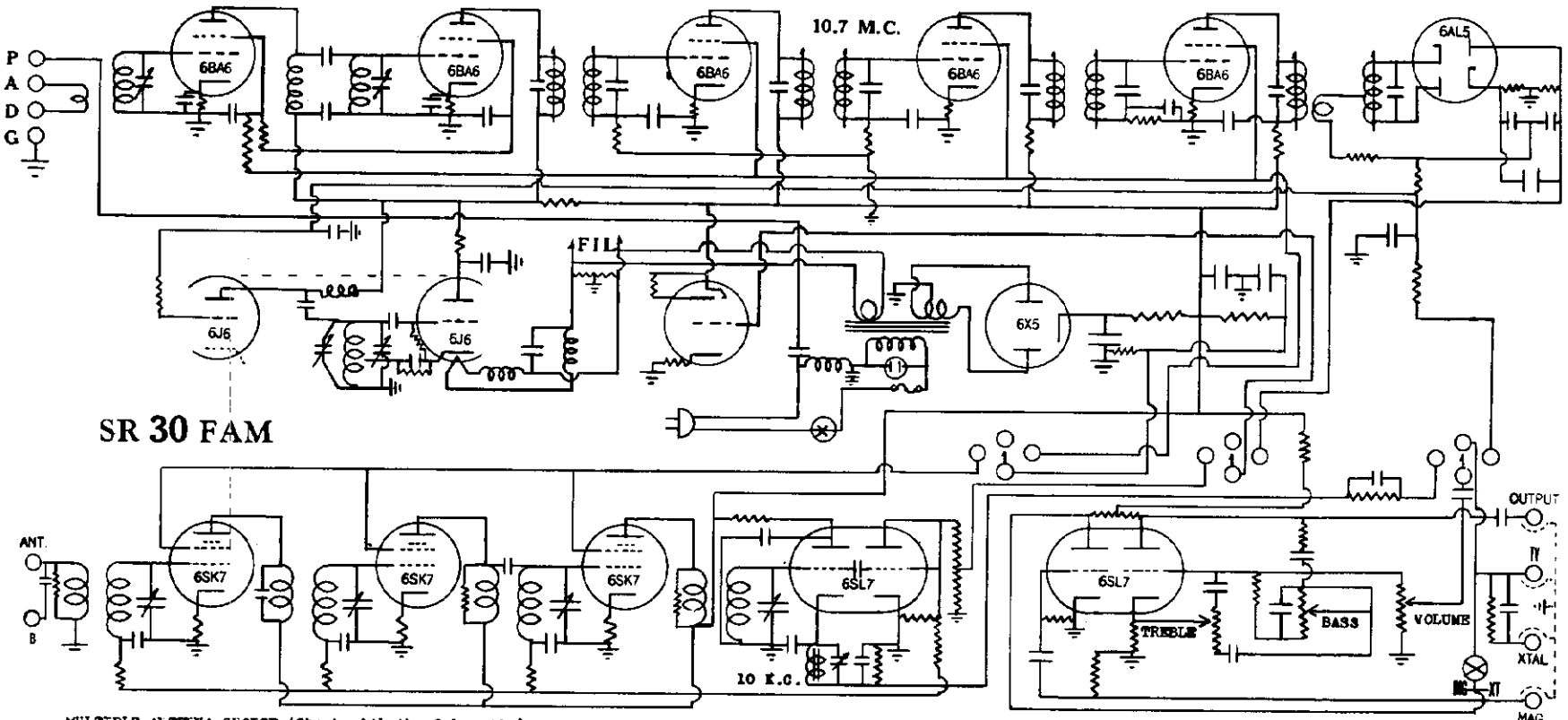
Power Output (Undistorted).....75 watts
Power Output (Maximum).....1.5 watts
Tuning Drive Ratio.....1 to 1
Rated Power Input.....32 watts

TUBE COMPLEMENT

1—12BE6 Oscillator and Mixer tube.
1—50B5 Power Output tube.
1—12BA6 IF Amplifer tube.
1—35W4 Rectifer tube.
1—12AT6 Second Detector and First Audio tube.

PARTS LIST

Part No.	Description	Part No.	Description
LL-21	Loop antenna assembly	EC-12	Two section electrolytic cond.
GC-9	Tuning gang condenser	VC-9	Vol. cont. & switch 1 megohm
LI-6	1st I.F. transformer 456 kc.	LO-14	Oscillator coil



MULTIPLE ANTENNA CHOICE (Check with the Schematic).
For best F.M. results a 100 M.C.Dipole should be installed well above surrounding obstructions. The twisted 300 ohm line from the dipole should be connected to antenna terminals "A" and "D".

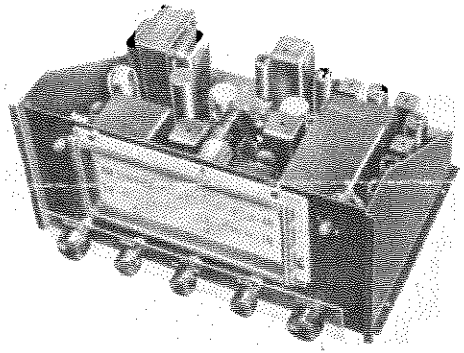
If only a single wire antenna is possible it should be connected to "A" with terminal "D" shorted to "G", which indicates "GROUND".

If suitable antenna is not available the power line may be used as a substitute antenna by connecting terminal "P" to terminal "A" and terminal "D" to "G". No other connections are necessary, just be sure that the line-cord is not skeined or coiled. Results will depend greatly on location.

THE ANTENNA FOR THE A.M. Section of SR30FAM must be connected to Ant. or Ant."B". Ant."B" inserts a 10 MMF capacitor in series with the Ant. connection and is to be used when an outside antenna is made necessary by the shielding construction of a building. Keep AM and FM leads apart.

PROVISION IS MADE FOR AURAL TELEVISION - when AM-PHONO-FM Switch is in PHONO position.

MG-XL. The switch so marked and located near the center rear of the chassis re-arranges the Phono input circuit for Variable Reluctance (magnetic) or crystal pickup.



THE AUTOMATIC FREQUENCY CONTROL is fixt and requires no adjustment.

ALL INPUTS go thru the SR "Tone Gate" tube and are therefore effected by all controls. This allows for a pre-set amplifier.

OUTPUT. The audio output jack should be connected by plug and shielded wire to the high impedence input circuit of a high quality amplifier. Choose a speaker capable of wide range reproduction.

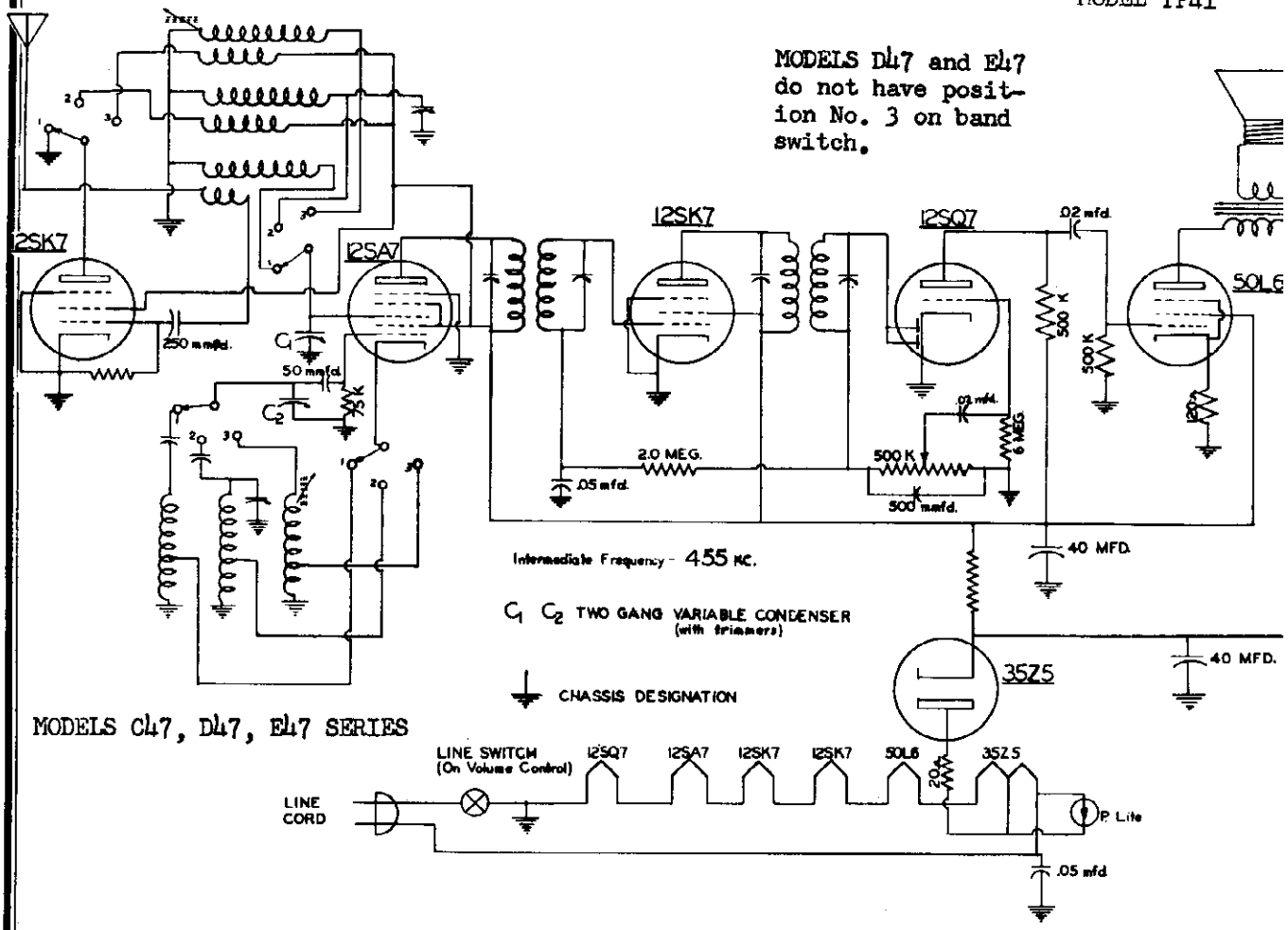
A.C.POWER. SR30FAM is completely powerized for 110-125 volts 50-60 cycles. The power switch (on the Volume Control) also controls the A.C. receptacle on the back of the chassis for convenience in amplifier installation.

No component values have been listed as each unit is clearly marked in accordance with RMA code and approximate values are obvious to the skilled technician.

TAFFET RADIO & TELEV. CO.

MODELS C47, D47
E47 SERIES
MODEL TP41

MODELS D47 and E47 do not have position No. 3 on band switch.

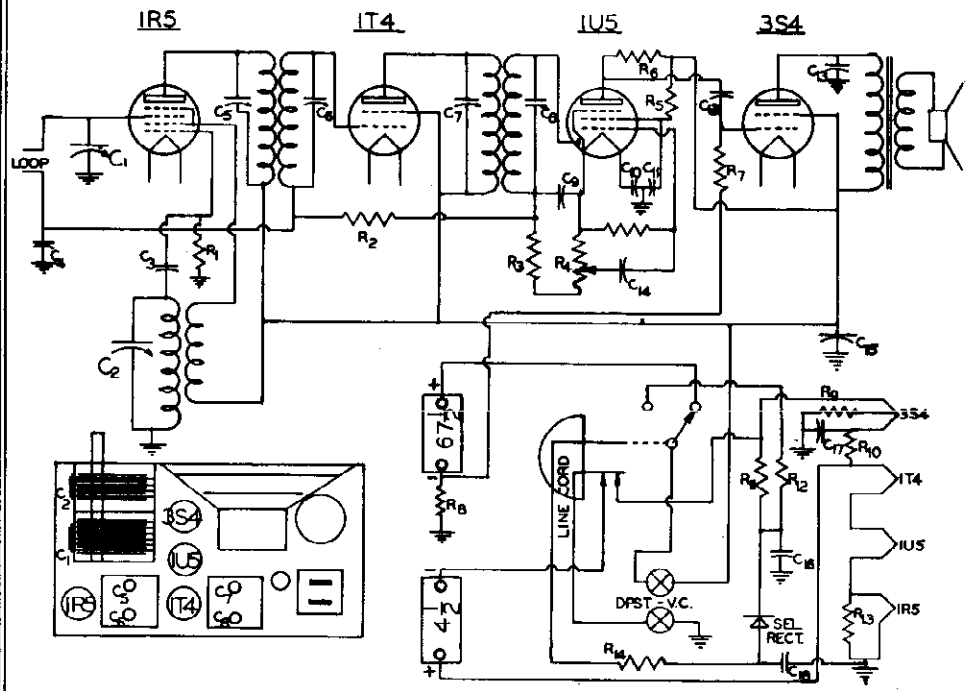


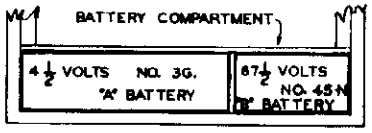
MODELS C47, D47, E47 SERIES

TO OPERATE ON LINE: (110 VOLTS AC-DC)
PLUG LINE CORD INTO WALL RECEPTACLE
(NOTE - REVERSE PLUG FOR BEST OPERATION)

TO OPERATE ON BATTERIES:
PLUG LINE CORD INTO RECEPTACLE ON CHASSIS

MODEL TP41



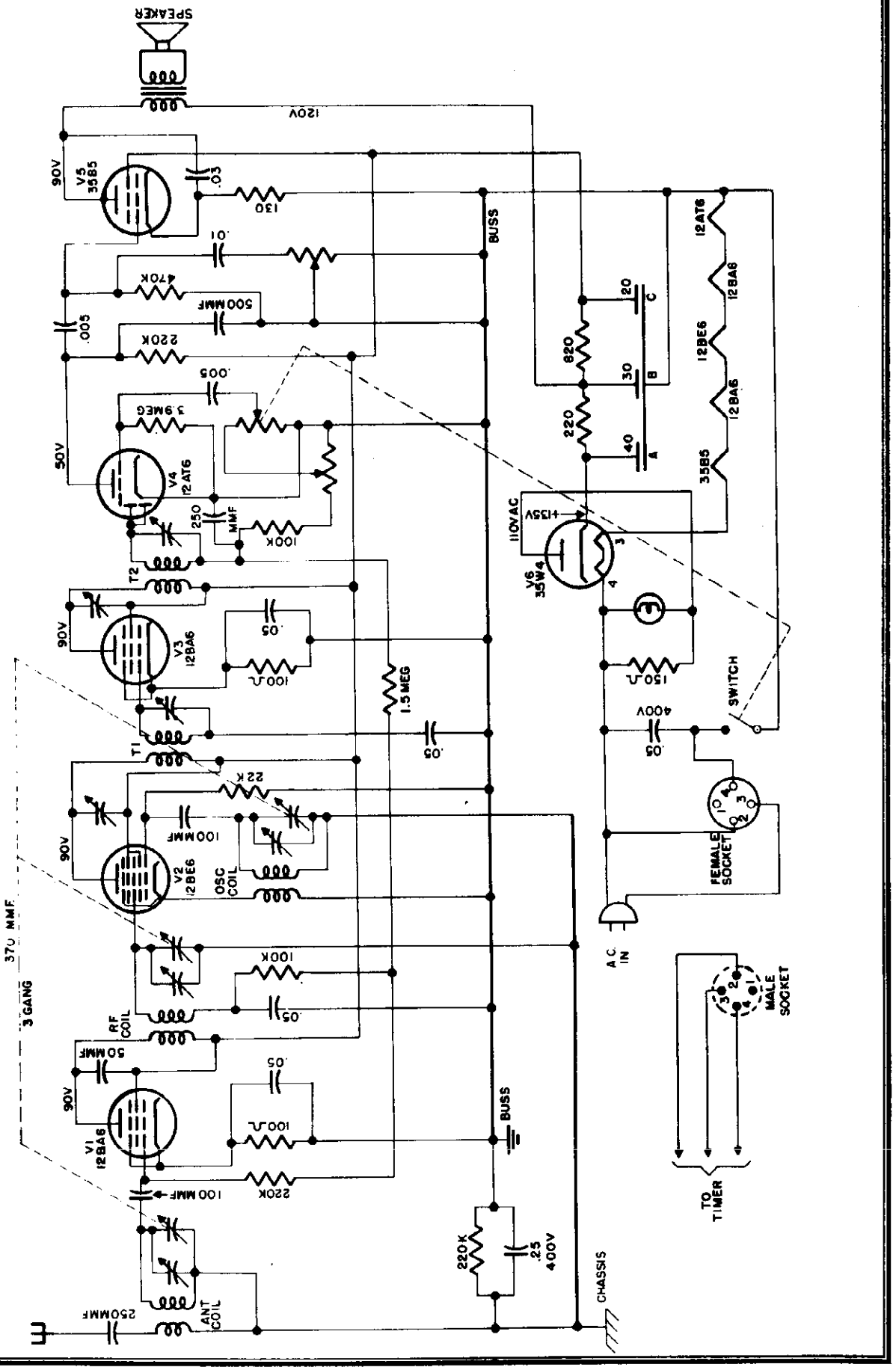


PARTS LIST

C_1 - C_2 - VARIABLE COND. with TRIMMERS	
C_3 - 50 MMFD. MICA	
C_4 - .03 MFD. - 150 v.	
C_5 - C_6 - C_7 - C_8 - I.F. TRIMMERS	
C_9 - 150 MMFD. MICA	
C_{10} C_{11} - .1 MFD. - 200 v.	
C_{12} - .01 MFD. - 200 v.	
C_{13} - .005 MFD. - 400 v.	
C_{14} - .0005 MFD. - 150 v.	
C_{15} - 30 MFD. - 150 v.	
C_{16} - 50 MFD. - 150 v.	
C_{17} - 100 MFD. - 150 v.	
C_{18} - .1 MFD. - 400 v.	
R_1 - 100,000 OHMS	
R_2 - 4.7 MEG.	
R_3 - 60,000	
R_4 - 1.0 MEG. POT. with DPST SW.	
R_5 - 4.7 MEG.	
R_6 - 1.0 MEG.	R_{10} - 35 OHM
R_7 - 2.2 MEG.	R_{11} - 2000 - 10 watt.
R_8 - R_{13} - 500	R_{12} - 3000
R_9 - 1000	R_{14} - 100 — 2 watt.

MODEL TF6

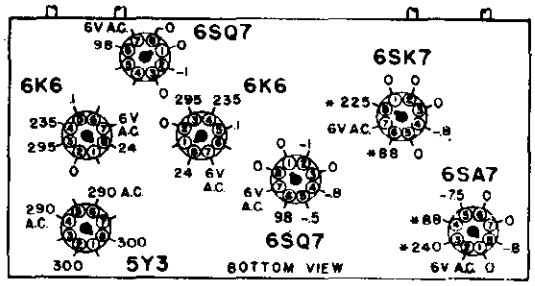
TRADIO



Admiral 7C65

The voltage data and parts list of model 7C65, chassis 7E1 were omitted from *page 17-3 of Rider's Volume XVII* and are here reproduced for inclusion in that Manual. The record changer for this receiver is the Admiral model RC170 or RC170A, the data for which will be found on *RCD.CH. page 16-1 of Rider's Volume XVI.*

VOLTAGE DATA — "Radiophone" switch in "Radio" position. Readings made between point indicated and chassis. Measured on 117-volt a-c line. Dial turned to low-frequency end, no signal. Voltages measured with a vacuum-tube voltmeter. If voltage readings are taken with "Radio-Phono" switch in "Phono" position, readings will be zero or practically zero.



RESISTORS

Symbol		Part No.
R1	22,000 Ohms, ½ Watt	60B 8-223
R2	15,000 Ohms, 2 Watt	60B 20-153
R3	47,000 Ohms, ½ Watt	60B 8-473
R4	4.7 Megohms, ½ Watt	60B 8-475
R5	270,000 Ohms, ½ Watt	60B 8-274
R6	270,000 Ohms, ½ Watt	60B 8-274
R7	1 Megohm, ½ Watt	60B 8-105
R8	220,000 Ohms, ½ Watt	60B 8-224
R9	4.7 Megohms, ½ Watt	60B 8-475
R10	270,000 Ohms, ½ Watt	60B 8-274
R11	270,000 Ohms, ½ Watt	60B 8-274
R12	680 Ohms, 2 Watt	60B 20-681
R13	2 Megohms, Tone Control	75B 1-8
R14	27,000 Ohms, ½ Watt	60B 8-273
R15	1 Megohm, Volume Control and Switch (SW2) Tapped at 500,000 Ohms	75B 2-2
R16	270,000 Ohms, ½ Watt	60B 8-274
R17	100,000 Ohms, ½ Watt	60B 8-104
R18	1,800 Ohms, 2 Watt	60B 20-182
R19	50 Ohms, 5 Watt	61A 1-6
R20	120,000 Ohms, ½ Watt	60B 8-124
R21	1,000 Ohms, ½ Watt	60B 8-102

CONDENSERS

Symbol		Part No.
C1	50 mmfd., Ceramic	65B 6-4
C2	20 mmfd., Ceramic (used only in early production)	65B 6-26
C3	.1 mfd., 400 Volts, Paper	64B 1-20
C4	.05 mfd., 400 Volts, Paper	64B 1-22
C5	100 mmfd., Ceramic	65B 6-3
C6	250 mmfd., Ceramic	65B 6-5
C7	.02 mfd., 400 Volts, Paper	64B 1-24
C8	.1 mfd., 200 Volts, Paper	64B 1-30
C9	.002 mfd., 600 Volts, Paper	64B 1-14
C10	.002 mfd., 600 Volts, Paper	64B 1-14
C11	.02 mfd., 400 Volts, Paper	64B 1-24
C12	.02 mfd., 400 Volts, Paper	64B 1-24
C13	.001 mfd., 600 Volts, Paper	64B 1-15
C14	.25 mfd., 200 Volts, Paper	64B 1-28
C15	.02 mfd., 400 Volts, Paper	64B 1-24
C16a	30 mfd., 350 Volts, Elect.	67C 6-22
C16b	30 mfd., 350 Volts, Elect.	
C17a	0-420 mmfd. (RF section)	
C17b	0-162 mmfd. (Osc. section) Gang and drum assembly A1530† (used in later production)	
C18	.002 mfd., 600 Volts, Paper	64B 1-14
C19	10 mmfd., Ceramic (used only in early production)	65B 6-24

CONDENSERS

Symbol		Part No.
C20a	4-70 mmfd. | Dual Trimmer	
C20b	4-70 mmfd. | (used with A1550 gang in later production	66A 1-10†
C21	.500 mmfd., Ceramic	65B 6-6

† If early type tuning gang (with trimmers attached) must be replaced, use gang assembly A1550 and separate trimmer 66A1-10, and remove C2 and C19 from circuit.

COILS AND TRANSFORMERS

L1	Loop Antenna (11')	95A 18-2
L2	Coil, Loop Loading	69A 26-1
L3	Coil, Oscillator	69A 14
T1	Transformer, 1st IF (Slug tuned)	72B 46
T2	Transformer, 2nd IF (Slug tuned)	72B 47

T1 & T2 were trimmer-tuned in early production.

T3	Transformer, Power	80B 1
T4	Transformer, Output	98A 34-10

DIAL AND TUNING DRIVE PARTS

"C" Washer (used with tuning shaft)	4A 4-1
Crystal, Dial (for 7C65W & 7C65M)	24B 7
Crystal, Dial (for 7C65B cabinet)	24B 7-1
Cord, Dial Drive (30½")	50A 1-3
Dial Drum and Hub Assembly	A1380
Dial Scale Assembly	A1530
Pointer, Dial	A1303
Shaft, Pointer	28A 16
Shaft, Tuning	28A 10-1
Snap Button, Dial Crystal Fastening (used on 7C65B cabinet only)	13A 1-3-21
Socket, Pilot Light, with leads	82A 8-3
Spring, Dial Cable Tension	19B 1-5
Spring, Hairpin (for pointer shaft)	19A 2-4
Spring, on Tuning Shaft	19A 18
Spring Washer (for pointer shaft)	4A 6-9-0
Spring Washer (for tuning shaft)	4A 6-5-0

MISCELLANEOUS

SW1	Switch, Radio-Phono	77A 16-2
SW2	Switch, AC power	Part of R15
SW3	Switch and Lever, part of record changer assembly)	G400A 162
M1	Socket, Speaker	87A 6-1
M2	Speaker, includes M3 and T4	78B 29
M3	Plug, Speaker	88A 4-4

MISCELLANEOUS

Description	Part No.
Grommet, Condenser Gang Mounting	12A 1-2
Socket, Octal Tube	87A 5-1

PHONOGRAPH PARTS

Note: See record changer manual for complete parts list.

M4	Socket and Leads	89A 6-6
M5	Socket, Phono Pickup	88A 5-8
M6	Pickup Cable & Plug	A1415
M7	Cartridge & Needle, Pickup	A1372
M8	Motor	407B 3-2
M9	Plug, Motor (Male)	86A 8-1
	Centerpost	G400B 137-1
	Drive Disc (under Turntable)	G400A 179
	Eye Bolt (for Tilt-Out Spring)	1A 87-1
	Idler Wheel (407B3 Motor)	G400A 23
	Idler Wheel (407B1 Motor)	G400A 57
	Nut, Wing (for fastening record changer during shipment)	2A 5-9-2
	Strip, Sponge Rubber (1/16x¼x1")	12A 5-5
	Tilt-Out Hinge Assembly (Pickup Arm Side)	AC118-2
	Tilt-Out Hinge Assembly (Record Support Side)	AC118-1
	Tilt-Out Spring (2¼" long)	19A 15-1
	Tilt-Out Tie Bar	15B 126
	Tilt-Out Tie Rod	28A 22

CABINET PARTS

*Cabinet	Walnut (7C65W)	35E 67-1
	Mahogany (7C65M)	35E 67-2
	Blond (7C65B)	35E 67-3
	Door Catch and Strike Plate	98A 34-9
*Door, Radio and Phono Tilt-Out	pair for 7C65W	98A 34-1
	pair for 7C65M	98A 34-2
	pair for 7C65B	98A 34-3
Door Handle, Radio or Phono Comp.	for 7C65W, 7C65M	98A 34-4
	for 7C65B	98A 34-5
	Grille Cloth	98A 34-8
Hinge, Radio Door	pair for 7C65W, 7C65M	98A 34-6
	pair for 7C65B	98A 34-7
	Knob	33A 13-3
	Washer, Felt (used under tuning knobs)	5A 4-4

* Supplied only if old part cannot be repaired. When ordering, describe condition of old part in detail.

Admiral Models 7RT41, 7RT42, 7RT43

These models are shown on *pages 16-11 and 16-2 of Rider's Volume XVI.* An error has been found in the part number of the SW2 radio-phono switch in the service information on these models. The part number of this switch should be 77A16-1 instead of 77A16-2.

Admiral Chassis 9A1

This chassis is shown on *pages 16-6 to 16-8 of Rider's Volume XVI.* It has been found that the dial windows of these chassis build up a small electrostatic charge, thus causing the plastic to attract fine dust particles. These are so fine that the dial windows appear milky or foggy.

Treating the windows with a solution called Hexco Dust-Ded reduces the amount of fine dust that collects on them. The dial window should be removed from the cabinet to apply the solution properly. Remove the knobs and the screws holding the escutcheon to the cabinet. Clean the window by wiping off the dust thoroughly on both sides with a damp (not wet) cloth or chamois skin. Apply the Hexco Dust-Ded according to the directions on the bottle.

Part No.	*Description*
98A11-2	Hexco Dust-Ded

Allied Radio 6A-127 Revised, 6B-127, 6C-127

This model is the same as Model 6A-127 appearing on *pages* 15-4 *and* 15-5 *of Rider's Volume XV,* except for the following changes. Part 36 has been changed in value from one megohm to 220,000 ohms and the bottom side of this resistor has been moved from the negative filament line (junction of parts 34 and 17 and 47) to the avc bus (junction of parts 33, 34, 14, and 35). Part 40 has been changed in value from 220,000 ohms to 100,000 ohms. Part 13 is now connected from the junction of resistor 39 and the secondary of the first i-f transformer to the positive side of the filament of the 1N5GT tube instead of from the junction to the common negative as previously.

Part 28 is now connected from the negative side of the filament of the 1H5GT tube to the grid of that tube instead of from the center arm of the volume control to the common negative. The bottom side of part 19 is now connected to the junction of part 48 and the center tap of the filament of the 3Q5GT tube, and thence to the left-hand side as shown on the schematic) of capacitor 10. This part was formerly connected directly to the right-hand side of the same capacitor. The connection from the negative side of the filament of the 1N5GT tube to the left-hand side of capacitor 10 has been removed. A 68-ohm resistor has been inserted in the high side of the 45-volt battery lead.

The following changes have been made in the parts list.

Illus. No.	*Part No.*	*Description*
36	27E224	Carbon, 220,000 Ohm, ½ W.
40	27E104	Carbon, 100,000 Ohm, ½ W.

Allied 6C-122

This model is the same as Model 6B-122 appearing on *pages 16-3 and 16-4 of Rider's Volume XVI.*

Automatic Tom Thumb

Please change the listing in your Rider's Volume XVII Index for Automatic page 17-8 from Models 660, 662, 666 to Model Tom Thumb.

Automatic 127

This model is the same as Model 120, appearing on *page 12-7 of Rider's Volume XII.*

Automatic 640, Series B

The schematic of this model is the same as the 640 shown on *page* 15-7 *of Rider's Volume XV* except for the change from octal type to loctal type tubes.

This model uses the 14Q7, 14A7, 14B6, 50A5, and 35Y4 in place of the 12SA7GT, 12SK7GT, 12SQ7GT, 50L6GT, and 35Z5GT tubes.

Automatic 650

This model is similar to the 650 shown on *pages 15-4 and 15-7 of Rider's Volume XV* except for the following change: The 20,000 resistor in the oscillator grid circuit of the 12SA7GT now is connected directly to ground instead of to the cathode of that tube.

Belmont 6D127

This model is the same as Model 5D128 appearing on *pages 15-4 and 15-5 of Rider's Volume XV.*

Belmont 8A510

This model is the same as the 8A59 shown on *pages 15-8 to 15-12 of Rider's Volume XV,* except for the addition of four parts.

The two miscellaneous parts of the removable tuner assembly are:

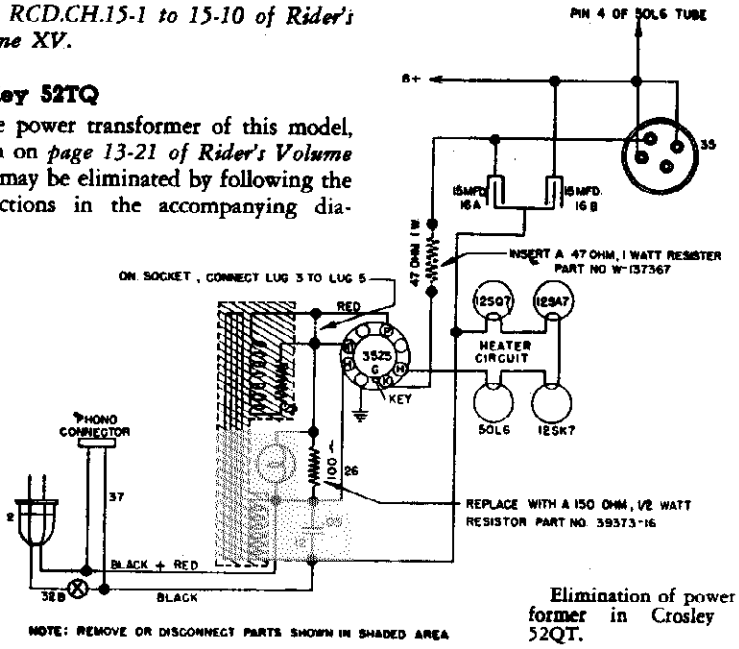
1. Part No. A-2J-7176—cam locking spring.
2. Part No. A-2J-7627-1—retainer spring.

The miscellaneous part added to the main chassis is part A-19A-11539 which is a plug on the speaker leads.

The final addition is an alternate record changer which can be used with this model. Part C-201-12545-1 is a Detrola changer model 550, which is shown on *pages RCD.CH.15-1 to 15-10 of Rider's Volume XV.*

Crosley 52TQ

The power transformer of this model, shown on *page 13-21 of Rider's Volume XIII,* may be eliminated by following the instructions in the accompanying diagram.



Elimination of power transformer in Crosley model 52QT.

Crosley 56PA, 56PB

These models appear on *pages* 15-29 to 15-31 *of Rider's Volume XV.* It has been found that the 3S4 tube used in these models has a tendency to burn out. The following change should be made to prevent this. Remove the wire that connects the plate lug 3 to the cathode lug 8 of the 117Z6 tube socket. In its place solder one end of a 47-ohm, 1-watt resistor (part number 39373-119) to the plate lug. The 1S5 Det.—AVC—1st A-F Amplifier tube has been changed to a 1U5 tube. The characteristics of the tubes are the same but the socket connections are different.

The accompanying socket voltage chart includes both changes.

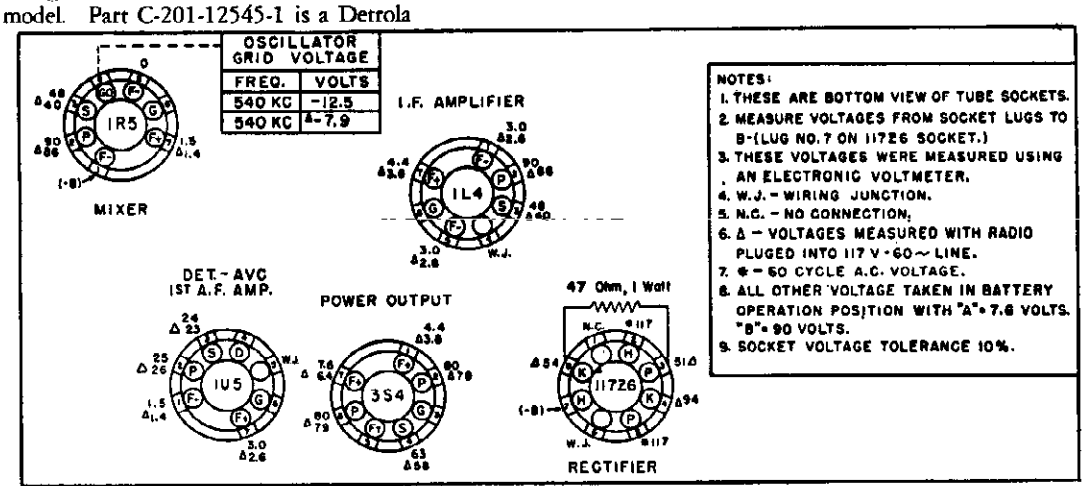
Crosley Model 66CS(0)

This model is the same as Model 66CS (s) appearing on *pages 16-16 to 16-19 of Rider's Volume XVI,* except for the cabinet and the following changes:

Item	*Part No.*	*Description*
44*	39368-10	Control, Tone
45*	39368-18	Control, Volume
	39369-1	Switch, Power
	39370-1	Shaft, Plug In
	R-139206	Cabinet
	D-137057	Record Changer
	AC-137885	Lid Support, Cabinet
	W-138330	Hinge, Cabinet Lid

* These parts replace the original equipment parts.

The record changer (Part No. D-137057) is Oak Model 6666 shown on *RCD.CH. pages 15-1 to 15-7 of Rider's Volume XV.*



Socket voltage chart for Crosley models 56PA and 56PB showing new socket connections.

DeWald 418

This model is the same as model 414 appearing on *page 11-2 of Rider's Volume XI.*

Electronic Laboratories 2811

This model, shown on *page 16-8 of Rider's Volume XVI,* uses the Webster model 56 record changer, which is shown on *page RCD.CH.15-10 of Rider's Volume XV.*

Emerson BF-169, BF-204, And BF-207

These models are the same as Model BF-191 appearing on *pages 9-1 and 9-2 of Rider's Volume IX.*

Emerson 567, Chassis 120016

This model is the same as Model 560, Chassis 120016, appearing on *pages 17-30 to 17-32 of Rider's Volume XVII.*

FM Specialties Model Fidelotuner

This model is shown on *pages 17-1 to 17-4 of Rider's Volume XVII.* Three terminals are shown in Fig. 5, page 17-4; the first labelled 3, and the third terminal (not labelled in this figure) should be labelled 4. The ground from the phonograph connection to the receiver should be made to this third terminal (terminal 4).

Farnsworth AC-55, Chassis C2-3

This model is the same as model ACL-55, Chassis C 2-3, shown on *pages 11-7 and 11-10 in Rider's Volume XI.*

Farnsworth ACL 55, ACL56, AKL58, AKL 59

These models shown on *pages 11-7 and 11-10 of Rider's Volume XI* are erroneously listed as ATL.

Farnsworth GK-140

Slippage of the dial-drive cable on the early production sets can be corrected by replacing the cable with part number 05096. This cord is softer and smaller than the one used previously.

If the push buttons bind on the front panel of the cabinet, the ganged capacitor may not be properly positioned. This may be corrected by installing a flat metal washer under each of the mounting grommets. This may be done without removing the gang from the chassis.

Oscillation or low sensitivity on f.m. may be due to poor ground connections from the gang to the r-f shelf. When aligning the f-m band, oscillation may occur with certain signal generators. Changing the value of the resistor in series between the generator and the chassis will prevent oscillation. With some generators more than 400 ohms are required, with others less.

In some preliminary sets a 200-$\mu\mu$f capacitor was placed in series with the short-wave converter-trimmer. If for any reason this trimmer requires replacement, removal of the capacitor is suggested. This capacitor is not shown on the schematic.

In some of the preliminary 14-tube sets, Belden braid was used to ground the ganged capacitor to the r-f shelf. In certain instances too much solder flowed into the braid and as a result some joints break loose or the set becomes microphonic. This braid should be replaced with soft copper strips.

General Electric A51, A56

These models are the same as model A54 shown on *pages 7-4 to 7-6 of Rider's Volume VII.*

General Electric H639AC-DC

The r-f alignment instructions of these models found on *page 11-80 of Rider's Volume XI,* should read as follows: With gang condenser plates completely meshed, set dial to the first mark at the left end of scale. Then set dial to 1500 kc. Apply a 1500-kc signal either through a standard I.R.E. dummy to the antenna terminal or through an additional loop connected to the generator output which can be magnetically coupled to the receiver Beam-a-Scope. Align C2 and C1 at 1500 kc for maximum output. Set dial to 580 kc and peak C3 on 580 kc while rocking the gang condenser. Retrim at 1500 kc.

GE YRB 60-12

This receiver is the same electrically as the YRB 60-2 appearing on *page 15-5 of Rider's Volume XV* but the cabinet is different.

GE YRB 92-2 and 81-3

These models are the same electrically as the YRB 82-1 appearing on *pages 15-53 to 15-54 of Rider's Volume XV,* but they have different cabinets.

General Electric L604

This model is the same as Model L600 appearing on *page 13-40 of Rider's Volume XIII.*

General Electric 202

This receiver is the same electrically as the model 200 as shown on *pages 15-54 to 15-56 in Rider's Volume XV,* except that it has a different cabinet.

General Electric 219, 220, 221

A few cases of hum which cannot be reduced in the normal manner from these models shown on *pages 15-28 to 15-31 of Rider's Volume XV,* may be corrected by cathode degeneration in the output tube, 35L6GT/G, cathode circuit. Remove R17 and C29-C from the circuit. This can be done by disconnecting one end of R17.

General Electric 260

This model appears on *pages 16-7 to 16-12 of Rider's Volume XVI.* It has been found that late production 1LC6 tubes, coded H7E, will oscillate at another frequency in addition to the desired frequency, causing unsatisfactory operation. To remedy this condition, the oscillator grid capacitor, C17, should be changed from 100$\mu\mu$f to 56$\mu\mu$f.

GE 254

This model is illustrated on *pages 16-to 16-5 of Rider's Volume XVI.* Th suffix letters after 254 indicate only th cabinet styling. All versions are elec trically identical.

Firestone 7402-4

This model is the same as model S7426-6 shown on *page 10-5 of Rider's Volume X.*

Firestone 7423-5

This model is the same as model S7402-5 shown on *page 13-38 of Rider's Volume XIII.*

Goodrich R655W

This model uses the Admiral record changer model RC161 or RC161A, whicl are to be found on Admiral RCD. CH pages 17-1 to 17-7 of Volume XVII.

Hallicrafters S-40A

This model is the same as Model S-40 second revision, on *pages 16-67 to 16-8 of Rider's Volume XV,* except for the fol lowing changes. C18 has been changed in value from 100$\mu\mu$f to 68$\mu\mu$f. A 10-ohm re sistor (R30) has been connected betwee the center tap of oscillator coil T10 anc terminal C. R30 has been removed from its previous position between C16 and the junction of C26, C6C, C7C, and switch S1F. C55 has been changed in value from 100$\mu\mu$f to 47$\mu\mu$f, and is now connected to the top of the 470-$\mu\mu$f capacitor (C54). The coil T17 is connected directly across C54, with one end going to ground. The center tap of this coil is connected to the cathode of the 6J8 tube. The 0.01-μf capacitor (C53) is connected from the plate of the 6J8 tube directly to ground.

The parts list should be changed to read as follows:

Ref. No.	*Description*	*Hallicrafter's Part No.*
C18	68$\mu\mu$f, ±10%, 500 vdcw; neg. temp. coeff. 0.0075$\mu\mu$f/$\mu\mu$f/deg.C; ceramic	CC25UK680K
C55	47$\mu\mu$f, ±20%, 500VDC, Mica	CM20A470M
T17	BFO coil; 455 kc; shielded	54B033-2

Hallicrafters SP-44 AND SX-42

These models appear on *pages* 17-1 *to* 17-5 *and* 17-6 *to* 17-16 *respectively of Rider's Volume XVII.* When the SX-42 is used with the SP-44 Panadaptor on the low-frequency band, it appears to motor boat. To correct this condition, do the following.

The connecting cable between the SP-44 and the SX-42 is shielded and the shield is connected to the SX-42 ground. Disconnect the shield from the SX-42 ground and place a 50-$\mu\mu$f capacitor between the shield and the SX-42 chassis. Be sure that the SX-42 chassis is well grounded. A shielded antenna lead, or a balanced antenna, on the SX-42 may also help.

The following modifications should be made on the SP-44 unit. A strip of bonding braid, 3/8 inch wide, may

be connected to the No. 1 grounded pin of the 6AC7 tube, going around the choke coil and connecting to the right side of the chassis. The braid should be insulated with a piece of spaghetti and should lie parallel to the front panel. Two pieces of braid ¼ inch wide, or a copper strap may also be used.

A piece of copper or steel sheet about 2½ inches wide may be screwed or soldered across the bottom so that it is attached to both edges of the chassis. This plate should be centered over the bottom of the 6AC7 tube.

Hallicrafters SX-42

This model appears on *pages 17-6 to 17-16 of Rider's Volume XVII*. It has been found that there is unsatisfactory image ratio on the 10-meter band. This can be corrected in two ways, one of which provides for the change or replacement of four parts and the other provides for no change in the oscillator coil.

The first method is as follows:

1. The band 4 oscillator coil should be removed and replaced with a new coil, part number 50-837D.
2. Resistor R24, now 56 ohms, should be removed and replaced with a 22-ohm resistor, part number RC20AE220M.
3. Remove the main tuning dial scale, part number 83C265, and replace with new scale, part number 83C325.
4. Remove antenna coil, part number 51B827-C, and replace it with antenna coil, part number 51B827-D.
5. Align the receiver in the normal manner, making certain that the image falls on the high-frequency side of the signal frequency.

The second method is as follows:

1. Remove the oscillator trimmer capacitor C-42.
2. Calibrate the main tuning dial at 28 megacycles, with slug S-33, making certain that the image falls on the high-frequency side of the fundamental.
3. Calibrate the bandspread as outlined on *page 17-15 of Rider's Volume 17*, except that slug S-33 should be used instead of trimmer C-42.

It will be noticed that in this method the calibration of the low-frequency end of the number 4 band has been neglected entirely, since this cannot be accomplished without the use of trimmer C-42. The oscillator coil would have to be replaced to allow the use of this trimmer.

International Detrola 339, 340, 340-1

These models appear on *page 12-4 of Rider's Volume XII*. The 30-ohm resistor used in these models is the resistor with 5% tolerance, part number 8158.

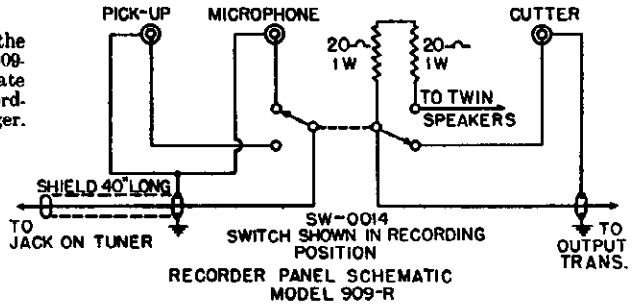
International Detrola 2744

This model is the same as Model 274 appearing on *page* 10-9 *of Rider's Volume X*.

Howard 909MR

This model is similar to Model 909M appearing on *pages 17-34 to 17-37 of Rider's Volume XVII*, except that recording units were added. The General Industries Model GI-RC130 recorder and record changer combination was used to make this change. The recorder unit was added without disturbing the wiring of the radio chassis. The wiring necessary for the addition is shown in the accompanying diagram.

The wiring in the Howard Model 909-MR to accomodate the GI-RC130 recorder and record changer.



RECORDER PANEL SCHEMATIC MODEL 909-R

Majestic 8FM783, Chassis 8BO7D

This model is the same as Model 8FM776, Chassis 8B07D, appearing on *pages 17-17 to 17-22 of Rider's Volume XVII*, except that "solid doors" are used instead of metal grilled frame doors. The parts list should be changed to read as follows:

Part No.	*Description*
115-48	Cabinet, console combination, mahogany or walnut (state color)

Montgomery Ward 04BR-420B

This model is the same as Model 93BR-420A appearing on *pages 11-25 and 11-26 of Rider's Volume XI*.

Montgomery Ward 14WG-635B

This model is the same as Model 14WG-624A appearing on *pages* 13-53 *and* 13-54 *of Rider's Volume XIII*.

Montgomery Ward 64WG-1050D, 74WG-1050B

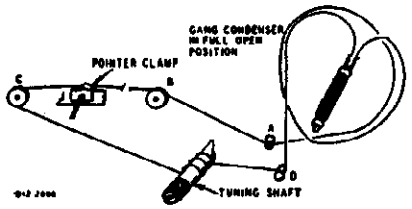
These models are similar to the 64WG-1050A shown on *pages 15-75 to 15-77 of Rider's Volume XV* with the following changes. The 0.1-μf capacitor (C-11) is connected to B— from pin 1 of the 1R5 socket instead of to chassis ground. A 1000-ohm resistor (R-13) is connected from pin 7 of the 3S4 output tube to B—.

Montgomery Ward 64WG-1804B, 74WG-1804B

These two models are similar to Model 64WG-1804A shown on *pages* 15-88 *to* 15-90 *of Rider's Volume XV*, except for the following changes.

The frequency range has been slightly contracted to 540-1600 kc. A 47-ohm dropping resistor (R-20) has been inserted between B+ and the junction of the primary winding of the first i-f transformer (T-3), the screen grids of the 12SA7 mixer, the screen-grid of the 12SK7 r-f amplifier, and resistor R-1. A 0.05-μf bypass capacitor is connected from this junction to the point marked "X" in the filament line of the schematic shown on *page* 15-88 *of Rider's Volume XV*.

The drive cord length has been increased for these models and the following drive cord replacement instructions should be observed. Turn the gang capacitor to the fully open position. Use a new drive cord 42 inches long and tie one end to the tension spring. Hook the other end of the tension spring over the tab on the drive pulley rim and continue around pulley ½ turn counterclockwise. Pass cord around stud D and wind three turns clockwise (from front of chassis) around the turning shaft. Turns must progress away from chassis. Pass cord around pulleys C and B and stud A. Pass cord under drive pulley and wind 1½ turns counterclockwise around drive pulley. Stretch tension spring and tie free end of cord to spring. Cut off any excess string. Attach the dial pointer to the cord and position as instructed on *page* 15-89 *of Rider's Volume XV*.



Winding for the new longer drive cord for Models 64WG-1804B and 74WG-1804B.

The components used in the Models 64WG-1804B and 74WG-1804B are the same as those enumerated on *page* 15-90 *of Rider's Volume XV*, except for the following.

Ref. No.	*Part No.*	*Description*
C-1	D67102	0.001μf, 400 v. tubular
C-14	B67403	0.04μf, 200 v. tubular
C-15	B67602	0.006μf, 200 v. tubular
C-19	B67253	0.025μf, 200 v. tubular
C-22	B67204	0.2μf, 200 v. tubular
C-24	17A123	1.5—12$\mu\mu$f, trimmer
C-28	B67503	0.05μf, 200 v. tubular
R-14	B84274	270,000Ω, 0.5 watt, carbon
R-20	B85471	470Ω, 0.5 watt, carbon
	20X329	Capacitor cushion stud in gang capacitor mounting
	28X95	Drive cord tension spring

Montgomery Ward 64WG-1807B, 74WG-1807B

These models are the same as model 64WG-1807A, shown on *pages 15-91 to 15-94 in Rider's Volume XV*, except for the following changes. A 0.2-μf bypass capacitor (C-35) has been connected between ground and the screen grid of the 6V6GT output tube, resistor R-14, resistor R-12, the red lead of the second i-f transformer (T-3), resistor R-5, resistor R-4, the red lead of the first i-f transformer (T-2), and resistor R-2. The 0.004-μf capacitor (C-31) is now connected from the plate lead of the 6V6GT output tube to the cathode of this tube. No counterpoise foil antenna is used.

Montgomery Ward 64WG-2500B, 74WG-2500B

These models are similar to the 64WG-2500A, shown on *pages 15-1 and 15-31 to 15-35 of Rider's Volume XV*, except for the following changes: The 64WG-2500B has a 10" electrodynamic speaker in place of an 8" electrodynamic speaker used in the issue A models. The part number and description of the new speaker is as follows:

Part No.	*Description*
12A399	10" Electrodynamic Speaker

Two types of speaker assemblies are used in the 74WG-2500B receiver. These are listed below and are directly interchangeable, both electrically and mechanically.

Part No.	*Description*
12A399	10" Electrodynamic Speaker
or	
12A455	10" Electrodynamic Speaker

Montgomery Ward 64WG-2700B

This model is similar to the 54WG-2500A, shown on *pages 15-1 and 15-32 to 15-35 of Rider's Volume XV*, except for the following change: This receiver has a 10" electrodynamic speaker in place of the 8" electrodynamic speaker used in the issue A models. The part number and description of the new speaker is as follows:

Part No.	*Description*
12A455	10" Electrodynamic Speaker

Montgomery Ward 74BR-1812B

This model is the same as Model 74BR-1812A appearing on *pages 16-17 through 16-21 of Rider's Volume XVI.*

Montgomery Ward 62-690

This model is the same as Model 14WG-690A appearing on *pages 15-61 and 15-62 of Rider's Volume XIII.*

Montgomery Ward 74WG-2711

This model is similar to model 74WG-2705B described in SUCCESSFUL SERVICING for September-October 1947, except for the addition of twin doors on the cabinet covering the dial panel.

Montgomery Ward 74BR-2003C

This model is the same as Model 74BR-2003B appearing on *pages 17-29 to 17-31 of Rider's Volume XVII*, except for the following changes. The 100-μμf capacitor in the external antenna lead CI has been changed to 820-μμf capacitor, C22. The 820-μμf capacitor, C2, which was connected from terminal 2 of the antenna socket to ground, has been removed. The 220,000-ohm resistor, R1, that was connected from terminal 2 of the antenna socket to the low side of capacitor C6 has been removed A 1000-ohm resistor, R17, has been inserted between terminal 2 of the antenna socket and C22. On some sets a 100,000-ohm resistor has been added in series with the high side of the volume control. The loop has been changed and the loops of series B and series C are not interchangeable.

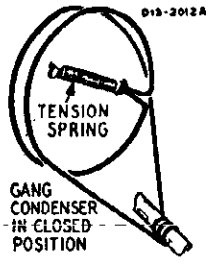
Ref. No.	Part No.	Description
	C-13E-15103	Loop antenna assembly
R17	C-9B1-62	1000 ohms, ½ watt

Montgomery Ward 74WG-1801C

This model is similar to 64WG-1801C shown on *pages 15-27 to 15-29 in Rider's Volume XV*, except for the following changes. The frequency range has been slightly contracted to 540 to 1600 kc. The dial cord length has been increased, and the following dial cord replacement data should be used.

Turn the gang capacitor to the fully closed position. Use a new drive cord 18 inches in length and tie one end to the tension spring. Fasten the other end of the tension spring to the hook on the drive pulley. Pass the cord through the slot in the drive-pulley rim and continue around pulley one-half turn, counterclockwise. Wind 3½ turns counterclockwise (from front of chassis) around tuning shaft. Turns should progress toward rear of chassis. See accompanying illustration.

Wind cord counterclockwise around drive pulley in back of previous ½ turn. Pass cord through the slot in the pulley rim. Stretch tension spring and tie free end of cord to the spring. Cut off any excess string.



New dial cord stringing for Montgomery Ward model 74WG-1801C.

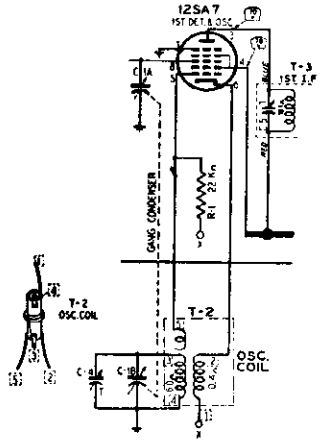
The components used in the 74WG-1801C are the same as those listed for the 64WG-1801A on *page 15-29 of Rider's Volume XV*, except as noted below.

Ref. No.	*Part No.*	*Description*
C-15	B67204	0.20 μf 200 V tubular
C-16	D67104	0.10 μf 400 V tubular
C-18	D67102	0.001 μf 400 V tubul
C-19	17A123	1.5-12 μμf trimmer
T-1	26A467	"B" band loop anten assembly
T-3	9A1775	1st i-f transformer as can assembly

Montgomery Ward 74WG-1801D

This model is similar to the 64WG 1801C shown on *pages 15-27 to 15-29 Rider's Volume XV*, except for th changes listed below. This model i corporates all the changes previous listed for the 74WG-1801C.

The grid resistor (R-1) of the 12SA det. and osc. tube has been changed 22,000 ohms. The oscillator coil h been changed and capacitance couplin to the tube is now obtained throug



First detector and oscillator circuits of th Montgomery Ward model 74WG-1801D.

the use of a "gimmick," as shown in th accompanying drawing. The component used in the 74WG-1801D are the same as those listed for the 64WG-1801C or *page 15-29* except for the changes previously noted for the 74WG-1801C and those below.

Ref. No.	*Part No.*	*Description*
R-1	B84223	22,000 ohms 0.5 watt carbon
R-4	36X368	0.5 megohm volume control and switch
R-8	B84151	150 ohms 0.5 watt carbon
T-2	9a1911	Oscillator coil assembly
	13X546	Line cord and plug assembly
	10X45	Drive cord assembly

To replace the dial cord, use either a new 10 x 45 drive-cord assembly or a piece of cord 18 inches long. See replacement instructions under Model 74WG-1801C.

Motorola 402

This model is the same as the Motorola shown on *pages* 12-62 *and* 12-65 *of Rider's Volume XII.*

National Union Presentation

This model is the same as Model G-619 appearing on *pages 16-1 and 16-2 of Rider's Volume XV*. This company's Presentation Deluxe is the same as Model G-613 appearing on *pages 16-1 and 16-2 of Rider's Volume XVI.*

Montgomery Ward 74WG-1054A and 74WG-1054B

These models are similar to 64WG-1054A shown on *pages 15-82 to 15-84 of Rider's Volume XV*, except for the following changes. The terminals of the oscillator coil are reversed. The high side of the 2.2-ohm winding goes to the first grid of the 1R5 mixer tube and the high side of the 6.4-ohm winding goes to grids 2 and 4 of the same tube. The low side of the 2.2-ohm winding is grounded and the low side of the 6.4-ohm winding is connected to R-7. These models also incorporate the changes noted on page 6 of the May 1947 issue of SUCCESSFUL SERVICING.

It has been called to our attention that misinterpretations are possible of the statements made in the May 1947 issue about wiring changes. The wiring of the set does not change, as no components are changed; but the wiring of the *socket* of the output tube changes as indicated in the afore-mentioned issue.

In model 74WG-1054B, in addition to the changes listed above, a 2.2-megohm resistor (R24) in parallel with a 100-$\mu\mu$f capacitor (C24) is connected from the antenna to grid 3 of the 1R5 mixer tube.

Arvin 140P, Chassis RE-209

This model appears on *pages 17-1 through 17-4 of Rider's Volume XVII*. The volume control mounting has been revised to prevent the dial-indicator eccentric mounted on the volume-control shaft from binding in its bracket. The mounting bushing on the control is slotted instead of threaded, and the control is mounted with a C20227 Speed Clip, instead of a 3/8-inch nut.

The following changes have been made in the oscillator circuit to increase the sensitivity. The 0.05-μf capacitor (C5) formerly located between the bottom of the oscillator tickler coil (L3) and floating ground, has been connected from the second grid of the 1R5 converter tube (pin 3) to the junction of the top of the tickler coil to the bottom of the primary of T1. The 22,000-ohm resistor (R3) is now connected in parallel with C5 instead of from the bottom of the tickler coil to the bottom of the primary of T1. The top of the tickler coil is connected to the bottom of the primary of T1 instead of to the second grid of the 1R5 converter tube. The 1R5 plate current as well as the screen current thus passes through the tickler coil.

To prevent audio oscillation, a 0.00025-μf bypass capacitor (C10) has been added from the plate to the positive filament of the 1S5 tube. The plate load of the 1S5 tube (R9) has been changed from 330,000 to 470,000 ohms. The value of R21 has been changed from 6.8 to 15 megohms. The value of C13 has been changed from 0.05μf to 0.02μf. The 0.05-μf capacitor (C19) has been changed from the input side to the plate side of L4 to reduce hash.

Since the clinch nuts in the top of the loop shield, which hold the screw in the top of the cabinet, have at times come loose, a brass extruded nut, part number A21681, has been made available for replacing these clinch nuts when they come loose.

In the note under the resistance chart on *page 17-4 of Rider's Volume XVII*, K was shown as equalling 100 ohms. This note should read K equals 1000 ohms. The parts numbers given in the parts list on *page 17-2* for the miniature tube sockets were A21032-1 and A21032-2. These should have been A20132-1 and A20132-2.

A slide switch, part number A21051, has been added to the parts list.

Arvin 150TC, 151TC, Chassis RE-228-1

These models are the same as Model 150TC appearing on pages *17-5 to 17-8 of Rider's Volume XVII*, except for the following changes. The 35W4 rectifier tube has been replaced with a 100-ma selenium rectifier. The 35B5 output tube has been replaced with a 50L6 output tube. A negative temperature coefficient resistor has been added in the filament line. The filter choke has been replaced by a 1200-ohm resister and a tap on the output transformer. The 0.005-μf tone capacitor has been replaced with an 0.003-μf capacitor.

DELETE

REF. NO.	PART NO.	DESCRIPTION
	A19141	Terminal Strip, Double
	B21123-1	Tube retainer Spring, long
R13	C20060-331	Resistor 330 ohm ¼
R14	C20070-123	Resistor 11,000 ohm ¼ W
R15	C20060-104	Resistor 0.1 Megohm ¼ W
L3	AE21107-1	Filter Choke Assembly
T3	AE21099-1	Output Transformer

ADD

REF. NO.	PART NO.	DESCRIPTION
	A19140	Terminal Strip, Single left hand
	A18254-1	Socket, tube wafer octal
SR	A20207-2	Selenium Rectifier
T3	AC21494-1	Output Transformer
NTCR	AC21489-1	N.T.C. Resistor and Can Assy.
C10	C20069-302	Capacitor 0.003 μf 600 V P.T.
R13	C20223-122	Resistor 1200 ohm, 2W. ± 10%

Arvin 544 and 544R (Noblitt-Sparks)

The following changes have been made in the circuit appearing on *pages 15-3 to 15-5 of Rider's Volume XV* to reduce low level hum and hum modulation.

1. The capacity of the electrolytic capacitor A19136 (C7) is changed from 40-20$\mu\mu$f, 150v, 20$\mu\mu$f, 25v, to 50-20$\mu\mu$f, 150C, 20$\mu\mu$f, 25c.
2. The rotor of the variable capacitor is now connected to AVC instead of to chassis. (This is the same circuit that was used in sets built previous to March 1946.)
3. C11 0.1μf, 400v, capacitor from AVC to chassis is deleted.
4. The bypass capacitor from B+ to chassis is changed from C9, 0.05μf, 400v, to C11, 0.1μf, 400v, to prevent oscillation.
5. A fiber washer part 20198 ¼ inch ID, ½ inch OD, ⅛ inch thick, is added under the pointer to prevent the pointer from touching the dial and shorting AVC to the chassis.
6. The floating ground wiring is changed; the jumper from the oscillator coil to the #3 lug on the 12SK7 socket is removed and replaced by a jumper from the ground side of the volume control to the a-c switch lug.
7. The top of the dial scale backing plate has been cut off even with the top of the dial, to allow the dial to set in a more vertical position. The part number remains the same, and the old and new plates are interchangeable.

The parts list for these models remains the same as that enumerated on *page 15-5 of Rider's Volume XV* except for the changes noted.

Part No.	*Description*
A19136	Capacitor, electrolytic 50-30$\mu\mu$f, 150v. 20$\mu\mu$f, 25v.
A20198	Washer, fiber

Noblitt-Sparks 664 and 664A

These models are the same as Model 6640, Chassis RE-206-1, appearing on *pages 17-16 to 17-18 of Rider's Volume XVII*, except that the loop assembly has been changed. The part number is AC18579-1.

Arvin 664 and 664A, Chassis RE-206-1

These models appearing on *pages 15-10 and 15-5 and 15-6 of Rider's Volume XV*, have been changed as follows to reduce the a-c hum. The 0.1-μf capacitor (C12) connected from B+ to the cathode of the 35L6 tube has been changed to 0.03μf. The resistance of R12 connected from B+ to the cathode of the 35L6 tube has been changed from 12,000 to 15,000 ohms .Making this change will reduce the a-c hum of many of the sets with the previous circuit.

The parts list should be changed as follows:

Delete:

Ref.No.	*Part No.*	*Description*
R12	C20070-123	Resistor 12,000 ohms, 1 watt
C12	C20068-104	Capacitor, 0.1μf, 400 v. p. t.

Add:

Ref.No.	*Part No.*	*Description*
R12	C20070-153	Resistor, 15,000 ohms, 1 watt
C12	C20068-303	Capacitor, 0.03μf, 400 v. p. t.

Phillips Petroleum 3-62A

This is the same as Model 3-61A, appearing on *pages 17-9 to 17-12 of Rider's Volume XVII*

Radio & Television (Brunswick) 4000, 4000½, 6000, 6000½, 6876

These models are the same as Model SF-6810 on *pages 16-1 to 16-5 of Rider's Volume XVI*.

Olympic Radio 6A-501W-U, 6A-501V-U, 6A-502-U

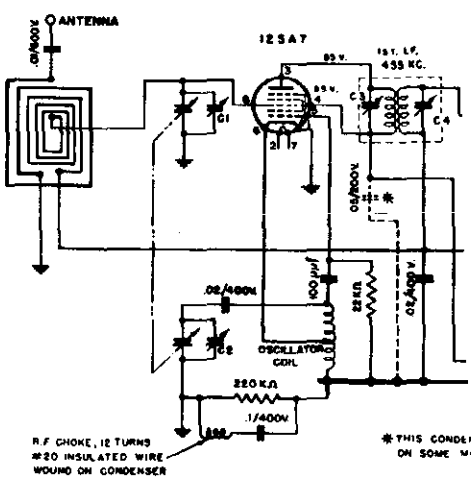
These models are the same as Model 6-501W-U on *page 15-2 of Rider's Volume XV*, except for the following changes. The tube lineup may be 12BE6, 12BA6, 12AT6, 50B5, and 35W4, instead of the lineup shown on page 15-2. The 330-$\mu\mu$f capacitor in the oscillator feed-in line has been changed to 100$\mu\mu$f. The 8200-ohm resistor connected from the top of this capacitor to B minus is now 22,000. A 220,000-ohm resistor is connected from B minus to the ground side of C2 and the trimmer capacitor across it. A 0.1-μf capacitor and an r-f choke are connected in series across the 220,000-ohm resistor. The choke consists of 12 turns of #20 insulated wire wound on the capacitor. In some models, a 0.05-μf capacitor is connected from the primary of the first i-f transformer to B minus.

A 47,000-ohm resistor has been placed inside the can of the second i-f transformer and two 100-$\mu\mu$f capacitors are connected across it. The resistor is connected between the secondary of the i-f transformer and the avc line. There is a connection from the cathode of the 12SQ7 (or 12AT6) tube to the junction of the capacitors.

The parts list has been changed as follows:

Part No.	*Description*
CA-327W	Cabinet—walnut bakelite cabinet
CA-327V	Cabinet—ivory bakelite cabinet
CL-575	Coil—oscillator coil
REB223M	Resistor—22,000 ohms, ±20%, 1/2 watt
ST-255-1	Back—cardboard back (for 6A-501U only)
TR-707	Transformer—first i-f transformer (shielded)
TR-708	Transformer—second i-f transformer with built in diode filter (shielded)

Changes in the mixer-oscillator circuit of the Olympic models 6A-501-W-U, 6A-501V-U, and 6A-502-U.



RCA QU61

The following circuit modifications have been made in RCA Model QU61, the schematic of which appears in *Rider's Volume XV on page 15-55:*

1. In some sets, a modification has been made in the "Radio-Phono Switch and Tone Control Strip," the diagram of which appears on *page 15-58*. The modified diagram appears in Fig. 1. In these sets, R9 (Stock No. 30648) has been omitted and C57, 120 $\mu\mu$f (Stock No. 39630) has been changed to 47$\mu\mu$f (Stock No. 35644). A 220,000-ohm resistor (R33, Stock No. 14583) has been added from terminal 12 of S7 to the ground terminal of R11.

2. In some sets, a modification has been made in the bias supply to the output tubes. The schematic for the unmodified diagram appears on *page 15-55 of Rider's Volume XV*, and the modified diagram is shown in Fig. 2. A 120,000-ohm resistor (R25, Stock No. 30180) has been added in series with the supply and a 0.05 μf capacitor (C56, Stock No. 70615) has been added from the output tube side of the 120,000-ohm resistor to ground.

3. Should interference from a powerful near-by station require the use of a wave trap, install RCA Stock No. 32553 trap as illustrated in Fig. 3. The complete chassis view is found on *page 15-58 of Rider's Volume XV*. Connect the coil lug to the receiver antenna connection; ground connection is made to the chassis through coil mounting foot. Adjust the capacitor mounted on top of the coil for minimum signal from the interfering station.

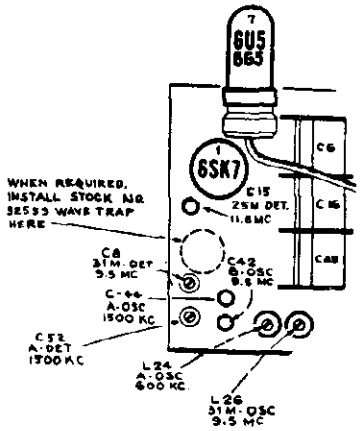


Fig. 3. In case of interference, a wave trap can be installed as shown in the RCA model QU61.

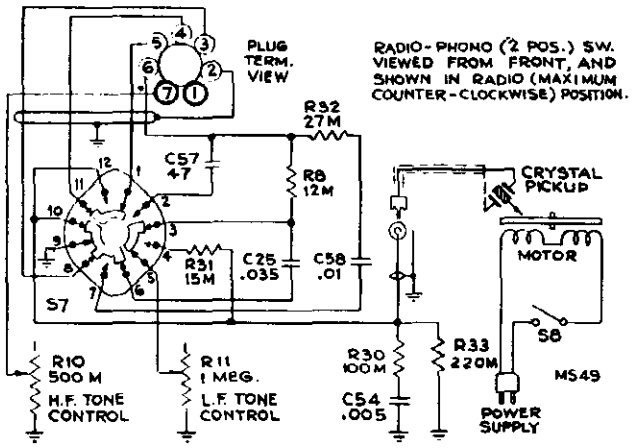
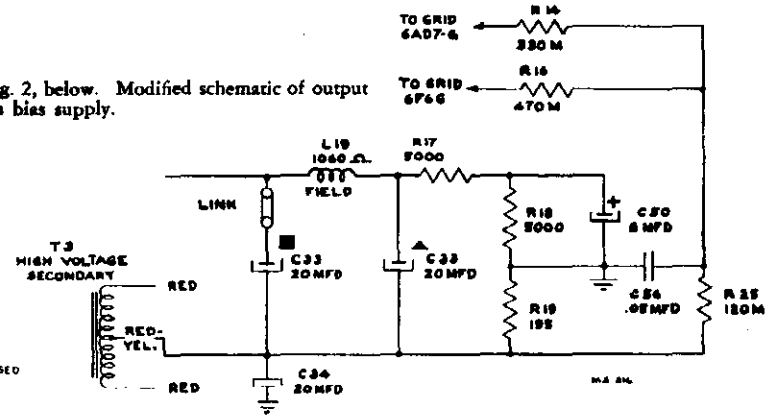


Fig. 1, above. Modified schematic of phono switch and tone control strip in RCA model QU61.

Fig. 2, below. Modified schematic of output tubes bias supply.



RCA QB55, Chassis RC-563A

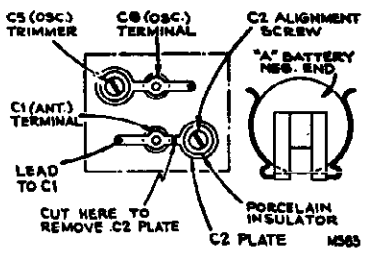
The following changes pertain to RCA QB55, chassis RC-563A appearing on *pages 15-27 to 15-28 of Rider's Volume XV*. In some chassis the 12-$\mu\mu$f section (C20) of the electrolytic capacitor has been changed to 20-$\mu\mu$f and the 20-$\mu\mu$f section (C22) has been changed to 30-$\mu\mu$f. C12 has been changed to 0.03μf and C18 to 0.003-μf.

RCA 54B Series

These receivers have been produced with loops of two types of construction: "taped," in which the coil is fastened to the loop cover with Scotch tape; and "cemented," wherein the coil is fastened to the loop cover with coil cement. Receivers using "cemented" loop have been produced with and without the antenna trimmer capacitor, C2. Receivers using the "taped" loop have only been produced with antenna trimmer C2, and they are to be aligned according to the instructions on *page* 15-22 *of Rider's Volume XV*. In the case of those receivers using the "cemented" loop which has the trimmer C2, this capacitor is removed before alignment. Trimmer C2 is removed by removing the C2 alignment screw and cutting off the C2 capacitor plate as shown in the accompanying illustration.

Removal of the trimmer necessitates changes in the alignment for sets using the "cemented" loop. Refer to the alignment instructions on *page* 15-22. Steps 1 and 2; connect the high side of the test oscillator to the connection lug of C1 located on rear of gang in series with 0.01-μf capacitor. Step 3: test oscillator tuned to 1500 kc; the gang capacitor is rocked instead of being set to 1600 kc. Step 4: omitted. Step 5: the gang capacitor is rocked instead of being set to 600 kc. All other instructions are the same with the foregoing exceptions.

If there is distortion and low volume in the RCA 54B series, check



Before aligning the RCA model 54B with a "cemented" loop, C2 is removed, as indicated.

the coupling capacitor C19 (0.002 μf) for leakage. This capacitor couples the audio signal from the 1S5 tube to the 3S4 output tube. This capacitor has only a 150-volt rating and it should be replaced with one that has a 200-volt rating.

The following is a list of changes for the parts lists for these models:

1. Delete Stock No. 70454—Capacitor-Tubular, 0.002 μf, 150 volts (C14, C19)

2. Add Stock No. 72315—Capacitor-Tubular 0.002 μf, 200 volts (C14, C19).

3. Delete Stock No. 70453—Capacitor-Tubular, 0.02 μf, 100 volts (C10, C15).

4. Add Stock No. 71928—Capacitor-Tubular, 0.02 μf, 200 volts (C10, C15).

NOTE: C15 (Stock No. 71928) should be located adjacent to the output transformer instead of under the socket subpanel, since its physical size is slightly larger than C15 (Stock No. 70453).

RCA 54B1, 54B2, 54B3

These models appear on *pages 15-22 to 15-24 of Rider's Volume XV*. The position of the green and black leads of the second i-f transformer (stamped (922246-2) have been transposed to facilitate assembly. This change affects only the wiring, not the schematic.

RCA 56X, 56X2, 56X3, Chassis RC-1011, A, B

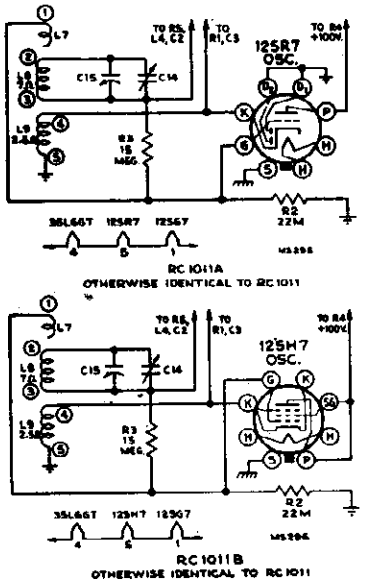
These models are the same as Model 56X on *pages 15-31 and 15-26 of Rider's Volume XV*, except for the following changes. Some sets have a 220,000-ohm resistor in shunt with the primary of the first i-f transformer. The replacement transformers may not need this resistor if the i-f amplifier seems stable.

Some sets have a 22-ohm, 1-watt resistor as a fuse in series with the electrolytic capacitor.

Some sets have a 56-$\mu\mu$f capacitor from terminal 1 of the oscillator coil to terminal 2. This is not necessary on replacement coils as they have a built-in capacity winding.

On some models the 500,000-ohm volume control is not furnished with a stop 50,000 ohms from the high end of the control. Controls having no stop can be identified by a dot of red lacquer on the left side of the control, viewing the shaft end with terminals up. In models using this completely covered with spaghetti tubing, is connected between the high end of the control and the yellow lead on the second i-f transformer.

Replacement controls equipped with a stop do not need this external 56,000-ohm resistor, so when replacing a volume control, check the resistance between the arm and the high end of the replacement control with the arm turned fully clockwise. A reading of 50,000 ohms will indicate that the control is equipped with a stop and that the 56,000-ohm resistor should be removed before installing the new control.

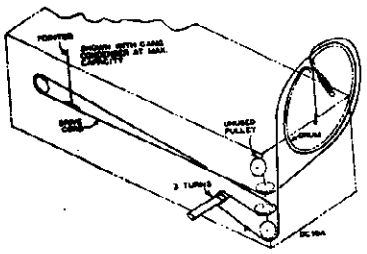


Changes in the oscillator circuit of RCA Chassis RC1011A, above, and Chassis RC1011B, below.

In chassis RC 1011A and chassis RC 1011B, the 12J5GT oscillator tube has been replaced with a 12SR7 in the former and a 12SH7 in the latter. The wiring changes in respect to these tube changes are shown in the accompanying partial schematics. Otherwise chassis RC 1011A and RC 1011B are identical to chassis RC 1011.

RCA 68R1, 68R2, 68R3, 68R4, Chassis RC-608

These models are the same as those illustrated on *pages 16-39 to 16-43 of Rider's Volume XVI*, except that the dial cord assembly has been redesigned. The revised design uses a simpler method, and the length of the dial cord has been reduced to approximately 67 inches



Revised method for dial cord stringing in RCA models 68R series.

rather than the original 80 inches. See accompanying illustration for method of restringing.

Radio Wire Television M72 and M73

These models are the same as Model M70A which appears on *pages 17-6 to 17-11 of Rider's Volume XVII*, with the following exceptions. The 22K resistor (R51) in the grid circuit of the first audio stage has been removed. The 0.02-μf capacitor (C19) which was connected from the top of R51 to one side of the tone control (R14) now is connected from the bottom of R13 to ground.

RCA 54B1, Chassis RC-589, 54B1-N, Chassis RC-589D, 54B2, Chassis RC-589A, 54B3, Chassis RC-589B, Second Production, Chassis RC-589U, RC-589UA, RC-589UB

These models are the same as Model 54B1, Chassis RC-589, appearing on *pages 15-22 through 15-24 of Rider's Volume XV*, except for the following changes. These models have been produced with loops of two types of construction: "taped"—the coil is fastened to the loop cover with scotch tape; and "cemented"—the coil is fastened to the loop cover with coil cement. The models with the "cemented" loops have been produced with and without the 2—15-$\mu\mu$f antenna trimmer capacitor C2. Receivers with the "taped" loop all have C2. The three combinations are listed below with the correct alignment procedure specified. CAUTION: A "taped" type loop should never be used as a replacement on those models which do not have antenna trimmer capacitor C2.

Loop Construction	*C2 Ant. Trimmer*	*Alignment Procedure*
Taped	With	As given on page 15-22
Cemented	With*	See following alignment table
Cemented	Without	See following alignment table

*Remove antenna trimmer capacitor C2 by removing C2 alignment screw and cut off C2 capacitor plate.

*Steps 3, 4, and 5 require a coupling loop from the signal generator to feed a signal into the receiver loop located in the lid. This loop should be approximately one turn of 6x3½ inches coupled to the signal generator through a 200-$\mu\mu$f capacitor, and loosely coupled to the receiver loop antenna at about 1¾ inches distances, so as not to disturb the receiver loop inductance. Ground test oscillator through 0.1-μf capacitor to receiver chassis.

Steps	Connect the high side of test osc. to—	Tune test-osc. to—	Turn radio dial to—	Adjust the following for max. peak output—
1	Connection lug of C1 located on rear of gang in series with .01 mf.	455 kc	Quiet point near 1,500 kc	C11, C12 2nd I-F trans.
2		455 kc	Quiet point near 1,500 kc	C8, C9 1st I-F trans.
3	*Antenna coupling loop thru 200 mmf. capacitor	1,500 kc	Rock gang	C3 (osc.)
4		600 kc	Rock gang	L2 (osc.)
5	Repeat steps 3 and 4 for final adjustments.			

The second production of these models use a type 1U5 tube in place of the type 1S5 (second detector, a-f, avc). They may be identified by the letter U in the chassis number which is stamped on the tuning capacitor or chassis. The accompanying diagrams show a partial schematic and a parts layout and wiring diagram for this tube. The replacement parts for these models are the same as those for the first production, with the exception of the following.

Stock No.	*Description*
72230	Support—tube support less tube sockets and transformers

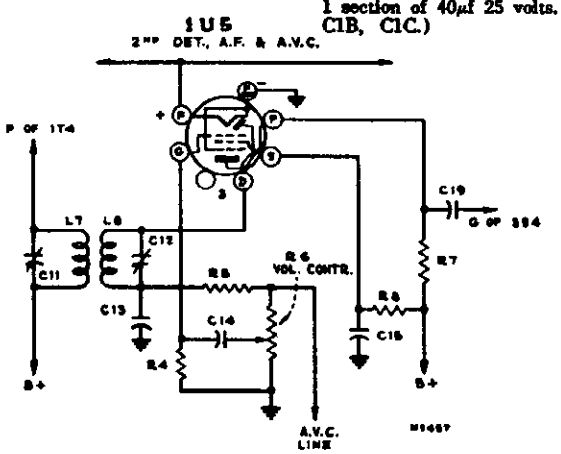
The following changes should be made in the parts list shown on *page 15-24 of Rider's Volume XV* to conform to all first production models.

Delete:

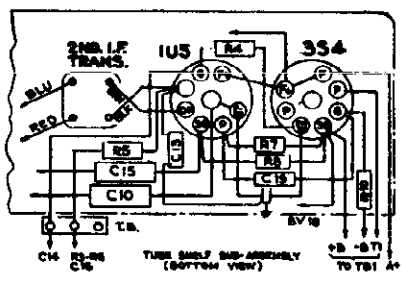
Stock No.	*Description*
60954	Capacitor—ceramic, 56$\mu\mu$f (C4)
65405	Capacitor—ceramic, 82$\mu\mu$f (C13)

Add:

Stock No.	*Description*
70448	Fastener—push fastener to hold loop (two required)
71563	Hinge—lid hinge—Model 54B3, —Red (two required)
71565	Lid—case lid complete with lid support less loop—Model 54B3—Red
71564	Loop—antenna loop complete with connectors less lid — Model 54B3—Red
71562	Plate—backing plate for mounting hinge on lid—Model 54B3—Red (two required)
71725	Screw—case cover mounting screw (one set)—Model 54B3
71567	Bottom—case bottom—Model 54B3—red
71566	Center—case center—Model 54B3—red
71568	Handle—carrying handle—Model 54B3—red
71569	Link—handle link—Model 54B3—red (two required)

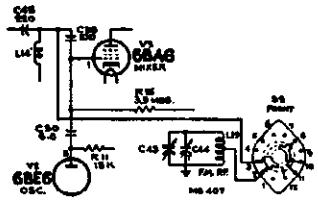


Alignment instructions for sets with cemented loop are shown in the table. The wiring changes for the type 1U5 tube used in the second production are shown on the right.



RCA 711V1, 711V2, 711V3, CHASSIS RK-117, RS-123

Models 711V1 and 711V3 are the same as Model 711V2 shown on *page 17-44 to 17-55 of Rider's Volume XVII* except for the cabinets. The following changes apply to all models. Resistor R6 is 1200 ohms instead of 680 ohms as indicated on the schematic of the RK-117 chassis. The



The revised V3 mixer circuit.

mixer (V3) input circuit of this chassis has been revised. C28 is omitted, the connections to terminals #2 and #3 of the range switch (S3 front) have been reversed, the plate circuit of the r-f amplifier (V1) is coupled to the grid circuit of the mixer (V3) through C38 instead of C28. Capacitor C1B on Chassis RS-123 has been changed from 15μf to 50μf. The following change should be made in the parts list for for this chassis. Stock number 36599 should be deleted, and number 72955 added.

Stock No.	*Description*
72955	Capacitor—Electrolytic, comprising 1 section of 30μf, 450 volts 1 section of 50μf 400 volts, and 1 section of 40μf 25 volts. (C1A C1B, C1C.)

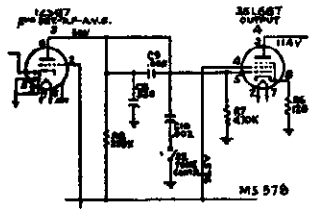
RCA 66X1, 66X2, RC-1038, 66X3, 66X4, 66X7, 66X8, 66X9, Chassis RC-1038A

These models are similar to Model 66X1, Chassis RC-1038, appearing on *pages 15-89 through 15-91 of Rider's Volume XV*. The following additions have been made to the parts list.

Stock No.	*Description*
72753	Plate—dial back plate complete with four (4) pulleys less dial for models 66X3, 66X4, 66X7, 66X8, 66X9
6134	Resistor—1200 ohms, 1 watt, (R11)
72514	Back—cabinet back for 66X7 and 66X9
72721	Back—cabinet back for 66X8
X1627	Baffle—baffle board and grill cloth for 66X7, 66X8, 66X9
Y1423	Cabinet—catalin (black) cabinet for 66X7
Y1408	Cabinet—catalin (red) cabinet for 66X8
Y1393	Cabinet—catalin (black and white) cabinet for 66X9
72822	Dial—glass dial scale for 66X3, 66X7, 66X8, 66X9
72678	Knob—control knob (black) for 66X7 and 66X9
71821	Knob—control knob (maroon) for 66X8
72295	Socket—phono

RCA 66X11, 66X12, 66X13, Chassis RC-1046C, RC-1046D, RC-1046E

These models are the same as Model 66X11, chassis RC-1046A, on *pages* 17-29 *and* 17-30 *of Rider's Volume XVII*, except for the following change. The capacitor C10 (tone-control circuit) which was connected



Capacitor C10 is here connected to the plate of the 12SQ7 a-f amplifier tube.

to the grid of the 35L6GT output tube, is now connected to the plate of the 12SQ7 a-f amplifier tube, as shown.

RCA 66X11, 66X12, 66X13, Chassis RC-1046C, RC-1046D, RC-1046E, Second Production

These models are similar to Model 66X11, chassis RC-1046A, on *pages 17-29 and 17-30 of Rider's Volume XVII*. They incorporate the changes listed in the June 1948 issue of SUCCESSFUL SERVICING, in addition to the following changes. The parts list should be amended as follows:

CHASSIS ASSEMBLIES

Change: 72896 Plate—to read
72896 Plate—dial back plate complete with drive cord pulleys for Model 66X11.

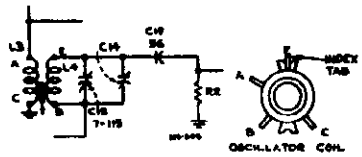
Add: 72601 Plate—dial back plate complete with drive cord pulleys for Model 66X12.

MISCELLANEOUS

Change: 73169 Back—to read
73169 Back—cabinet back for Model 66X13—walnut

Add: 73278 Back—cabinet back for Model 66X13 mahogany
71893 Decal—trade mark decal

The stock number of the dial cord should be 72953 instead of 72913. This cord is supplied in 250 foot reels. Approximately 56 inches are required for the first



Oscillator Circuit
RC-1046C, RC-1046E

Schematic otherwise identical to RC-1046-A,-B except ant. tuning cond. C12 is 10-398 mmfd., only one dial lamp used on RC-1046E.

production and approximately 49 inches for the second production.

The differences between these various chassis are as follows. Chassis RC-1046C uses oscillator coil without capacity winding, L5. Capacitor C19 is used and a tuning capacitor without C16 is used. Two dial lamps type number 1490 are used. Chassis RC-1046E is the same as RC-1046C, except that only one dial lamp, Type 47, is used. For oscillator circuit see accompanying diagram.

73172	Capacitor—ceramic, 56μμf (C19)
73163	Coil—Oscillator coil complete with adjustable core and stud (L3, L4)
73164	Capacitor—Variable tuning capacitor (C12, C13, C14, C15)

RCA 612V1, 612V3, AND 612V4

These models appear on *pages* 17-31 *to* 17-43 *of Rider's Volume XVII*. The alignment tabulation should be corrected to read as follows.

Step No. 12—Repeat steps 10 and 11 for exact calibration.

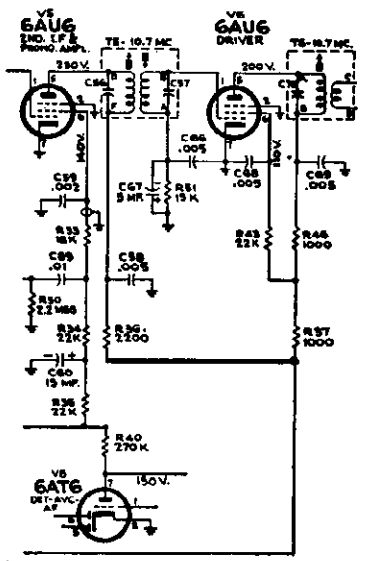
Step No. 18—Repeat steps 16 and 17 for maximum output.

On chassis RS-123, the electrolytic capacitor C1B has been changed from 15μf to 50μf.

RCA 612V1, 612V3, 612V4, Chassis RK-121

These models, appearing on *pages* 17-31 *to* 17-43 *of Rider's Volume XVII*, have been changed as follows. R36 is no longer connected to the junction of R35-R40-R22-R25. It is now connected to R37 and terminal #11 of S5. This change removes the plate voltage from V5 (6AU6) when the range switch is in the "Phono" position, and is illustrated here.

If the shielded lead of the power cable touches the speaker frame, noise will be caused. The power cable should be clamped in such a position to prevent contact with the speaker frame.



This new connection for R36 removes the plate voltage from V5 when the range switch is in the "Phono" position.

RCA Record Changer Model 960015

This model is shown on *RCD.CH. Page 15-11 of Rider's Volume XV*. If binding or freezing of turntable bearing occurs, the turntable shaft should be removed and polished with very fine emery cloth or crocus cloth. Clean off any bearing metal or foreign particles from the shaft, including the set-screw burr. Next, bevel the top edge of the top bearing slightly, with a knife or scraper. Clean the shaft and the bearing with carbon tetrachloride, removing oil and grease and being certain to clean out any chips which may have dropped into the bottom bearing. Lubricate all moving surfaces with a light coating of a very light-bodied grease.

If records do not separate properly and it is found necessary to adjust record slide actuating lever, proceed as follows:

1. Rotate separator shelf to 10" position.
2. Remove 10" landing adjustment bolt.
3. Press down on reject button and rotate turntable by hand in the normal direction until a "click" is heard (reject actuating slide latching).
4. Loosen set screws "G" and set record actuating lever ⅜ inch from bracket as indicated in Fig. 2 of service data.
5. Tighten set screws "G" and replace landing adjustment bolt.
6. Make necessary landing adjustment as described in service data.

NOTE: This method just described makes the set screw "G" more accessible and is therefore found more convenient. This method can be substituted for step No. 9 under Preliminary Adjustments.

RCA Record Changers 960001 Series

These changers are the same as Model 960001-1 on *RCD. CH. page 15-1 of Rider's Volume XV* except for the following changes:

960001-4 Uses L230270 Motor. Has additional pickup shorting switch that shorts out pickup arm when in the rest position.

960001-5 Uses pickup cable 72583 of different length.

960001-6 Same as 960001-5 except for color of knobs, arm, etc.

Regal Electronics 208

This model is the same as models 800 and 801 shown on *page* 16-1 *of Rider's Volume XVI.*

Remler Model 5100

This model appears on *Misc. page 16-9 in Rider's Volume XVI.* The external resistor connected from the suppressor grid (pin 3) to the cathode (pin 5) of the 6SK7 i-f amplifier has been changed from 100 ohms to 220 ohms. The 1-meg resistor connected from the plate (pin 3) of the 6V6GT audio amplifier to the junction of the 0.01-μf coupling capacitor and the 220,000-ohm plate load resistor of the 6SQ7 detector, has been removed. A 0.05-μf filter capacitor has been connected from each side of the a-c power line to ground.

Sears Roebuck 3351, 3451, 3551, Chassis 132.802-2C, -2D, -2E

These models are the same as Model 3351, Chassis 132.802 on *page 12-34 of Rider's Volume XII,* except for the following changes. A pilot-light shield and snubber assembly has been added, replacing the dial-light shield which was assembled to the dial-pointer shaft bracket. The push-button caps are permanently cemented to the push buttons at the time the set is built.

Sears-Roebuck 4518, Chassis 101.393

This model is the same as model 4500, chassis 101.393 shown on *page 8-15 of Riders Volume VIII.*

Sears-Roebuck 6200A, Chassis 101.800-1; 6203, Chassis 101.800-A

These models are the same as Model 6200, chassis 101.800, shown on *pages* 15-13 *and* 15-2 *of Rider's Volume XV,* except for the following changes. A phono socket has been added to Model 6200A. An ivory cabinet, instead of a brown one, is used on Model 6203.

Part Number	Description
R61010	Cabinet, Ivory (101.800-A)
R44897	Socket, phono (101.800-1)

Sears-Roebuck 7025, Chassis 132.807-2

This model is the same as that shown on *page* 13-63 *of Rider's Volume XIII,* with the following exceptions. The electromagnetic speaker (Part No. N17258) has been replaced by a permanent magnet speaker (Part No. N16993.) The oscillator coil (Part No. 17233) has been rotated 180 degrees and the mounting lug soldered to the back of the chassis to provide a better mounting. This change does not involve any circuit changes.

Sears Roebuck 7056

This model appears on *pages 13-75 and 13-76 of Rider's Volume XIII.* The Astatic L-40A crystal cartridge should be used as a replacement cartridge for the phonograph pickup.

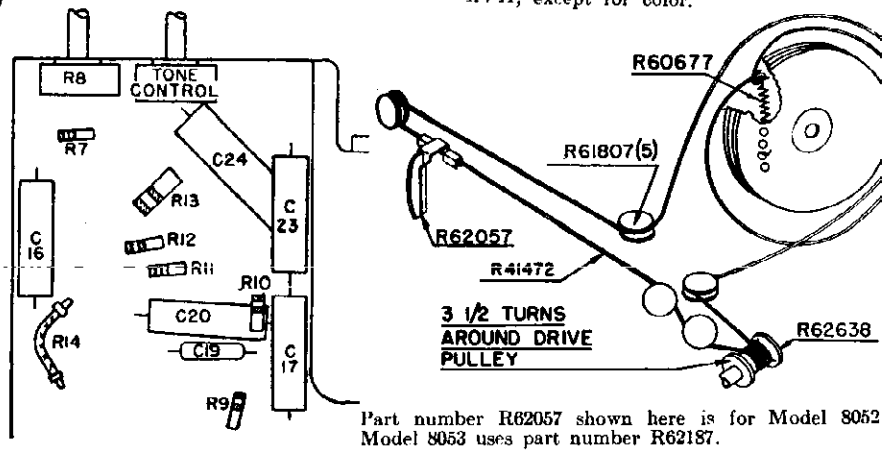
Sears-Roebuck 7080, Chassis 101.809; 7100, Chassis 101.811

These models, shown on *page 16-4 of Rider's Volume XVI,* use The General Instrument model 205 record changer which is shown on *page RCD.CH.15-5 of Rider's Volume XV.*

Sears Roebuck 8052, Chassis 101.808-1C, and 8053, Chassis 101.808-1D

These models are similar to Model 7054, Chassis 101.808, appearing on *pages 16-1 to 16-3 of Rider's Volume XVI,* except for the appearance of some of the parts and the addition of a variable tone control circuit. This circuit, consisting of a 0.001-μf capacitor (C23) in series with a 2-megohm variable resistor (R15), has been connected from the plate of the 7C6 tube to the B minus line. The location of these parts is shown in the accompanying illustration.

The dial stringing diagram for these models is shown in the accompanying diagram and is the same for both Models 8052 and 8053 except that part No. R62057 is part No. R62187 for Model 8053.



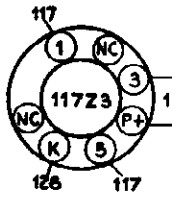
Part number R62057 shown here is for Model 8052 Model 8053 uses part number R62187.

The variable tone control consisting of capacitor C23 and resistor R15 in Models 8052 and 8053.

Sentinel Model 286P

In this model (*pages 16-14 to 16-16 Rider's Volume XVI*) all factory wirin connections were made to the 117Z3 tu socket at pin number 1. The 117Z3 tub as originally produced, had an intern connection to pins 1, 3, and 5. Therefor

When a new type 117Z3 is used in the Sentinel model 286P, pins 1, 3, and 5 must be externally connected. Voltages are here shown.



the foregoing connection was satisfactor and no jumper was provided.

The new production of 117Z3 tub provides no internal connection betwe the number 1 pin and the number 3 and pins. Therefore, it is necessary to wire t 1, 3, and 5 socket connections togeth so that this receiver will operate wh the original 117Z23 tube is replaced wi a recent production tube.

Setchell Carlson 416

This model appears on *Misc. pag* 15-19 *of Rider's Volume XV.* The i- transformers were coated with a lov melting point wax (yellow wax). I this wax runs, the trimmers will no stay adjusted. The only remedy is t replace the transformer.

Sonora RMR-219, RMR-220, RMR-245, 402A Mahogany and Prima Vera

These models are the same as Mode RMR appearing on *pages 17-6 to 17-8 o Rider's Volume XVII.*

Sonora KBU-168

This model is the same as Chassis KB, appearing on *page 12-6 of Rider's Volume XII.*

Stewart Warner VM-506261 Record Changer

This model is the same as Model VM-505339, appearing on *pages RCD.CH. 17-14 to RCD.CH. 17-19 of Rider's Volume XVII,* except for color.

Sentinel 1U286

This model is the same as Model 286PR on *pages 16-14 to 16-16 of Rider's Volume XVI*, except for the following changes.

A 0.1-μf capacitor (46) has been placed between pin number 6 of the 1R5 oscillator-modulator tube and the top side of the ganged tuning capacitor. A 470,000-ohm resistor (48) has been connected in the ave line between the top of the 0.05-μf capacitor (14) and the 4,700,000-ohm resistor (35). A 0.05-μf capacitor (47) has been connected from the junction of resistors 48 and 35 and ground. Two interlock plugs have been added in the power line. The i-f transformers (2 and 3) may either be the transformers listed in the parts list on page 16-16, or they may be part number 20E299.

The following parts should be deleted from the parts list shown on page 16-16.

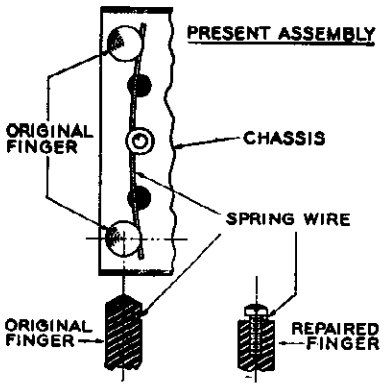
Illus. No.	Part No.	Description
8	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
10	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
11	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
12	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
13	23E2014-6	Capacitor, tubular, 0.01 μf, 150 V.
14	23E2014-8	Capacitor, tubular, 0.05 μf, 150 V.
16	23E2014-12	Capacitor, tubular, 0.002 μf, 150 V.
17	23E2014-9	Capacitor, tubular, 0.01 μf, 150 V.
46	23E2014-9	Capacitor, tubular, 0.1 μf, 150 V.
23	23E680-3	Resistor, carbon, 68 ohm, ½ W.
	20E128	"A" battery con. bracket assembly, with 4 No. 10E43 trimount studs
	20E130-1	Complete cabinet assembly, with lid and loop, handle, lid catch and pushbutton assembly and bottom assembly
	20E184	Top lid assembly with loop and hinges.
	20E185-1	Bottom assembly with locking slotted head stud
	30E25-1	Cabinet center section, less lid and bottom assemblies, with handle, speaker screen, lid catch and pushbutton
	20E136-1	Hinge and spring assembly with two No. 82E36-F10 No. 4-24 x ¼ mounting screws
	55E22-1	Handle, leather
	71E42-F10	Screw, No. 4-40 x 3/16 slot B.H.I.M.

The following parts should be added to the parts list.

Illus. No.	Part No.	Description
8	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
10	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
11	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
12	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
13	23E2004-5	Capacitor, tubular, 0.01 μf, 200 V.
14	23E2004-7	Capacitor, tubular, 0.05 μf, 200 V.
16	23E2004-2	Capacitor, tubular, 0.002 μf, 400 V.
17	23E2004-8	Capacitor, tubular, 0.01 μf, 200 V.
23	27E680-3	Resistor, carbon, 68 ohm, 1 W.
44	20E280-2	Switch, lid operated, mounted on "A" battery bracket assembly
45	20E284	Interlock, socket assembly
46	23E2014-9	Capacitor, tubular, 0.1 uf, 200 V.
47	23E2014-8	Capacitor, tubular, 0.05 μf, 200 V.
48	27E47-7	Resistor, carbon, 470,000 ohm, ¼ W.
48	20E284	Interlock, socket assembly
	20E130-3	Complete cabinet assembly with lid and loop, handle, lid catch and pushbutton assembly and bottom assembly
	20E184-3	Top lid assembly with loop and hinges
	30E25-3	Cabinet center section, less lid and bottom assemblies, but with handle, speaker screen, lid catch and pushbutton assembly.
	20E136-2	Hinge, right hinge and spring assembly with two No. 82E36-F10 No. 4-24 x ¼ mounting screws
	20E136-3	Left hinge and spring assembly with two No. 82E36-F10 No. 4-24 x ¼ mounting screws
	20E280-2	Complete "A" battery bracket assembly with lid operated switch assembly
	20E283	"A" battery contact plate assembly
	52E28	Plastic covered handle
	55E39	Handle strap, clock spring steel
	85E4-21	Screw, No. 4-40 x 3/16 Slot headless cup point for control knobs
	82E2004	Screw, for adjusting lid switch shaft

Setchell Carlson 427

This model appears on *page* 16-1 *of Rider's Volume XVI*. If the line voltage is extremely low, the 50L6 tube should be replaced with a 35L6 tube. The chassis is held in the cabinet by means of a spring wire caught in slots which are near the top of a finger built into the cabinet. If the head of this finger breaks off, repair can be made by drilling and tapping for an 8/32 machine screw. The accompanying illustration shows this method.



A machine screw can be substituted for the broken head of the finger which catches the spring wire holding chassis of Setchell Carlson 427 in cabinet.

Stewart-Warner 61TR36 (9029-B), 61TR46 (9029-H), 61TR56 (9029-J), 61TR66 (9029-K), 61TR76 (9029-L)

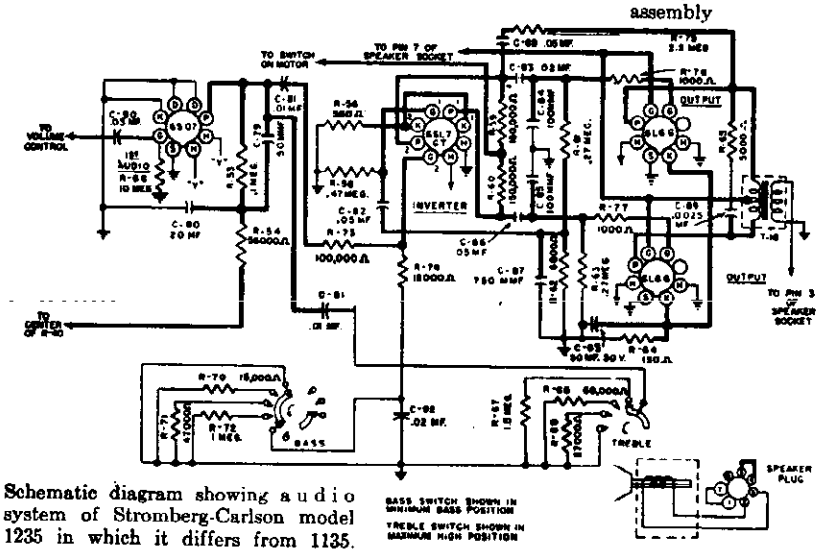
These models are the same as the 61TR36 shown on *pages 15-9 and 15-10 of Rider's Volume XV*, except for the addition of a 0.0008-μf capacitor 52 part No. 502470. This is connected at the junction of resistor 27 and the phono-pickup cable socket to ground when an L-70-Z cartridge is contained in the tone arm used with the DT-505049 changer.

Stromberg-Carlson 1235

This model is similar to Model 1135, appearing on *pages 16-8 to 16-10 and 16-16 to 16-19 of Rider's Volume XVI*, except for the following changes. The audio system has been changed and is shown in the accompanying diagram. Connections have been omitted from pins 1, 2, 3, 4, and 7 of the wire record socket. Pin 6 is grounded and the 17,000-ohm resistor, R-79, has been removed. Pin 5 is still connected to the junction of R46 and R47. A 1000-ohm resistor, R-41, has been added to the top of the bleeder. There is no connection to the junction of R-41 and R-40.

The following additional parts are used on the Model 1235.

149246	R-64	150 ohm, 5 watt
28155	R-56	560 ohm, ½ watt
149247	R-41	1000 ohm, 5 watt
28158	R-76, 77	1000 ohm, ½ watt
28168	R-62	6800 ohm, ½ watt
28172	R-70	15000 ohm, ½ watt
28179	R-68	68000 ohm, ½ watt
28191	R-72	1 megohm, ½ watt
28193	R-67	1.5 megohm, ½ watt
149121	R-75	2.2 megohm, ½ watt
149125	R-66	10 megohm, ½ watt
25485	C-81	0.01 μf
29891	C-86, 88	0.05 μf
110494	C-90	0.05 μf
111012	Electrolytic	50 uf
41489		6SL7 tube
30224		Plug
161230		Output transformer
33964		Bull's eye socket assembly



Schematic diagram showing audio system of Stromberg-Carlson model 1235 in which it differs from 1135.

TELETONE 139, 140, 141, 149, 157, 163, 164, Chassis H

These models are the same as Model 135, Chassis H, appearing on *Misc. Page 16-11 of Rider's Volume XVI.*

Teletone 161, 167, 168, 171, 174, Chassis T

These models are all the same as Model 150, Chassis T, appearing on *pages 17-2 and 17-3 of Rider's Volume XVII.*

Wells-Gardner 7A41-593

This model is the same as Model 7A41-704 appearing on *pages 12-8 to 12-11* of *Rider's Volume XII.*

Truetone D-696

This model is the same as Model D-727, which appears as Model 175 on *Detrola page* 9-1 *of Rider's Volume IX.*

Truetone D1118B

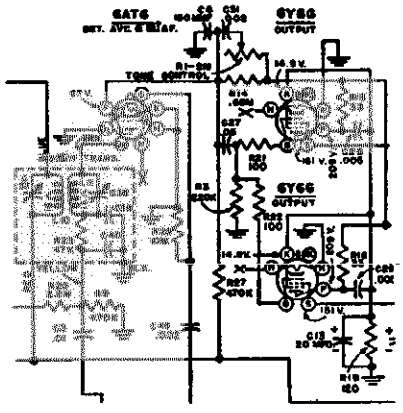
This model is similar to the D1118A model, shown on *pages 13-68 and 13-69 of Rider's Volume XIII* except for the following changes: The antenna trimmer (C2), part number 17A1116, mounted on the loop aerial assembly in the issue A model has been removed. The 1400-kc adjustment as given in the alignment procedure is omitted. The 1400-kc adjustment is made at the factory and need not be made in the field.

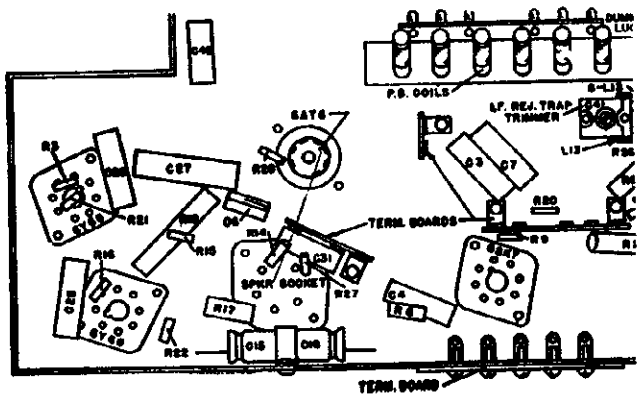
Westinghouse H-110A, H-111A, H-137A, and H-138A, Chassis V-2102-2

These models are the same as Model H-104 on *pages 15-1 to 15-4 of Rider's Volume XV*, except that the tone control circuit has been modified and a 6AT6 miniature tube replaces the 6SF7 tube used originally. The tube layout is the same, but certain components have been added, as may be seen in the accompanying diagrams.

The following parts should be added to the parts list.

Part No.	Description
RCP10W6202A	Capacitor, 0.002 μf, 600 v. (C48)
RC10AE474M	Resistor, 470K ¼ w. (R27)
RC10AE106M	Resistor, 10M ¼ w. (R28)

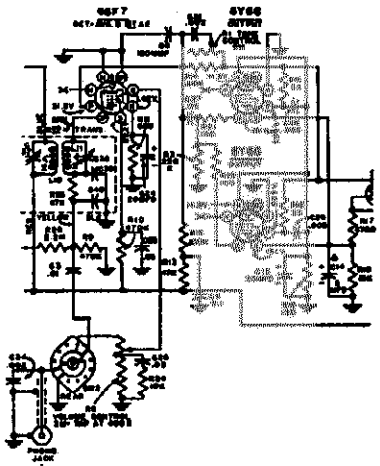




Changes in the tone control circuit, above, and in the parts layout, left, of the Westinghouse Chassis V-2102-2.

Westinghouse H-110, H-111, H-137, and H-138, Chassis V-2102-1

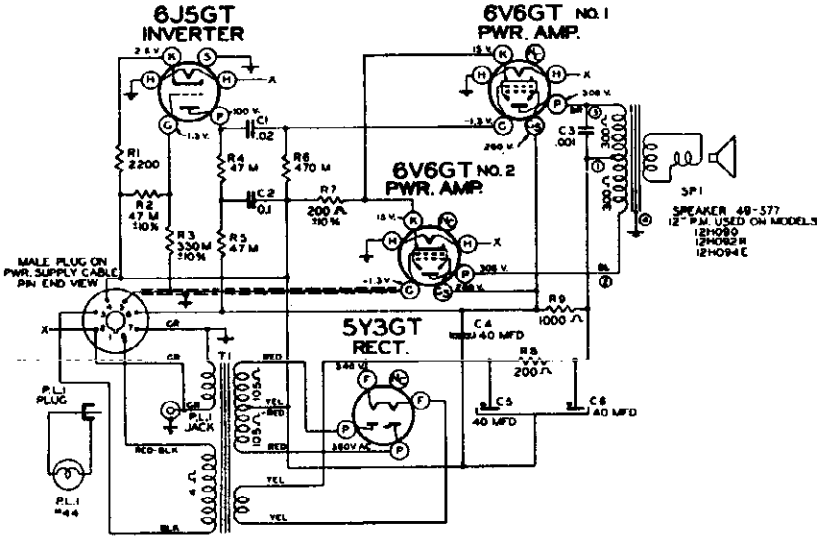
These models are the same as Model H-104 on *pages 15-1 to 15-4 of Rider's Volume XV*, except that the tone control circuit has been modified. This change is illustrated in the accompanying diagram.



The modified tone control circuit of the Westinghouse Chassis V-2102-1.

Zenith 12H090, 12H091, 12H092, 12H093, 12H094, Chassis 11C21Z

These models are similar to Mode 12H090, Chassis 11C21, on *pages 15-87 t 15-94 of Rider's Volume XV*. The diffe ence between these chassis appears in th power supply and the audio section. Cha sis 11C21 uses an electro-dynamic speake and the field of the speaker is used as choke in the power-supply filter circui Chassis 11C21Z uses a permanent magne speaker. To convert Chassis 11C21 t 11C21Z, it is necessary to replace th speaker field with a 200-ohm, 5-watt resiste (R8 in the accompanying diagram). 40-μf capacitor must be connected fro the center tap of the powe transforme to pin number 6 of the power-supply cab plug, as shown in the diagram. C40 ar C41 must be changed from 30μf to 40 (they appear as C5 and C6 in the 11C21 chassis). A 1000-ohm, 3-watt resistor (R must be connected between the screen gr of the first beam-power output tube ar the center tap of the output transforme The capacitor shown as C3 in the accor panying diagram is capacitor C39 in th schematic on *page 15-87, 88 of Rider Volume XV.*



The audio section and power supply of the Zenith chassis 11C21Z

IMPORTANT: Only difference between RC 180 & RC 181 is shape of pan.

OPERATING INSTRUCTIONS

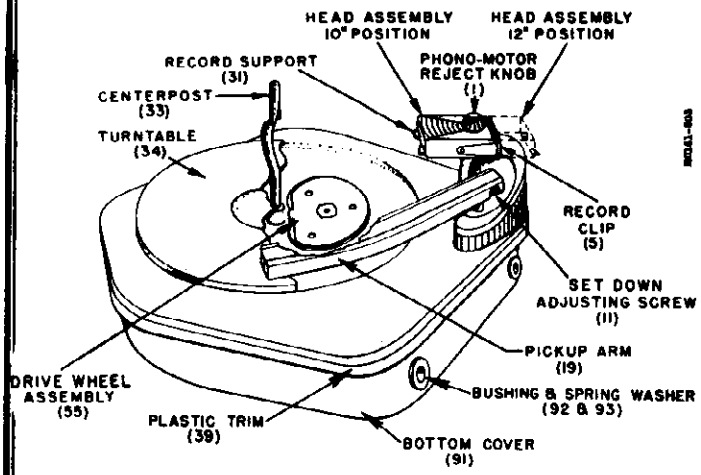


Figure 1A - Record Changer RC181, Top View.

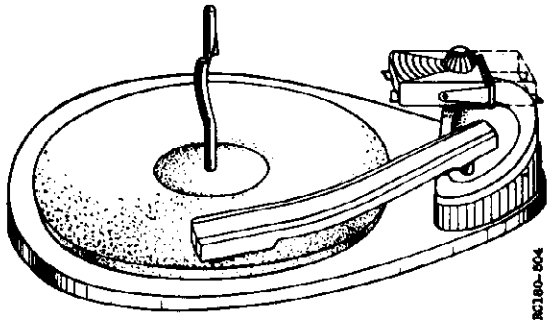


Figure 1B - Record Changer RC180, Top View Showing Pear-Shaped Pan.

1. SETTING FOR SIZE OF RECORD

The size of record for which the record changer is set to play is determined by the position of the head assembly (See Figure 1). With the embossed design toward the centerpost, the changer is set for 10-inch records. With the embossed design away from the centerpost, the changer is set for 12-inch records.

To change the setting, rotate the head assembly in either direction, until it clicks and locks in the desired position.

A slight amount of pressure may be required to begin the rotation when the head assembly is locked in an operating position.

2. STARTING THE RECORD CHANGER

To load the record changer, move the record clip (5) away from the centerpost (33) and place the records on the centerpost. The bottom record is supported by the offset in the centerpost and the record support (31).

Move the record clip so that it rests on the top record.

Turn the Phono-Motor switch knob (1) to the ON position. Then press down on this knob momentarily. The bottom record will drop to the turntable and the Record Changer will play the entire stack of records automatically.

3. REJECTING A RECORD

To reject a record at any time, press down o the Phono-Motor switch momentarily.

4. STOPPING THE RECORD CHANGER

This Record Changer cannot be turned off b means of Phono-Motor switch during its chang cycle. If the On-Off switch on the radio is used t turn off the changer, it is advisable to stop it whe the changer mechanism is out of cycle.

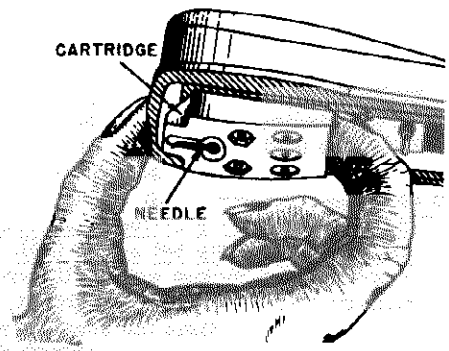


Figure 2 - Removing Cartridge by Pulling Down on Back Edge.

5. REPLACING CARTRIDGE AND NEEDLE

Before replacing, see cartridge service data i paragraph 14.

Remove the old cartridge (25) by getting you finger nails or a small screwdriver under it a shown in Figure 2 and pull down on the back edge Press new cartridge into place again, making sur to push near its back edge where its pins go into th socket.

THE CHANGE CYCLE

6. DESCRIPTION OF CHANGE CYCLE
(See Figures 1, 3 and 4)

If at all possible, we recommend that you carefully observe the operation of a changer that is in normal operating condition. It is a good idea to rotate the turntable by hand and repeat the changing cycle until you understand the function of each part. It is important to note that this changer employs the oscillating type trip, which depends upon the in and out movement of the pickup arm caused by the eccentric groove in the record. This is different than previous Admiral Changers which tripped when the pickup arm reached a given position.

The changer operates as follows: The changer mechanism is driven during its change cycle by the knurled hub of the turntable rotating the rubber-tired drive wheel (55). During normal playing, the drive wheel is held in a neutral position as illustrated in Fig. 1 & 3A, so that the indentation prevents the tire from contacting the knurled hub. The drive wheel (55) is held in this position by the trip stop wire (81A) and the cam stop stud (58A) on the control cam (58).

During the record play and as the needle enters the eccentric groove, the pickup arm is moving in toward the centerpost. The pawl (87A) is moving across the trip serrations (83). When the eccentric groove in the record causes the pickup arm to move away from the centerpost, the pawl tends to reverse its direction but its sharp point catches in one of the trip serrations (83) and moves the trip lever (81). As the eccentric groove moves the pickup arm back in toward the centerpost, and then away from the centerpost again, the pawl (87A), again locks in one of the trip serrations, moves the trip lever (81) far enough so that the trip stop wire (81A) is no longer engaged with the cam stop stud (58A). This oscillating trip action is dependent upon the adjustment of the trip set screw (85). If it is adjusted properly, the pickup arm will move away from the centerpost, toward the centerpost, and as it comes away the second time the changer will trip and start its change cycle. (See paragraph 8.) The position of the drive wheel (55) at this moment is shown in Figure 3B.

This allows the cycle spring (82) to pull the control cam clockwise (bottom view). Since the control cam (58) and the drive wheel (55) are on the same shaft, the drive wheel is turned so its rubber tire is against the knurled hub of the turntable (see Figure 3B). The turntable now rotates the drive wheel (55) which in turn rotates the control cam (58). As soon as changer has been tripped, the trip cocking spring (80) causes the trip lever (81) to return the trip stop wire (81A) to the normal playing position.

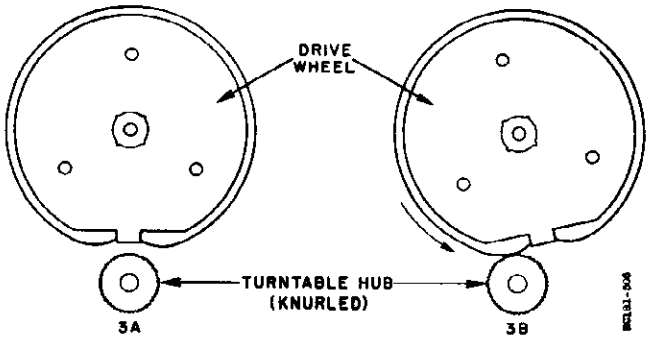


Figure 3 - Drive Wheel Positions.

Roller (72) riding on the control cam moves the pivot link (70) which in turn rotates the control plate (69). The rotation of the control plate (69) causes its inclined tab (69A) to ride against the lift rod (16) which lifts the pickup arm from the record. The arm control lever roller and stud (87B) then engages the safety arm (76). Further rotation of the control cam (58) moves the pivot link (70) causing further rotation of the control plate (69) causing the pickup arm to move to the right, clearing the record. This much has taken place in approximately one-third of the total rotation of the control cam.

As the control cam rotates further, its push-off stud (58B) engages with the end of the slot in the pushoff link assembly (62), moving it. This movement is transmitted through the push-off arm (62A) and as a result, the push-off shaft (8) is rotated. This rotates the push-off cam (8A) which in turn slides the push-off plate (30) forward and drops the next record to be played. (Note that the record stack rests on the record support shelf (31) and not on the push-off plate as on the RC170 and RC170A. The small slide at the top end of the centerpost holds back all records other than the bottom one when the push-off plate (30) moves forward.

As the control cam continues its rotation, the pivot link (70) moves back following the cam, since the roller (72) is kept in contact with the cam by the control plate spring (71). This moves the control plate (69) back, the arm control lever (87) moves the pickup arm to the set-down point for the record to be played. The pickup arm is held above the record because the lift rod (16) is still resting at the top of the inclined tab (69A) on the control plate (69). The set-down point is governed by the set-down adjusting screw (11). (See figure 1 & 5.) The shoulder on the set-down arm (88A) holds the pickup arm at the set-down point until it is pushed back by the

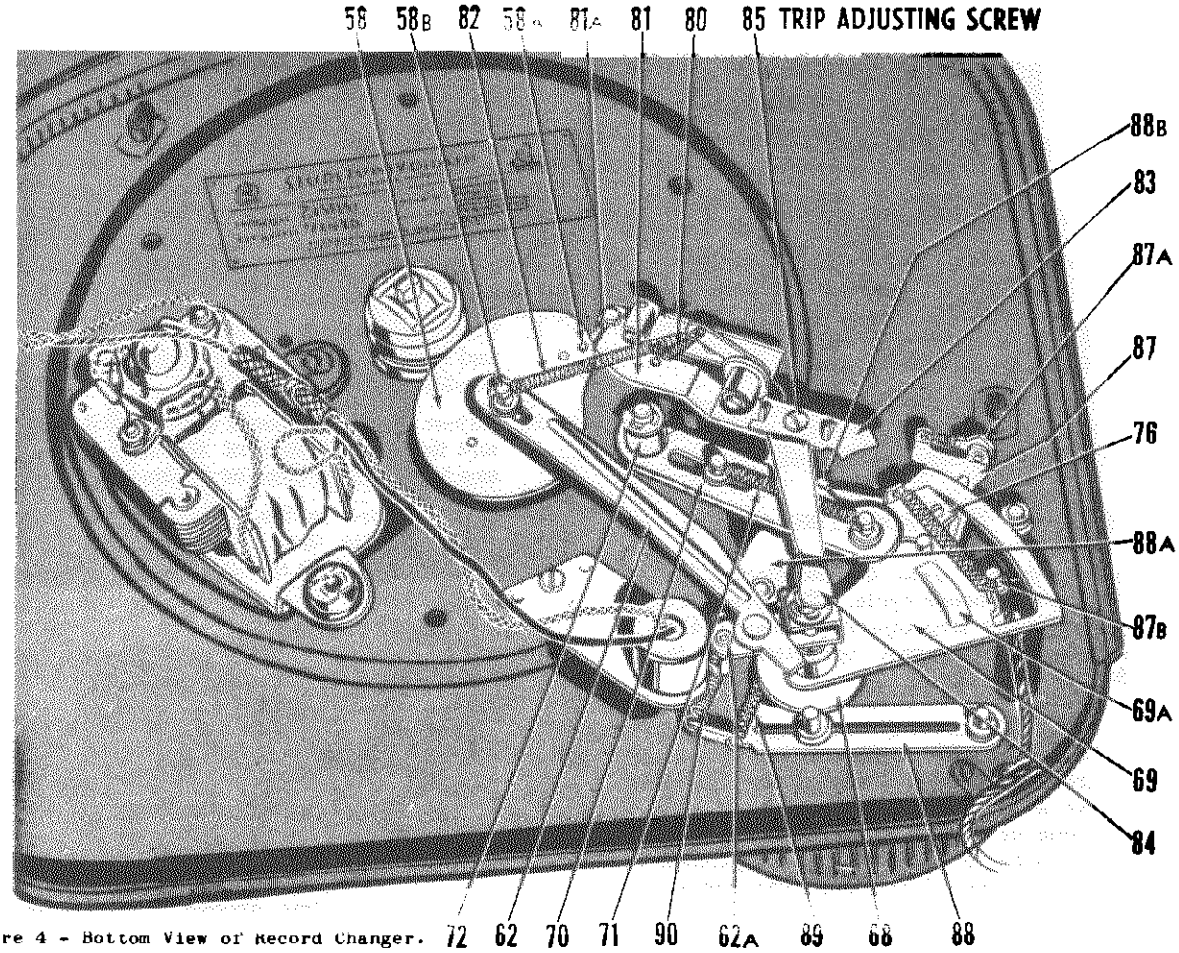


Figure 4 - Bottom View of Record Changer.

THE CHANGE CYCLE - Continued

edge of the control plate engaging the set-down arm stud (88B). The arm is then free and starts moving down toward the record starting groove.

When the record changer is set to play 10-inch records, the set-down arm (88A) through the tension of the set-down spring (89) moves the arm in to-the centerpost until the arm return roller and stud (87C) reaches the shoulder of the set-down arm (88A). The pickup arm is held in this position until the control plate (69) engages the set-down arm stud (88B), pushing the set-down arm back, releasing or freeing the pickup arm.

When the changer is set for 12-inch records the size change eccentric (68) moves the set-down and size change assembly (88) so that the arm return roller and stud (87C) does not travel as great a distance along the set-down arm (88A) before it reaches the shoulder. Therefore the pickup arm cannot move in toward the centerpost as far as for 10-inch records, during change cycle.

When the On-Off reject knob (1) is pressed down, the push-off cam and shaft (8) moves the reject link (84) down. This movement causes the trip lever (81) to move which prevents the trip stop wire (81A) from engaging the push-off pin (58A). The change cycle then proceeds in the manner described above.

ADJUSTMENTS

7. ADJUSTMENT OF SET-DOWN POINT

Adjustment of the set-down point, for either 10-inch or 12-inch records, is made by adjustment of the set-down adjusting screw (11), see Figures 1 & 5. Turning this screw in moves the set-down point of the pickup arm farther away from the centerpost and turning the screw out moves it closer to the centerpost. The proper set-down point for 10-inch records is between 4-5/8" and 4-11/16" from the needle to the near side of the centerpost. The proper set-down point for 12-inch records is between 5-5/8" and 5-11/16" from the needle to the near side of the centerpost.

To make the set-down point adjustment, proceed as follows:

1. Set the record changer for 10-inch records.
2. Press down on the Phono-Motor switch knob (1) momentarily and rotate the turntable by hand through the change cycle until the pick-up arm moves down toward the turntable.

ADJUSTMENTS - Continued

3. Check the distance between the needle and centerpost.
4. Adjust set-down screw (11) and repeat steps 2 and 3 until the proper distance between needle and centerpost is obtained.
5. Set Record Changer for 12-inch records, rotate the turntable by hand through the change cycle and check the 12-inch set-down point. This should be very close to being correct without further adjustment.
6. If any fine adjustment for 12-inch records is necessary, make the adjustment and repeat steps 5 and 6 for the 10-inch position.

8. ADJUSTMENT OF TRIP ADJUSTING SCREW

This Record Changer uses the oscillating trip principle to begin the change cycle. Therefore it is very important that the trip adjusting screw (85) is properly adjusted for correct operation of the changer. (See Figure 4 and 6.)

The trip adjusting screw (85) is properly adjusted when the changer trips into change cycle after the eccentric groove in the record has caused the arm to move away from the centerpost once or twice, that is, one or two backswings of the arm, before it trips into cycle. Some eccentric grooves cause greater movement of the arm than others.

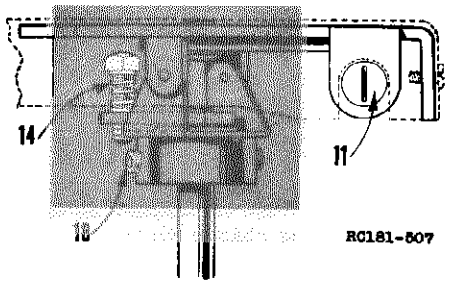


Figure 5 - Arm Detail Showing Adjustments.

Consequently the changer might trip with only one backswing on some records and with two backswings on others.

The ideal adjustment of screw (85) for best operation, is when the smooth side of the trip serrations (83) and the point of the pawl (87A) are horizontally even, as shown in Figure 6.

When adjusting the trip adjusting screw (85) proceed as follows:

1. Connect changer motor to power source and turn Phono-Motor switch on and off as needed to check adjustments.
2. Adjust screw (85) until the point of the pawl and the smooth side of the trip serrations are horizontally even or at the same level.
3. Place record on the turntable and check to make certain that the changer trips into change cycle with one or two backswings.

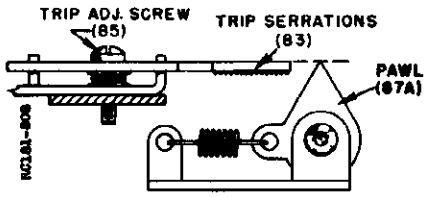


Figure 6 - Positioning Pawl Trip Serrations.

NOTE: The eccentric groove of a record should be used when checking the trip adjustment. Do not lift the pickup arm and move it, in toward the centerpost and out, by hand.

If the trip adjusting screw is turned out too far it will take more than two backswings of the arm to trip into cycle. If the screw is almost all the way out the changer will not trip.

If the screw is too far in, there will be excessive drag and wear on the trip serrations, pawl point and the record eccentric groove. Consequently this adjustment should be made carefully.

SERVICE AND REPAIR

9. ADJUSTING THE PICKUP ARM HEIGHT (See Figure 5.)

Before adjusting the pickup arm height, make sure that the cartridge (25) is all the way in its holder (23), and that the needle projects 1/16" from the cartridge (see paragraph 14).

This changer is designed so that if the pickup arm rests 1/4" above the changer pan, the arm will automatically lift high enough, during change cycle, to clear the top record of a stack twelve 10-inch records or ten 12-inch records on the turntable, and will not lift enough to touch the bottom record of a stack to be played.

With the Record Changer out of cycle and the pickup arm clear of the turntable, adjust screw (14) so that the needle is approximately 1/4" above the top of the changer pan. Turning the screw in lowers the arm and turning it out raises the arm.

After this adjustment has been made, the changer should be run through the change cycle to make certain that the pickup arm does not touch bottom of record stack. If, for some reason, the arm lifts too high, a compromise adjustment should be made. That is, turn screw in and lower arm slightly. If the pickup arm is held slightly above the record by riding on the edge of the base housing (28), the Allen set screw (18) should be loosened and the pi-

SERVICE AND REPAIR - Continued

vot spring and hub assembly (17) moved up on the shaft just enough so that the arm will rest 1/4" above the top of the pan. Generally there should be no clearnace between the pivot spring and hub (17) and retaining ring (26).

10. REMOVING THE PLASTIC BASE HOUSING (28) (See Figures 4 and 8)

Should it be necessary to remove the plastic base housing, proceed as follows:

1. Remove retaining rings (73 and 74).
2. Release one end of the index spring (90).
3. Lift the entire head assembly up from the top of the changer.
4. Loosen Allen set screw (18) and lift complete pickup arm assembly off.
5. Remove retaining ring (26) and spring washer (27).
6. Remove three screws (29) holding base.
7. Lift off the plastic base housing (28).
8. When reassembly has been completed, the pickup arm height should be carefully checked and adjusted, if necessary, by means of the lift adjusting screw (14).

11. REMOVING TURNTABLE AND BEARING ASSEMBLY

To remove the turntable it is only necessary to grasp the table by its edges and lift up. Before replacing the turntable, make sure that the recessed part of the drive wheel (55) is towards the centerpost. If necessary, turn drive wheel counter clockwise about a turn so it locks in this position. The pickup arm should be positioned away from the turntable. In replacing the turntable, force is not needed to seat it. Make sure, however, that the idler wheel of the motor has been pushed in towards the centerpost and that the wheel is making contact with the inner side of the turntable flange. In some cases it may be found that the two cork washers, after considerable use, are compressed so the turntable will rub. To build the stack up, an extra cork washer should be used. This third cork washer may be placed at the top or bottom of the stack.

The washers (35) and thrust bearing assembly (36) are removed by sliding them off of the centerpost. In replacing, have them in the order shown in Figure 8.

12. REMOVING BOTTOM COVER (91)

To remove the bottom cover (91) from the record changer, remove the two rear screws (44) through the bottom. Then press on the front edge of the bottom cover; this frees the changer from the slotted mounting brackets at the front of the bottom cover. To replace bottom cover, reverse above operations.

The changer must float on the springs (43) to prevent microphonic feedback, thus these springs must be re-installed properly. The wider end fits around and hugs the extrusion in the mounting brackets in the bottom cover. The narrow end of the spring fits over the threaded bushing on the changer pan (45). In some changers it has been necessary to add spacer washers beneath the narrow portion of the spring (43) to assure "free floating" of the changer.

13. MOUNTING 407B1 MOTOR TO CHANGER

The model 407B1 motor may be used with this record changer but it is necessary that a fibre or felt washer be used as a spacer between the motor mounting grommet and the changer pan. The No. 401A106 shakeproof motor fastener can be used to then mount the motor.

14. CARTRIDGE (See Figure 7)

The new Admiral pick-up cartridge uses an entirely new principle since it is not a crystal, magnetic, or capacitive device. The pick-up element is made of special rubber which is a high resistance electrical conductor (R-1 & R-2). The resistance varies as the length of the rubber is changed. A Monel metal needle, osmium tipped, is clamped to the center of the resistive rubber as shown at B. As the needle moves back and forth in the record groove, it alternately lengthens the rubber on one side and shortens the rubber on the other side.

A DC voltage is applied at A. The voltage drop from B to C varies as the resistance changes due to the "back and forth" movement of the needle. The varying voltage drop is in reality an alternating voltage of audio frequency. This voltage is applied through the coupling condenser (Cc) to the grid (G) of the audio amplifier tube.

Trouble Shooting: If you suspect the cartridge or needle and have a replacement cartridge available, the quickest test is to try the other cartridge. This is very simple since the Admiral cartridge plugs in. Remove the old cartridge as described on page 1 and plug in the replacement cartridge. If replacing cartridge does not correct the trouble or if no replacement is available, proceed as follows:

1. Make sure radio operates satisfactorily on radio stations.
2. Turn switch to Phono and turn volume control up high. Touch the needle with finger... If a loud hum is heard, circuit from B to G is not open or shorted. If hum is not heard, check circuit from B to G.
3. If hum is heard, check voltage across outer terminals on bottom of cartridge. Generally it should measure from 80 to 100 volts DC. See circuit diagram for individual chassis. If voltage is correct, cartridge should be replaced.
4. If voltage is not correct, check circuit for fault. In case of distortion, check coupling condensers.
5. If the needle is bent, it can be straightened by bending it down so that it projects 1/16" from cartridge. If should then be pressed back several times with a flat object.

SERVICE AND REPAIR - Continued

Do not attempt to repair cartridge or remove the cap on the cartridge assembly as this will void the warranty.

15. LUBRICATION

Under normal operating conditions, the motor should never require oiling. The rest of the changer, however, should be lubricated with grease whenever it comes into the shop for repairs or adjustment. All pivot and friction points should be greased adequately but not excessively. A good grade automobile chassis grease may be used for this purpose.

The push-off shaft (8), powdered iron roller (72), oilite bearings, used in the turntable hub and base housing, may be lubricated with SAE No. 20 motor oil.

Care should be taken to prevent any of the lubricant from coming into contact with the drive or idler wheel tires. Also be careful, when using oil, that an excess does not seep into the felt of the turntable.

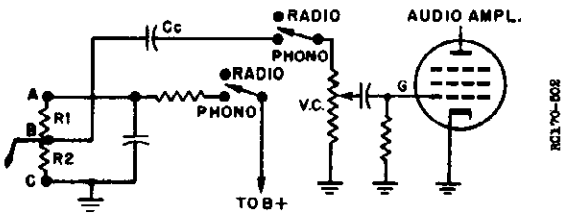
16. REPLACEMENT PARTS

In some cases replacement parts from the factory may be a different type than those being replaced. These parts will be of a later production but may be used as replacement parts. In cases where rivets or adapting parts are needed, they will be included with the replacement part.

17. CAUTIONS!

1. See that the rubber tires on both the drive wheel and the idler wheel are kept clean and free from oil, grease, dirt or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.
2. The drive wheel assembly (55) appears to be almost identical with that used on the RC170 and RC170A. These parts are not interchangeable.
3. When replacing the rubber tire (54) do not bend the tab on the drive wheel over too far as this may result in the tire catching or rubbing on the drive wheel pressure spring (57).
4. If the On-Off reject knob (1) cannot be pulled off with the fingers, pry very carefully.
5. When removing or replacing the pawl spring (86) care should be taken not to stretch it.
6. When removing or replacing the pickup arm (19), always loosen the Allen set screw (18) and lift off the complete assembly. The pivot spring, hub and pin assembly (17) can be removed from the pivot plate assembly (13) and replaced much more readily with the complete pickup arm assembly off of the changer.
7. Washers (75) and (63) have the same dimensions except that (75) is thicker. Do not replace washers (63) with (75) or vice versa.

ADMIRAL CARTRIDGE
BASIC CIRCUIT



SEE SCHEMATIC FOR EXACT CONNECTIONS ON INDIVIDUAL MODELS

Figure 7 - Basic Circuit for Admiral Cartridge.

8. When replacing the switch mounting bracket (65) or the trip bracket (79) be sure to locate the half punches in the holes in the pan before tightening their mounting screws (66).
9. When replacing the on-off switch assembly (67) care should be used in bending the tab fasteners so that the switch is mounted firmly to the bracket.
10. The powdered iron roller (72) is similar to the roller used on the RC170 and RC170A except that the ends are chamfered. The new roller (chamfered) can be used on both the RC170 and RC180 models. The old style roller should not be used on the RC180 or RC181.

18. RECORD CHANGER TROUBLE SHOOTING

1. Records Do Not Drop To Turntable Or More Than One Record Drops.
   (a) Check the distance between the inside edge of the centerpost (33) and the edge of the record support (31). This distance should be 4-61/64" ± 1/32", in the 10-inch position. This dimension is very critical.

   If distance does not meet specifications, bend the centerpost slightly toward or away from the head assembly as needed.

2. Changer Repeatedly Trips Into Change Cycle.
   (a) Check for broken or loose trip cocking spring (80), or
   (b) Check for broken or missing reject spring (2), or
   (c) Check for bent reject link (84).

3. Changer Will Not Trip.
   (a) Check for broken or loose cycle spring (82), or
   (b) Check On-Off switch cover (67). If cover is not assembled to switch properly, it may bind push-off link and arm (62) preventing cycle spring (82) from pulling the main cam (58) around.

4. Changer Will Not Reject.
   (a) Check for bent reject link (84).

5. Cannot Get Proper Set Down.
   (a) Check for broken or loose set-down spring (89), or
   (b) Check for broken or loose set-down adjusting spring (11).

RC 180 & RC 181 PARTS LIST (TOP)

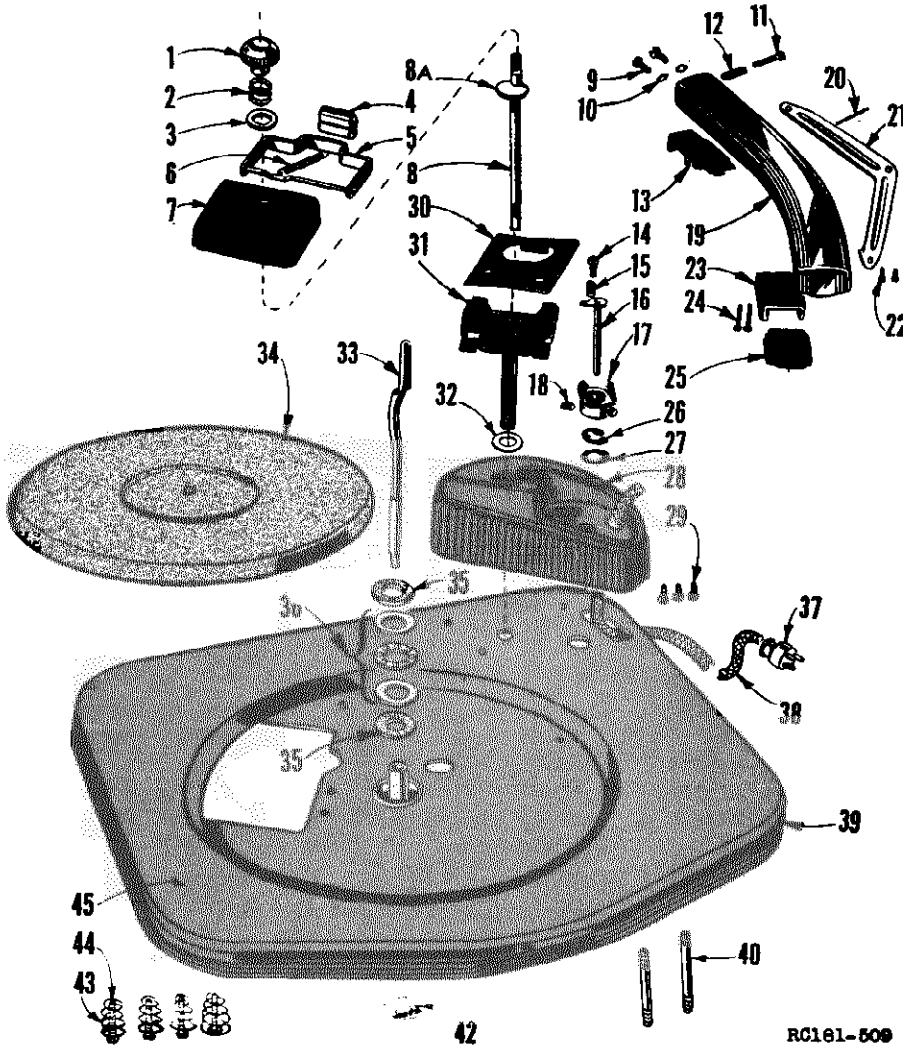


Figure 8 - Top View of Record Changer, Exploded.

Ref. No.	Part No.	Description
1	†403A27	Reject Off-On Knob
2	405A97	Reject Spring
3	481-166-47	Washer .390 X 5/8 X 1/16
4	406A18	Rubber Bumper for Record Clip
5	G400A253	Record Clip
6	405A94	Record Clip Spring
7	G400A258	Head Cover
8	G400A248	Push-Off Cam & Shaft
9	45-250-C2-47	Screw, 4-40 X 1/4"
10	381-23-21	#4 Lockwasher
11	45-500-C2-47	Set-down Adjusting Screw, 4-40 X 1/2 BH MS
12	405A95	Set-down Adjusting Spring
13	G400A240	Pickup Arm Pivot & Mtg. Plate
14	402A141	Lift Adjusting Screw
15	405A81	Lift Adjusting Lock Spring
16	G400A239	Lift Plate & Rod
17	G400A242	Pivot Spring, Hub & Pin
18	1A43-14	Allen Set Screw 8-32 X 3/16
19	†403B29	Pickup Arm, Plastic
20	414A26	Pickup Arm Wire Clip
21	401A234	Pickup Arm Stiffener
22	402A139	#2 Type 25 Plastiscrew 1/4" long, 3 required
23	G400A198	Cartridge Holder (socket with contacts)
24	402A129	Screw, Shakeproof #2 Type 25 Thread Cutting Plastic
25	A1372	Cartridge and Needle
26	401A229	Retaining Ring
27	405A27	Support Spring Washer
28	403C28	Base Housing
29	402A115	Screw, Base Housing Mtg.
30	401A165	Push-Off Plate
31	G400A249	Support Tube & Shelf
32	481-166-47	Washer, .390 X 5/8 X 1/16
33	G400B137-1	Centerpost Ass'y. (includes 405A62 Speed Nut)
34	G400B167	Turntable
35	412A1	Cork Washer (2 required)
36	415A11	Thrust Bearing
37	98A19	Plug (3 contact)
	88A8-5	Plug (4 contact)
38		See radio service manual for proper cable & part no.
39	403A24	Plastic Trim
40	1A80-5	Mounting Screws
42	405A62	Speed Nut
43	19A10-3	Conical Mounting Spring
44	G400A197	Mtg. Screw & Washer Assy. 4 required
45	G400D257	Changer Pan (RC 181)
	G400D263	Changer Pan (RC 180)

†Before replacing parts marked †, see appropriate caution in paragraph 17.

MODELS RC180, RC181 ADMIRAL CORPORATION

RC 180 & RC 181 PARTS LIST (BOTTOM)

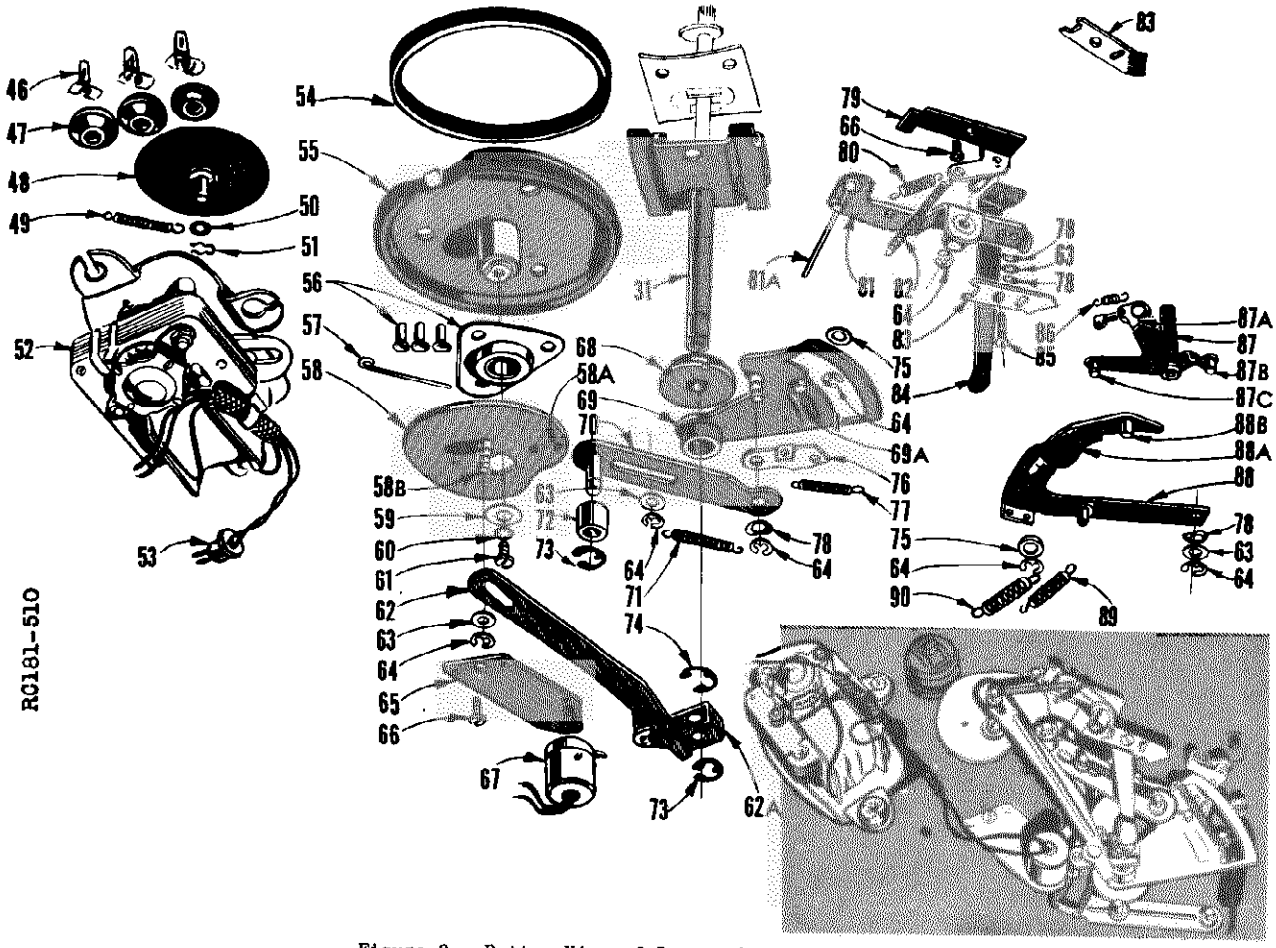


Figure 9 - Bottom View of Record Changer, Exploded.

Ref. No.	Part No.	Description
46	401A106	Shakeproof Motor Fastener
47	G400A196	Rubber Mounting Grommet and 401A106 fastener (for 407B3-2 and 407B4-2 motor)
	G400A203	Rubber Mounting Grommet, spacer, and fastener (for 407B1 Motor)
48	G400A23	Idler Wheel Ass'y. (407B3, 407B4 Motor)
	G400A57	Idler Wheel Assembly (for 407B1 Motor)
49	405A14	Spring, Idler Wheel (407B3, 407B4 Motor)
	405A67	Spring, Idler Wheel (for 407B1 Motor)
50	412A3-2	Hard Fibre Washer under Hairpin Clip
51	405A15	Hairpin Clip for Idler Wheel
52	*407B3-2	Motor with Idler Wheel and fasteners; 105-125V 60 Cycle
	*407B4-2	Motor with Idler Wheel and fasteners; 105-125V 50 Cycle
	401A48	Drive Pulley (Part of 52. For Motors 407B3, 407B4. In addition, Motor 407B4 includes a coil spring part no. 405A32
	405A32	50 Cycle Conversion Spring (Used to convert 407B3 Motor)
53	88A8-1	Motor Plug (Male)
54	406A13	†Drive Wheel Tire Only
55	G400A252	†Drive Wheel (Includes Tire)
56	404A18-1	Drive Wheel Support (Includes Rivets)
57	414A23	Drive Wheel Pressure Spring
58	G400A227	Control Cam
58A		Cam Stop Stud (Part of 58)
58B		Push-Off Stud (Part of 58)
59	401A145	Control Cam Washer
60	381-26-47	#8 I. T. Lockwasher
61	85-376-C2-39	Control Cam Screw 8-32 X 3/8 BH MS
62	G400A219	Push-Off Arm & Link
62A		Push-Off Arm (Part of 62)
63	†481-68-2	Washer
64	401A177	Retaining Ring
65	†401A223	Switch Bracket
66	1A53-10-47	Switch and Trip Bracket Mounting Screws
67	†408A1	On-Off Switch & Cover
68	404A17	Size Change Eccentric
69	G400A226	Control Plate, Hub & Stud
69A		Inclined Tab (Part of 69)
70	G400A224	Pivot Link & Stud
71	405A91	Control Plate Spring
72	†415A9	Powdered Iron Roller
73	401A229	Retaining Ring
74	401A230	Retaining Ring
75	†401A173	Washer
76	401A202	Safety Arm
77	405A90	Safety Spring
78	405A22	Spring Washer
79	†G400A228	Trip Bracket & Stud
80	405A88	Trip Cocking Spring
81	G400A230	Trip Lever Complete
81A		Trip Stop Wire (Part of 81)
82	405A87	Cycle Spring
83	401A224	Trip Serrations
84	401A222	Reject Link
85	65-500-C2	Screw, Trip Adjusting 6-32 X 1/2 BH MS
86	†405A89	Pawl Spring
87	G400A233	Arm Control Lever, Studs & Pawl
87A		Pawl (Part of 87)
87B		Arm Control Lever Roller (Part of 87)
87C		Arm Return Roller (Part of 87)
88	G400A222	Set Down & Size Change Assembly
89	405A93	Set Down Spring
90	405A92	Index Spring
91	G400D260	Bottom Cover (Consoles only)
92	27A24	Bushings in Bottom Cover (Consoles only)
93	405A99	Spring Washer for bushing (Consoles only)

†Before replacing, see appropriate caution in paragraph 17.
*407B3-2 and 407B4-2 are the same as 407B3 and 407B4 respectively except that three 401A106 fasteners are included. Also note that some 407B1 motors were used in production.

RC180 & RC181 PRODUCTION CHANGES

A few minor changes have been made in the late production of RC180 & RC181 Record Changers. These changes are included in the RC182 Two Speed Record Changer.

The most important change is the addition of an adjustable reject link (84) which assures more positive rejecting action. See Figure12. This new reject link consists of reject arm support (84A) spotwelded to trip lever (81), reject arm (84B), adjusting screw (84C), spring washers (84D), and flat washer (84E). The new and old links are interchangeable.

The record clip (5) and the head cover (7) are now made of plastic. The set-down adjusting screw (11) was 1/2" long; it is now 3/4" long.

Part numbers for these parts are listed below:

Ref. No.	Part No.	Description
5	403A 32	Record Clip (Plastic)
7	403A 31	Head Cover (Plastic)
11	45-750-C2-47	Screw, Set-down Adjusting 4-40x3/4 BH MS
84	G400A 266	Reject Link & Trip Lever Assembly
84A	G400A 230-1	Reject Arm Support & Trip Lever
84B	401A 237	Reject Arm
84C	65-375-C2-39	Screw (6-32x3/8 BH MS)
84D	405A 98	Spring Washer
84E	481 68-2	Flat Washer

FAULTY REJECT AND TRIP ACTION

Before making reject or trip adjustments on the RC180, RC181 or RC182 Record Changers, it is very important to see that the reject spring (2) is holding the push-off shaft (8) up as far as it will go. If it is not, erratic reject and trip action may result. Possible causes of the spring not holding the push-off shaft up are: the knob (1) may be loose; the spring (2) broken, missing or placed incorrectly; or push-off shaft binding.

When servicing an RC180, RC181 or the new RC182 Two Speed Record Changer which repeatedly rejects records, will not trip or trips erractically, proceed as follows:

Old Type Reject Link #401A222
(See Fig. 4 in RC180 & RC181 Service Manual.)

1. Make certain that the On-Off Reject knob (1) is tight and down as far as it will go on the push-off shaft (8).
2. Check to be sure that the reject spring (2) pulling the push-off shaft (8) up as far as will go. The reject spring (2) should rest washer (3) and should not slip between it a the push-off shaft (8).
3. Bend the end of the reject link (84) enough that when it is resting on the end of the pus off shaft (8) it causes the top of the trip st wire (81A) to be level with the top of t main cam stop stud (58A). See Figure11.
4. Adjust the trip adjusting screw (85) until t point of the pawl (87A) is even with t smooth side of the trip serrations (83) outlined in paragraph 8 of the RC180 & RC1 service manual.
5. It may be necessary to repeat steps 3 and making slight re-adjustments until the chan er will reject and trip properly.
6. If the changer will not trip properly aft carefully making the above adjustments, r place the reject link with the new type.

New Type Reject Link #G400A266
(See Fig12)

1. Repeat steps 1 & 2 as outlined above.
2. Adjust the reject link adjusting screw (84 until there is approximately 1/32 of an in space between the round end of the reje arm (84B) and the rivot on the push-off ar and link assembly (62). If there is no spa between these two parts, it will be possib for the changer to begin its change cyc when the On-Off Reject knob is turned to t "OFF" position.
3. Adjust the trip adjusting screw (85) until t point of the pawl (87A) is even with t smooth side of the trip serrations (83) outlined in paragraph 8 of the RC180 & RC1 service manual.
4. If the top of the trip stop wire (81A) is level with the top of the main cam stop st (58A) as shown in Figure11, bend the wi enough to make it even with the top of t stud.
5. If necessary, repeat steps 3, 4 and 5 until t changer rejects and trips properly.

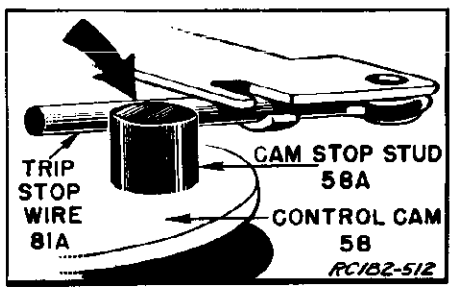
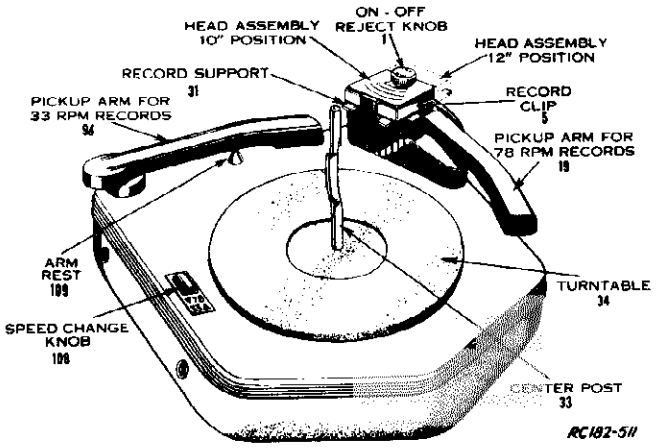


Figure11 - Positioning Trip Stop Wire.

The RC182 Two Speed Record Changer is a modification of the RC181 in order to adapt it for manually playing the new 33-1/3 RPM records in addition to either automatically or manually playing the standard 78 RPM records.

The major differences are the addition of a second pickup arm, a new two speed motor, a speed change switch and knob, and a few related miscellaneous parts. Figures12,13 &14 and the parts list on the back page indicate the parts which have been added to modify the RC181 for playing the 33-1/3 RPM records.



RC182 Two Speed Record Changer.

OPERATION

The pickup arm on the right side of the RC182 Record Changer is for automatically or manually playing the standard 78 RPM records. The operation of this part of the changer is described in detail in the RC180 and RC181 Record Changer Service Manual.

The second pickup arm, at the rear of the changer is for manually playing the new 33-1/3 RPM records.

In order to play this new type record, merely move the speed change switch to the "33" position, place the 33-1/3 RPM record on the turntable, turn the changer on by means of the "ON-OFF REJECT" knob and place the pickup arm for 33-1/3 RPM record, on the record. When moving the speed change switch to either position make certain that it "clicks" or "snaps" into the desired position.

When the record has finished playing, the changer will automatically shut off. If the pickup arm is lifted from the record and moved toward its arm rest, the changer will automatically turn on unless the "ON-OFF REJECT" knob has been turned to the "OFF" position.

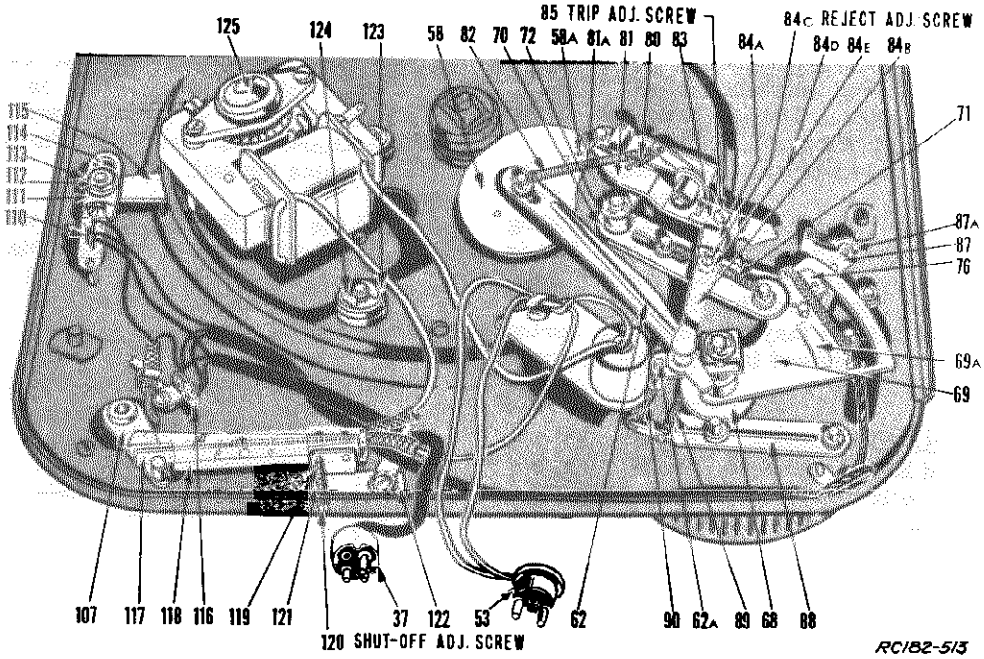


Figure12 - Bottom View of RC182.

NEEDLE FOR 33 RPM PICKUP ARM

The needle (95) used in the 33-1/3 RPM pickup arm is an osmium tipped needle especially designed for playing 33 RPM records. The point of the needle has a radius which is only 1/3 of the radius of a standard needle. To prevent possible damage to "microgroove" records, be abolutely certain when replacing a needle that the correct needle is used.

TWO SPEED MOTOR (125)

The turntable speed of the RC182 Two Speed Record Changer is changed mechanically. When the speed change knob (108) is moved to the "33" position, the speed change arm (115) moves. This causes the 33 RPM drive shaft to pivot and ride against the idler wheel (126). Simultaneously, the 33 RPM pickup arm (94) is switched into the circuit, and the 78 RPM pickup arm (19) out of the circuit, by means of switch (110). When the speed change knob is moved to the 78 RPM position, the speed change arm causes the 33 RPM drive shaft to pivot away from the idler wheel (126).

When the speed change switch knob (108) is moved, make certain that it "clicks" or "snaps" into position. If it is not moved far enough, the speed of rotation will change but the correct pickup arm will not have been switched into the circuit.

Note that the 33 RPM drive shaft is driven by the 78 RPM drive shaft by means of a rubber belt (130). This belt should be clean and free from oil. If the belt is greasy or stretched, it might possibly slip which would cause the turntable speed to vary resulting in unsatisfactory operation.

AUTOMATIC SHUT-OFF ADJUSTMENT

When the changer is playing 33 RPM records, it should shut-off when the needle is approximately 2-1/4 inches from the near side of the centerpost.

If the changer motor shuts off before or after the arm reaches this point, merely turn the shut-off adjusting screw (120) in or out until the roller on the arm stop and shaft assembly (107) opens the contacts of the leaf switch (117) when the needle is 2-1/4 inches from the near side of the centerpost.

If this adjustment is insufficient to obtain prop shut-off, reposition the arm stop and shaft assem (107) as follows:

1. Loosen Allen set-screw (104). With the pic up arm (94) resting on the arm rest (10 move the arm stop and shaft assembly (1 until it touches the rear flange or lip of changer pan.
2. Tighten the Allen set-screw (104). Adj screw (120) for proper shut-off.

SERVICE HINTS

1. The dimensions of the two speed motor are su that an extra cork washer (131) has been added u der the turntable hub to keep the turntable from ru bing against the idler wheel drive shafts. This co washer (approximately 3/64" thick) should not omitted.

2. The rubber mounting grommets (123) are t same as those used for mounting the RC180 a RC181 motor, except that they are put on so the co portion of the grommet is against the changer pa The grommets are mounted in the opposite directi in the RC180 and RC181.

3. The largest of the four holes in the switch li (111) is slightly off-center. When replacing or r installing this part, be sure the narrow side toward the nearest edge of the changer pan or bas

Installing this part with the narrow side towa the center of the changer pan will cause the spe change knob (108) to bind making it extremely di cult to switch from one speed to another.

4. Fibre washers (113) and (114) have the same mensions except for thickness. The thin was (113) should be placed between the spacer nut (1 and the switch link (111). The thicker washer (1 goes between link (111) and the speed change a (115).

MODEL RC182

ADMIRAL CORPORATION

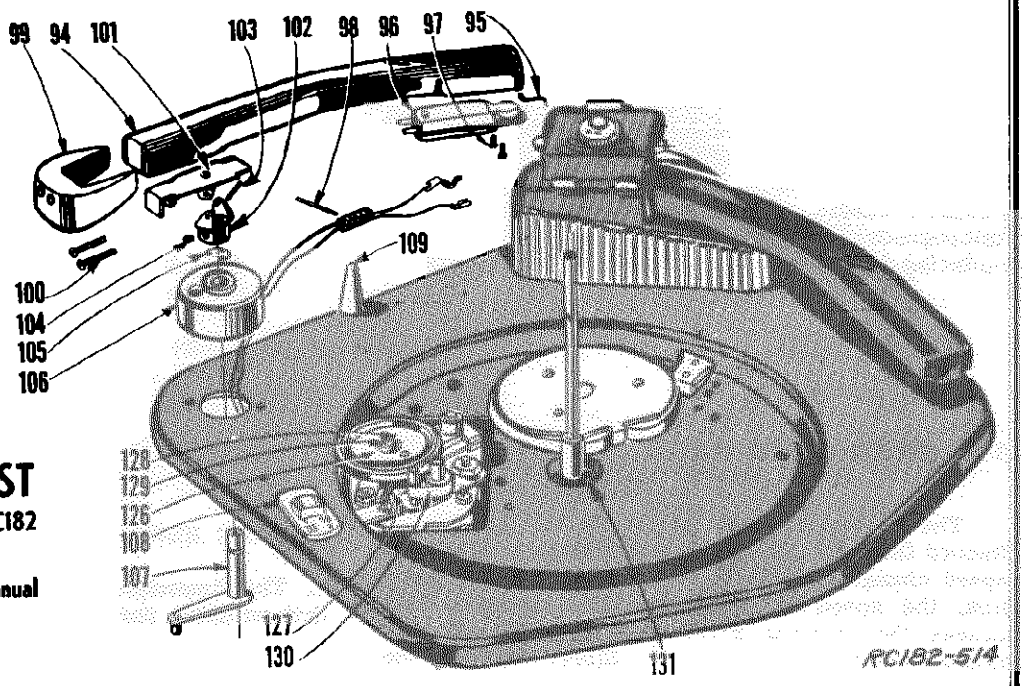


Figure13 - Top View of RC182.

RC182 PARTS LIST

Use this list when ordering RC182 parts.

See RC180 & RC181 Service Manual for any part NOT listed here.

Ref.No.	Part No.	Description
5	403A 32	Record Clip (Plastic)
7	403A 31	Head Cover (Plastic)
11	45-750-C2-47	Screw, Set-down Adjusting 4-40x3/4 BH MS
84	G400A 266	Reject Link & Trip Lever Assembly
84A	G400A 230-1	Reject Arm Support & Trip Lever
84B	401A 237	Reject Arm
84C	65-375-C2-39	Screw (6-32x3/8 BH MS)
84D	405A 98	Spring Washer
84E	481 68-2	Flat Washer
94	403B 29-3	Pickup Arm
95	98A 15-2	Needle
96	409A 10	Cartridge
97	402A 139	#2 Type 25 Plastiscrew (2 req.)
98	414A 26	Wire Clip
99	404A 21-1	Pickup Arm Counterweight
100	40-562-C2-47	Screw 4-40x9/16 RH MS (2 req.)
101	G400A 278	Pivot and Mounting Plate
102	G400A 271	Pivot Spring and Hub
103	414A 29	Pivot Shaft
104	1A 43-14	#8 Allen Set Screw
105	401A 235	Retaining Ring
106	G400A 173	Pickup Arm Base
107	G400A 270	Arm Shaft and Stop Assembly
108	403A 33	Knob (speed change)
109	402A 151	Pickup Arm Rest
110	778 1-1	Switch (speed change)
111	401A 241	Switch Link
112	402A 152	Spacer Nut
113	412A 28	Fibre Washer
114	412A 23	Fibre Washer
115	401A 242	Speed Change Arm
116	108 1-6	Terminal Board

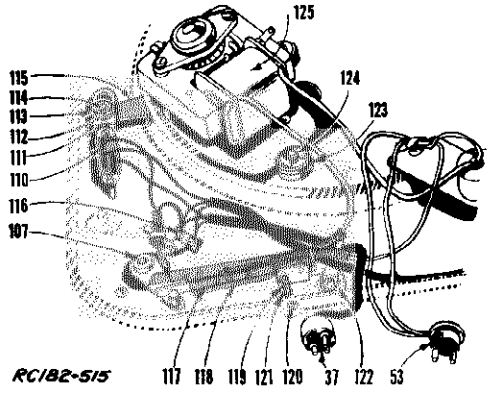


Figure14 - Bottom View of RC182 — 33 RPM Section.

Ref.No.	Part No.	Description
117	408A 2	Leaf Switch (Automatic shut-off)
118	412A 29	Switch Cover
119	401A 244	Leaf Switch Bracket
120	45-1125-C2-47	Screw, Shut-off Adjusting
121	405A 106	Lock Spring
122	402A 165	Spacer
123	408A 4	Rubber Mounting Grommet (3 req.)
124	401A 229	Retaining Ring
125	407B 15	Motor, Two Speed
126	G400A 279	Idler Wheel Assembly
127	405A 107	Idler Wheel Spring
128	405A 15	Hairpin Clip
129	412A 30	Washer (under hairpin clip)
130	406A 20	Drive Belt
131	412A 9	Cork Washer

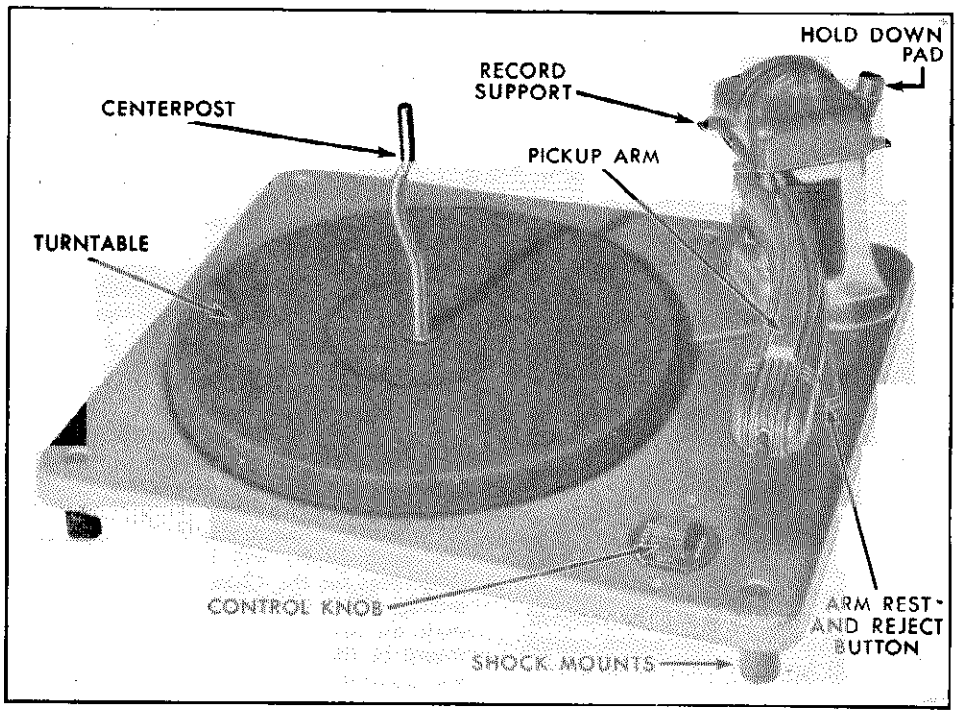


FIGURE 1. RECORD PLAYER, TOP VIEW

1. SETTING FOR SIZE OF RECORD

The size of record for which the record changer is set to play is indicated by the number (on the top of the cover assembly) nearest the turntable.

To change the setting, grasp the record support and cover assembly and rotate it a half turn until it snaps into place with the correct record size toward the turntable. **In changing the setting from 10-inch to 12-inch, rotate the assembly counterclockwise only; in changing from the 12-inch to the 10-inch setting, rotate the assembly clockwise only.**

2. STARTING FOR AUTOMATIC PLAY

Load the record changer with a maximum of ten twelve-inch or twelve ten-inch records, and set the hold down pad so that it rests on the top record. Move the control knob to the auto-on position which will set your record changer for automatic play and start the turntable rotating.

Press down on the reject button which is located on top of the arm rest or push down on the pickup arm momentarily if it is setting on the arm rest. The entire stack of record will be played automatically.

3. MANUAL PLAY

Set record support and cover assembly for size record you intend to play and place record on turntable. Move control knob setting to manual-on position and press down on reject button or push down on pickup arm momentarily if it is setting on the arm rest. If you desire to play the record for the second time in succession press down on reject button and the record will be played again. After record has been played manually grasp pickup arm and place on arm rest and remove record.

Reject button may be used during manual play only when playing standard ten or twelve inch records otherwise it must be done manually.

4. REJECTING A RECORD

To reject a record at any time and start playing the next one, merely press down on the reject button. This may be done while playing manually also.

5. UNLOADING RECORDS

To remove the records it is advisable to have the changer mechanism out of cycle. However, it is possible to unload the changer while it is in cycle so long as the pickup arm is clear of the records.

Move the control knob to the off position before lifting pickup arm to arm rest and remove records.

When removing records, hold them lightly and lift straight up.

CAUTIONS

1. **Do not place your unit on a radiator or other source of heat. The pickup may be damaged by heat.**
2. **Never use force to stop the motor or turntable.**
3. **Do not leave records on the supports as they are liable to warp. To protect your records, keep them in a record file, album or cabinet when not in use.**
4. **Records which have become warped or damaged will slide on one another when playing, resulting in unsatis factory operation.**
5. **Never leave the pickup arm with the needle resting on a record or the turntable.**
6. **Do not let the pickup arm drop off of the arm rest.**
7. **When setting for size of records, be careful not to breal the hold down pad.**

THE CHANGE CYCLE

6. DESCRIPTION OF CHANGE CYCLE. (See Figures 2, 5, and 6.)

While a record is playing and as the pickup arm moves toward the center of the record, the arm control pin (28A) on the arm control assembly (28) moves along the portion of the arm control track (33B) as indicated at "P", figure 2. As the record reaches the pickup or trip point, the pin reaches point "T" on the track. As it moves into the recessed position in which it is shown in the illustration, it permits the trip spring (32) to pull the arm control plate (33) forward towards the centerpost (37). As the arm control plate is drawn forward, the stop tab (33A) on the arm control plate (33) is withdrawn from behind the reject catch (51) on the eccentric cam (53). The cam, which no longer is held in place by the stop tab (33A), is pulled over by the eccentric cam spring (54) until the rubber tire makes contact with the knurled roller (46) on the turntable shaft (38A). This knurled roller, which rotates with the turntable shaft, rotates the eccentric cam. In turn, this forces the riser plate assembly (34) back along its guide rods (42A) away from the centerpost (37). As soon as the riser plate begins to move, the push-off cam and shaft assembly (36) rides along the inclined track (34C) of the riser plate (34). This action causes the push-off cam and shaft assembly (36) to be drawn downward; as a result the pickup arm lift (21) presses down on the arm lift bearing pin (15), causing the pickup arm to be raised clear of the record. Then the riser plate tab (34B) contacts and moves the arm control assembly (28) which, since it is coupled to the pickup arm support assembly (23) carries the pickup arm away from the centerpost and clear of the edge of the turntable. As the riser plate (34) continues to travel further along the guide rods (42A), the riser plate motion bracket (34A) contacts and rotates the push-off cam and shaft assembly (36); as a result, the push-off arm (5), which is coupled to the push-off cam and shaft assembly (36) causes the push plate (7B) to drop a record to the turntable.

During the second half of the change cycle, the pressure of the push plate spring starts to return the push plate (7B) and push-off arm (5) back to their normal position. At the same time, the motion of the eccentric cam (53) and the guide rod recoil spring (35) propel the riser plate (34) toward the centerpost. The arm control assembly (28), and hence the pickup arm, are drawn back by the tension in the set-down spring (27). After the arm reaches this point directly above the set-down point, the riser plate (34) has moved far enough back towards the centerpost (37) to allow the push-off cam and shaft assembly (36) to ride down the inclined track (34C) of the riser plate (34). This lowers the pickup arm onto the record. As the eccentric cam (53) aided by the eccentric cam spring (54) completes its revolution, the rubber tire of the cam moves away from the knurled roller (46) on the turntable shaft and the reject catch (51) to rest against the stop tab (33A) of the arm control plate (33). The change cycle is completed.

7. DESCRIPTION OF DETERMINATION OF 10-INCH AND 12-INCH SET-DOWN POINTS.

During the early part of the change cycle, the arm control plate (33) has traveled (in a direction away from the centerpost) until the size change stop (33C) reaches the cam (36B) of the push-off cam and shaft assembly. The distance traveled by the arm control plate (33) will depend on the size of the record being played; the distance is less for a 12-inch setting than for a 10-inch setting. (This is true because the push-off cam [36B] presents its short radius to the size stop [33C] for the 10-inch setting and presents its long radius to the size change stop for a 12-inch setting.) This variation in distance traveled means that the arm control track (33B) will be in a position closer to the centerpost for the 12-inch setting than for the 10-inch setting. This in turn means that during the change cycle the arm control pin (28A) whose path is determined by the motion of the arm control assembly (28) will leave its recessed position, and will ride along the "S" portion of the arm control track for the 12-inch setting and along the "L" portion for the 10-inch setting. (See Figure 2.)

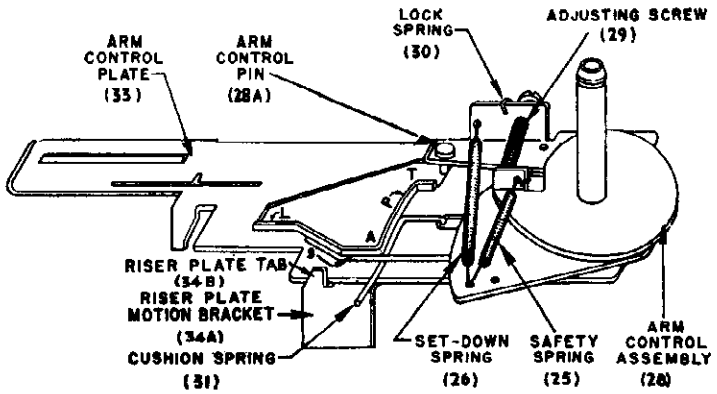


FIGURE 2

As the pickup arm moves back towards the record during the second half of the change cycle, it will be stopped when the bracket (28C) reaches the adjusting screw (29). How far the arm returns before being stopped depends on whether the arm control pin (28A) has been riding in the "S" or "L" portion of the arm control track. If the pin has been riding in the "S" or 12-inch portion of the track, the arm will be stopped at a point directly above the 12-inch set-down point; if the pin has been riding in the "L" or 10-inch portion, the arm will be stopped at a point directly above the 10-inch set-down point.

8. REJECTING A RECORD. (See Figures 3 and 6.)

The reject button (59A) is located on the top of the arm rest (59). The parts used to provide push button rejection are shown in Figures 3 and 6.

Figure 3 shows the changer going thru cycle, that is, in the process of rejecting a record. When the changer is out of cycle the reject catch (51) engages both the stop tab on the arm control plate and the reject arm (44A). If the changer is allowed to finish playing the record, the stop tab on the arm control plate is withdrawn from behind the reject catch (51); the eccentric cam (53) is then pulled against the knurled roller (46) and the change cycle begins. However, when the reject button (59A) is pressed the reject trigger wire (64) pulls the reject arm (44A) from behind the reject catch (51); the eccentric cam (53) is then pulled against the knurled roller (46) and the change cycle begins.

9. MANUAL PLAY.

The control knob (60) is located on top of the motorboard (72). The parts used to provide manual play are shown in figures 5 and 6.

To play manually, move the control knob (60) to the left. This will shift switch mounting to the left and cause manual control bracket (44B) to be engaged, so that size change stop (33C) is prevented from coming forward and completing change cycle.

The reject button may still be used as explained in Paragraph 8 even though the control knob is set for manual play.

ADJUSTMENTS

CAUTIONS

1. **See that the drive pulley and the rubber tire on the motor (61) and the rubber tire on the eccentric cam (53) are kept clean and free from oil, grease, dirt, or any foreign material. Carbona or carbon tetrachloride may be used for cleaning these parts.**

2. **If replacement of any parts requires the removal of the lift adjusting collar (10), pickup arm support assembly (23), or the push-off arm (5), be sure to re-position or replace these parts as directed in paragraphs 11, 12, and 14 respectively.**

TOOLS REQUIRED

#6 Bristol Set Screw Wrench
#6 Allen Set Screw Wrench
#8 Bristol Set Screw Wrench
#8 Allen Set Screw Wrench
Lift Out Tool (2 Required)

} Can be obtained as Kit.

10. REMOVING CHANGER FROM CABINET FOR ADJUSTMENT.

When it is necessary to remove changer from cabinet for adjustment this can easily be done with the aid of the lift out tool furnished as specified above. *Wires must be disconnected first.*

The changer is mounted on four rubber shock mounts (73), their location can be quickly identified by the location of the four phillips head screws (76) on the motorboard (72). Hold lift out tools by long handle, one in each hand and pry up under bulb of rubber mount, two at a time. Pry up on two that are located on the same side of motorboard. When one side is free of cabinet, wedge something under motorboard so the free mounts do not fall back into the hole. Use the same procedure on the other two mounts and the changer is free of cabinet.

To install changer back in cabinet line up rubber mounts with holes in cabinet and push down on motorboard. The changer is automatically locked in cabinet, connect wires and changer is ready for operation.

11. SET-DOWN POINTS AND PICKUP OR TRIP POINT.

(If the pickup arm support assembly [23] has been removed or if its set screws are loose, it must be repositioned as described in paragraph 13 before adjusting the set-down points and pickup or trip point.)

This changer is designed so that the 10-inch set-down point, the 12-inch set-down point, and the pickup or trip point are simultaneously adjusted in a single operation. It is recommended that you make the adjustment at either of the set-down points. This adjustment is made by means of the adjusting screw (29) shown in Fig. 3. Turning this screw counter-clockwise will cause the arm to set down closer to the centerpost; turning it clockwise will cause the arm to set down further

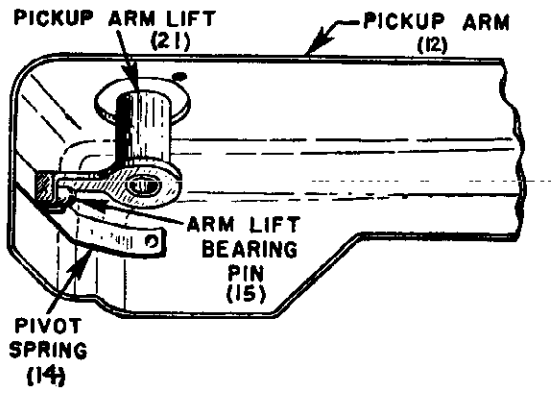


FIGURE 4

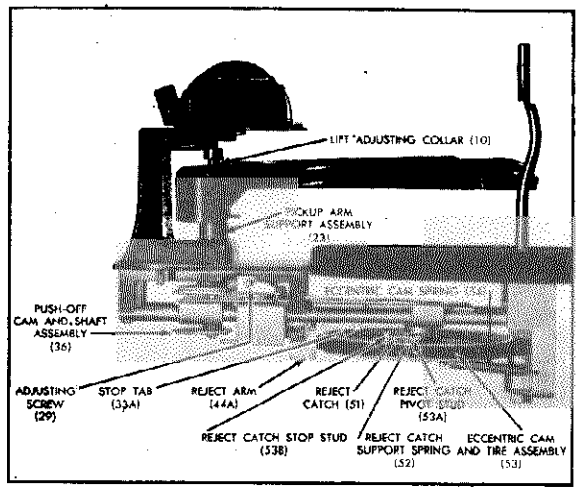


FIGURE 3

away from the centerpost. One turn on the screw will move the arm about ¼ inch.

If the adjusting screw (29) will not change the seting sufficiently, the pickup arm support assembly (23) may be out of position (see paragraph 13)

The set-down point when using a straight-shank needle will differ slightly than when using an offset shank needle.

If you do not know which type of needle is to be used by the customer, we suggest the following settings when tested with a straight needle: measuring from the side of the centerpost, 4⅝" for the 10-inch set-down point, 5⅝" for the 12-inch set-down point, and 1-19/32" for the pickup or trip point.

If you know which type of needle will be used by the customer, and test with that type of needle, the following settings are recommended:

Measuring from the side of the centerpost, 4-21/32" for the 10-inch set-down point, 5-21/32" for the 12-inch set-down point, and 1⅝" for the pickup or trip point.

When using an offset-shank needle, slight variations in set-down point can often be corrected by loosening the needle screw and rotating the needle slightly.

12. PICKUP ARM HEIGHT.

When properly adjusted, the pickup arm height should be such that, without a needle and with a single record on the turntable, the arm should be about 1/32" above the record. The arm height depends on the location of the lift adjusting collar (10). As the collar is moved down, the arm is raised, and vice versa. When necessary, the pickup arm height may be adjusted by re-positioning the lift adjusting collar (10) as follows·

CRESCENT INDUSTRIES, INC.

SERVICING AND REPAIR

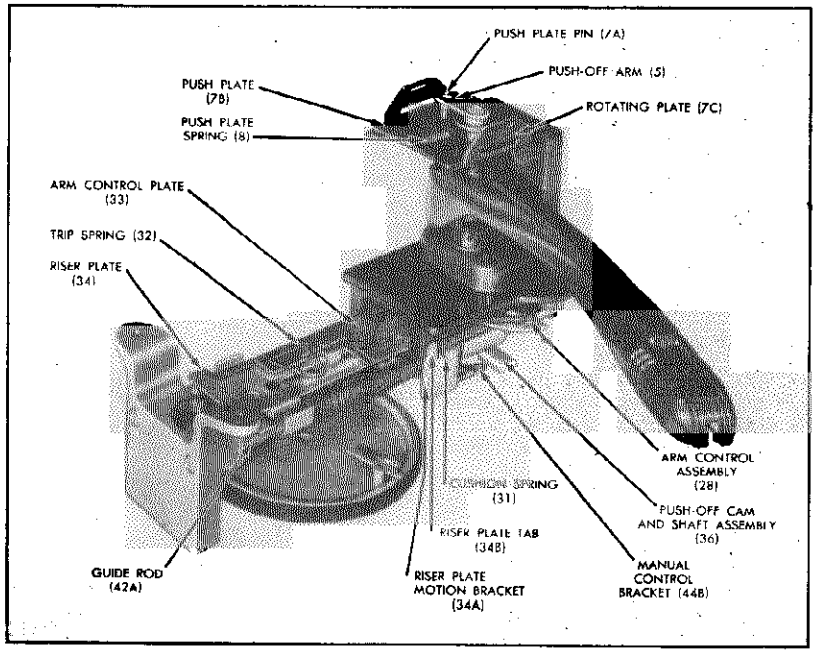


FIGURE 5

(a) The changer should be out of cycle.

(b) Lift the pickup arm and check to see that the pickup arm lift (21) is positioned properly over arm lift bearing pin (15). (See Fig. 4.)

(c) Remove needle and place pickup arm on turntable close to its edge.

(d) Loosen set screw in lift adjusting collar (10).

(e) Remove slack by pushing up on push-off cam and shaft assembly (36). Do not compress the arm lift shaft spring (36C).

(f) Using a #6-32 Bristol wrench, place it in the set screw and slide the lift adjusting collar (10) down until it is snug against the pickup arm lift (21).

(g) Tighten set screw in the lift adjusting collar.

(h) Check height.

13. RE-POSITIONING PICKUP ARM SUPPORT ASSEMBLY (23).

To assure proper set-down adjustment, this must be done carefully as follows if set screws are loose or if pickup arm support assembly (23) has been removed.

(a) Turn adjusting screw (29) (see paragraph 11) clockwise 2 full turns.

(b) Place a 12" record on the turntable.

(c) With the changer out of cycle, manually move the arm control assembly (28) outwards as far as it moves freely. In this position, the arm control pin (28A) will be located as indicated at "A" in Figure 2.

(d) Place pickup arm so that needle rests in first playing groove on the 12" record.

(e) Tighten the two set screws in pickup arm support assembly (23).

(f) Make the final set-down adjustment as described in paragraph 11.

14. REMOVING COVER (3) FROM HEAD ASSEMBLY (7).

(a) To remove cover (3) from head, squeeze cover at ends and lift up enough for cover to come free of rotating plate (7C).

(b) Remove hairpin spring from hold down plate (4) and slide hold down plate (4) out of rotating plate (7C).

15. RE-POSITIONING PUSH OFF ARM (5).

This must be carefully done if set screws are loose or push off arm (5) has been removed.

(a) Rotate the record support to the 10-inch position. Remove push off arm (5).

(b) Line up push off cam (36C) with push off arm (5) so they are parallel. If the push off is still faulty set push off cam (36C) slightly back of push off arm (5), this will give a little less push off on 10-inch side and little more on 12-inch side. Reverse this procedure for more push off on 10-inch side.

(c) Put push off arm (5) in position leaving push off arm about 1/32" above top of arm lift shaft.

(d) Tighten set screws in push off arm.

16. CHANGER REPEATEDLY GOES THROUGH CHANGE CYCLE WITHOUT PLAYING RECORD.

(a) Mounting screw on eccentric cam (53) may be loose. Tighten.

(b) Cushion spring (31) has slipped out of position and is on wrong side of riser plate tab (34B). Re-position spring. (See Figure 5.)

(c) In normal operation, the trip spring (32) holds the arm control plate (33) against the riser plate (34). If the trip spring is faulty, it permits the arm control plate to rise too high above the riser plate. This causes the reject catch (51) to pass underneath the stop tab (33A). To correct, bend the legs of the trip spring closer together. If necessary replace trip spring.

(d) Eccentric cam (53) is bent so that reject catch (51) passes underneath stop tab (33A) on the arm control plate (33). To correct, straighten cam by putting changer out of cycle and pressing upward on cam near reject catch.

17. NEEDLE SLIDES ACROSS PORTION OF RECORD AFTER SET-DOWN ON 12-INCH RECORD.

Cushion spring (31) has slipped out of position and is on wrong side of riser plate tab (34B). Re-position spring. (See Figure 5.)

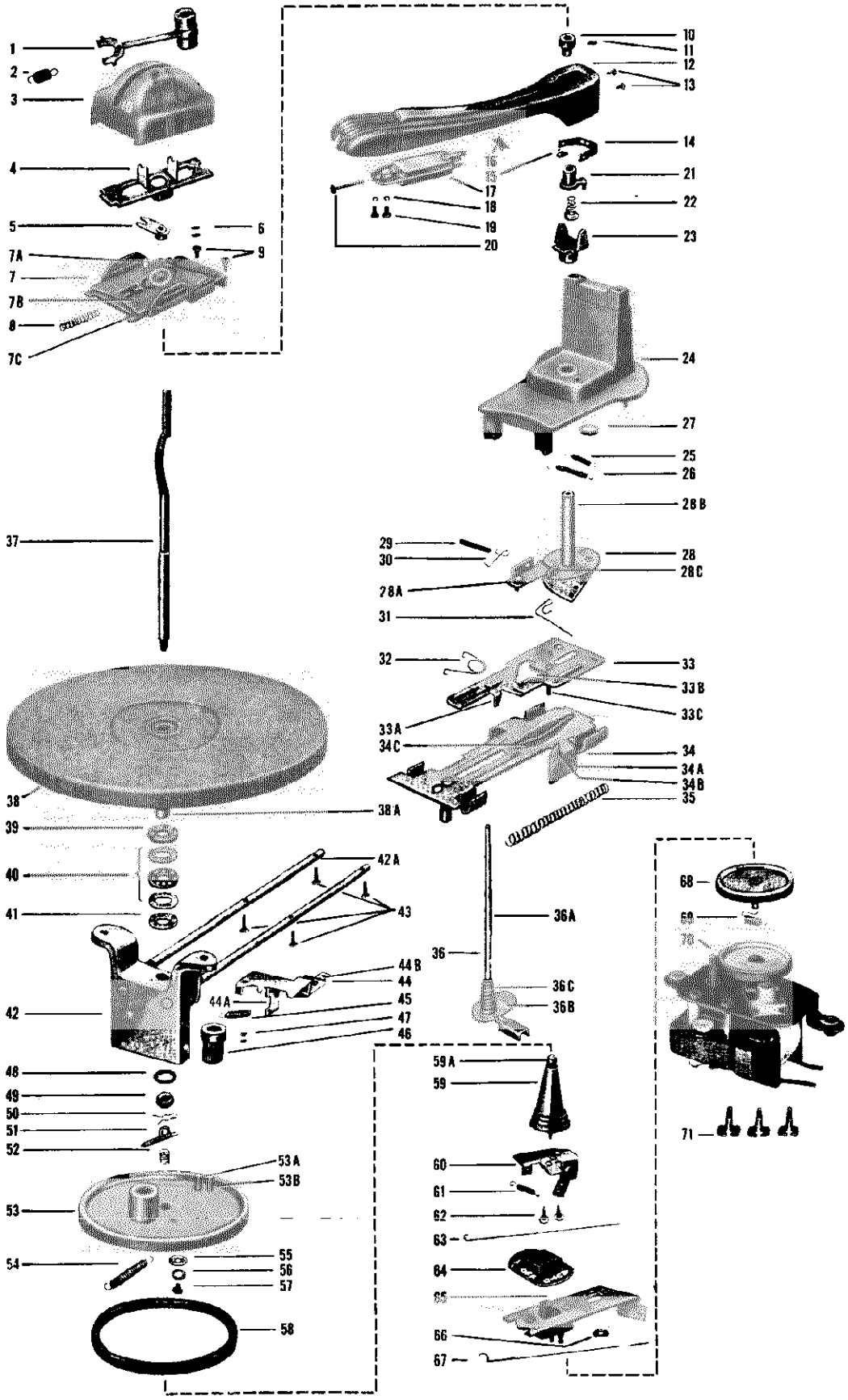

1
2
3
4
5
6
9
7A
7
7B
8
7C
10
11
12
13
14
21
22
23
16
15
17
18
19
20
24
27
25
26
28B
29
30
28
28C
28A
31
32
33
33B
33C
33A
34C
34
34A
34B
35
37
38
38A
39
40
41
42A
43
42
44B
44
44A
45
47
46
36A
36
36C
36B
48
49
50
51
52
53A
53B
53
54
55
56
57
58
59A
59
60
61
62
63
64
65
66
67
68
69
70
71

FIGURE 6

MODEL C-250

CRESCENT INDUSTRIES, INC.

See Exploded View, Figure 6, for Identification of Parts.

Ref. No.	Part No.	Description
1	2C3-A1	Hold Down Pad
2	405-A4	Hold Down Spring
3	2C3-B2	Cover
4	2C1-A14	Hold Down Plate
5	G400-A66	Push Off Arm Assembly
6	1A44-37	Set Screw (Bristol Head #6-32x1/8")
7	C250-A3	Head Assembly
7A		Push Plate Pin (Part of 7)
7B		Push Plate (Part of 7)
7C		Rotating Plate (Part of 7)
8	405-A33	Push Plate Spring
9	6C-312	Screw (#6x5/16" Phillips Flat Hd. Type Z)
10	402-A57	Lift Adjusting Collar
11	1A44-38	Set Screw (Bristol Head #6-32x3/16")
12	C250-A8	Pickup Arm, Pivot Spring and Arm Lift Bearing Pin Assembly. (Does not include 16-20 incl.)
13		Rivet (pickup arm pivot spring) — Supplied as a group. Order Part No. C250-A9
14		Pivot Spring (pickup arm) — Supplied as a group. Order Part No. C250-A9
15		Arm Lift Bearing Pin — Supplied as a group. Order Part No. C250-A9
16	405-A13	Spring Clip (pickup arm)
17	409-A1	Pickup Cartridges — Interchangeable
	409-A2	Pickup Cartridges — Interchangeable
	409-A3	Pickup Cartridges — Interchangeable
18	3A2-3-21	Lockwasher, #4 Split — Doz.
19	42-250	Screw (Fil. H.M.S. #4-40x1/4"; Mtg. Cartridge
20	402-A43	Needle Screw for Cartridges
21	G400-A86	Pickup Arm Lift Assembly
22	405-A46	Brake Spring
23	G400-A73	Pickup Arm Support Assembly
24	2C4-C1	Base Casting
25	405-A41	Safety Spring
26	405-A49	Set Down Spring
27	405-A27	Spring Washer
28	C250-A10	Arm Control Assembly
28A		Arm Control Pin (Part of 28)
28B		Arm Support Tube (Part of 28)
28C		Bracket (Part of 28)
29	402-A60	Adjusting Screw
30	2C5-A2	Lock Spring (Set Down Adjustment)
31	405-A45	Cushion Spring
32	405-A43	Trip Spring
33	C250-A11	Arm Control Plate
33A		Stop Tab (Part of 33)
33B		Track (Part of 33)
33C		Size Change Stop (Part of 33)
34	C250-A12	Riser Plate Assembly
34A		Riser Plate Motion Bracket (Part of 34)
34B		Riser Plate Tab (Part of 34)
34C		Inclined Track (Part of 34)
35	405-A9	Recoil Spring
36	G400-A98	Push off cam and shaft Assembly (Includes retaining ring, safety collar, and spring.)
36A		Arm lift shaft (Part of 36)
36B		Push off cam (Part of 36)
36C		Arm Lift shaft spring (Part of 36)
37	G400-B21	Centerpost
38	C250-B13	Turntable
38A		Turntable shaft (Part of 38)
39	412-A1	Cork Washer
40	415-A2	Thrust Bearing Assembly (Replace as a unit)
41	412-A9	Cork Washer
42	C250-B14	Turntable mounting and guide rod Assembly
42A		Guide Rods (Part of 42)
43	6C-625	Screw (#6x5/8 Fil. Hd. Type Z)
44	C250-A6	Reject Manual Control Assembly
44A		Reject Arm (Part of 44)
44B		Manual Control bracket (Part of 44)
45	405-A25	Reject Arm Spring
46	2C2-A1	Knurled roller, turntable shaft
47	1A44-13	Set Screw (Bristol Head #8-32x1/8")
48	3B1-29	Lockwasher, 1/4" I.D. — Doz.
49	402-A41	Hex nut (1/4"-20; used on centerpost)
50	405-A15	Hairpin Spring
51	2C1-A8	Reject Catch
52	405-A50	Reject Catch support spring — Doz.
53	G400-A117	Eccentric cam and tire assembly
53A		Reject Catch pivot stud (Part of 53)
53B		Reject Catch Stop stud (Part of 53)
54	405-A47	Eccentric Spring
55	4B1-57-47	Flat Washer (eccentric cam)
56	3B1-26-47	Lockwasher #8 I.T. — Doz.
57	84-250	Screw (B.H.M.S. #8-32x1/4" for mtg. cam) — Doz.
58	406-A1	Rubber Tire (Eccentric cam)
59	C250-A15	Arm Rest Assembly
59A		Reject Button (Part of 59)
60	C250-A16	Reject lever Assembly
61	405-A25	Reject lever spring
62	1A20-14-21	Screw (#6x3/8" Drive Screw; used for reject lever mounting)
63	414-A13	Reject trigger wire
64	2C3-B3	Control Knob
65	C250-A5	Switch Mounting Assembly
66	405-A22	Spring Washer
67	2C14-A2	Manual Control wire
68	G400-A57	Idler wheel assembly (Used with motor 407-B1 only.)
	G400-A59	Idler wheel assembly (Used with motor 407-B10 only.)
	C250-A17	Idler wheel assembly (Used with motor 407-B9 only.)
69	405-A35	Spring, idler wheel (Used with motor 407-B1 only.)
	405-A36	Spring, idler wheel (Used with motor 407-B10 only.)
	2C5-A6	Spring, idler wheel (Used with motor 407-B9 only.)
70	407-B1	Motor, complete with idler wheel; 105-125 Volts. 60 cycle (Motor 407-B9, 407-B10 are interchangeable with 407-B1.)
	407-B6	Motor, complete with idler wheel; 105-125 Volts. 50 cycle (Motors 407-B7, 2C7-B1 are interchangeable with 407-B6.)
	2C7-B2	Motor, complete with idler wheel; 220 Volt. 60 cycle (Motors 2C7-B4, 2C7-B6 are interchangeable with 2C7-B2.)
	2C7-B3	Motor, complete with idler wheel; 220 Volt. 50 cycle (Motors 2C7-B5, 2C7-B7 are interchangeable with 2C7-B3.)
71	2C5-A3	Motor snap fasteners, motor mounting

The following parts are not identified in exploded view, figure ???

72	C250-B2	Motorboard Assembly (Does not include 73, 74, 75, 76)
73	2C6-A3	Rubber shock mount
74	2C2-A5	Motorboard mounting stud
75	4B1-72	Flat Washer, #10 I.D.
76	100-500	Screw (Phillips countersunk flat head)
77	9B1-15	Solder lug
78	10B1-18	Terminal Board
79	2C5-A5	Faston Washer, fastening base to motorboard

SPECIFICATIONS

Power Consumption at 117 volts ..... 18 watts

Voltage Rating ..... 105 to 125 volts at 60 cycles

Speed at 117 volts ..... 78 r.p.m.

Starting Torque at 117 volts ..... 27.5 in. oz.

Weight less records ..... 7.5 pounds

Type of Pickup
- P-72 ..... Variable Reluctance
- P-73 ..... Crystal

Type of Needle
- P-72 and P-73 ..... Permanent Osmium Point

Maximum Record Capacity
- 12 inch ..... 10 records
- 10 inch ..... 12 records
- 10 and 12 inch intermixed ..... 10 records

DESCRIPTION AND OPERATION OF THE CHANGER

RECORD LOADING

The record spindle shelf is to be loaded to a maximum of 12 ten inch, 10 twelve inch, or to the red line on the spindle with both sizes, intermixed. The stabilizer arms must be moved into the recess of the spindle to prevent interference in loading the records.

The tone arm set-down is always in 10" position unless a 12" record has just been dropped from the spindle shelf. In dropping to the turntable, the 12" record strikes the intercepter lever #58698, contacting the tone arm swing lever #58698, imparting movement to the tone arm lift lever #58694 and causing the tone arm to be set down to 12" position.

RECORD CHANGING

After the changer is loaded with records, the control button is pressed to start the record change cycle. Rotation of the main cam will actuate the compression lever causing the compression rod to depress the inner-spindle assembly. The four-prong spring support (spindle shelf) has receded into the outer spindle and the rubber sleeve on the spindle, being compressed, has expanded, and therefore holds all but the bottom record which descends to the turntable. Then the tone arm return lever moves the tone arm into position to be lowered to the record by following the cam track. The tone arm moves across the record until the selection is finished and the trip mechanism functions. Finally, the tone arm is lifted and carried over the record until clear of the record stack and the next record is released, completing one change cycle. In this manner all the records in the stack are played.

AUTOMATIC STOP

The weight of the records on the spindle allows the record lift lever to follow the contour of the main cam. When the last selection is played, a spring lifts the record lift lever into position to move the automatic stop pawl inward. The main cam carries the stop pawl into engagement with the switch lever, thus stopping the changer.

SPRING MOUNTING

The changer is solidly mounted on a panel which is floated upon spring mountings. These spring mountings eliminate rumble or feedback and insulate the changer from any cabinet vibration occasioned by the sound waves emanating from the speaker. This vibration, if transmitted through the tone arm to the pickup, would be amplified in the audio system of the radio and passed into the speaker again. The spring mountings also cushion the changer from sudden jars or shocks.

To remove the changer from the cabinet, remove four acorn nuts located on the corners of the mounting panel and lift panel out of cabinet. In some cases it is necessary to remove the cabinet drawer before removing the mounting panel.

On the underside of changer loosen screw next to spindle (paragraph B, section 7), and turn lock so that turntable may be removed from changer Remove three screws and lift changer out of mounting panel.

CYCLE OF OPERATION

STUDYING THE CYCLE

The record change cycle consists of the sequence of motions required to move the pickup into position on a record, play the record, remove the pickup and place a record into position. Since movements of various parts are being performed simultaneously, it is impossible to follow all of the actions at one time. A suggested method is to select one certain cycle of operation. For example the raising of the tone arm, moving it over the record and the replacement on the record may be studied while running the changer slowly by hand. After the motions associated with the tone arm are understood, another portion of the changer may be observed.

TRIP ASSEMBLY

Motion of the tone arm is transmitted through the tone arm crank to the tone arm lever and pin assembly #15194 which is secured to the tone arm support tube with lever #58695. When the needle enters the trip grooves of a record, the increased velocity of movement impels the tone arm lever against the starting reset lever #58853. The start-

ing reset lever then engages the starting pawl on the turntable hub.

THE CHANGE CYCLE

The turntable is driven through an idler pulley by the electric motor, the turntable being free on the spindle. A gear on the turntable hub meshes with the main cam gear. Several teeth are left off the main cam to stop it in playing position. After a selection has been played, the trip mechanism moves the starting reset lever, which is part of the main cam assembly #13672, forward at the right speed and correct distance to permit it to mesh properly with the starting pawl on the turntable hub. As the main cam rotates, the tone arm lift lever #58694 lifts the tone arm upward and the tone arm return lever moves the tone arm over the record. The compression lever #57240 will actuate the compression rod #55424, which will in turn depress the inner-spindle assembly #11379. During this cycle the rubber sleeve #62152 has expanded and is holding all but the bottom record. At the same time the spindle shelf recedes into the outer spindle #55334, dropping the bottom record to the turntable. By following the cam track the tone arm return lever moves the tone arm into position to lower the pickup needle to the starting groove in the record. The main cam is now in playing position, disengaged from the turntable hub gear. One change cycle has been completed.

PICTORIAL REPRESENTATION

The following series of photographs, with a corresponding brief explanation of each phase, are inserted to illustrate the movements of pertinent parts of the changer during a change of record cycle.

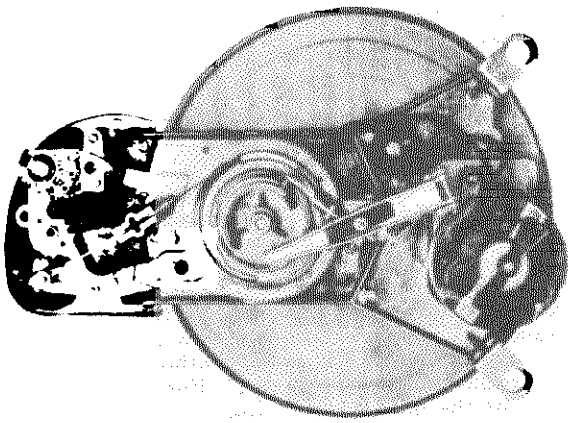


FIGURE A

The main cam is driven through the gear on the turntable hub. When a change cycle is completed, the main cam disengages from the turntable gear because several teeth are left off the main cam gear. The tone arm is in position on the record and free to follow the playing groove. This phase of cycle is called the playing position.

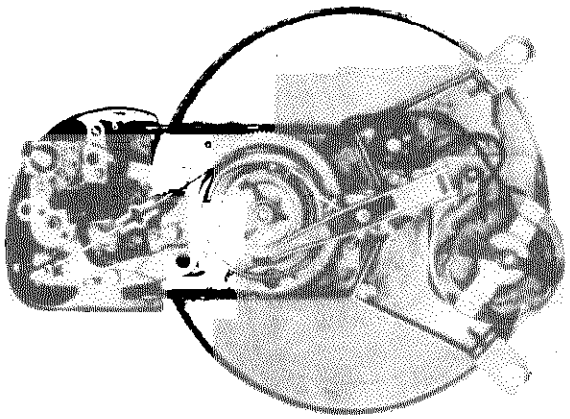


FIGURE B

The change cycle has just begun. The tone arm lift lever has raised the tone arm from the record and the tone arm return lever has started to move the tone arm away from the turntable. The compression lever assembly has started to pull the compression rod, thus beginning to recede the spindle shelf into the outer spindle and expanding the rubber sleeve on the spindle.

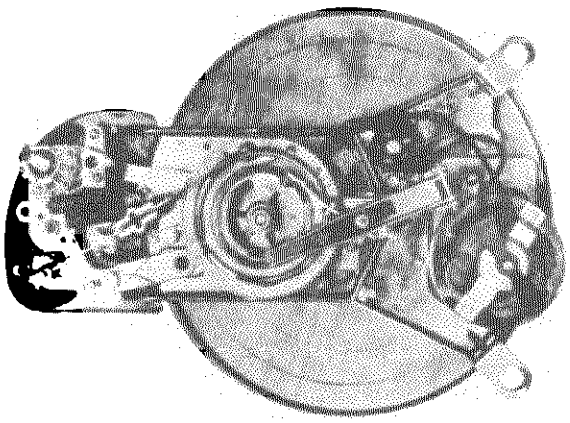


FIGURE C

The tone arm has moved outward, clear of the turntable, and the spindle shelf has fully receded into the outer spindle, dropping the bottom record to the turntable. The rest of the record stack is held by the expanded rubber sleeve. The spindle shelf has started to return to its former position.

CHANGER LUBRICATION

The record changer should be lubricated and cleaned periodically or when a major part or assembly is replaced. Dirt, old oil, or grease may be removed with carbon tetrachloride or other similar cleaning fluid.

Use only a good grade of electric motor oil.

Care should be exercised to prevent an excess of oil being used on any part and that no oil gets on the velocity trip assembly, motor pulley, idler pulley or turntable rim. There is a self-lubricating type bearing in the turntable with an oil reservoir which may be filled through the four holes in the turntable hub.

Once a year a thin coat of light grease of the vaseline type may be applied to all surfaces of the main cam that contact lift levers and record lift lever roller. Also grease all working parts on the main cam and oil other moving parts (see figures D & E) except those that rely upon friction, i.e., contact surfaces being dry.

PRECAUTIONS

With mechanical devices, much information pertinent to lubrication can be obtained by observation. Obviously, it will be seen that certain parts of rotating or sliding machinery must be lubricated,

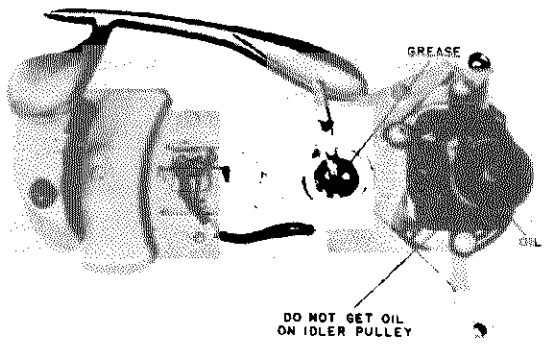


FIGURE D

but that other parts depend upon contact surfaces being dry and free from foreign substances, such as grease, so that proper friction exists. Where lubrication is indicated, it should be applied judiciously, avoiding any excess lubricant that may be transferred or thrown to some part designed for dry operation.

Inspect parts not requiring lubrication to make certain they are clean. Always be sure to use the type of oil or grease recommended for lubricating specified items.

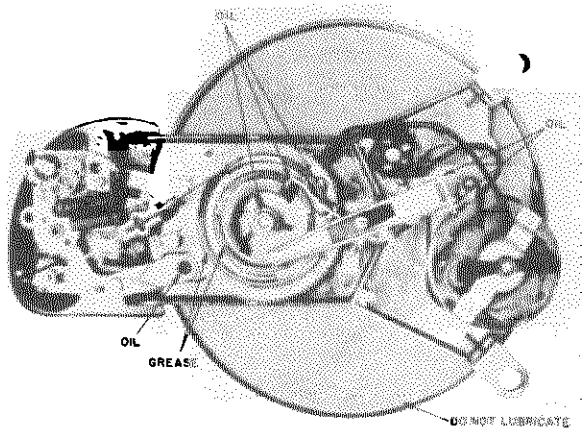


FIGURE E

PARTS IDENTIFICATION

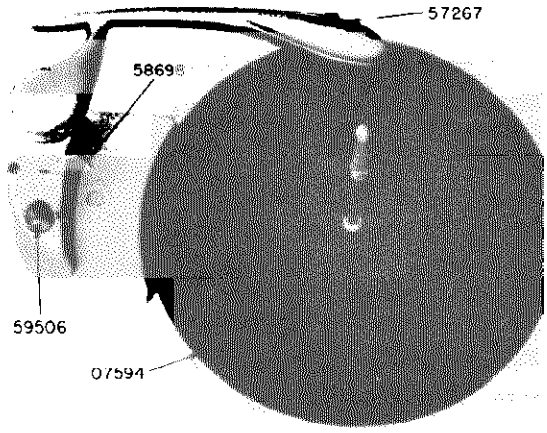


FIGURE 1—Top View

FIGURE 1

Part No.	*Description*
07594	— Turntable Assy.
55343	— Reject Plunger.
57259	— Tone Clarifier Knob.
57267	— Tone Arm.
58698	— Tone Arm Interceptor Lever.
59506	— Reject Button.

MODELS P-72, P-73 FARNSWORTH TELEV. & RADIO CORP.

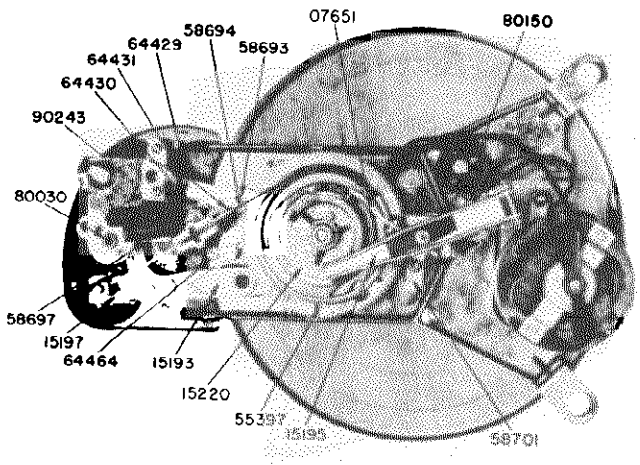


FIGURE 3—Bottom View

FIGURE 3

Part No.	*Description*
07651	— Record Lift Lever Assy.
15193	— Tone Arm Swing Lever Assy.
15195	— Compression Lever Assy.
15197	— Tone Arm Crank and Pin Assy.
15220	— Main Cam.
55397	— Trip Adjustment Screw.
58693	— Switch and Reject Lever.
58694	— Tone Arm Lift Lever.
58697	— Tone Arm Adjusting Lever.
58701	— Turntable Hold-Down.
64429	— Reset Spring.
64430	— Reject Spring.
64431	— Lift Lever Spring.
64464	— Switch Release Spring.
80030	— Phono Output Jack.
80150	— 4 Prong Motor Plug (Male).
90243	— Tone Switch.

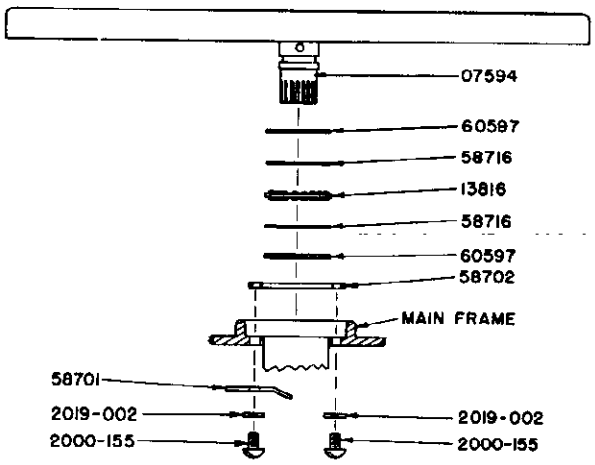


FIGURE 4—Turntable and Bearing Assembly

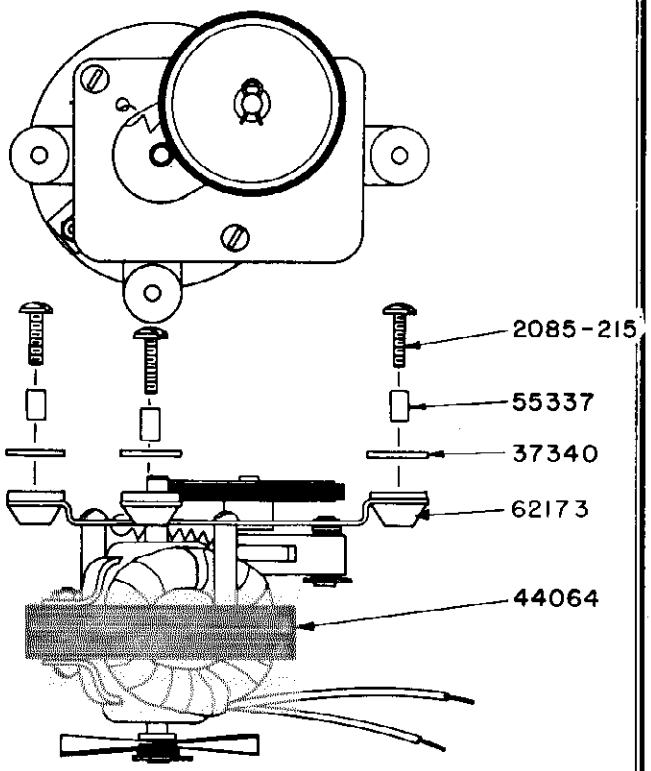


FIGURE 5—Phono Motor Assembly

FIGURE 5

Part No.	*Description*
37340	— Brass Washer.
44064	— Phono Motor.
55337	— Motor Mtg. Spacer.
62173	— Rubber Motor Mtg. Grommet.
2085-215	— Motor Mtg. Bolt (#6-32 x 5/8").
11437	— Phono Motor Assy. Complete.
13819	— Idler Pulley.
15237	— Idler Brkt. and stud assy.
37421	— "E" washer (to mount idler pulley, idler pulley brkt., and ventilator fan).
54308	— Fibre thrust washer (to mount idler pulley and idler pulley brkt.)
54309	— Fibre thrust washer (to mount ventilator fan).
64471	— Spring for idler pulley.
80150	— 4 prong motor A. C. plug (male).
92335	— Felt washer (for ventilator fan).
62190	— Alternate rubber motor mounting.

FIGURE 4

Part No.	*Description*
07594	— Turntable Assy.
13816	— Ball Bearing and Retainer.
58701	— Turntable Hold Down.
58702	— Bearing Support Washer.
58716	— Bearing Race Washer.
60597	— Cork Washer for Turntable Bearing.

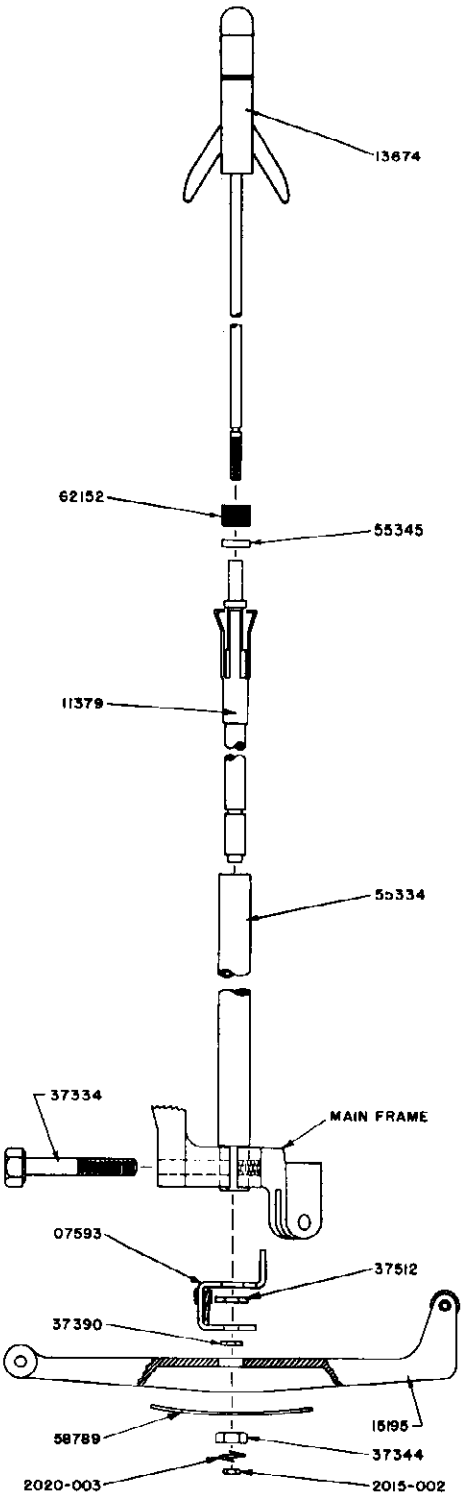


FIGURE 6—Spindle Assembly

FIGURE 6

Part No.	*Description*
07593	— Record Lift Lever Bracket Assy.
11379	— Inner Spindle Assy.
13674	— Upper Spindle Assy.
15195	— Compression Lever Assy.
37334	— H. H. Bolt (#10-32 x 7/8").
37344	— Special Hex Nut (#3-48).
37390	— "E" Washer (small) for Record S dle.
37512	— "E" Washer (large) for Record S dle.
55334	— Outer Spindle.
55345	— Sleeve Support Washer.
58789	— Compression Spring.
62152	— Rubber Sleeve for Record Spindl
2015-002	— Hex Nut (#3-48).
2020-003	— Split Lockwasher (#3)

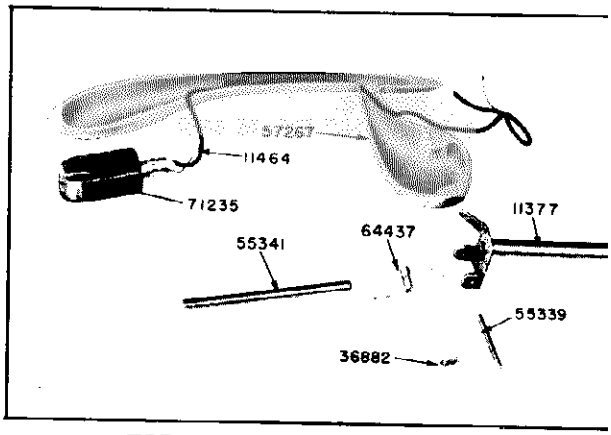


FIGURE 7—Tone Arm Assembly

FIGURE 7

Part No.	*Description*
11464	— Pickup Lead Assy.
36882	— H.P. Cotter.
55339	— Hinge Pin.
55341	— Tone Arm Lift Rod.
57267	— Tone Arm.
64437	— Tone Arm Spring.
71235	— Magnetic Pickup (P-72).
71243	— Crystal Pickup (P-73).

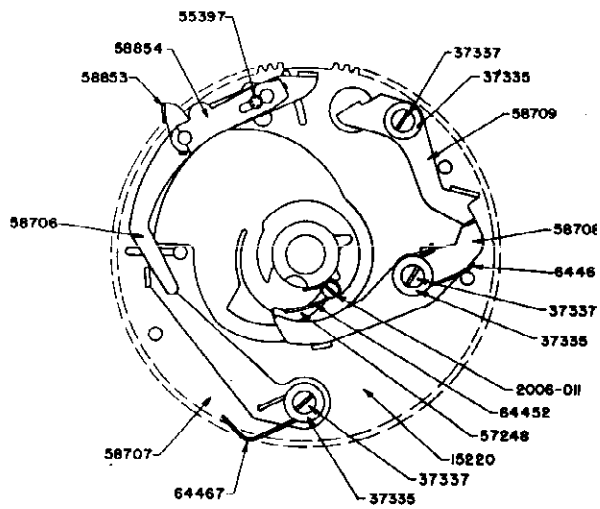


FIGURE 8—Main Cam Assembly

FIGURE 8

Part No.	*Description*
15220	— Main Cam and Pin Assy.
37335	— Washer (#4 x 3/8" o.d).
37337	— Mtg. Screw for Levers (H.M.S #4-36 x 1/4").
55397	— Trip Adjustment Screw.
57248	— Main Cam Switch.
58706	— Starting Lever.
58707	— Reject Lever.
58708	— Tone Arm Hold Out Lever.
58709	— Hold Out Locking Lever.
58853	— Starting Reset Lever.
58854	— Starting Lever Spring.
64452	— Cam Switch Spring.
64466	— Spring for Hold Out Lever.
64467	— Trip Spring.
2006-011	— #2-56 x 7/16" Fil. M.M.S.

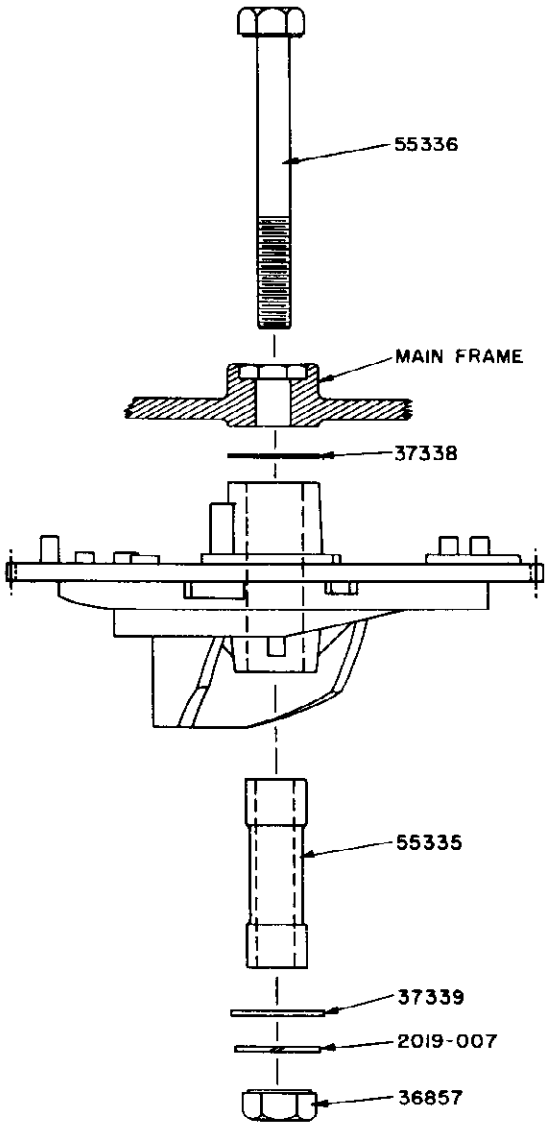


FIGURE 10—Cam Mounting Assembly

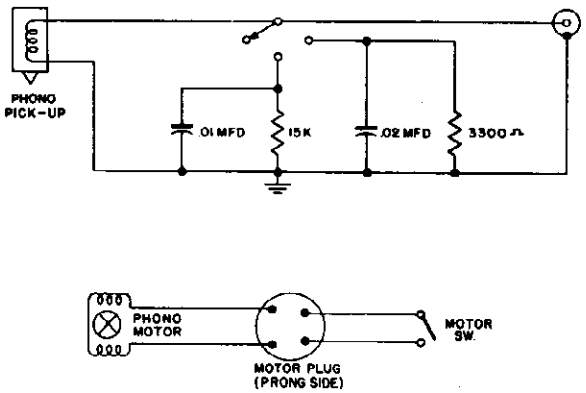


FIGURE 9—Circuit Diagrams

FIGURE 10

Part No.	*Description*
36857	— 1/4-28 Hex. Nut (To Mount Main Cam)
37338	— Shim Washer.
37339	— Flat Washer (1/4" i.d. x 5/8" o.d. x 1/16" thick).
55335	— Cam Spacer (Inside Main Cam Hub).
55336	— Mtg. Bolt for Main Cam.
2019-007	— 1/4" S.P. Int. Lockwasher.

Inspect parts not requiring lubrication to make certain they are clean. Always be sure to use the type of oil or grease recommended for lubricating specified items.

PARTS REPLACEMENT

A. REASSEMBLING PARTS

When repairs are being made, a careful check should be made of all moving parts in order to make sure that no binding occurs. Check all moving parts for binding before springs are connected.

All levers which operate on shoulder studs should be assembled with the burred side of the retaining washer away from the lever to prevent the washer from binding on the lever.

B. TO REMOVE AND REPLACE TURNTABLE

Remove the changer from the cabinet, and from the bottom side of the main frame (near the spindle) loosen the screw which holds the turntable down, so that it is clear of the pinion gear. The turntable may then be raised from the top side of the changer. Care must be taken not to damage the cork washers next to the bearing.

When replacing the turntable, see that the cork washer 60597, then the bearing race 58716, bearing retainer 13816, and another bearing race and cork washer are installed in this sequence (see Figure 1). Align these parts with the center spindle. When pushing the turntable over the spring assembly, push firmly but cautiously, avoiding too much pressure which may damage the springs. When the turntable is in place, move hold-down into groove in turntable hub and tighten screw.

C. TO REMOVE IDLER PULLEY

After the turntable has been removed, the idler pulley can be removed by slipping off the small hairpin cotter on the end of the idler pulley shaft.

When replacing the pulley a single drop of oil should be used on the pulley shaft.

CAUTION:

Do not allow oil to get on either the idler pulley or the turntable rim.

D. TO REMOVE AND REPLACE SPINDLE ASSEMBLY

Remove nuts from bottom of compression rod. Lift compression lever 57240 out of position. Remove E washers and record lift bracket 58700. Pull spindle assembly out from top side. Do not attempt to repair assemblies but replace with new parts. To reassemble, push assembly inside of outer spindle from the top. Put record lift bracket in place and install E washers. Swing compression lever into position and install flat spring 58789, nuts 37344 and 2015-002 and No. 3 lockwasher. Tighten nuts on compression lever until rubber sleeve on spindle reaches .330" to .337" diameter when fully compressed. Use Glyptal to secure lock nuts.

E. TO REMOVE AND INSTALL MAIN CAM ASSEMBLY (Fig. 1)

Remove turntable (paragraph B). Remove nuts from bottom of spindle and turn compression lever back to clear cam. Disconnect spring from tone arm lift lever 58694. Remove nut 36857 from under side of cam and withdraw bolt 55336 from top side of changer. Slide cam out carefully so as not to bend any levers on baseplate side. Adjust screw 55397 so that tension on starting reset lever 58853 is 6 to 8 grams. Use Glyptal on bottom side of screw. To reinstall the cam replace cam shim 37338, slide bolt through from top side of changer and slide cam into place being sure that spacing shim 37338 is not lost. Cam should have insert spacer 55335. Use flat washer 37339, lockwasher 2019-007 and hex nut 36857. Reinstall tone arm lift lever 58694 and attach spring 64431. Swing compression lever into place and install flat spring, two nuts and lockwasher. Secure these nuts with Glyptal after spindle assembly has been adjusted. Reassemble turntable (paragraph B.)

F. TO REMOVE AND INSTALL TONE SWITCH & BRACKET ASS'Y 13825

Disconnect pickup lead wires from socket 80030. Remove two screws which hold bracket to baseplate. Lift bracket from assembly.

To reinstall, insert tone switch coupling 64464 between rejects plunger 55420 and switch 90243. Replace screws 2000-157 and lock washers 2019-004. Resolder pickup wires to socket; the black wire should be connected to the center terminal.

G. TO REMOVE AND REPLACE TONE KNOB & PLUNGER ASSEMBLY 09353

Remove Tone Switch and bracket assembly 13825 (paragraph F). Lift plunger assembly out from top side. Unscrew reject knob 59486 while holding shaft 55420 rigid. Remove spring 64474 and knob 57262 by lifting over top of shaft. To reassemb place knob 57262 on shaft. Drop spring into kn and screw reject knob onto shaft. Push assemb in from top side of changer so that pointer is markings on baseplate. Reinstall tone switch a bracket assembly (paragraph F).

H. SHIPPING CHANGER

The changer is solidly mounted on a mounti board. The mounting board is mounted upon fr floating springs.

When shipping the changer, a hold-down b should always be used on each side of the chang mounting board to hold the changer securely the cabinet. A cardboard spacer ⅛" thick shou be placed adjacent to the shipping bolts betwe the mounting board and the cabinet. The tone a may be held securely to the outer edge of the tu table by arranging a cardboard strip to fit over t spindle and hold the tone arm down.

I. INSERTING PHONO PLUG

The phono input plug must be inserted into t phono socket as far as possible to avoid "grid hur If hum presists, check ground connection of sock

OPERATIONAL ADJUSTMENTS

J. TONE ARM HEIGHT ADJUSTMENT

Load a 10" record on the spindle and turn turntable by hand through cycle until the tone a is at its highest point. From bottom side of chan er, loosen hex nut 2015-007 and adjust screw 37 to tone arm height desired. Tighten locknut lift lever.

To remove lift lever 58694, release spring 54 and withdraw lever from slot. To reinstall, ins pin 55325 in lift lever. Insert lift lever in slot a connect spring.

K. NEEDLE LANDING ADJUSTMENT

Place a 10" record on spindle and press reje button. Changer should continue in cycle un coming into playing position. Observe wheth or not the needle lands in starting groove (abo 3 32" from outside edge of record). If needle lan too close to outer edge of record, turn top tone ar adjusting screw 55328 with coin in direction i dicated on baseplate. If needle landing was t far from outer edge of record, turn adjusting scre in opposite direction. Hold top of spindle down ar press reject button to check needle landing.

12" needle landing will usually not require a justment. If required, it should be made only aft 10" adjustment has been corrected. For errat needle landing, check the wire leads to see th they do not bind or interfer with the tone arm.

L. VELOCITY TRIP ADJUSTMENT

Break the seal on the adjustment screw 553 which is located in hole in bottom of cam ne spindle. Turn to the left to tighten until the ton arm will trip on the record. To check adjustme lever 58706 on cam should contact both lugs c turntable hub when tone arm is in last playin grooves of record before tripping. Seal scre thread with Glyptal to prevent screw from comir out of adjustment.

M. RECORD FEED

1. DOES NOT DROP RECORDS

a. See that stabilizer arms are not down under the record stack.
b. Check vertical clearance in spindle. Should be approx. 1/64".
c. Check the records to see that the label is not extended into the center hole.

2. DROPS MORE THAN ONE RECORD

a. Check center hole of record for being chipped or oversized. (This changer will not chip or break records).
b. If 12" record hangs on interceptor lever 58698, check slot in changer head for burrs. This lever should move freely with a slight drag on the side of the slot.

3. CHANGER DOES NOT START

a. If changer does not start immediately, press reject button a second time.
b. Check if phono plug and line cord are in their respective sockets.
c. If further trouble, turn turntable several revolutions to be sure that changer was not shut off during cycle. Press reject button to start.

4. CHANGER SHUT-OFF

Changer should shut off after last record is played. Spindle should have approx. 3/32" vertical motion when no records are on spindle. One 10" record should be sufficient weight to depress spindle so that changer will not shut off. If changer does not shut off or if it shuts off before last record is played, see that spindle is not sticking. It should have a free vertical motion. Also check stop pawl for binding.

N. REPRODUCTION

1. No response.
   a. Audio system. Check with radio reception.
   b. Pickup leads shorted.
   c. Pickup cartridge dead. Try new cartridge.
2. Distorted tone.
   a. Worn needle.
   b. "WOWS" or variance in speed.
      (1) Oil on idler pulley and turntable rim.
   c. Warped records.
   d. Defective pickup cartridge.
      1. Use of badly chipped records or records with breaks.
      2. Dropping tone arm on record.
3. Thumping noise.
   a. Groove in idler pulley worn by motor drive pulley. Result of idler pulley being held stationary with motor running.
      1. Sand idler pulley smooth or replace pulley.
4. "Grid Hum".
   a. Insert phono input plug into phono socket as far as possible.
   b. Check electrical ground connection of phono socket.
5. Mechanical Hum.
   Check alignment of turntable motor armature.

CHECKING THE CHANGER

Check the needle landing with full stack of records, intermixed. This is done by loading the spindle shelf with 10 records, both 10" and 12" and pressing the control button to reject a record and put the changer into operation. The stabilizer arms must be moved into the recess in the spindle to prevent interference in loading the records. Allow the first record to play through and trip, observing the needle landing on several 10" and 12" records, then trip records up to and including nine. Allow the ninth record to play through and feed number ten automatically, observe needle landing, automatic trip and automatic shut-off.

Check electrical operation by turning radio program switch to phono position and playing a record. The tone clarifier should be checked in each position by listening to reproduction. As a rule, old worn records should be played while the switch is in the No. 1 position. Position 2 is for normal records, while No. 3 gives wide-range reproduction from the new high-fidelity recordings.

PARTS LIST

Part No.	Description
07593	Record Lift Lever Bracket Assy.
07594	Turntable Assembly
07651	Record Lift Lever Assy.
09370	Mtg. Spring Assy.
11377	Tone Arm Support Tube & Brkt. Assy.
11379	Inner Spindle Assy.
11437	Phono Motor Assy.
11464	Pickup Lead Assy. For P-72, P-73
13674	Upper Spindle Assy.
13816	Ball Bearing & Retainer (for turntable)
13819	Idler Pulley
13825	Tone Switch & Brkt. Assy. Complete
15193	Tone Arm Swing Lever Assy.
15194	Tone Arm Lever & Pin Assy.
15195	Compression Lever Assy.
15196	Automatic Stop Switch Assy.
15197	Tone Arm Crank & Pin Assy.
15220	Main Cam (casting only)
15237	Idler Brkt. and Stud Assy. (on Phono motor)
25112	.01 mfd. 200 volt Condenser
25276	.02 mfd. 200 volt condenser
36857	1/4-28 Hex nut (to mount main cam)
36882	H. P. Cotter
37066	Acorn Palnut
37155	Spade lug (for tone arm lift lever spring)
37332	#6 Special flat washer (to mount reject lever assy.)
37333	"E" Washer (for tone arm adjusting stud)
37334	#10-32 x 7/8" H. H. bolt (to mount outer spindle)
37335	#4 x 3/8" o.d. washer (for mounting levers on main cam)
37337	#4-36 x 1/4" Bdg. H.M.S. (Mtg. screws for levers on main cam—reject, tone arm hold out)
37338	Shim Washer (to mount main cam)
37339	Flat Washer 1/4" i.d. x 5/8" o.d. x 1/16 thick (to mount main cam)
37340	Brass Washer (to mount motor)
37341	#8-32 x 7/8" hex head bolt (for tone arm crank assy.)
37343	#3 x 5/16" o.d. flat washer (on bottom of record spindle)
37344	#3-48 special hex nut (spindle height adj. nut)
37390	"E" washer (small) for record spindle
37421	"E" Washer (to mount idler pulley, idler pulley brkt. and ventilator fan)
37511	#10-32 x 5/8" H.H.M.S. (on tone arm lift lever)
37512	"E" washer (large) for record spindle
37646	Mounting bolt (for mtg. changer to mtg. board) (two required)
54308	Thrust Washer for idler pulley and idler pulley Brkt.
54309	Thrust Washer for motor ventilator fan
55325	Lift Lever Pin
55328	Tone arm set down adjustment stud
55329	Pin for tone arm interceptor lever
55332	Pin for compression lever
55333	Pin for record lift lever
55334	Outer spindle
55335	Cam spacer (inside main cam hub)
55336	Mounting Bolt for Main Cam
55337	Motor Mtg. Spacer
55339	Tone Arm Hinge Pin
55341	Tone Arm Lift Rod
55345	Sleeve support washer for record spindle
55395	Hinge pin for reject link
55396	Mounting pin for starting lever
55397	Trip adjustment screw
55416	Mounting bolt (one required to mount changer to mounting board)

Part No.	Description
55420	Manual reject plunger rod
57248	Main cam switch
57262	Tone Clarifier Knob (Chrome) for P-
04128	Tone arm for P-72, P-73 (Less Picku
58692	Interceptor reset lever
58693	Switch & reject lever
58694	Tone arm lift lever
58697	Tone arm adjustment lever
58698	Tone arm interceptor lever
58701	Turntable hold down Brkt.
58702	Bearing support washer (under tur table bearing)
58706	Starting lever
58707	Reject lever (on main cam)
58708	Tone arm hold out lever
58709	Hold out locking lever
58716	Bearing race washer (for turntable)
58789	Compression spring
58851	Tone switch bracket
58852	Manual reject link
58853	Starting reset lever
58854	Starting lever spring
58971	Ventilator fan for phono motor
59486	Reject Button For P-72
09367	Reject Button & Plunger ass'y. for P-7
60597	Cork washer for turntable bearing (f turntable)
62152	Rubber sleeve for record spindle
62173	Rubber motor mtg. grommets
64429	Reset spring
64430	Reject Spring
64431	Lift lever spring
64433	Spring for tone arm adjustment
64434	Spring for tone arm interceptor lever.
64437	Tone arm counterbalance spring
64452	Cam switch spring
64464	Switch release spring
64465	Tone switch coupling link
64466	Spring for tone arm hold out lever
64467	Trip spring
64471	Spring for idler pulley
64474	Spring for reject button
64476	Lead-in spring
71235	Magnetic Pickup for P-72
71243	Crystal Pickup for P-73
77240	3300 ohm 1/2 watt resistor
77246	15K ohm 1/2 watt resistor
80030	Phono output jack
80150	4 prong motor plug (male)
80327	2 prong molded pickup socket
90243	Tone selector switch
92256	Felt Washer for turntable bearing
92335	Felt washer for motor ventilator fan
2003-155	#6-32 x 1/4" F.H.M.S. (to mount ton arm adjusting lever)
2006-011	#2-56 x 7/16" Fil. H.M.S. (to moun cam switch)
2015-001	#2-56 Std. Hex nut (to mount cam switch)
2015-002	#3-48 Std. Hex nut (lock nut for spindl height adj.)
2015-007	#10-32 Std. hex nut
2017-004	#8 i.d. x 3/8" o.d. flat washer (for ton arm crank assy.)
2019-007	1/4" S.P. Int. lockwasher (to mount mai cam)
2085-205	#6-32 x 1/4" Truss H.M.S. (for mtg reject lever)
2085-215	Motor mtg. bolt #6-32 x 5/8"

CYCLE OF OPERATION

Records should be examined before placing them on the shelves. Badly warped records, badly chipped records, or records with breaks, should not be used. The record shelves are set for the size record to be played (either 10" or 12") by turning either shelf to the position indicated on the decal, then the correct number of records should be placed on the record shelves. (Twelve 10" or ten 12"). The tone arm should be on its rest.

Move the control switch which starts the phonograph and move the reject button sidewise. The changer will go into cycle, lifting the tone arm off the rest and swinging it under the stack. The tone arm should swing clear of the record stack, a record should drop to the hooks, pause, then gently settle to the turntable. The tone arm should swing back and be lowered to the starting groove on the record. When the record is played the above cycle is repeated until all the records have been played.

The turntable is screwed onto the spindle and gear assembly and both are driven through the idler pulley by the motor.

When the reject button is moved, the reject lever pushes the starting lever into position to engage the pawl on the spindle gear. This moves the main cam assembly forward at the right speed and the correct distance to cause the gears to mesh properly. Then the main cam goes through a complete revolution. When the cycle is completed the main cam gear disengages from the spindle gear because several teeth are left off it. This is called the playing position.

First the Tone Arm is lifted off the record through the Tone-Arm Lift Lever (07215). As soon as it is elevated both the Record Plungers move toward the Spindle to center the record for the drop to the Turntable; if no record is on the shelves the Automatic Switch is turned off, however the cycling switch makes the changer complete the cycle. As this happens the Tone Arm Return Lever (09123) moves the Tone Arm from under the record stack. The Rear Record Plunger moves forward at the same rate of speed as the eccentric portion of the Spindle and the Front Plunger moves. This pushes the record off the Rear Shelf where the Rear Record Plunger catches it. Both Front and Rear Plungers move backwards at the same rate as the Spindle does, pushing the record off the Front Shelf and dropping it to the Front Hooks, the record pauses here until the Hooks move to center the record in respect to the Spindle. Then both Hooks snap back out of the way, allowing the record to settle gently to the turntable. Next the Tone Arm swings into the proper position and is lowered to the record. A wire feed-in spring acts against the Tone Arm Crank to feed the Tone Arm into the music grooves in case there is no feed-in groove on the record.

To accomplish the record feed there are three sections of the Main Cam, together with the Centering Lever and Rocker Arm Assembly, involved. The first section of the Main Cam is a "Boss" illustrated at the end of the Tone Arm Lift Lever in Fig. A. The Second section is the Trip Roller Assembly on top of the Main Cam. The third section is the "slot" in the Tone Arm Lift portion of the cam adjacent to the Trip Roller Assembly.

The action is as follows: As the Main Cam rotates, the "Boss" strikes the Centering Lever and Rocker as shown in Fig. B, this moves the Record Plungers toward the Spindle. Because this pressure is applied through a spring, variations in record diameter are of little consequence. After the Boss passes the Centering Lever, the Trip Roller strikes the Rear Rocker the first time moving the Rear Record Plunger forward and the Front Record Plunger is also moved forward, Fig. C. As the Main Cam moves on, the Record Plungers go to a central position then both move backward, Fig. D, then resume the central position, this is while the record rests on the Hooks. Then the Centering Lever drops into the "slot" in the Main Cam, Fig. E, the Front and Rear Hooks are suddenly withdrawn from the record and it drops to the Turntable.

The trip action of the P-62 is positive and is set to trip automatically when the needle reaches a predetermined distance (1⅞") from the spindle.

The following five illustrations show the cycle of operation of a P-62 Capehart Changer.

Figure A. When the cycle is complete the Main Cam disengages from the Spindle Gear because several teeth are left off the Main Cam Gear. This position is called the playing position.

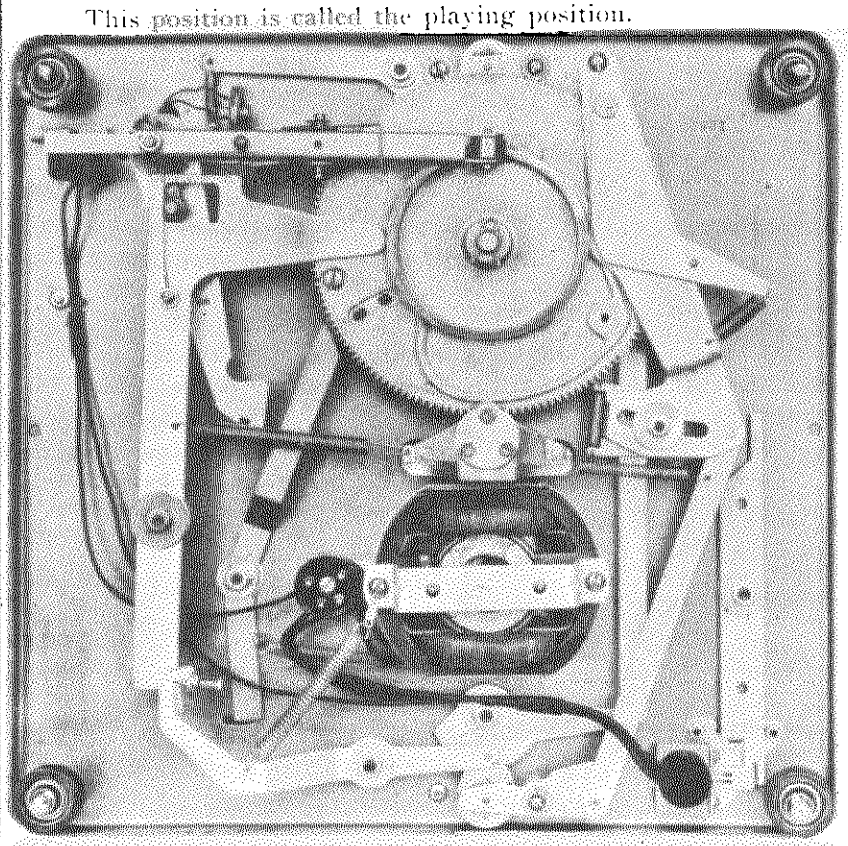


FIGURE A

FRONT

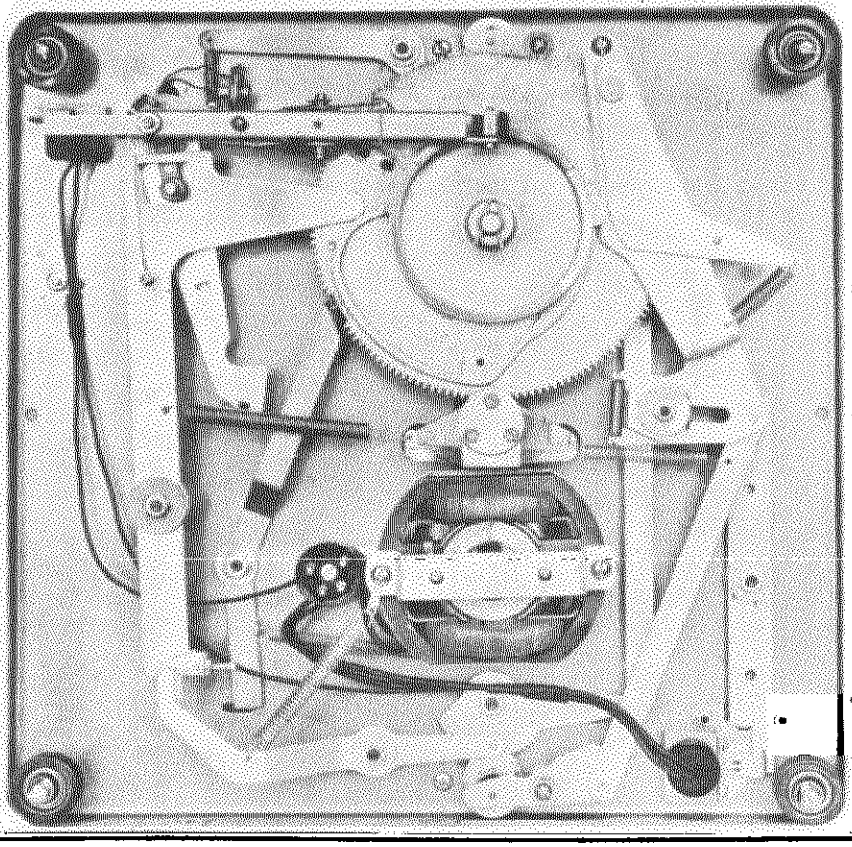
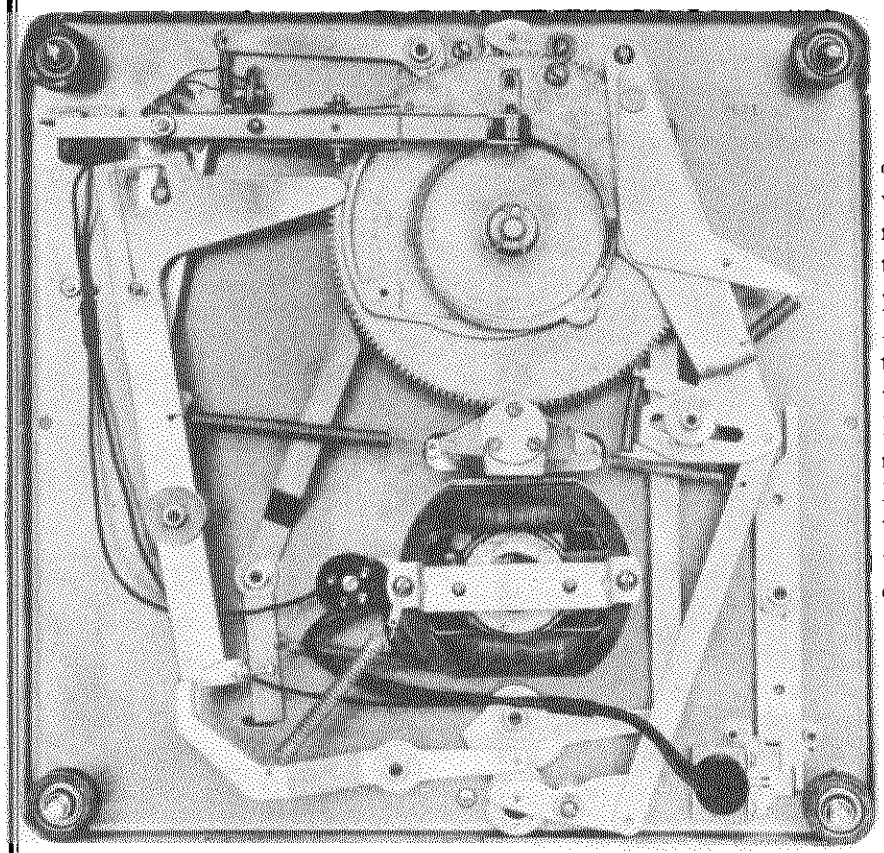


FIGURE B

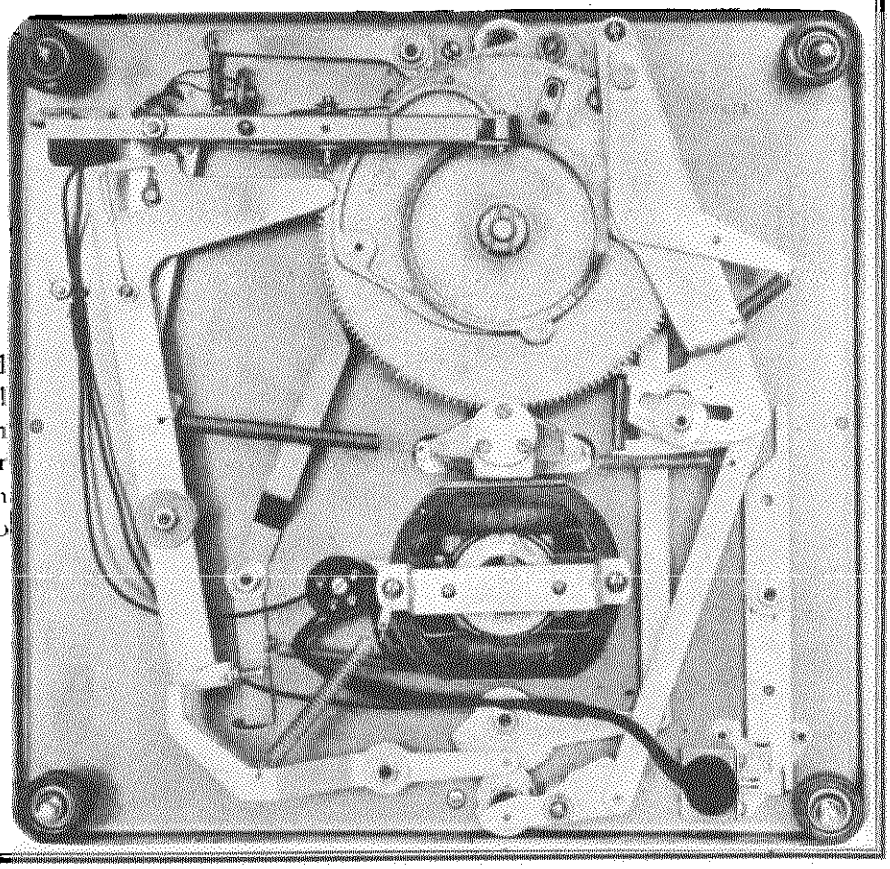
In figure B the Main Cam advanced so the "Boss" on Main Cam has moved the Cer ing Lever Return Arm away f the cam, which because of the turn Spring causes the Cente Arm through the Rocker Levers Plunger Shafts to move the Re Plungers toward the Spindle. to the motion being transmi through the Return Spring, diffe diameter records are handled ec ly well. The equalizer spring in exactly centering the recor regard to the Spindle. Note, in illustration the Tone Arm Sv Lever is part way up the Shoulder.



In Fig. C the Trip Roller (part of Main Cam Assembly) has advanced to move the rear plunger rocker away from the spindle, at the same time moving the front plunger rocker toward the spindle. Due to the Plunger Shafts, which transmit the motion of the Rockers to the Record Plungers, the Record Plungers move in the opposite direction from the Rockers, i.e. Front Record Plunger moves away from the Spindle. This causes the record to be pushed off the Rear Shelf and drop to the Rear Hooks.

FIGURE C

FRONT



Between C & D the Record Plungers go through the central position and assume the position shown in Fig. D where the Rear Record Plunger moves away from the Spindle causing the record to drop to the Front Hooks.

FIGURE D

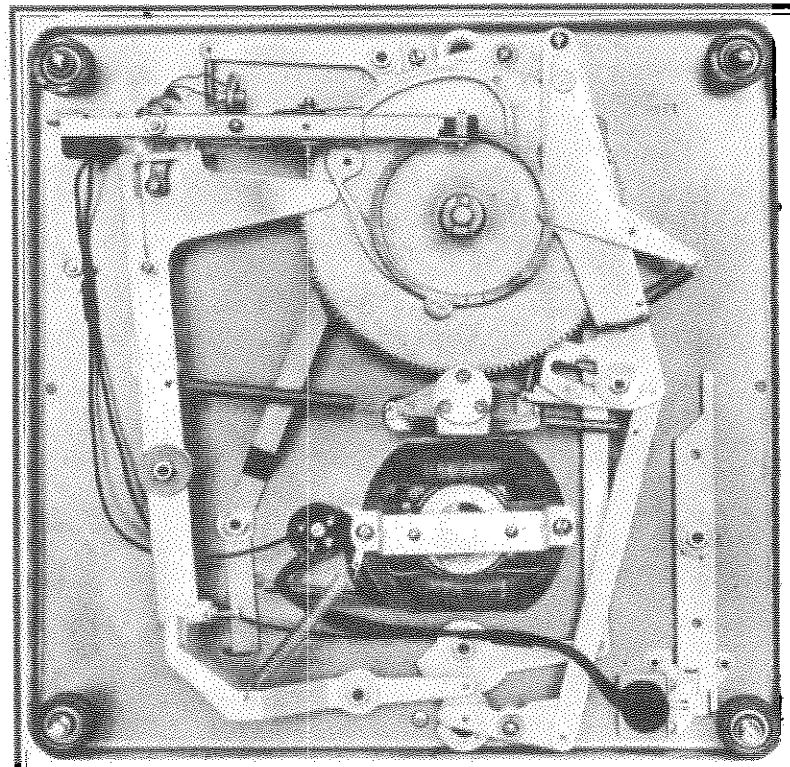
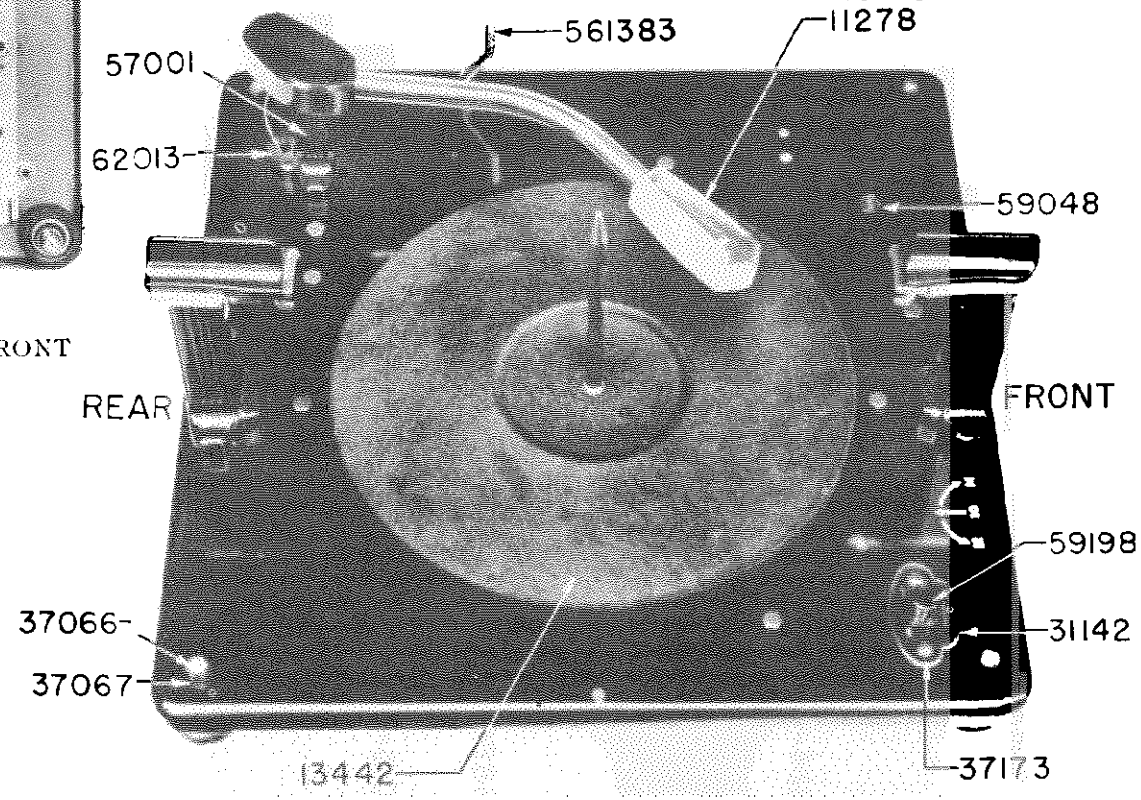


FIGURE E

In Fig. E the Centering Lever Return Arm has dropped into the "Slot" in the Main Cam, moving both Plungers Rockers toward the Spindle, causing the Front and Rear Hooks to snap back, permitting the record to settle flat on the turntable. In this illustration the Tone Arm Swing Lever is returning to the normal position.

TOP VIEW P-62 RECORD CHANGER

11278	Pickup head assembly
13442	Turntable assembly
31142	Escutcheon for automatic on-off switch
37066	Acorn Palnut, record changer mounting
37067	Flat washer, record changer mounting
37173	#6—32 x 3/8" Phil. O.H.M.S. for automatic on-off switch
561383	Tone arm rest
57001	Tone arm support housing
59048	Reject knob
59198	Knob for automatic on-off switch
62013	Rubber bushing for tone arm support post



MODEL P-62 FARNSWORTH TELEV. & RADIO CORP.

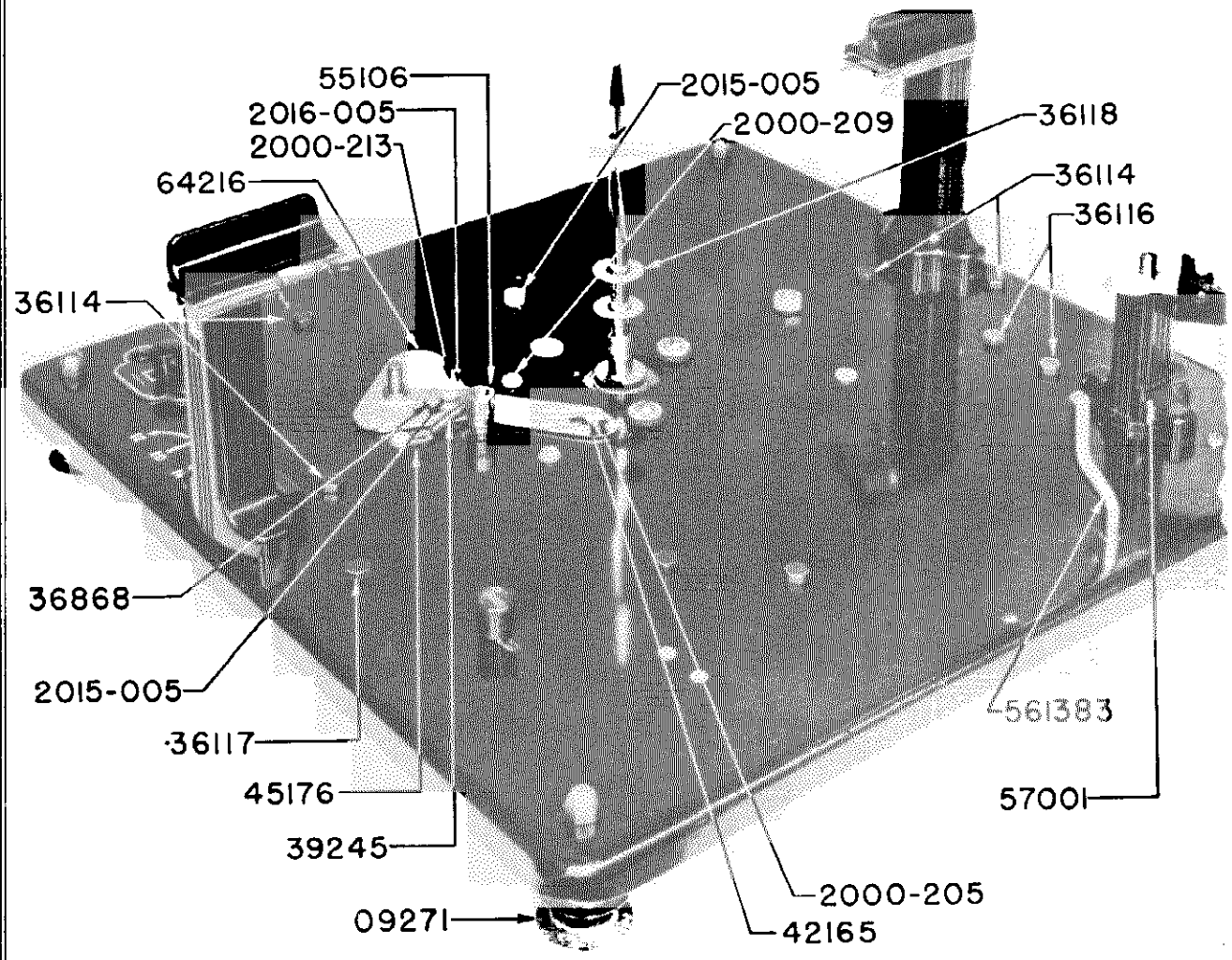


FIGURE 2
TOP VIEW WITH TURNTABLE REMOVED

09271	Record changer m't'g spring assembly
36114	#10—32 x 21/32" H.H. bolt
36116	#10– 32 x ¼" H.H. bolt
36117	#10—32 x 1" H.H. bolt
36118	Spacer Washer
39245	Spring for idler pulley bracket
45176	Spring clip
55106	Motor pulley (60 cycle)
561383	Tone arm rest
57001	Tone arm support housing
64216	Mounting bracket for idler pulley
	2000-209 #8—32 x ⅜" R.H.M.S.
	36868 Brass washer
	42165 Spacer
2000-205	#8—32 x ¼" R.H.M.S.
2000-213	#8—32 x ½" R.H.M.S.
2015-005	#8—32 x 11/32" Hex nut
2016-005	#8—32 x ¼" Hex nut

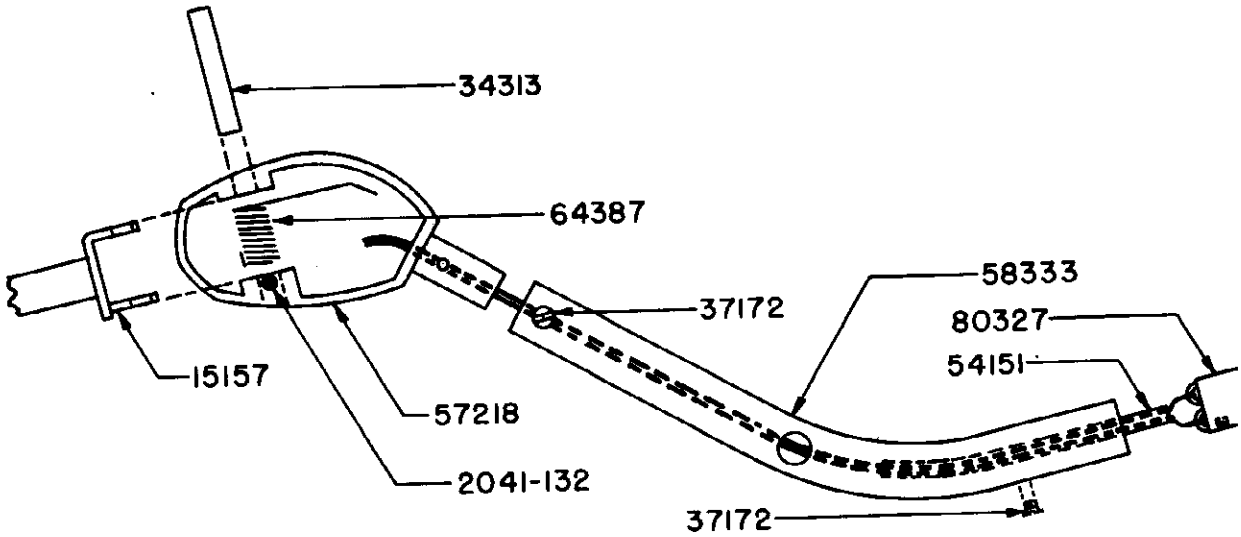


FIGURE 3—TONE ARM ASSEMBLY

15157	Tone arm support tube and bracket assembly
34313	Hinge pin
37172	#4—36 x 1/8" Spec. flat head M.S. (Chrome)
54151	Insulating sleeve
57218	Tone arm end
58333	Tone arm tube (Chrome)
64387	Counterbalance spring
80327	2 Pin socket
2041-132	Set screw for hinge pin

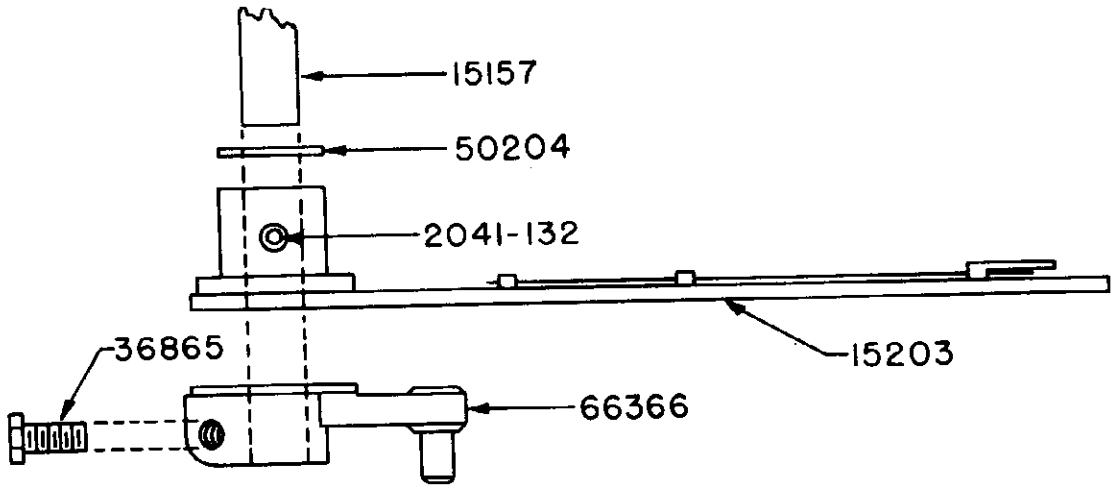


FIGURE 4—TRIP LEVER ASSEMBLY

15157	Tone arm support bracket and tube assembly
15203	Trip lever, collar and spring assembly
36865	#10—24" x 1/2" H.H.M.S.
50204	Cork washer, 3/4" O.D.
66366	Tone arm crank assembly
2041-132	#6—32 x 3/16" set screw

MODEL P-62 FARNSWORTH TELEV. & RADIO CORP.

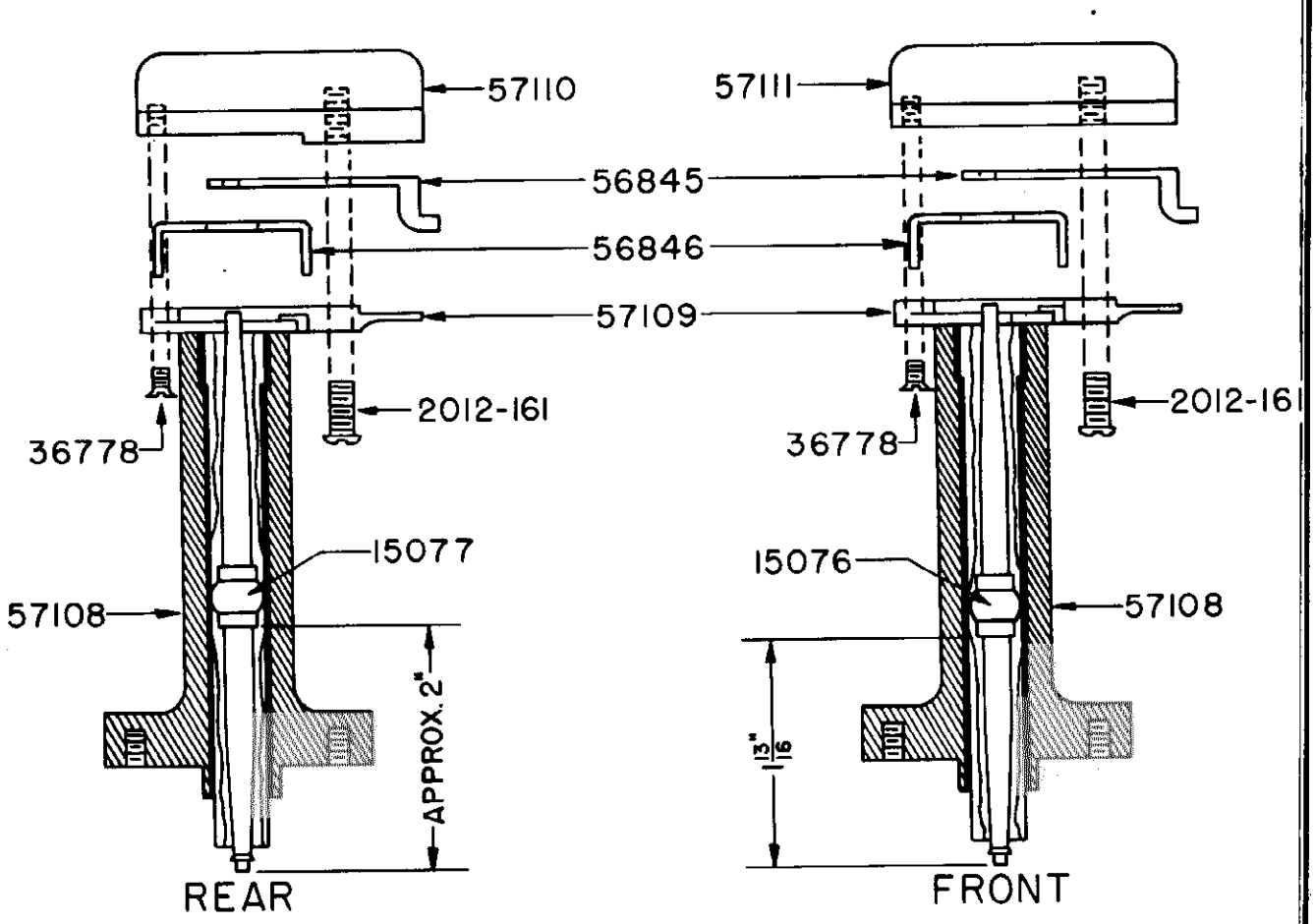


FIGURE 5

RECORD SUPPORT POST AND COVER ASSEMBLY

15076	Front plunger shaft assembly
15077	Rear plunger shaft assembly
36778	#4—36 x 3/8" F.H.M.S.
56845	Plunger 10"
56846	Plunger 12"
57108	Record support post
57109	Record support shelf & tube assembly
57110	Shelf cover (rear)
57111	Shelf cover (front)
2012-161	#6—32 x 7/16" Bdg. H.M.S.

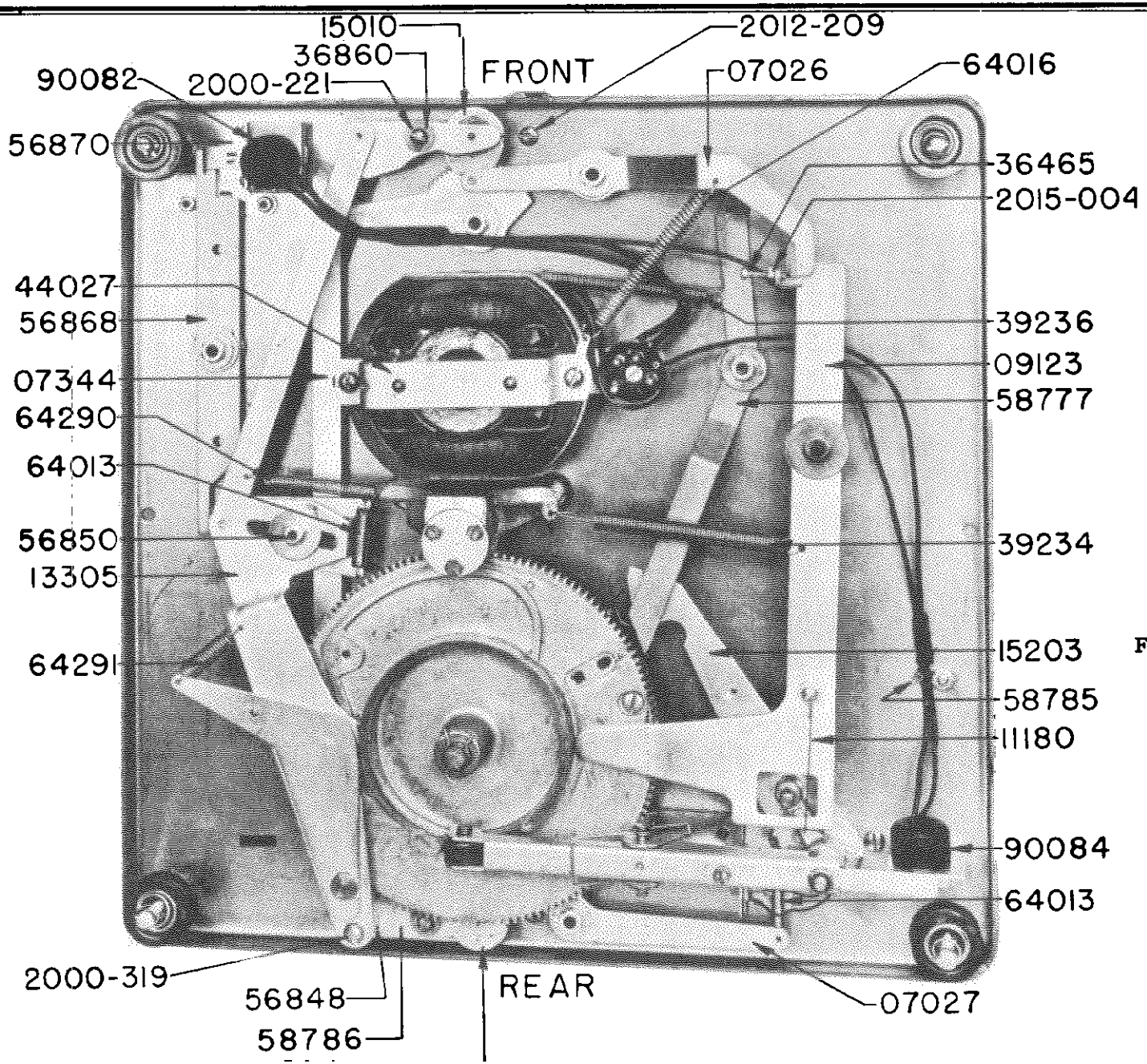

15010
36860
90082
2000-221
FRONT
2012-209
07026
64016
56870
36465
2015-004
44027
56868
39236
07344
09123
64290
58777
64013
56850
39234
13305
64291
15203
58785
11180
90084
64013
2000-319
56848
58786
REAR
07027

FIGURE 6

FIGURE 6 — PARTS LIST

07026 Front locking lever assembly
- 36117 #10—32 x 1" Spec. H.H. bolt
- 36845 #10 flat washer ¾" O.D.
- 56112 Mounting spacer
- 2015-007 #10—32 Std. Hex nut
- 2019-006 #10 S.P. Int. lockwasher

07027 Rear locking lever assembly
- 36114 #10—32 x 21/32" Spec. H.H. bolt
- 36878 #10 flat washer ⅝" O.D.
- 56122 Mounting Spacer
- 2015-007 #10—32 Std. hex nut
- 2019-006 #10 S.P. Int. lockwasher

07344 Connecting link assembly
- 36114 #10-32 x 21/32" Spec. H.H. bolt
- 36873 Spring wave washer
- 36874 Flat washer ¾" O.D. x 17/64" I.D. x .050"
- 36878 #10 flat washer, ⅝" O.D.
- 56263 Gear sector spacer
- 2015-007 #10—32 Std. hex nut
- 2019-006 #10 S.P. Int. lockwasher

09123 Tone arm return lever assembly and feed-in spring assembly
- 36112 #10 Flat washer 1" O.D.
- 36115 #10—32 x 1½" Spec. H.H. bolt
- 56103 Mounting spacer
- 2015-007 #10—32 Std. hex nut
- 2019-006 #10 S.P. Int. lockwasher

11180 Feed-in spring assembly
- 2000-155 #6—32 x ¼" R.H.M.S.
- 2017-003 #6 Std. flat washer
- 2019-004 #6 S.P. Int. lockwasher

13305 Centering lever and rocker assembly
- 36860 #8 Flat washer
- 56848 Spacer
- 2000-221 #8—32 x 1" R.H.M.S.
- 2019-005 #8 Int. lockwasher

15010 Front gear and cam assembly

15011 Rear gear and cam assembly

15203 Trip lever, collar and spring assembly

36465 #6—32 x ⅝" Spec. R.H.M.S.

39234 Spring for tone arm return lever

39236 Spring, reject lever

44027 Motor

56848 Spacer

56850 Centering lever guide stud
- 56849 Washer for guide stud
- 2015-005 #8—32 Hex nut 11/16 A.F.
- 2019-005 #8 S.P. Int. lockwasher

56868 Switch shifting lever (on-off switch)
- 36114 #10—32 x 21/32" Spec. H.H. bolt
- 36867 #10 Flat washer ⅝" O.D.
- 36873 Spring wave washer
- 36874 Flat washer ¾" O.D. x 17/64 I.D. x .050"
- 56263 Mounting spacer
- 2015-007 #10—32 Std. hex nut
- 2019-006 #10 S.P. Int. lockwasher

56870 Switch mounting bracket
- 37173 #6—32 x ⅜" Phil. oven H.M.S.
- 2016-004 #6—32 Std. hex nut ¼ A.F.
- 2019-004 #6 S.P. Int. lockwasher

58785 Trip finger stop

58777 Reject lever
- 36136 #10 Flat washer ¾" O.D.
- 36231 #10—32 x ½" Spec. H.H. bolt
- 56865 Spacer
- 2015-007 #10—32 Std. hex nut

58786 Plunger rocker

64013 Spring

64016 Spring, front locking lever

64290 Spring

64291 Spring

90082 Automatic on-off switch
- 60205 Switch cover
- 2000-153 #6—32 x 3/16" R.H.M.S.
- 2019-004 #6 S.P. Int. lockwasher

90084 Cycling switch
- 36624 #6—32 x ½" Phil. Bdg. H.M.S.
- 56881 Mounting spacers
- 561144 Switch cover

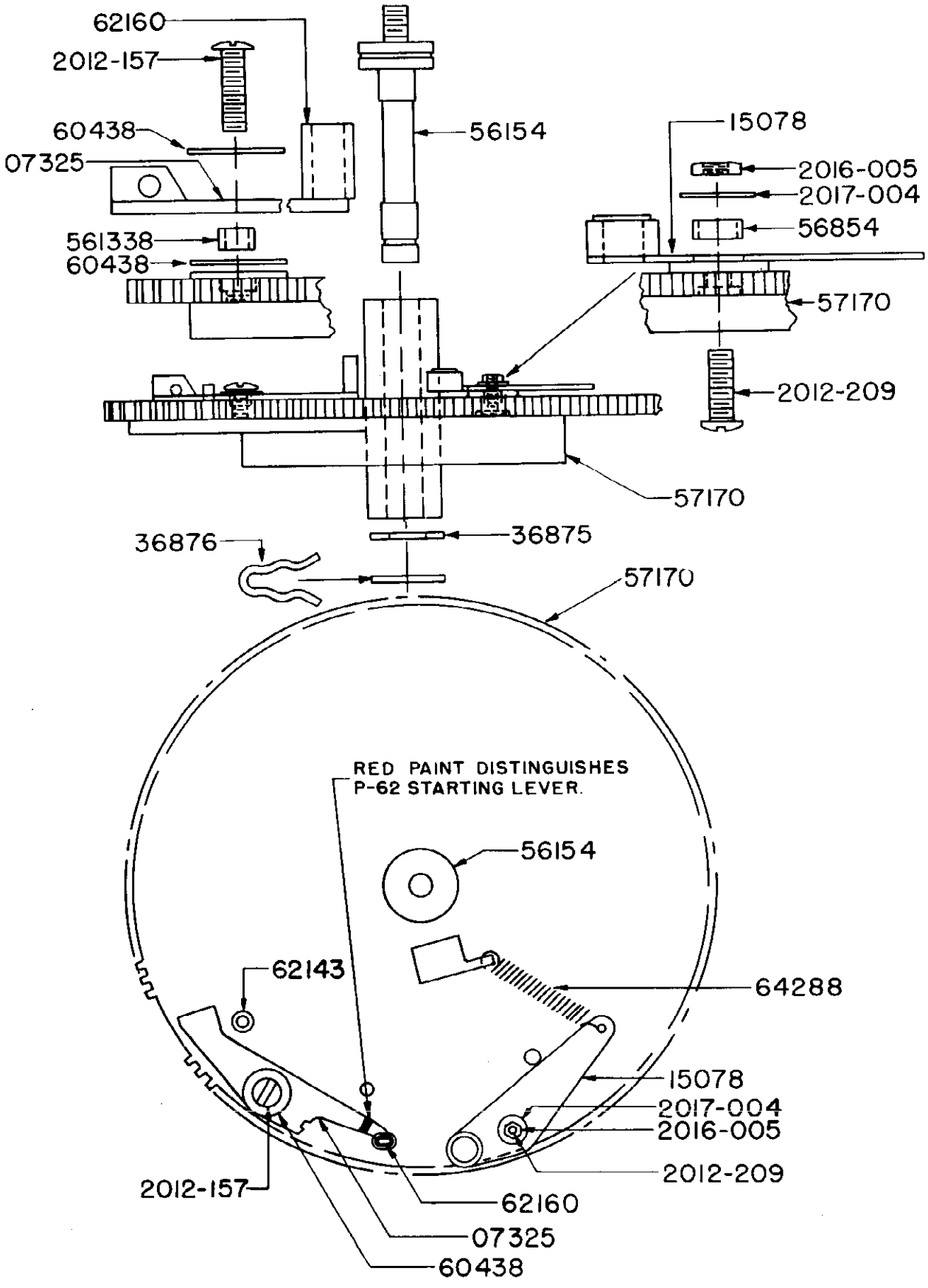
2000-221 #8—32 x 1" R.H.M.S.

2000-319 #10—32 x ⅞" R.H.M.S.

2012-209 #8—32 x ⅜" Bdg. H.M.S.

2015-004 #6—32 Hex nut 5/16" A.F.

FARNSWORTH TELEV. & RADIO CORP. MODEL P-



RE 7 — MAIN CAM ASSEMBLY

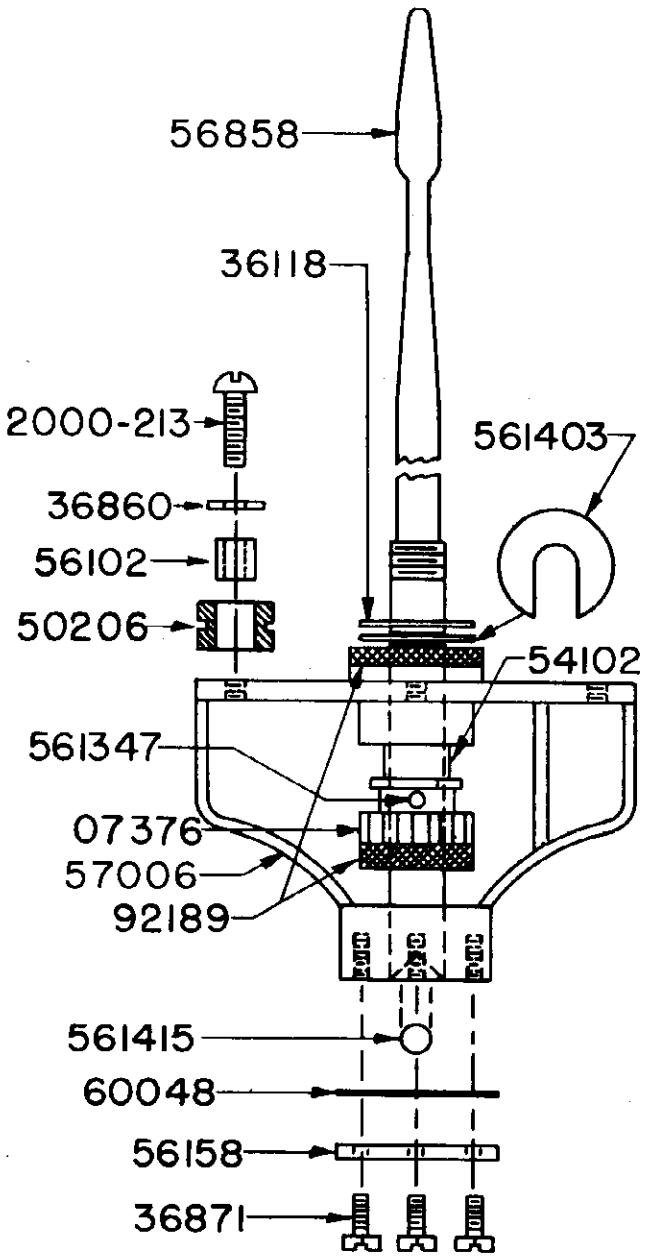


FIGURE 8

SPINDLE AND BRACKET ASSEMBLY

FIGURE 8

SPINDLE AND BRACKET ASSEMBLY

PARTS LIST

07376	Gear and starting pawl assembly
36118	Flat spacer washer
36860	Flat washer
36871	#6—32 x ¼" H.H.M.S.
50206	Rubber grommet
54102	Fibre spacer
56102	Spacer
56158	Thrust plate, spindle bracket
56858	Spindle
561347	Pin
561403	"C" washer, turntable stop
561415	3/16" diameter ball
57006	Support bracket for spindle
60048	Gasket, spindle bracket
92189	Felt washer
2000-213	#8—32 x ½" R.H.M.S.

MAIN CAM ASSEMBLY PARTS LIST — FIGURE 7

.07325	Starting lever assembly
15078	Trip roller assembly, main cam
36875	Flat washer, main cam stud
36876	Hair pin cotter, main cam stud
56154	Mounting stud, main cam
56854	Spacer, trip roller mounting
561338	Spacer, starting lever mounting
57170	Main cam, casting, only
60438	Paper washer for starting lever
62143	Rubber sleeve
62160	Sleeve for starting lever
64288	Spring for trip roller bracket
2012-157	#6—32 x 5/16" Bdg. H.M.S.
2012-209	#8—32 x ⅜" Bdg. H.M.S.
2016-005	#8—32 x ¼" Hex nut
2017-004	Washer, main cam

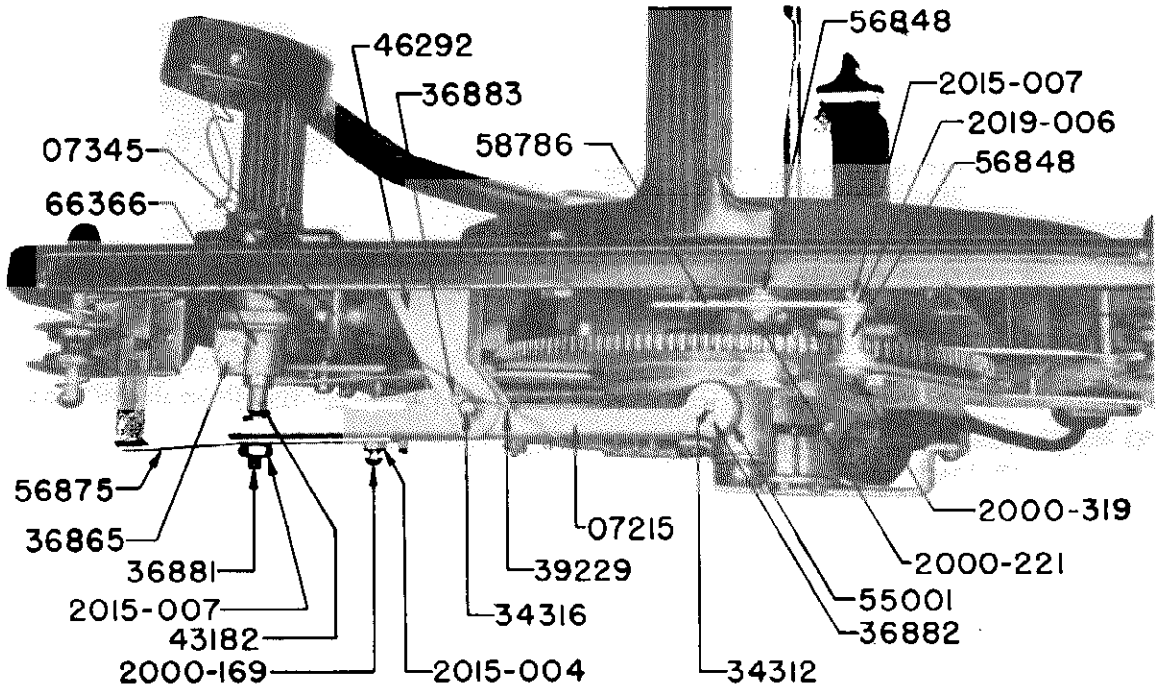


FIGURE 9 — TONE ARM LIFT LEVER ASSEMBLY

07215 Tone arm lift lever and brake spring assembly
07345 Pickup socket and bracket assembly
2012-207 #8—32 x 5/16" Bdg. H.M.S.
56251 Wire clip
34312 Pin for tone arm lift lever roller
34316 Pin for tone arm lift lever pivot
36865 #10—24 x ½" HHMS for tone arm crank
36881 #10—32 x ½" HHMS
36882 Hairpin cotter for lift lever roller
36883 Hairpin cotter for tone arm lift lever pivot pin
39229 Spring for tone arm lift lever
43182 Tone arm lift rod
46292 Mounting bracket for tone arm lift leve
55001 Tone arm lift lever roller
56848 Rocker lever spacer
56875 Operating finger for cycling switch
58786 Plunger rocker
66366 Tone arm crank
2000-169 #6—32 x ⅞" RHMS
2000-221 #8—32 x 1" RHMS
2000-319 #10—32 x ⅞" RHMS
2015-004 #6—32 hex nut
2015-007 #10—32 Std. hex nut
2019-006 #10 Sp. Int. lockwasher

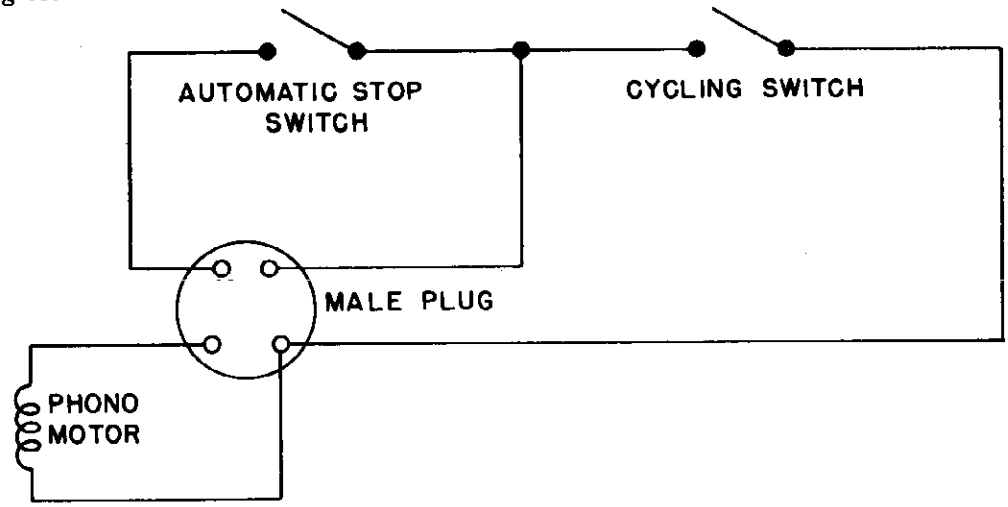


FIGURE 10 — CIRCUIT DIAGRAM

SERVICE SUGGESTIONS

1. TO REMOVE TURNTABLE 13442

The Spindle Gear may be wedged, by a screwdriver between it and the Main Cam, to prevent its turning while the Turntable is unscrewed from the Spindle. When removing the Turntable make certain none of the Spacer Washers are lost. These Washers often adhere to the Turntable because of an oil film from the Felt Washer. When replacing Turntable make sure it is properly tightened. NEVER USE GAS PLIERS TO HOLD SPINDLE.

2. TO REPLACE OR ADJUST IDLER PULLEY 13441

First remove Turntable. The Idler Pulley is used to transfer power from the Motor Pulley 55106 to the Turntable. If the Idler Spring tension is incorrect the Turntable speed may be too high or too low, it should fall between 76.59 R.P.M. and 80.00 R.P.M. This tension is adjusted by loosening the Motor Mounting Screw holding the Spring Holder 45176 and turning the Spring Holder until the required tension is secured.

If it is necessary to replace the Idler Pulley remove the Hair Pin Cotter 36869 and the Thrust Washer 50209. After removing the Idler Pulley also remove the Thrust Washer used underneath the pulley. If the Idler Pulley is replaced both Thrust Washers should be also.

When replacing the Pulley a single drop of oil should be used on the Pulley Stud.

CAUTION—Do not allow oil to get on either the Idler Pulley or the Turntable Rim.

3. ALIGNMENT OF RECORD SUPPORT SHELVES

The center line of the record shelves should form a straight line, in 10″ position, which passes through the center of the spindle. The shelves should be exactly 9 and 41/64 inches apart, plus or minus .005″, and should be equidistant from the spindle. In the event it becomes necessary to change the spacing of the record shelves it is recommended that shims be used to adjust them. In some cases if oversized or undersized records are used it may be necessary to change the spacing of the shelves.

4. ALIGNMENT OF RECORD SPINDLE

To prevent feedback the Spindle, Gear and Bracket Assembly is rubber mounted and can shift in transit. To reposition the spindle loosen all three mounting screws, position the spindle and tighten all three mounting screws equally; so as not to force the spindle out of place which may happen if one screw is tightened first.

5. SHELF LOCKING LEVER ADJUSTMENTS

The Front Record Shelf 57111 should be lined up with the record spindle in the 10″ position. The Shelf Locking Cam 15010 is lined up with the center line of the Gear Sector Assembly and adjusted until the Locking Lever is properly seated in the Shelf Locking Cam. The Record Shelf should not be permitted to slip when adjusting these parts.

When aligning the Rear Shelf Locking Cam the Locking Lever Hex Head Mounting Screw may be loosened to permit the necessary adjustment to properly align the Shelf Locking Cam and Shelf Locking Lever.

6. RECORD DROP

If a record fails to drop due to the record plunger not coming out far enough, remove the plunger shaft assembly (No. 15076 or 15077) and check to see if it is bent. If neither of these are bent and both front and rear plungers do not have sufficient travel loosen screw 2012-209 (Fig. 7 Page 12) and move screw out toward rim of main cam. Make sure that the plunger shafts are not reversed as they are not interchangeable. If the front plunger, only, lacks sufficient travel loosen screw 2000-221 (Fig. 9 Page 14) to a sliding tension and lightly bump stud 56848 out slightly toward edge of changer baseplate. Retighten screw to maintain adjustment. If the rear plunger, only, lacks sufficient travel loosen the corresponding mounting screw on the rear of the changer and bump the stud lightly toward the edge of the changer baseplate. Retighten screw to maintain adjustment.

7. NEEDLE LANDING AND TRIP SETTING.

Needle landing must be set correctly for 10″ record before any attempt is made to set the trip lever. Loosen the Allen set screw in the trip lever collar and loosen the set screw in the tone arm crank. Insert a .008″ spacer between the tone arm

SERVICE SUGGESTIONS---Continued

support bracket and the top of the tone arm support post. Set the automatic on-off switch in manual position, set the record support shelves in 10" position and run the changer by hand through cycle until playing position is reached. Press down on the tone arm support tube and up on the tone arm crank. Set the needle in approximately 3/32" from the outside of a 10" record. Press the tone arm crank pin firmly against the outer edge of the cut-out in the tone arm return lever. This will depress the feed-in spring slightly. Tighten the tone arm crank set screw. Move the tone arm in until the needle is 1⅞" from the center of the spindle. Set the trip lever so that it is touching the end of the starting lever and starting to move the lever in to engage the pawl on the spindle. Tighten the Allen set screw in the trip lever collar.

8. TONE ARM HEIGHT ADJUSTMENT (See Fig. 9)

With records on the shelves, the top of the pickup arm at the highest point in its return should be 3/16" below the bottom of the lowest record on the shelves. When so adjusted the needle will not slide across the top of a stack of twelve ten inch records during the change cycle. To set this correctly, remove the power plug from the changer at that part of the cycle where the tone arm has reached maximum lift and just before it starts to swing out. In this position loosen locknut No. 2015-007 and adjust machine screw No. 36881 for correct tone arm height. Tighten locknut securely after correct adjustment is made.

9. STARTING LEVER.

If there is a tendency for the spindle to "jump" when the cycle starts due to the main cam and spindle gear not meshing properly, it is probably due to the end of the starting lever being bent.

10. MOTOR SPEED

Due to commercial tolerance it is impossib to secure motors which will run at exactly 78.2 R.P.M. Our limits are from 76.59 R.P.M. to 80.(R.P.M.

In the event it becomes necessary to get exa speed on one of these changers choose a mot pulley that gives a slightly higher speed than r quired. Using a fine file reduce the diameter the motor pulley a little at a time until the require speed is secured.

11. THE FOLLOWING SIMPLE OILING IN STRUCTIONS WILL RESULT IN *MINIMUM OF SERVICE CALLS—*

Every six months or once each year, two three drops of oil should be put on the two fe washers in the Spindle Gear Bracket. One wash is located at the bottom of the Spindle Gear, tl other is at the top of the bracket and is accessib by removing the Turntable. Two or three dro of oil on the felts in the Motor. One drop of c on the Pin for the roller of the Tone Arm Li Lever. A very light application of White Vaseli on the teeth of the Main Cam, also some on tl face of this Cam where the Tone Arm Swing Lev rides. A single drop of oil on the 10" and 1 plungers. Care should be exercised to prevent excess of oil being used on any part.

No further lubrication on the tone arm bearir will be necessary unless a replacement is mad In this case a thin film of vaseline may be used.

Care should be taken to see that no oil gets the motor pulley, idler pulley or rim of the tur table.

Use only a good grade of machine oil with viscosity of SAE 10.

MODEL P-62 FARNSWORTH TELEV. & RADIO CORP.

PARTS LIST FOR P-62 RECORD CHANGER

Part No.	DESCRIPTION
56154	Mounting Stud for Main Cam
56158	Thrust Plate
56251	Wire Clip
56263	Mounting Spacer
56845	Plunger 10"
56846	Plunger 12"
56848	Rocker Lever Spacer
56849	Centering Lever Washer
56850	Centering Lever Guide Stud
56854	Spacer,Trip Roller Mtg.
56858	Turntable Spindle
56865	Spacer, Reject Lever Mtg.
56868	Switch Shifting Lever for Automatic On-off Switch
56870	Switch Mtg. Bracket for Automatic On-off Switch
56875	Operating Finger for Cycling Switch
56881	Spacer, Cycling Switch Mtg.
561144	Cover for Cycling Switch
561338	Spacer for Starting Lever Mtg.
561347	Pin for Spindle Gear
561383	Tone Arm Rest
561403	"C" Washer, Turntable Stop
5614153	16 Dia. Ball
57001	Tone Arm Support Housing
57006	Spindle Support Brkt.
57108	Record Support Post
57109	Record Support Shelf & Tube Assy.
57110	Plastic Cover for Rear Record Shelf
57111	Plastic Cover for Front Record Shelf
57170	Main Cam, Casting Only
57218	Tone Arm End Housing
58333	Tone Arm Tube Only (Chrome)
58777	Reject Lever
58785	Trip Finger Stop
58786	Plunger Rocker
59048	Reject Knob
59198	Auto, On-off Switch Knob
60048	Gasket for Spindle Brkt.
60205	Switch Cover for Automatic On-off Switch
60438	Paper Washer, Starting Lever Mtg.
62013	Rubber Bushing for Tone Arm Support Post
62143	Starting Lever Stop Bumper
62147	Starting Lever Sleeve
62160	Bumper for Starting Lever
64013	Spring
64016	Spring, Front Locking Lever
64216	Idler Bracket & Stud Assy.
64288	Spring, Trip Roller
64290	Spring
64291	Spring
64387	Spring, Tone Arm Counterbalance
66366	Tone Arm Crank Assy.
80327	2 pr. Molded Socket, in Tone Arm Tube
90082	Automatic On-Off Switch
90084	Switch, Cycling
92189	Felt Washer
2000-153	#6—32 x 3/16 R H M S
2000-155	#6—32 x ¼ R H M S
2000-169	#6—32 x ⅜ R H M S
2000-205	#8—32 x ¼ R H M S
2000-209	#8—32 x ⅜ R H M S
2000-213	#8—32 x ½ R H M S
2000-221	#8—32 x 1 R H M S
2000-319	#10—32 x ⅞ R H M S
2012-155	#6—32 x ¼ Bdg. H M S
2012-157	#6—32 x 5/16 Bdg. H M S
2012-161	#6—32 x 7/16" Bdg. H M S
2012-207	#8—32 x 5/16" Bdg. H M S
2012-209	#8—32 x ⅜ Bdg. H M S
2015-004	#6—32 Hex Nut 5/16 AF
2015-005	#8—32 Hex Nut 11/32 AF
2015-007	#10—32 Std. Hex Nut
2016-004	#6—32 Std. Hex Nut ¼ AF
2016-005	#8—32 Hex Nut ¼ AF
2017-003	#6 Std. Flat Washer
2017-004	Washer
2019-004	#6 SP Int. Lockwasher
2019-005	#8 SP Int. Lockwasher
2019-006	#10 SP Int. Lockwasher
2041-132	#6—32 x 3/16 Allen Cup Point Set Screw

PARTS LIST FOR P-62 RECORD CHANGER

Part No	DESCRIPTION
07026	Front Locking Lever Assy.
07027	Rear Locking Lever Assy.
07215	Lever & Brake Spring Assy.
07325	Starting Lever Assy.
07344	Connecting Link Assy.
07345	P. U. Socket & Bracket Assy.
07376	Spindle Gear
09123	Tone Arm Return Lever & Feed-In Spring Assy.
09271	Record Changer Mtg. Spring Assy. (4 required)
11180	Feed-In Spring Assy., Tone Arm Return Lever
11278	Pickup Head Assy.
13305	Centering Lever & Rocker Assy.
13441	Idler Pulley
13442	Turntable
15010	Front Gear & Cam Assy.
15011	Rear Gear & Cam Assy.
15076	Front Plunger Shaft Assy.
15077	Rear Plunger Shaft Assy.
15078	Trip Roller Assy., Main Cam
15157	Tone Arm Support Brkt. & Tube Assy.
15203	Trip Lever, Collar & Spring Assy.
31142	Stop Switch Escutcheon
34312	Pin for Tone Arm Lift Lever Roller
34313	Hinge Pin
34316	Pin for Tone Arm Lift Lever Brkt
36112	#10 Flat Washer
36114	#10—32 x 21/32 H H Bolt
36115	#10—32 x 1½ Spec. H H Bolt, Tone Arm Return Lever Mtg
36116	#10—32 x ¼ Spec. H H Bolt, Tone Arm Lift Lever Mtg.
36117	#10—32 x 1" Spec. H H Bolt
36118	Turntable Washer
36129	¼—28 Std. Hex Nut
36136	#10 Flat Washer
36231	#10—32 x ½ Spec. H H Bolt, Reject Lever Mtg.
36465	#6—32 x ⅜ Spec. R H M S
36624	#6—32 x ½ Phil Bdg. H M S
36690	#10 Flat Washer, ½" O. D. x .042"
36778	#4—36 x ⅜ F H M S, Record shelf cover mtg.
36845	#10 Flat Washer
36860	#8 Flat Washer
36865	#10—24 x ½ H H M S
36867	#10 Flat Washer
36868	Brass Washer
36869	H P Cotter
36871	#6—32 x ¼ H H M S
36873	Spring Wave Washer
36874	Flat Washer
36875	Washer, Main Cam Mtg. Stud
36876	H P Cotter, Main Cam Mtg. Stud
36878	#10 Flat Washer
36881	#10—32 x ½ H H M S
36882	H P Cotter for Lift Lever Roller Pin
36883	H P Cotter for Tone Arm Lift Lever Brkt
37066	Acorn Palnut, Record Changer Mtg.
37067	Flat Washer, Record Changer Mtg.
37172	#4—36 x ⅛ Spec. Flat H M S, Chrome
37173	#6—32 x ⅜ Phil Oven H M S, On-off switch escutcheon mtg
39229	Spring, Tone Arm Lift Lever
39234	Spring, Tone Arm Return Lever
39236	Spring, Reject Lever
39245	Spring for Idler Pulley
42165	Spacer
43182	Tone Arm Lift Rod
44027	Motor
45176	Tension Spring Holder
46292	Mounting Bracket for Tone Arm Lift Lever
50204	Cork Washer (small) ¾" O. D.
50206	Rubber Mtg. Grommet
50209	Thrust Washer for Idler Pulley
54102	Fibre Spacer for Turntable Spindle
54151	Pick-Up Wire Insulating Sleeve
55001	Roller for Tone Arm Lift Lever
55051	Motor Pulley (50 Cycle)
55106	Motor Pulley (60 cycle)
56102	Spacer, Spindle Mtg. Brkt.
56103	Spacer, Tone Arm Return Lever Mtg.
56112	Spacer, Front Locking Lever
56122	Spacer, Rear Locking Lever

RECORD STANDARDS

Major record manufacturers have adopted standards intended to govern the physical characteristics of records produced. Such standards are of course necessary in order that records may properly operate automatic changers.

Below is outlined certain manufacturing standards.

Some records, however, are yet being issued which do not conform to established standards. Some years ago, the knife-edge was unknown—yet today, many cases of faulty operation are traceable to various forms of knife-edge records.

The old masters are yet being used for pressings, resulting in lack of feeding or trip grooves.

Other factors to be considered when tracing malfunction of the record changer are thickness of the record, warpage and chipped edges.

DIMENSIONAL STANDARDS 10" & 12" RECORDS

RECORD SIZES (A)	WEIGHT	OUTSIDE DIA. (B)	THICKNESS (C)	CENTER HOLE (D)	ECCENTRICITY OF HOLE (E)	OUTER EDGE (F)	LEAD SPIRAL (G)	DIA. FIRST GROOVE AT RECORDING PITCH (H)	MIN. INSIDE DIA. RECORDING (I)	ECCENTRIC GROOVE D. (J)	ECCENTRICITY OF ECCENTRIC GROOVE (K)	GUARD CIRCLE (L)
12"	11½ to 12 oz.	11 ± 1/16	.090 +.010 −.000	286 +.001 −.001	.005 MAX.	"V" CONTOUR	FROM OUT EDGE	11½ +.020 −.020	4	5 3/8	1/8	3 5/8
10"	7 to 7½ oz.	9 ± 1/16	.075 +.010 −.005	"	"	"	"	9½ +.020 −.020	4	3 3/8	1/8	3 5/8

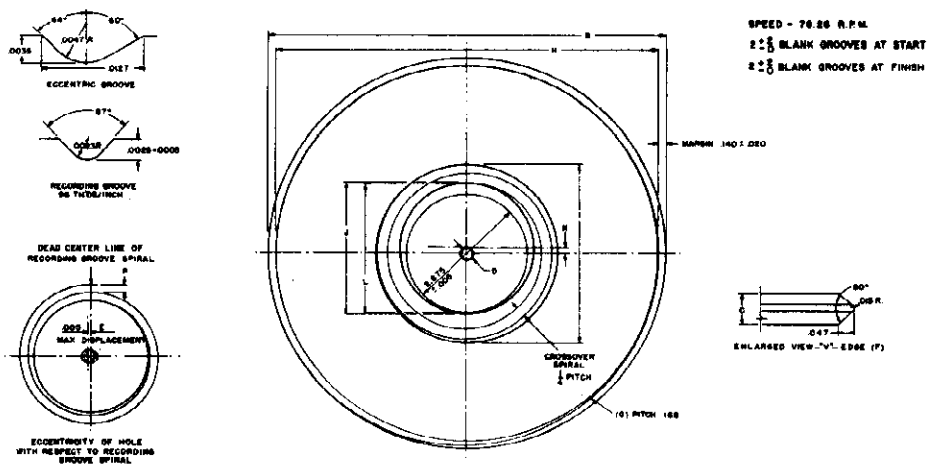


Figure 1

INSTRUCTIONS FOR INSTALLING IMPROVED LOWER RECORD SUPPORT ASSEMBLY WITH DOUBLE SEPARATOR KNIFE

1. Remove the pin from below the base plate on the separator hook assembly. (Part No. 09218.)
2. Screw on adjusting nut. (Part No. 37347.)
3. Replace the pin in the separator hook assembly.
4. Adjust the separator hook post (Part No. 561178), so that the lever arm will have a 1/32" clearance over the cam. (Part No. 57135.)
5. Secure separator hook post with locking nut.
6. Remove the four screws from the lower record support assembly. (Part No. 09189.)
7. Remove the reversing arm lock, lock screw, lock spring, and lock spring anchor stud and install them in the new lower record support assembly.
8. Remove the record reverse guide arm assembly (Part No. 67340) and install it on the new lower record support assembly.
9. Install the new lower record support assembly in the machine and adjust the record ejector arm to clear the bottom of a 10" record by 1/32".
10. Adjust the separator hook assembly to fit the slot in the record ejector arm.
11. Replace the upper record support with the new support (Part No. 57256). Use the same screws in doing this. No adjustment is required with this change.
12. Refer to: Reshaping the Interceptor Reset Lever, Page 15.

MODEL 41-E, CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

Herein is presented a complete listing of the various checks which may be applied to the 41E changer in determining the cause of malfunction. It is recommended that the serviceman follow the listing in detail prior to customer delivery. Having followed the procedure several times and having so gained familiarity with the various checks, he may then employ this section simply as a guide.

Reference is made to section X whose indexing follows that of this section.

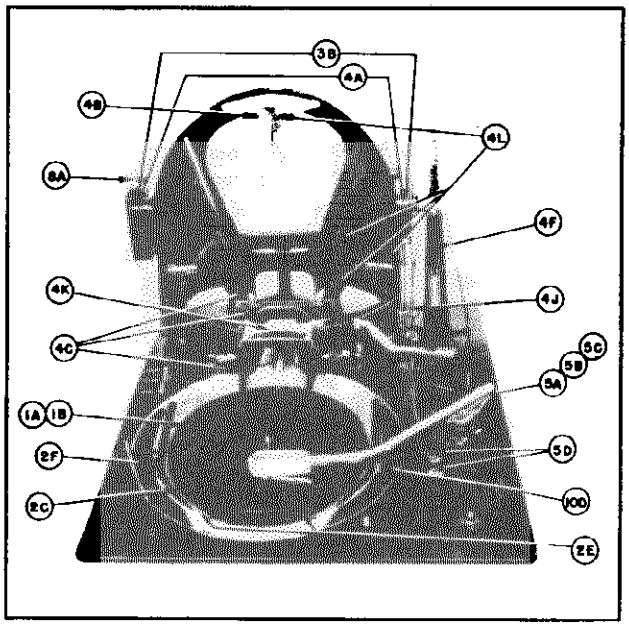


Figure 2A

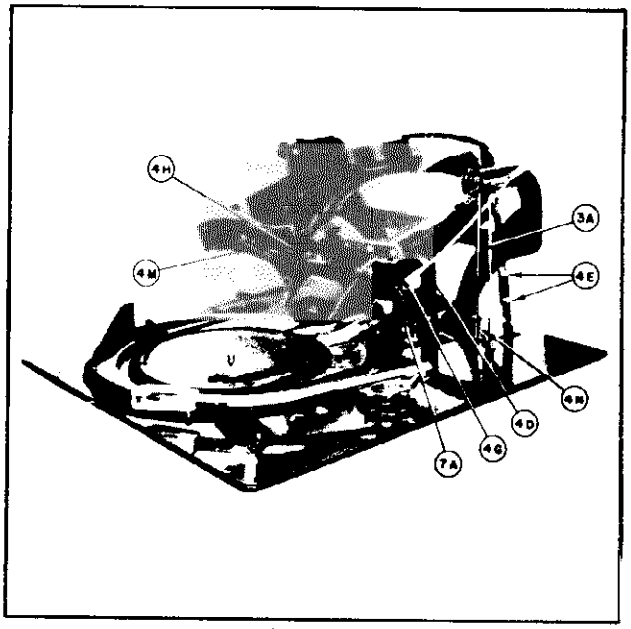


Figure 2B

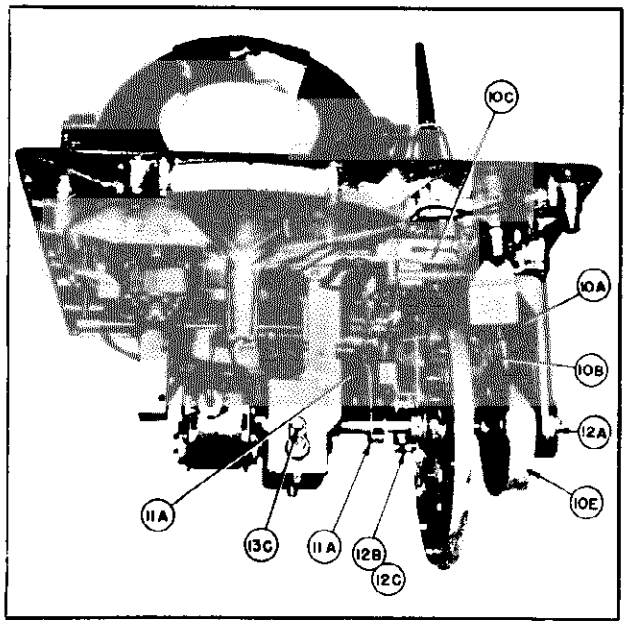


Figure 2C

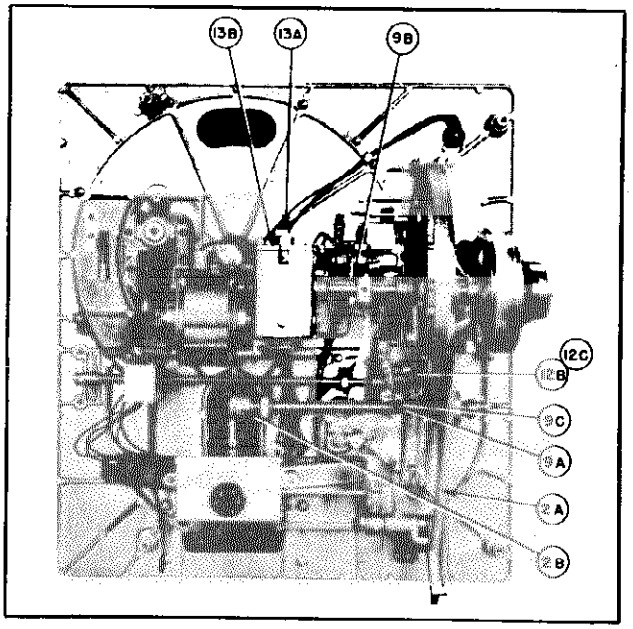


Figure 2D

TURNTABLE

1. A. Check height of turntable.
   B. Check to see that the turntable cover is of the later type with the felt extending 3/8" beyond the plastic. Also check to see that 1/8" felts have been installed on the baseplate under the bosses of the record tray.

RECORD TRAY CHECKS

2. A. Check the position of #561264 record tray slide arm spring.
   B. Check for binding between record tray gears.
   C. Check centering of record tray with turntable.
   D. Check the second pause position of the record tray.
   E. Check 10" rubber bumpers #62101.
   F. Check 10" record guard for smooth operation and roughness.

3. A. Check the distance from the center of #561297 magazine pivot pin, which is mounted in the buckhorn section of the #57138 magazine support, to the milled section of the baseplate, on which is mounted #561178 record separator hook post.
   B. Check distance between buckhorn pivot arms.

MAGAZINE CHECKS

4. A. Check distance between magazine pivot arms.
   B. Check position of the upper record support Part No. 57162 on changers incorporating the single-action separator knife, and part No. 09349 on those using the double separator knife.
   C. Check centering of record magazine in relation to #05084 record bumper guide and felt assembly and record tray.
   D. Check adjustment of #2000-269 magazine stop adjustment screw.
   E. Check adjustment of magazine linkage.
   F. Check #07340 record reverse guide assembly,
      a. centering in magazine
      b. parallel to 12" record
      c. trueness and width of fork section.
   G. Check the adjustment of #15115 record separator stop adjustment.
   H. Check the action of #15124 record separator and hub assembly.
   J. Check the relation between the end of #15124 record separator and hub assembly and #55016 record separator hook.
   K. Check the #561177 record support bracket.
   L. Check lubrication and surfaces.
   M. Check lower record support felts for loose ends and proper shape.
   N. Check record separator hook post #561178.

TONE ARM

5. A. Check tone arm height.
   B. Check the distance of travel of the tone arm in toward the turntable spindle on a 12" record.
   C. Check pickup.
   D. Check 10" and 12" adjustments.

TRIP SLIDE ASSEMBLY

6. A. Check trip slide and arm assembly.
      a. height above baseplate at rubber roller end,
      b. slide action
      c. working freely in pressed sleeve bearing in baseplate
      d. tension setting of #561213 friction trip lever screw
      e. setting of stop.

RECORD BUMPER GUIDE

7. A. Check #05084 record bumper guide and felt assembly.
      a. position
      b. curvature of ends.

8. A. Check play control.

BELOW CHASSIS—Reverse Arm Mechanism

9. A. Check position of #561238 reverse segment adjustment cam.
   B. Check adjustment of reverse arm linkage.
   C. Check adjustment of #09197 reverse arm unlocking lever assembly.

TONE ARM MECHANISM

10. A. Check horizontal and vertical position of #09198 tone arm crank assembly, also relation to #07313 tone arm swing lever assembly.
   B. Check position of #561375 tone arm brake spring collar.
   C. Check action of #13408 tone arm stop bracket assembly.
   D. Check for roughness, at the point of interception with a 12" record, of #13408 tone arm stop bracket assembly.
   E. Check position of #57142 tone arm cam.
      a. horizontally on main cam shaft.
      b. clockwise and anti-clockwise on main cam shaft for timing with main cam.
   F. Check tone arm trip pin.

MERCURY SWITCH OPERATION

11. A. Check the position of #561221 main cam shaft mercury switch reset lever,
      a. timing with main cam
      b. point of interception with #561222 mercury switch dog. Check the clearance between #09176 trip slide assembly and #561222 mercury switch dog.

MAIN CAM SHAFT ASSEMBLY

12. A. Check for horizontal play in the main cam shaft with the record magazine tilted up.
   B. With the selector lever in the one side position and while the changer is going through change cycle, check clearance between #561204 magazine slide arm selector pin and the #57154 gravity operated main cam switch rest pin (rest pin is part of the #57135 main cam casting) with the play taken up in the #07341 magazine slide arm rivet assembly toward the main cam. With the selector lever in the one side position and while the changer is going through change cycle, check for definite interception of #561204 magazine slide arm selector pin and #57155 spring loaded main cam switch with the play taken up in the #07341 magazine slide arm rivet assembly away from the main cam.
   C. Check cam switches #57154 and #57155.
   D. Check lubrication on the cam tracks.
   F. Check for screw in cam. (See page 15.)

GEAR REDUCTION BOX

13. A. Check adjustment of #561246 gear box end thrust screw.
   B. Check cover alignment.
   C. See that bottle of oil s placed in the gearbox.

MODEL 41-E,
CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

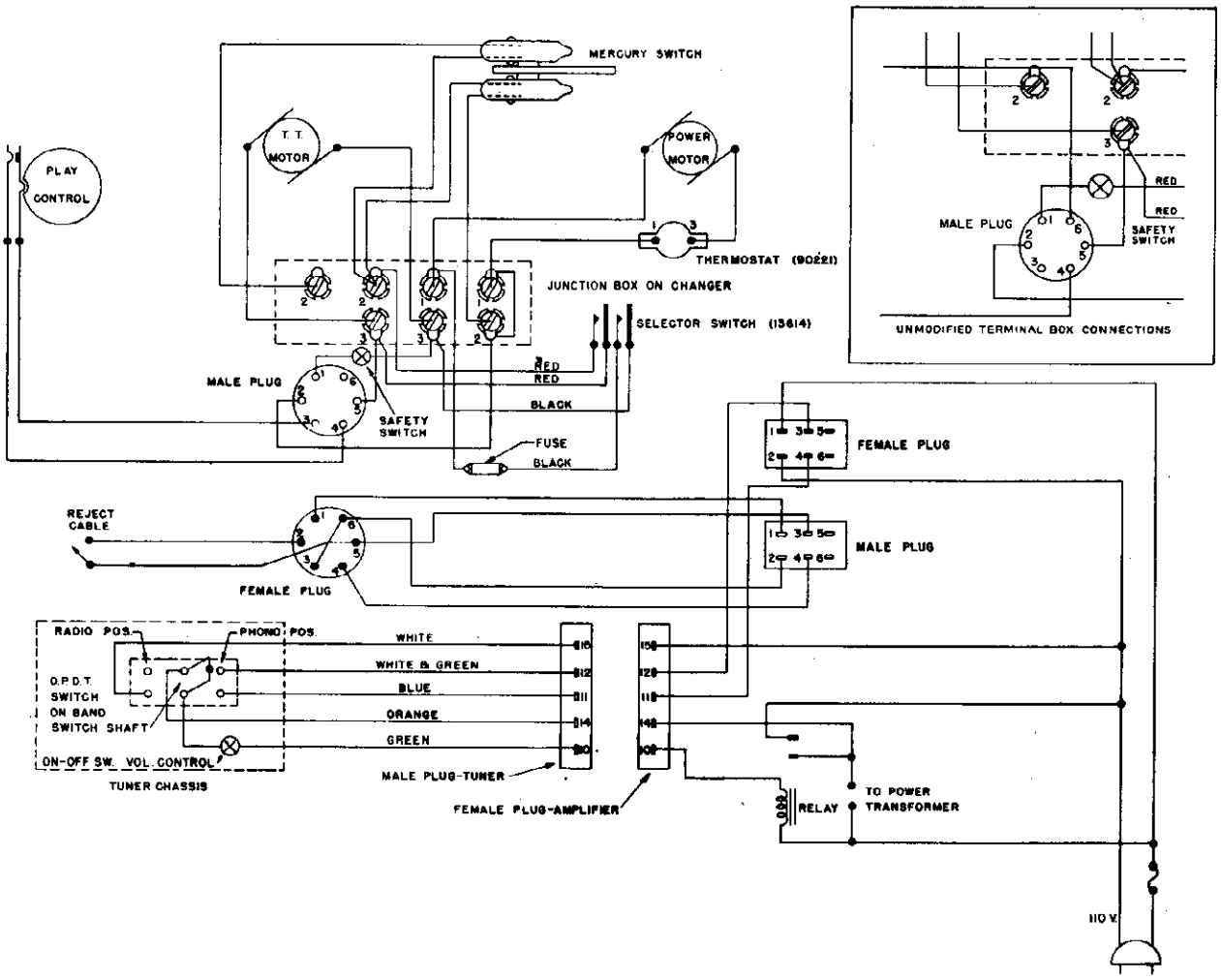


Figure 3

In the Electrical System of the 41E Changer we have:

1. Two (2) mercury switches mounted on one bracket and actuated by the mechanical trip. One operates the Cycle Motor. The other is used to keep the changer in operation to complete the cycle, should the instrument be turned off during a change cycle. These may be used to shut off current, when working under baseplate, by raising bulbs.

2. There is a manually operated switch on top of the base that opens the circuit of both motors (T. T. and C. M.) so that the changer may be stopped during any part of the cycle.

3. There is a switch that opens the circuit of the cycle motor when the shift lever is placed in the manual position.

4. Also built as part of the changer is a play control which shuts the whole instrument off after it has completed the desired number of selections. The play control is mechanically operated by the action of the magazine.

WIRING MODIFICATIONS

Wiring modifications have been two in number. (1) No fuse was incorporated in the early changers. (2) Junction box wiring was originally as here shown, which we shall term the "unmodified" changer. Identification is by a colored dot painted on the bearing cover plate of the main cam support bracket as follows:

Red dot or no dot—unmodified changer.
Brown dot—modified changer.

This modification was occasioned by the introduction of N4 instruments using the 41E changer.

At the same time, connecting cables (terminating in the 6-prong socket) of instruments other than the N4-series were changed by the addition of a jumper between terminals #3 and #6. Such a cable change permits the use of a modified changer in any instrument. Only the modified changer may be used in the N4 instrument.

The thermostat (safety) switch is mounted on the cycling motor.

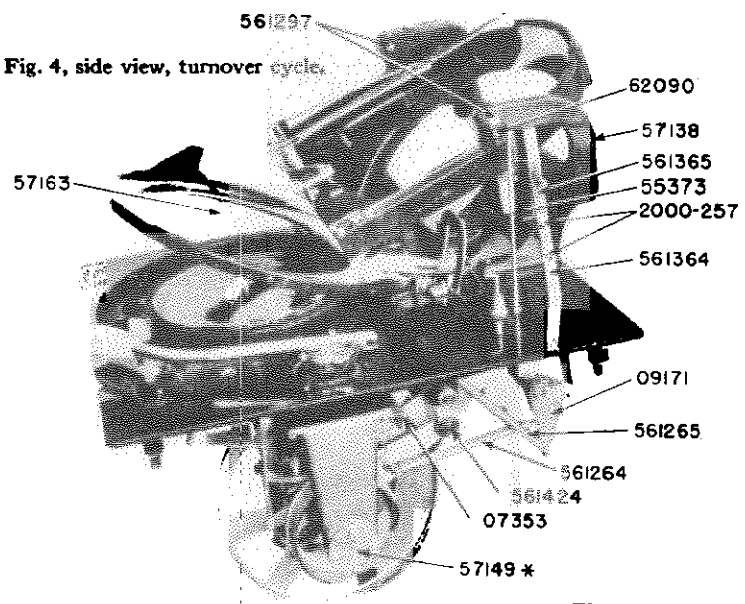


Fig. 4, side view, turnover cycle.

Figure 4

Part No.	Description
07353	Pickup Socket and Bracket Assembly
09171	Magazine Slide Arm Lever Assembly
55373	Magazine Support (Right) Tie Rod
57138	Magazine Support
57149	Bearing Support Cover Plate, Main Cam Shaft
57163	10-inch Guard, Record Tray
62090	Rubber, Reverse Arm Rest Pin
561264	Spring, Record Tray Slide Arm
561265	Spring, Magazine Slide Arm Lever
561297	Magazine Pivot Pin
561364	Magazine Link, Lower
561365	Magazine Link, Upper
561424	Eccentric Shoulder Screw, Record Tray Slide Arm
2000-257	#10—24x5/16" R.H.M.S.

*Designates expanded drawing.

Figure 5

Part No.	Description
05074	Play Control Knob & Dial Assembly
05084	Record Bumper Guide & Felt Assembly
07340	Record Reverse Guide Assembly
11278	Pickup Head Assembly
13419	Record Reverse Arm & Fork Assembly
13424	Turntable Assembly
15133	Tone Arm Support Housing & Lower Bearing Assembly
36855	#10-24x1/4" Allen Set Screw
39130	Reverse Guide Spring
57137	Record Magazine Casting
57140	Lower Record Support Casting
57145	Tone Arm Support Bracket (chrome)
57162	Upper Record Support (chrome)
58317	Tone Arm Tube (chrome)
59169	Capehart Name Plate (plastic)
59171	Selector Lever Escutcheon
62101	Record Tray Bumper (front) 4 required
62102	Record Tray Bumper (rear) 2 required
90182	Toggle Switch S.P.S.T.
92194	Record Tray Felt, large, 2 required
92195	Record Tray Felt, small, 2 required
92196	Magazine Felt, 2 required
92219	Magazine Felt, 2 required
561177	Record Support Bracket (chrome)
561179	Tray Hinge Pin
561180	Reversing Arm Lock
561194	Adjusting Screws, 10" and 12" set down
561233	Magazine Roller

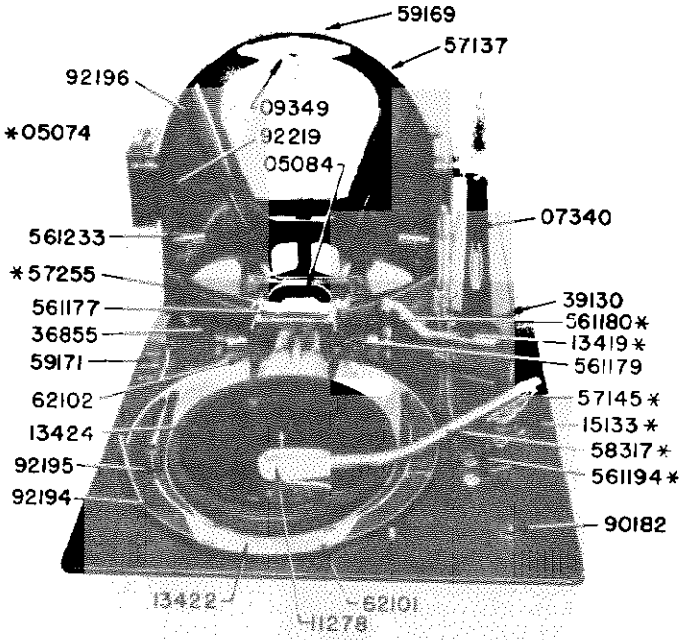


Fig. 5, top view, playing position.

MODEL 41-E,
CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

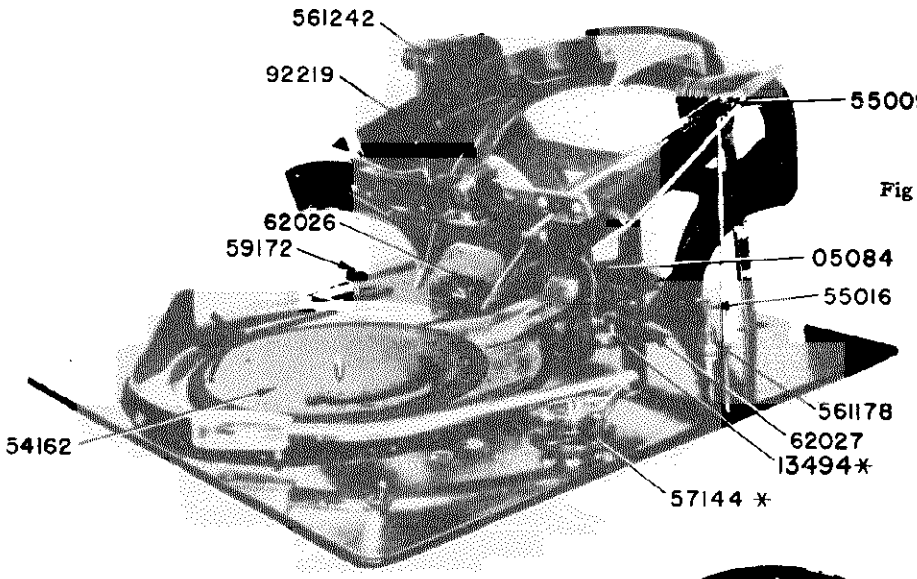


Fig 6—Side view—one side cycle.

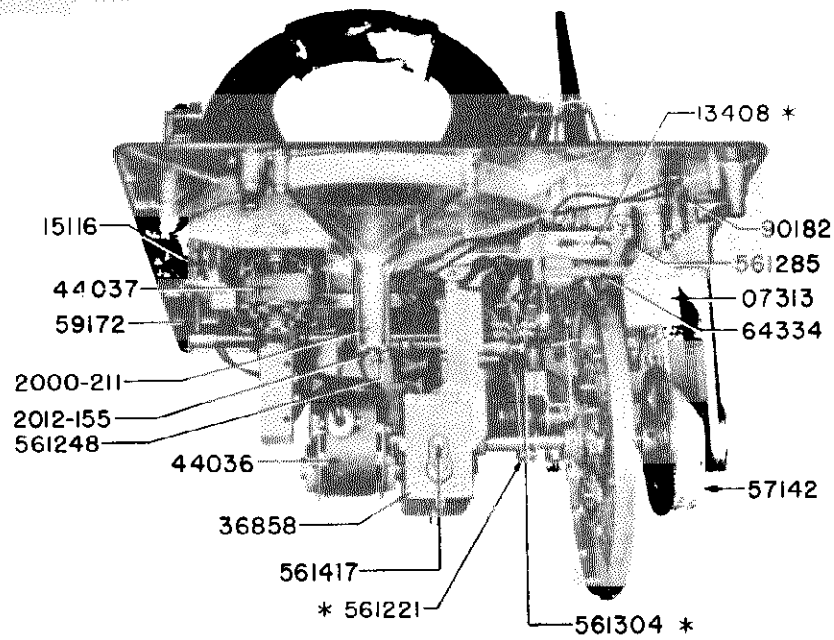


Fig. 8—Bottom view—showing gear reduction box.

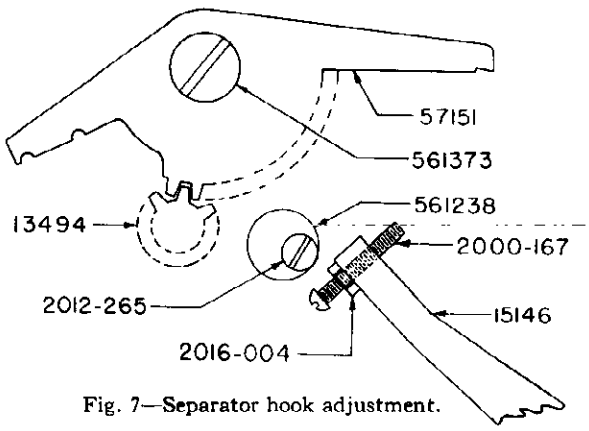


Fig. 7—Separator hook adjustment.

FARNSWORTH TELEV. & RADIO CORP.

MODEL 41-
CAPEHART

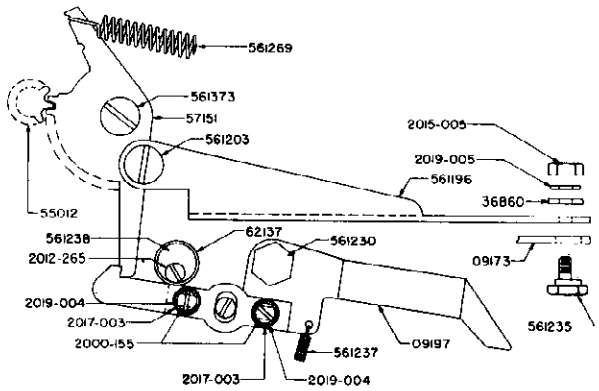


Fig. 10 Reverse arm linkage adjustment.

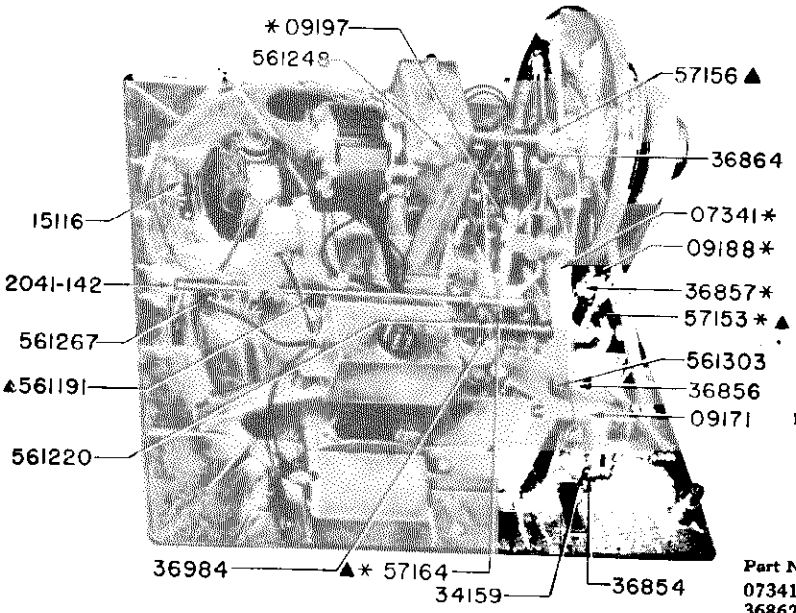


Fig. 9 Bottom view showing magazine slide arm.

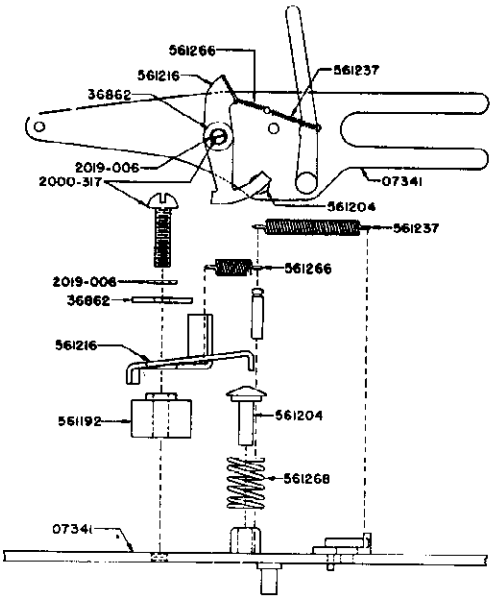


Fig. 11 Magazine slide arm assembly.

FIGURE 9

Part No.	Description
07341	Magazine Slide Arm, Rivet Assembly only
09171	Magazine Slide Arm Lever Assembly
09188	Slide Arm Assembly, Record Tray (not sold as an assembly)
	36857 ¼"x28 Hex Nut
	561234 Slide Pin
	561273 Slide Arm
	2019-007 ¼" S.P. Int. Lockwasher
09197	Reverse Arm Unlocking Assembly
15116	Guard Roller and Bracket Assembly (10-inch)
34159	Arm Lever Pin, Magazine Slide
36854	Cotter Pin
36856	⅜"x24 Std. Hex Nut, Magazine
36857	¼-28 Hex Nut ¼" thick, Record Tray Slide Arm
36864	#0x13/16" Taper Pin
36984	Driv-Lok Pin 3/32"x¾"
57153	Drive Arm, Record Tray Shaft
▼57156	Collar, Magazine Slide Arm
▼57164	Selector Lever Stop
▼561191	Selector Shaft
561220	Spring Stop Washer, Tray Shaft
561248	Thrust Plate, Reduction Gear Box
561267	Spring, Selector Shaft
561303	Shoulder Screw, Magazine Slide Arm
2041-142	#8 - 32x3/16" Allen Set Screw

FIGURE 11

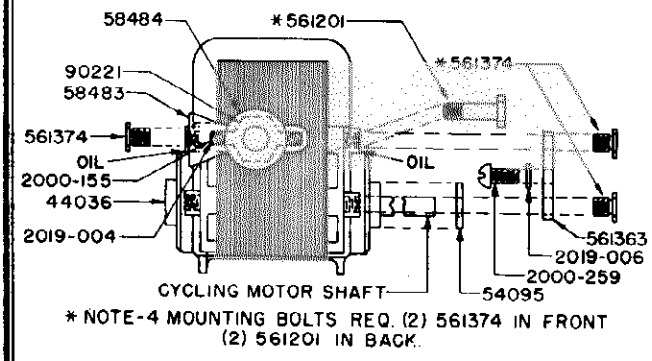
Part No.	Description
07341	Magazine Slide Arm Rivet Assembly
36862	Flat Washer, 196" I.D.x¾" O.D.x1/6" Th.
561192	Magazine Slide Arm Spacer
561204	Magazine Slide Arm Selector Pin
561216	Magazine Slide Arm Selector Lever
561237	Magazine Slide Arm Unlocking Lever Spring
561266	Magazine Slide Arm Selector Lever Spring
561268	Magazine Slide Arm Selector Pin Spring
2000-317	#10—32x¾" R.H.M.S.
2019-006	#10 S.P. Int. Lockwasher

FIGURE 10

Part No.	Description
09173	Reverse Arm Lever and Hub Assembly
09197	Reverse Arm Unlocking Lever Assembly
36860	#8 Flat Washer ½" O.D. x 1/32" Th.
55012	Reverse Pinion
57151	Record Reverse Pinion Segment
62137	Locking Lever Silencer
561196	Reverse Arm Link
561203	Reverse Arm Link Screw
561230	Shoulder Screw, Reverse Unlocking Lever
561235	Reverse Lever Eccentric Screw
561237	Unlocking Lever Spring, Magazine Slide Arm
561238	Reverse Segment Stop Adjustment Cam
561269	Reverse Segment Arm Lever Spring
561373	Reverse Segment Shoulder Screw
2000-155	#6—32x¼" R.H.M.S.
2012-265	#10—24x⅝" Bdg. H.M.S.
2015-005	#8—32 Hex Nut 11/32" A.F.
2016-004	#6—32 Hex Nut ¼" A.F.
2019-004	#6 S.P. Int. Lockwasher
2019-005	#8 S.P. Int. Lockwasher

MODEL 41-E, CAPEHART

FARNSWORTH TELEV. & RADIO CORP.



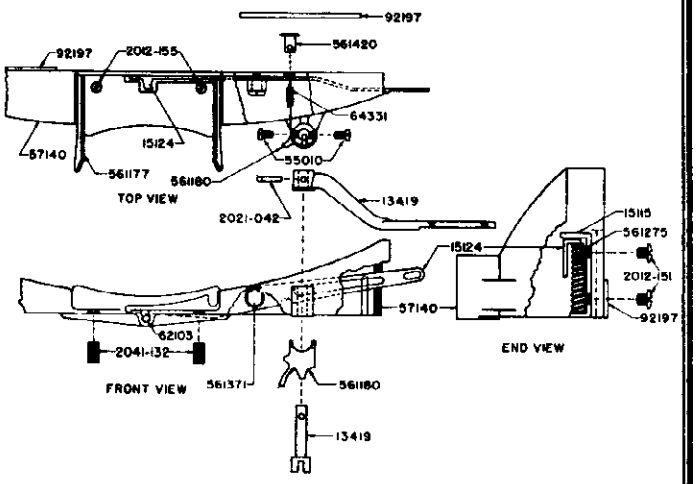


Fig. 14 Lower record support assembly (single separator knife).

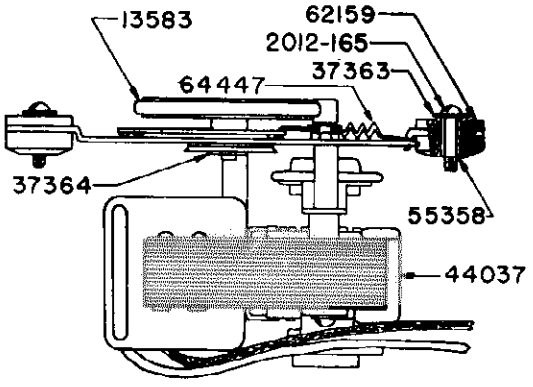


Fig. 12 (Top) cycling motor.
Fig. 13 (Bottom) Turntable motor.

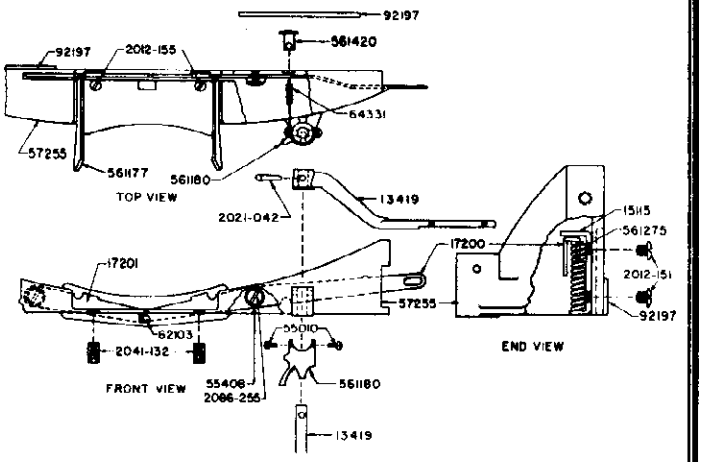


Fig. 15 Lower record support assembly (double separator knife).

FIGURE 12

Part No.	Description
44036	Cycling motor
54095	Motor to gear box gasket
58483	Thermostat bracket
58484	Thermostat Cover
90221	Thermostat
561201	Motor Mounting Bolt (long)
561363	Motor Mounting Bracket
561374	Motor Mounting Bolt (short)
2000-155	#6—32x1/4" R.H.M.S.
2000-259	#10—24x3/8" R.H.M.S.
2019-004	#6 S.P. Int. Lockwasher
2019-006	#10 S.P. Int. Lockwasher

FIGURE 13

Part No.	Description
13583	Idler Pulley
37363	Flat Washer (brass)
37364	Hairpin Cotter
55358	Sleeve Spacer
60533	Fibre thrust washer (upper)
60534	Fibre thrust washer (lower)
62159	Rubber motor mounting grommet (turntable motor)
64447	Spring
2012-165	#6—32x5/8" Bdg. H.M.S.

FIGURE 14

Part No.	Description
13419	Reverse Arm & Fork Assembly
15115	Record Separator Stop Assembly
15124	Record Separator and Hub Assembly
55010	Reversing Arm Lock Screw
57140	Lower Record Support Casting
62103	Reverse Arm Bumper
64331	Reverse Arm Lock Spring
92197	Lower Record Support Felt
561177	Record Support Bracket
561180	Reversing Arm Lock
561275	Record Separator Spring
561371	Separator Knife Shoulder Screw
561420	Reverse Arm Lock Spring Anchor Stud
2012-151	#6—32x1/8" Bdg. H.M.S.
2012-155	#6—32x1/4" Bdg. H.M.S.
2021-042	#00x1/2" Taper Pin
2041-132	#6—32x3/16" Allen Cup Pt. Set Screw

FIGURE 15

Part No.	Description
17200	Record Ejector Assembly, R.H.
17201	Record Ejector Assembly, L.H.
55408	Record Ejector Bearing
2086-255	#8-32x1/4" Truss H.M.S. Brass

(All other parts same as for the single separator knife.)

FARNSWORTH TELEV. & RADIO CORP.

MODEL 41.
CAPEHART

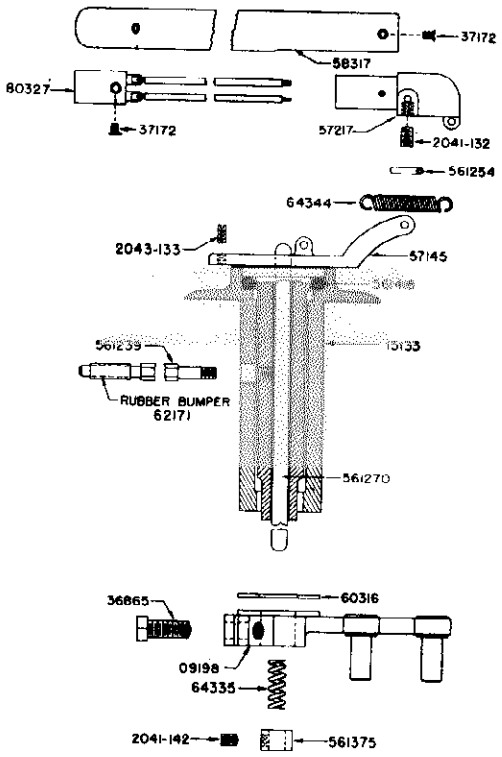


Fig. 16 Tone arm assembly and tone arm support housing assembly.

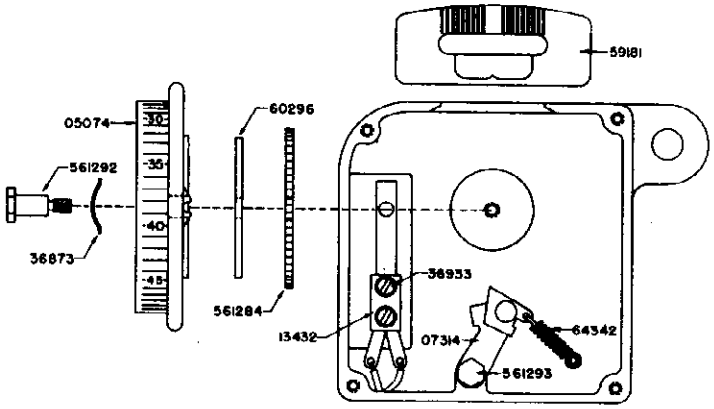
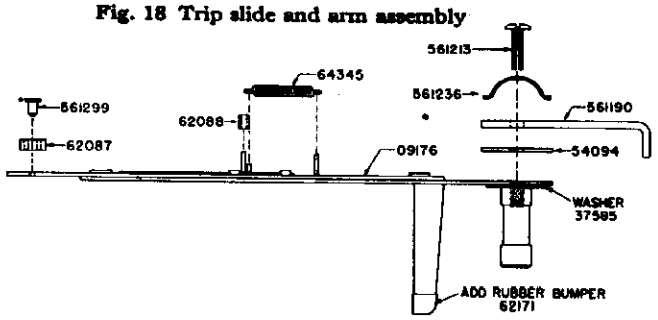


Fig. 17 Play Control Assembly.

Fig. 18 Trip slide and arm assembly



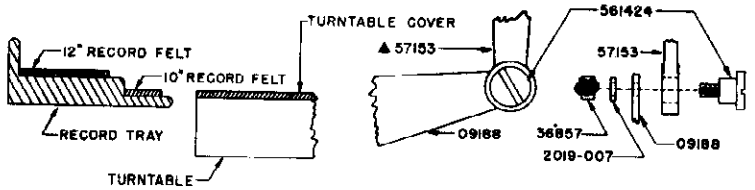


Fig. 19

FIGURE 16

Part No.	Description
09198	Tone Arm Crank Assembly
15133	Tone Arm Support Housing & Lower Bearing Assembly
36875	#10—24x1/2" H.H.M.S.
37172	#4—36x1/8" Flat H.M.S.
57145	Tone Arm Support Bracket (chrome)
57217	Tone Arm End (chrome)
58317	Tone Arm Tube only (chrome)
60316	Tone Arm Brake Facing Cork Washer
64335	Tone Arm Brake Spring
64344	Tone Arm Counter Balance Spring
80327	Two Prong Molded Socket (tone arm)
561239	Tone Arm Trip Pin
561254	Tone Arm Hinge Pin
561270	Tone Arm Lift Rod
561375	Tone Arm Brake Spring Collar
561416	5/32" Diam. Ball, Tone Arm Support (17 required)
2041-132	#6—32x3/16" Allen Cup Pt. Set Screw
2041-142	#8—32x3/16" Allen Cup Pt. Set Screw
2043-133	#6—32x1/4" Slotted Cup Pt. Set Screw

FIGURE 19

Part No.	Description
57172	Separator Hook Arm
561238	Reverse Segment Adjustment Cam
561373	Reverse Segment Shoulder Screw
2000-167	#6—32x3/4" R.H.M.S.
2012-265	#10x5/8" Bdg. H.M.S.
2016-004	#6—32 Hex Nut 1/4" A. F. x 3/32 Th.
2015-005	#8—32 Hex Nut 11/32" A.F.
2016-004	#6—32 Hex Nut 1/4" A.F.
2019-004	#6 S.P. Int. Lockwasher
2019-005	#8 S.P. Int. Lockwasher

FIGURE 17

Part No.	Description
05074	Play Control Knob and Dial Assembly
07314	Play Control Pawl Assembly
13432	Play Control Switch Assembly
36873	Spring Wave Washer
36236	#6-32x1/4" Phillips O.H.M.S. Play Control Cov Mtg.
36933	#5- 40x1/2" R.H.M.S.
59181	Play Control Escutcheon
60296	Cork Washer
64342	Pawl Spring
561283	Play Control Cover Plate
561284	Play Control Ratchet
561292	Play Control Stud
561293	Pawl Screw

FIGURE 18

Part No.	Description
09176	Trip Slide Assembly
54094	Friction Trip Cork Washer
62087	Trip Roller
62088	Rubber Stop
64345	Trip Slide Spring
561190	Automatic Stop Trip Lever
561213	Friction Trip Lever Screw
561236	Friction Trip Spring Wave Washer
561299	Trip Stud

MODEL 41-E, CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

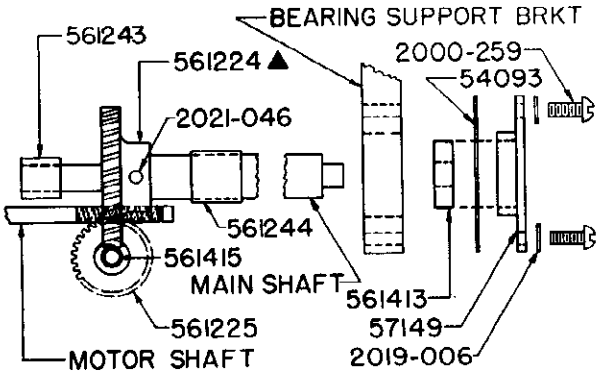


Fig. 20. Reduction gear box train.

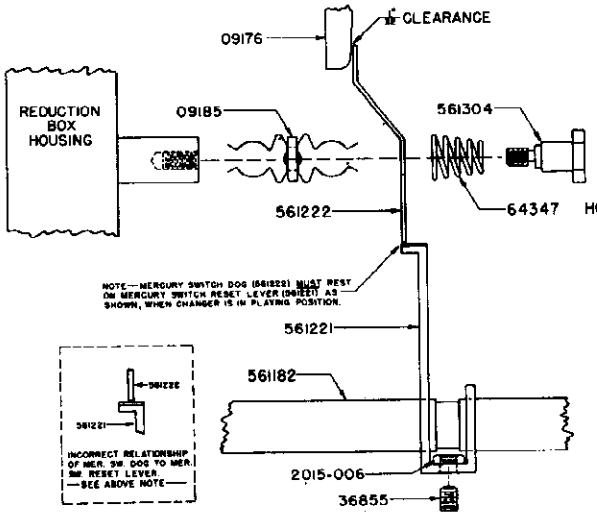


Fig. 21. Mercury switch adjustment screws and related parts.

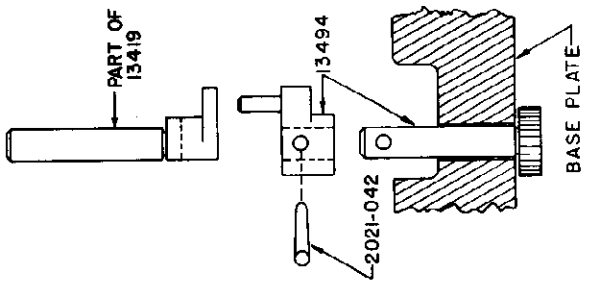


Fig. 22. Reverse pinion and crank assembly.

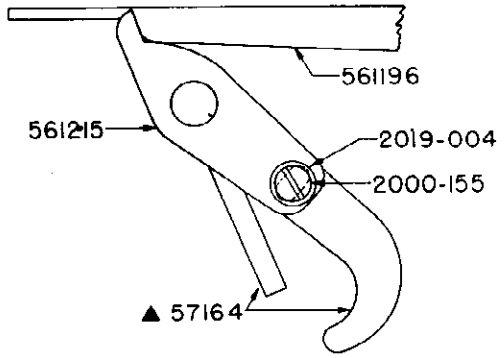
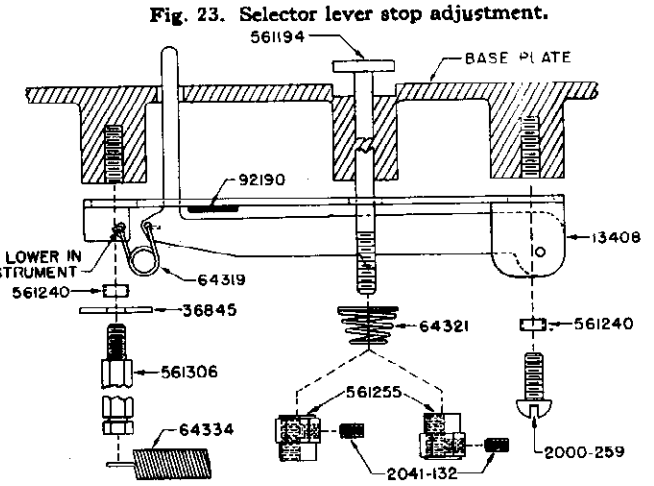


Fig. 23. Selector lever stop adjustment.



NOTE PART NOS. 561194, 64321, AND 561255. TWO OF EACH ARE REQUIRED, ONE FOR 10" TONE ARM ADJ. & ONE FOR 12" TONE ARM ADJ. ECCENTRIC SHOULDER ON 561255 SHOWN DOWN FOR 10" ADJ. AND UP FOR 12" ADJ.

Fig. 24. Tone arm stop bracket assembly and tone arm adjusting screw.

FIGURE 20

Part No.	Description
54093	Bearing Support Shim, Main Cam Shaft
57149	Bearing Support Cover Plate, Main Cam Shaft
561224	Main Shaft Gear, Second Reduction
561225	Second Reduction Gear & Shaft
561242	Sleeve Bearing (used on each end of 561225 Gear and Shaft Assembly)
561243	Sleeve Bearing, Small, Main Shaft
561244	Sleeve Bearing, Large, Main Shaft
561413	Main Shaft Ball Bearing and Race
561415	3/16" dia. Thrust Ball Bearing; Gear Box and T. T. Spindle
2000-259	#10 24x3/8" R.H.M.S.
2019-006	#10—S.P. Int. Lockwasher
2021-046	#00—1" Taper Pin

FIGURE 22

Part No.	Description
13494	Reverse Pinion and Crank Assembly
2021-042	#00 x 1/2" Taper Pin
13419	Record Reverse Fork and Arm Assembly

FIGURE 24

Part No.	Description
13408	Tone Arm Stop Brkt. Assembly
36845	#10 Flat Washer 3/4" O.D.
64319	Interceptor Spring
64321	Tone Arm Adjusting Spring
64334	Tone Arm Swing Lever Spring
92190	Tone Arm Stop Felt Bumper
561194	Tone Arm Adjusting Screw
561240	Spacer, Tone Arm Stop Bracket
561255	Tone Arm Adjusting Nut
561306	Spring Stud. Tone Arm Stop Bracket
2000-259	#10—24x3/8" R.H.M.S.
2041-132	#6—32x3/16" Allen Cup Pt. Set Screw

FIGURE 21

Part No.	Description
09185	Mercury Switch Mtg. Bracket Assembly
36855	#10—24x1/4" Allen Cup Pt. Set Screw
64347	Mercury Switch Dog Spring
561182	Main Cam Shaft
561221	Mercury Switch Reset Lever, Main Cam Shaft
561222	Mercury Switch Dog
561304	Shoulder Screw, Mercury Switch Mtg.
2015-006	#10—24 Std. Hex Nut

FIGURE 23

Part No.	Description
57164	Selector Lever Stop
561196	Reverse Arm Link
561215	Selector Lever Lock
2000-155	#6—32x1/4" R.H.M.S.
2019-004	#6 S.P. Int. Lockwasher

FARNSWORTH TELEV. & RADIO CORP. MODEL 41-
CAPEHART

INSTRUCTIONS FOR INSTALLING MAGAZINE SUPPORT TIE RODS

PARTS NEEDED

Right Hand Tie Rod	Left Hand Tie Rod
1 Tie Rod (Part #55373 7 15/16" long threaded at both ends	1 Tie Rod (Part #55423) 5 1/16" long threaded at both ends
2 Flat Metal Washers	2 Flat Metal Washers
1 Lock Washer	2 Lock Washers
3 Hex Nuts	4 Hex Nuts

Run one (1) nut to the full extent of the threads on each end of the rods.

1. Remove magazine link assembly (consisting of parts #561364 and #561365.)

2. Remove the four screws (under base plate) holding the magazine support (#57138), tip the magazine upward and lift magazine support backward with a folding motion, resting the support on a box or other object of proper height to prevent strain on the play control wires.

3. Drill hole in base plate 3/4" from center of separator hook boss, which will be 3 1/2" from rear of base plate and 3 27/32" from right side of base plate (as viewed in cabinet) using 13/64" drill (see drawing).

4. Drill hole in magazine support 7/16" deep with No. 25 drill, 9/16" from the center of magazine pivot pin set screw and 1/4" from edge. NOTE: DO NOT use same drill as used on base plate!

5. Tap hole in magazine support, using #10-24 bottom tap. Use care in tapping to prevent breakage of the top. Remove shavings from hole.

6. Drill hole in baseplate 3/8" from left edge and 2 3/4" from rear of base plate, using 13/64" drill (see drawing).

7. Remove play control cover plate and drill hole in the bottom of play control box 2 3/4" from rear and 5/8" from outside of box.

8. Screw short threaded end of tie rod (#55373) into magazine support as far as it will go. See that the flat washer is under the nut. Lock the nut using an end wrench.

9. Fasten the bent end of the tie rod (#55423 to the play control box (as shown) with the locl washer on inside of box. Replace control box cove plate.

10. Raise magazine support into position, in serting the rods into the holes drilled in the bas plate. Replace the magazine support mountin screws.

11. Replace magazine link assembly, lower enc first. The upper shoulder screw (#55009) (Fig 6.) can usually be replaced by moving magazin slightly. Otherwise, the link screws #2000-25 must be loosened.

12. Place nuts on ends of the rods protrudin through the base plate and draw up the right hanc nut until the distance from the top of the mille section around the hook post to the center of the magazine pivot pin is 7 9/16". Draw up the lef hand nut an equal amount. Tighten the nuts above the base plate to lock the adjustment, and recheck the distance.

13. Adjust tension of the magazine. (See part 4, pages 17-18). Check the record separator hook (#55016) to see that it does not touch end of record separator (#15124).

The installation of these tie rods is intended tc retain the permanency of magazine support adjustment during transit of instruments from factory to dealer. Some dealers feel that this is a desirable modification to add to early production 41-E Record Changers, when instruments are given a thorough test before delivery to a customer. It is for this reason that the foregoing instructions are herein included.

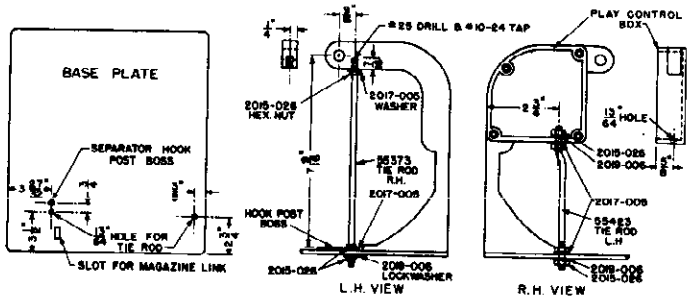


Fig. 26

MODEL 41-E, CAPEHART — FARNSWORTH TELEV. & RADIO CORP.

OPERATING POSITIONS

On the baseplate is located the selection-arm for the three functions; manual, one side and both sides.

Manual

In this position, the instrument operates without the changer mechanism functioning—only the turntable revolves. A switch is provided at the right-front portion of the baseplate whereby the turntable may be stopped while manually changing records.

One Side

When the selector lever is in the ONE SIDE position, each record in the record magazine is played on one side only, in sequence. The records are turned over when returned to the magazine. Therefore, the second side is played on the second playing.

Both Sides

Each record is played on both sides when in this position, whereby continuity is had when selections are continuous from one side to another. In addition, the uninterrupted-playing capacity of the changer is doubled over that of conventional record changers.

LOADING MAGAZINE

To load the record magazine, place one record in the magazine with its lower edge resting on the record support bracket and push it back snugly against the shoulder of the lower record support with the top of the record in front of and resting against the lower part of the upper record support. Then the rest of the records may be placed in the magazine either singly or in groups, assuming that all records are on the record support bracket.

To load an album set of records, select the first record, place it on the record support bracket with the "A" side toward the turntable. Move the selector lever to the ONE SIDE position and press the reject button. As soon as the first record moves to the turntable, move the selector lever to the proper position for the type of album set. Check the play control and if at or near zero, reset.

TO PLAY RECORDS

After the records have been placed in the magazine, turn the program switch on the radio to "Phono" position and the "Off-On" switch on the right side of the changer to "On" position.

The changer will not start if the play control is set at "Off."

PLAY CONTROL

The play control is located at the front of the magazine. This Capehart development allows any number, up to fifty, recorded selections to be played, after which the instrument stops automatically. The play control is set by turning the knob beside the dial until the desired number of selections to be played appears opposite the pointer. If for any reason, it is desirable to have the play control inoperative, the dial may be turned beyond the number 50 until the word "OUT" is seen.

NOTE: When the play control dial is at "OFF" the record changer cannot be started.

NEEDLE LANDING

Ten-inch setting—Allow the changer to deliver a 10" record to the turntable and the tone arm to move over the record. Stop the changer with the "OFF-ON" switch and lift the tone arm so that a coin may be inserted in the slot in the tone arm indexing screw marked 10. If the tone arm is moved away from the turntable spindle, a definite stop will be noticed. Beyond this point a spring tension will tend to return the arm to the correct landing on the record. The arm should be against this "stop" while turning the 10" indexing screw. Start the changer and reject the record. Check the needle landing on the next record. If incorrect, repeat the adjustment.

Twelve-inch setting—The same procedure is followed as explained for the 10" setting except that it is necessary to use 12" records and the adjusting screw marked 12.

REJECT BUTTON

A "reject button" is located on the panel of the tuner compartment. By pushing this button, any record which is being played may be rejected. The button should be depressed for one or two seconds.

HOW IT OPERATES

"THREE CHANGERS IN ONE"

The best approach to a knowledge of the 41E changer is to accept it on the basis that it is really "Three Changers in One." A study of each of the three fundamentals will enable a quick analysis of trouble.

The first operation, (Manual), is accomplished by placing the Selector Lever in the "Manual" position, thus opening the Mercury Trip Switch circuit so the changer mechanism does not trip at the end of a record.

The second operation, (Play one side).

1. Pickup Arm is elevated.
2. Pickup Arm swings clear of Record Tray.
3. Record Tray lifts to deliver record to Magazine.
4. As record in Record Tray touches Record Support Bracket, another record is discharged from the Magazine.
5. After record is expelled from the Magazine, the Record Tray returns part way and pauses.
6. Magazine tilts, and waits to deliver record to Record Tray, which starts down again.
7. Record Tray again pauses to allow record to settle over Spindle.
8. Magazine returns to normal position as does Record Tray.
9. Pickup Arm swings in and needle is lowered to record.

The third operation, (Play both sides).

1. Pickup Arm is elevated and swings clear of the Record Tray.
2. The Record Reverse Arm and Guide swing around in front of the Magazine.
3. The Record Tray places the record against the Reversing Arm and starts back to normal position, pausing midway.

4. The Magazine tilts to slide the reversed record onto the Record Tray, pauses in its return until the record touches the front of the Tray, and then returns to normal position.
5. The record settles over the Spindle.
6. The Tray returns to normal position.
7. Pickup Arm swings against either 10" or 12" indexing screw depending on size of record.
8. Needle is lowered on record.

ONE SIDE CYCLE

The selector lever is moved to the one side position. The change cycle is started by the tone arm moving in to the trip groove of a record. In this position the trip slide assembly is moved in toward the turntable spindle. The Trip Bracket on the turntable strikes the hook on the trip slide assembly. This motion is transmitted to the mercury trip switch mounting bracket pushing it off the reset lever on the main cam shaft. The mercury switch drops, thus energizing the cycling motor. The Pickup Arm is elevated and swung clear of the Record Tray, which lifts the record off the Turntable and delivers it to the Magazine. Just before the tray with the record reaches the point where the record touches the sloping face of the Record Support Bracket, a record is rejected from the Magazine by the Record Separator. When the changer is in cycle, the Main Cam revolves; on its periphery is a raised portion that lifts the Record Separator Hook Arm, drawing the Record Separator Hook down, thereby raising the Record Separator and three records. One record is lifted to the shoulder of the Lower Record Support Assembly, and the Hook which is part of the Record Separator, and located on the center line of the Lower Record Support Assembly, engages the two bottom records of the stack and lifts them slightly. This assists in the discharge of the record from the Magazine by forcing the second and third record back against the first record, thereby helping to push it off the separator knife into the record well. The record drops to the Rubber Bumpers in the well while the Record Tray is delivering a record to the Magazine. The tray starts downward and its curved tail-piece lifts the record as the Magazine starts to tilt. The Record Tray pauses midway on its downward trip until the Magazine moves to the highest horizontal point, thus allowing the record to slide out; the Magazine then remains stationary until the record slides against the front of the Record Tray which resumes its downward movement, only pausing to allow the Magazine to lower the center hole of the record over the Spindle. The Record Tray returns to normal position as does the Magazine, the Pickup Arm swings in and is lowered, and the mercury trip switch is raised by the reset lever on the main cam shaft striking the mercury mounting bracket.

On One Side position the reverse arm linkage is locked to prevent the reverse guide from moving around in front of the magazine. Also a pin (561204 Fig. 11) on the magazine slide arm assembly is pushed into position to engage a shoulder on switch (part No. 57155) on the main cam. This throws the switch and keeps the magazine slide arm pin in the outer track.

BOTH SIDES CYCLE

The selector lever is moved to the "Both Sides" position. The cycle is started as outline under "One Side Cycle."

After the Pickup is elevated, the Record Re verse Arm and Guide Assembly swings around i front of the Magazine. When it gets to the re versing position and the Tone Arm is clear of th Record Tray, the Tray raises. As the Tray raise the record slides back against the Rear Rubbe Bumpers, and the Tray compresses the spring arr of the Record Reversing Guide. The record touche the slanting face of the Support Bracket while th Tray continues up, and the record slides up thes faces to the top surface of the Support Bracket When the Record Tray starts to return, the sprin tension of the Record Guides pushes the botton edge of the record off the support bracket and a the record Tray pauses midway to the normal o playing position, the Magazine tilts, causing th record to slide down the Record Guide. The Maga zine reaches its furthest excursion and returns par way, where it pauses, and the Record Tray con tinues downward to nearly the normal position About the time the record touches the front of the Tray, the Magazine returns to the normal position after the record has dropped over the Spindle. The Record Tray then returns to normal, and the Pick up Arm is returned as in the one side cycle.

If one carefully watches the Magazine in the Both Sides Position, it will be noted the travel of the Magazine is shorter in the "Turnover" cycle than in the change cycle. It will also be observed that there are two tracks on the side of the main cam facing the gear reduction box. The pin on the Magazine Slide Arm follows the outer track when the magazine is tilted to its highest position to discharge a record. It follows the inner track when turning a record over. The passage of the pin through one track automatically throws the switch (part No. 57155) into the opposite position so that on the next cycle the pin follows the other track thus permitting alternate discharge of a record from the magazine and then turning the record over.

In the turnover operation the gravity operated switch (part No. 57154,) strikes a lever on the Magazine Slide Arm assembly. This unlocks the reverse arm linkage permitting the reverse arm crank and roller to follow the outer edge of the main cam and thus moves the reverse arm and guide around against the front of the magazine to turn the record over. The crank and roller continue to follow the main cam until it reaches the highest point on the cam which returns the reverse arm and guide back to normal playing position. It is locked in this position until the next turnover cycle. Caution! Do not attempt to move the guide around by hand.

The segment gear which meshes with the pinion gear on the reverse crank and pin assembly has an arm which also engages a part of the record separator hook moving it off the main cam and preventing a record being discharged from the magazine during the turn-over cycle.

Due to the impossibility of covering the action of each part in the changer in the brief description above, it is essential that every service man spend considerable time observing the action of each part of the changer under each of the conditions outlined above.

MODEL 41-E,
CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

The numbering system employed in this section coincides with and refers to that of the check-list of section V. These are adjustments which may be applied to the changer in the correction of malfunction, adjustments to be effected in the event that the check list routine reveals some discrepancy. These adjustments are also referred to in the "complaint" section.

It must here be pointed out that some adjustments are interdependent with others. Therefore, after making an adjustment, if not sure that some other adjustment beforehand proper has not been disturbed, the check list should be referred to in checking other pertinent points.

TURNTABLE—Part 1

A. The top surface of the turntable should be level with the milled surface of the baseplate on which is mounted # 15133 tone arm support housing and lower bearing assembly (Note: check with a straight edge ruler long enough to extend over the complete turntable and to the milled surface). The allowable tolerance is 1/64" high or low. If this check shows the turntable to be high or low beyond this allowable tolerance, it can easily be corrected by pressing the spindle in the desired direction in the turntable. The spindle is a pressed fit in the turntable.

NOTE: To remove turntable, remove set-screw in turntable well.

RECORD TRAY—Part 2

A. Due to the use of light records, it has been found necessary to relocate the position of # 561264 record tray slide arm spring. On the first run of 41E changers, this spring was hooked to the upper pin of # 09171 magazine slide arm lever assembly. It should be mounted in a hole drilled in # 09171 magazine slide arm lever assembly through the F (the F prefixes the casting part number.) Too much tension may hang up Record Tray just before play position.

B. If the tray gears bind, the pause position of the record tray will vary with different weight records. An easy way to check for binding gears is to run the changer through change cycle stopping at the second pause position of the record tray (without records) and press lightly on the tray, if then the tray is found to assume a lower position, the gears are likely to be binding. To correct a binding condition of the tray gears, remove # 561424 eccentric shoulder screw and work tray up and down by hand with .012 shim stock between the gears. Tray gears should be aligned so that when the tray is in max. upward position, the first tooth of the tray gear will mesh in between the 2nd and 3rd teeth of the drive gear.

C. After the gears are properly meshed, the record tray should be adjusted sidewise until the turntable is uniformly spaced within the tray at the time when the record tray is raised until the front edges of the 10" felts are level with the turntable cover. After the tray has been properly positioned sidewise, tighten the two Allen set screws (36855 Fig. 5) holding the tray pivot pins, then check to see that no side play exists.

D. With the record selector lever (59172 Fig. 6) in the "One-side" position, run the record changer through a cycle. It will be noted that before the tray has come to rest in its playing position it has paused twice. So to adjust the elevation of the tray it is necessary to stop the changer in the portion of the cycle where the tray has reached the second point where it pauses. In this position the front points of the 10" felts in the record tray should be level with the turntable cover. (A straight edge should be used). If the level is not the same, loosen the nut (36857) on the back of the eccentric screw (561424. See Fig. 4.) Adjust this screw until the felts are the same height, then while holding the screw to prevent its turning, tighten the nut. A slight pressure approximately equivalent to the weight of a 10" record should be applied downward on the tray so as to duplicate normal operating conditions when this adjustment is made.

E. If bumpers are too high, the 12" records will catch on them when sliding on the tray. If too high, trim off as required.

F. Check 10" Record Guard # 57163 to see that there are no burrs and that it is not binding on the tray as where it enters the base plate. Guard roller and bracket assembly # 15116 should be adjusted so that 10" guard is not too high and rubs against 12" records. See that all polished and chrome surfaces are clean and polished.

BUCKHORN—Part 3

A. This distance should be 7 9/16". If the changer does not incorporate a buckhorn brace, this should be installed before making further adjustments. See page 21 for instructions.

B. This distance should be 13 7/16" between the inner surfaces of the buckhorn pivot arms. If this distance is found to be incorrect it can be adjusted by striking the buckhorn with a rubber hammer. Move in the desired direction by striking side of pivot arms.

MAGAZINE—Part 4

A. This distance is 13¼" (outside dimensions of pivot arms).

B. The # 57162 upper record support should be back as far as possible yet so adjusted to allow a straight (not warped) record to rest against both sides. If the upper record support is more forward, a 10" record that is followed by a 12" record may fail to be discharged from the magazine. Note new upper record support, page 20.

C. Stop the changer just as the record magazine lower forks are even with # 05084 record bumper guide and felt assembly. If not evenly spaced, shift the # 561297 magazine pivot pins allowing no side play in the magazine.

D. The record magazine should always return snugly against the magazine stop screw (2000-269). If it does not, it is necessary to place selector lever on one-side position and run the changer through its cycle until the magazine attains the maximum height position as shown in Fig. 6. Stop the cycle

FARNSWORTH TELEV. & RADIO CORP. MODEL 41 CAPEHART

by use of the on-off switch. Loosen the two adjusting screws on the magazine actuating link to a sliding tension. Press downward on the lower part of the magazine thus lengthening the magazine link assembly. Now resume the cycle, and when the magazine touches the magazine stop screw, the magazine will adjust itself, after which the adjusting screws on the link assembly should be tightened securely. Avoid too much tension to prevent distortion of #57138 magazine support. Too much tension may cause failure of changer to start change cycle.

E. Just as the changer is starting a reverse cycle and the #07340 record reverse guide assembly has just swung around in front of the magazine, stop the changer and check to see that the reverse arm fork (#55015) projects approximately 1/16" beyond reverse arm crank pin (#15144) with the magazine held firmly against #2000-269 magazine stop screw. If not, correct by adjusting stop screw.

F. (a) After the #07340 record reverse guide assembly has swung around in front of the magazine, stop the changer and see that it is equally spaced between the ends of #56177 record support bracket. If not, loosen the two screws mounted up through #57143 record reverse arm and shift in the desired direction.

(b) If the guide is parallel with the 12" record, it should return and rest against the rubber bumper on the magazine support assembly, in such a position as shown in Fig. 5. If the eccentric cam (561235 Fig. 7) is properly adjusted, the guide will rest against the rubber bumper; however, if the record reverse guide does not properly return, loosen the nut holding the eccentric cam and rotate the cam slightly until the correct position is secured. CAUTION! Do not attempt to move the record reverse arm and guide assembly in front of the magazine by hand.

(c) The upper fork section should be parallel with the magazine so as to avoid pushing one side of a 12" record over the outer 10" rubber bumpers on the tray before the other. If this is not the case unclip the fork from #39130 reverse guide spring and form in the desired direction. Also if the ends of this upper fork are too close together, it will be noted that the tray has a tendency to raise the reverse guide assembly. To correct this unclip from the #39130 reverse guide spring and bend the ends of the fork out.

G. With the magazine tilted up set the separator knife stop so as to allow at least 1/64" and not more than 1/32" between the record separator and a "V" edge 10" record. (With a 10" record in the magazine, the upper edge of the record separator should be flush with the top of the lower support.) To adjust the position of the record separator, move the record separator stop to the position desired by loosening the two screws (2012-151) holding this stop. This stop (15115) is shown clearly in the end view portion of Fig. 14, and is located at the rear of the right bottom side of the magazine. When the magazine has returned to playing position the record separator hook should then be readjusted. Make sure that screws #2012-151 are not too long. These should be 6-32 x 1/16" binder head screws.

H. The end of the record separator that comes in contact with the records, should be as snug against the magazine as possible without binding. To accomplish this, it may be necessary to remove the record separator and bend the end toward the hook so that it will be perfectly free at that end and then bend it 3/8" from the hub toward the knife end and reinstall it. It now may be binding some against the magazine but with a thin screw-driver it can be bent back a little at a time to arrive at its proper position. It may be found helpful to slightly bend the tip end away from or toward the magazine casting for the use of some of the present records on the market. Check to see that the knife operates freely.

J. Adjust the #55016 record separator hook so that the #15124 record separator and hub assembly will not be disturbed as the magazine comes back to its normal position. Hook should not touch end of knife. If a complete turn of the hook gives more adjustment than is desired, some adjustment may be gained by bending the end of the record separator.

K. The top surface of the outer ends of #561177 record support bracket should be slightly higher than the rear rubber bumpers on the record tray with the tray in the vertical position. Two Allen screws are provided in the magazine directly under the record support to make this adjustment if needed. If the outer ends of the record support bracket should be slightly lower than the rubber bumpers on the tray, records will be pulled back off of the record support bracket as the tray starts to lower itself. Adjust screws #2041-132 so that the lower record support #561177 lifts the record off the rear record tray bumpers #62102.

L. See that rollers on the magazine are operating freely and that all polished and chrome surfaces that contact the record are kept clean and polished.

M. The position of these felts (#92197) is shown in Fig. 14. Check to see that they are securely cemented to the magazine and that the inner ends are cut off at a 45 degree angle so as not to restrict the dropping of records.

N. This post should be adjusted for improved operation of the single-action separator by raising until the roller on separator lever 561212 clears the periphery of the main cam by 1/32", lock into position by a lock nut. (To add this lock nut, 1. remove pin from below baseplate on separator hook assembly 09218, 2. screw on adjusting nut 37347 (size), 3. replace pin in separator hook assembly, 4. adjust separator hook post 561178 so that lever arm will have 1/32" clearance on cam 57135, 5. secure separator hook post with locking nut.)

TONE ARM Part 5

A. Check tone arm height. Pick up needle should barely clear turntable cover when the tone arm swings over without record on turntable. Adjustment is made with slotted head screw #2043-133. After setting is correctly made, one or two drops of shellac placed on top of screw will prevent loss of setting from vibration. Alcohol may be used to free screw.

B. The tone arm should come in far enough on a 12" record for the stylus to freely come in past the label on the record. If this condition does not exist, it is possible that the tone crank assembly #09198 is being restricted by the tone arm swing lever assembly #07313 being bent down at the point of interception or there is not enough clearance in

the cut out portion of the tone arm swing lever assembly. This can be easily corrected by removing the tone arm swing lever assembly and filing 1/32" in the cut out portion of the tone arm swing lever where the tone arm crank rides against. CAUTION! Be sure to file evenly across this 5/8" portion of the tone arm swing lever assembly.

C. See that the pickup is parallel to the record.

D. 10" adjustment: For 10" adjustment allow the changer to deliver a 10" record to the turntable and the tone arm move over the record. Stop the changer by use of the On-Off switch after the changer has completed its cycle. Lift the tone arm to give access to the indexing screw marked 10. As the tone arm is moved away from the spindle a definite "stop-point" will be noticed. Beyond this point, a spring tension will tend to return the tone arm to the correct landing on the record. The tone arm should be against the "stop point." while turning the 10" indexing screw. The needle landing should be 3/32" in from the edge of both 10" and 12" records. Allow the changer to complete one more cycle and note the tone arm set down. If incorrect the above adjustment should be repeated. If 10" record adjustment is not sufficient, see part 11a.

12" adjustment: For 12" adjustment the same procedure as above should be followed except a 12" record should be used and the indexing screw marked 12 is adjusted. When used with a 12" record the tone arm stop bracket (13408 Fig. 24) is pushed down by the record and allows the 12" indexing screw to control the needle landing. Note: Tone arm action will be erratic if bracket # 57145 is bent. Make sure that tone arm trays pin # 561239 does not screw into support too far and bind the tone arm lift rod. Check for burrs in bearing assembly.

TRIP SLIDE ASSEMBLY—Part 6

On instruments using the piano wire spring on trips, remove and discard the piano wire spring from trip slide assembly # 09176. Carefully reinstall the various parts, except for piano wire spring, being sure to maintain their original relationship. Be sure that the trip stud on the tone arm support tube assembly is carefully inserted inside of the "U" shaped trip lever # 561190.

The stop is to be set so that it will only be intercepted by the lower portion of the trip slide assembly and set so as to make it impossible for the trip clip, mounted on the underside of the turntable, to ever catch on the end of the trip slide assembly (this would stall the turntable). This can easily be checked by replacing the turntable and turning by hand while holding the trip slide assembly in toward the spindle and noting the amount of travel of the upper portion of the trip slide assembly, if this is three fourths of the possible travel, the stop is set correctly.

A. Should be at least 1/8" above the baseplate, also check to see that it will definitely be intercepted by the trip clip, mounted on the under side of the turntable. If it is too high, the turntable trip clip mounting screws will strike # 561299 trip stud causing a clicking noise. As not to disturb the slide action, all bending should be at the end opposite the rubber roller. The action should be positive with no possibility of sticking. Use no lubricant. This should work free enough as not to require more than 1½ grams pressure to move it at the rubber roller end. If this is not the case polish with crocus cloth the surfaces causing the friction (the stud on the trip slide assembly and the pressed sleeve bearing in the baseplate. In polishing the pressed sleeve bearing in the baseplate, better results may be gained by using a circular motion, that is by wrapping the crocus cloth around a pencil. Set this screw as to gain a tension of from 5 to 7 grams at the rubber roller end. Whenever trip is re-adjusted, screw No. 561213, Fig. 18, page 13, should be removed. When replacing screw in order to "HOLD" its adjustment, use a slight amount of cement or shellac on the threads. After proper adjustment, has been effected, let stand five or ten minutes until cement sets.

RECORD BUMPER GUIDE—Part 7

A. The record bumper guide # 05084 (or "U" bracket) and felt assembly should be mounted as far toward the magazine side of the changer as possible and yet not restricting the record tray from dropping into its rest position. The bottom ends should be curved as far as possible toward the turntable and yet still allowing a 12" record (to check, use as thick a record as is normally ever used on the changer) to drop freely into the record well onto the sponge rubber bumpers.

PLAY CONTROL—Part 8

A. Make sure that the spring on the magazine is so adjusted that the play control will move positively as the magazine comes to its rest position. Check to see that the # 59181 play control escutcheon is not restricting the movement of the play control knob and dial assembly.

NOTE: When replacing play control knob and dial assembly, place the dial in off position so that the contact points are left open, in that manner there is no strain or pressure on the dial, which will allow shoulder screw to be replaced without binding cork washer or rachet gear.

REVERSE ARM MECHANISM—Part 9

A. With the Record Selector in the Both Sides position, run the changer through a cycle until the point is reached where the Record Reverse Guide swings in front of the Magazine. In this position the Crank Pin should touch the side of the Record Reverse Fork that is toward the magazine without binding.

B. Stop the changer just before it has completed a reverse cycle, that is just as the roller on # 09172 reverse arm crank assembly is on the highest point on the outer periphery of the main cam and check to see that the pin on assembly 15144 reverse pinion crank and pin is centered or free in the slot of record reverse fork part # 55015. If not free, adjust # 561235 eccentric adjusting screw. See Fig. 10. Caution, with the use of an eccentric screw, two maximums and two minimums may be reached with the full 360 degree turn of the screw. Use the 180 degree swing most favorable to keep the # 561196 reverse arm link away from the baseplate rib which it works near to.

C. Now allowing the changer to complete the reverse cycle and the roller has just dropped off the highest point of the main cam, check to see that the hook on #09197 reverse arm unlocking assembly is just holding the roller off of the main cam. This can be checked, either of two ways, first by unlocking and locking it by hand to see that the pressure is on the hook or by checking to see that the roller can be turned by hand. If this adjustment is incorrect, loosen #2000-155 set screws and adjust center eccentric screw, after correct adjustment tighten set screws. See Fig. 10. It may be necessary to loosen screw 2012-263 and turn eccentric spacer 561238 slghtly to insure more positive action of hook. In making this adjustment, make sure that the point of reverse arm unlocking lever #09197 does not catch on the main cam track walls—should clear by 1/16". Be sure the screw 2000-167 in Fig. 7 is screwed half way in and locked with the nut. This prevents the Separator Hook from ejecting a record from the magazine during the Reverse Cycle, and allowing the record to be caught under the returning magazine, due to its inability to reach the turntable while another record is being reversed. If not, adjust eccentric cam #561238 Fig. 7 until pin is properly set.

TONE ARM MECHANISM—Part 10

A. To determine the proper position of the tone arm crank assembly, it is necessary to set the 12" record adjusting screw #561194 in the center of its eccentric swing and then set the tone arm crank so that the tone arm pickup stylus will set down properly on the edge of a 12" record. If the allen set screw #2041-132 in the 12" tone arm-adjusting nut #561255 is facing either side of the changer (or nearly so) and the tone arm to setting down correctly on 12" records it can safely be assumed that the tone arm crank assembly is horizontally set correctly. For vertical setting, see that there is at lea.t .008" play up and down of the tone arm support bracket #57145. Also check to see that the tone arm crank assembly is far enough down in the tone arm swing lever assembly #07313. It may be necessary to use more than one cork washer above the tone arm crank assembly or a thicker washer.

B. With the changer in the playing position the tone arm brake spring collar should be just against the spring. If the collar is too far up against the spring, the movement of the tone arm will be restricted. If the collar is not up against the spring, the tone arm lift rod #561270 may not smoothly follow the cam track and a little chatter is heard.

C. The action of the tone arm stop bracket assembly should be free enough to be readily actuated by a very light record. Failure to be perfectly free may be found to be that the torsion spring is bent too much at the end or ends. It is very important that the intercepter reset lever #561285 is so formed as to raise the intercepter lever to the highest point, not just past center and depending on the torsion spring to raise it the rest of the way.

D. If the point of interception with a 12" record is found to be rough or with a burr be sure to properly grind off and polish.

E. a. By stopping the changer just as the to arm has swung out to its extreme limit, check see that the pin on the tone arm swing lever a sembly #07313 is not binding on the tone arm ca To correct a binding condition move the tone ar cam further in toward the main cam.

b. The tone arm cam should be so timed wi the main cam so as to just allow the tone arm swing out before the tray rises. Setting the to arm cam at this point minimizes the possibili of the tone arm starting to raise as the chang stops in the playing position.

MERCURY SWITCH OPERATION—Part

A. a. The #561221 main cam mercury swit reset lever should be so adjusted on the main ca shaft as to allow the changer to stop the chan cycle as the highest point on the outer periphe of the main cam has passed the roller on #091 reverse arm crank assembly approximately 3/8 Examine for burrs on top edge of part No. 56122

b. The mercury switch dog should be inte cepted by the main cam shaft mercury switch res lever on its outer edge (the edge opposite the bend

NOTE: Wire to mercury switches must be fr (not stiff) and long enough for freedom of motio

MAIN CAM SHAFT ASSEMBLY—Part 12

A. About .020" horizontal play is permissib in the main cam shaft, if greater loosen the fo mounting screws of the outer main cam sha mounting bracket and place shims between moun ing bracket and base plate at the outer edge an tighten screws.

B. It will be noted that shortly before th changer completes a change cycle (one side pos tion), the selector pin passes very close to the re pin on the main cam and should these pins b intercepted by one another, the changer will eithe jerk at this point or possibly stall. It is possibl that the #561216 magazine slide arm selecto lever is so formed that it is pushing the selecto pin further in than is actually necessary to defin itely retrack the #57155 spring loaded main car switch. More clearance may be gained by eithe slightly reforming the magazine slide arm selecto lever or filing a little off the end of the rest pin o the main cam or both.

C. Should operate freely and have a minimun of side play.

D. Use petroleum jelly such as Vaseline.

GEAR REDUCTION BOX—Part 13

A. Check for end play in Second Reductio gear shift. Adjustment made with changer in play ing position. Loosen lock nut 36861, turn screw 561246 up snug and back out approximately 1/ turn until shaft does not bind. Tighten lock nut Trip changer and run through one cycle. If cyclin motor will not start, adjustment is too tight. I gear chatters, adjustment is too loose.

B. If cover is not aligned properly, it will cause binding of gears.

C. Should use two ounces of special Capehar gearbox oil.

MODEL 41-E, CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

MAINTENANCE OF THE CHANGER

SECTION VIII

References are to section X, that showing adjustments to the changer.

1. RECORD BREAKAGE
   - A. See page 16.
   - B. All polished surfaces on magazine and tray should be cleaned
   - C. Improper loading
2. CHANGER NOISE
   - A. Motor noise. Misalignment of motor or gear
   - B. A "groaning" noise may be heard as magazine is tilting if the thrust bearing adjustment on the gear reduction box is too loose.
   - C. The record bumper guide may be adjusted improperly, allowing 12" records, especially, to strike the lower bent portion of the bumper guide and be deflected against the back of the record magazine, instead of dropping on the rubber bumpers in the baseplate. This occurs as the record is separated and dropped from the record stack. If an early correction is not made the felt may be worn off the bumper guide, causing extra noise.
   - B. Rubber bumpers in record tray may be worn, permitting records to strike tray instead of bumper.
3. NEEDLE DRAGS ON TURNTABLE COVER
   Check tone arm height, adj. sec. 5A. See adj. sec. 5A
4. POOR TONE
   - A. Wow may be due to worn spot on idler pulley
   - B. Check pickup and tubes
5. IMPROPER NEEDLE LANDING
   - A. Check tone arm adjustments, adj. sec. 5D.
6. DOES NOT TRIP PROPERLY
   - A. See Adj. sec. 6A
   - B. Stud on baseplate under turntable may be holding trip lever out too far to contact trip pin on the turntable.
   - C. Cycling motor or changer stalls or jams.
7. TRIP CLICK
   - A. See fig. 18
   - B. See Adj. sec. 6A
8. REVERSE ARM MOTION SLUGGISH
   - A. Adj. sec. 4D, E, F, J, 9A, B, C
   - B. Pickup arm binding
   - C. Adj. sec. 10A, B, E
9. RECORD NOT CENTERING ON SPINDLE
   - A. Adj. sec. 3A, B, 4A, 1A, 2A, B, C, D, E
   - B. 12" records jamming in magazine
   - C. Adj. sec. 7A
10. TWO RECORDS COMING OUT AT ONE TIME
    - A. See adj. sec. 4H
    - B. Be sure that record chips are not lodged behind knife
11. MAGAZINE JUMPS (JERKS) AT FULL RETURN
    - A. Adj. sec. 4E, F
12. RECORD TRAY STICKING
    - A. Adj. sec. 2A, B
13. CHATTERING GEARS, GEARBOX
    - A. Adj. sec. 13A
    - B. Check lubrication
14. CHISEL EDGE RECORD HANGS UP behind record support bracket projections in turnover cycle
    - A. See 4L, adj. sec.
15. RECORDS FAIL TO MOVE INTO WELL
    - A. Magazine rollers should be free and oiled
    - B. See adj. sec. 4B, G, H, J, M, N
    - C. Insufficient records. Six to sixteen provide best operation
    - D. Warped records and/or chips on edges.
16. 12" RECORDS MARKED NEAR EDGE IN PLAYING GROOVE
    - A. See adj. sec. 1A, B, 2F, 10C, D
17. 12" RECORD HANGING UP IN MAGAZINE, usually occurring when followed by number of 10" records
    - A. See adj. sec. 4D, 7A
    - B. See that the wires in the record tray are properly imbedded
18. 12" RECORDS CATCH ON 10" RUBBER BUMPERS
    - A. See adj. sec. 2E
19. RECORD COMES OUT ON TURNOVER CYCLE
    - A. Make sure stop screw #2000-167 on separator hook arm #57172 does not hang on cam #561238
20. MOTOR STALLS
    - A. Check whether actually stalled when energized or if not energized by holding piece of iron against frame to detect magnetic field

    IF NOT ENERGIZED
    - A. Check switch operated by record selector lever (cycling motor)
    - B. Play control in out position or defective points (both motors)
    - C. On-Off switch (both motors)
    - D. Thermostat (cycling motors)
    - E. Fuse in terminal box. (Cycling notes)
    - F. If reject button is pressed and released before main drive shaft rotates sufficiently to drop mercury switch. (Cycling motor). Instruct operator to hold reject button down for a few seconds rather than only for an instant.
    - G. Unmodified changer with N4 instrument

    IF ENERGIZED
    - A. Defective motor
    - B. Check thrust on motor drive shaft (cycling motor)
    - C. Check alignment of motor and gearbox cover (cycling motor)
    - D. Mercury switch binding (cycling motor)
    - E. Check changer for jams (cycling motor)
    - F. Defective mercury switches (cycling motor)

RESHAPING THE INTERCEPTOR—RESET LEVER

As an aid in record-separation by action of the separator knife, the two steps outlined below are given. These lead to an extra "Kick" by the separator knife which has been found to be advantageous in separating records which do not conform to manufacturers' standards.

First, disassemble the interceptor reset lever and bend a larger radius of curvature on the end as sketched:

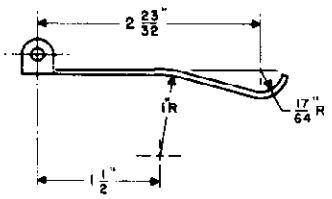


Fig. 25

This larger curvature is to assure that the end of the interceptor reset lever which contacts the main cam will pass over the machine bolt next added.

Second, drill the main cam with a #45 drill at the point giving GREATEST ELEVATION of the separator lever.

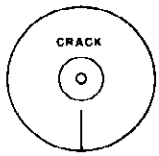
Tap with a 4-36 tap and install a 4-36, 1/8" binder head machine screw. This is the same screw which is used in the tray assembly, No. 36278. This operation must be done with due care, that the hole be drilled without damage to the cam and that the tap be not broken off in the hole. Since we are dealing with aluminum, it is recommended that a thread finer than #36 be not used. Remove burrs from the main cam outside periphery.

FARNSWORTH TELEV. & RADIO CORP. MODEL 41-
CAPEHART

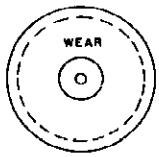
PROBABLE CAUSE OF RECORD INJURY

Figures shown here of record injuries are exaggerated merely to illustrate damage which might occur to records due to improper changer adjustments. For example records with small nicks or wear might have to be scrutinized closely observe the damage. If they are prevalent t changer should be adjusted to eliminate furth record damage.

LARGE NICK
Magazine too far forward. Record support pins bent.



CRACK
Magazine too far forward. Magazine overloaded (more than 16 records).



WEAR
Interceptor lever too tight or burr on top of lever. Install felt-edge turntable cover. Check record tray adjustment.

SMALL NICK
Made in turnover position. Check shoulder on reco support bracket. These should not be too steep. File a use crocus cloth or replace with later type of bracket.

SMALL BREAK
Record failing to drop in well. Dropping late or sticki on slide rolls of magazine. Improper knife height adjustme

LARGE BREAK
Complete breakout caused by failure of record to sl from magazine to tray. See items 2 and 4 of section VI.

The following tools are necessary to complete adjustment of the 41E changer.

Part No.	Description
37149	1/4" Allen wrench
88086	#8 Allen wrench
88326	#6 Allen wrench
88327	#10 Allen wrench
88065	8-32 Bristol wrench
37159	6-32 Bristol wrench

3/8" Spintite wrench
11/32" Spintite wrench
5/16" Spintite wrench
1/4" Spintite wrench
9/16 flat end wrench
7/16" flat end wrench
4" or 6" Crescent adjustable end wrench
Heavy screwdriver
Medium screwdriver
Medium Phillips screwdriver

REPLACING GEARS, COLLARS AND SHAFTS

SECTION IX

The expense and inconvenience of stocking complete taper pinned assemblies has been eliminated by adopting standard automotive practice. This method of supplying shafts drilled, or gears or collars drilled through one side, allow the individual parts to be reamed to an accurate taper for the pin. Parts finished with pilot hole drilled are designated with ▼.

To replace a gear or collar, center the pilot hole with the small diameter of the present taper pin hole in the shaft and drill through to the other side of the gear or collar, using size drill specified in the table below. Then, using the specified size taper reamer, the hole is reamed through the shaft and gear or collar. Be sure the large diameter of taper in the gear or collar will align with the large diameter of taper in the present hole in the shaft when the parts are in correct position. The pin may now be inserted.

To replace a shaft, the gear or collar is installed in correct position on the shaft and the specified size reamer run through gear or collar and shaft pilot hole. Insert taper pin.

Drill and Taper Reamer Size

Description	Drill	Tap Rear
Record Tray Shaft Assembly		
Shaft 561231		#
Collar 55014	#29	#
Drive Arm 57153	#29	#
Gear Driver 57152	#29	#
Main Shaft Assembly		
Main Cam Shaft 561182		For G #
Main Cam Shaft 561182		For Co or Ca #
Gear, 2nd Reduction 561224	#28	#
Slide Arm Collar 57156	#28	#
Main Cam 57135	#28	#
Selector Shaft Assembly		
Shaft 561191		#
Hub 561272		#
Selector Lever Stop 57164	#31	#

MODEL 41-E, FARNSWORTH TELEV. & RADIO CORP.
CAPEHART

LUBRICATING THE CHANGER

The 41-E changer is shipped with a one-ounce bottle of oil. THIS OIL MUST BE PLACED IN THE GEARBOX PRIOR TO OPERATION. A medicine dropper is convenient for this operation.

Materials needed: Light oil SAE 10; lubriplate; carbon tetrachloride; cleaning cloth; wrench, to fit gear reduction box cover screws; screw driver.

Approximately twice a year a few drops of oil should be applied in the oil holes at each end of the cycling motor. The turntable motor armature should be raised vertically by hand and a few drops of oil applied to the lower bearing. The turntable should be removed and oil applied to the upper turntable drive bearing being careful not to get any oil on the rubber tired idler pulley or the inner rim of the turntable. The idler pulley should be removed and a drop or two of oil placed on its bearing. If the changer is out of the cabinet the hair pin cotter and lower thrust washer can be removed and the idler pulley taken out. If the changer is in the cabinet it will be easier to remove the three motor mounting screws and lift up the motor thus exposing the hair pin cotter and washer. Apply a few drops of oil to the felt washer above the center turntable spindle bearing.

The main cam tracks and slide arms should then be thoroughly cleaned using a cloth saturated with carbon tetrachloride. The cam tracks and slide arms should then be covered with a light coat of lubriplate.

The oil in the gear reduction box should not need replenishing for an indefinite period of time. However, if in doubt the cover can be removed allowing the oil to drain and after replacing the cover one ounce may be added either by removing the pipe plug in the cover or removing the neoprene plug in the side opposite the cycling motor. A medicine dropper is convenient for placing oil in the gearbox.

CONVERSION TO 50 CYCLE OPERATION CAPEHART 41-E RECORD CHANGER

The Capehart instrument normally operates from power mains supplying 105-125 volts at 60 cycles. Operation from 50 cycle mains, without conversion, would result in

(1) slow turntable speed

(2) turntable-drive motor would overheat and might become damaged.

Conversion for 50 cycle operation may be made in the following steps:

1. Obtain from the Capehart Service Department at Fort Wayne, Indiana, a kit for making the conversion consisting of (a) Special 50 watt resistor with mounting assembly (b) Turntable motorshaft spring bushing (c) "50 cycle" tag to be attached to the cabinet, indicating the conversion. This kit is part No. 41135

2. Remove the set-screw in the turntable well and remove turntable. Should the ball bearing upon which the shaft revolves come out, it must be replaced before replacing turntable

3. Place the bushing spring over the turntable motor shaft.

4. Replace turntable and tighten set screw in turntable well.

5. Mount the resistor assembly as shown on the accompanying sketch.

6. Remove jumper between terminals 1 and 2 on the terminal strip.

7. Move the turntable wire from #3 to #1.

8. Move thermostat wire from #1 to #2.

9. Connect the resistor between terminals 1 and 3.

10. Attach the "50 cycle" tag to the inside of the cabinet in a prominent place.

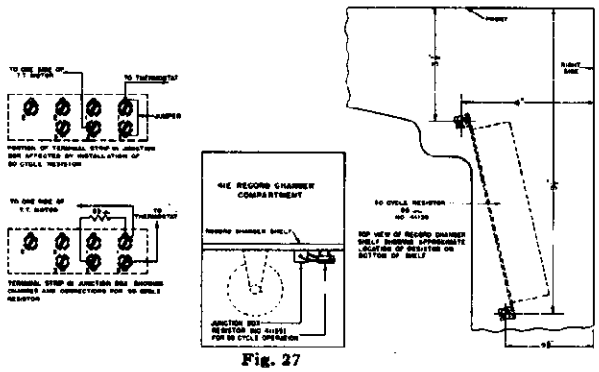


Fig. 27

PARTS

Part No.	Description
05074	Play control knob and dial assembly
05084	Record bumper guide and felt assembly
07313	Tone arm swing lever assembly
07314	Play control pawl assembly
07340	Record reverse guide assembly
07341	Magazine slide arm rivet assembly
07353	P. U. socket and bracket assembly
09171	Magazine slide arm lever assembly
09176	Trip slide assembly
09180	Switch lever assembly
09182	Reverse arm lever, crank and pin assembly.
09185	Mtg. bracket assembly, mercury switch
09197	Reverse arm unlocking lever assembly
09198	Tone arm crank assembly
11278	Pickup head assembly
13408	Tone arm stop bracket assembly
13419	Reverse arm and fork assembly
13422	Record tray assembly
13424	Turntable assembly
13432	Play control switch assembly
13583	Idler pulley
13614	Switch and bracket assembly, manual
13494	Reverse pinion and crank assembly
13710	Cement for turntable cover
15115	Record separator stop assembly

FARNSWORTH TELEV. & RADIO CORP.

MODEL 41-
CAPEHART

Part No.	Description
57137	Record magazine (casting only)
57138	Magazine support (casting only)
57140	Lower record support (casting only)
57142	Tone arm cam
57144	Tone arm support housing
57145	Tone arm support bracket, chrome
57149	Bearing support cover plate, main cam shaft
57150	Cover plate
57151	Reverse pinion segment
57152	Gear, record tray driver▼
57153	Drive arm (record tray shaft)▼
57154	Main cam switch (gravity operated)
57155	Main cam switch (spring loaded)
57156	Magazine slide arm collar (specify right or left)▼
57162	Upper record support, chrome
57163	10" guard, record tray
57164	Selector lever stop▼
57167	Main shaft bearing bracket
57217	Tone arm end, chrome
58317	Tone arm tube only, chrome
58483	Thermostat bracket
58484	Thermostat cover
59169	Capehart name plate, plastic
59170	Plastic reverse guide plate
59171	Selector lever escutcheon
59172	Selector knob and lever
59181	Escutcheon, play control
60296	Cork washer for play control
60309	Gear box plug (Neoprene)
60316	Cork washer, tone arm brake facing
60533	Fibre thrust washer, upper
60534	Fibre thrust washer, lower
62026	Record well bumper, L. H.
62027	Record well bumper, R. H.
62085	Stop rubber, mercury switch
62087	Trip roller
62088	Rubber stop, trip slide
62089	Stop rubber, main cam switch
62090	Rubber, reverse guide rest pin
62092	Mounting rubbers
62093	Mounting rubbers for record changer
62101	Record tray bumper, front (4 required)
62102	Record tray bumper, rear (2 required)
62103	Reverse arm bumper
62137	Locking lever silencer
62159	Rubber motor mounting grommet (turntable motor)
62171	Rubber for tone arm rest
64319	Interceptor hair pin spring
64321	Spring, tone arm set down adjustment
64331	Spring, reverse arm lock
64333	Play control spring (magazine)
64334	Spring, tone arm swing lever
64335	Spring, tone arm brake
64342	Pawl spring, play control
64344	Spring, tone arm counterbalance
64345	Spring, trip slide
64347	Spring, mercury switch dog
64348	Spring, record tray shaft
64349	Separator hook spring

Part No.	Description
64447	Spring
64455	Feed in spring for tone arm
80263	6 pr. plug, male
80327	2-prong molded socket (tone arm)
80454	Fuse block
90147	Mercury switch (single)
90182	Toggle switch, S. P.S.T.
90221	Thermostat
92181	Tray shaft felt washer
92182	Guard, felt
92190	Felt bumper, tone arm stop
92191	Record reverse guide felt
92194	Record tray felt, large (2 required)
92195	Record tray felt, small (2 required)
92196	Magazine felt (2 required)
92197	Lower record support felt (2 required)
92219	Magazine side felt (2 required)
92237	Felt washer (under turntable)
92290	Felt record tray bumper
2000-100	#4—40 x 1/8" R.H.M.S.
2000-155	#6—32 x 1/4" R.H.M.S.
2000-167	#6—32 x 3/4" R.H.M.S.
2000-211	#8—32 x 7/16" R.H.M.S.
2000-257	#10—24 x 5/16" R.H.M.S.
2000-259	#10—24 x 3/8" R.H.M.S.
2000-269	#10—24 x 7/8" R.H.M.S.
2000-276	#10—24 x 1 3/8" R.H.M.S., tone arm swing lever mtg.
2000-317	#10—32 x 3/4" R.H.M.S.
2000-363	1/4 x 20 x 1/2" R.H.M.S., magazine support mtg.
2012-151	#6—32 x 1/8" Bdg. H.M.S.
2012-155	#6—32 x 1/4" Bdg. H.M.S.
2012-165	#6—32 x 5/8" Bdg. H.M.S.
2012-209	#8—32 x 3/8" Bdg. H.M.S., (lower record support, magazine assembly)
2012-255	#10—24 x 1/4" Bdg. H.M.S.
2012-263	#10—24 x 1/2" Bdg. H.M.S.
2012-265	#10—24 x 5/8" Bdg. H.M.S.
2015-003	4/40 std. hex nut
2015-005	#8—32 hex nut
2015-006	#10—24 hex nut
2015-026	#10—24 hex nut (stainless)
2016-004	#6—32 x 1/4" hex nut
2017-005	Flat washer
2019-003	#4 S. P. int. lockwasher
2019-004	#6 S. P. int. lockwasher
2019-005	#8 S. P. int. lockwasher
2019-006	#10—S. P. int. lockwasher
2019-007	1/4" S. P. int. lockwasher
2019-046	#10—S. P. ext. lockwasher
2021-042	#00 x 1/2" taper pin
2021-044	#00 x 3/4" taper pin
2021-046	#00 x 1" taper pin
2021-054	#0 x 3/4" taper pin
2021-056	#0 x 1" taper pin
2021-143	#00 x 5/8" taper pin
2041-132	#6—32 x 3/16" Allen set screw
2041-142	#8—32 x 3/16" Allen set screw
2043-133	#6—32 x 1/4" slotted head set screw
2090-052	Rivet 1/8" x 9/32" (chrome)

ELECTRICAL-MECHANICAL SPECIFICATIONS

Power Consumption at 117 Volts
- Turntable Motor ..... 17 Watts
- Cycling Motor ..... 91 Watts

Voltage Rating ..... 105 to 125 Watts at 60 Cycles*

Turntable Speed at 117 Volts ..... 78 r.p.m.

Maximum Record Capacity
- 10 Inch Records ..... 16 Records
- 12 Inch Records ..... 16 Records
- 10 Inch & 12 Inch Intermixed ..... 16 Reco
- (Records Can Be Played on Both Sides or One Side Only)

Type of Pickup ..... Capehart True Tim

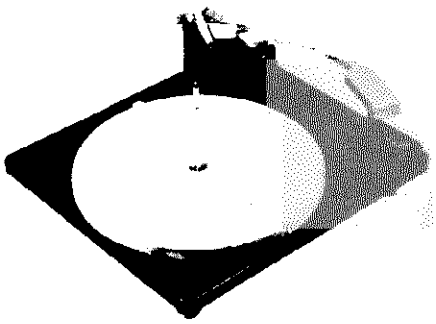
Type of Needle .....
..... Permanent "Precious Metal" Po

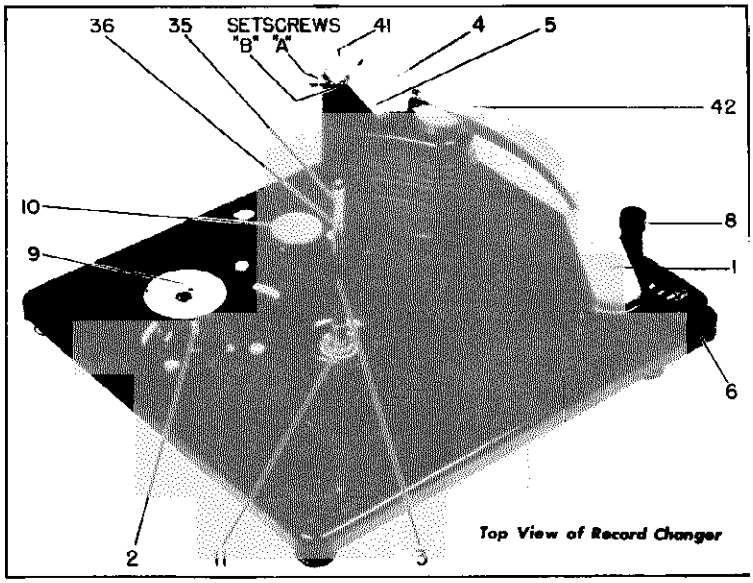
*50 Cycle Operation with Modification.

MODEL 41-E, CAPEHART

FARNSWORTH TELEV. & RADIO CORP.

Part No.	Description
15116	Guard roller and bracket assembly (10")
15124	Record separator and hub assembly
15133	Tone arm support housing and lower bearing assembly
15146	Separator hook arm assembly
34159	Arm lever pin magazine slide
36236	#6—32 x 1/2" Phillips O.H.M.S., St., St. Br., Play control
36278	#4—36 x 3/16" Bd. H.M.S. steel, stat. br., record tray
36279	#4—36 x 1/8" Bdg. H.M.S. steel
36835	Driv-Lok pin, type 1/8" x 3/4"
36845	#10 flat washer 3/4" O. D.
36852	5/32 x 5/8" Driv-Lok pin, type "F," gear box
36853	1/4-20 x 1/4" Allen cup pt. set screw, st., park., tone arm cam
36854	Cotter pin, 1/16" x 1/2"
36855	#10—24 x 1/4" Allen set screw
36856	3/8-24 hex nut, magazine slide arm
36857	1/4-28 hex nut, tray slide arm assembly
36858	#10-24 x 3/8" Hex H.M.S. steel, cad., gear box cover
36859	#10 flat washer 3/8" o.d. steel, chrome, magazine link assembly
36860	#8 flat washer, 1/2" o.d.
36861	7/16-20 hex nut, gear box thrust lock
36862	Flat washer, magazine slide arm
36864	#0 x 1 3/16" taper pin main cam collar
36865	#10-24 x 1/2" H.H.M.S., tone arm crank
36873	Spring wave washer, play control knob and dial assembly
36880	Rivet 1/8" x 1/8" steel, chrome, record reverse guide arm assembly
36882	Hairpin cotter
36911	#0 x 3/16" drive screw, main cam switch arm
36933	#5-40 x 1/2" R.H.M.S., play control switch mtg.
36984	Driv-Lok pin type "E" 3/32" dia. x 3/4" lg., tray shaft
37172	#4-36 x 1/8" flat hd. M.S. brass, brt. nic., tone arm
37180	#6 x 1/4" R.H.S.T.S., P.K. type "A" cad., junction box cover
37250	#4 x 1/4" R.H.M.S. self-tap. screw, P.K. type "2" cad., manual switch cover
37363	Flat washer (brass)
37364	Hairpin cotter (Hubbard #115)
39130	Reverse guide spring
44036	Cycling motor
44037	Turntable motor
48013	3 amp., 250 v. fuse
54093	Bearing support shim, main cam shaft
54094	Cork washer, friction trip
54095	Motor to gear box gasket
54096	Gasket, thrust cover plate
54097	Cover plate gasket, large, reduction gear box
54162	Turntable cover assembly
54274	Fuse cover
55009	Shoulder screw, magazine link
55010	Screw, Reversing arm lock
55014	Record tray shaft collar▼
55016	Record separator hook
55231	Sleeve bearing, second reduction shaft
55358	Sleeve spacer
55373	Buckhorn brace
55375	Tone arm rest
561177	Record support bracket, chrome
561178	Separator hook post
561179	Tray hinge pin
561180	Reversing arm lock
561182	Main cam shaft▼
561189	Turntable trip bracket
561190	Auto. stop trip lever
561191	Selector shaft▼
561192	Spacer, magazine slide arm
561194	Adjusting screw, 10" and 12" set down
561196	Reverse arm link
561198	Locking lever hook
561201	Cycling motor mtg. bolt, long
561203	Shoulder screw, reverse arm link
561204	Selector pin, magazine slide arm
561212	Separator lever
561213	Friction trip lever screw
561215	Selector lever lock
561216	Magazine slide arm selector lever
561220	Spring stop washer, record tray shaft
561221	Mercury switch reset lever, main cam shaft
561222	Mercury switch dog
561224	Main shaft gear, second reduction▼
561225	Second reduction gear and shaft
561230	Shoulder screw, reverse unlocking lever
561231	Record tray shaft▼
561232	Magazine roller bracket
561233	Magazine roller
561234	Record tray slide pin
561235	Eccentric shoulder screw, reverse lever
561236	Spring wave washer, friction trip
561237	Spring, magazine slide arm unlocking lever
561238	Adjustment cam, reverse segment stop
561239	Tone arm trip pin
561240	Spacer, tone arm stop bracket
561241	Spacer, tone arm swing lever
561242	Sleeve bearing, record tray, magazine pivot, and second reduction shaft (cover plate)
561243	Sleeve bearing, small, main shaft
561244	Sleeve bearing, large, main shaft
561246	End thrust screw, gear box
561248	End thrust plate, turntable shaft housing and reduction gear box
561254	Tone arm hinge pin
561255	Tone arm set down adjustment nut
561256	Shoulder screw, main cam
561257	Shoulder screw, main cam
561263	Hair pin spring, main cam switch arm
561264	Spring, record tray slide arm
561265	Spring, magazine slide arm lever
561266	Spring, magazine slide arm selector lever
561267	Spring, selector shaft
561268	Spring, magazine slide arm selector pin
561269	Spring, reverse segment arm lever
561270	Tone arm lift rod
561272	Manual switch lever and hub (on selector shaft)
561273	Record tray slide arm
561274	Locking plate, selector lever
561275	Spring, record separator
561283	Play control cover plate
561284	Play control ratchet
561285	Interceptor reset lever, tone arm set down
561286	Interceptor reset lever bracket, tone arm set down
561292	Play control stud
561293	Play control pawl screw
561297	Magazine pivot pin
561298	Record tray shoulder screw, 10" guard
561299	Trip stud
561301	Magazine slide roller
561302	Tray slide roller
561303	Magazine slide arm shoulder screw
561304	Shoulder screw, mercury switch mount
561306	Spring stud, tone arm stop bracket
561307	Reset lever hinge pin, tone arm stop
561363	Mounting bracket, cycling motor
561364	Magazine link, lower
561365	Magazine link, upper
561369	Reverse guide rest pin sleeve
561370	Reverse guide rest pin
561371	Shoulder screw, separator knife
561372	Tray shaft bearing, main frame
561373	Shoulder screw, reverse segment
561374	Cycling motor mounting bolt, short
561375	Collar, tone arm brake spring
561376	Main frame turntable spindle bearing (2 required)
561413	Main shaft ball bearing and race
561414	Trip spring clip
561415	3/16" dia. thrust ball bearing, gear box and turntable spindle
561416	5/32" dia. ball bearing, tone arm support housing (17 required)
561417	Pipe plug (reduction box)
561418	1/4" dia. ball bearing, reduction box main shaft
561420	Anchor stud, reverse arm lock spring
561424	Eccentric shoulder screw
57135	Main cam (casting only)▼





Top View of Record Changer

GENERAL

This record changer is designed to operate from a power source of 105-125 volts a-c, 60 cps. It will automatically play twelve 10-inch records or ten 12-inch records at a single loading. The turntable speed is 78 rpm.

MANUAL OPERATION

1. Turn record support (4) so that its long curved surface faces the spindle.
2. Turn the hold-down finger (5) so that it slants across the corner of the record changer.
3. Twist the top of the spindle (35) so that it aligns into a smooth spindle with the lower part (3) of this assembly.
4. Place the record on the turntable and push the switch button (6) to ON position, then gently lower the pickup on the first groove of the record.
5. When the record is through playing, depress switch as indicated for reject and allow tone arm to reset on record, then gently lift tone arm (42) and place on rest position and push switch to OFF position.

AUTOMATIC OPERATION

1. Twist the top of the spindle (35) so that the top part is "off-center" and a little step appears.
2. For 10-inch records, turn the record support (4) so that its short side is towards the spindle. For 12-inch records the long, curved side should face the spindle. Keep the hold-down finger (5) turned slantwise across the corner.
3. Place the records to be played on the spindle (35). They will rest on the record support (4) and the step (36) of the spindle. Swing the hold-down finger so that it rests on the top record.
4. Start operation by moving the switch button to ON position, then push down on this button. The records will play through and then will repeat the last record until the operation is stopped. If you wish to reject a record before it has finished playing, push down on the switch plate button.
5. To stop the phonograph before or after all records are played, remove any records remaining on the record support. Depress switch button and allow tone arm to reset on record, then gently lift tone arm and return it to its rest post.
6. Push switch plate button (6) to OFF position.

OPERATION PRECAUTIONS

1. Use only unwarped records for automatic operation. For warped, odd size or home recorded records, play as for manual operation.
2. Never use force to start or stop the motor or any part of the record changing mechanism.
3. Do not store the records on the record post or on the turntable as they may warp, especially if the temperature is high.
4. Do not allow oil or grease to come in contact with the drive wheels or any other rubber part.

LUBRICATION

Use light grease (Lubriplate or equivalent) on the following:

1. Worm gear and main cam gear.
2. All cams.
3. Spindle bearing.

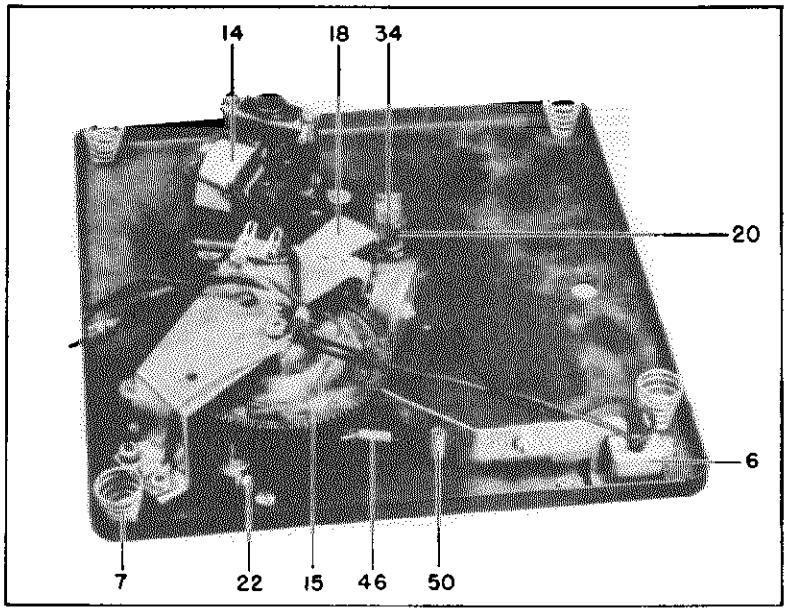
Use light machine oil on the following:

1. All shafts before insertion in bearing (replacement).

Keep oil or grease away from drive pulleys or other rubber parts.

RECORD CHANGER REPLACEMENT PARTS LIST

CAT. NO	REFERENCE	DESCRIPTION
RBH-001	14	MOTOR—Phono motor 105-125 v., 60 cycles (complete)
RHW-001		WASHER—"C" washer 9/32"
RHW-002		WASHER—"C" washer 5/16"
RMB-002	11	BEARING—Turntable ring bearing
RMF-002	5	FINGER Record stabilizer finger
RMM-012		FAN—Fan assembly (external fan motor)
RMM-014	31	BAR—Manual trip bar
RMO-001	6	SWITCH—Power switch
RMP-002	24	PIN—Tone arm lift pin
RMR-001	19	ROLLER—Feed cam roller
RMS-011	7	SPRING—Shock mounting spring
RMS-012	45	SPRING—Stop lever spring
RMS-013	46	SPRING—Trip lever spring
RMS-014	58	SPRING Pull-in spring
RMS-022	53	SPRING—Record feed spring
RMS-023	62	SPRING—Carrier lever spring
RMS-026	42	SPRING—Counterbalance spring
RMS-027	41	SPRING—Stabilizer finger spring
RMS-028	50	SPRING—Trip bar spring
RMS-045		SPRING—Motor idler wheel spring (external fan motor)
RMS-046		SPRING—Motor idler wheel spring (internal fan motor)
RMS-047		SPRING—Motor drive pinion spring (internal fan motor)
RMS-053		SPRING—Selector rod spring (assembled at end of 40)
RMT-002		TURNTABLE Turntable used with internal fan motor
RMT-006		TURNTABLE—Turntable used with external fan motor
RMW-019	9	WHEEL—Idler wheel (external fan motor)
RMW-020	9	WHEEL—Idler wheel (internal fan motor)
RMX-002	16	DRIVE—Flexible drive shaft
RMX-023	3	SPINDLE—Turntable spindle assembly
RMX-024	36	ECCENTRIC—Spindle eccentric assembly
RMX-025	35	CAP Spindle cap assembly
RMX-026		ASSEMBLY—Thrust bearing assembly
RMX-027	20	PINION—Pinion gear assembly
RMX-031	17	GEAR—Worm gear assembly
RMX-032	10	WHEEL—Drive wheel assembly
RMX-035		ASSEMBLY—Feed sector assembly (cam gear end of feed arm)
RMX-043	15	CAM—Cam gear assembly
RMX-048		ROD—Stabilizer finger rod assembly
RMX-050	16, 17	DRIVE Drive assembly (with vibration damper)
RMX-051	40	ROD—Selector rod assembly
RMX-053	25	LEVER—Stop lever assembly
RMX-054	21	LEVER—Sweep lever assembly
RMX-057	12	LEVER—Carrier-trip lever assembly
RPX-010		PICKUP—Magnetic pickup
RPX-016	1	TONE ARM—Tone arm assembly (less pickup)



Bottom View

PICKUP

A special General Electric magnetic pickup is used in this changer which will give superior results from the standpoint of high fidelity, low surface noise, and negligible record wear. This pickup is not replaceable with a crystal pickup as the ratio of output voltage levels of the two types is at least 70 to 1, the pickup supplied having an extremely low output.

The pickup is supplied with a semipermanent-type stylus. Dust and foreign matter should be removed from the stylus assembly at regular intervals with a soft brush. Make sure the stylus arm is centered between the stops. This clearance should be 9 to 11 mils on each side.

CYCLE OF OPERATION

INITIATING THE CHANGE CYCLE—Pushing the *control button* (6) forward turns the power ON and starts the turntable rotating. Automatic cycling may be started by depressing the button (6). This movement pivots the *trip bar* (31), causing engagement with the *carrier lever* and its attached *drive wheel* (10). This *drive wheel* (10) contacts the rim of the turntable and rotates with it. This motion is transmitted through the *flexible coupling* (16) to the *worm drive* (17), which in turn drives the *main cam* (15).

CYCLING—A single revolution of the *main cam* (15) results in a complete automatic cycling of the changer. This includes selection of a record from the stack, lifting the *tone arm* (1) from its rest position and setting the needle in the first groove of the record. Near the completion of the revolution, the automatic *trip cam* (13) which has the *block* (65) on the *trip lever* (12) riding on its outer surface, drops into a depression on the *trip cam* (13) which causes the *carrier lever* to return to its original position so that the *drive wheel* (10) will disengage with the turntable rim.

RECORD FEED—The outer surface of the *main cam* (15) controls the record selection. Motion of the *feed cam roller* (19) about the cam groove causes the *feed sector lever* (18) which is engaged with the *record feed pinion* (20), to turn the *eccentric* (35) to the proper position for a record selection and to then return, allowing the record to drop over the *spindle* (3).

PICK-UP ARM MOVEMENT—The inner surface of the *main cam* (15) controls the *pick-up arm* movement. The tone arm is lifted by the motion of the *lift pin* (24) as it contacts the outer vertical edge of the cam as the latter rotates. The direction of swing of the tone arm is controlled by the engagement of the *main cam* (15) with the *sweep lever pinion* (29). The *sweep lever* (21) connects directly to the *tone arm* (1) by means of a *clamp* (22) around the pick-up arm *pivot sleeve* (23). A boss projecting from the upper side of the *main cam* (15) displaces the *stop lever* (25) at the end of the change cycle, thus permitting the tone arm to proceed across the record.

POSITIVE TRIP ACTION—As the tone arm runs in the inner groove of the record after the playing of that record, the *sweep lever* (21) hits the *positive trip screw* (28) mounted on the *trip lever* (12). This action re-engages the *drive wheel* (10) with the rim of the turntable and starts a new cycle.

10-INCH OR 12-INCH OPERATION—Setting the *record support shelf* (4) to the 10-inch or 12-inch position lowers the selector rod (40) a definite amount. The raising and lowering of this rod determines whether the *stop lever* (25) positions against the *rod* (40) or the *cap* at the top of the rod. This regulation of the distance that the *sweep lever* (21) will travel determines whether the tone arm which is attached to the *sweep lever* (21) will lower on the first groove of a 10-inch or 12-inch record.

SERVICE ADJUSTMENTS

The turntable is driven by means of a friction *idler wheel* (9). The driving power is transferred from the motor *bushing* (2) to the *drive wheel* (9) and then to the rim of the turntable. It is important, therefore, that the *motor bushing* (2) and the *idler wheel* (9) be kept clean of grease, oil, dirt, or any foreign matter. Any quick drying solvent like naphtha is satisfactory for cleaning these parts.

A. Tone Arm Drop-point

The point at which the stylus of the tone arm drops on the record is adjusted by loosening slightly the *sweep lever clamp* (22) and repositioning the *tone arm* (1) with respect to the *sweep lever* (21) sufficiently so that the proper landing point is obtained. The stylus should land approximately ⅛-inch in from the edge of the record when properly adjusted. When the landing adjustment has been made for 10-inch records, the landing will be correct for the 12-inch records.

B. Position of Record Support (4)

The angle through which the record support rotates when changing from its 10-inch to its 12-inch position, and the position of its edge with respect to the records it supports when in either of its two positions may be adjusted by means of the two positioning screws "A" and "B," see Figure 1. Screw "A" adjusts the 12-inch position; screw "B" adjusts the 10-inch position.

The position of the record support for either 10-inch or 12-inch records is correct when the support is symmetrical with respect to the records being supported (so that the record will drop from both corners of the support simultaneously).

C. Positive Trip

The time at which the changer starts to cycle is adjustable by turning the positive trip screw (28). Turn the screw clockwise to delay tripping or cycling of the mechanism and counterclockwise to trip earlier in the playing cycle. The

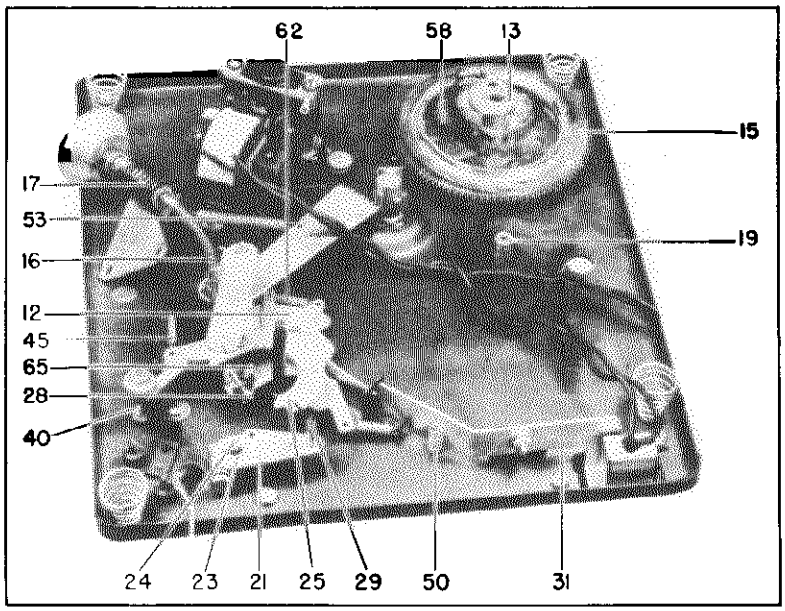


Fig. 3. Bottom View (Cam Removed)

screw should be adjusted so that the changer trips when the needle is 3 1/8 inches in from the edge of a 10-inch record. This adjustment is rather critical and should be made accurately.

D. Alignment of Eccentric (36)

The alignment of the eccentric (36) is accomplished by loosening the clamping screw on the ***feed pinion*** (20), shifting the position of the eccentric so that it is aligned with the spindle (3) and retightening the clamping screw.

The position of the eccentric is correct if it is aligned with the spindle when the mechanism is not in a change cycle.

E. Alignment of Spindle Cap (35)

The alignment of the spindle cap (35) is accomplished by loosening the two setscrews holding the ***cap index cam*** (34) in place, rotating the ***cap index cam*** until the ***spindle cap*** (35) is aligned with the spindle (3). Tighten the two setscrews.

TROUBLE SHOOTING CHART

SYMPTOMS	REMEDIES OR CAUSES
RECORD SELECTION	
1. Records drop unevenly from record support.	1. (a) Check adjustment B.
2. Records do not slip on or off the spindle smoothly.	2. (a) Check adjustment D. (b) Check adjustment E.
3. Records fail to drop.	3. (a) Check adjustment D. (b) Check adjustment B.
4. Records drop more than one at a time.	4. (a) Check adjustment E. (b) Check center hole in records—probably too large.
5. Records fail to stay on spindle cap when loading.	5. (a) Check adjustment E.
TONE ARM MOVEMENT	
1. Needle lands incorrectly.	1. (a) Check adjustment A.
2. Needle fails to feed in after landing.	2. (a) Check ***pull-in spring*** (58)—probably too weak.
3. Needle lands properly on record but slides in on record.	3. (a) Check for broken stylus in pickup. (b) Pull-in spring (58) too strong.
TRIPPING-CYCLING	
1. Changer fails to trip.	1. (a) Check adjustment C.
2. Changer trips too soon.	2. (a) Check adjustment C. (b) Check record—may be eccentric.
3. Changer trips continuously.	3. (a) ***Trip lever spring*** (46) too weak. (b) ***Trip block*** (65) on trip lever turned out of line or catching edge worn. (c) Disengaging ***cam*** (13) worn. (d) ***Carrier lever spring*** (62) too strong.
4. Changer trips but fails to change—turntable continues to turn.	4. (a) ***Carrier lever spring*** (62) too weak. (b) Grease on drive wheel or turntable rim.
MOTOR	
1. Changer is sluggish or motor overheats.	1. (a) Check lubrication—oil old or gummy. (b) Incorrect line voltage. (c) Defective motor winding. (d) Check binding of worm on main cam.
2. Motor rumble heard in record reproduction.	2. (a) Shipping bolts not removed from motor board.

Record Changer B-27-RC: for Motorola 1946 Home Set Models 55F11, 65F11 & 12, 65F21, 75F31 and 85F21 (dark brown paint finish).

Record Changer B-28-RC & phono oscillator chassis HS-18: for Motorola 1946 Wireless Record Players, Models WR6, WR7 & WR8. (Same as B-27-RC except for the power switch and addition of phono oscillator chassis HS-18).

Record Changer B-29-RC: for Motorola 1946 Home Set Models 95F31 & 95F31B (same as B-27-RC except light brown paint finish).

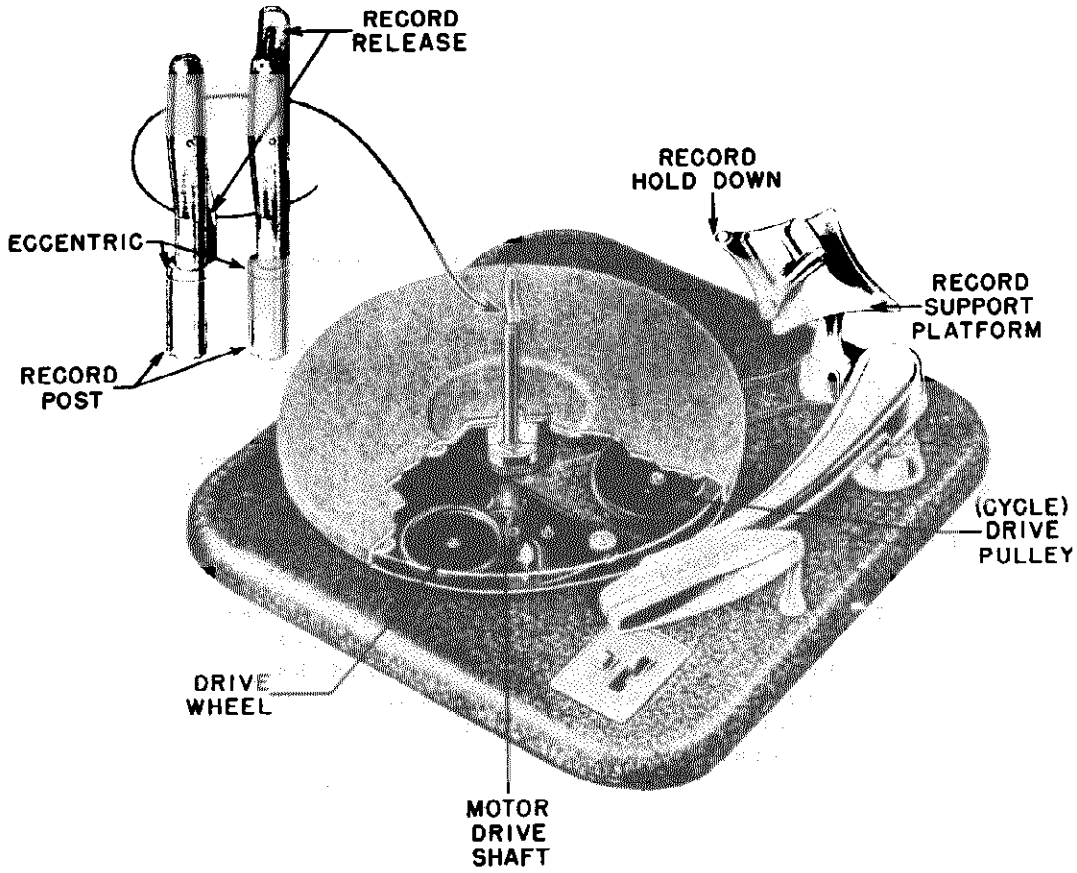


FIGURE 1 TOP VIEW OF RECORD CHANGER

Record Changers B-27-RC and B-28-RC are the revised and improved versions of Record Changers B-24-RC and B-25-RC, respectively. Fundamentally, the changer is the same, that is, it operates on the same general principle but numerous revisions in manufacturing methods, types of material, finishes, etc., have been made.

The revised record changers can be distinguished from the original changers by the new model number which is stamped on the bottom of each revised record changer base. From the top, the B-27-RC, B-28-RC and B-29-RC Record Changers can be easily identified by the large adjustment nut at the base of the record support platform.

For your guidance, we are listing the revisions that were incorporated in the changers. These may be found on page Record changers B-24-RC and B-25-RC may be revised to include some or all of the revisions by following the detailed information given on page

MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC — MOTOROLA INC. — MODELS B-32-RC, B-33-RC

IMPORTANT POINTS TO REMEMBER WHEN SERVICING RECORD CHANGERS

WARNING: Do not lift record changer by record post or record support platform! Always lift the changer by its base only.

IMPORTANT: Final adjustments on record changer are to be made with the changer horizontal and supported on springs by its 4 corners. AVOID DISTORTING THE BASE WHEN MAKING FINAL ADJUSTMENTS. Placing a mirror below the changer would permit the service man to make observations and adjustments without getting into awkward positions.

CHECK THE RECORD FIRST

Before attempting to service or adjust the record changer, check the records first to make sure they are not causing the trouble. This instrument will handle most of the 10 or 12 inch records available on the market, but it is not guaranteed to handle all of them. Records must be in good mechanical condition and should not be chipped, particularly around the center hole. Do not try to play automatically, records that are too thick, too thin, or that are oversized or undersized, in regard to the diameter of record or centerhole. Do not mix 10 and 12 inch records on the changer.

Warped records can slip on the turntable and introduce "WOWS". Such records may be flattened by placing between two pieces of flat plate glass and then heating in the sun or oven. Do not overheat. Allow record to cool for several hours before removing glass.

Old records made before the days of automatic record changers may not change automatically, due to the difference in thickness, or to lack of the proper eccentric groove at the finish. Most of the old records, however, may be played one at a time.

RECORD CHANGER OPERATION

SUMMARY OF OPERATION INSTRUCTIONS

As many as 10 ten-inch or 8 twelve-inch records may be loaded and played automatically on this record changer at one time.

Set the record support for the size records to be used and place records on spindle. Records will be supported above turntable by the small ledge formed by the off-set in the spindle and the record support platform. Steady the stack with the record hold-down plate.

The left hand button will start the motor. Momentarily, push the right hand button to the reject position to start the cycle. Last record will be repeated until the machine is stopped. Lift up the pick-up arm only while it is resting on the record.

To play records manually, push right hand button to MANUAL position and load records one at a time. When loading, hold the record at a slight angle so that the edge is under the lip of the record support. The record support should be turned to the 12" position to allow more room for loading and unloading records.

The wireless record players have a 3 position power switch (Record Changer B-28-RC); the switch is marked "OFF-TUBES ON - MOTOR ON" In the center (TUBES ON) position the tubes are on but the turntable does not revolve; this position is used when changing records. In the "MOTOR ON" position, the tubes are on and the turntable revolves. To turn player completely off, it is necessary to push the switch to the "OFF" position.

The wireless record players are set to 1560 KC at the factory. It is necessary to tune your radio to this frequency before record can be heard.

If the radio is a push-button type, it is desirable to set one button for the wireless record player.

TO CHANGE FREQUENCY

NOTE: The 1560 KC position was selected as a good average setting for most localities. If by chance you receive a strong radio station at that frequency, you should retune the record player to some other frequency that is reasonably free from interference. The oscillator can be adjusted to any frequency between 1250 KC and 1750 KC.

Proceed as follows:

1. Turn your radio dial to some other frequency between 1250 KC and 1750 KC where there is no radio station interference.

2. While the record player is operating, carefully adjust the tuning screw until you can hear the recorded music through your radio. The tuning adjustment may be reached by removing a plug button on top of the unit. Its exact location is shown in Figure 2. To lower frequency, turn screw clockwise; turn screw counterclockwise to increase frequency.

When the tubes are renewed or if music is distorted, reset the oscillator adjustment under the chassis, as follows:

1. Let the instrument overhang the edge of a table or console so the control is accessible from below. See Figure 2 for location.

2. Turn the oscillator control full counterclockwise.

3. Start the record player and tune in the record on the radio.

4. Push left hand switch to center position; turntable will stop revolving.

5. Turn the control full clockwise - carrier should disappear.

6. Very slowly turn the control back in a counterclockwise direction until a "plop" is heard in the radio speaker.

7. The control should remain in the position where the "plop" appears.

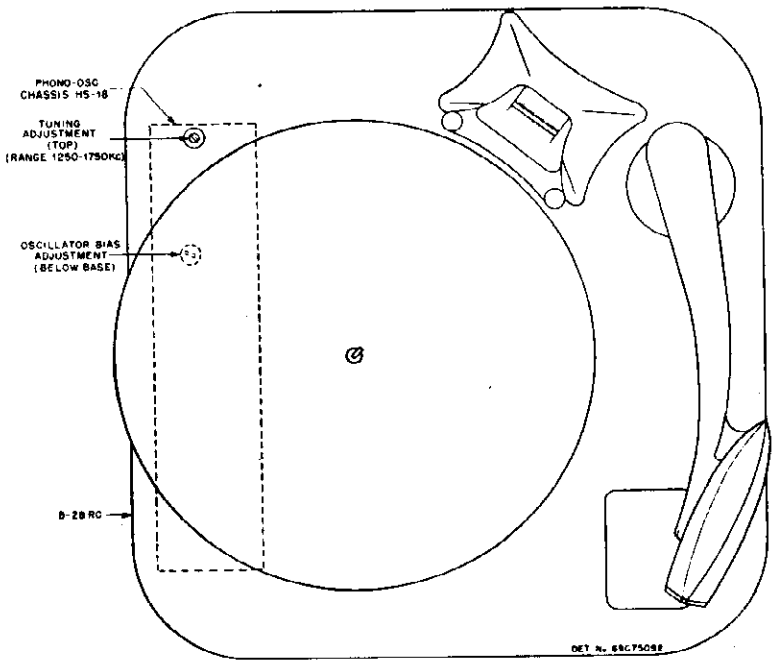


FIGURE 2. OSCILLATOR ADJUSTMENTS ON WIRELESS RECORD PLAYERS

MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC, B-32-RC, B-33-RC

MOTOROLA INC.

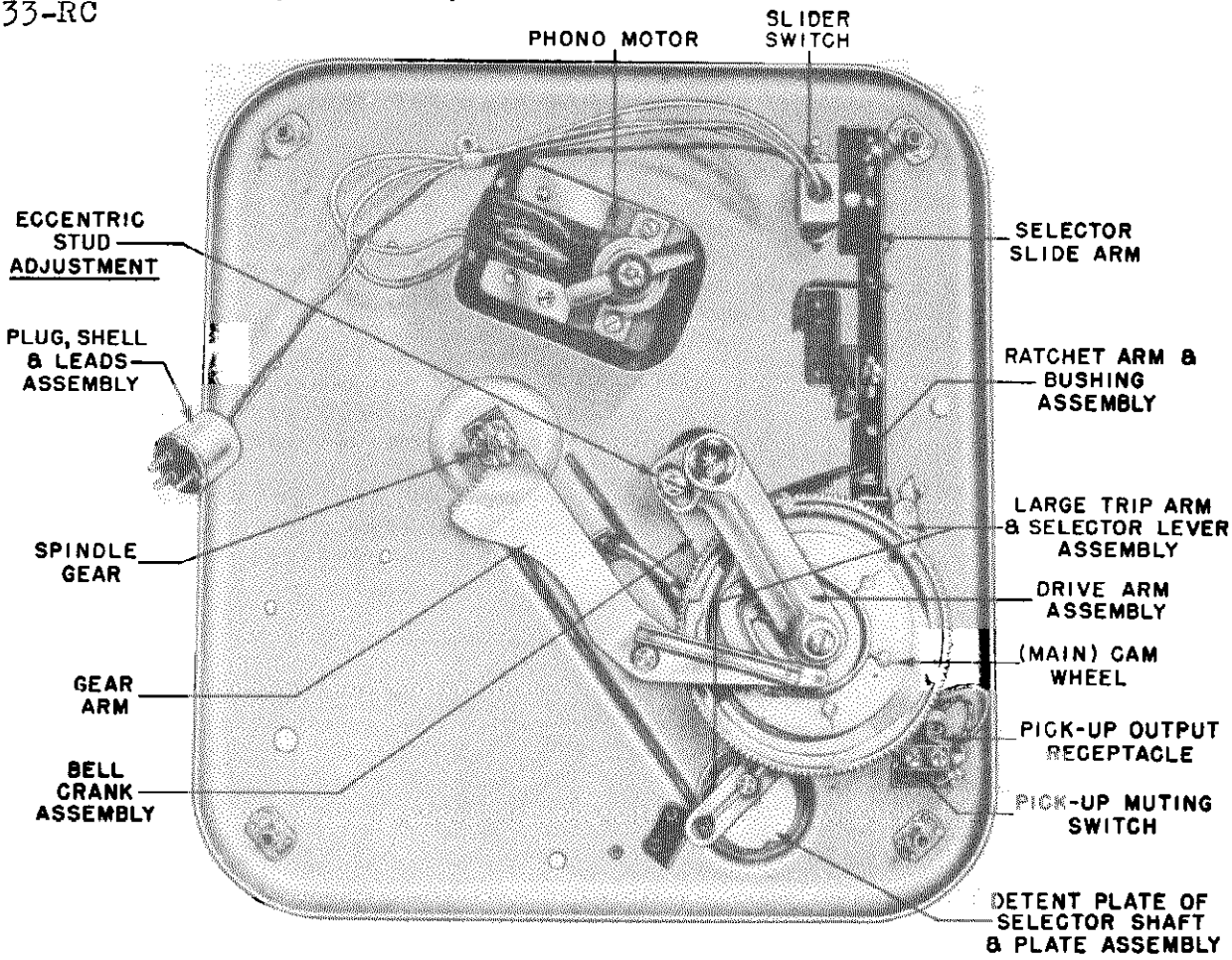


FIGURE 3. BOTTOM VIEW OF RECORD CHANGER

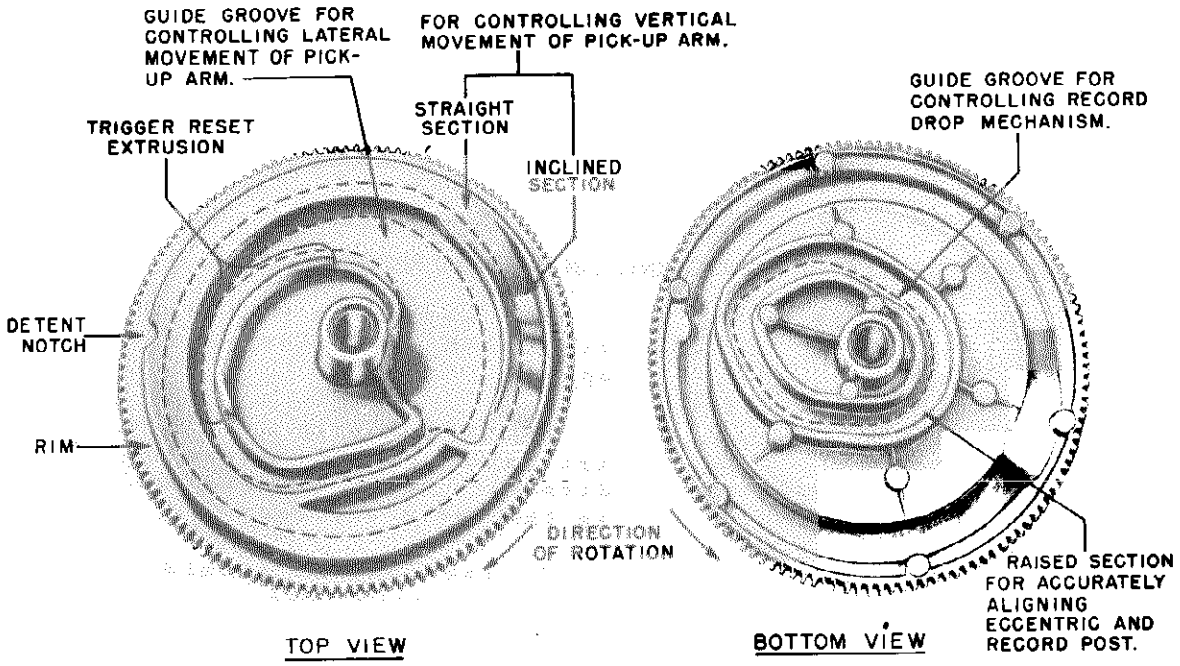


FIGURE 4. MAIN CAM WHEEL

MOTOROLA INC. MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC, B-32-RC, B-33-RC

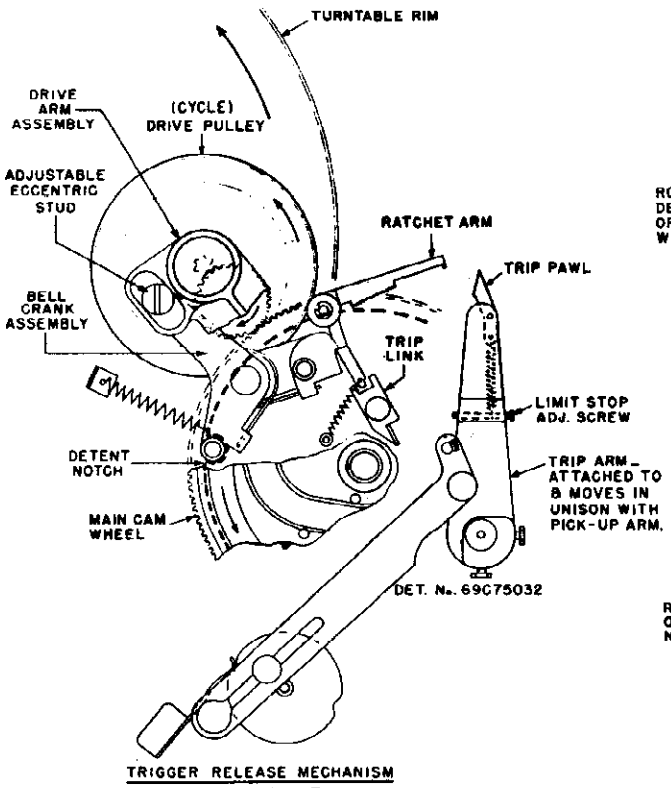
THEORY OF OPERATION

By referring to the various photographs and figures which will be found in the service manual, you can readily follow through the changing cycle from the continuity given hereafter:

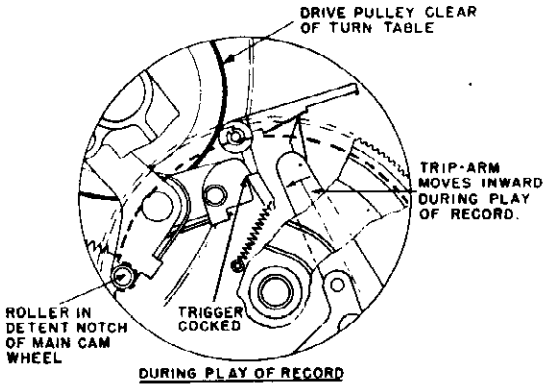
The turntable is rim driven. Power is transmitted to it from the motor shaft by means of a rubber tired drive wheel. The record spindle does not revolve; it is fixed to the record changer base.

The heart of the record changer is the main cam wheel. On it are cast all the cams, extrusions etc., required to perform all the operations during the changing cycle. See Figure 4.

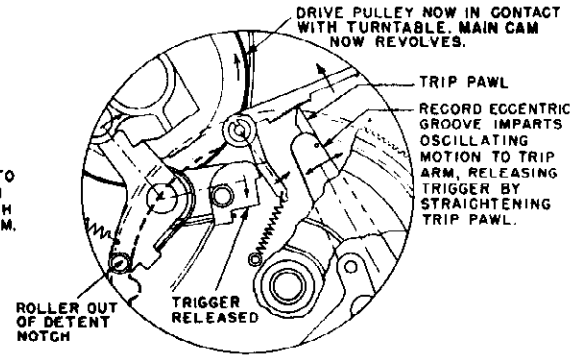
The only mechanism that operates during the playing of a record is the motor and turntable. The changing mechanism is entirely disengaged until the change cycle starts.



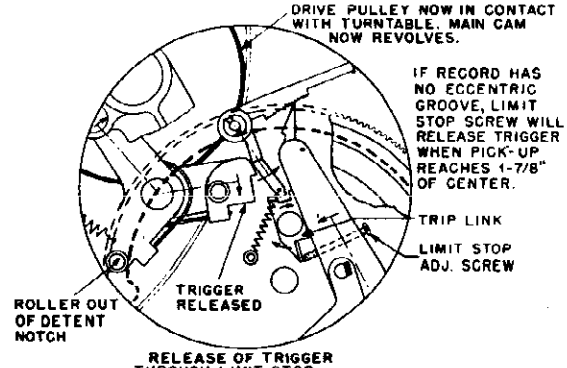
TRIGGER RELEASE MECHANISM
FIGURE 5



DURING PLAY OF RECORD
FIGURE 5A



RELEASE OF TRIGGER THROUGH PAWL & RATCHET ARM
FIGURE 5B



RELEASE OF TRIGGER THROUGH LIMIT STOP
FIGURE 5C

FIGURE 5. RELEASE OF TRIGGER AND START OF CYCLE (BOTTOM VIEW)

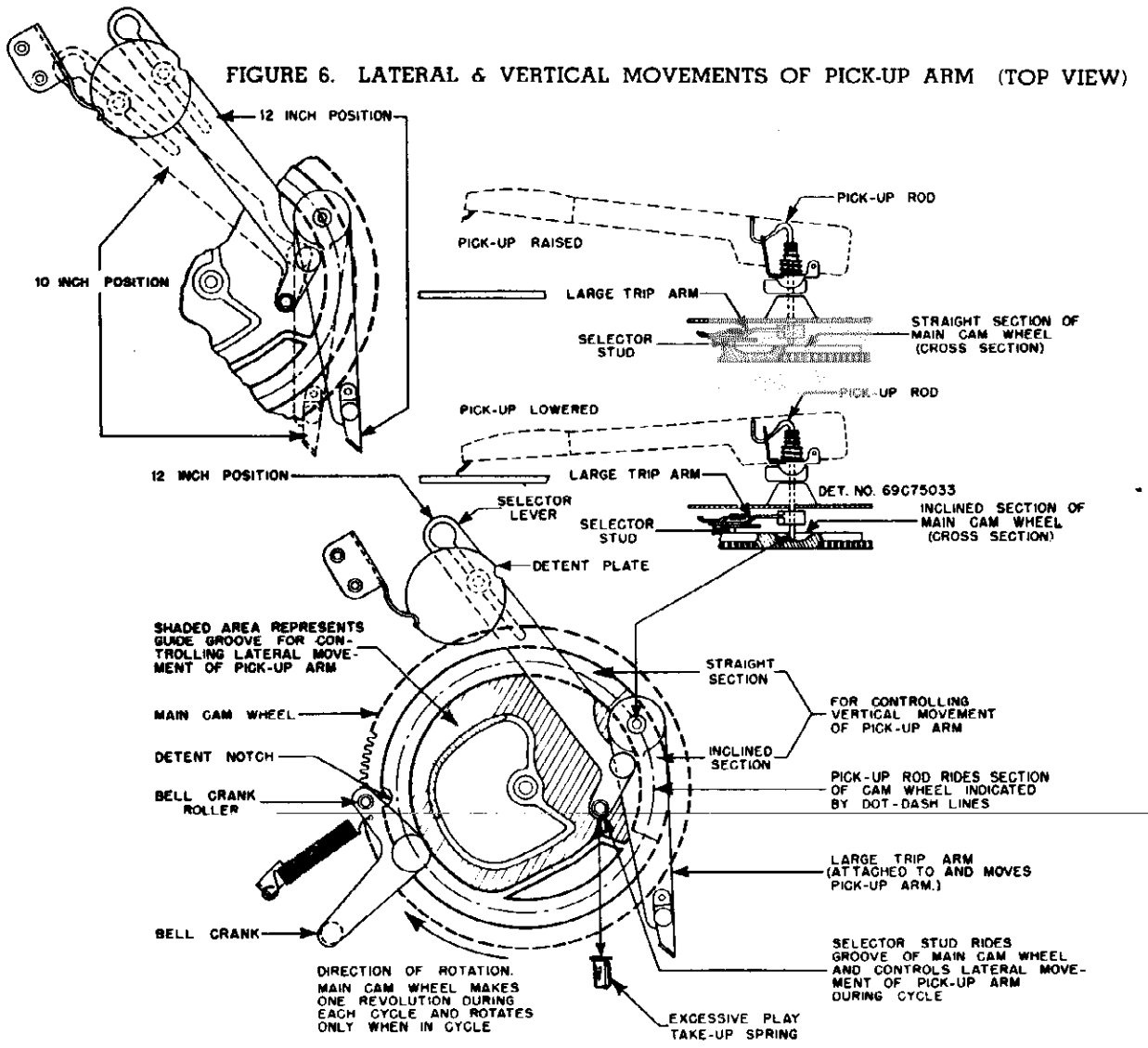
In explaining the theory of operation, let us begin from the point where the record changer is just finishing a record.

The needle in the pick-up finishes the record and enters the eccentric groove. This imparts an oscillating motion to the pick-up arm, which in turn, causes the trip pawl to release the trigger through its action against the ratchet arm. See Figures 5A & B. If the record does not have an eccentric groove, the limit stop will trip the trigger when the pick-up needle reaches a point 1-7/8" of the spindle center. See Figure 5C.

Tripping the trigger, releases the bell crank assembly, allowing its tension spring to push the cycle drive pulley up against the inside rim of the revolving turntable, starting the changing cycle. See Figures 5B & C. With the same motion of the bell crank, its roller leaves the detent notch in the rim of the main cam wheel and the main cam wheel revolves. The roller now rides on the rim of the main cam wheel and in this manner, holds the cycle drive pulley firmly against the turntable.

As the main cam wheel revolves, the pick-up rod rides out of the inclined section, raising the pick-up clear of the record. See Figure 6. After the pick-up arm is elevated, continued rotation of the main cam wheel swings the pick-up arm outward, clear off the record. The lateral movement

FIGURE 6. LATERAL & VERTICAL MOVEMENTS OF PICK-UP ARM (TOP VIEW)



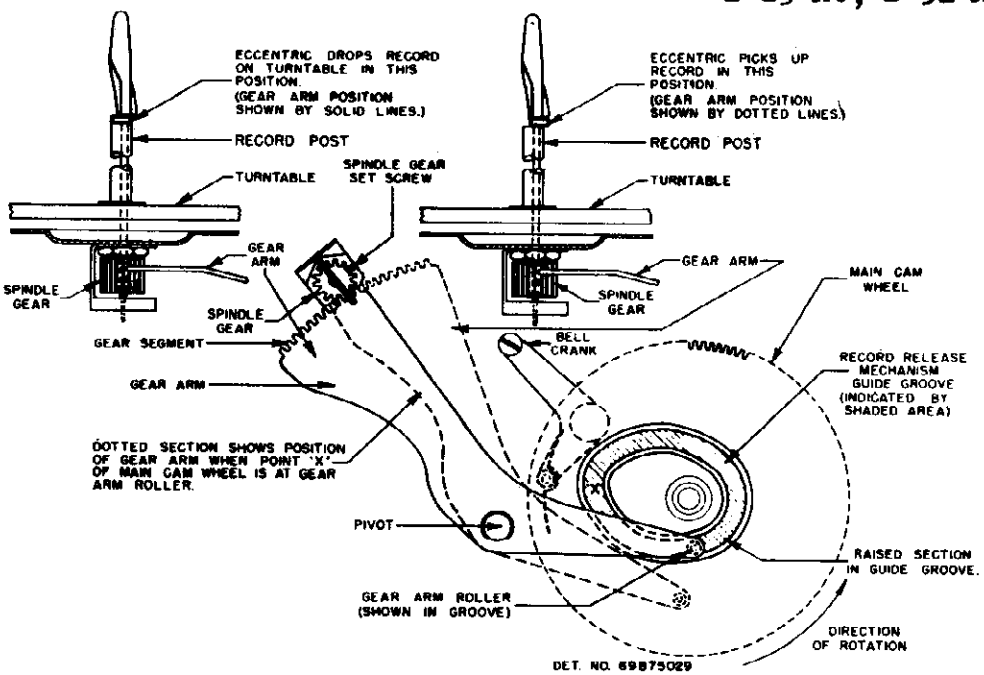


FIGURE 7. RECORD DROP MECHANISM (BOTTOM VIEW)

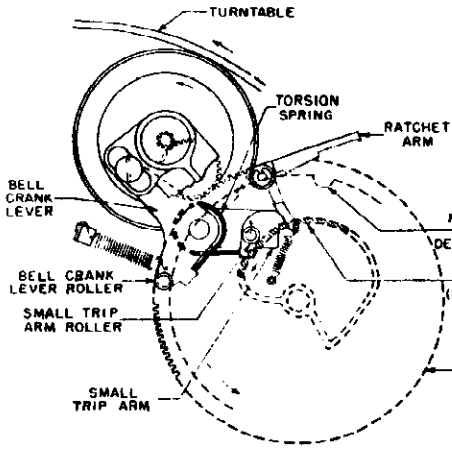


FIGURE 8B
START OF TRIGGER RESET

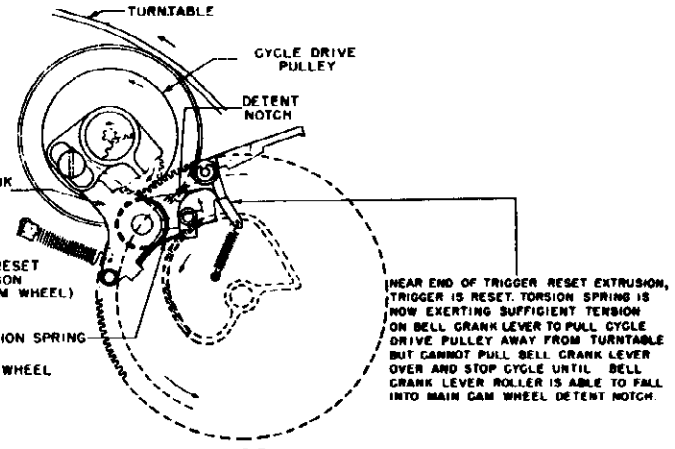


FIGURE 8C
TRIGGER RESET

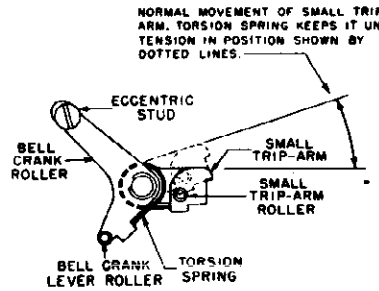


FIGURE 8A
DETAIL OF BELL CRANK ASSEMBLY

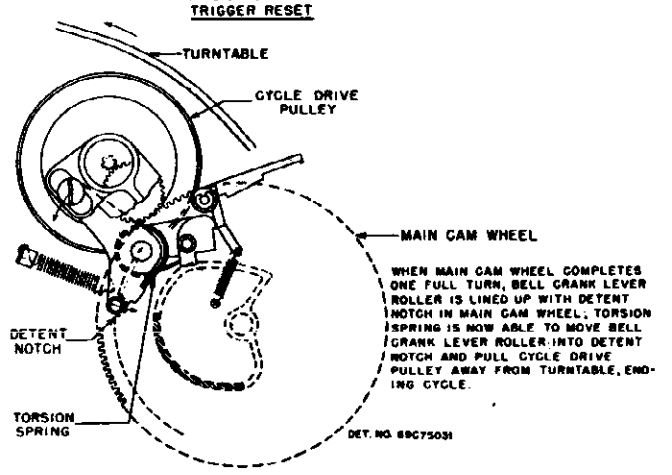


FIGURE 8D
ENDING OF CYCLE

FIGURE 8. TRIGGER RESET AND CYCLE STOPPING MECHANISM (BOTTOM VIEW)

of the pick-up arm is controlled by the selector stud which rides in a specially shaped groove in the main cam wheel See Figure 6.

At the same time the pick-up arm was being lifted and swung clear, the record release cam was rotated through 180° by the gear segment arm to pick up a record and then back to its normal position in line with the record on the turntable. The movement of the segment gear is controlled by the specially shaped groove on the bottom of the main cam wheel. See Figure 7.

Continued rotation of the main cam wheel swings the pick-up arm (by the action of the selector stud riding in the top groove of the main cam wheel) back over the first groove in the record and the arm is gently lowered on to the record when the inclined section of the main cam wheel reaches the pick-up rod. See Figure 6.

As the main cam wheel approaches the full 360 degree point of its rotation the reset extrusion pushes against the trigger reset stud of the small trip arm, causing the trigger to be "cocked" ready for the next cycle, and in the same motion applies spring tension through the torsion spring to the bell crank lever so that when the main cam wheel detent notch reaches the bell crank lever roller, the roller falls into it, pulling the cycle drive pulley away from the turntable, causing the main cam wheel to stop, thus ending the cycle. See Figure 8.

A shorting switch, operated by the straight and inclined sections of the main cam wheel, shorts the pick-up cartridge whenever the record changer is in cycle. This keeps all unwanted, noises from reaching the speaker.

Turning the record support post to accommodate the size record being used, automatically sets the mechanism so the pick-up needle will come down in the middle of the blank area between the outer edge and the first groove of the record. Turning the record post, positions the large trip arm so that the attached pick-up arm will swing out farther for 12 inch records and closer in for 10 inch records. See Figure 6.

The right hand button controls a three position mechanical switch. Through it it is possible to start the changing cycle at any time regardless of whether or not the record has been completely played. By this means a record can be rejected. This lever can also be pushed into the manual position at any time without damage to the mechanism. Figure 9 shows the mechanics behind the switch.

A self-centering cam device built into the base of the pick-up arm prevents damage to the mechanism, should the arm be accidentally touched while the instrument is in a changing cycle. Should you accidentally move it out of adjustment, the self-centering device will automatically return the arm to the proper position.

PHONOGRAPH NEEDLE

The changer is equipped with a permanent point (sapphire or precious metal) long-life needle that is good for several thousand plays, unless damaged by dropping or mishandling. For best results use Motorola phonograph needles; they have been especially designed for use in these changers.

To replace phonograph needle, it is only necessary to loosen the small set screw that holds the needle in place. The set-screw is accessible through a small hole in the front of the pick-up arm; use a small screwdriver to avoid damaging the crystal cartridge or pick-up arm.

MODELS B-32-RC, B-33-RC MOTOROLA INC. MODELS B-27-RC, B-28-RC B-29-RC, B-31-RC

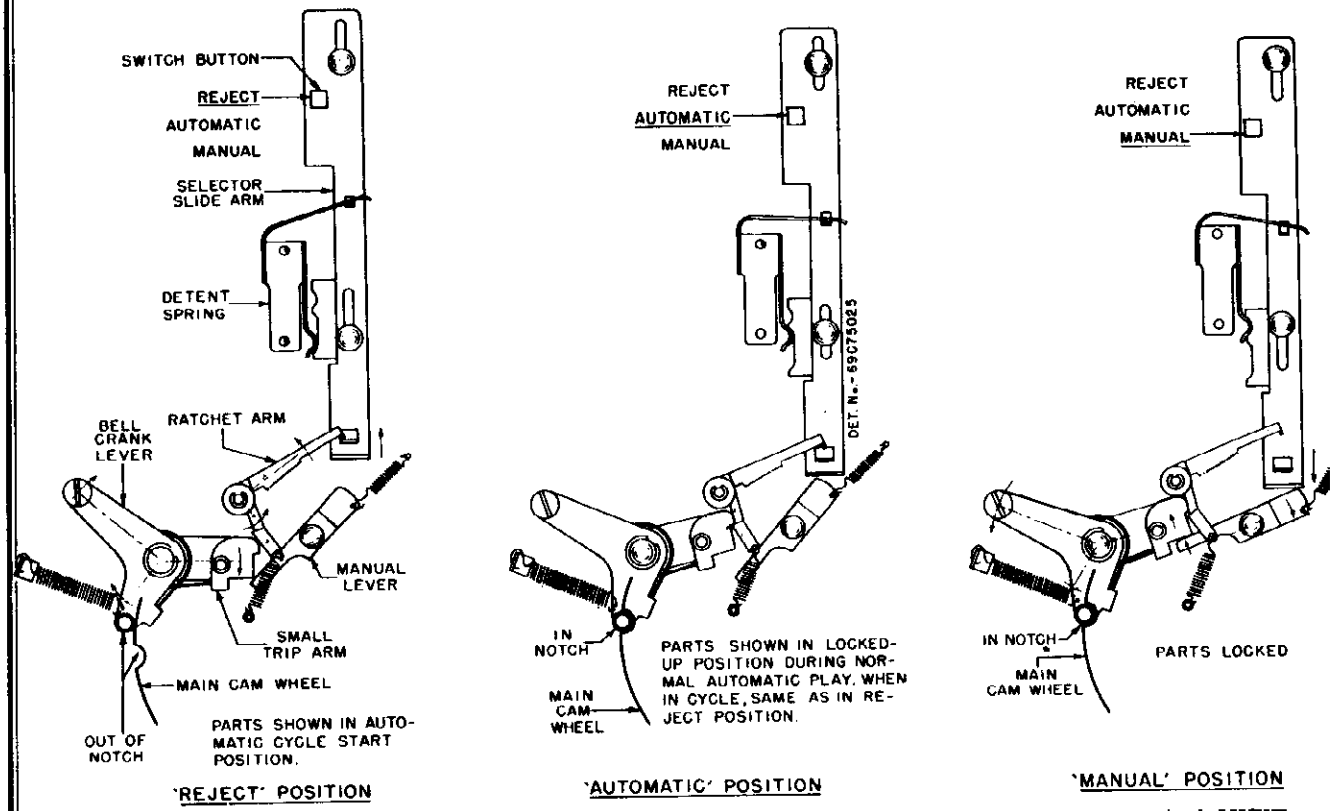


FIGURE 9. MECHANICS BEHIND REJECT-AUTOMATIC-MANUAL SWITCH (BOTTOM VIEW)

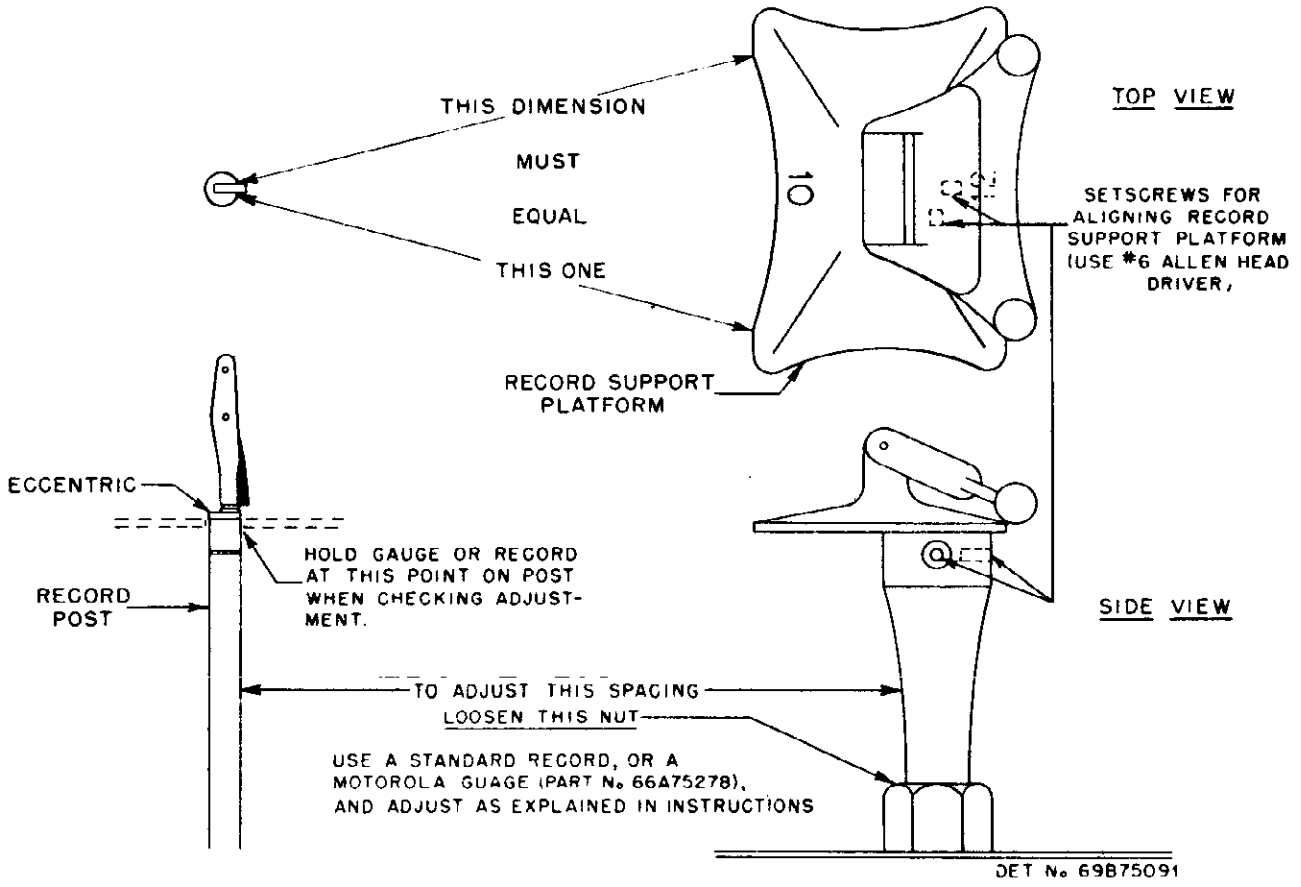


FIGURE 10. RECORD SUPPORT PLATFORM ADJUSTMENT DETAIL

MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC MOTOROLA INC. MODELS B-32-RC, B-33-RC

ROUTINE CHECKS AND ADJUSTMENTS

LINING UP THE RECORD SUPPORT PLATFORM

It is important that all points on the "lip" of the record support platform be equi-distant from the center point of the spindle. This will assure that all points of the record will leave the platform at the same time. If the record support is too far out of alignment, the record would actually hang on the point nearest the spindle and fail to drop properly. See Figure 10. The record support platform must also be spaced properly from the record post.

TO CHECK ADJUSTMENT OF RECORD SUPPORT PLATFORM

1. Turn the record support platform to the ten-inch position, making sure it is turned so that the selector lever falls into the detent notch.

2. Slip a ten-inch record over the record post and cycle the changer once to allow the record to drop on the turntable, then stop the changer.

3. Lift the record so it is in line with the top of record post (not eccentric) as shown in Figure 10. The record should clear the lip of the record support platform equally at all points and the gap between the record and record support platform should be just large enough to let the record clear the platform.

NOTE: The 10" record used should have a diameter of 9-7/8" ± 1/64.

TO ADJUST RECORD SUPPORT PLATFORM

1. If one point of the record support platform is nearer the record than the other, the position of the platform may be adjusted after loosening the two allen head set screws located directly under the record support platform. Use a #6 allen head driver (Motorola part number 66X10704).

2. The spacing between the record post and the record support platform can be varied by loosening the large hex nut at the base of the record support base (see Figure 10) and moving the platform, as required. The spacing should be such that the record, when held as shown in Figure 10, will just clear the platform.

NOTE: A "standard gauge" (Motorola part number 66A75278) can be used in place of a record when adjusting the platform.

3. TEST: After tightening the set screws, test the adjustment by running a ten-inch record through a complete cycle and check the point where the needle falls. If the needle misses the record by one inch, the record support platform is 180 degrees out of line with the detent plate and should be turned one-half turn without turning the detent plate.

ADJUSTMENT OF RECORD DROP MECHANISM

For minimum wear around the center hold of records and proper automatic dropping of records, it is important that the record release eccentric and record post line up perfectly at the end of each change cycle.

TO CHECK ADJUSTMENT OF RECORD DROP MECHANISM

1. Cycle the record changer once, by pulling the reject button.

2. At the end of the cycle, stop changer and carefully observe the position of the eccentric with respect to the record post. It should line up perfectly with the record post.

3. If at the end of a cycle the eccentric does not line up perfectly with the record post, re-adjust as described below.

TO ADJUST THE RECORD DROP MECHANISM

1. Pull the reject button and slowly revolve the turntable by hand until the gear arm roller is resting on the raised section of the record guide groove. See

Figure 7 for its location. The raised section of the groove is very small and resembles what is often taken for flash on castings. It serves to narrow down the guide groove at this point and in this manner insures closer alignment of eccentric and record post.

2. Loosen the slab head set screw in the spindle gear. The eccentric will now turn freely. See Figure 7.

3. Turn the eccentric so it is in perfect alignment with the record post.

4. Tighten slab head set screw in spindle gear. WARNING: Do not use excessive pressure when tightening slab head set screw. Excessive pressure may dent the eccentric tube and cause binding.

PICK-UP ARM LATERAL ADJUSTMENT

The lateral adjustment positions the pick-up arm so the needle will come down on the record at a point midway between the edge and the first groove of the record.

TO CHECK LATERAL ADJUSTMENT OF PICK-UP ARM

1. Turn the record support to the twelve-inch position.

2. Place a standard twelve-inch record on the turntable.

3. Start the changer and allow it to go through its cycle.

4. Note the point at which the needle contacts record. It should contact the record in the middle of the area between the first groove and the edge of the record.

5. If the needle doesn't come down at the proper point, adjust as described below.

TO MAKE LATERAL ADJUSTMENT OF PICK-UP ARM

1. Place a full stack (eight) of twelve-inch records on the turntable.

2. IMPORTANT: It is imperative to make the lateral adjustment while the selector stud is still riding in the groove of the main

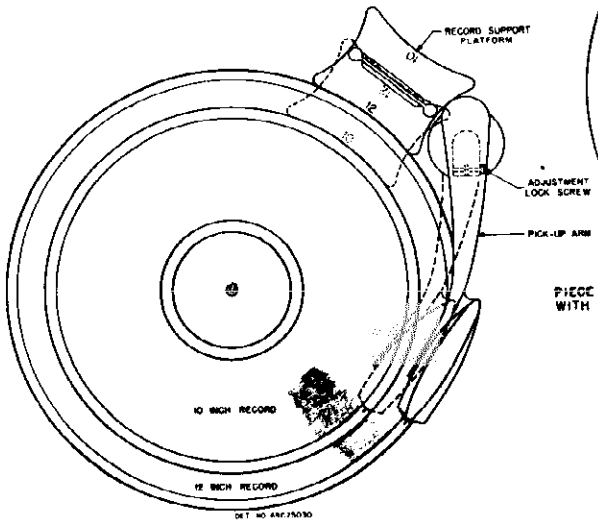


FIGURE 11. PICK-UP ARM LATERAL ADJUSTMENT DETAIL

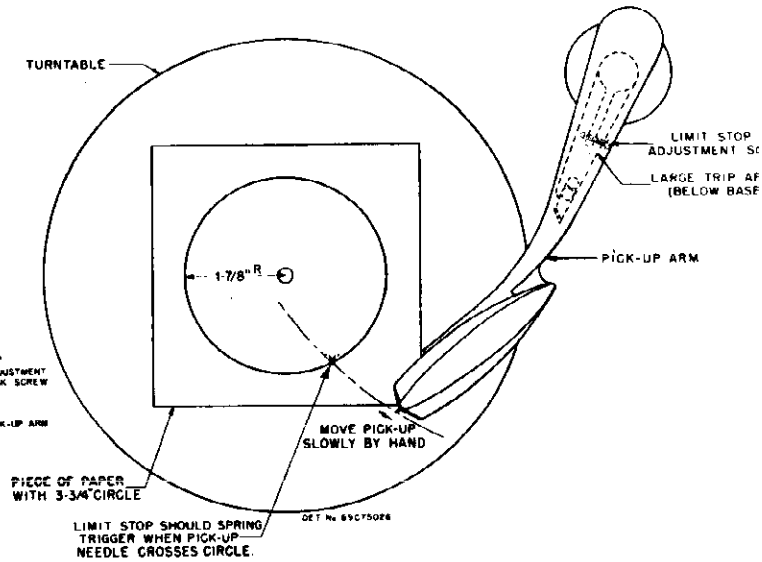


FIGURE 12. LIMIT STOP ADJUSTMENT DETAIL

cam wheel. See Figure 6. If the record player is stopped just before the needle contacts the top record of a full stack of records, the selector stud will still be in the main cam wheel groove and the pick-up arm will not be free to move annoyingly about while the lateral adjustment is being made. This is the reason for using a full stack of records on the turntable. If any pick-up arm side play is noted at this point, it should be eliminated by slightly spreading the play take-up spring on the selector stud. See Figure 6. Excessive play between the selector stud and main cam wheel groove will prevent needle from coming down at exactly the same spot on the record each time.

3. With a screw driver, loosen the adjustment lockscrew (see Figure 11) and then move the pick-up arm until phono needle is positioned correctly over the middle of the area between the edge and the first groove in the record.

NOTE: The lateral adjustment screw was omitted from B-27-RC and B-28-RC record changers after the first production run. It is suggested that the service man remove the lateral adjustment screws from changers he services; this will simplify adjustment.

4. After adjustment, tighten the adjustment lockscrew.

5. Check the adjustment by putting the changer through its cycle.

6. If further adjustment is required, repeat above steps 1 through 5.

7. Remove the twelve inch records and place a ten inch record on the turntable.

8. Turn the record support to the ten-inch position and cycle the changer. The needle should come down into the area between the first groove and the edge of the ten-inch record. If necessary, make minor compromise adjustments so needle will come down properly on both ten and twelve-inch records.

ADJUSTMENT OF THE LIMIT STOP

The limit stop mechanism permits the record changer to operate even though the record may not have an eccentric groove or if the eccentric groove is too close to the center hole.

Before checking or making adjustment on the limit stop, make sure the lateral adjustment is O.K.

TO CHECK LIMIT STOP ADJUSTMENT

1. Scribe a 3-3/4" diameter circle on a piece of stiff paper. Cut out a 1/4" hole at the center of the circle and slip the paper over the record post of the record player. See Figure 12.

2. Set up the record changer for twelve-inch records.

3. Turn on the record player, momentarily push the button to the reject position and allow the changer to complete one cycle. Stop the changer; the pick-up arm should now move freely.

4. Grasp the pick-up arm and slowly move it towards the record post. As the pick-up needle crosses the scribed circle line the trigger should be heard to "click over".

5. Should the trigger mechanism be actuated before or after crossing the scribed line, readjust as described below.

TO ADJUST THE LIMIT STOP

1. Move the pick-up arm to its resting post.

2. Reset the trigger mechanism by moving the button momentarily to the MANUAL position and then back to AUTOMATIC (center position).

3. With a screwdriver, adjust the limit stop adjustment screw.

which is located on the trip arm. See Figure 12. Turn the screw clockwise if the trigger is tripped after the needle crosses the scribed line, and counter-clockwise if it trips too soon.

4. Check adjustment by moving the arm manually across the scribed line.

5. If the adjustment is still not correct, repeat above steps 1, 2, 3, 4 and 5 until it is correct.

VERTICAL ADJUSTMENT OF PICK-UP ARM

This adjustment assures that:

1. The pick-up arm rests properly on the first record.

2. The pick-up arm will clear a full stack of records (10 ten-inch or 8 twelve-inch) on the turntable, during the changing cycle.

3. There will be sufficient clearance between the top of the pick-up arm and a record in position on the record support, during the changing cycle.

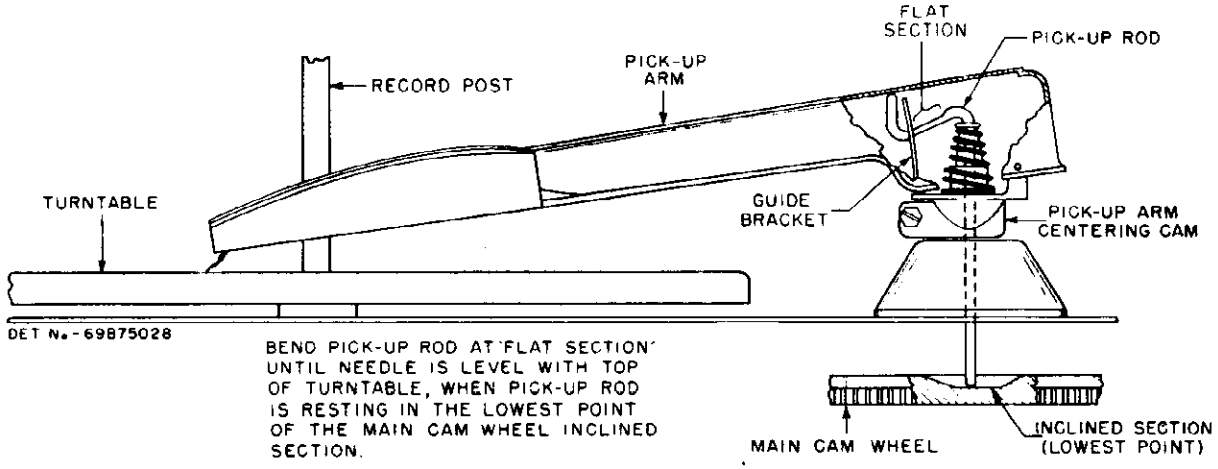


FIGURE 13. PICK-UP ARM VERTICAL ADJUSTMENT DETAIL

4. There will be sufficient clearance between the pick-up arm and the pick-up resting post during the changing cycle.

TO CHECK VERTICAL ADJUSTMENT OF PICK-UP ARM

1. Turn the record support to the twelve-inch record position and cycle the record changer. As soon as the changing cycle is complete, turn off the changer by means of the left hand button. The pick-up arm should now be resting alongside the turntable. Correct adjustment is indicated if the pick-up needle is exactly level with the top of the turntable.

2. Fully load the record changer with records. Use 10 ten-inch or 8 twelve-inch records of standard manufacture only. Start the changer and drop one record on the turntable. The pick-up should come down and rest normally in the playing position on the record.

3. Push the left hand button to the REJECT position momentarily and release. Now as the pick-up is lifted off the record, carefully note that there is clearance between the top of the pick-up arm and the bottom record on the record support.

4. Drop the full load of records (10 ten-inch or 8 twelve-inch) on the turntable. As the record changer is cycled, note the clearance between the pick-up needle and the top record.

ADJUSTMENT OF VERTICAL TRAVEL OF PICK-UP ARM

The pick-up rod (Figure 13) controls the vertical movement of the pick-up arm.

1. After the changer has completed its cycle and pick-up arm is resting in playing position, stop the changer by pushing the left hand switch to OFF. The pick-up rod will now be resting on the bottom of the inclined

section of the main cam wheel and the pick-up arm will be at its lowest point of vertical travel.

2. Lift the pick-up arm straight up, exposing the pick-up rod. With long nose pliers, bend the pick-up rod (along its straight portion) in the required direction till the pick-up needle point is level with the top of the turntable. See Figure 13.

3. Recheck as shown under TO CHECK VERTICAL ADJUSTMENT OF PICK-UP ARM. In some cases minor compromise adjustment will be required.

ECCENTRIC STUD ADJUSTMENT INSTRUCTIONS

This adjustment is one of the most important for dependable cycling of the record changer. It must be followed closely as too tight an adjustment will cause slow cycling and undue motor wear or the changer may keep cycling continuously; a loose adjustment may prevent changer from cycling at all. See Figure 3 for location of eccentric stud adjustment.

CHECK AND ADJUSTMENT OF ECCENTRIC STUD

1. Set changer in cycle and stop turntable when pick-up arm comes back to within one inch of right of turntable (almost the set down position).

2. Loosen eccentric stud completely so cycle drive pulley (see Figure 1) moves completely free of the turntable.

3. Rotate turntable by hand (counterclockwise) 90° (1/4 turn) and back (clockwise). Pick-up arm should not move.

4. With a screwdriver, turn eccentric stud until pick-up arm begins to move when rotating turntable by hand clockwise. Do not hold screwdriver on eccentric stud while checking adjustment.

5. When pick-up arm moves down with the clockwise rotation of turntable without slipping, but not up with counterclockwise rotation, the critical position of the adjustment has been reached.

6. Then tighten the eccentric just far enough to pick up the pick-up arm when rotating the turntable counterclockwise and the setting is complete.

7. To check for too tight adjustment, complete cycle of changer with motor operating. Complete change cycle should not take more than 7 seconds; if it takes longer, eccentric stud should be readjusted.

SERVICE INFORMATION

REPLACEMENT OF ECCENTRIC & TUBE ASSEMBLY (104) OR SPINDLE & RELEASE ASSEMBLY (113)

These two assemblies, reference numbers (104) and (113) are supplied only in factory matched sets for replacement purposes. For positive record changing performance, always replace assemblies (104) and (113) with a factory matched set. Do not replace one assembly without replacing the other at the same time. Lubricate parts before installing, use Lubriplate #105 grease.

TO REMOVE TURNTABLE

Refer to Figure 15 for location of parts.

1. Remove two screws (59) and spindle clamp (13).

2. Remove the spindle and release assembly (113).

3. The turntable can now be lifted off the record post (108). Make sure the eccentric (104) is in line with record post (108) otherwise it may be damaged when removing turntable.

CRYSTAL CARTRIDGE CONNECTION NOTE

Observe that one of the pins on the crystal pick-up cartridge is grounded through a copper strip to the cartridge case. It is important that the connecting lead shield be connected to this pin.

MECHANISM IS SLOW IN STARTING OR MOTOR HEATS UP

1. Check lubrication.

2. Dirt in bearings. Wash dirt out with carbon tetrachloride or similar solvent and relubricate. Use a #10 motor oil in the phono motor and turntable bearings and Lubriplate #105 grease on all other bearings and moving parts.

3. Check line voltage and frequency.

4. Motor damaged. If found damaged, remove motor and return it to factory for repair or replacement.

5. Room temperature abnormally low.

6. Eccentric stud adjustment set at maximum throw causing cycle drive wheel to drag on turntable rim. Correct by setting eccentric stud per instructions under ECCENTRIC STUD ADJUSTMENT.

7. Loose sleeve on motor drive shaft. Replace motor.

8. Slew motor. Replace motor.

9. Defective turntable bearing. Replace.

10. Grease on rubber rim idler wheel and/or inner rim of turntable. Clean off with carbon tetrachloride.

MOTOR FAILS TO RUN

1. Check to see that ON-OFF switch is OK and that power is being supplied to motor.

2. Trouble in motor winding. If easily seen, repair; otherwise, replace.

3. Damaged or frozen bearings. Replace motor.

4. Gummed oil or foreign material between armature and pole-piece. Clean out.

SQUEAKS OR OTHER NOISES DURING PLAYING OF RECORDS

1. Check lubrication (if squeaks are heard, they will usually be found to come from the records - not from mechanism).

2. Compare the squeak with and without a load of records. If squeak disappears when records are removed, then noise is obviously from records. Correct by rubbing a little wax on the turntable record post.

CHANGER IS NOISY WHEN IN CYCLE

1. Check lubrication.

2. See if any part has become loose or bent and is rubbing against a moving part.

3. Check center post eccentric shaft (104) lubrication.

"WOW" IN RECORD REPRODUCTION

1. Record is warped or otherwise defective, or the instrument is not being operated at normal room temperature (70°F). See CHECK THE RECORD FIRST

2. May be caused by slippage due to grease on idler wheel or inside rim of turntable.

PICK-UP ARM TRIPS OUT OF OSCILLATING GROOVES

1. Record changer not level.

2. Rough surface on catch surface of small trip arm (116). Repolish.

3. Ratchet arm (50) bent too close to trip pawl. Replace.

4. Pick-up arm main shaft binding in bearing.

(a) Ream out the hole.

(b) Sometimes the trip arm (117) may be too close to the base, causing a bind. To remedy, loosen its two setscrews (65) and space lightly.

5. Selector lever (117) may be bent out of shape and binding against detent plate (109). Straighten.

6. Selector lever (117) slot or retaining rivet on detent plate (109) may be undersize or oversize, respectively, effectively causing a binding feeling on the pick-up arm. Correct by spreading slot in selector lever (117).

7. Record may have oscillating groove covered with paper nameplate. Remove paper from oscillating groove.

8. Needle may be chipped. Replace.

CHANGER KEEPS CYCLING

1. Eccentric stud adjustment sets too tight. Correct per instructions found under ECCENTRIC STUD ADJUSTMENT.

2. Catch surface of small trip arm (116) or ratchet arm (50) worn to improper angle causing slipping apart of mating surfaces. Correct by replacing parts.

3. Bell crank torsion spring (83) may be too weak. Replace.

4. Ratchet arm (50) improperly formed. Replace.

CHANGER WILL NOT CYCLE

1. Weak pawl spring (82) causing non-mating of pawl on ratchet arm (50) teeth. Replace spring.

2. Pawl frozen on trip arm (117). Check for cause; if other than due to dirt or grease, replace entire trip arm and selector lever assembly (117).

3. Binding drive arm (17) or main cam wheel (9) on shaft (75). Replace parts or remove burrs.

4. Eccentric adjustment stud set at minimum throw. Cycling drive wheel (49) is not against inner rim of turntable. Correct by setting up as shown under ECCENTRIC STUD ADJUSTMENT.

5. Weak bell crank arm spring (79). Bend bracket to tighten spring or replace spring (79).

6. Bell crank arm (103) binding on shaft (84).

NEEDLE SETS DOWN ON RECORD WITH A WHIP MOTION

1. Pick-up arm centering cam (40) not seating properly during cycle caused by pick-up arm rod (57) pushing against its guide bracket. Correct by bending guide bracket forward to relieve pressure. See Figure 13.

RECORD WILL NOT DROP WHILE CYCLING

1. The record release in the spindle assembly (113) may not be protruding out enough from the spindle assembly. It should stick out as far as the eccentric does when the eccentric is picking up a record. If it doesn't and trouble persists, replace spindle assembly (113).

2. Eccentric (104) out of line with record post. Correct as shown in ADJUSTMENT OF RECORD DROP MECHANISM.

3. Set screw (111) loose on spindle gear (22). Tighten after readjusting.

REVISIONS INCORPORATED IN RECORD CHANGERS

NOTE: Changers that have been revised as indicated below, are known as B-27-RC and B-28-RC; without these revisions, the changers are known as B-24-RC and B-25-RC. A model number is stamped on the bottom of the B-27-RC and B-28-RC record changer bases; this will serve to easily identify these units. From the top, the B-27-RC and B-28-RC record changers can easily be identified by the large adjustment nut at the base of the record support platform.

Record changers B-24-RC and B-25-RC may be revised to include some or all of the revisions by following the detailed information given below Reasons for changes are given in the "remarks" column

OLD REF. NO.	OLD PART NO.	NEW REF. NO.	NEW PART NO.	DESCRIPTION	REMARKS
None	None	102	43A76396	Bearing, Oilite: ring type	Slips over record post and replaces the original ball bearings (2). Before installing a new Oilite bearing, pre-soak it in a good 20W motor oil for at least 1/2 hour.
3	1B71785	103	1B76783	Bell Crank Assembly: includes bell crank lever with eccentric stud and roller (4), torsion spring (83) and small trip arm (116)	Material in small trip arm (116) changed from aluminum to stainless steel to reduce wear. When installing this new part, place a small quantity of very light grease on the trigger catch surface. Directly interchangeable with old part.
18	47A72662	104	1B76770	Eccentric & Tube assembly	Re-designed to work with new spindle and release assembly (113). Cannot be interchanged with original part. Sold only in matched set with Spindle & Release Assembly (113). Lubricate lightly with Lubriplate #105 grease before installing.
21	1X71798	105	1X76781	Gear Arm Assembly: with re-inforcing channel	Reinforcing channel added to stiffen arm and reduce possibility of gear arm bending should record jam during change cycle. Revised part is directly inter-

OLD REF. NO.	OLD PART NO.	NEW REF. NO.	NEW PART NO.	DESCRIPTION	REMARKS
23	45A27549	23	45A27549-D	Lever, manual	Re-designed to prevent possibility of manual lever wedging itself between base and small trip arm (116). Directly interchangeable with old part.
None	None	106	2A76397	Nut, adjustment: acorn shaped	Used with redesigned record support post (115).
39	47D71605	39	47D71605-G	Pick-up arm (only): less all other parts	Hole drilled in arm to make needle replacement setscrew accessible from outside. This makes it unnecessary to remove crystal cartridge when replacing needle.
44	1X71797	107	1X76774	Platform & Clamp Assembly	The corners of the new record support platform have been cut off to reduce area that record hangs on. New platform is directly interchangeable with old one.
50	1X75569	50	1X75569-B	Ratchet Arm & Bushing Assembly	Notches added on revised part to give a better trigger mesh. Directly interchangeable with old part.
52	47A71702	108	47B76762	Record Post & Bearing Assembly	Redesigned to be used with new ring type Oilite bearing (102). When this part is used, the turntable retaining washer (96) and the ball bearings (2) are eliminated. Use with the new Oilite bearing (102) to directly replace old record post and bearing assembly (52).
74	1X71788	109	1X76778	Selector Shaft & Plate Assembly	Part differs from old assembly by use of new type of shoulder rivet. New rivet (part No. 5A76489) spaces selector lever from detent plate, thus eliminating rubbing or catching of selector lever (117) on selector spring (80). New selector shaft and plate assembly

					is not interchangeable with original one. A new trip arm and selector lever assembly (117) must be used with this revised selector shaft and plate assembly.
62	3S2672	110	3S9700	Setscrew, steel: 6-32 x 3/16, Allen head, cup-point machine screw; cadmium plated	Record support mounting screw was cone point type. Now it is changed to cup point (same as (63)) to permit easier adjustment of record support platform.
64	3S7119	111	3S7109	Setscrew, steel: 6-32 x 5/16 slabhead, cup point machine screw, cadmium plated	Length was 1/4". Increased for better wrench grip.
77	41A72568	112	42A76484	Spring, clip (cycle pulley retainer)	Re-designed to have greater holding power and facilitate removal and installation. Directly interchangeable with old part.
76	1B71709	113	1B76766	Spindle, & Release Assembly	Redesigned to provide greater ledge for records. Cannot be directly interchanged with old part (76). Must be used with the new eccentric and tube assembly (104). Sold only in matched set with Eccentric & Tube Assembly (104). Lubricate lightly with Lubriplate #105 grease before installing.
82	41A27491	114	41A76681	Spring, tension	Tension increased (approximately doubled) to give positive cycling action. Directly replaces old tension spring (82).
86	46B71653	115	46B76775	Support Post	Part redesigned by threading lower portion for adjustment nut (106). Replaces original support post, but adjustment nut (106) must also be used with it. Lockwasher (27) must also be replaced with flat washer (120). The redesigned support post and addition of adjustment nut permits adjustment of

OLD REF. NO.	OLD PART NO.	NEW REF. NO.	NEW PART NO.	DESCRIPTION	REMARKS
					and record post by simply loosening adjustment nut (106) from top of changer (no dismantling of changer required).
90	1X71787	116	1X76780	Trip Arm Assembly (small)	Material changed from aluminum to stainless steel to reduce wear. When installing this new part, place a small quantity of a very light grease on the trigger catch surface. Directly interchangeable with old part (90). Bell Crank Assembly now changes from (3) to (103).
91	1X71789	117	1X76779	Trip Arm & Selector Lever Assembly (large): consists of large trip arm assembly and selector lever and stud assembly, assembled together; pawl spring (82) and screws (65) & (58) not included.	Differs from old assembly by bend in selector lever (45A71632-B). Bend gives more clearance between selector lever and selector spring (80), eliminating rubbing. Use this new trip arm and selector lever assembly with the new selector shaft and plate assembly (109). Old and new assemblies are not directly interchangeable.
None	None	118	4K76609	Washer, brass: 9/16 x .315 x .010 thick	Washer added between drive arm assembly (17) and washer (98) to reduce main cam wheel play.
None	None	119	4A21491	Washer, brass: 9/16 x .315 x .020 thick	Washer added between record changer base and main cam wheel to reduce play. Washer is the same type as used in position (101).
None	None	120	431758	Washer, brass: 13/16 x .515 x .040 thick; bright nickel finish	Replaces lockwasher (27).
None	None	121	487569	Washer, steel: 5/16 x .145 x .027 thick; cadmium plated	Washer is inserted in slot of die cast pick-up shaft cam assembly (40) to eliminate possibility of cracking die casting when tightening lateral adjustment lockscrew. The lateral adjustment lockscrew (68) is passed through the washer.

MOTOROLA INC. MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC, B-32-R, B-33-RC

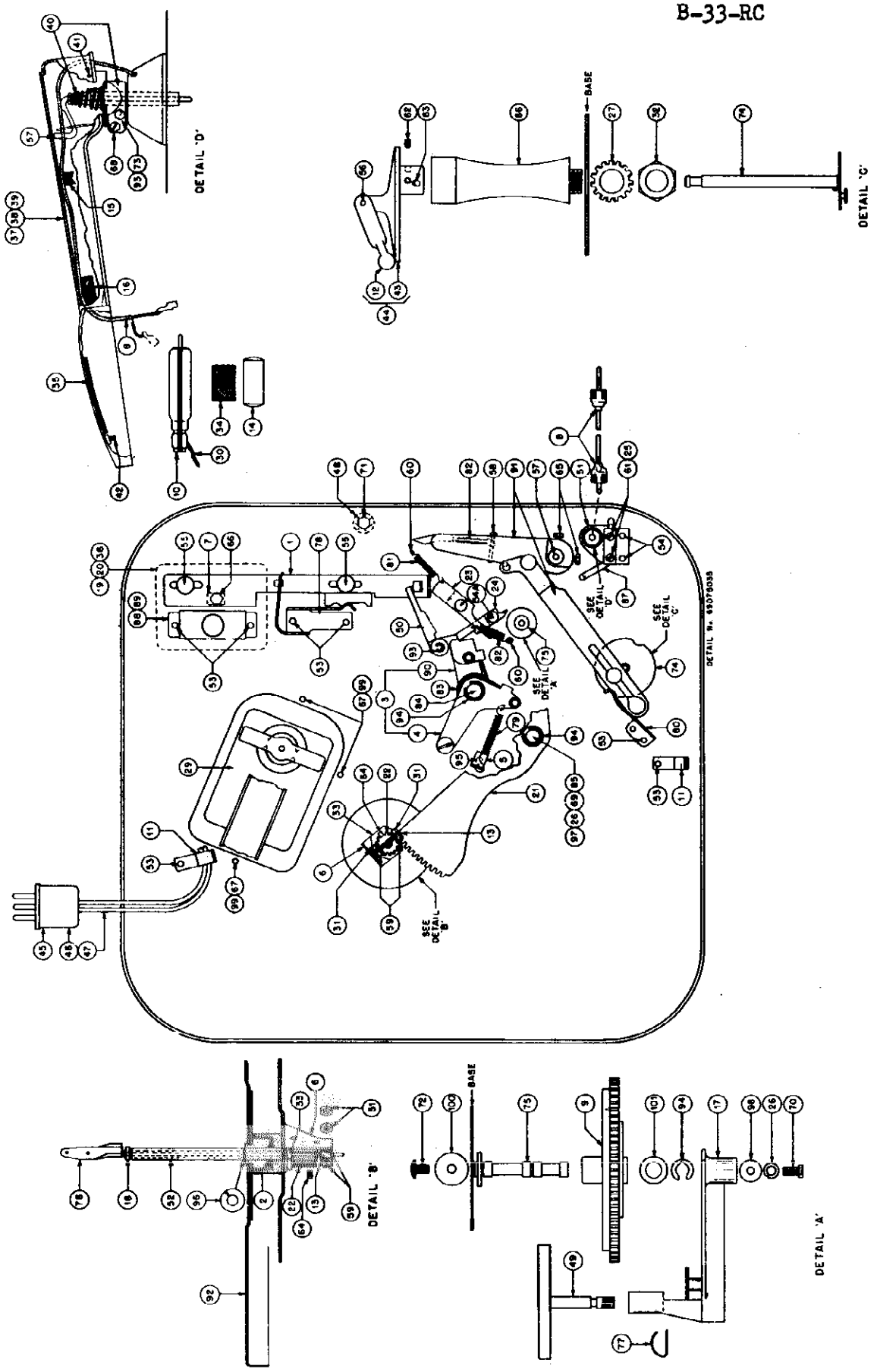


FIGURE 14. RECORD CHANGER PARTS LOCATION DETAIL

MODELS B-27-RC, B-28-RC, B-29-RC, B-31-RC

MOTOROLA INC.

MODELS B-32-RC, B-33-RC

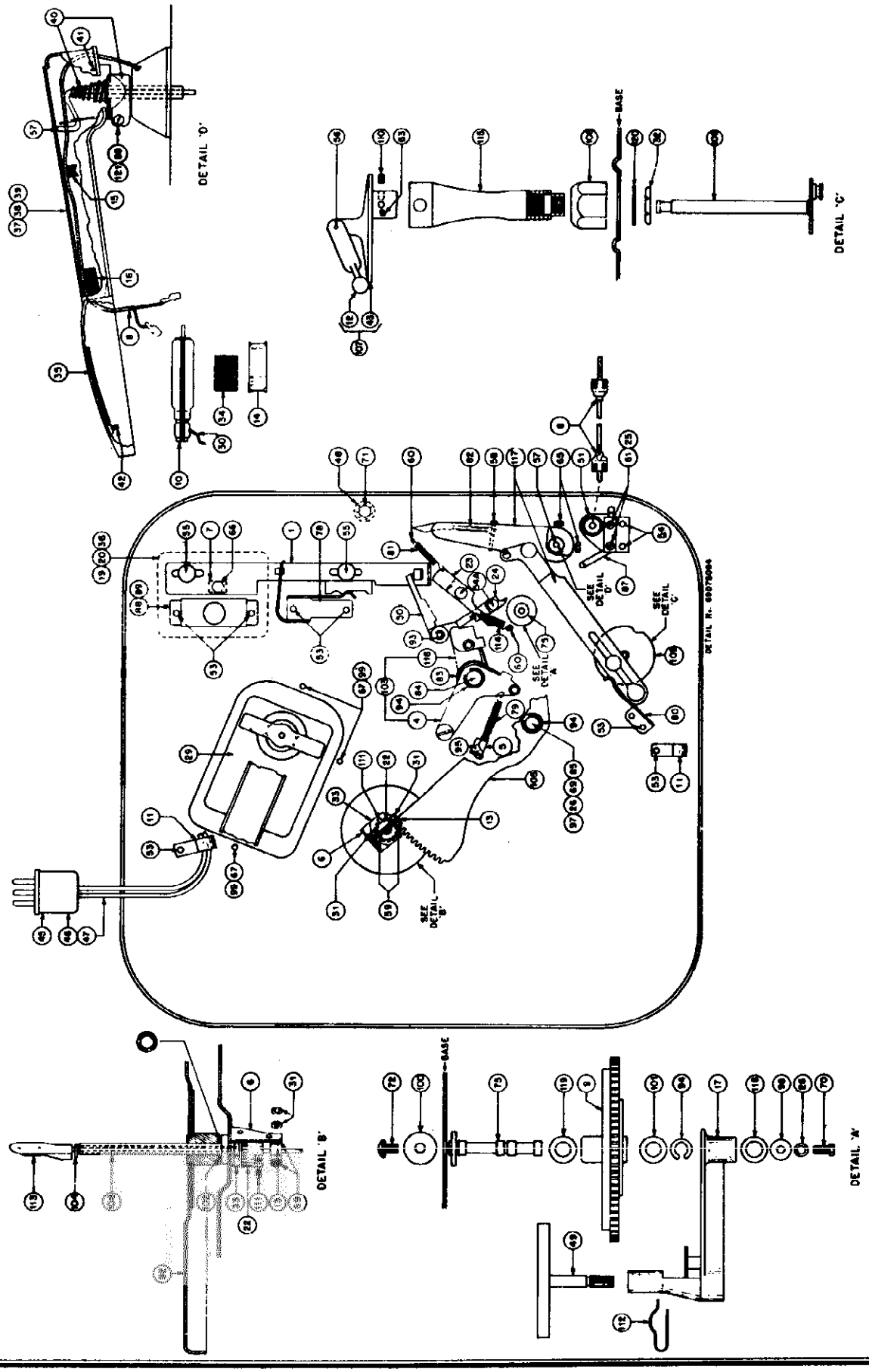


FIGURE 15. RECORD CHANGER PARTS LOCATION DETAIL

PARTS LIST

REF. NO.	PART NO.	DESCRIPTION
1	45B27543	Arm, selector slide
2	43X4554	Bearing, ball: .062 diameter (16 used in turntable bearing) B-24-RC & B-25-RC only. No longer used; replace with Oilite bearing (102)
3	1B71785	Bell Crank Assembly - B-24-RC & B-25-RC only. Replace with (103)
4	1X71786	Bell Crank Lever Assembly: consists of bell crank lever with eccentric stud and roller
5	7A72463	Bracket, mounting (anchors bell crank spring)
6	7A71686	Bracket, spindle
7	38A27564	Button, switch
8	1X72672	Cable & Pin Terminal Assembly (pick-up connecting lead)
9	1B71679	Cam Wheel & Bearing Assembly: die cast cam wheel with pressed in Oilite bearing
10	59A71618 or 59A74887	Cartridge, crystal
11	42K13135	Clamp, cable: 1/2"; cadmium plated (cable support)
12	42B71643	Clamp, record
13	42A71690	Clamp, spindle
14	42A75809	Clip, cartridge retainer: spring steel
15	42A72314	Clip, retainer: steel, 7/8 long (holds pick-up lead inside pick-up arm)
16	35A72628	Cushion, pick-up arm: sponge rubber, 19/64 x 3/8 x 1/2 long
17	1X71794	Drive arm assembly: die cast; includes brass idler gear
18	47A72662	Eccentric & Tube Assembly - Replace with matched (113) & (104)
19	13A27714	Escutcheon, switch (B-24 & 27-RC only)
	13K77077	Escutcheon, switch (B-29-RC only)
20	13A27526	Escutcheon, switch (B-25 & 28-RC only)
21	1X71798	Gear Arm Assembly: includes roller and bushing - B-24-RC & B-25-RC only. Replace with (105)
22	44B71634	Gear, spindle
23	45A27549	Lever, manual
24	45A74582	Link, trip
25	487695	Lockwasher, steel: #5 internal: cadmium plated (muting switch mounting)
26	487671	Lockwasher, steel: #8 split; cadmium plated (gear arm stud mounting - drive arm mounting)
27	486441	Lockwasher, steel: 1/2" external; cadmium plated. B-24-RC &
28	11M8605	Lubricant: Metal Lubriplate #105 (general lubricant)
29	59C71678 or 59C75524	Motor, Phono: complete: 117V, 60 cycles
30	47X72643 or	Needle, phonograph: sapphire tipped
	47X74920	Needle, phonograph: precious metal tipped
31	287019	Nut, steel: 4-40 x 1/4 hex; cadmium plated (spindle clamp mounting)
32	2K17206	Nut, steel: 1/2-28 x 5/8 hex; cadmium plated (record support mounting)
33	2A72311	Nut, special (record post mounting)
34	35A74665 or 35K74908	Pad, cartridge (small): sponge rubber: 1/2 x 3/4 x 1/16 thick Pad, cartridge (small): sponge rubber: 1/2 x 3/4 x 1/8 thick (cushion between cartridge retainer clip and cartridge. 1/16 pad used with Shure cartridge; 1/8" pad is used with Webster cartridge)
35	35A74664	Pad, cartridge (large): sponge rubber; 3/4 x 1-1/2 x 1/8 thick (pad between pick-up arm and pick-up cartridge)
36	32A27776	Pad, escutcheon: paper

REF. NO.	PART NO.	DESCRIPTION
37	1X76313	Pick-up Arm Assembly (less needle) complete with crystal cartridge, cable, shaft, pick-up elevating rod, guide bracket and cam assembly. (B-24, 25, 27 & 28 RC Only)
	1X77202	Pick-up Arm Assembly (less needle) same as above except for B-29-RC only)
38	1X71792	Pick-up Arm, Shaft & Arm Cam Assembly: complete but less crystal cartridge, lead and cartridge retaining parts. (B-24, 25, 27 & 28-RC only)
	1X77062	Pick-up Arm, Shaft & Arm Cam Assembly: same as above except for B-29-RC only
39	45D71605	Pick-up Arm (only): less cartridge and all other parts (B-24, 25, 27 & 28-RC only)
	49K77074	Pick-up Arm (only): less cartridge and all other parts (B-29-RC only)
40	1X72338	Pick-up Shaft & Cam Assembly
41	47A71685	Pin,pick-up arm: steel (hinges pick-up arm to shaft & cam assembly)
42	47A74666	Pin, cartridge locating: rubber; 7/64 diameter 5/16 long
43	64B71647	Plate, record support (B-24, 25, 27 & 28 RC only)
	64K77075	Plate, record support (B-29-RC only)
44	1X71797	Platform & Clamp Assembly: B-24-RC & B-25-RC only; no longer used; replace with (107)
45	28A27573	Plug: 3 pin
46	1X72351	Plug, Shell & Leads Assembly: 3 pin plug with two leads. (B-24, 27 & 29-RC only)
47	1X72498	Plug, Shell & Leads Assembly: 3 pin plug with three leads. (B-25 & 28-RC only)
48	46A27563	Post, pick-up resting; tenite
49	1X71795	Pulley & Shaft Assembly
50	1X75569	Ratchet Arm & Bushing Assembly
51	1X75267	Receptacle, Bracket & Switch Assembly (pick-up output receptacle & muting switch on bracket)
52	47A71702	Record Post and Bearing Assembly: antique copper finish; powdered iron bearing - B-24-RC & B-25-RC only. No longer used. Replace with (108) and use Oilite bearing (102) in place of the original ball bearings (2). Discard turntable retaining washer (96).
53	5S7716	Rivet, steel: .122 x 5/32; antique copper finish
54	5S7718	Rivet, steel: .122 x 3/16; antique copper finish
54A	5K21337	Rivet, shoulder (trip link & manual lever mounting)
55	5K72597	Rivet, shoulder (selector slide arm mounting)
56	47K76777	Rod, record clamp; steel, .062 diameter x 1-3/8 long; copper plated
57	47A71633	Rod, pick-up (pick-up arm elevating rod)
58	382697	Screw, steel: #2 x 5/8 PKZ slotted round head; cadmium plated (limit stop adjustment)
59	382286	Screw, steel: lockscrew, 4-40 x 3/16 locking type hex head machine screw: cadmium plated (spindle clamp)
60	382689	Screw, steel: #4 x 5/16 PKZ Phillips binder head: antique copper finish (spring anchoring studs)
61	381443	Screw, steel: 5-40 x 5/16 slotted binder head machine screw, nickel plated (muting switch mounting)
62	382672	Setscrew, steel: 6-32 x 3/16 Allen head, cone point: cadmium plated - B-24-RC & B-25-RC only. No longer used. Replace with cup point setscrew (110)
63	389700	Setscrew, steel: 6-32 x 5/16 Allen head, cup point machine screw: cadmium plated (record support mounting)
64	387119	Setscrew, steel: 6-32 x 1/4 slab head machine screw; cadmium plated; B-24-RC & B-25-RC only. Use longer screw (111) for replacement

REF. NO.	PART NO.	DESCRIPTION
65	3S7152	Screw, steel: 6-32 x 1/4 slotted hex head machine screw, cadmium plated (large trip arm mounting setscrews)
66	3S7506	Screw, steel: #6 x 1/4 PKZ plain hex head; cadmium plated (switch button mounting)
67	3S7342	Screw, steel: 6-32 x 5/8 slotted binder head machine screw; cadmium plated (motor mounting)
68	3S2288	Screw, steel: 6-32 x 3/4 slotted hex head machine screw; cadmium plated (pick-up arm lateral adjustment lockscrew)
69	3S2291	Screw, steel: 8-32 x 5/16 slotted hex head machine screw; antique copper finish (gear arm stud mounting)
70	3S7374	Screw, steel: 8-32 x 5/16 slotted hex head machine screw; cadmium plated (drive arm mounting)
71	3S2678	Screw, steel: #8 x 5/8 plain locking hex head; cadmium plated (pick-up resting post mounting)
72	3S2287	Screw, steel: 12-24 x 1/4 slotted binder head machine screw; antique copper finish (cam shaft mounting)
73	3A71612	Screw, adjustment: special; cadmium plated (pick-up arm lateral adjustment) - Remove & discard, no longer required
74	1X71788	Selector Shaft & Plate Assembly - B-24-RC & B-25-RC only
75	47A21298	Shaft, cam (for main cam wheel)
76	1B71709	Spindle Assembly - B-24-RC & B-25-RC only. Replace with matched (113) & (104)
77	41A72566	Spring, clip (cycle pulley retainer) - B-24-RC & B-25-RC only. Use improved clip (112) when replacing
78	41B71660	Spring, detent (for selector slide arm)
79	41A72337	Spring, drive arm tension
80	41A71635	Spring, selector (for 10-12 inch selector detent plate)
81	41A27775	Spring, tension (manual lever)
82	41A27491	Spring, tension (ratchet arm & pawl springs)
83	41A71676	Spring, torsion (used in bell crank assembly)
84	46A71620	Stud, bell crank lever
85	46A71631	Stud, shoulder (gear arm mounting stud)
86	46B71653	Support Post: B-24-RC & B-25-RC only. NOTE: If top adjustment type of record support is desired, replace parts (86) and (27) with (115) (106) and (120).
88	40A27646	Switch, slider: 2 position; with shell (B-24, 27 & 29-RC only)
89	40A27645	Switch, slider: 3 position; with shell (B-25 & 28-RC only)
90	1X71787	Trip Arm Assembly (small): small trip arm with roller. Use improved type (116) when replacing.
91	1X71789	Trip Arm and Selector Lever Assembly (large): consists of large trip arm assembly and selector lever and stud assembly, assembled together, less pawl spring (82) and screws (66) & (58). (B-24-RC & B-25-RC only)
92	59C71664	Turntable, phono
93	4K24125	Washer, "C" Spring (holds pick-up arm lateral adjustment screw in position and ratchet arm retainer) - Remove & discard; no longer required.
94	4A21941	Washer, "C" spring (bell crank retainer, main cam retainer & gear arm retainer)
95	4A19199	Washer, spring (used between mounting bracket that holds the bell crank spring and chassis base.)
96	4A74646	Washer, spring steel: special (turntable retainer) B-24-RC & B-25-RC only.
97	4S7623	Washer, steel: 3/8 x 11/64 x .033

REF. NO.	PART NO.	DESCRIPTION
98	4S7597	Washer, steel: 7/16 x .171 x .038 thick; cadmium plated (drive arm retainer)
99	4S1765	Washer, steel: 1/2 x .147 x 1/64 thick; cadmium plated (motor mounting)
100	4S7643	Washer, steel: 11/16 x 15/64 x .021 thick; antique copper finish (on cam wheel shaft mounting screw)
111	3S7109	Setscrew, steel: 6-32 x 5/16 slab-head machine screw; cadmium plated
112	42A76484	Spring, clip (cycle pulley retainer)
113	1B76786	Spindle & Release Assembly: furnished only in matched set with Eccentric & Tube Assembly (104)
114	41A76681	Spring, tension
115	46B76775	Support Post (B-27 & 28-RC only)
	46K77076	Support Post (B-29-RC only)
116	1X76780	Trip Arm Assembly (small)
117	1X76779	Trip Arm & Selector Lever Assembly (large): consists of large trip arm assembly and selector lever and stud assembly, assembled together; pawl spring (82) and screws (65) & (58) not included
118	4K76609	Washer, brass: 9/16 x .315 x .010 thick
119	4A21491	Washer, brass: 9/16 x .315 x .020 thick
120	4S1758	Washer, brass: 13/16 x .515 x .040 thick; bright nickel finish
121	4S7569	Washer, steel: 5/16 x .145 x .027 thick; cadmium plated
101	4A21491	Washer, brass: 9/16 x .315 x .020 thick (main cam wheel thrust washer)
102	43A76396	Bearing, Oilite: ring type (should be pre-soaked in grade 20W motor oil for at least 1/2 hour before installation)
103	1B76783	Bell Crank Assembly: includes bell crank lever with eccentric stud and roller (4), torsion spring (83) and small trip arm (116).
104	1B76770	Eccentric & Tube Assembly: furnished only in matched set with Spindle & Release Assembly (113)
105	1X76781	Gear Arm Assembly: with re-inforcing channel
106	2A76397	Nut, adjustment: acorn shaped
107	1X76774	Plate & Clamp Assembly (B-24, 25, 27 & 28-RC only)
	1X77083	Plate & Clamp Assembly (B-29-RC only)
108	47B76762	Record Post & Bearing Assembly
109	1X76778	Selector Shaft & Plate Assembly
110	3S9700	Setscrew, steel: 6-32 x 3/16; Allen head, cup-point machine screw; cadmium plated

PHONO OSCILLATOR CHASSIS HS-18

C-1	21R6535	Capacitor, fixed: mica; 25 mmf. 500V
C-2	21R6641	Capacitor, fixed: mica; 100 mmf. 20% 500 V
C-3	20A14502	Capacitor, trimmer: 16-160 mmf; with mounting bracket
C-4	21R6535	Capacitor, fixed: mica; 25 mmf. 500V
C-5	21R6638	Capacitor, fixed: mica; 1000 mmf. 500V
C-6	23A20887	Capacitor, electrolytic: 10-10-10 mf 150V; with mounting strap
C-7	8S9816	Capacitor, fixed: paper; .05 mf 400V
C-8	8S9816	Capacitor, fixed: paper; .05 mf. 400V
L-1	24A20892	Coil, oscillator
R-1	6R6056	Resistor, fixed: carbon; 47,000 1/2W Ins.
R-2	18A20889 or 18A71773	Resistor, variable: 10,000; screwdriver adj. type
R-3	6R2122	Resistor, fixed: carbon; 4.7 meg 1/2W Ins.
R-4	6R6101	Resistor, fixed: carbon, 4700 1/4W N.I.
T-1	25A17449	Transformer, Power
	42A22318	Clip, line cord: formed wire (holds line cord against chassis)
	30K31258	Cord, line & plug: 3 conductor; rubber covered

WR6, WR7 & WR8 MECHANICAL PARTS

PART NO.	DESCRIPTION
32K31269	Lock, line cord: fibre (holds line cord to chassis)
29R5207	Lug, soldering: #6; hot tinned
2S7051	Nut, steel: 3/8 -32 x 9/16 hex palnut; cadmium plated (bias control mounting)
9A22182	Receptacle, plug: 1 prong
9A27674	Receptacle, plug: 3 prong
5S7707	Rivet, steel: .122 x 5/32; nickel plated (tube socket and bias control mounting bracket)
5S7701	Rivet, steel: .122 x 3/16; nickel plated (osc. coil and trimmer mounting)
5S7703	Rivet, steel: .122 x 7/32; nickel plated (Power transformer and receptacle mounting)
5S7708	Rivet, steel: .122 x 9/32; nickel plated (line cord lock mounting)
3S7464	Screw, steel: #8 x 1/4 PKZ plain hex head; cadmium plated (cover mounting)
3S7456	Screw, steel: #8 x 1/4 PK A slotted acorn head; antique copper finish, mounts HS-18 to B-25-RC or B-28-RC
9A8738	Socket, tube; octal; saddle type
4S7578	Washer, brass: 5/16 x .130 x .025 thick (power transformer mounting)
4S1719	Washer, steel: 3/8 x .140 x .030 thick; cadmium plated (line
38A10544	Button, plug: for 1/4" hole; copper oxide finish
42X22210	Button, plug: fits 3/8" hole; copper oxide finish
16D71242	Cabinet, wireless record player: metal (WR8)
16E71007	Cabinet, wireless record player: wood (WR7)
1X75247	Cabinet, wireless record player: fibre; (WR8), includes 4 cover mounting brackets
32K70058	Cover, bottom (WR6)
32K70059	Cover, bottom (WR7)
32C72868	Cover, bottom (WR8)
37K15841	Foot, rubber: 3/4 diameter (WR7)
3S7163	Screw, steel: 8-32 x 1/4 slotted hex head machine screw: cadmium plated (bottom cover mounting - WR8)
3S7345	Screw, steel: 10-32 x 1/2 slotted round head machine screw; cadmium plated (Record changer mounting - WR8)
3S7329	Screw, steel: 10-32 x 2-1/4 slotted hex head machine screw; cadmium plated (record changer mounting - WR7)
3S7325	Screw, steel: 10-32 x 2-3/4 slotted hex head machine screw; copper plated (Record changer mounting - WR8)
41A21807	Spring, cushion (bottom) (WR7)
1X72458	Phono Pick-up Lead Assembly: 15" long
3S7439	Screw, steel: #4 x 1/2 slotted acorn head wood screw; antique copper finish (bottom cover mounting - WR6 and WR7)
3S7437	Screw, steel: #5 x 3/8 round head wood screw; antique copper finish (anchor strip mounting - WR6 and WR7)
3S1319	Screw, steel: #6 x 1/2" slotted oval head wood screw; antique copper finish (lid support mounting WR7)
3S1321	Screw, steel: #6 x 3/8 slotted round head wood screw; statuary bronze finish (lid support mounting WR7)
32A30684	Strip, anchor (WR6 and WR7)
55B71779	Support, lid (WR7)
4S8206	Washer, steel: 3/8 x .171 x .027 thick; cadmium plated (bottom cover mounting - WR8)
4S7582	Washer, steel: 1/2 x .195 x .033 thick; cadmium plated (Record changer mounting - WR8)
4S7565	Washer, steel: 1/2 x .218 x .048 thick; cadmium plated (Record changer mounting - WR7)
4S7563	Washer, steel: 5/8 x .203 x .033 thick; cadmium plated (record

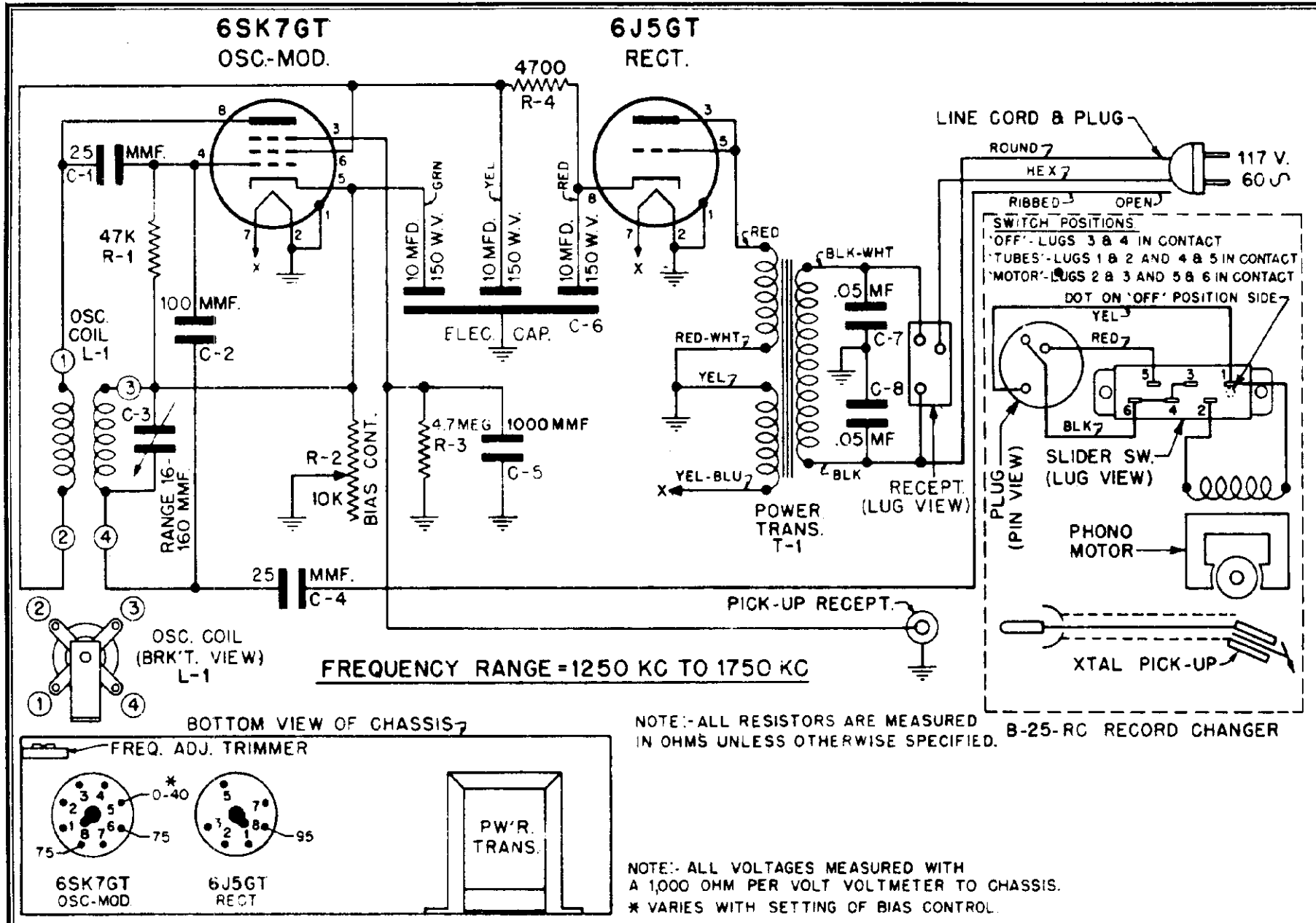


FIGURE 16. CHASSIS HS-18 SCHEMATIC DIAGRAM

These models are mechanically identical, the only difference being in the tone arm. This difference can be seen in figures 1 and 2. The tone arm on the D-10 employs a crystal pickup, while the tone arm on the D-10A is equipped with a dynamic pickup.

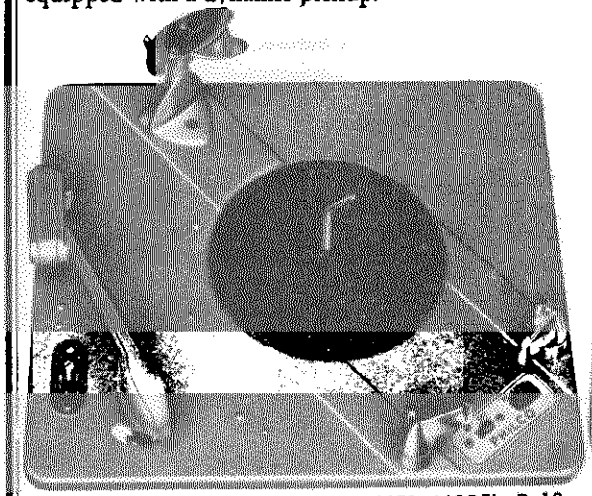


Figure 1. PHILCO RECORD CHANGER MODEL D-10

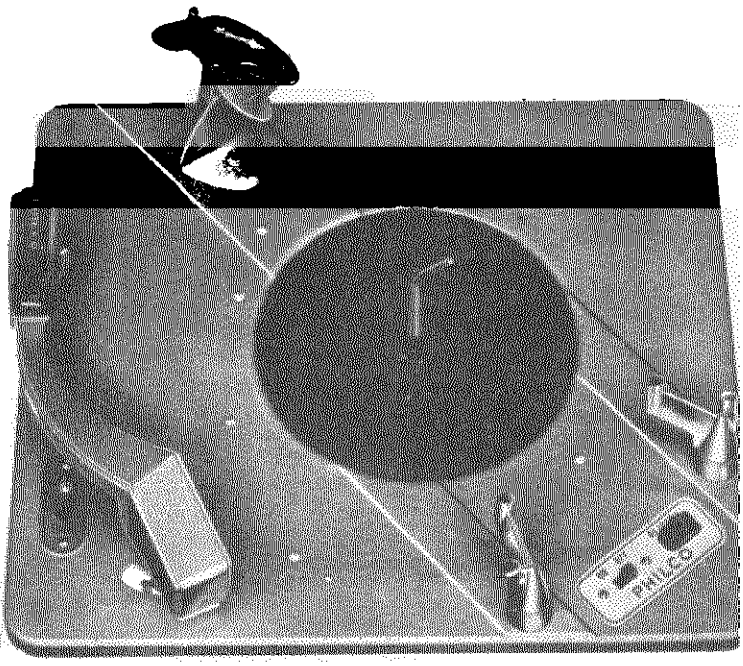


Figure 2. PHILCO RECORD CHANGER MODEL D-10A

PREPARATION FOR USE

OPERATING CHECKS—The following is a logical series of checks to be performed before the instrument is delivered to the owner. Should any of these checks reveal faulty operation, the correct adjustment will be found in the SERVICING section of this manual.

1. Without using a record, place the tone arm on its rest, set both record support levers and the record-separator post to their 12″ positions, as shown in figure 3. Set the manual-automatic lever to AUT. Turn the motor ON and operate the REJECT control; the changer should go through its cycle. Watch the tone arm swing out; it should clear the arm rest. At the completion of the cycle, the point of the needle should clear the changer base plate by $\frac{3}{32}$″.

2. Place a good 12″ record over the spindle and onto the record support levers and separator post. Operate the REJECT control and observe the action of the separator. The record should drop smoothly and evenly onto the turntable. The pickup should lower (index) so that the needle strikes the record approximately ⅛″ in from the outside edge.

3. Allow the record to play through and, when the needle enters the eccentric finishing groove, observe the tripping action; it is normal for the tone arm to ride the eccentric groove for three or four revolutions of the turntable.

4. Load the changer to capacity by placing nine more 12″ records on the supports. Reject each record with the REJECT control. The separator should select each record individually and each should drop smoothly. The tone arm, in its elevated position, should not strike the bottom of the remaining stack of records. After the full stack of records has dropped onto the turntable, the tone arm should lift high enough to clear the top record by ⅛″.

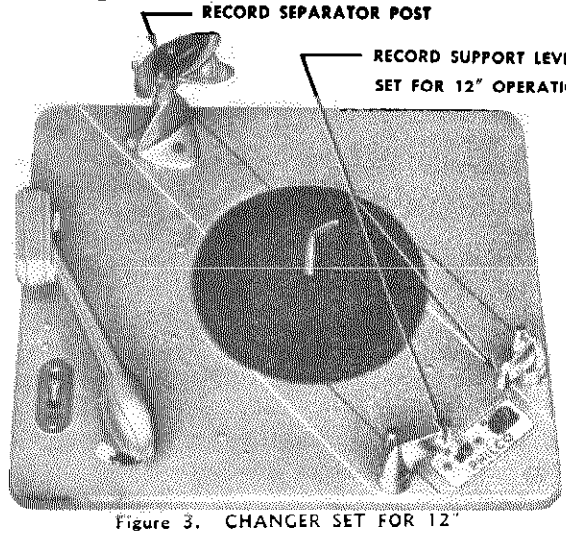


Figure 3. CHANGER SET FOR 12″ AUTOMATIC OPERATION

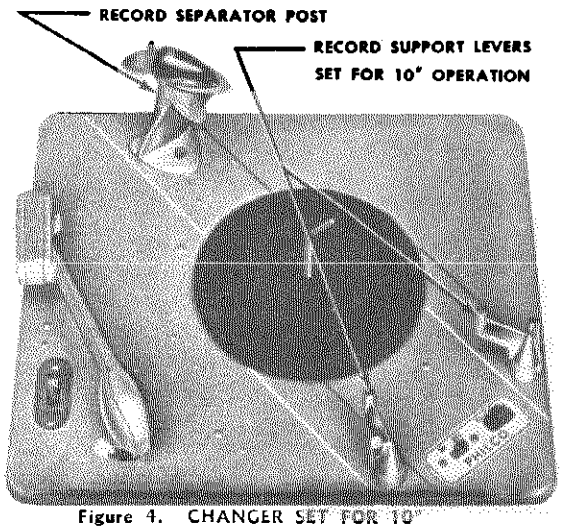


Figure 4. CHANGER SET FOR 10″ AUTOMATIC OPERATION

5. Place the manual-automatic lever at MAN; place the tone arm on its rest; shut off the motor and unload the changer.

6. Set the record support levers and record separator post in the 10″ position, as shown in figure 4. Place a good 10″ record over the spindle and onto the support levers and separator post. Set the manual-automatic lever to AUT, turn on the motor and operate the REJECT control. The record should drop smoothly and the tone arm should lower so that the needle strikes the record approximately ⅛″ in from the outside edge.

7. Allow the record to play through and observe the tripping action. Again, it should be smooth and positive.

8. Load the changer to capacity with eleven more 10″ records. Reject each record with the REJECT control, making certain that each record drops smoothly and individually. When the full stack has dropped onto the turntable, place the manual-automatic lever at MAN and play one record through to determine that the automatic mechanism is disengaged.

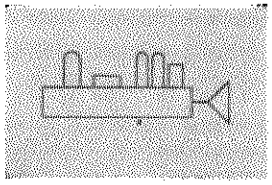
9. Turn the changer off as before, and unload.

PHILCO RADIO-PHONOGRAPH TROUBLE-SHOOTING PROCEDURE

The following tests are given for quickly localizing trouble in a Philco radio-phonograph. Be sure to make each test, in the order given, *before* removing the record changer from the cabinet.

If the trouble is found to be in the audio amplifier, refer to the radio service manual for the particular model under test. If the trouble is in some part of the record changer, refer to the SERVICING section of this record-changer manual.

1. AUDIO-AMPLIFIER TEST



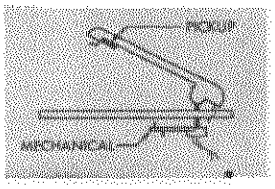
The audio amplifier is common to both the radio and phonograph sections of the combination. With a station tuned in, check the audio amplifier by noting the tonal quality and volume of the speaker output.

On models using the D-10A record changer, also check the phonograph pre-amplifier stage by applying a weak audio signal to the grid of the first audio tube of the radio; the signal should be just strong enough to be barely audible through the speaker. Then apply the same signal to the grid of the phonograph pre-amplifier tube. If the pre-amplifier stage is normal, an appreciable increase in volume will be noticed. An output meter connected across the output of the audio amplifier would normally indicate a gain of approximately five times.

If trouble is found in the audio amplifier, refer to the service manual for the particular model under test.

2. TONE-ARM TESTS

a. Pickup Test



Play a familiar record on the radio-phonograph, and listen to the reproduction. If the audio amplifier was found to be normal in the first test, distortion or low volume indicates trouble in the pickup or in the connecting leads to the radio chassis. Try a new needle if the output is distorted.

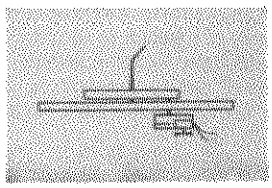
NOTE: It is advisable that a familiar record be carried as a regular part of the serviceman's test equipment.

b. Indexing and Tripping Test

Set the record separator post to the 12″ position and place a good 12″ record on the turntable. Set the manual-automatic lever to AUT, turn on the motor, and operate the REJECT control. Observe the action of the tone arm. It should rise and travel over to the record, with the needle making contact approximately ⅛″ in from its outside edge. After the record has played through, tripping of the mechanism should occur during three or four revolutions of the turntable.

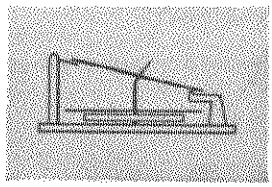
Set the record separator post to the 10″ position and, using a 10″ record, repeat the procedure.

3. TURNTABLE AND MOTOR TEST



Set the manual-automatic lever to MAN. Load the turntable with ten 12″ records and place the tone arm on the top record. Place a stroboscope disc, such as Philco Part No. 45-2900, on the record, and illuminate the disc with a lamp (preferably a neon bulb) operated on 60-cycle a.c. The dots in the row calibrated for 78 r.p.m. should appear to remain stationary, or drift slowly but smoothly forward or backward. Erratic motion of the dots indicates trouble in the drive mechanism.

4. RECORD-SEPARATOR TEST



Set the record separator post and the support levers to the 12″ position and load the changer with ten 12″ records. Set the manual-automatic lever to AUT, turn on the motor, and operate the REJECT control. Observe the action of the separator and the motion of the record as it drops. Repeat the operation of the REJECT control to drop each record in turn. The records should be released smoothly, one at a time.

Set the record separator post and the support levers to the 10″ position and, using twelve 10″ records, repeat the procedure.

If the records do not drop properly, an adjustment of the separator post or an alignment of the spindle may be necessary.

SERVICING

DESCRIPTION OF OPERATING CYCLE—Power for the motor is supplied from the power line through the ON-OFF switch. The turntable is rim-driven by a rubber-tired idler wheel between the motor shaft and turntable rim. A small gear, cast as part of the turntable at its hub, drives a larger composition gear to furnish power to the main cam of the changer mechanism through a pinion gear. The pinion gear is engaged with the main cam gear through action of the trip mechanism. The changer is so designed that the tone arm and record separator post mechanisms operate by levers in contact with the various surfaces of the main cam. The trip mechanism is operated by a pawl and ratchet assembly and starts the change cycle when the needle travels the eccentric finishing groove of the record. The trip mechanism is locked in a disengaged position when the manual-automatic lever is in MAN position.

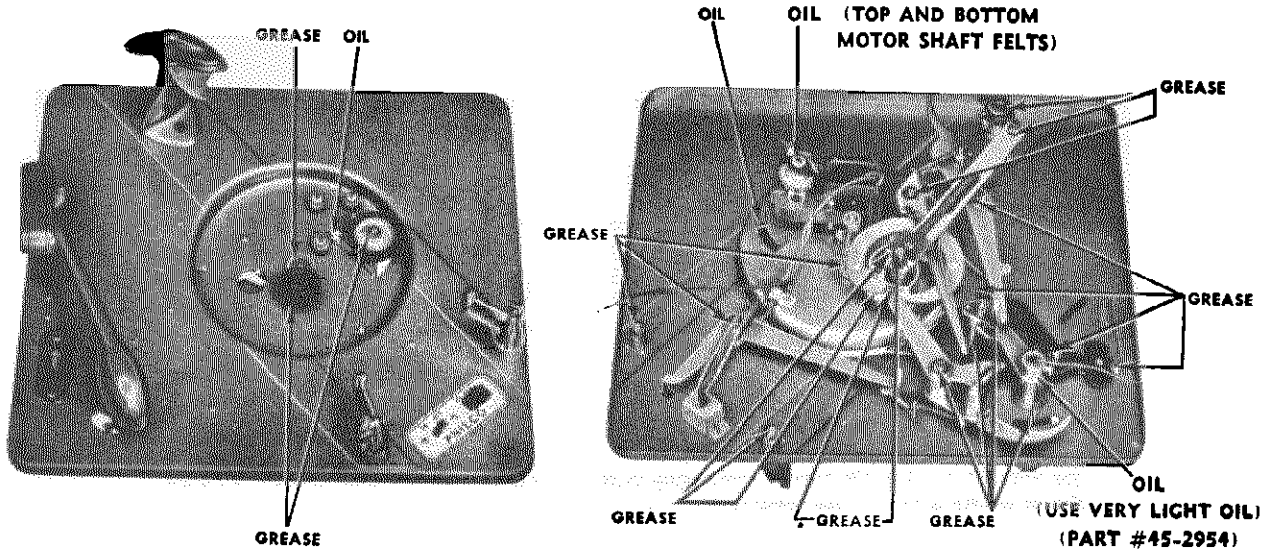


Figure 5. CHANGER LUBRICATION POINTS

CLEANING AND LUBRICATION — Cleaning and lubrication of the record changer should be done periodically or when a major part or assembly is replaced. Carbon tetrachloride or other similar cleaning fluid may be used to remove dirt, old oil or grease. All lubrication points are shown in figure 5.

PARTS NOT TO BE LUBRICATED— The following parts should not be lubricated at any time:

Separator
Trip pawl and ratchet (serrated surface)
Sliding segment on top of main cam.

PARTS TO BE GREASED—Using a light grease of the vaseline type, such as Philco Part No. 60130, lubricate the following parts:

All studs with moving parts attached.
Elevating lever where it contacts tone-arm lift rod.
Locating and tone-arm levers where they contact stud on trip arm.
Detent spring on manual lever.
Idler-wheel bearing stud.
Manual lever where it contacts trip-pawl stud in manual position.
Separator lever (both ends).
Main cam gear and pinion gear.
All shafts (except tone-arm shaft).
Record-separator-post shaft.
Record supports (under posts).
Turntable hub and composition drive gear.
Turntable bearing and ball bearings under turntable.

PARTS TO BE OILED—Using a good grade of light machine oil, lubricate the following parts:

Idler-wheel lever assembly.

CAUTION: Do not get oil on rubber tire, if so, remove immediately with carbon tetrachloride.

Motor-shaft felt oil retainers (top and bottom).
Tone-arm shaft (use very light oil such as Philco Part No. 45-2954).

Some parts and assemblies may have to be removed for proper lubrication. The correct procedure for the removal and re-installation of these parts and assemblies will be found in the REPLACEMENT OF PARTS AND ASSEMBLIES section of this manual.

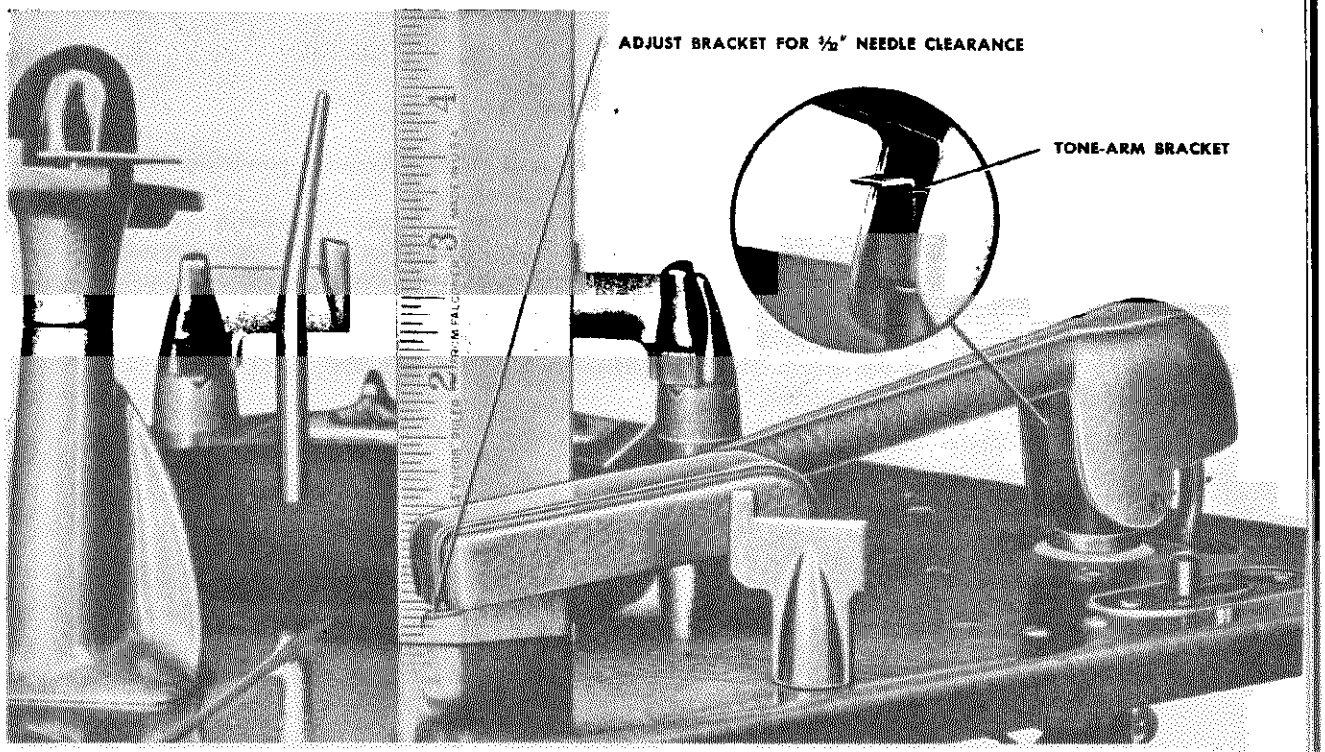


Figure 6. TONE-ARM BASE-PLATE CLEARANCE

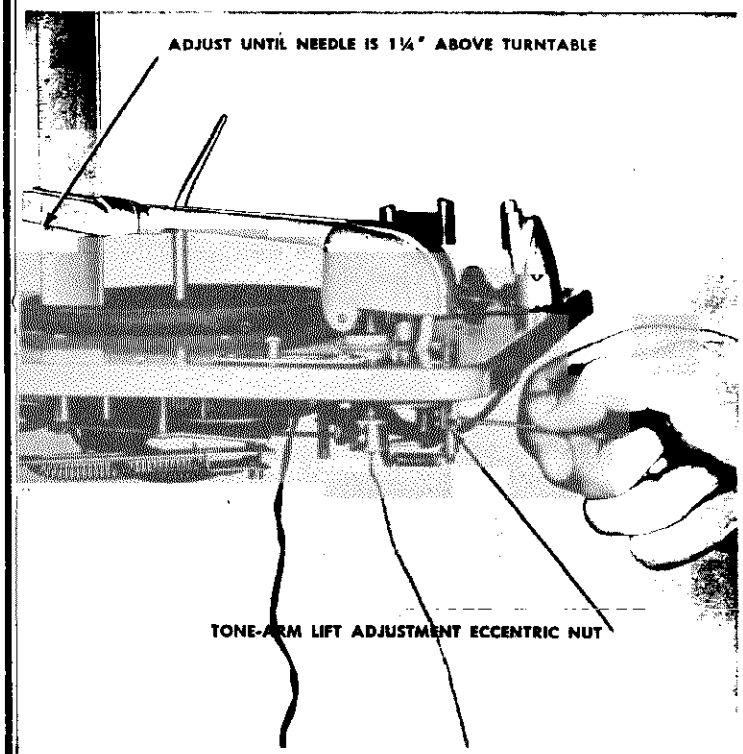


Figure 7. TONE-ARM LIFT ADJUSTMENT

TONE-ARM BASE-PLATE CLEARANCE — Without a record on the turntable and the changer out of cycle (playing position), the needle point should clear the changer base plate by 3/32". To adjust, shape the tone-arm bracket, when necessary, as shown in figure 6.

TONE-ARM LIFT ADJUSTMENT—Without using a record, place the changer in automatic position; do not turn the motor on. Bring the tone arm into the center to actuate the trip. Manually revolve the turntable 1¼ turns. At this point, the needle should be 1¼" above the turntable. Adjustment is made by turning the eccentric nut on the tone-arm elevating assembly, figure 7, until the proper height is obtained.

12" INDEXING ADJUSTMENT

NOTE: As the 12" indexing adjustment affects the 10" indexing, any changes made in the 12" adjustment must be followed by an adjustment for 10" indexing. The 12" adjustment must be made first.

With the changer set for 12" operation, place a good 12" record on the changer and cycle the changer. Shut off the motor and stop the turntable when the needle is approximately ¼" above the record. Loosen the two setscrews (one has a flat end, the other a cone-pointed end) on the trip-lever assembly attached to the tone-arm vertical shaft. See figure 8. Holding the tone-arm lever lightly against the stop, move the tone arm until the needle point is approximately ⅛"

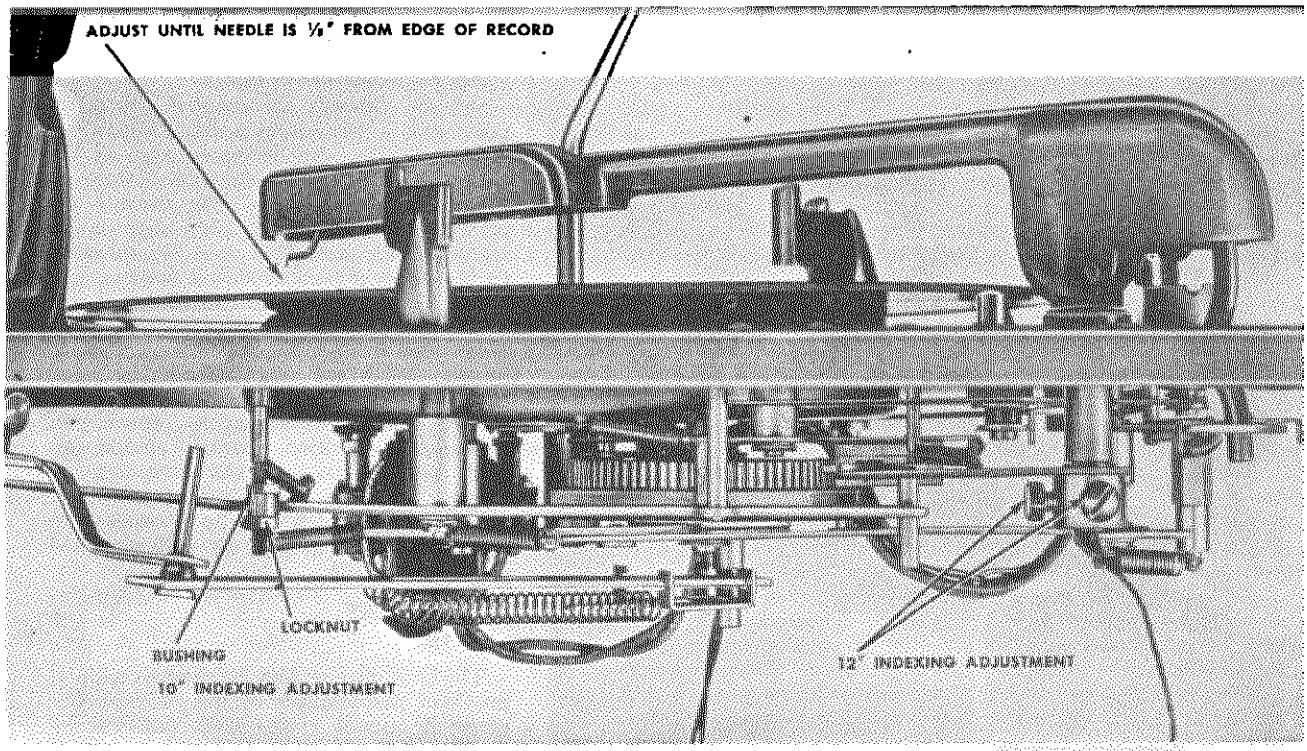


Figure 8. 12" AND 10" INDEXING ADJUSTMENTS

in from the outer edge of the record. Using a shim to provide .003" to .005" end play of the tone-arm post, first tighten the flat-end setscrew. Cycle the changer a few times to make sure the adjustment is correct; then tighten the cone-pointed setscrew.

10" INDEXING ADJUSTMENT—With the changer set for the 10" operation, place a good 10" record on the changer and cycle the changer. Shut off the motor and stop the turntable when the needle is approximately ¼" above the record. Referring to figure 8, loosen the locknut and turn the eccentric bushing directly above until the needle is approximately ⅛" in from the outside edge of the record. Tighten locknut. Cycle changer a few times to make certain the adjustment is correct.

TONE-ARM NEEDLE PRESSURE AND VERTICAL FRICTION

With a 2 oz. postal-type scale, similar to Philco Part No. 45-2958, hooked under the front edge of the tone arm, as shown in figure 9, lift the arm while noting the reading; lower the arm, again noting the reading. The difference in these two readings represents the vertical friction; this friction should not exceed 3/16 ounce. The reading midway between the two readings taken is the needle pressure. The crystal tone arm should have a needle pressure between 1 and 1¼ ounces. The needle pressure of the dynamic tone arm should be between ¾ and 1 ounce. If the tone arm pivot screw is too tight, excessive friction will result. Loosen lockscrew, adjust the pivot screw, and retighten the lockscrew. If the pivot screw is too loose, trip failure on some records is likely.

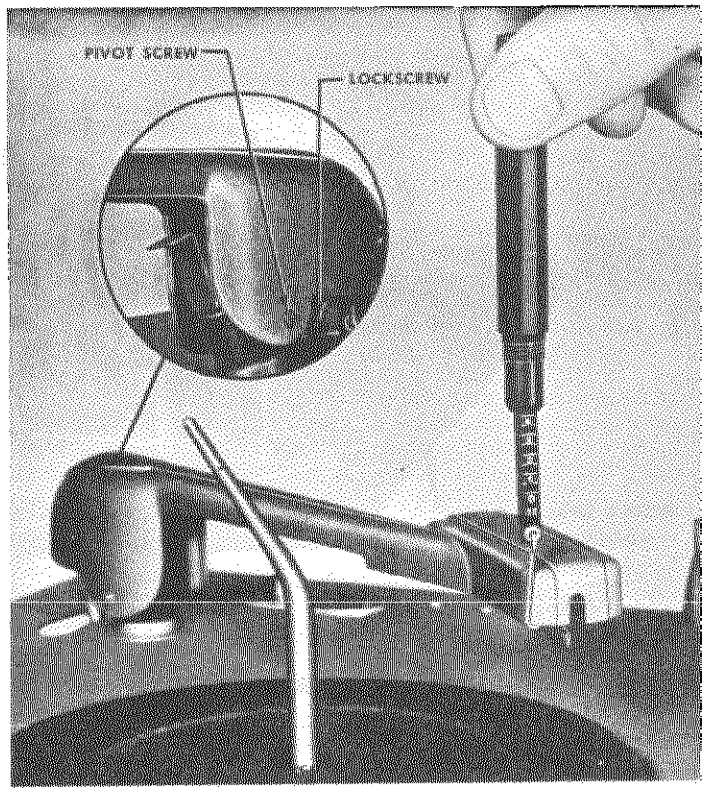


Figure 9. CHECKING TONE-ARM NEEDLE PRESSURE AND VERTICAL FRICTION

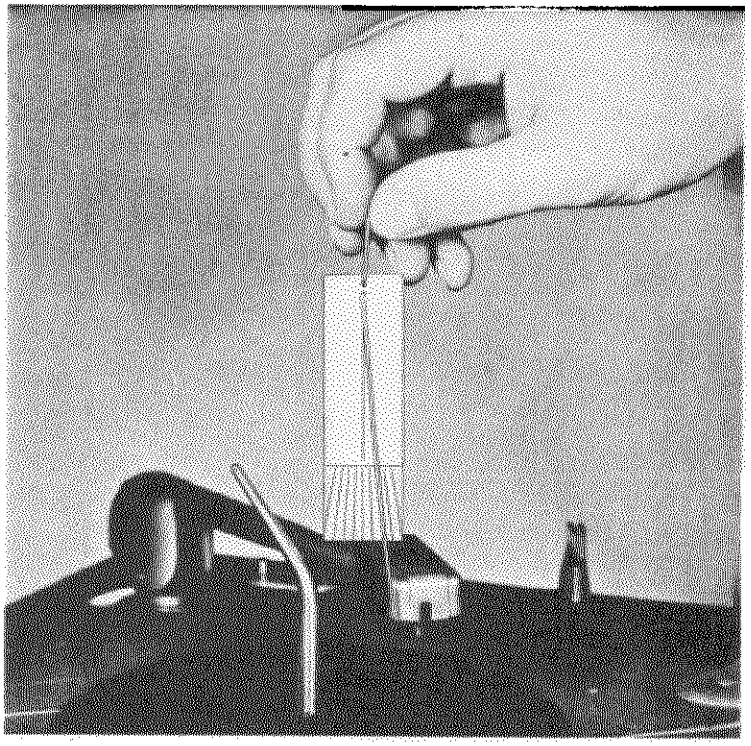


Figure 10. CHECKING TONE-ARM HORIZONTAL FRICTION

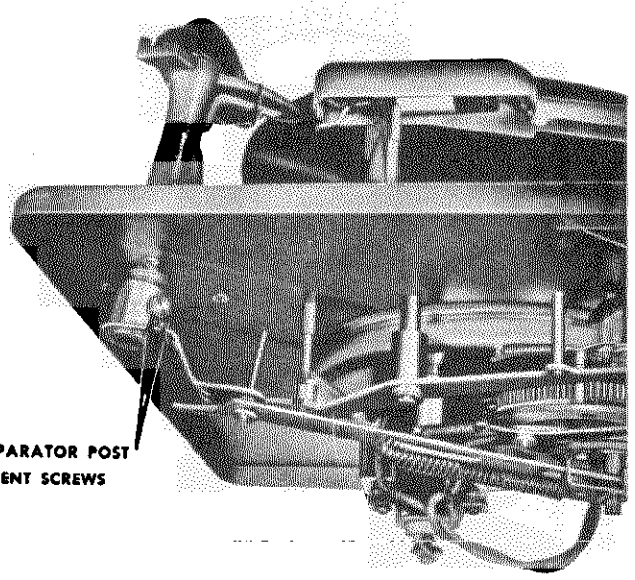


Figure 11. RECORD-SEPARATOR-POST ADJUSTMENT

TONE-ARM HORIZONTAL FRICTION AND TRIP SENSITIVITY

Set the changer for manual operation, and hook a pendulum scale, Philco Part No. 45-2953, under the front edge of the tone arm, as shown in figure 10. Move the tone arm with scale slowly toward the spindle, and back to the outer edge of the record. The pendulum scale is calibrated in $\frac{1}{16}$-ounce divisions, with 0 center. The average of both readings should not exceed $\frac{1}{8}$ ounce. Unlatch the trip; over the same range the average should not exceed $\frac{1}{16}$ ounce. With the trip latched, the horizontal reading in the direction toward the spindle should not exceed $\frac{5}{16}$ ounce. In the reverse direction, the trip should unlatch with a reading not exceeding $\frac{1}{2}$ ounce. If these specifications are met, many records which may be considered to have defective trip grooves will play and trip satisfactorily.

PICKUP TEST

D-10

The D-10 pickup may be checked simply, provided performance of the radio-phonograph is normal in the radio position, by playing a familiar record and listening to the tone quality and volume. If there is no reproduction, check for a short or open circuit in the shielded-wire pickup lead before replacing the pickup unit.

D-10A

The D-10A pickup may also be checked by the same listening test described for the D-10 pickup, provided radio performance is good and the pre-amplifier checks normal. If there is no reproduction, or if the reproduction is weak or distorted, check for a short or open circuit in the connecting leads and phono input transformer before replacing the pickup unit. The primary of the transformer should measure .1 ohm, and the secondary 7000 ohms.

D-10 or D-10A

If reproduction with either the D-10 or D-10A pickup is weak, but the leads and transformer check normal, replace the pickup unit as directed under REPLACEMENT OF PARTS AND ASSEMBLIES. If the reproduction is distorted, try a new needle before replacing the pickup unit.

RECORD-SEPARATOR-POST ADJUSTMENT

There are wide variations in records with respect to outside diameter, size of center hole, and thickness; we urge, therefore, that the record separator post adjustment never be made to any record, unless it has been carefully chosen to meet industry centerline specifications, as follows: For the

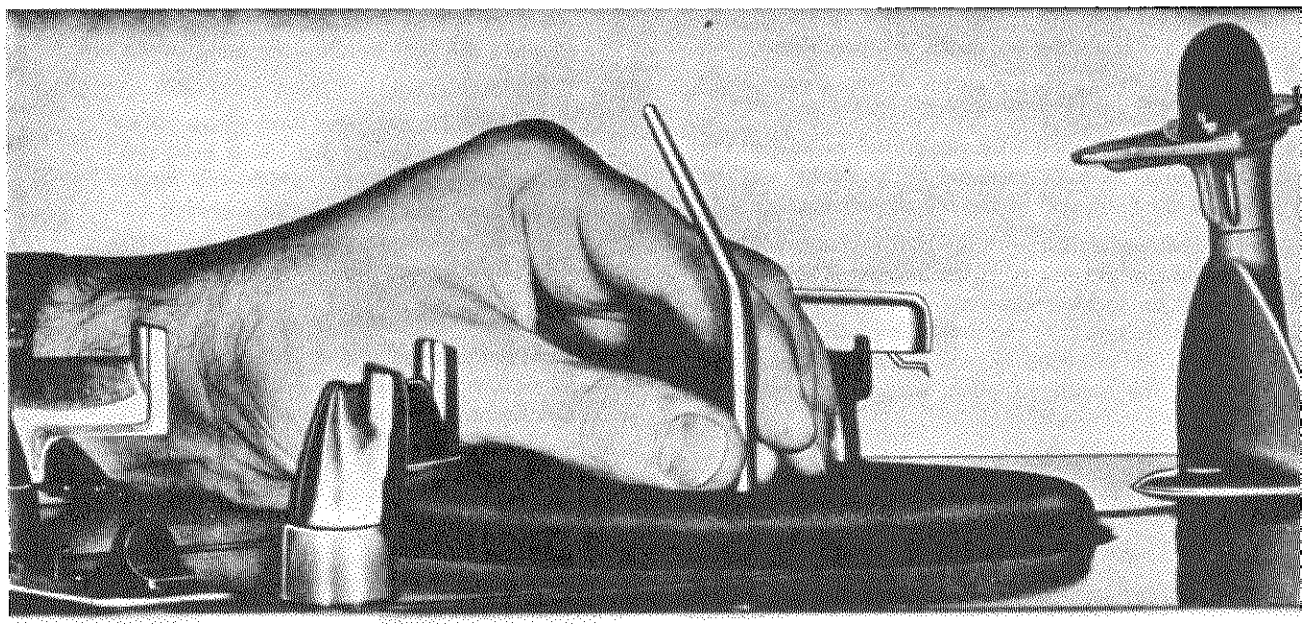
10" record—outside diameter, 9⅞"; center hole, .286"; thickness, .080"; for the 12" record—outside diameter, 11⅞"; center hole, .286"; thickness, .090". However, with an average record, observations can be made that should indicate a normal adjustment. With a 10" record placed on the separator post and both record supports, and with the record held on the separator post as far as the spindle will permit, the separator blade should not touch the record; the outer edge of the record should rest approximately in the center of the record supports. When held away from the separator base, the distance from the edge of the record to the separator tip should not exceed ⅛". With a 12" record placed on the separator post and both record supports, and with the record held on the separator post as far as the spindle will permit, the separator blade should not touch the record; the outer edge of the record should rest approximately in the center of the record supports. When held away from the separator base, the distance from the edge of the record to the separator tip should not exceed $\frac{1}{16}$". These conditions can be met precisely by adjusting the height of the spindle as shown in figure 12. However, the spindle should not be adjusted too low, as binding of the turntable will reduce speed. If the spindle is adjusted too high, the ball bearings may be allowed to escape, and the cleats on the spindle will damage the bottom record.

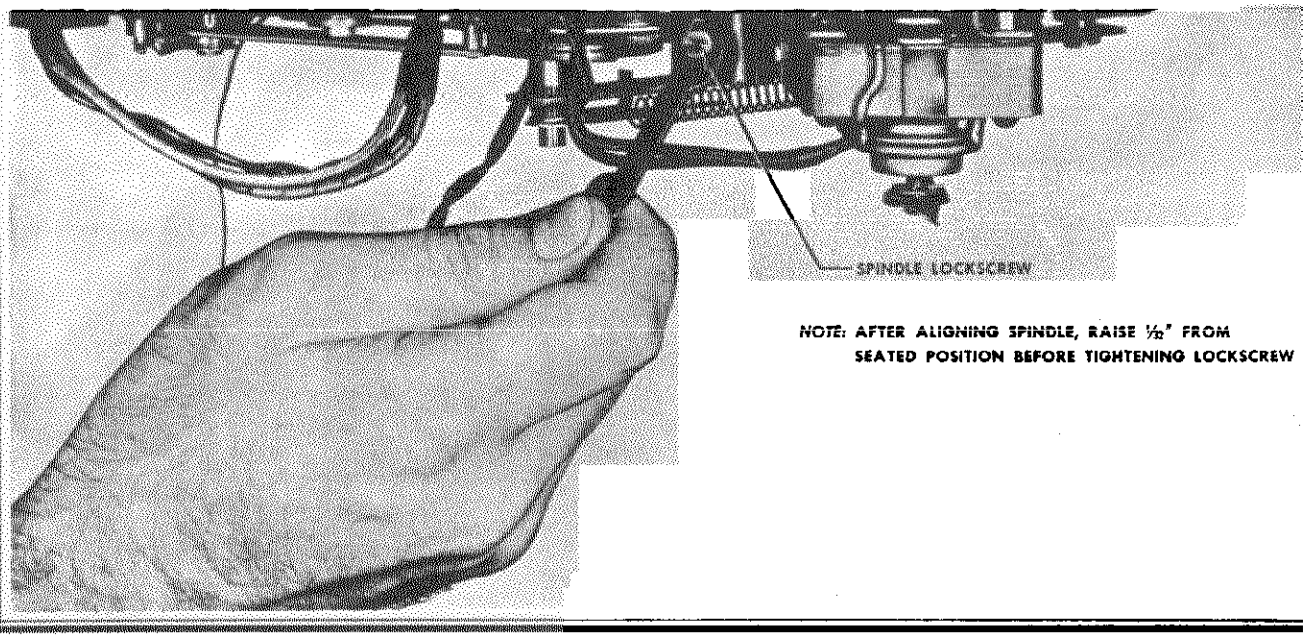
RECORD-SEPARATOR HEIGHT ADJUSTMENT

The changer is adjusted so that the separator blade engages a 10" record at a height of .060" ± .002", and a 12" record at a height of .070" ± .002".

SPINDLE ALIGNMENT—Loosen the hex-head setscrew in collar at bottom of spindle. Align spindle, with its top away from record separator post, so that tip of spindle points midway between the two record support levers.

Figure 12. SPINDLE ALIGNMENT





NOTE: AFTER ALIGNING SPINDLE, RAISE 1/32" FROM SEATED POSITION BEFORE TIGHTENING LOCKSCREW

REPLACEMENT OF PARTS AND ASSEMBLIES

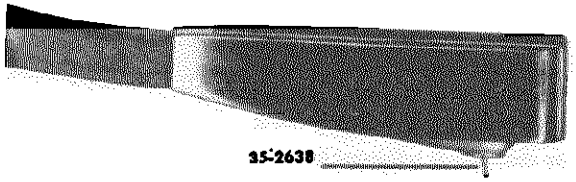


Figure 13. NEEDLE POSITION IN D-10A PICKUP

Whenever a part or assembly is found to be defective, or it becomes necessary to remove parts for lubrication, the following procedures are recommended. The part should be replaced by reversing the order of removal and adjusted according to the directions given in the SERVICING section of this manual. Be certain that the changer is out of cycle (playing position) before removing any parts or assemblies.

1. NEEDLE

a. The needle used with the crystal pickup in the D-10 changer may be replaced by loosening the setscrew at the front end of the crystal cartridge.

b. The needle used with the D-10A changer should be pulled straight out with the fingers. There are no setscrews or locking devices. When replacing the needle, make sure that the needle is placed so that its bend is in the direction of record rotation. See figure 13. Push the needle in place, using finger pressure only.

2. CRYSTAL

a. Remove tone arm, by loosening lockscrew and pivot screw. See figure 14. It is not necessary to unsolder the shielded cable, as there is generally enough slack to allow the arm to be turned over.

b. Remove the two screws and lockwashers which hold crystal to arm. See figure 15.

c. Lift out crystal cartridge and remove two jacks from end, as shown in figure 15.

3. DYNAMIC HEAD

a. Remove tone arm, by loosening lockscrew and pivot screw. See figure 14. It is not necessary to unsolder the shielded cable at the radio, as there is usually enough slack to allow the arm to be turned over.

b. Unsolder the wires from the head at points shown in figure 16.

c. Remove the bolt holding the head to the arm, and lift off head.

CAUTION: Do not place head where it may pick up iron filings or dirt. This head contains a powerful magnet which will attract and hold any small particles of magnetic material, and a delicate mechanism which will be damaged by any foreign material.

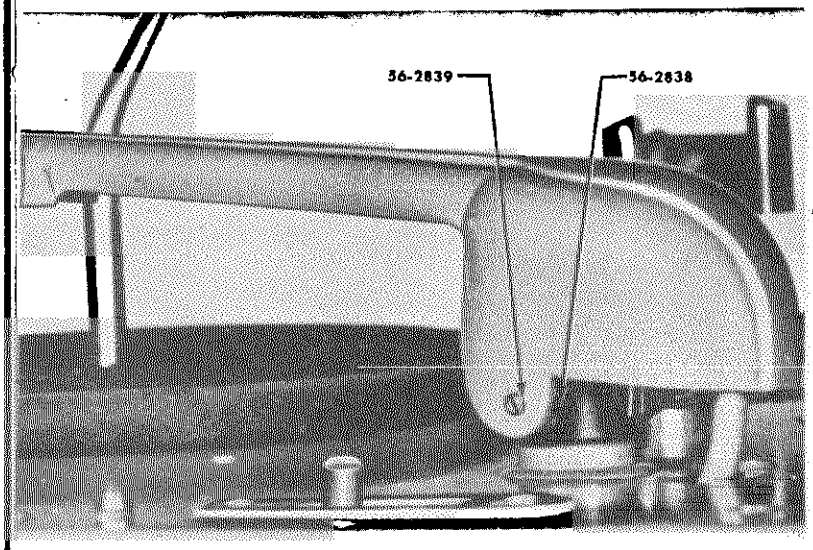
4. TONE-ARM ASSEMBLY

a. Unsolder end of the shielded cable which is soldered directly to a terminal panel in table model sets, and to a plug in floor models.

b. Loosen lockscrew and pivot screw. See figure 14.

c. Lift out tone arm.

Figure 14. TONE-ARM LOCKSCREW AND PIVOT SCREW



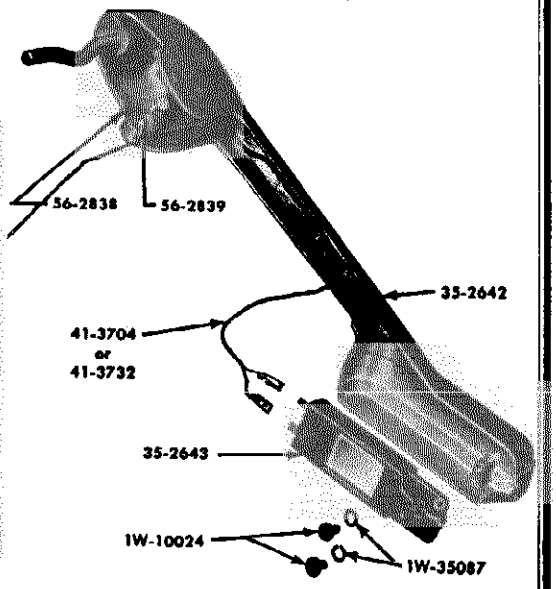


Figure 15. CRYSTAL CARTRIDGE REMOVED

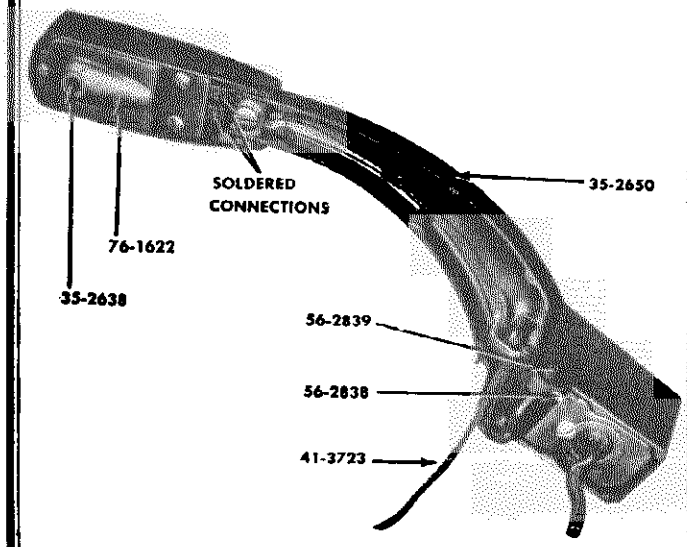


Figure 16 D-10A PICKUP, BOTTOM VIEW

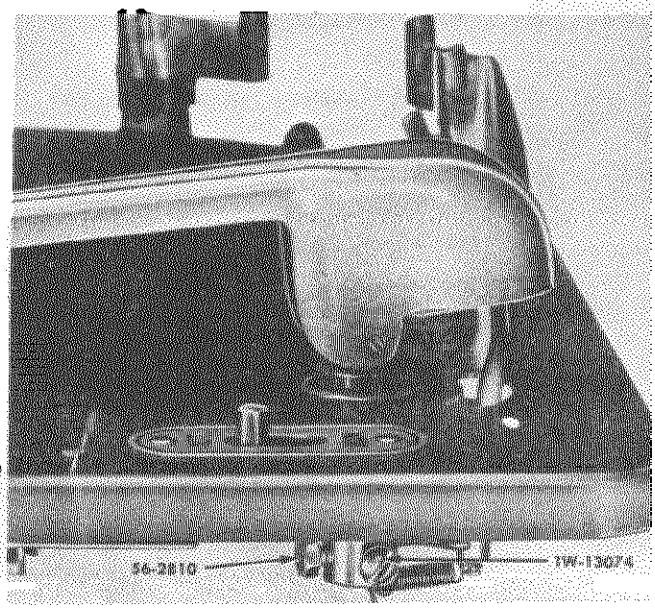


Figure 17. TONE-ARM-POST SETSCREWS

5. TONE-ARM AND POST ASSEMBLY

a. Unsolder the end of the shielded cable which is soldered to a terminal panel in table model sets, and to a plug in floor models.

b.. Loosen the cadmium-plated and bronze setscrews, figure 17, which hold the trip-lever assembly to the tone-arm post and remove trip-lever assembly.

c. Dress setscrew burrs from tone-arm-post shaft with a fine file to prevent damage to tone-arm bearing bushing. If these are thoroughly removed, the post will pass through the bearing freely.

d. Lift out tone-arm and post assembly, being careful not to lose the single ball bearing on top of bushing. The proper sequence of parts is shown in figure 18.

6. TURNTABLE

CAUTION: Be careful not to lose the eleven ball bearings and two thrust washers under the turntable gear. To prevent loss of the bearings when removing the turntable and spindle, place hand on container under spindle opening to catch any ball bearings that may fall out. These parts are shown in their proper relationship in figure 19.

a. Loosen setscrew 56-2810 in turntable-bearing bushing 56-2814, figure 20, and lift out spindle.

b. Lift off turntable.

Figure 18. TONE-ARM REMOVAL

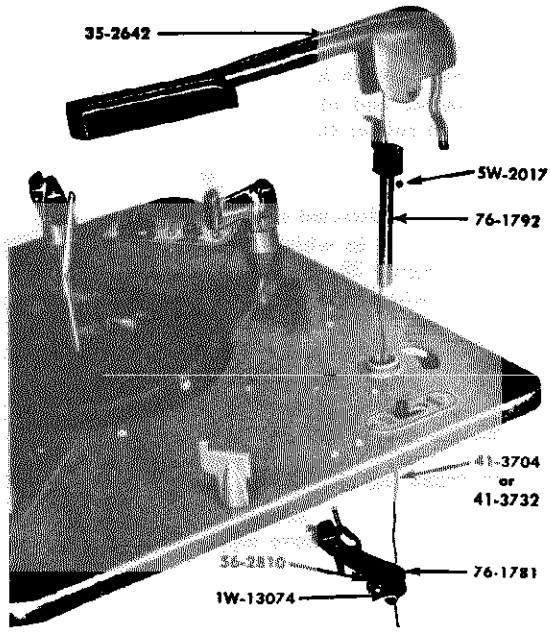
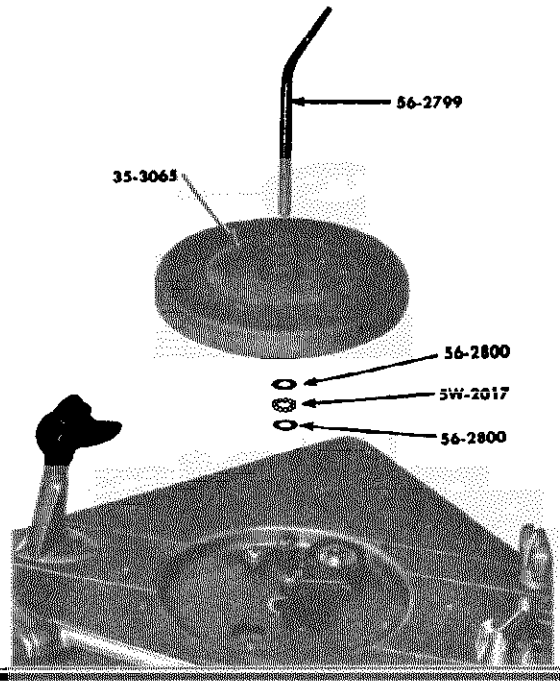


Figure 19. TURNTABLE REMOVAL



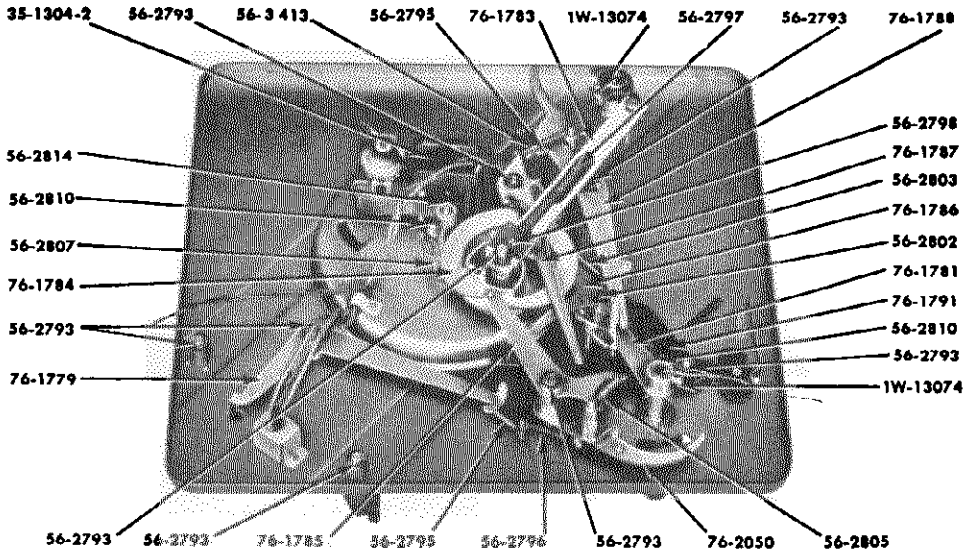


Figure 20. BOTTOM VIEW OF CHANGER

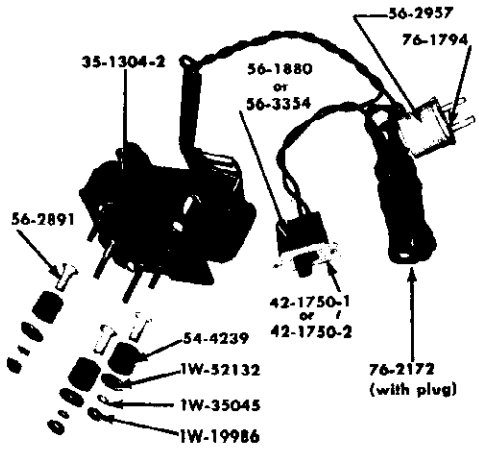


Figure 21. MOTOR REMOVAL

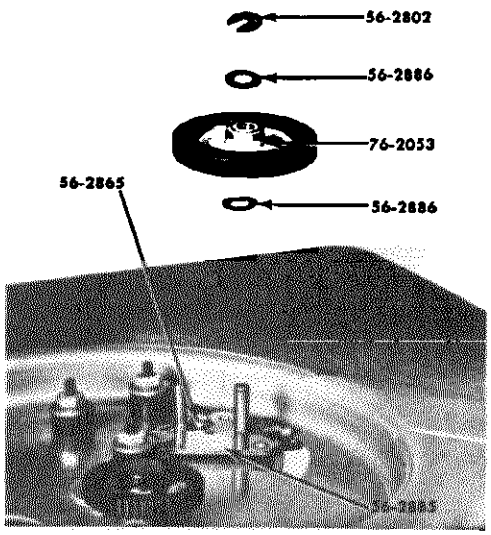


Figure 22. IDLER-WHEEL REMOVAL

c. Use grease on ball bearings, as directed in the CLEANING AND LUBRICATION paragraph of this manual, when replacing bearings. This will hold bearings in place for reassembly and will provide proper lubrication.

d. After replacing turntable, adjust height of spindle, as directed in the SERVICING section of this manual.

7. MOTOR

a. Remove turntable, as directed in paragraph 6.

b. Remove two screws from ON-OFF switch, and remove switch from base plate.

c. Loosen sheet-metal screw from clamp which holds wires against base plate, and lift wires from under clamp.

d. Remove three nuts from motor mounting bolts. Be sure there are three lockwashers, three flat washers, three rubber grommets, and three spacers, as shown in figure 21.

e. Lift out motor.

8. IDLER WHEEL

a. Remove turntable, as directed in paragraph 6.

b. Remove "C" washer with long-nose pliers.

c. Remove flat washer and idler wheel. See figure 22. Do not get grease or oil on rubber tire.

9. CAM-GEAR DRIVE-GEAR ASSEMBLY

a. Remove turntable, as directed in paragraph 6.

b. Drive out tapered pin in white metal pinion gear 56-2807 under base plate. See figure 20.

c. Remove lower (white metal) and upper (composition) gears.

10. SEPARATOR

a. Remove Phillips-head screw from plastic handle.

b. Remove plastic handle and separator. See figure 23.

11. SEPARATOR-POST ASSEMBLY

a. Loosen cadmium-plated and bronze setscrews in separator-lever assembly, figure 24, and remove separator lever from separator post.

b. Lift out post. See figure 23.

12. SEPARATOR-LEVER ASSEMBLY

a. Loosen cadmium-plated and bronze setscrews at separator-post end, figure 24.

b. Remove "C" washer and flat washer at cam-gear end and lift off lever.

13. TONE-ARM ACTUATING-LEVER ASSEMBLY

a. Remove separator-lever assembly at cam-gear end.

b. Remove tension spring 56-3413 from stud at short end of tone-arm actuating-lever assembly 76-1787. See figure 20.

c. Remove "C" washer and flat washer, and lift off lever.

14. TONE-ARM LOCATING-LEVER ASSEMBLY

a. Remove separator-lever assembly at cam-gear end.

b. Remove tension spring 56-3413 from tone-arm actuating lever 76-1787. See figure 20.

c. Remove tension spring 56-2795 from tone-arm locating lever 76-1788. See figure 20.

d. Remove "C" washer and flat washer and lift off lever.

15. TONE-ARM ELEVATING-LEVER ASSEMBLY

a. Remove lower tension spring 56-3414 from lower tone-arm elevating lever 76-1785. See figure 20.

b. Remove upper tension spring 56-2796 from upper tone-arm elevating lever 76-2050. See figure 20.

c. Remove "C" washer and flat washer and lift out both levers.

16. CAM-GEAR ASSEMBLY

a. Remove separator-lever assembly at cam-gear end.

b. Remove lower tension spring from tone-arm elevating levers and move lower tone-arm elevating lever away from cam gear.

c. Remove tension spring from stud at short end of tone-arm lever.

d. Remove "C" washer and flat washer from stud holding cam gear.

e. Lift tone-arm lever over stud on trip-lever assembly and hold away from cam gear with one hand while removing cam gear with the other hand, as shown in figure 25.

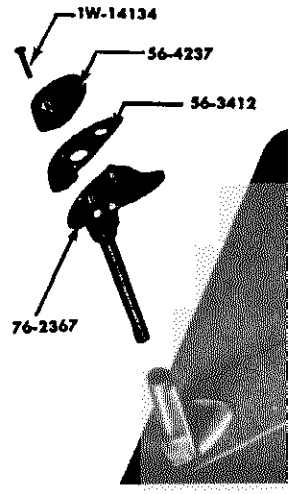


Figure 23. SEPARATOR-POST-ASSEMBLY REMOVAL

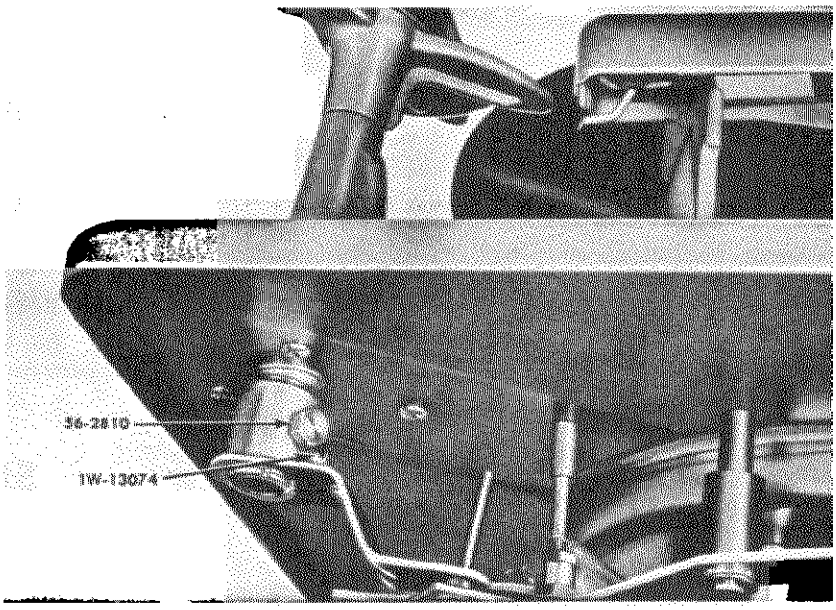
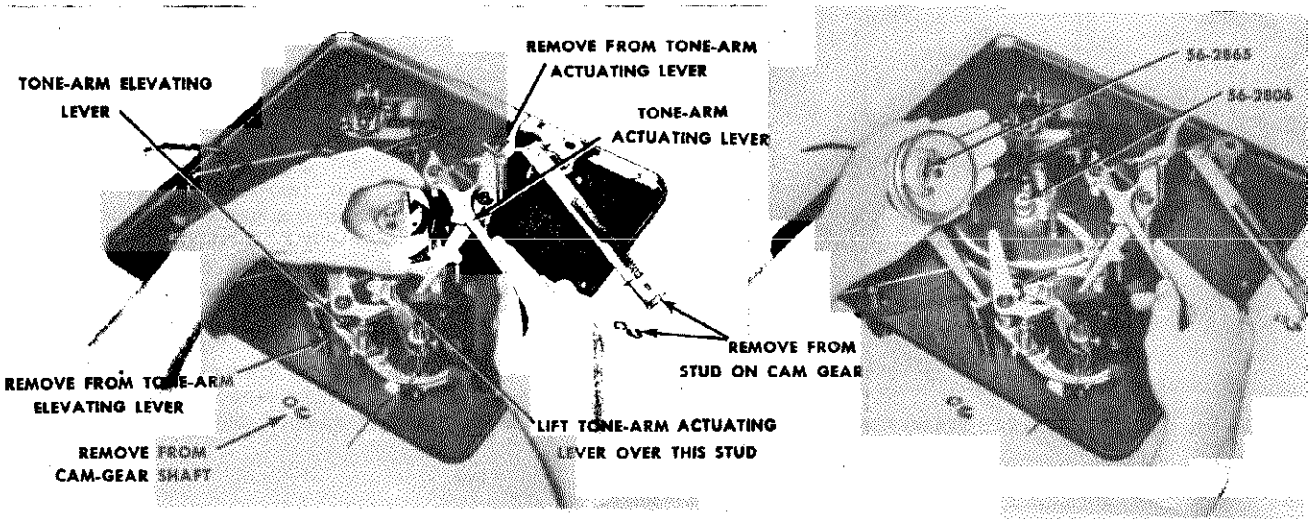


Figure 24. SEPARATOR-LEVER SETSCREWS

Figure 25. CAM-GEAR REMOVAL



REPLACEMENT PARTS LIST MODELS D-10 and D-10A

SERVICE PART NO.	DESCRIPTION
27-6209	Socket, cable plug (D-10A)
35-1304-2	Motor (can be used on either model)
35-2638	Needle (D-10A)
35-2641	Tone-arm assembly (D-10)
35-2642	Tone arm (D-10)
35-2643	Cartridge, pickup (D-10)
35-2644	Needle (D-10)
35-2648	Tone-arm assembly (D-10A)
35-2650	Tone arm (D-10A)
35-3065	Turntable
35-5078	Plate, base
41-3704	Cable, shielded, tone-arm (D-10)
41-3723	Cable, shielded, tone-arm (D-10A)
41-3732	Cable, shielded, tone-arm (double conductor used on a-c and d-c sets)
42-1750-1	Switch, ON-OFF (Stackpole)
54-4235	Bumper (record)
54-4236	Knob (REJECT control)
54-4237	Cap, separator
54-4239	Grommet, rubber (motor mounting)
56-1880	Cover (Stackpole switch)
56-2027	Plug (shielded cable D-10)
56-2448	Cover, socket (D-10A)
56-2792	Spring, compression (record-support lever)
56-2793	Washer, "C"
56-2794	Nameplate (ON-OFF—REJECT)
56-2795	Spring, tension (reject lever and locating lever)
56-2796	Spring, tension (upper elevating lever)
56-2797	Spring, compression (separator lever)
56-2798	Slide, separator-lever
56-2799	Spindle, turntable
56-2800	Washer, bearing (turntable bearings)
56-2801	Washer (ratchet lever)
56-2802	Washer, "C" (ratchet lever and drive wheel)
56-2803	Spring, tension (ratchet lever)
56-2805	Spring, tension (lower elevating lever)
56-2806	Pin, pinion (pinion gear)
56-2807	Gear, pinion
56-2809	Nameplate (AUT-MAN)

SERVICE PART NO.	DESCRIPTION (Continued)
56-2810	Setscrew (hex head)
56-2823	Spring, detent (manual lever)
56-2838	Screw, pivot-locking (tone arm)
56-2839	Screw, pivot-point (tone arm)
56-2851	Spring (trip pawl)
56-2865	Spring, tension (idler wheel and segment ge
56-2891	Bushing (motor mounting)
56-2957	Cover (a-c plug)
56-3023	Bushing, eccentric (10" indexing)
56-3074	Spring (feed-in lever)
56-3412	Separator
56-3413	Spring, tension (tone-arm actuating lever)
56-3414	Spring, tension (tone-arm elevating lever)
76-1622	Unit, pickup (D10-A)
76-1775	Lever, support (right-hand)
76-1776	Lever, support (left-hand)
76-1777	Knob (REJECT)
76-1779	Reject-lever assembly
76-1781	Trip-lever assembly
76-1782	Separator assembly
76-1783	Separator-lever assembly
76-1784	Cam assembly
76-1785	Tone-arm elevating-lever assembly (lower)
76-1786	Ratchet-lever assembly
76-1787	Tone-arm actuating-lever assembly
76-1788	Tone-arm locating-lever assembly
76-1789	Gear assembly
76-1791	Manual-lever assembly
76-1792	Tone-arm shaft assembly
76-1794	Plug (a-c)
76-2050	Tone-arm elevating-lever assembly (upper)
76-2053	Wheel, idler
76-2172	Cable, a-c (with plug)
1W-14134	Screw, Phillips-head (separator cap)
5W-2017	Bearing, ball (turntable and tone-arm)
318-4316	Stud and lever assembly (idler wheel)

OPERATING CHECKS

The following is a logical series of checks to be performed before the instrument is delivered to the owner. Should any of these checks reveal faulty operation, the correct adjustment will be found in the SERVICING section of this manual.

1. Place the spindle into the turntable and turn the spindle so that the offset is toward the record shelf. The spindle should drop all the way into its slot.

2. Place the tone arm on its rest post, turn the record shelf fully counterclockwise to the 10″ position and lift the record hold-down over and toward the corner of the changer, as shown in figure 2.

3. Place a good 10″ record over the spindle and onto the record shelf. Bring the hold-down over onto the record.

4. Turn the master control switch to REJ (reject) and release; it will spring back to AUT (automatic). The changer should go through its cycle. Observe the action of the push-off mechanism; the record should drop smoothly onto the turntable. The pickup jewel should lower onto the record approximately ⅛″ in from the edge.

5. Allow the record to play through and, when the jewel travels the eccentric finishing groove, observe the tripping action; it should be smooth and positive.

6. Load the changer to capacity by placing eleven more 10″ records over the spindle and onto the record shelf. See figure 3. Reject each record with the master control switch and observe the changer action. The tone arm, in its elevated position, should not strike the bottom of the remaining stack of records. After the full stack of records has dropped onto the turntable, the tone arm should lift high enough to clear the top record by approximately ⅛″.

NOTE

Should any record fail to drop onto the turntable, carefully examine the record before making any adjustments to the changer. An unusually thick record may not drop.

7. Turn the changer master control switch to OFF, place the tone arm on its rest post, and pull the spindle straight up and out; unload the records, and replace the spindle.

8. Turn the record shelf fully clockwise to the 12″ position, as shown in figure 4.

9. Place a good 12″ record over the spindle and onto the record shelf. Bring the hold-down over onto the record. Repeat steps 4, 5, and 6, using nine additional 12″ records in step 6.

10. Place the master control switch at MAN (manual) and play one record through to determine that the tripping mechanism is electrically disconnected.

11. Unload the changer as outlined in step 7.

12. With the master control switch OFF, the idler wheel should automatically disengage from the turntable rim. Check by spinning the turntable manually; it should revolve freely.

NOTE

Should the tone arm be held during a change cycle, the safety device will permit the changer to cycle without damage to any parts or adjustments.

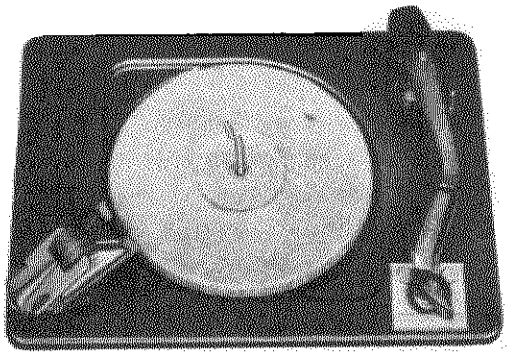


Figure 2—CHANGER, RECORD SHELF IN 10″ POSITION.

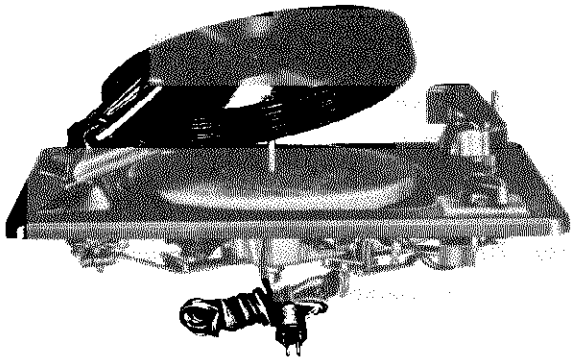


Figure 3—CHANGER, LOADED WITH TWELVE 10″ RECORDS.

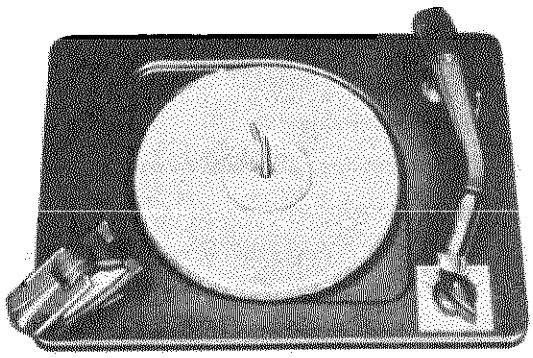


Figure 4—CHANGER, RECORD SHELF IN 12″ POSITION.

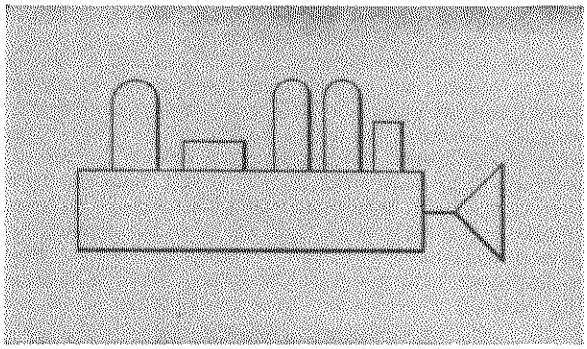
TROUBLE-SHOOTING PROCEDURE

The following tests are given for quickly localizing trouble in a Philco radio-phonograph. Be sure to make each test, in the order given, *before* removing either the radio chassis or the record changer from the cabinet.

If the trouble is found to be in the audio amplifier, or pre-amplifier, refer to the radio service manual for the particular model under test. If the trouble is in some part of the record changer, or in the separately-mounted phono input transformer, refer to the SERVICING section of this record changer manual.

1. AUDIO-AMPLIFIER TESTS

The audio amplifier, with the exception of the pre-amplifier and separately-mounted phono input transformer, is common to both the radio and phonograph



sections of the combination. With a station tuned in, observe whether the speaker output is normal by listening to its tonal quality and volume, with the volume control set to the tap. To locate the tap, set the tuning control for background noise between stations, or slightly out of tune with a station; then slowly turn the volume control from its minimum volume position until a sharp increase in high-frequency response is noted. The tap is at this point. The volume should be approximately the same in radio and phonograph operation.

a. Pre-Amplifier

Check the pre-amplifier as follows:

Remove the cable plug connection between the phono input transformer and radio chassis. Adjust the volume control for normal radio volume (tap on volume control). With the radio-phonograph set for phonograph operation, touch a test prod to the receptacle contact on the radio chassis; a loud audible response should be heard from the speaker.

If no response is heard, there is trouble in the pre-amplifier circuit; test the pre-amplifier tube before removing the radio chassis from the cabinet. An audible response merely indicates that the circuit is not completely inoperative, and does not conclusively indicate that the gain is normal.

b. Phono Input Transformer

Check the input transformer as directed on page of this manual.

2. TONE-ARM TESTS

a. Pickup

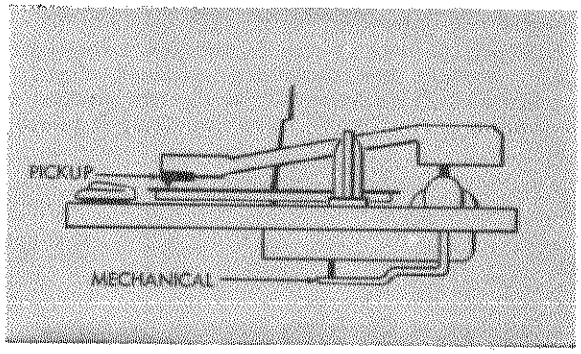
Play a familiar record on the radio-phonograph, and listen to the reproduction.

NOTE

It is advisable that a familiar record be included as a regular part of the serviceman's test equipment.

If the output is distorted, try a new needle. Distortion or low volume may indicate trouble in the pickup, phono input transformer, connecting leads, or pre-amplifier.

Further tests on the pickup are given on page of this manual. If the pickup is found to be faulty, it will be necessary to remove the record changer from the cabinet.



b. Set-Down

Set the record shelf to the 10" position, and place the tone arm on its rest post. Place a good 10" record on

the turntable, then turn the master control switch to REJ, and release. Observe the action of the tone arm; it should rise and travel over to the record, the needle coming down approximately ⅛" in from the outside edge of the record. If the tone arm does not set down correctly, the necessary adjustment may be made, as directed on page of this manual, without removing the record changer from the cabinet.

c. Lift

Set the record shelf for 10" operation and place a full stack of twelve 10" records on the changer. Start the changer by turning the master control switch to REJ and releasing. During the change cycle, the tone arm, in its elevated position, should not strike the bottom of the remaining stack of records.

Continue to reject each record until the full stack is on the turntable. Make sure that the tone arm clears the top record by ⅛" when the arm swings away from the spindle.

If either of these clearances is not correct, the lift adjustment may be made, as described on page of this manual, without removing the record changer from the cabinet.

d. Tripping

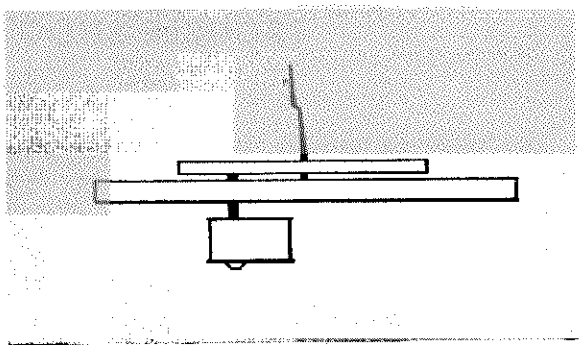
Play a record through, with the master control switch in AUT position. As the needle travels the eccentric finishing groove, tripping of the mechanism should be prompt and positive. The adjustments required are given on page of this manual.

3. TURNTABLE and MOTOR TEST

Load the turntable with ten 12" records. Place a stroboscope disc, such as Philco Part No. 45-2900, on the top record. Illuminate the disc with an electric light, preferably a neon bulb. The circle of dots on the disc indicating the turntable speed will normally appear to remain stationary, or will drift slowly in one direction or the other. The speed of the turntable should be 78 +3 −1.4 r.p.m. Erratic movement of the dots indicates unstable turntable speed.

If a stroboscope disc is not available, a small piece of paper may be inserted under the edge of a record to serve as an indicator, and the revolutions may then be counted and timed.

Remove the stack of records, and play a single record, preferably one containing sustained, high-frequency tones. Listen critically to the reproduction to determine if any "wow" (tone variation) is present.

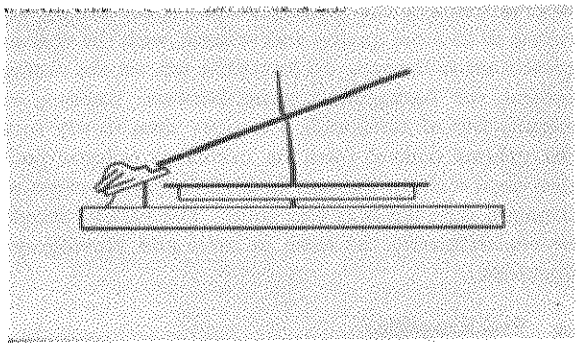


Wows are caused by unstable turntable speed. See page of this manual.

Unsatisfactory operation in the above tests indicates trouble in the motor, idler-wheel assembly, or turntable bearings.

4. RECORD-SHELF TEST

Turn the record shelf to the 10" position. Place a stack of twelve 10" records over the spindle. Turn the master control switch to REJ, and observe the record-dropping action. The record should fall smoothly; the edge of the record should leave the lips of the record shelf *after* the center has started to fall. Run through the change cycle, using the complete stack of records. If one record fails to change, examine the record for defects. Unsatisfactory record changing may be due to improper adjustment of the record shelf, including the push-off slider cam. These adjustments, given on page of this manual, require removal of the record changer from the cabinet.

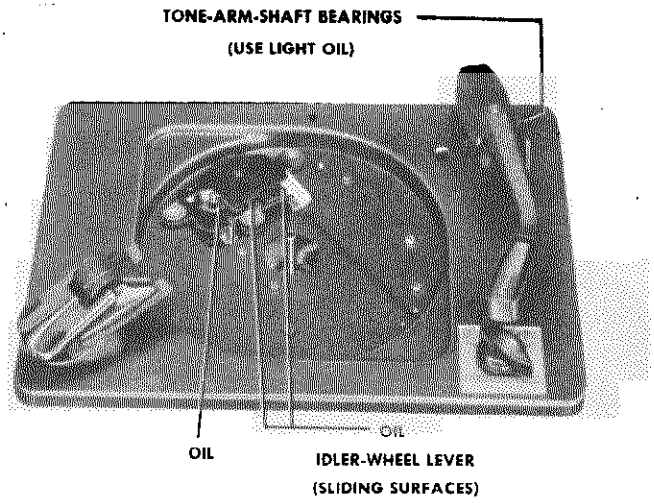


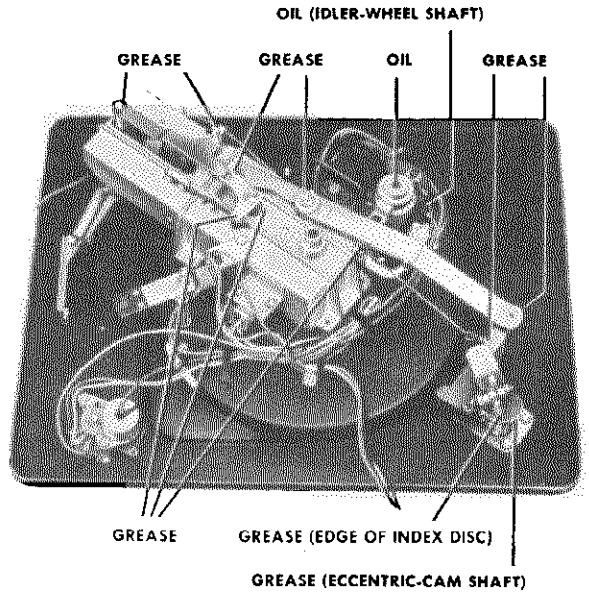
SERVICING

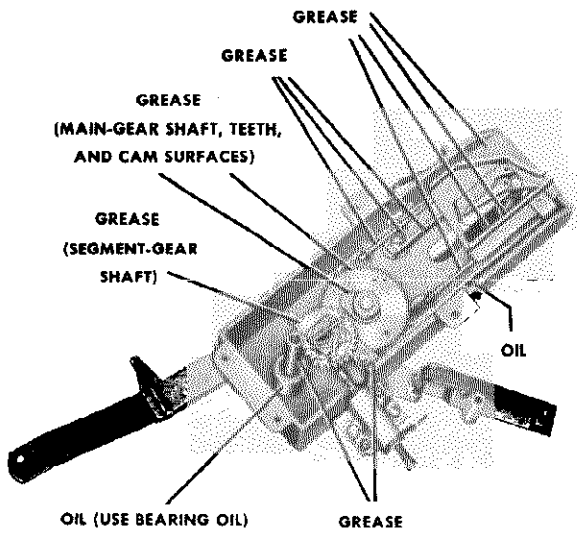
Description of Operating Cycle

Power for the motor is supplied from the power line through a master control switch having OFF, MAN, AUT, and REJ positions. The turntable is rim-driven by a rubber-tired idler wheel between the motor and turntable rim.

The changer mechanism is driven, by the turntable gear, through an intermediate gear having a retractable







segment; when retracted, this segment is held by a latch, thus mechanically disconnecting the turntable from the remainder of the changer mechanism while a record is playing. When the needle travels the eccentric finishing groove of the record, the change cycle is started, electrically, by a trip pawl riding a trip switch. This switch energizes a solenoid, driving its plunger against the intermediate-gear latch, and releasing the movable segment. The segment meshes with the turntable-hub gear, causing the changer mechanism to be driven through a cycle. At the completion of the cycle, the gear segment is retracted by a cam lever and is again held by the latch.

During the change cycle, the tone arm is operated by a lift-rod and a sliding, main-cam assembly, while the next record is dropped by the operation of a push-off slider in the record-shelf assembly.

Record rejection is also started electrically by the control switch, which, in REJ position, shorts across the trip-switch circuit, energizing the solenoid.

Cleaning and Lubrication

After long periods of use, or when a major part or assembly is replaced, the record changer should be cleaned and lubricated. Carbon tetrachloride or other similar cleaning fluid may be used to remove dirt, old oil, or grease. Some parts and assemblies may have to be removed for proper lubrication. The correct procedure for the removal and reinstallation of these parts and assemblies will be found in the REPLACEMENT OF PARTS AND ASSEMBLIES section of this manual. Apply lubricants sparingly, using only enough to do the job. All lubrication points are shown in figure 5.

Parts Not to be Lubricated

The following parts should not be lubricated at any time:

Segment, latch, or gear teeth, of segment gear.
Turntable-hub gear teeth.
Trip pawl.
Solenoid plunger.
Guide arm and tracking pawl (part of main-cam assembly).

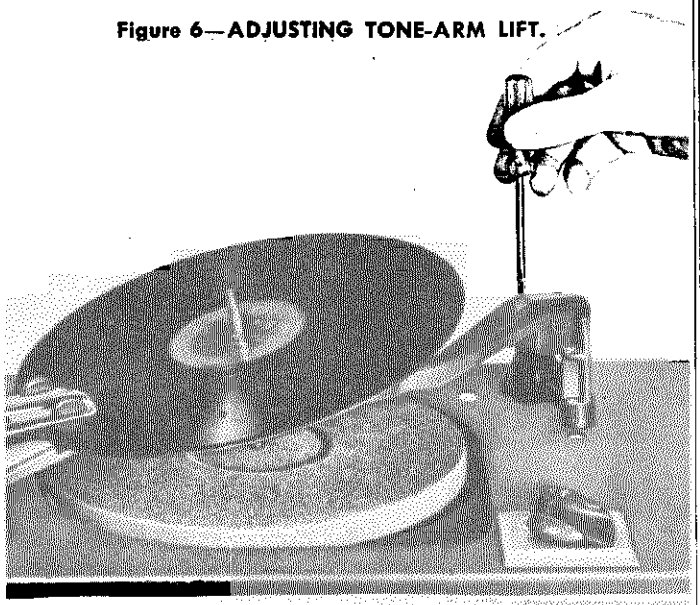
Parts to be Greased

Using a light grease of the vaseline type, such as Philco Part No. 60130, lubricate the following parts:

All studs with moving parts attached.
Index disc and lever.
Turntable shaft (apply grease around sleeve, then put turntable on).
Main-cam and slider-cam slide rods (4).
Positioning-cam slots.
All shafts (except tone-arm shaft).
Main-cam gear teeth and cam surfaces.
Push-off-slider eccentric cam and shaft.
Tone-arm pivots.
Lift-arm bushing.

Figure 5—CHANGER, SHOWING ALL LUBRICATION POINTS.

Figure 6—ADJUSTING TONE-ARM LIFT.



Parts to be Oiled

Using very light oil, Philco Part No. 45-2954, lubricate the following parts:
Motor bearings.
Idler-wheel bearing and idler-wheel lever assembly.
Turntable-shaft ball bearings.
Tone-arm-shaft bearings.

CAUTION

Do not get oil on rubber tire, motor pinion, or inside rim of turntable; if so, remove immediately with carbon tetrachloride.

ADJUSTMENTS AND TESTS

All adjustments to this changer made on the service bench require the use of a radio chassis designed for the changer; all adjustments except those made to the pickup may be made by the use of a suitable auxiliary power supply, to furnish operating voltage for the electric trip mechanism. Details of the auxiliary supply will be found on page 11 of this manual.

Tone-Arm Lift Adjustment

Set the record shelf for 10″ operation. With the master control switch OFF, manually trip the changer by lightly pushing the solenoid plunger into the coil. Swing the tone arm in near the spindle. Revolve the turntable one turn by hand. Place a 10″ record onto the record shelf and spindle. Position the tone arm so that the needle point is approximately 1½″ from the center of the spindle. In this position, the tone arm is at maximum height and should clear the bottom of the record by 1/16″ to ⅛″, and the needle point should clear the turntable by approximately 1¼″. Adjust for correct clearance by turning the adjustment screw through a hole at the top and rear of the tone arm, as shown in figure 6. Turning the screw clockwise raises the arm; counterclockwise lowers it. Then determine whether the tone arm lowers sufficiently to play the first record by revolving the turntable through the complete cycle. The tone arm should lower until the needle point is below the top surface of the turntable.

Figure 7—ADJUSTING TONE-ARM SET-DOWN.

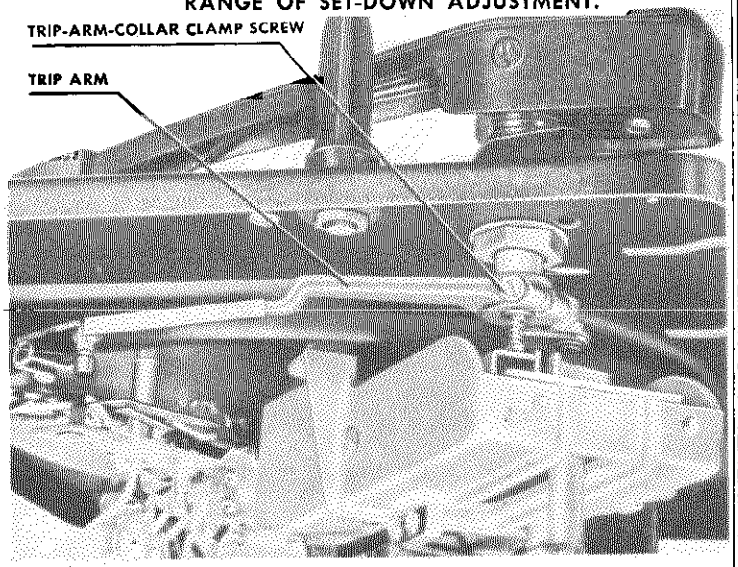
Tone-Arm Set-Down Adjustment

Set the changer for 10″ operation. Place a 10″ record in position and start a change cycle. Shut off the changer and stop the turntable when the jewel lowers to approximately ¼″ above the record. An eccentric screw, reached through a slot in the changer base plate near the tone-arm mounting, provides the adjustment. See figure 7. Adjust so that the jewel will lower onto the record ⅛″ in from the edge.

In the event that the range of the eccentric screw does not provide the correct adjustment, proceed as follows:

Turn the eccentric screw to the mid-position of its range. Loosen the clamp screw on the trip-arm collar attached to the tone-arm shaft. See figure 8. Hold the

Figure 8—TRIP-ARM CLAMP, FOR EXTENDING RANGE OF SET-DOWN ADJUSTMENT.



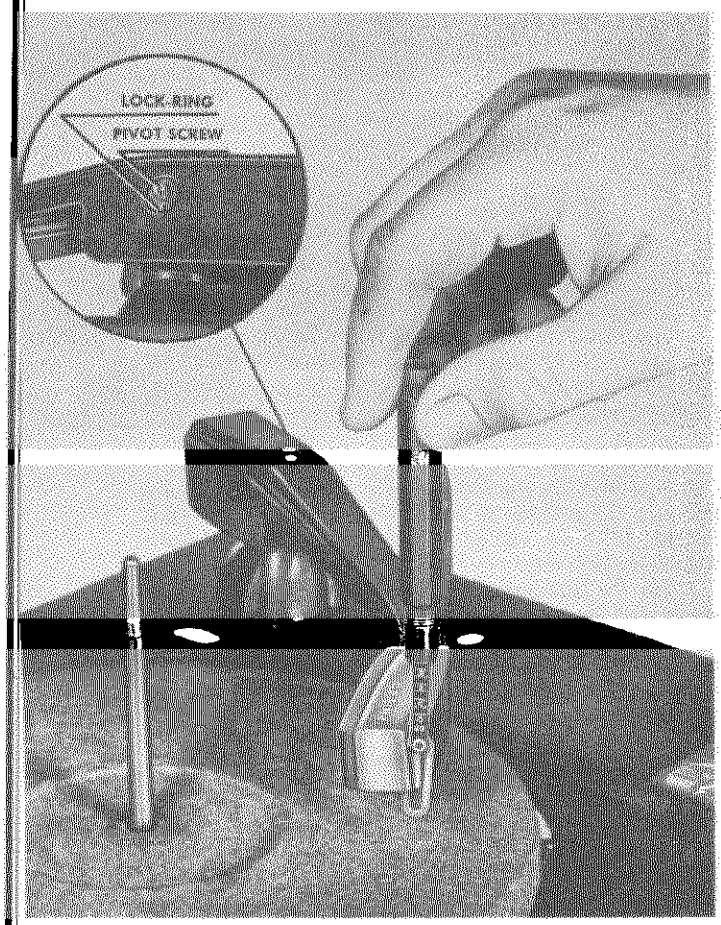


Figure 9—MEASURING TONE-ARM VERTICAL FRICTION.

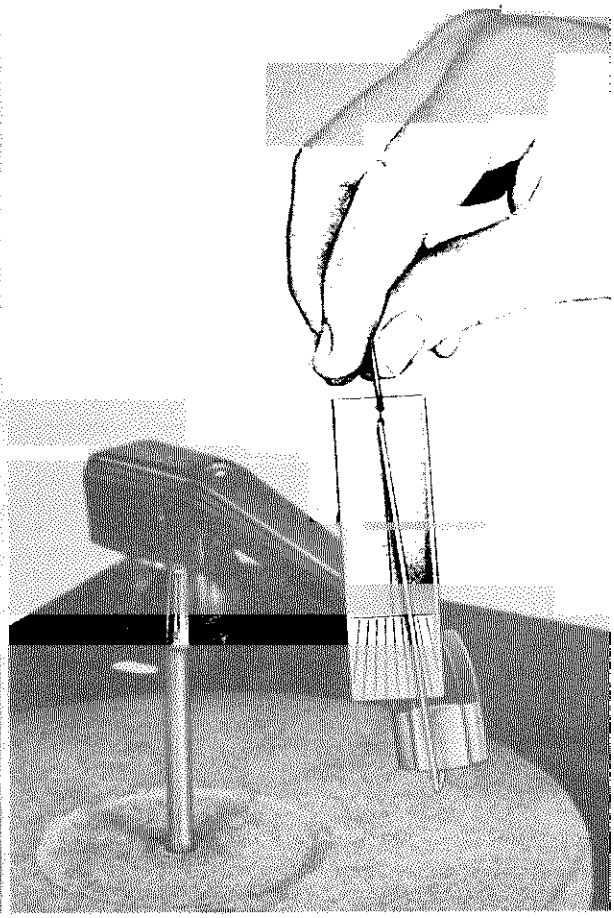


Figure 10—MEASURING TONE-ARM HORIZONTAL FRICTION.

trip arm firmly and move the tone arm to the approximate desired position and tighten the collar.

NOTE

A .003″ to .005″ vertical play in the tone-arm shaft must be maintained when making this adjustment.

If necessary, a vernier set-down adjustment may now be made with the eccentric screw, as previously described.

The 10″ adjustment should be correct for 12″ records. However, the tone-arm rest is adjusted so that the tone arm cannot set down off a 12″ record.

Tone-Arm Needle Pressure and Vertical Friction

With a 2-oz., postal-type scale, similar to Philco Part No. 45-2958, hooked under the front edge of the tone arm, as shown in figure 9, lift up the arm with the scale, noting the reading. Lower the arm, again noting the reading; the difference in these two readings represents vertical friction and should not exceed ⅛ oz.

The reading midway between the two readings taken is the needle pressure. The needle pressure of the dynamic tone arm should be between ¾ and 1 ounce. If the tone arm pivot screw is too tight, excessive friction will result. Loosen the locknut, adjust the pivot screw, and retighten the locknut. If the pivot screw is too loose, erratic set-down of the tone arm and trip failure on some records is likely.

Tone-Arm Horizontal Friction and Trip Sensitivity

With the changer out of cycle and the master control switch OFF, hook a pendulum scale, similar to Philco Part No. 45-2953, under the front edge of the tone arm, as shown in figure 10. Move the tone arm with scale slowly toward the spindle, and back to the outer edge of the record. The pendulum scale is calibrated in 1/16-ounce divisions, with 0 center. The average of both readings should not exceed 1/16 ounce.

With the trip pawl riding at 45° on the top member of the trip switch, the needle should be in the operating range for tripping, i.e., 1½″ to 3″ from the center of the spindle. The trip contact should make with a reading of from ¼ to ⅜ ounce. If these specifications are met, many records which may be considered to have defective trip grooves will play and trip satisfactorily.

Excessive friction may be caused by lack of vertical play in the tone-arm shaft or a defective shaft bearing. Correct assembly of shaft and bearing is given under REPLACEMENT OF PARTS AND ASSEMBLIES.

Tone-Arm Lead-In Test

Using a record which has no lead-in groove, see that the tone arm leads into the first record-playing groove. If it does not lead in properly, check to make

sure that the changer is level in the cabinet. If necessary, level the changer by adjusting the T-nuts and locknuts, as required.

Pickup and Phono Input Transformer Test

To test the pickup and phono input transformer, attach the pickup plug to the phono input transformer, Philco Part No. 32-8256, and attach the lead from the transformer to a radio chassis, designed for use with the dynamic pickup, and known to be in normal operating condition. If such a receiver is not available,

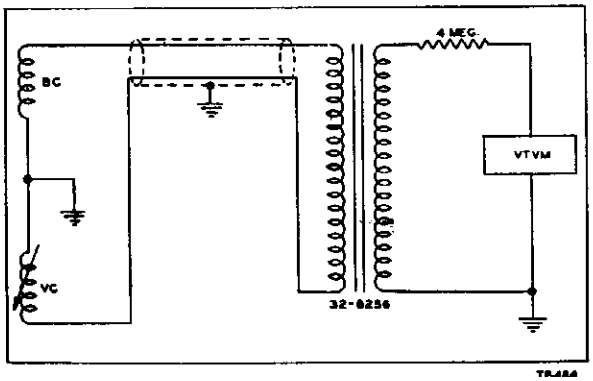


Figure 11—TESTING DYNAMIC PICKUP.

a comparable audio amplifier may be used. Play a record of good quality and listen to the reproduction.

If no reproduction is heard:

Check for a short or open in the shielded-wire pickup lead.

Check the pickup voice coil; this coil should have a resistance of approximately 3 to 4 ohms.

Check the primary and secondary of the transformer; normal resistance of the primary is approximately .1 ohm; secondary, 7000 ohms.

If output is distorted:

Try a new needle.

For a complete check of the dynamic pickup, a standard audio-tone record, or equivalent, and a vacuum-tube voltmeter with a range of 1 or 1½ volts, and with an input impedance of 1 megohm or more, are required. An oscilloscope may be used in the place of the vacuum-tube voltmeter, if desired.

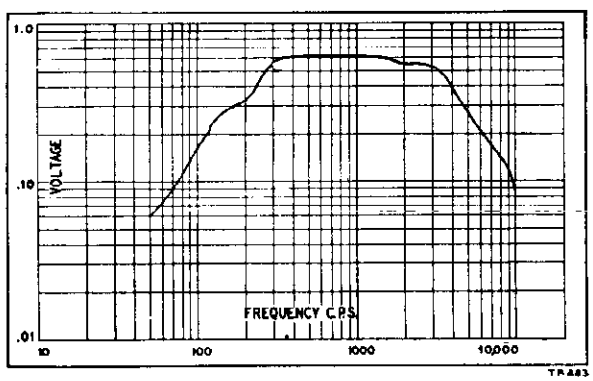


Figure 12—FREQUENCY-RESPONSE CURVE OF DYNAMIC PICKUP.

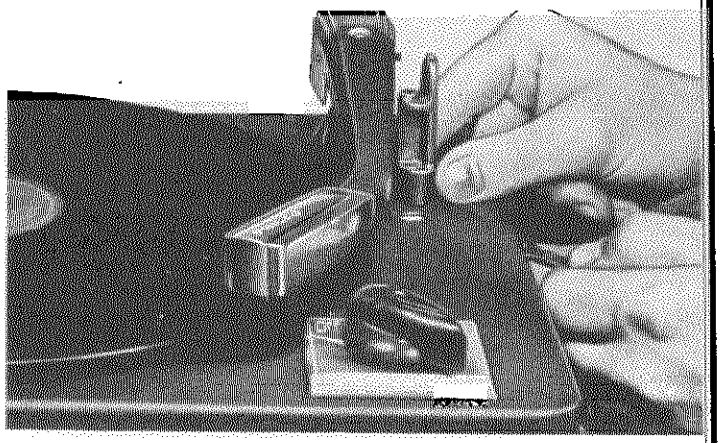


Figure 13—ADJUSTING TONE-ARM REST POST.

Before making the check, make sure that the needle pressure is between ¾ and 1 ounce, that the vertical friction does not exceed ⅛ ounce, and that the horizontal friction does not exceed $\frac{1}{16}$ ounce.

With the vacuum-tube voltmeter (or oscilloscope) connected as shown in figure 11, the output voltage, when playing 1000 cycles on the audio-tone record, should be at least .6 volt. A complete frequency-response curve should closely approximate that of figure 12.

Tone-Arm Rest-Post Placement

The tone-arm rest is adjusted so that the tone arm cannot set down off a 12" record. See figure 13.

Tripping Adjustments

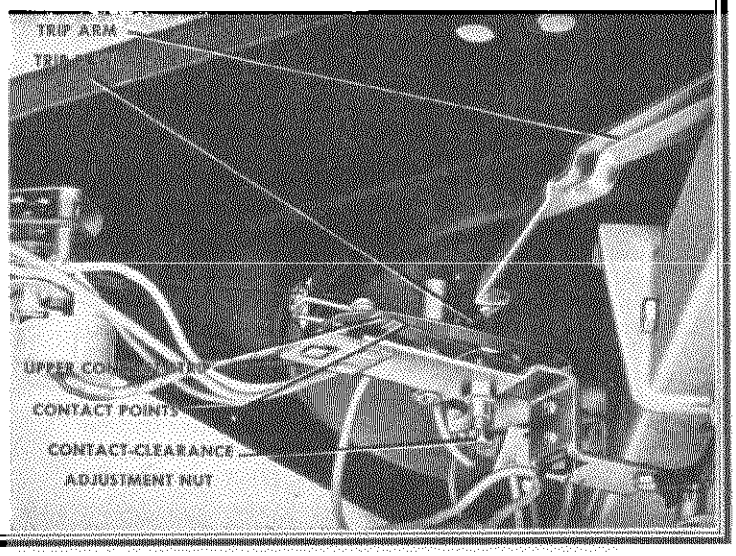
Before making any adjustments to the trip-switch assembly, make the following observations:

Be sure the two trip-switch-assembly mounting screws are tight. One point of mounting is on the changer-mechanism housing and the other screw is under the turntable.

Examine the upper contact strip and make sure it is reasonably flat along the center portion. The strip should have sufficient tension to hold the lip, located on the outer end, against the slotted insulated piece, with a pressure of from ⅛ to ¼ oz.

With the master control switch OFF, swing the tone

Figure 14—TRIP-CONTACT ASSEMBLY, SHOWING CORRECT ANGLE OF TRIP PAWL.



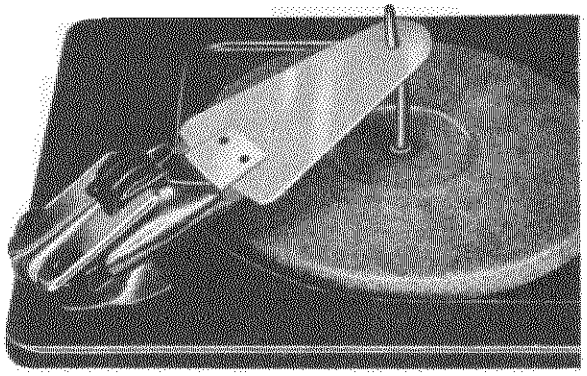


Figure 15—RECORD SHELF, SHOWING SPECIAL RECORD-SHELF GAUGE IN CORRECT POSITION.

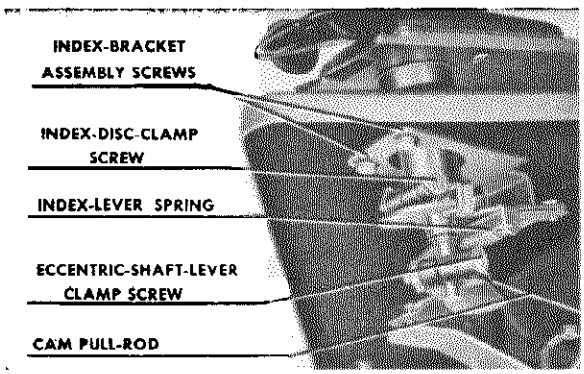


Figure 16—INDEX-BRACKET, INDEX-DISC, AND ECCENTRIC-SHAFT-LEVER ASSEMBLIES.

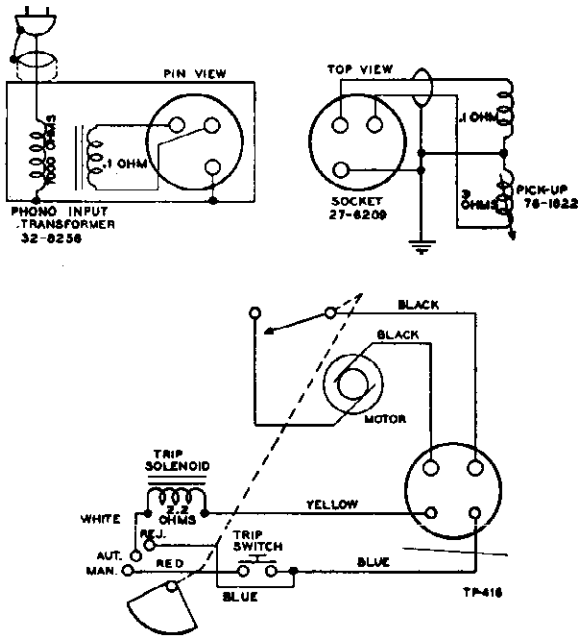


Figure 17—WIRING DIAGRAM OF CHANGER.

arm in so that the rubber-tipped trip pawl is approximately in the center of the flat portion of the upper contact strip. In this position, the trip pawl should be at an angle of approximately 45° with respect to the strip, as shown in figure 14. If necessary, shape the trip arm slightly up or down to give the correct angle.

The clearance between the contact points should be adjusted for a gap of $\frac{1}{32}$", by means of the adjusting nut on the lower strip. See figure 14. The tripping action can be checked by watching the trip pawl and the contacts while the jewel needle is travelling the eccentric finishing groove of a record.

The trip should operate by a slight backward movement of the tone arm (not less than $\frac{1}{16}$") while the arm is between 1½" and 3" from the center of the spindle. Check the action at several points within this range.

NOTE

The top surface of the upper contact strip is coated with a substance for positive action.

Record-Shelf Adjustments

To set the record shelf correctly, place the shelf in its 10" position. Place a special record-shelf gauge, Philco Part No. 45-1470, over the spindle and onto the record shelf, as shown in figure 15.

Loosen the two hex-head screws which hold the index-bracket assembly to the changer base plate. See figure 16. Also loosen the hex-head clamp screw on the index disc. Disconnect one end of the index-lever spring. Move the record-shelf assembly away from the spindle, allowing the center raised portion of the gauge to fit between the record shelf lips, and the wide part of the gauge to drop level with the shelf lips, as shown in figure 15. Push the entire assembly lightly against the edge of the gauge. Before tightening the index-bracket-assembly screws, turn this assembly so that the cam pull-rod is just taut without tensing the spring. Hold the assembly in this position and tighten the two index-bracket screws. Re-connect the index-lever spring; then tighten the clamp screw on the index disc. When the above adjustments have been made, both lips of the record shelf should be touching the edge of the gauge.

Record Push-Off Adjustment

With the changer out of cycle, set the record shelf to the 10" position. Loosen the hex-head clamp screw holding the eccentric-shaft lever to the push-off cam shaft. See figure 16. Rotate the push-off cam shaft *clockwise* until the end of the push-off slider nearest the turntable emerges from the slot in the record shelf and retracts to a point where the center portion of the slider end is just flush with the edges of the slot. Tighten the clamp.

Uneven Turntable Speed (Wows)

Uneven turntable speed (wows) may be caused by the following:

Dirt under and around turntable or idler-wheel assembly. Remove the turntable and clean out the dirt.

Flat or worn spots on rubber tire of idler wheel or defective turntable shaft and bearing assembly. Replace

defective parts as directed under **REPLACEMENT OF PARTS AND ASSEMBLIES.**

Lack of lubrication on turntable-bearing assembly or idler-wheel assembly. Follow directions under the *Cleaning and Lubrication* paragraph in this section of the manual.

Hole in record too large or too small. Try other records.

AUXILIARY POWER SUPPLY

A power adapter for the Model M-4 Philco Automatic Record Changer, providing proper voltages for the motor and solenoid through the connector on the changer, can be quickly assembled.

A small power transformer with one 6.3-volt filament winding, such as Philco Part No. 32-8190, will be satisfactory. The filament winding should have a rating of at least 2 amperes. The voltage for the motor is obtained by a direct connection to the power-transformer primary. The solenoid is energized by the 6.3-volt winding. The use of a socket, Philco Part No. 27-6182, will facilitate the connection of the auxiliary power supply to the changer.

The power supply may be assembled on any suitable chassis; the wiring diagram is shown in figure 18.

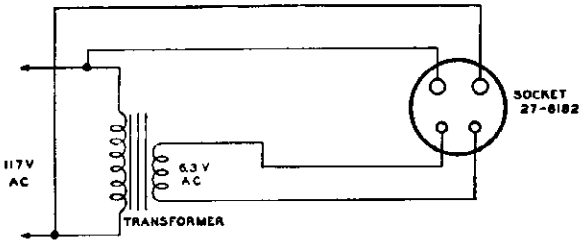


Figure 18—WIRING DIAGRAM OF AUXILIARY POWER SUPPLY.

SPECIAL TOOLS

Most of the adjustments and repairs to the Philco M-4 Changer may be made with the tools usually found in the serviceman's tool kit, and the two scales and special gauge illustrated in figure 19.

The pendulum scale, Philco Part No. 45-2953, may be used to measure the horizontal friction, or drag, of the tone arm.

The 2-oz. scale, Philco Part No. 45-2958, may be used to measure the vertical friction and needle pressure of the tone arm, and all spring tensions not in excess of 2 ounces.

The special record-shelf gauge, Philco Part No. 45-1470, must be used to make the record-shelf adjustments accurately.

A stroboscope disc, Philco Part No. 45-2900, will aid in detecting faulty turntable speed.

After the changer has been removed from the cabinet for repairs, a stand similar to the one shown in figure 20 may be used. This stand is constructed from easily obtainable parts, listed in the figure, and is a convenient addition to any repair shop which expects to service record changers.

If it is not convenient to construct a stand to support the changer, changer support posts, Philco Part No. 45-2894 (4 required), may be purchased.

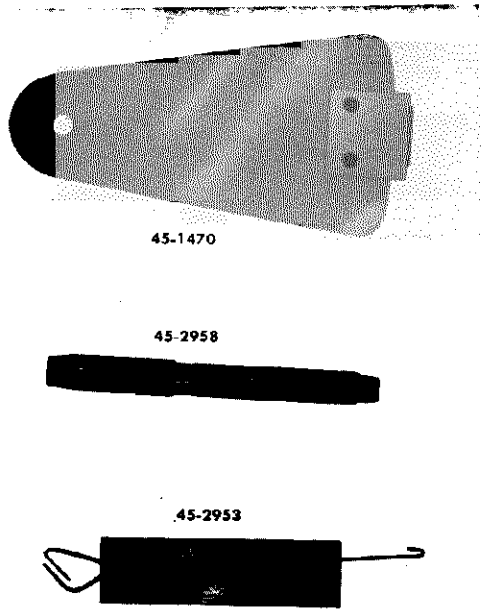


Figure 19—SCALES AND SPECIAL GAUGE.

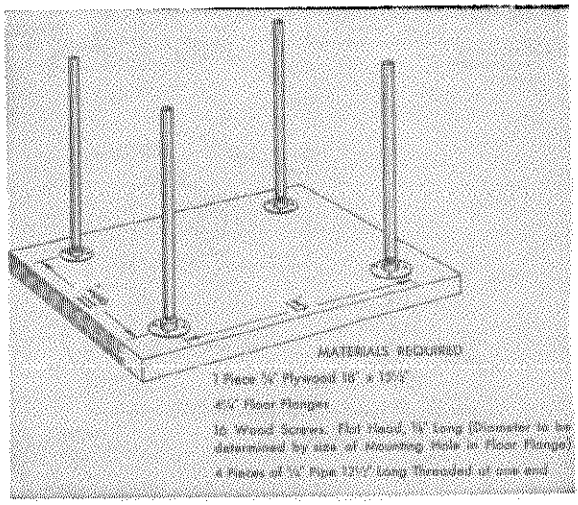


Figure 20—DETAILS OF SUPPORTING STAND FOR CHANGER.

REPLACEMENT OF PARTS AND ASSEMBLIES

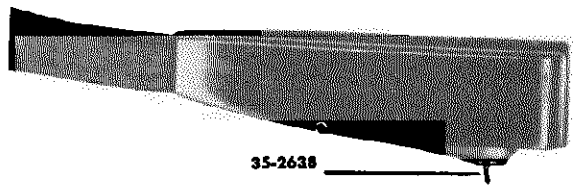


Figure 21—PICKUP HEAD, SHOWING CORRECT PLACEMENT OF NEEDLE.

Whenever a part or assembly is found to be defective, by test or visual inspection, or when it becomes necessary to remove parts for lubrication, the following procedures are recommended.

Parts should be replaced by reversing the order of removal, and adjusted and lubricated according to the directions given in the SERVICING section of this manual. A part should be replaced only when a defect is evident or when all adjustments fail to produce proper operation.

1. Needle (Part No. 35-2638)

The needle should be pulled straight out with the fingers. There are no setscrews or locking devices. When replacing the needle, make sure that it is placed so that its bend is in the direction of record rotation. See figure 21. Push the needle in place, using finger pressure only.

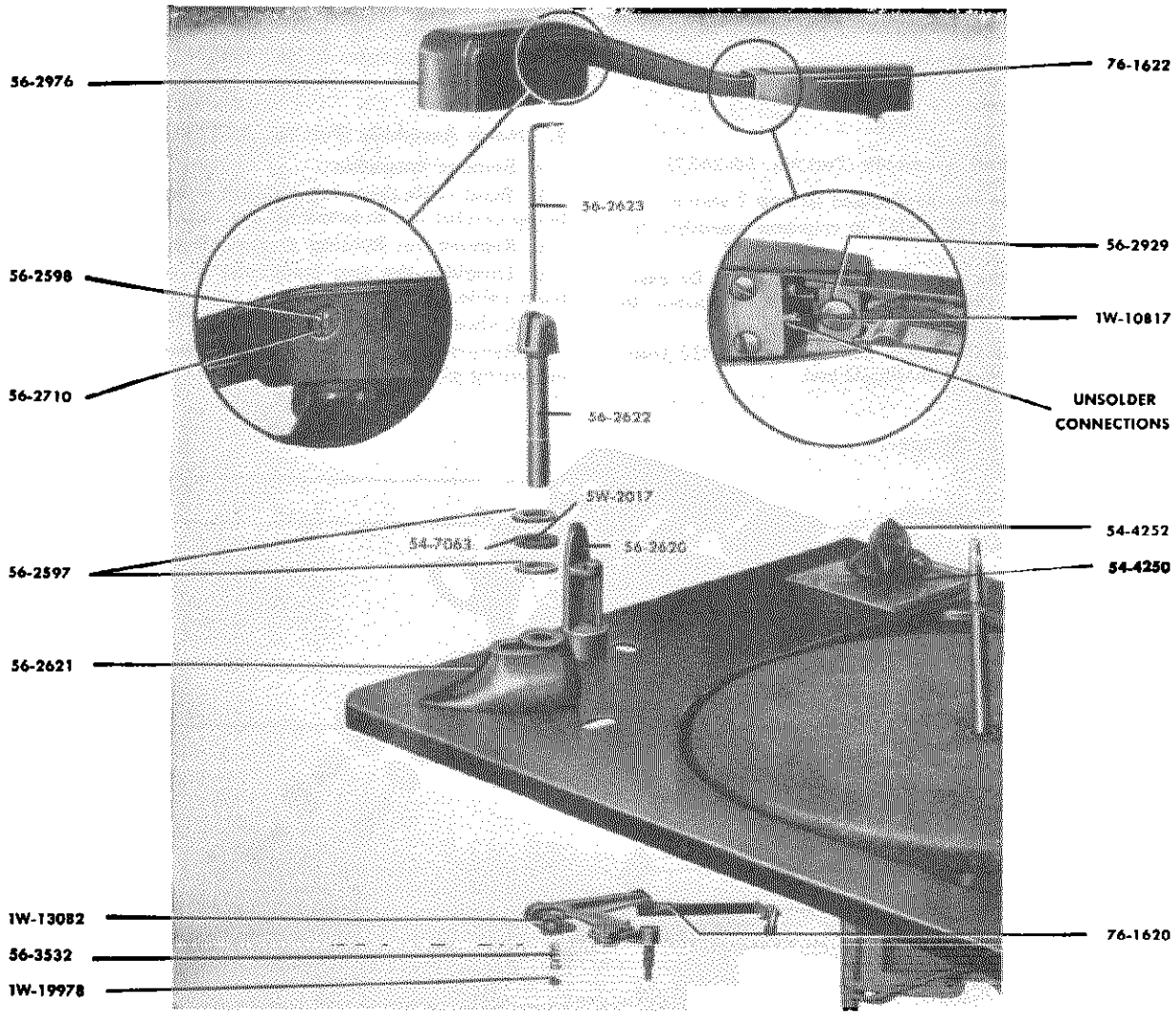


Figure 22—TONE-ARM-SHAFT AND TRIP-ARM ASSEMBLIES, EXPLODED VIEW.

9. Idler Wheel (Part No. 76-2379)

a. Remove spindle and turntable.

b. Remove retaining spring and flat washer from idler-wheel shaft (underside of changer).

c. Lift out idler wheel.

10. Master Control Switch (Part No. 42-1734)

a. Unsolder five leads from switch.

b. Lift off knob 54-4252, figure 22.

c. Remove ⅜" nut under knob.

d. Unhook pull-cord spring 56-2617, figure 24.

11. Record Hold-Down (Part No. 56-2653)

a. Remove record-shelf cap cover 56-2915, by turning counterclockwise about ⅛ turn and lifting out. See figure 25.

b. Lift out retaining spring 56-2656.

c. Unhook hold-down spring 56-2654 and lift off hold-down.

12. Eccentric-Shaft-Lever Assembly (Part No. 76-1618)

a. Remove cross-link spring 56-2627 and cross-link 56-2626, figure 24.

b. Loosen screw 1W-13082 and remove assembly, figure 25.

c. When replacing assembly, make record push-off adjustment as directed under ADJUSTMENTS AND TESTS.

13. Index-Disc Assembly (Part No. 76-1904) and Index-Bracket Assembly (Part No. 76-1615)

a. Remove eccentric-shaft-lever assembly as directed in step 12 above.

b. Unhook one end of pull-rod spring 56-3591, figure 24.

c. Loosen screw 1W-13083 holding index-disc assembly.

d. Remove two screws, 1W-32694, holding index-bracket assembly and remove both assemblies.

e. When replacing these assemblies, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

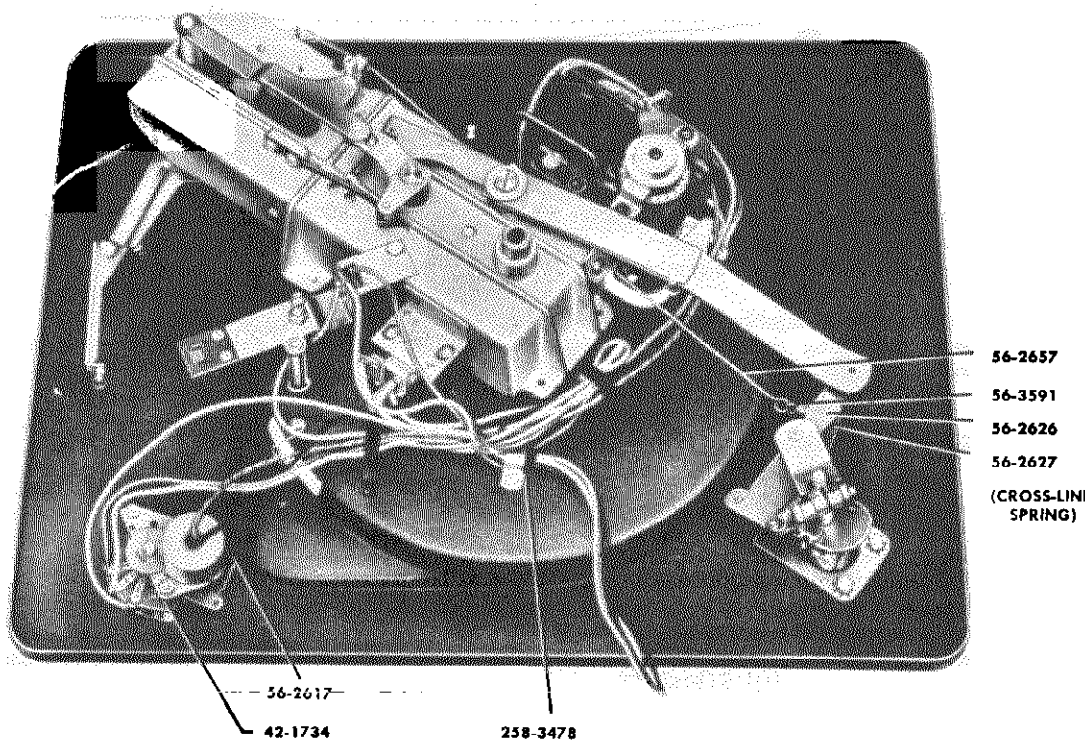


Figure 24—CHANGER, UNDERSIDE VIEW.

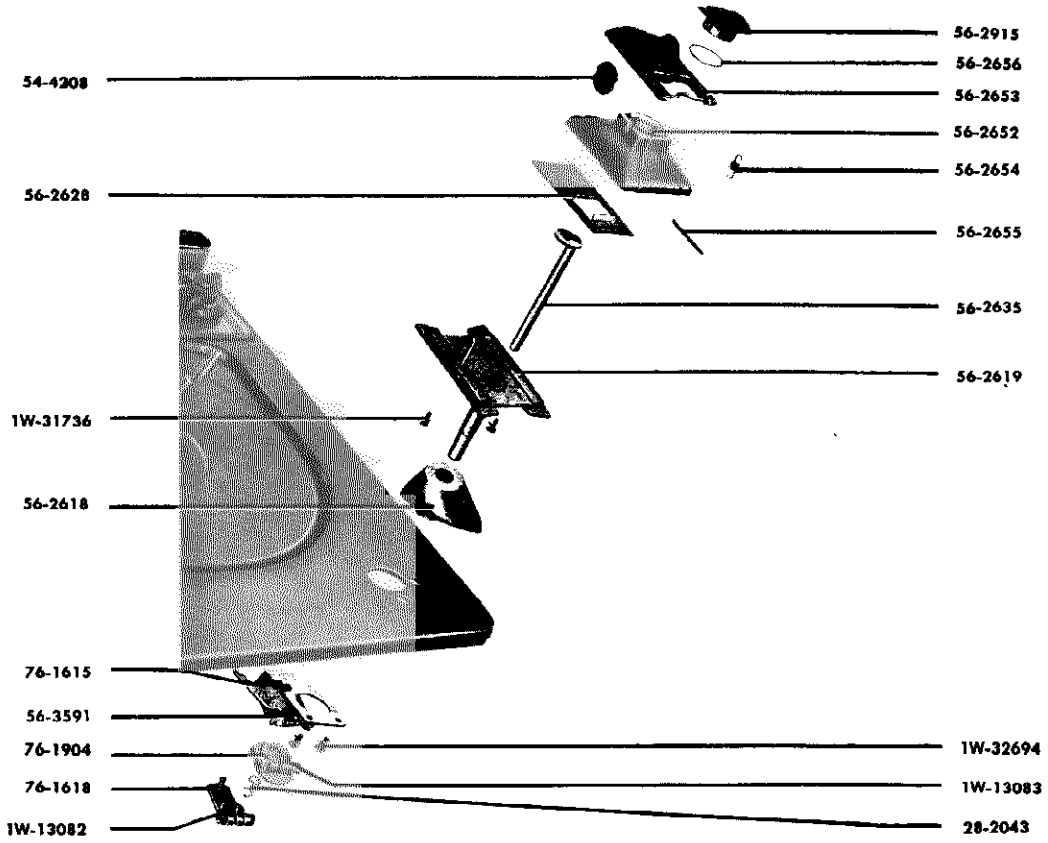


Figure 25—RECORD SHELF AND ASSOCIATED ASSEMBLIES, EXPLODED VIEW.

14. Record-Shelf Stanchion (Part No. 56-2618)

a. Remove index-disc assembly and index-bracket assembly as directed in step 13 above.

b. Lift out record-shelf and cap assembly and lift out stanchion.

c. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

15. Record-Shelf-Cap Assembly (Part No. 56-2652)

a. Remove index-disc assembly and index-bracket assembly as directed in step 13 above.

b. Lift out record-shelf and cap assembly.

c. Remove two screws, 1W-31736, figure 25, from underside of record shelf and lift out record-shelf-cap assembly.

d. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

16. Push-Off Slider (Part No. 56-2628)

a. Remove record-shelf-cap assembly as directed in step 15 above.

b. Lift out push-off slider.

c. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

17. Push-Off-Cam Assembly (Part No. 56-2635)

a. Remove record-shelf-cap assembly as directed in step 15 above.

b. Remove locking ring 28-2043, figure 25.

c. Lift out push-off-cam assembly.

d. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

18. Record Shelf (Part No. 56-2619)

a. Remove push-off-cam assembly as directed in step 17 above.

b. Lift out record shelf.

c. When replacing this assembly, make all record-shelf adjustments, including record push-off adjustment, as directed under ADJUSTMENTS AND TESTS.

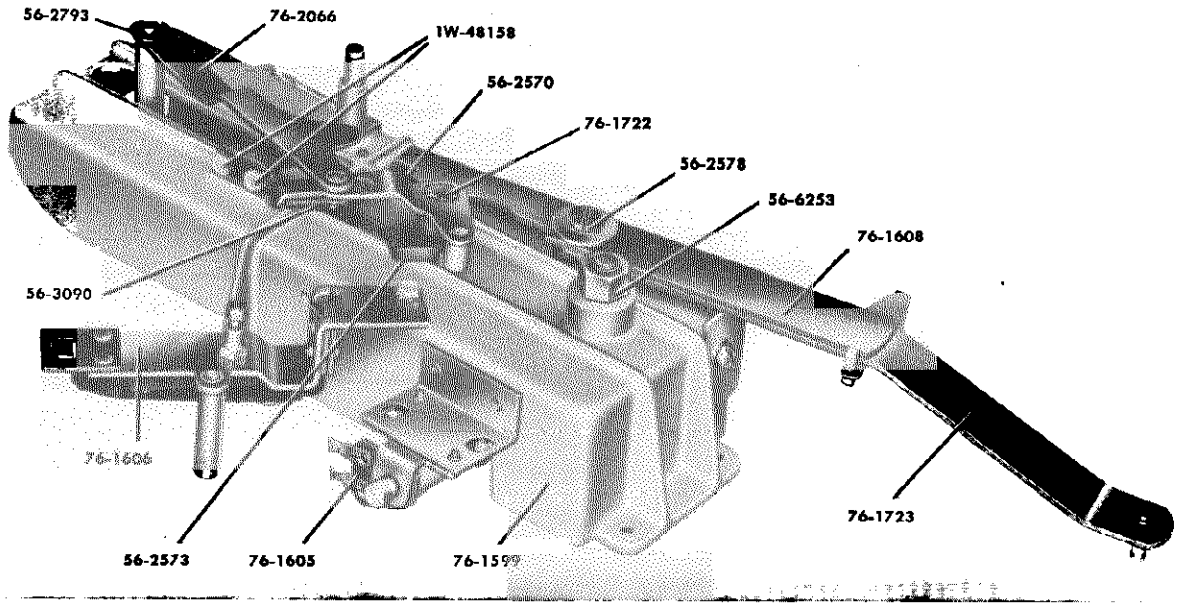


Figure 26—CHANGER MECHANISM ASSEMBLY, UNDERSIDE VIEW.

19. Trip-Contact Assembly (Part No. 76-1606)

a. Remove spindle and turntable.

b. Unsolder the red and blue wires.

c. Remove hex-head screw holding trip-contact assembly to changer-mechanism housing, figure 26.

d. Remove slotted screw holding trip-contact assembly to base plate and lift off assembly.

e. When replacing, adjust contact clearance as directed under ADJUSTMENTS AND TESTS.

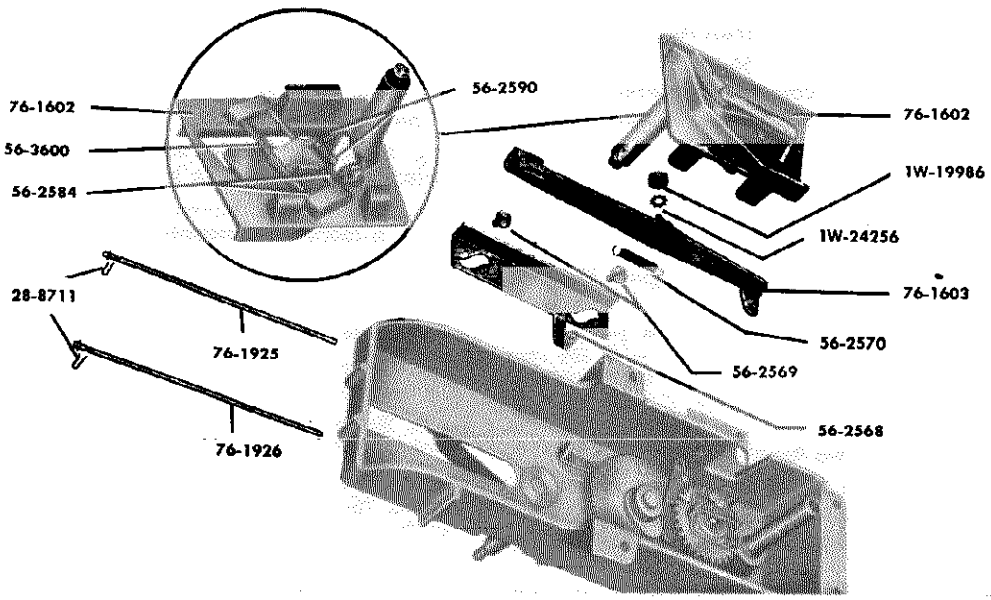
20. Push-Link Assembly (Part No. 76-2066)

a. Remove "C" washers 56-2793 from main-cam and main gear-shaft assemblies, figure 26.

b. Remove spring 56-3090 from main gear-shaft assembly.

c. Lift out link.

Figure 27—CHANGER MECHANISM ASSEMBLY, SHOWING DISASSEMBLY OF MAIN CAM, LIFT ARM, AND POSITIONING CAM.



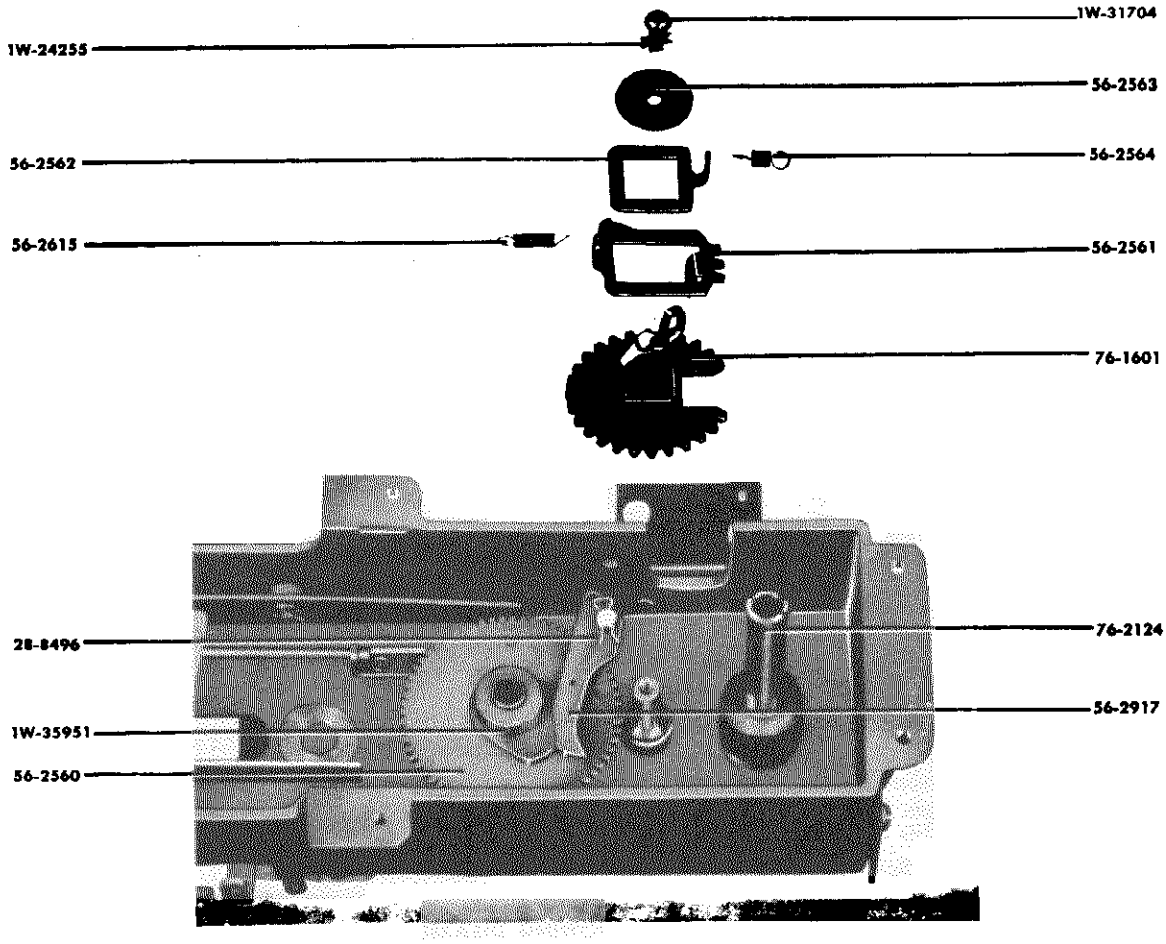


Figure 28—CHANGER MECHANISM, DISASSEMBLY OF INTERMEDIATE GEAR.

21. Push-Off-Lever Assembly (Part No. 76-1608)

a. Remove cross-link spring 56-2627, and cross-link 56-2626, figure 24, from eccentric-shaft lever.

b. Remove spring 56-2570 from mechanism frame, figure 26.

c. Remove bearing screw 56-2578 and lift off assembly.

22. Stop-Spring (Part No. 56-2573)

a. Remove two screws, 1W-48158, figure 26, from mechanism frame and lift off spring.

b. When replacing this spring, adjust position of intermediate gear; the gear should stop with the cut-out section centered, with respect to the turntable shaft.

23. Changer-Mechanism Assembly (Part No. 76-1599)

a. Remove cross-link spring 56-2627, figure 24.

b. Remove cross-link 56-2626.

c. Remove spring 56-3591 and pull-rod 56-2657, figure 24.

d. Remove spindle and turntable.

e. Remove cable clamp 258-3478.

f. Bend dress lugs to remove wires; be careful not to break lugs.

g. Remove one screw (under turntable) holding trip-switch assembly to main base plate.

h. Remove four screws (under turntable) holding changer-mechanism assembly to main base plate.

i. Lift out assembly.

24. Main-Cam Assembly (Part No. 76-1602)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove "C" washer 56-2793 which holds push-link 76-2066 to main-cam stud. See figure 26.

c. Lift out two retaining springs, 28-8711, from slide shafts 76-1925 and 76-1926, figure 27, and pull out shafts.

d. Lift out main-cam assembly.

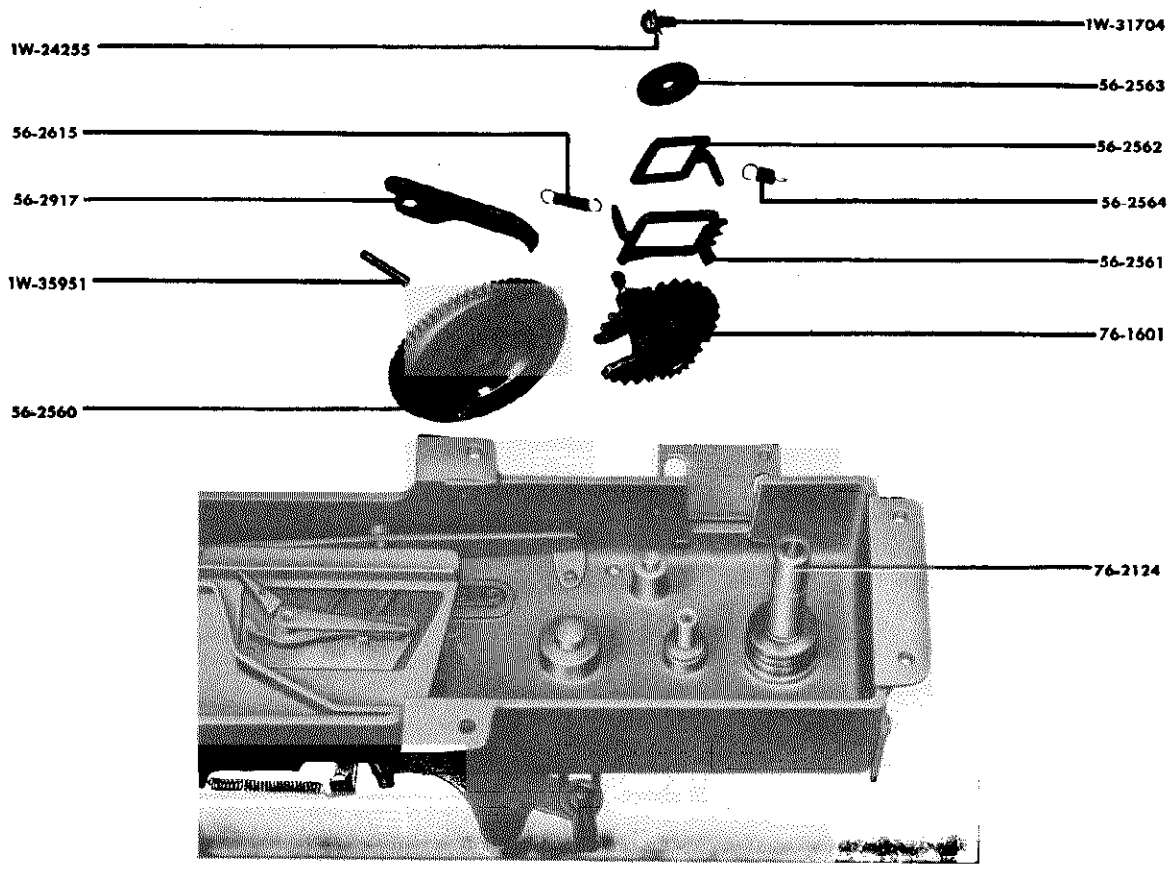


Figure 29—PARTS OF MAIN-GEAR AND INTERMEDIATE-GEAR ASSEMBLIES, UNDERSIDE VIEW.

25. Positioning Cam (Part No. 56-2568)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove main-cam assembly as directed in step 24 above.

c. Remove pull-rod 56-2657, figure 24, and spring 56-2570, figure 26.

d. Remove two shouldered screws, 56-2569, figure 27, and lift out cam.

26. Lift-Arm Assembly (Part No. 76-1603)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove nut 1W-19986 and lockwasher 1W-24256. See figure 27.

c. Lift out assembly.

d. When replacing this assembly, be sure to place ball-end on cam surface under main gear.

27. Intermediate-Gear Assembly (Part No. 76-1601)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove two springs, 56-2564 and 56-2615, from latch and segment gear. See figure 28.

c. Remove screw 1W-31704, lockwasher 1W-24255, and retaining washer 56-2563.

d. Lift out spring lug 56-2562 and gear segment 56-2561.

e. Lift out intermediate-gear assembly. Figure 29 shows the underside of the parts in the assembly.

28. Main Gear (Part No. 56-2560)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove intermediate-gear assembly as directed in step 27 above.

c. Remove main-cam assembly as directed in step 24 above.

d. Remove two screws, 1W-47664, figure 30, holding solenoid assembly 76-1605 to mechanism, and remove solenoid.

e. Remove hex-head screw holding trip-contact assembly 76-1606 to changer-mechanism housing and remove trip-contact assembly.

f. Remove retaining spring 28-8496, figure 28, and remove cam lever 56-2917.

g. Drive out tapered pin 1W-35951 in main gear and lift out main gear. Figure 29 shows the underside of the main gear.

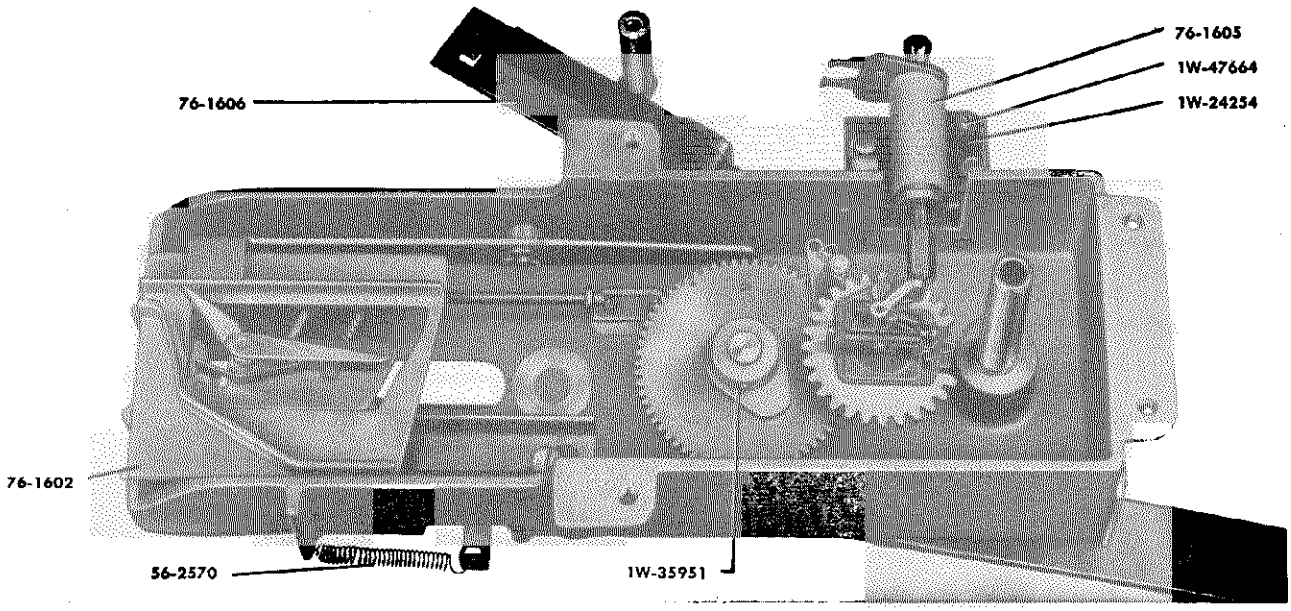


Figure 30—CHANGER MECHANISM ASSEMBLY, TOP VIEW.

29. Main-Gear-Shaft Assembly (Part No. 76-1722)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove push-link assembly as directed in step 20 above.

c. Remove main gear as directed in step 28 above.

d. Lift out main-gear-shaft assembly, figure 26.

30. Turntable-Shaft Assembly (Part No. 76-2124)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Loosen nut 56-6253, figure 26, a few turns and tap with a wooden mallet. Continue this process until shaft is free.

31. Turntable Bearings (Part No. 5W-2017)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Remove turntable-shaft assembly as directed in step 30 above.

c. Remove spring ring 56-2599, steel washer 56-2596, neoprene washer 54-4220, ball race 56-2597, ball retainer 54-7063, ball race 56-2597, neoprene washer 54-4220, and steel washer 56-2596, in order, as shown in figure 31.

32. Solenoid Assembly (Part No. 76-1605)

a. Remove changer-mechanism assembly as directed in step 23 above.

b. Unsolder the two wires from the lugs of the solenoid.

c. Remove the two screws, 1W-47664, and lockwasher, 1W-24254, figure 30.

d. When replacing this assembly, align the solenoid plunger so that its center strikes the latch and trips the segment gear, but does not over-push so as to bind the gear segment. The correct position is shown in figure 30.

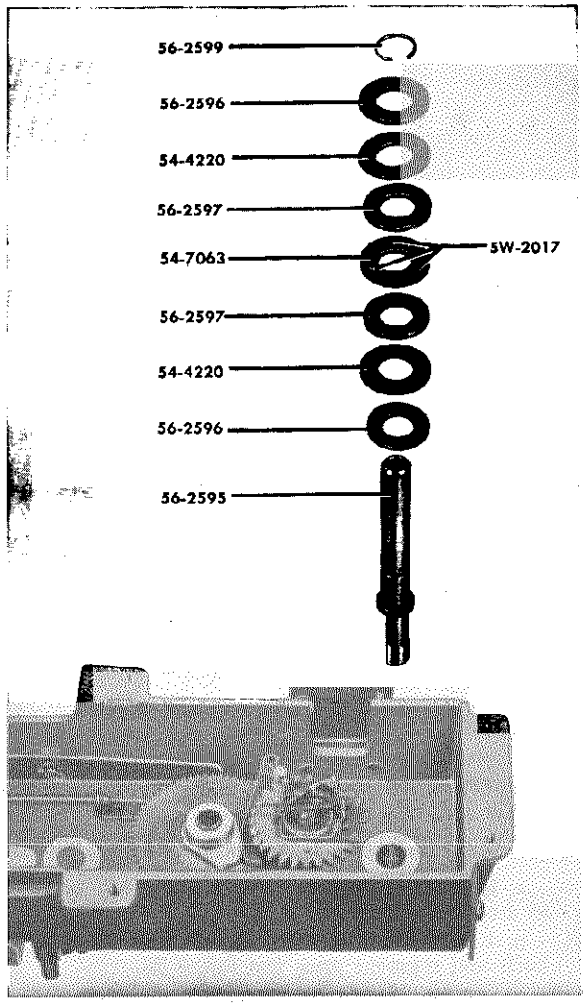
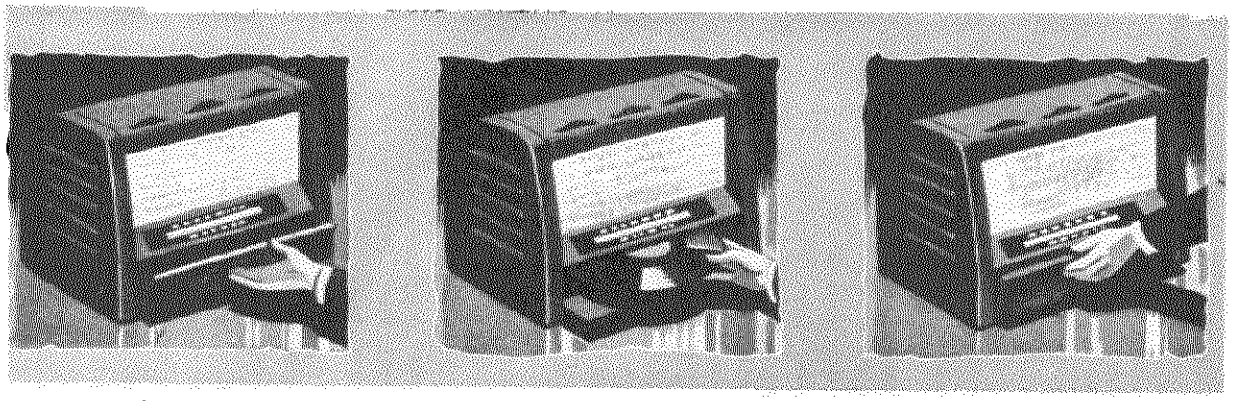


Figure 31—DISASSEMBLY OF TURNTABLE SHAFT AND BEARINGS.

REPLACEMENT PARTS LIST

SERVICE PART NO.	DESCRIPTION
27-6209	Socket (Pickup Cable)
28-2043	Ring, Locking (Push-Off-Cam Shaft)
28-8496	Spring, Retaining (Lift Arm—Cam Lever)
28-8711	Spring, Retaining (Main-Cam Slide Shaft)
32-8256	Transformer (Phono Input)
35-1298	Motor
35-2638	Needle
35-2639	Turntable
41-3685	Cable Assembly (A-C)
41-3723	Cable (Tone Arm)
42-1734	Switch, Master Control
54-4142	Plug, Four-Prong (A-C)
54-4181	Bumper, Rubber (Trip Pawl)
54-4208	Bumper, Rubber (Record Hold-Down)
54-4220	Washer, Cushion (Turntable Shaft)
54-4250	Plate (Master Control Switch)
54-4252	Knob (Master Control Switch)
54-4254	Grommet (Motor Mounting)
54-7063	Retainer, Ball (Turntable Shaft—Tone-Arm Shaft)
54-7124	Cord, Pull
56-2071	Shell, Plug (A-C)
56-2448	Cover, Plug (Pickup Cable)
56-2560	Main Gear
56-2561	Gear Segment
56-2562	Lug, Spring (Segment-Gear Assembly)
56-2563	Washer, Retaining (Segment-Gear Assembly)
56-2564	Spring (Segment-Gear Assembly)
56-2568	Cam, Positioning
56-2569	Stud (Positioning Cam)
56-2570	Spring (Positioning Cam—Push-Off Lever)
56-2573	Spring, Stop (Push-Off Arm)
56-2578	Screw, Push-Off Lever
56-2584	Slider Cam Rod, Cam Assembly
56-2590	Spring (Slider Cam—Guide Arm)
56-2595	Shaft Assembly, Turntable
56-2596	Washer (Turntable Shaft)
56-2597	Race, Ball (Turntable Shaft—Tone Arm Shaft)
56-2598	Screw, Tone-Arm Bearing
56-2599	Ring, Spring (Turntable Shaft)
56-2615	Spring, Segment (Segment-Gear Assembly)
56-2617	Spring (Pull-Cord)
56-2618	Stanchion, Record-Shelf
56-2619	Record Shelf
56-2620	Rest Post
56-2621	Bushing, Tone-Arm-Shaft
56-2622	Shaft, Tone-Arm
56-2623	Rod, Lift (Tone Arm)
56-2626	Cross Link
56-2627	Spring, Cross-Link
56-2628	Slider, Push-Off
56-2635	Shaft, Push-Off-Cam
56-2652	Cap, Record-Shelf
56-2653	Hold-down, Record
56-2654	Spring (Record Hold-Down)
56-2655	Pin, Spring (Record Hold-Down)
56-2656	Spring, Retaining (Record-Shelf Cap)
56-2657	Pull-Rod, Cam
56-2710	Locknut (Tone-Arm Pivot)
56-2713	Counterweight (Tone Arm)
56-2714	Spring (Push-Off-Lever Extension)
56-2793	"C" Washer (Push-Link)
56-2915	Cap Cover (Record Shelf)
56-2917	Cam Lever
56-2919	Spindle (Turntable)
56-2920	Push-Off-Lever Guide
56-2929	Clamp Plate (Pickup Head)
56-2976	Tone Arm
56-2996	Bearing Pin (Tone Arm)
56-2997	Brass Spacer (Motor Mounting)
56-3090	Spring (Push-Off Arm)
56-3091	Roller (Push-Link)
56-3092	Stud, Roller (Push-Link)
56-3532	Spring (Lift-Rod)
56-3591	Spring (Pull-Rod—Bell-Crank)
56-3600	Spring (Slider-Cam Rod)
56-6243	Nut, Tone-Arm Swivel-Bushing
56-6253	Nut, Turntable-Shaft Mounting
76-1599	Changer-Mechanism Assembly
76-1600	Base Assembly (Changer Mechanism)
76-1601	Intermediate-Gear Assembly
76-1602	Main-Cam Assembly
76-1603	Lift-Arm Assembly
76-1604	Turntable-Shaft Assembly
76-1605	Solenoid Assembly
76-1606	Trip-Contact Assembly
76-1608	Push-Off-Lever Assembly
76-1614	Plate and Lug Assembly
76-1615	Index-Bracket Assembly
76-1617	Push-Off-Cam Assembly
76-1618	Eccentric-Shaft-Lever Assembly
76-1620	Trip-Arm Assembly
76-1622	Pickup-Head Assembly
76-1722	Shaft Assembly
76-1723	Push-Off Lever Extension Assembly
76-1725	Tone-Arm Assembly
76-1904	Index-Disc Assembly
76-1925	Slide-Shaft Assembly (Short)
76-1926	Slide-Shaft Assembly (Long)
76-2066	Push-Link
76-2379	Idler Wheel Assembly
1W-10639	Screw, Motor Mounting, No. 6-32
1W-10817	Screw
1W-10941	Screw
1W-13082	Screw, No. 10-32
1W-13083	Screw, No. 10-32
1W-14318	Screw, Lift-Adjust
1W-19978	Nut (Lift-Rod)
1W-19986	Nut, No. 6-32
1W-24254	Washer
1W-24255	Lockwasher, No. 5
1W-24256	Lockwasher, No. 6
1W-24257	Lockwasher, No. 8
1W-24264	Lockwasher, 3/8"
1W-24520	Lockwasher, 3/8" (Rest Post)
1W-24524	Lockwasher, 5/8"
1W-31704	Screw, No. 5-40
1W-31736	Screw, No. 6-32
1W-32694	Screw
1W-35951	Pin
1W-36672	Rivet
1W-36675	Rivet
1W-44709	Nut, 3/8"-32
1W-47664	Screw
1W-48158	Screw, No. 6-32
1W-48188	Screw
1W-52100	Washer, Compression
1W-56913	Nut, Speed
5W-2017	Ball Bearing
W-1775	Locknut, Spring



Open Door *Insert Record* *Close Door*

Figure 1

GENERAL DESCRIPTION

The PHILCO M-7 AUTOMATIC RECORD PLAYER automatically plays single 10-inch or 12-inch records. See Figure 1. The player is loaded by simply opening the door in the front and pushing the record through the slot. As the door is closed, the tone arm is placed on the record, and the drive mechanism is started; after the record is played, the drive mechanism is turned off automatically. The door may be opened at any time a record is being played, without harming any part of the mechanism; the opening of the door shuts off the power and places the tone arm in its starting position.

The tone arm is equipped with a crystal pickup unit using a special, alloy needle having a precious-metal point; this needle plays several thousand records before replacement is necessary.

REMOVAL OF PACKING SUPPORTS

Special packing is used for the tone arm, which is supported by a corrugated cardboard strip, and is lashed to the tone-arm index pin. The turntable is held in place by a cord. Remove the packing carefully.

PRELIMINARY INSPECTION

Connect Set to Power Source

After removing the packing from the tone arm, see that the needle is held tightly by its set screw. Close the door, and see that the tone arm swings freely, without undue friction, over the playing range; also, see that it moves easily upward and downward. Turn the RADIO-OFF-PHONO switch knob of the radio receiver to the PHONO position.

Phono Test—Ten-Inch Record

Open the door of the record player and insert a 10-inch record through the slot, pushing the record in until it stops. While observing the player, close the door; the needle should readily enter the lead-in groove of the record, the *spindle* should rise upward through the hole in the record, and the turntable drive mechanism should start.

Adjust the receiver volume control for moderate volume, and turn the tone control to the treble position. Listen for general quality of reproduction. After the record is played, the turntable should stop automatically. When the door is opened, the tone arm should lift and swing over against the *tone-arm index pin.*

Check the turntable speed while a record is being played; the speed should be approximately 78 r.p.m. Open the door when a record is partially played; the tone arm should lift and swing aside, and the turntable should stop.

Phono Test—Twelve-Inch Record

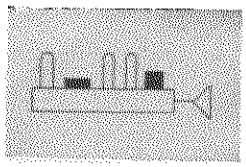
Insert a 12-inch record, pushing inward until the record stops; as the record is pushed home, the tone arm should swing aside (needle remaining over lead-in groove), and the 10-inch hinged section of the *rear index bracket* should lift to clear the edge of the record. When the door is closed, the two rubber-covered *guide rollers* should move away from the edges of the record at least 1/16 inch. When the door is opened, the tone arm should swing aside, and the *guide rollers* should come into contact with the sides of the record; when the record is removed, the hinged section of the *rear index bracket* should fall into its 10-inch position.

SERVICING

TEST PROCEDURES

The following tests are given for quickly localizing trouble in a Philco radio-phonograph. Be sure to make each test, in the order given, *before* removing the record player from the cabinet.

If the trouble is found to be in the audio amplifier, refer to the radio service manual for the particular model under test. If the trouble is in some part of the record player, refer to pages of this manual.

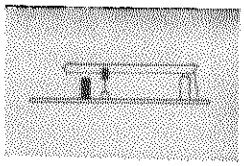


1. AUDIO-AMPLIFIER TEST

The audio amplifier is common to both the radio and phonograph sections of the combination. With a station tuned in, check the audio amplifier by noting the tonal quality and volume of the speaker output.

If the trouble is found to be in the audio amplifier, refer to the radio service manual for the particular model under test.

2. TONE-ARM TESTS



a. Pickup Test

Play a familiar record on the radio-phonograph, and listen to the reproduction. If the audio amplifier was found to be normal in the first test, distortion or low volume indicates trouble in the pickup or in the connecting leads to the radio chassis. Try a new needle if the output is distorted. If the pickup is found to be faulty, replace the unit, following the procedure given on page of this manual.

Note: It is advisable to carry a familiar record with you as a regular part of your test equipment.

b. Indexing and Tripping Test

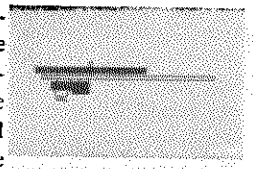
Open the door of the record player. While observing the record player, insert a 10-inch record, and close the door. As the door is closed, the tone arm should set down with the needle in the lead-in groove of the record. After the record has played through, tripping of the mechanism should occur during three to five revolutions with the needle riding in the eccentric groove.

Open the door; the tone arm should lift and swing across to the index pin.

Insert a 12-inch record and repeat the above test.

If the indexing or tripping is incorrect, refer to ADJUSTMENTS in this manual.

3. TURNTABLE-AND-MOTOR TEST



In table-model combinations, it is necessary to raise the top of the cabinet, as directed on page 11. Open the door of the record player, and insert a 12-inch record. Place a stroboscope disc, such as Philco Part No. 45-2900, on the record, and illuminate the disc with a lamp (preferably a neon bulb) operated on 60-cycle a.c. Close the door to start the turntable. The dots in the row calibrated for 78 r.p.m. should appear to remain stationary, or drift slowly but smoothly forward or backward. Erratic motion of the dots indicates trouble in the drive mechanism.

If the speed of the turntable is unstable, refer to POSSIBLE CAUSES OF "WOWS" on page of this manual.

QUALITY OF RECORDS

When diagnosing trouble, or when adjusting or servicing this record player, it should be borne in mind that records, in general, are non-uniform in a number of respects. The characteristics encountered, not only in new records from different manufacturers, but in different records of the same make, include:

Lack of (or incomplete) lead-in groove

Lack of (or incomplete) eccentric groove

Variations in position of eccentric groove

Small hole

Poor recording

In addition to the above, used records may also be found to have cracks, warpage, or high surface noise.

To properly service the PHILCO M-7 AUTOMATIC RECORD PLAYER, the operation of the mechanism should be well understood; therefore, the following explanation is given, preliminary to the actual servicing information.

HOW THE M-7 OPERATES

The operation of the record player is controlled by a *slide-lever assembly,* and an *index-lever assembly.* The *slide-lever assembly,* under the *motor board* (main base plate) is coupled to the door by a *connector-bar,* and is moved forward or backward by the opening or closing of the door.

The indexing (adaptation to 10-inch or 12-inch records) is accomplished by the action of the *index-lever assembly,* which is controlled by the diameter of the record pushed into the slot.

WHEN THE DOOR IS OPENED, as shown in Figure 2, the following operations are performed:

1. The tone arm is moved, by a *pull-cord,* to the starting position; in this position, the pickup and needle are raised, to clear an incoming record.
2. The *record spindle* is retracted.
3. If a record is playing, the motor is turned *off.*

Figure 3 shows the bottom view of the record player (for clarity of reproduction, the wood frame and door are removed). All parts are in their closed-door positions. The *slide-lever assembly* is forward. Note that the tone-arm pull-cord is taut, the record-spindle *connector block* is lowered, and the *mercury switch-case assembly* is tilted to the *off* position.

WHEN A 10-INCH RECORD IS PUSHED INTO THE SLOT, it is guided into place, with the hole approximately centered on the turntable, without altering the positions of the *index-lever assembly* or *rear-inaex bracket.* Figure 4 shows the 10-inch record in position.

WHEN A 12-INCH RECORD IS PUSHED INTO THE SLOT, the *guide rollers* are moved outward, operating the *index-lever assembly* and changing the *rear index bracket* to its 12-inch position. The *tone-arm index pin,* being mounted on the right-hand *index lever,* moves outward, allowing the needle to assume the starting position required by the larger record.

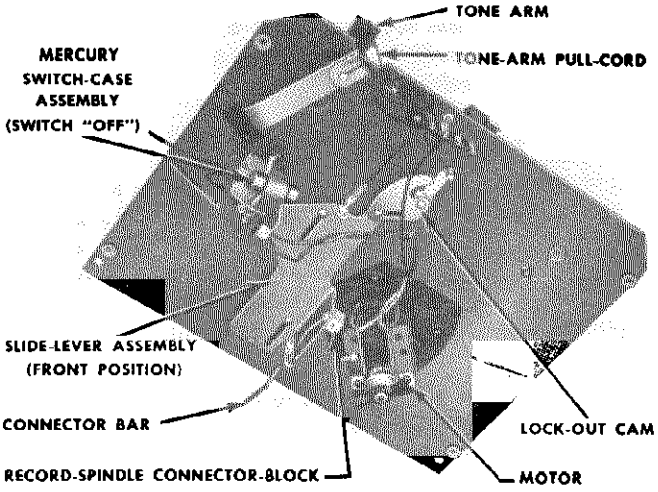


Figure 3—BOTTOM VIEW, COMPONENTS IN OPEN-DOOR POSITIONS, WITHOUT RECORD.

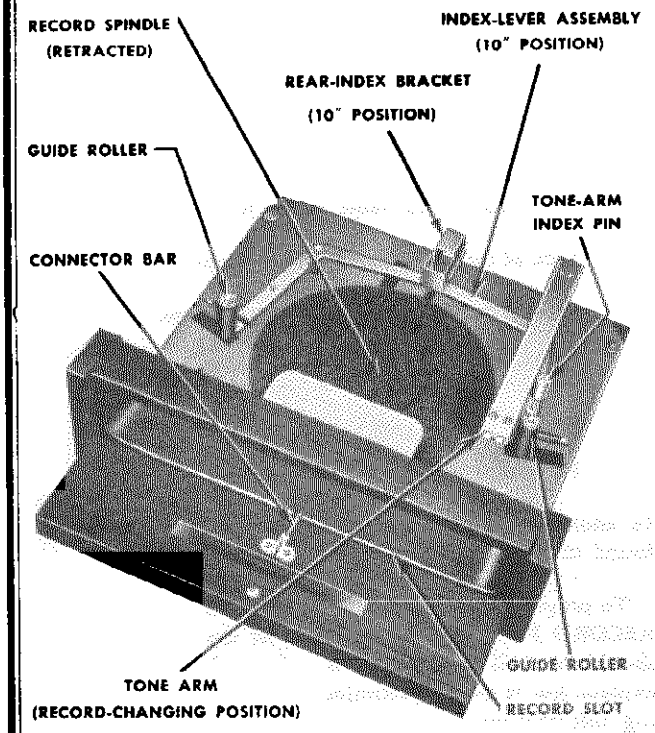


Figure 2—TOP VIEW, DOOR OPEN, WITHOUT RECORD.

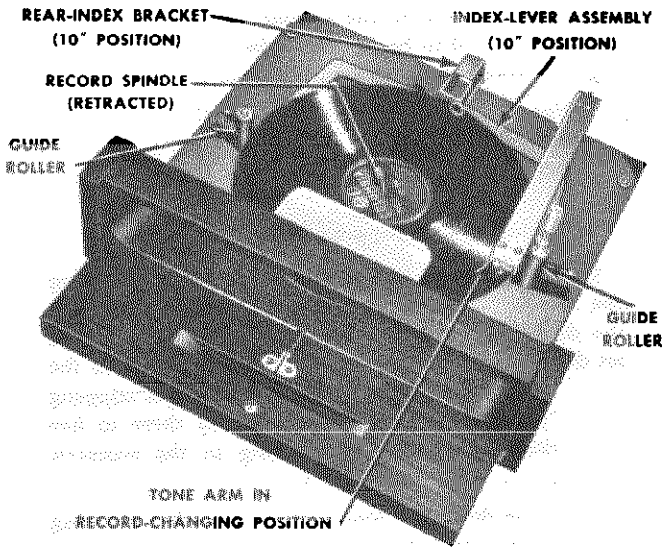


Figure 4—TOP VIEW, DOOR OPEN, WITH 10" RECORD.

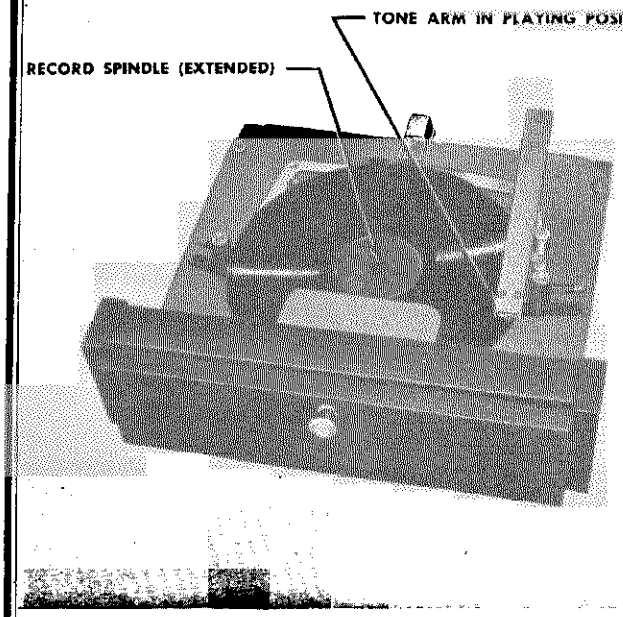


Figure 5—TOP VIEW, DOOR CLOSED, WITH 10″ RECORD.

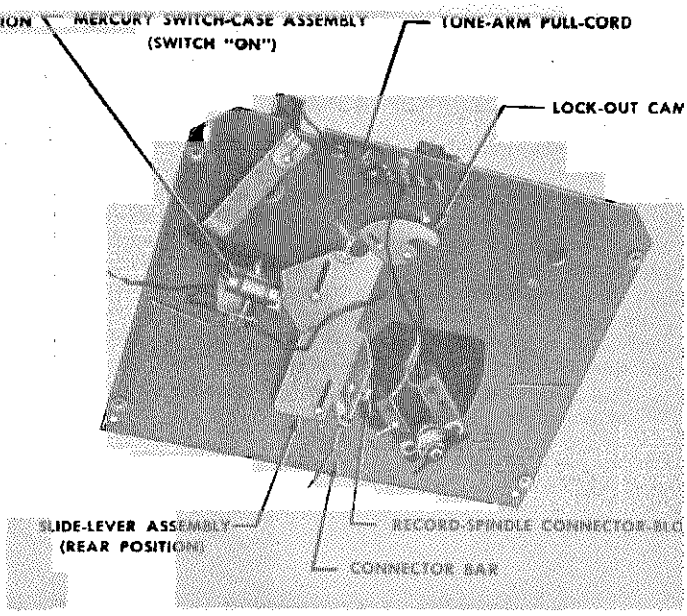


Figure 6—BOTTOM VIEW, COMPONENTS IN CLOSED-DOOR POSITIONS, WITH 10″ RECORD.

WHEN THE DOOR IS CLOSED, WITH A 10-INCH RECORD IN PLACE, the following operations are performed:

1. The *record spindle* is extended through the hole in the record, positioning the record accurately for the tone-arm set down.
2. The needle is lowered to the lead-in groove.
3. The motor is turned *on*.

Figure 5 shows the 10-inch record in place, with the door closed. Note the position of the *record spindle* and the tone arm.

Figure 6 shows the bottom view under the same conditions. Note the positions of the *slide-lever assembly*, the record-spindle *connector-block*, and the *mercury switch-case assembly*. It will be seen that the *tone-arm pull-cord* is slack.

WHEN THE DOOR IS CLOSED, WITH A 12-INCH RECORD IN PLACE, the operations mentioned above are performed, and, in addition, the *stud* of the *index-lever assembly* is engaged by the *lock-out cam;* this causes the two *guide rollers* to be moved away from the edges of the record, permitting the record to turn freely. Figure 7 shows a top view of the record player with a 12-inch record in place. Figure 8 shows the bottom view, with all parts in their closed-door position. Note the positions of the *index-lever stud* and the *lock-out cam.*

When the needle rides into the eccentric portion of the groove, at the finish of the record, the motor is turned *off*. The motor is controlled by the *mercury trip switch;* the power is turned *on* or *off* by closing or opening the door, or turned *off*, at the finish of the record, by the tone-arm trip mechanism.

Figure 7—TOP VIEW, DOOR CLOSED, WITH 12′ RECORD.

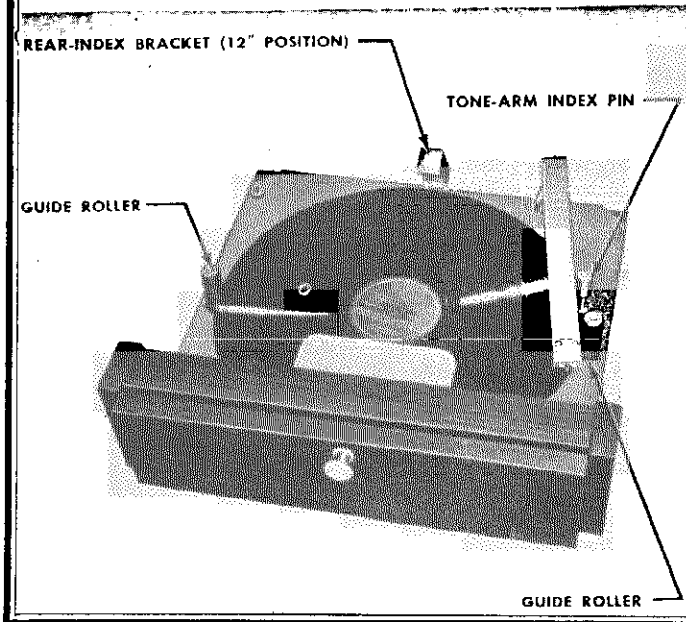
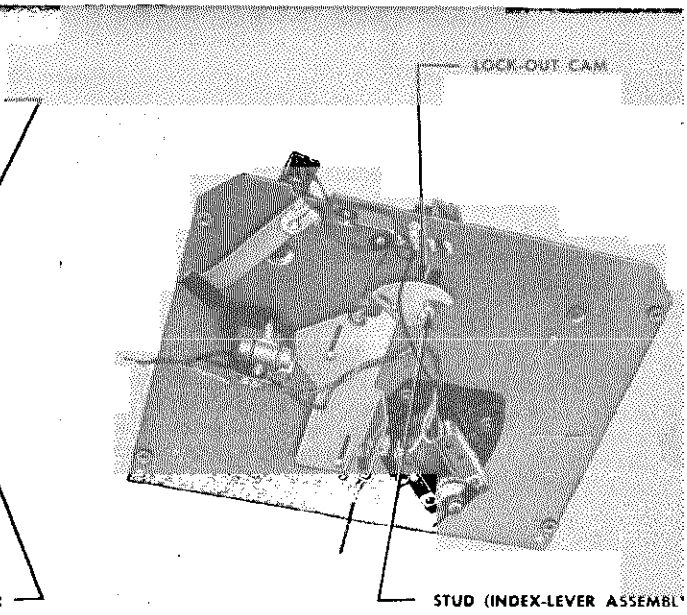


Figure 8—BOTTOM VIEW, COMPONENTS IN CLOSED-DOOR POSITIONS, WITH 12′ RECORD.



SLIDE-LEVER ASSEMBLY

Most of the operations of the record player are controlled by the *slide-lever assembly* (Figure 9), which is actuated by the opening or closing of the door. The door is coupled to a *connector-bar*, the other end of which is attached to the *slide-lever assembly*, located under the motor board (main base plate). The *slide-lever assembly* moves forward or backward as the door is opened or closed. The operations performed by the *slide-lever assembly*, besides positioning the tone arm, are accomplished by its three elements.

1. The trip-switch reset spring turns the trip switch *off* or *on*.

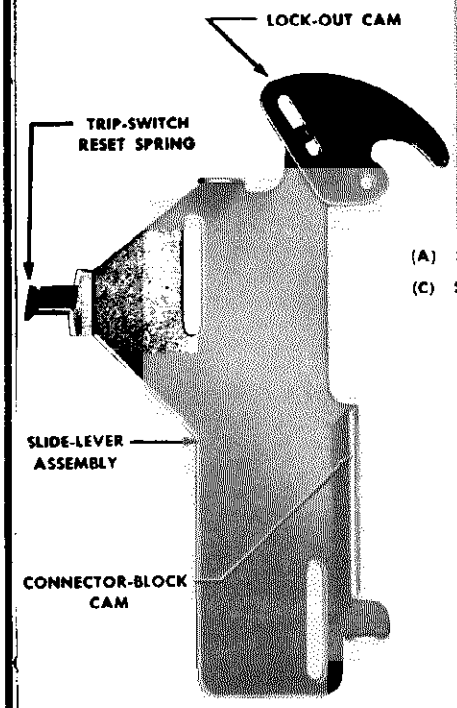


Figure 9—SLIDE-LEVER ASSEMBLY.

2. An ear having a diagonal slot (connector-block cam) retracts or extends the *record spindle*.
3. The *lock-out cam*, at the rear, moves the two *guide rollers* away from the edges of a 12-inch record, allowing the record to turn freely.

TRIP-SWITCH ASSEMBLY

The power to the drive motor is controlled by the *mercury trip switch*, shown in Figure 10A; the *mercury switch-case assembly*, which is mounted in a rocking clamp assembly, is provided with an adjustable *trip lever* at one end of the supporting shaft, and a lever and *trip pawl* at the other end. The switch contacts are closed when the case is tilted so that the mercury settles in the end nearest the *slide lever;* in the *on* position, this end is slightly lower than the opposite end, as shown in Figure 10A. The switch is turned *off* or *on*, when the door is opened or closed, by the *trip-switch reset spring* on the *slide-lever assembly;* this spring engages the tip of the adjustable *trip lever*. The switch is turned *off*, when the needle rides into the eccentric groove of the record, by the *trip pawl;* this pawl is actuated by a reverse motion of the *tone-arm trip lever*.

Figures 10A, 10B, 10C, and 10D show the positions of the *tone-arm trip lever, trip pawl,* and *mercury switch-case assembly* for a sequence of record-playing and tripping actions.

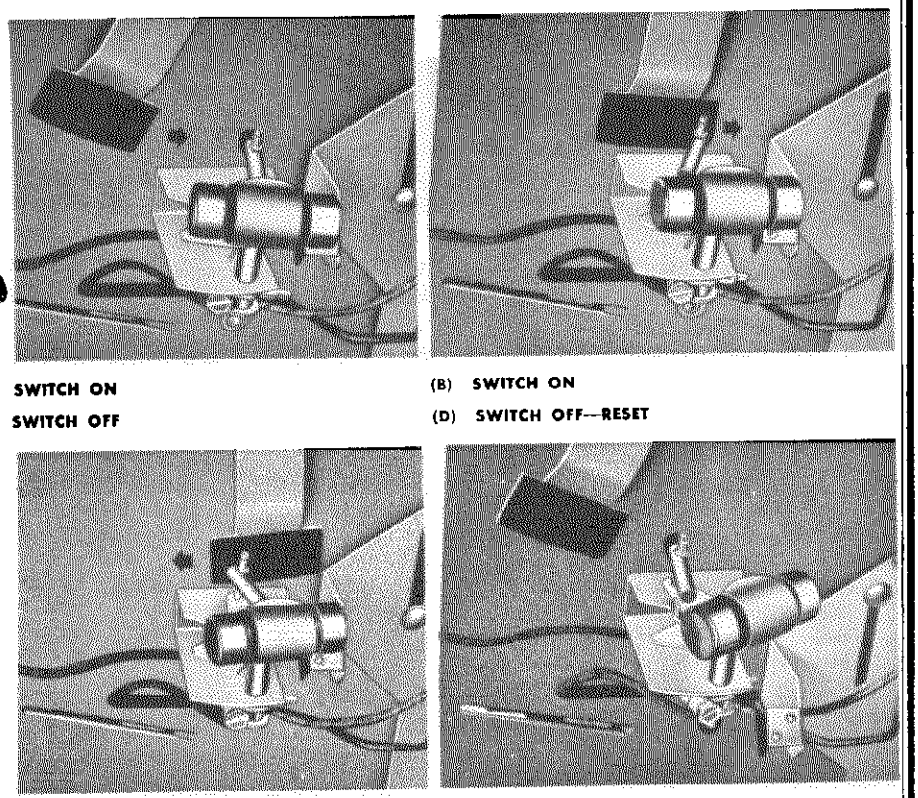


Figure 10—MERCURY TRIP-SWITCH AND TONE-ARM TRIP-MECHANISM OPERATION.

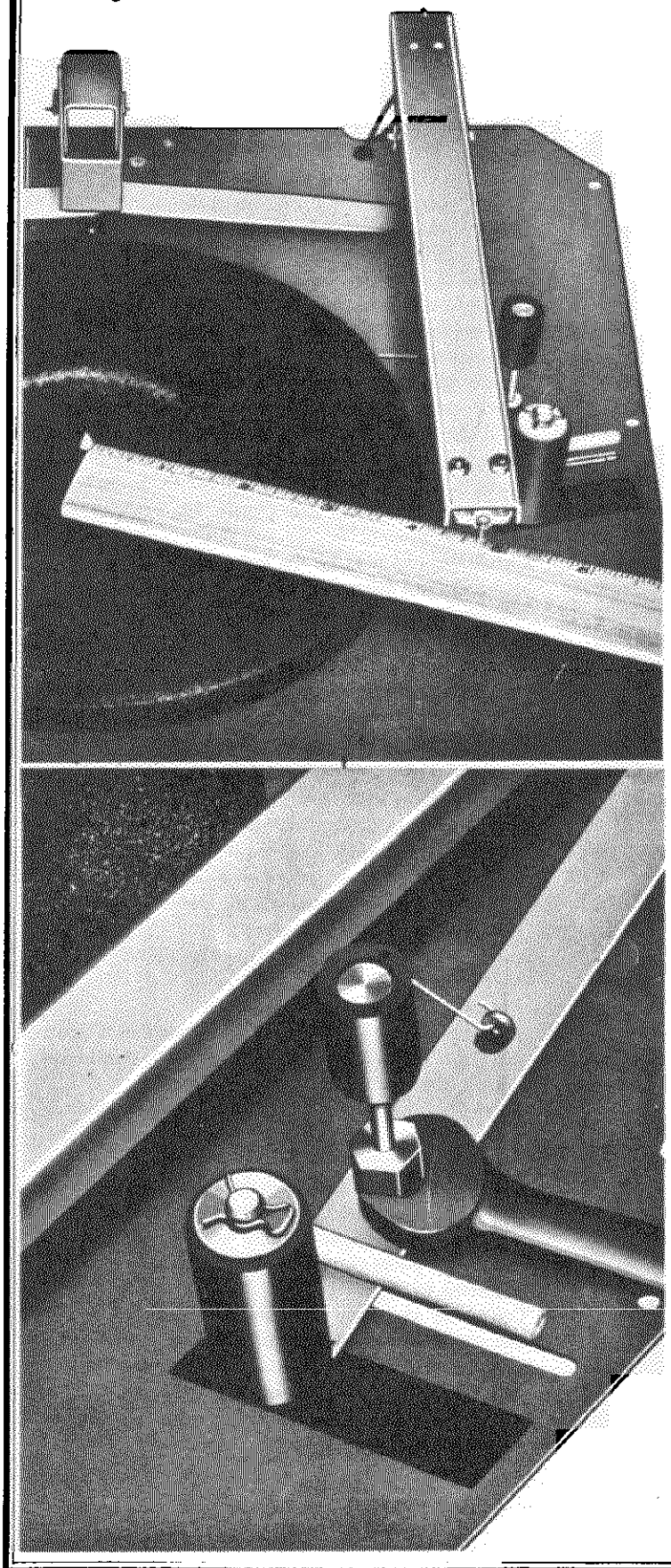
Figure 10A shows the switch in *on* position, and the *tone-arm trip-lever* position soon after the record has started to play.

Figure 10B shows the *trip pawl* starting to ride the *tone-arm trip lever* as the record is partially played.

Figure 10C shows the *trip pawl* after the trip action is completed; the switch is turned *off*.

Figure 10D shows the position of the *mercury switch-case assembly*, after the door is opened; the switch has been *reset*, by the *trip-switch reset spring*, to the position from which it may again be turned *on*, by the same spring, when the door is closed.

Figure 11—TONE-ARM SET-DOWN ADJUSTMENT.



ADJUSTMENTS

Each of the adjustments described below, un otherwise stated, is independent of other adjustme and may be performed separately as required. I advisable, however, to check all adjustments w servicing the record player.

TONE-ARM SET-DOWN

This adjustment should be made without a rec because of the wide variation in individual reco the adjustment is made by measurement, *to insure best average set-down position.*

1. See that the door of the record player is closed.
2. Lift the tone arm until the needle is slightly hig than the turntable.
3. Hold the tone arm lightly against the tone-arm dex pin.
4. Using a ⅜" open-end wrench on the hex shoul of the eccentric-mounted tone-arm index pin, t the pin until the distance between the point of needle and the *side* of the *spindle* nearest the nee is $4\frac{11}{16}$". See Figure 11.

INDEX-LEVER ASSEMBLY

This adjustment establishes the minimum clearа between the guide rollers and the edges of a 10-i record. The position of the index-lever assembly ca ing these rollers is determined by the adjustable inc lever cam shown in Figure 12.

1. Place a 10-inch record on the turntable, and cl the door.
2. Using a socket wrench, loosen the nut (beneath motor board) holding the adjusting cam.
3. Turn the cam until the clearance between the gu rollers and the edges of the record is $\frac{1}{16}$". Hold the cam firmly, tighten the nut.
4. Try a variety of 10-inch records on the turnta If the guide-roller tires contact any of these records with the door closed, repeat the adjustment.
5. After this adjustment is satisfactory, make the tone-arm set-down adjustment, since this is disturbed by changing the index-lever cam.

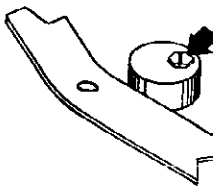


Figure 12 INDEX-LEVER ADJUSTMENT.

Figure 13—TONE-ARM TRIP-LEVER ADJUSTMENT.

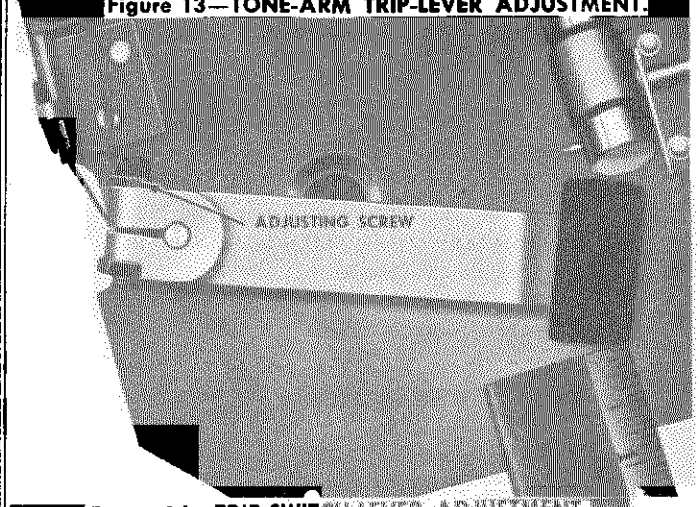
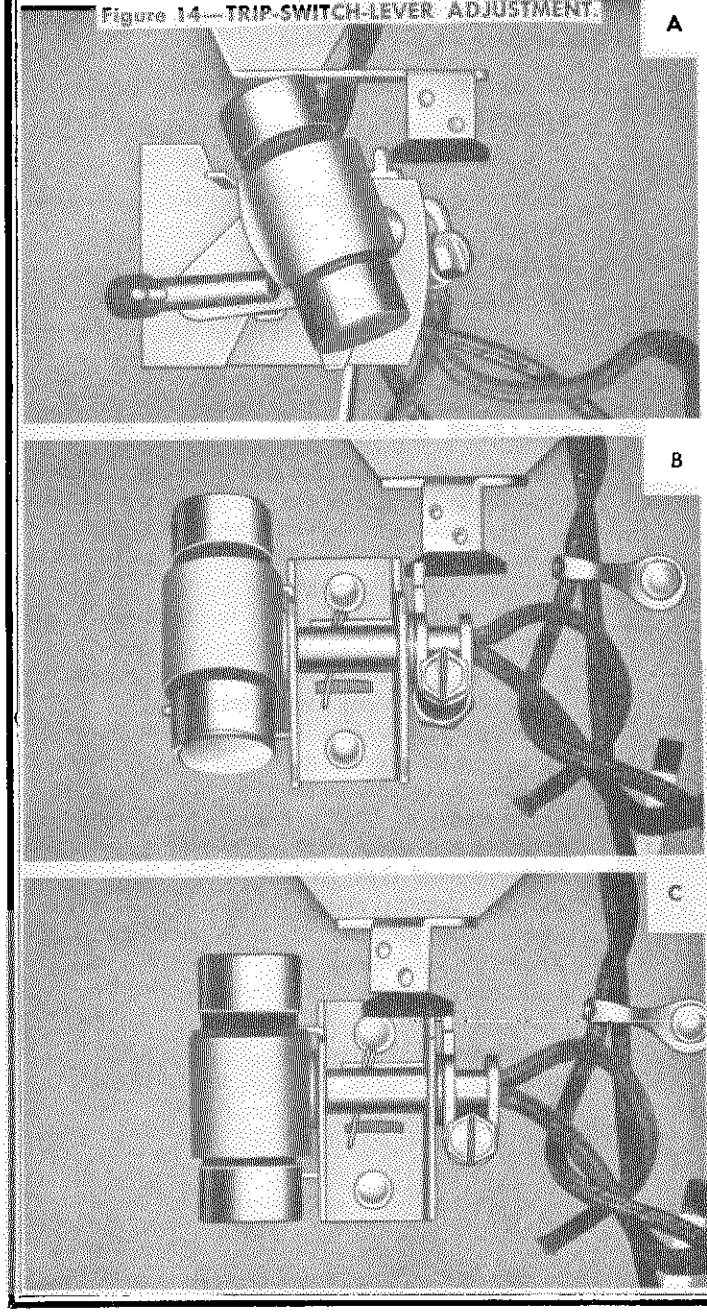


Figure 14—TRIP-SWITCH-LEVER ADJUSTMENT.



TONE-ARM TRIP LEVER

This adjustment is made to obtain the proper relationship between the trip lever and the tone arm, thus allowing the tone arm, when starting to oscillate in the eccentric groove, to turn off the drive-motor power. There should be an angular difference of approximately 15° between the tone arm and its trip lever. The adjustment, when made according to the following procedure, insures proper operation of the trip mechanism with the wide eccentric-groove variations encountered in different records.

1. See that the door of the record player is closed. No record is required.
2. Loosen the screw in the trip-lever clamp on the lower end of the tone-arm spindle. See Figure 13.
3. Hold the tone arm against the tone-arm index pin.
4. Swing the trip lever until the outside corner of the adhesive-coated portion is ¾" to ⅞" from the edge of the motor board. See Figure 13. Tighten the clamp screw.
5. Check the end play of the tone-arm spindle; there should be just enough play (.003" to .005") to allow the tone arm to swing freely throughout its range. The adhesive-coated end of the trip lever should be close to the motor board, and should swing throughout its range without scraping.
6. When this adjustment is properly made, the trip mechanism should operate through a range between 1½" and 3" from the center of the record spindle.

TRIP-SWITCH LEVER

This adjustment establishes the proper relationship between the trip-switch lever and the trip switch, so that the switch is turned *off* or *on* by opening or closing the door, and is turned *off* by the tone-arm trip mechanism after a record is played.

1. Loosen the screw in the trip-switch-lever clamp. See Figure 14A.
2. Open the door of the record player.
3. Tilt the switch to the position shown in Figure 14A; the lever carrying the trip pawl should be against the stop.
4. Turn the trip-switch lever until its tip is contacted, when the door is closed, by the under surface of the switch-reset spring at a point close to the upper tip of the spring, as shown in Figure 14B. When the door is reopened, the lever tip should be contacted by the upper surface of the switch-reset spring at a point close to the lower tip of the spring, as shown in Figure 14C.
5. Open and close the door several times, observing the upper and lower points where the trip lever contacts the spring; readjust the lever until its tip makes contact at equal distances from the tips of the spring as the spring is moved forward and backward. Tighten the screw.

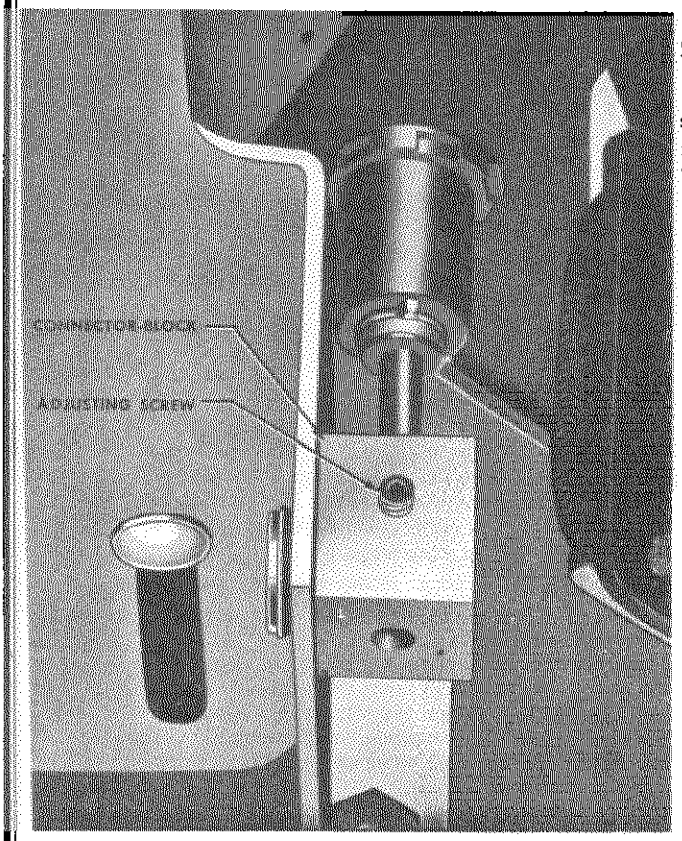
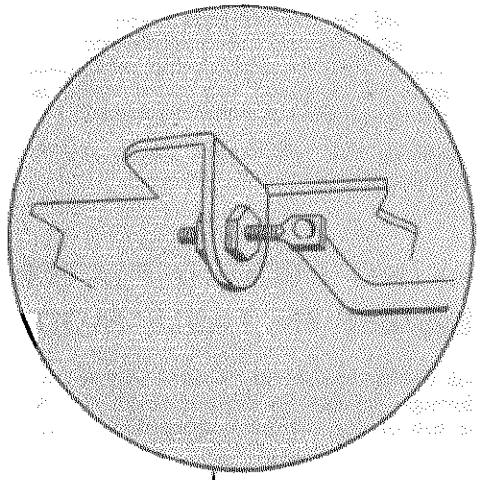


Figure 15—SPINDLE-HEIGHT ADJUSTMENT.

SPINDLE HEIGHT

The height of the record spindle, when extended, should be such that the spindle properly engages the record hole without delay, when the door is closed. The adjustment is made as follows:

1. Open the door of the record player. No record should be used.
2. Using a No. 4 Allen wrench, release the set screw in the spindle connector block. See Figure 15.



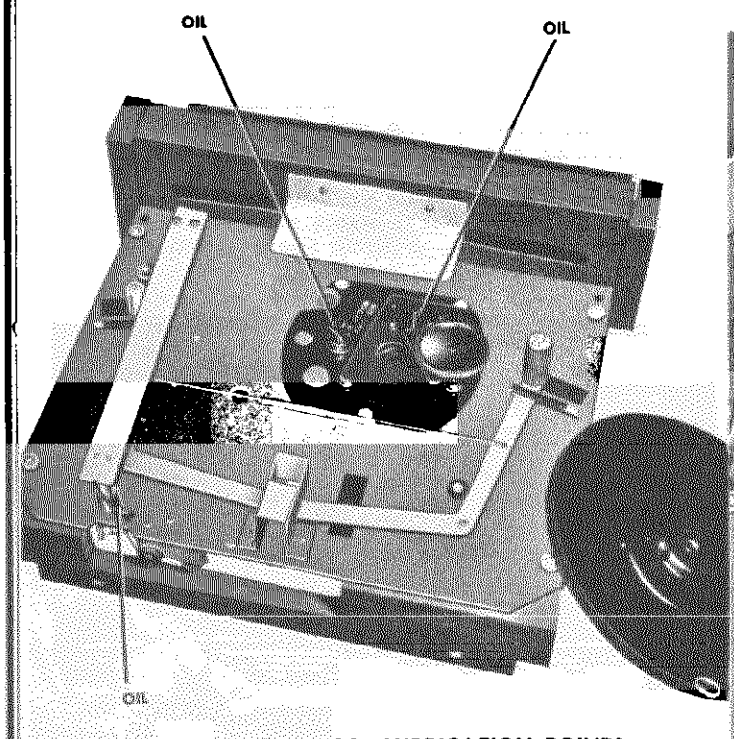


Figure 16—LUBRICATION POINTS UNDER TURNTABLE.

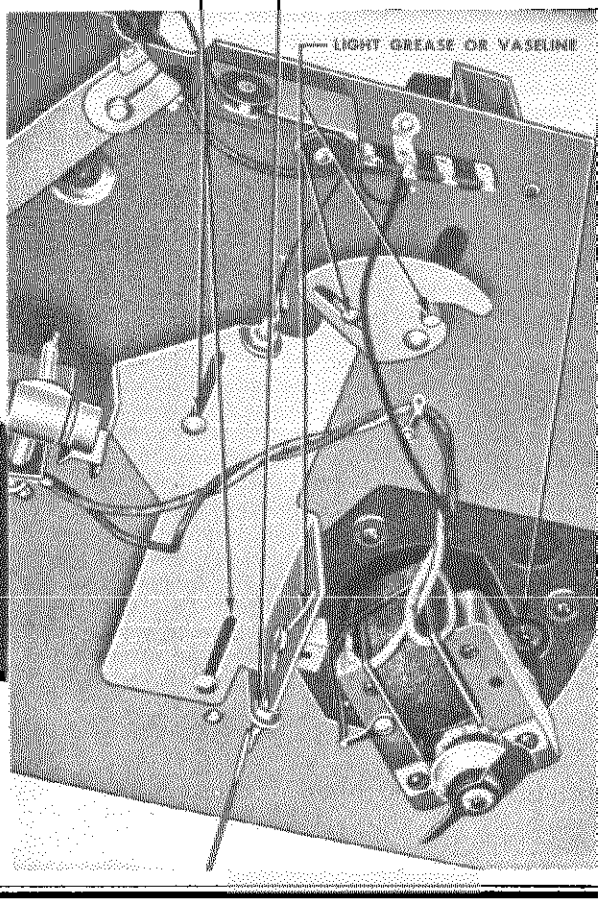


Figure 17—LUBRICATION POINTS UNDER MOTOR BOARD.

3. Adjust the spindle height until the point on the upper end of the spindle is flush with the spindle bushing. Tighten the set screw.

CONNECTOR BAR

This adjustment establishes the correct position of the slide-lever assembly, with respect to the door.

1. Open the door to its limit (do not force).
2. Loosen the two nuts on the threaded stud of the connector bar. See detail, Figure 17.
3. Hold down the door, and separate the two nuts, so that the slide-lever assembly may be pulled forward until stopped by the shoulder rivets in the two straight slots. With the slide-lever assembly held in this forward position, tighten the nuts. Avoid an adjustment which places too much strain on the ear to which the threaded stud is fastened.

After making this adjustment, check the record-spindle height, readjusting if necessary.

MAKING RECORD PLAYER ACCESSIBLE IN TABLE MODELS

Unhook the latch; this can be done by inserting one finger through the hole in the bottom of the cabinet. Push the top of the cabinet backward, then upward.

LUBRICATION

It is recommended that the PHILCO M-7 AUTOMATIC RECORD PLAYER be lubricated about once a year. Remove the turntable, by lifting upward.

CAUTION

Do not get any oil or grease on the idler-wheel tire, drive-motor pinion, or turntable.

The points to be lubricated are indicated in Figures 16 and 17. Apply a few drops of *oil*, such as Philco Part No. 60319, to the following points:

1. Edges of slot under idler-wheel plate (the slot in which the guide pin rides).
2. Record-spindle and bushing.
3. Tone-arm spindle.
4. Idler-wheel bearing, shown in Figure 17.

Clean off old grease with carbon tetrachloride, and apply *light grease* or *vaseline*, such as Philco Part No. 60130, to the following points, also shown in Figure 17.

1. Two straight slots of slide-lever.
2. Diagonal slot carrying record-spindle connector block.
3. Slot of lock-out cam.

After completing the lubrication, close the door of the record player and wipe oil from the extended portion of record spindle. Replace the turntable. Dip a pipe cleaner in carbon tetrachloride, and carefully clean the pin on which the trip pawl swings; do not apply any lubrication to this pin.

REPLACEMENT OF PARTS

Parts or assemblies which may be replaced for worn, damaged, or broken parts or assemblies are listed in the Replacement Parts List. Many of the parts are attached to the motor board by rivets; movable sections are attached by shoulder rivets. When replacing a part or assembly, drill out the ends of the rivets, and knock them out with a nail set or center punch.

NEEDLE

TO REPLACE THE PICKUP NEEDLE IN TABLE MODELS, first remove the top of the cabinet according to the directions given on this page. Then pull the phonograph-compartment door fully open to tilt the tone arm upward. Hold the end of the tone arm and loosen the needle screw on the end of the arm with a small screwdriver. Remove the old needle, and insert the new one *as far into the needle hole as it will go, with the flat side of the shank facing toward the needle screw.* Hold the end of the tone arm with the needle in the proper position, and tighten the needle screw.

TO REPLACE THE PICKUP NEEDLE IN FLOOR MODELS, first pull the phonograph-compartment door about halfway open, and carefully move the tone arm around toward the back of the cabinet until a slight resistance to movement is felt. Then close the door to permit free movement of the tone arm to the end of its backward swing. Hold the end of the tone arm in the left hand, as shown in Figure 18, and loosen the needle screw on the end of the arm with a small screwdriver. Remove the old needle, and insert the new one *as far into the needle hole as it will go, with the flat side of the shank facing toward the needle screw.* Hold the end of the tone arm, with the needle in the proper position, and tighten the needle screw. Again pull the phonograph-compartment door about halfway open, and move the tone arm around toward the front of the cabinet until resistance to movement is felt. Then close the door to permit free movement of the tone arm to its original position.

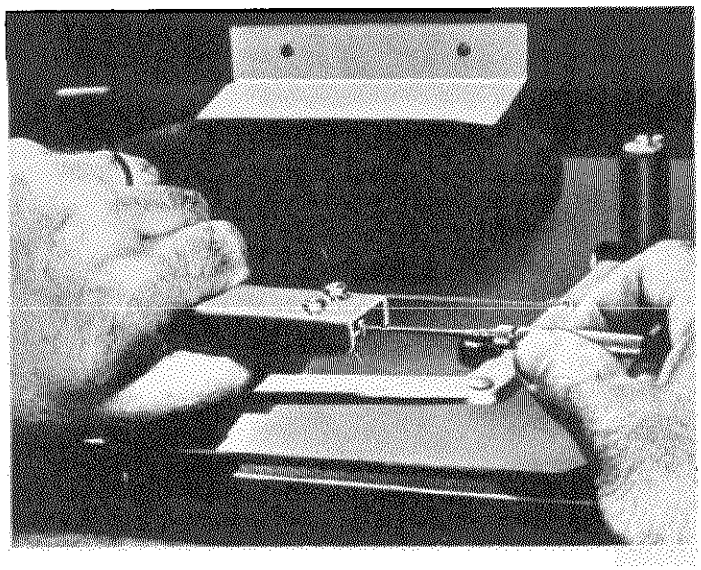


Figure 18—REPLACING NEEDLE.

CRYSTAL-PICKUP UNIT

To replace the pickup unit, first remove the two hex nuts and lockwashers from the tone arm; then withdraw the unit from under the tone arm sufficiently to permit unsoldering the connections.

CAUTION

Excessive heat will damage the crystal in the pickup unit. When unsoldering or soldering connections to this unit, use a well-tinned soldering iron. *Do not apply more heat than is absolutely necessary.*

After removing the connections, the new unit may be connected, and mounted in the tone arm.

MERCURY SWITCH-CASE ASSEMBLY

When replacing the mercury switch-case assembly, this unit must be positioned properly in its clamp, so that, when the switch case is tilted to the *on* position, the mercury covers the contacts. After running the switch leads through the hollow shaft, turn the switch case until the hole through which the leads enter is facing directly upward (toward motor board).

SLIDE-LEVER ASSEMBLY

When any part of the slide-lever assembly becomes worn or damaged, it is recommended that the entire assembly be replaced.

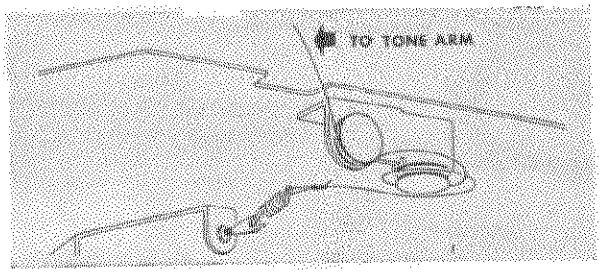


Figure 19—PULL-CORD INSTALLATION DETAILS.

PULL-CORD AND SPRING ASSEMBLY

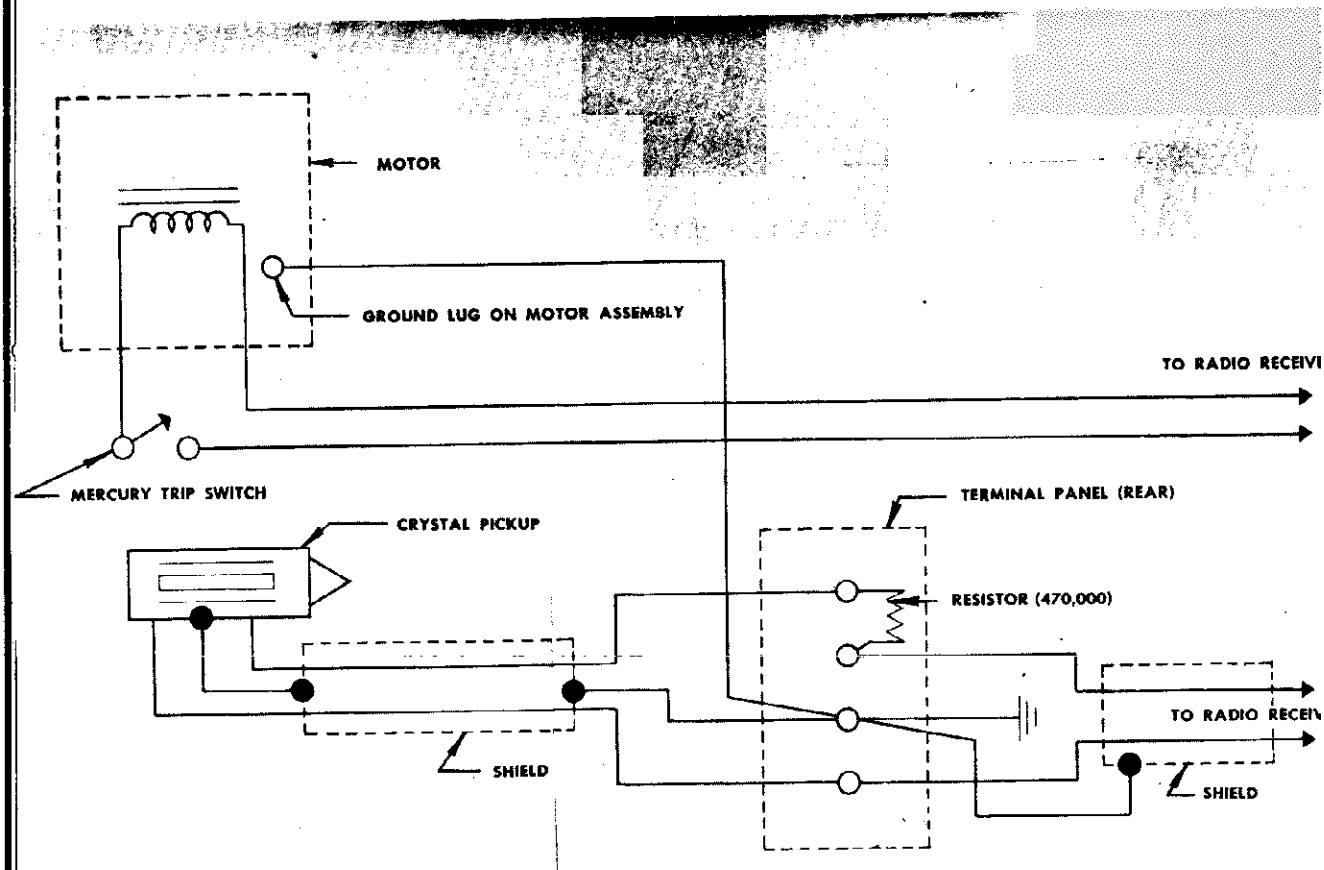
The pull-cord and spring assembly may be replaced by referring to the sketch, Figure 19.

POSSIBLE CAUSES OF "WOWS"

The presence of "wows" (pitch variations) is usually caused by a change in the speed of the turntable during each revolution. If this condition develops, it may be due to one of the following causes:

1. Defective record.
2. Idler-wheel tire unevenly worn.
3. Oil (or other foreign matter) on idler-wheel tire.
4. Binding of idler-wheel shaft.
5. Binding between record spindle and turntable bushing.
6. Guide roller tire touching edge of record.

Figure 20—WIRING DIAGRAM OF M-7 RECORD PLAYER.



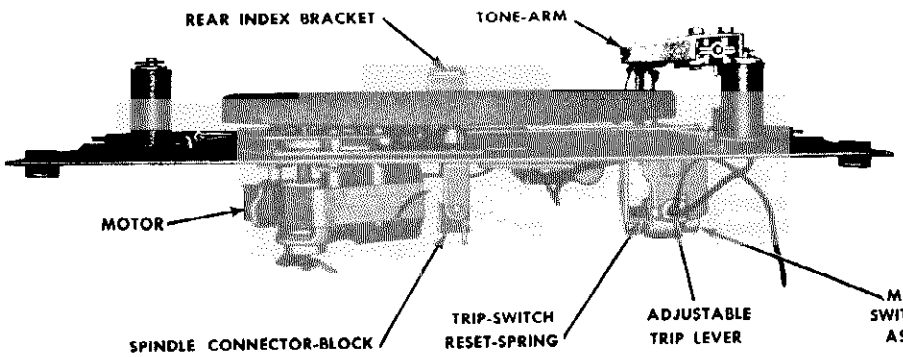


Figure 21
FRONT EYE-LEVEL VIEW.

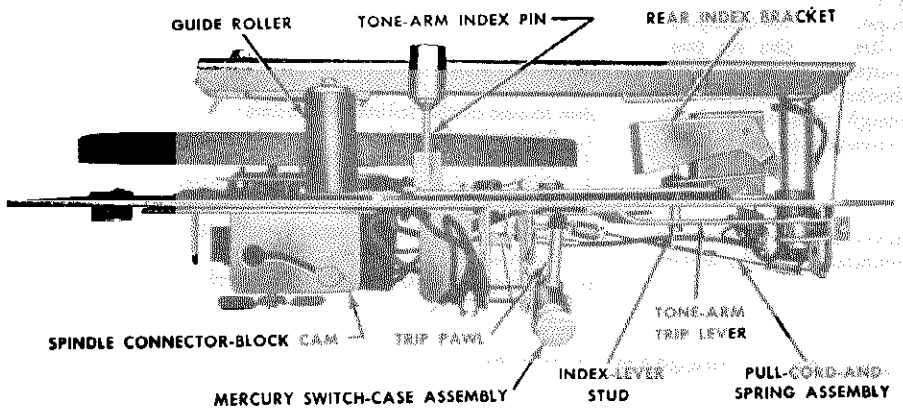


Figure 22
RIGHT EYE-LEVEL VIEW.

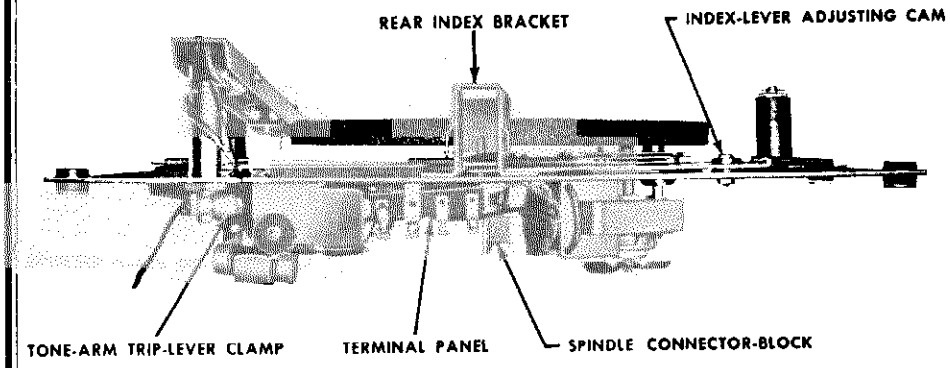


Figure 23
REAR EYE-LEVEL VIEW.

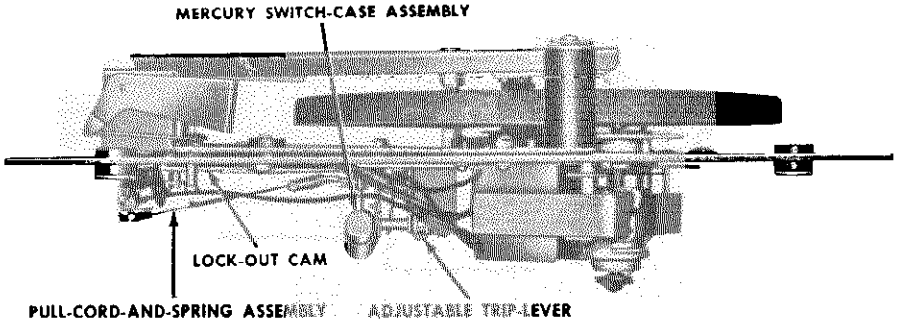


Figure 24
LEFT EYE-LEVEL VIEW.

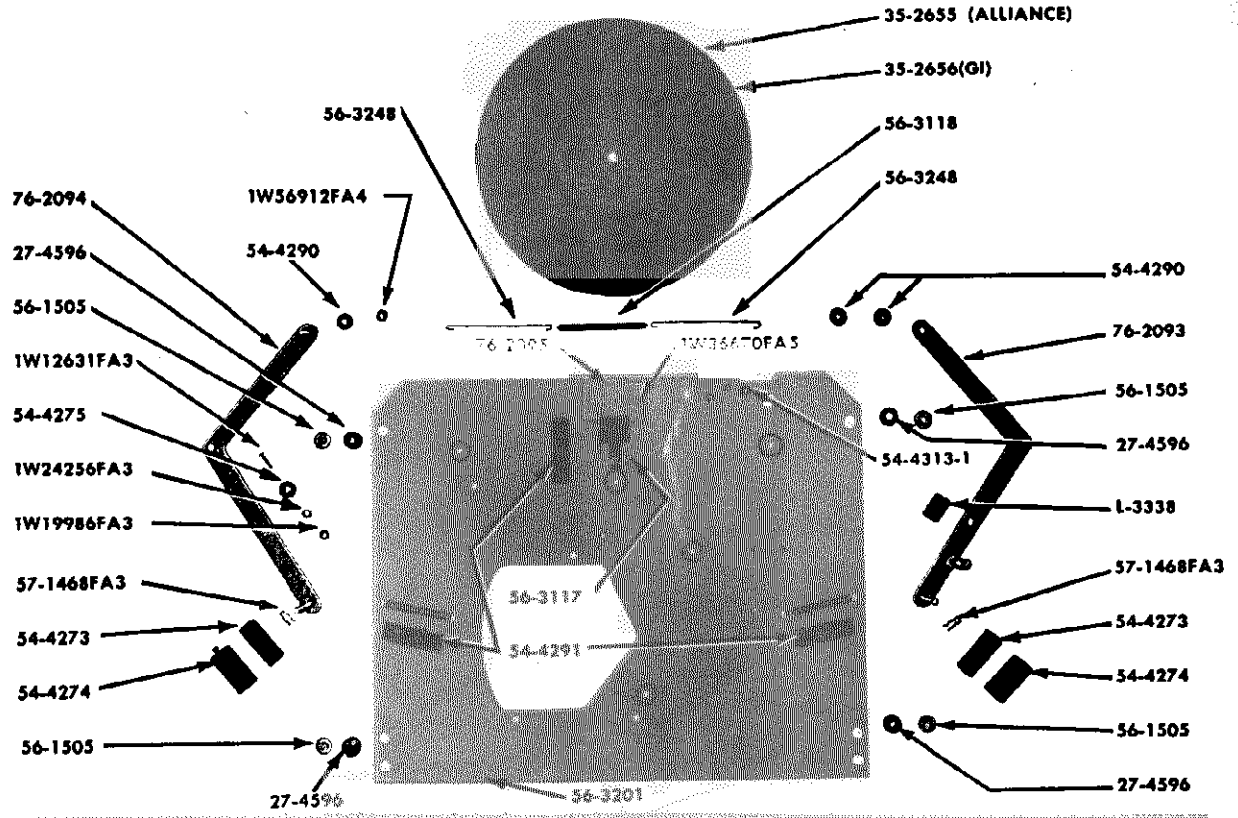
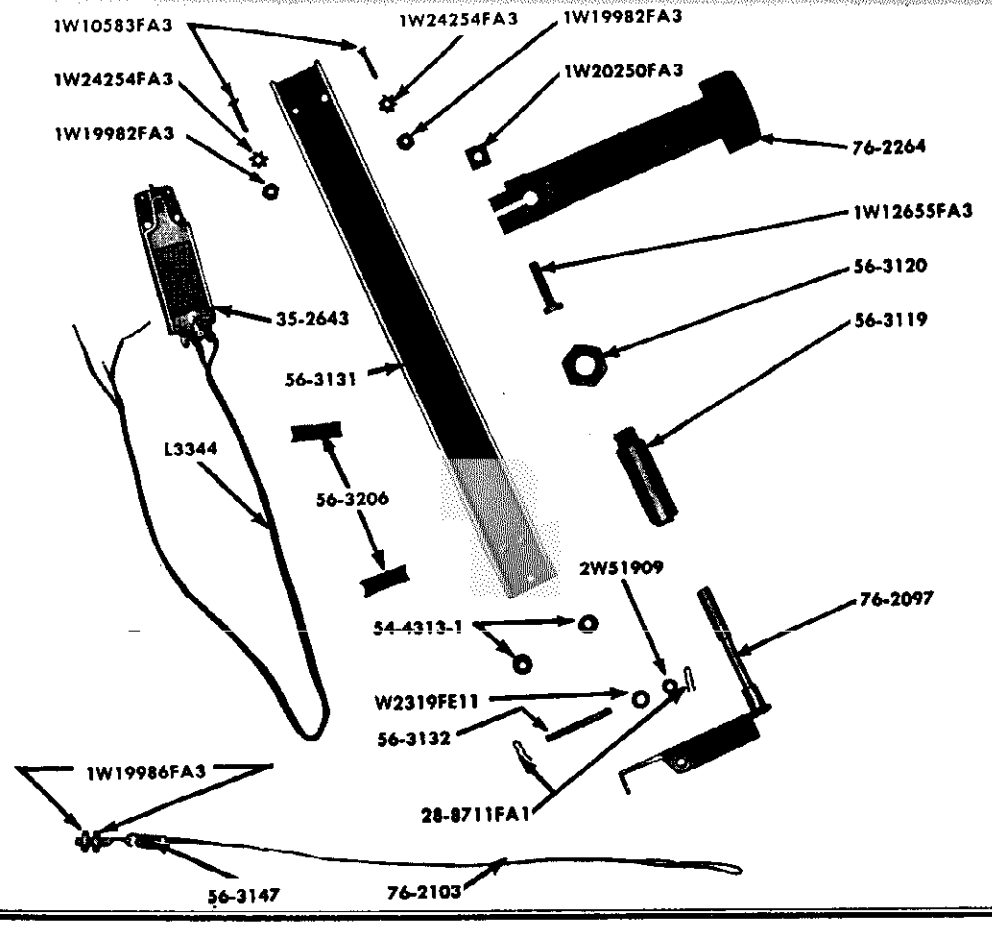


Figure 25—TOP VIEW OF MOTOR-BOARD AND PARTS.

Figure 26—TONE-ARM AND TRIP-LEVER ASSEMBLIES.



MODEL M-7 PHILCO CORP.

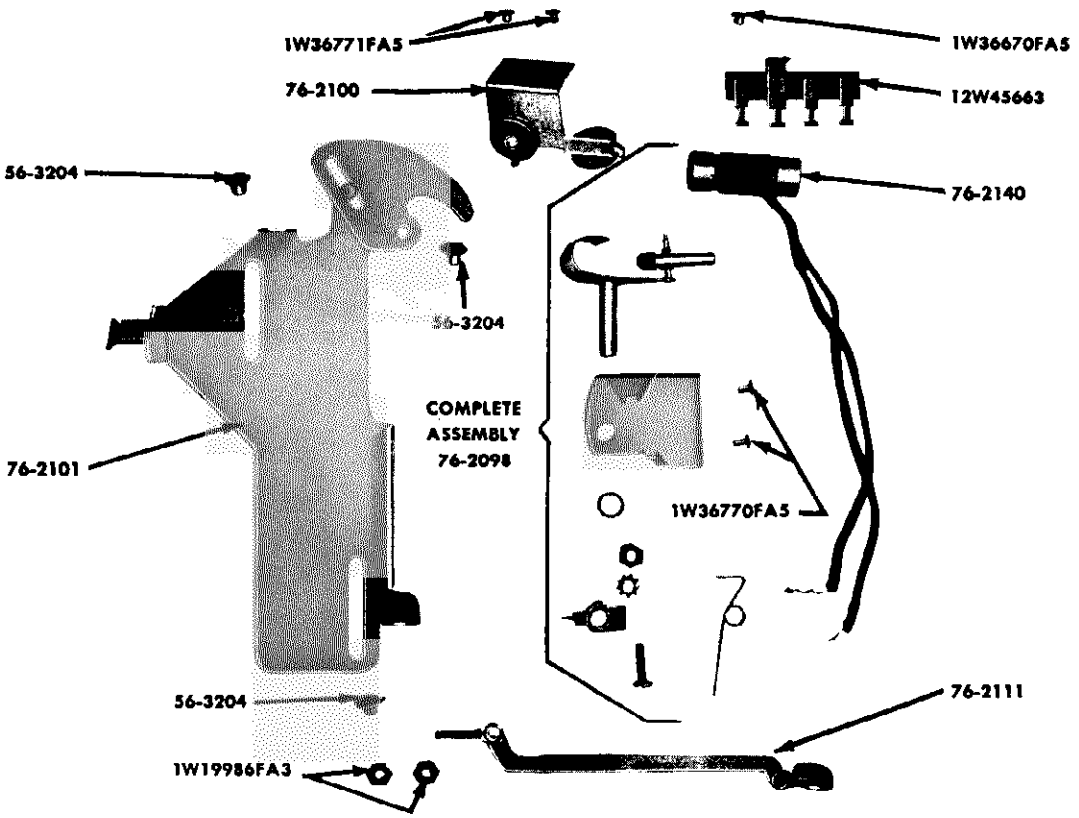
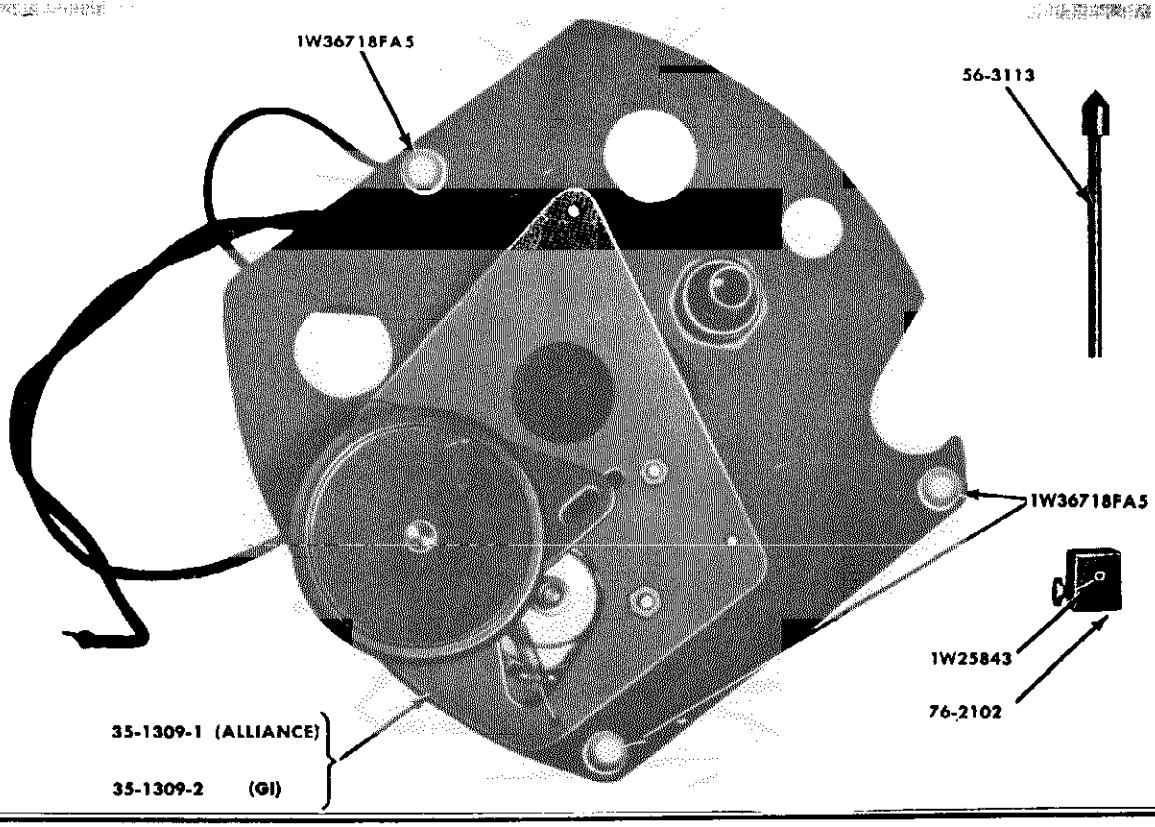


Figure 27—ASSEMBLIES-SLIDE LEVER, TRIP SWITCH, CONNECTOR-BAR, TERMINAL PANEL, BRACKET AND PULLEY.

Figure 28—MOTOR, RECORD SPINDLE, AND CONNECTOR-BLOCK.



REPLACEMENT PARTS LIST

PART No.	PART NAME
27-4596	Grommet
28-8711FA1	Hair Pin
35-1309-1	Motor (Alliance)
35-1309-2	Motor (GI)
35-2643	Crystal Pickup
35-2655	Turntable (Alliance)
35-2656	Turntable (GI)
45-2996	Needle (Philco Hi-Quality, Card of 12)
54-4273	Index Roller
54-4274	Index Tire
54-4275	Cam
54-4290	Rubber Washer
54-4291	Felt Pad
54-4313-1	Rubber Grommet
56-1505	Spacer
56-3113	Spindle
56-3117	Wire Clip
56-3118	Index Spring
56-3119	Spindle Bearing
56-3120	Spindle-Bearing Nut
56-3123	Record Hold-down (on Cabinet)
56-3131	Tone Arm
56-3132	Bearing
56-3135	Bracket (Trip Switch)
56-3147	Spring
56-3201	Motor Board
56-3204	Shoulder Rivet (Slide Lever and Index Lever)
56-3206	Cable Retainer
56-3248	Extension (Index Spring)
57-1468FA3	Hair Pin
66-4473340	Resistor 470,000 ohms—½ watt
76-2093	Index-Lever Assembly (R.H.)
76-2094	Index-Lever Assembly (L.H.)
76-2095	Rear-Index Bracket Assembly
76-2096	Tone-Arm Assembly
76-2097	Spindle and Bearing-Bracket Assembly
76-2098	Switch and Clamp Assembly
76-2100	Bracket and Pulley Assembly
76-2101	Slide-Lever Assembly
76-2102	Connector-Block Assembly
76-2103	Cord and Spring Assembly
76-2111	Connector Bar and Clip Assembly
76-2140	Mercury Switch-Case Assembly
76-2264	Trip-Lever Assembly
76-2374	Idler Wheel, with Tire (Alliance Motor)
76-2375	Idler Wheel, with Tire (GI Motor)
1W10583FA3	Screw No. 4-40 x ½"
1W12496FA3	Screw No. 6-32
1W12631FA3	Screw No. 6-32 x ½"
1W12655FA3	Screw No. 8-32
1W19982FA3	Nut No. 4-40 hex
1W19986FA3	Nut No. 6-32
1W20250FA3	Nut No. 8-32 Square
1W24254FA3	Lockwasher No. 4
1W24256FA3	Lockwasher No. 6
1W24520FA1	Lockwasher
1W251181FA9	Wood Screw No. 4 x ⅜"
1W25368FA3	Wood Screw No. 8 x ⅜"
1W25843FA3	Screw (Allen) No. 4
1W36670FA5	Rivet
1W36671FA5	Rivet
1W36716FA5	Rivet
1W56912FA4	Speed Nut
2W51909	Flat Washer
12W45663	Terminal Panel
L-3338	Tubing
L-3344	Shielded Cable
W-2319FE11	Spring Washer

RADIO CORP. OF AMERICA

MODELS RP-177, RP-177A
RP-177B

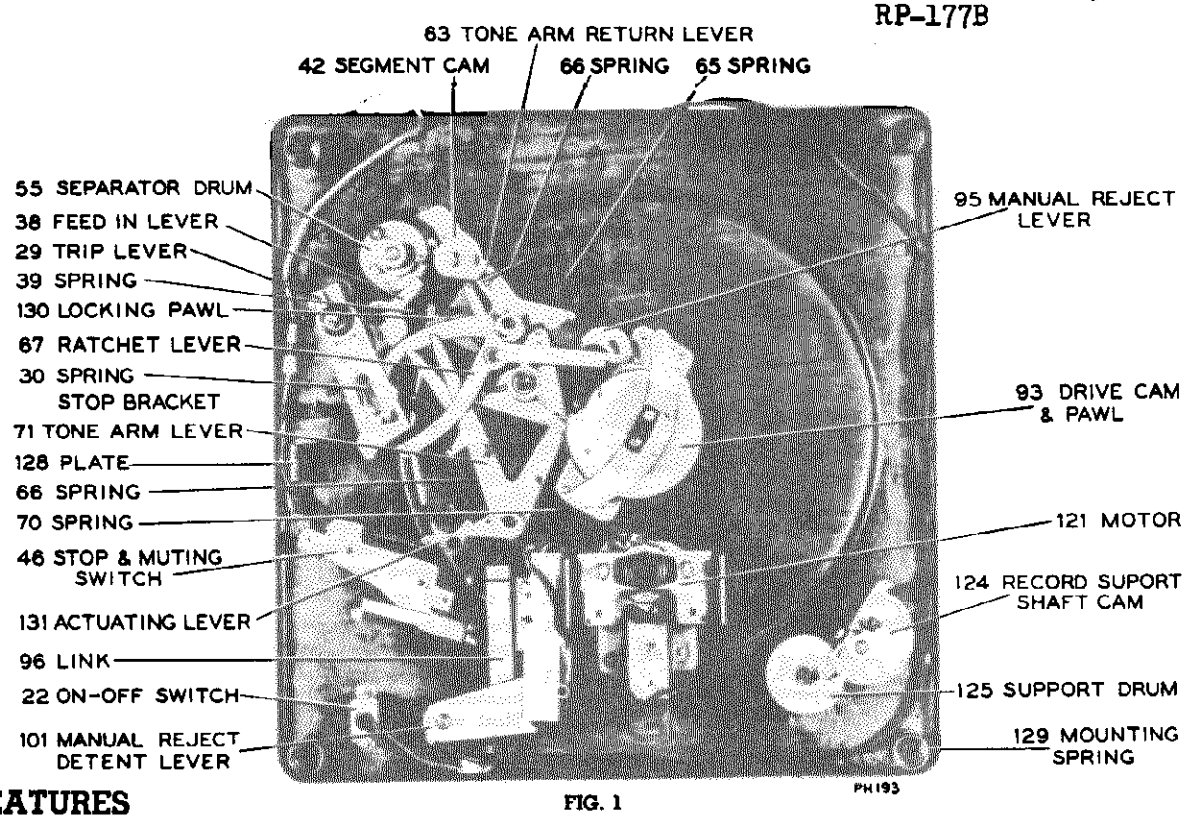


FIG. 1

FEATURES

1. This record changer is a two-support, drop type, non-intermixing mechanism designed to play automatically a series of twelve ten-inch or ten twelve-inch records of the standard 78 RPM type.
2. The mechanism uses a lightweight, low-noise, crystal pickup cartridge, equipped with a long-life sapphire point.
3. The tone arm is automatically returned to rest position and the power removed from the drive motor, after the mechanism has finished playing the last selection of the stack.
4. The changer is equipped with an eccentric tripping device which insures tripping on all standard records.
5. A pickup muting switch is incorporated, which shorts out the pickup while the changer is in cycle. This prevents mechanical noise of moving parts from being amplified.
6. The record support and separator are mechanically linked, requiring only one operation for changing of record size.
7. Moving parts are few in number while playing records. This insures quiet reproduction, free from rumble and wow.
8. The mechanism is provided with a safety clutch which prevents damage to the mechanism in case of a jam due to a defective record.

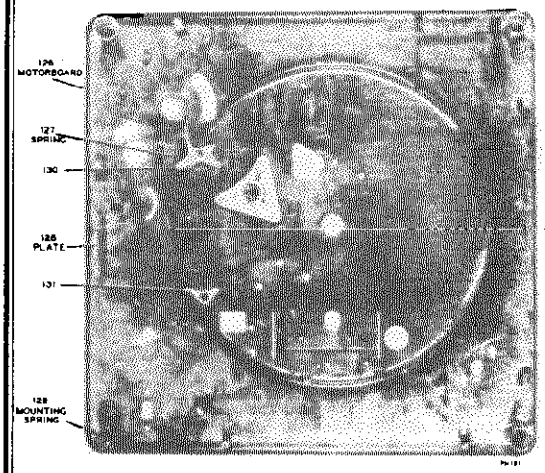


FIG. 3

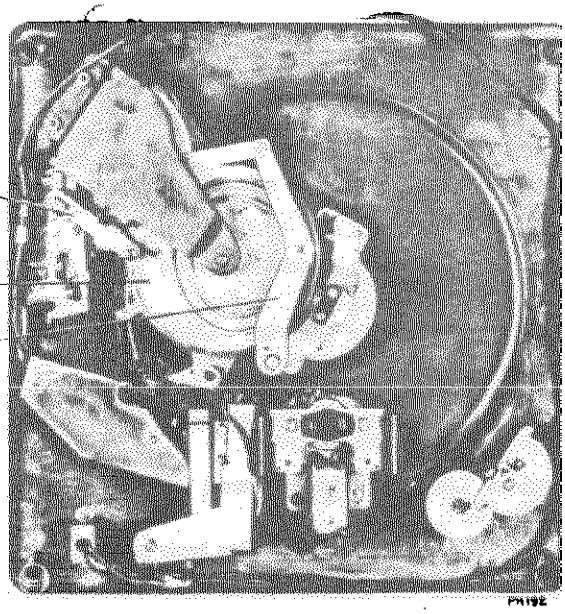


FIG. 2

MODELS RP-177, RP-177A, RP-177B RADIO CORP. OF AMERICA

MANUAL OPERATION

1. Make certain the mechanism is out of cycle with the pickup on the rest.
2. Push "Start-Reject" knob to manual position.
3. Place record on turntable and push the power switch to the "on" position.
4. Lift and place pickup on record.
5. When the selection has finished playing, the pickup will continue to ride in the eccentric groove until the pickup is lifted from the record or the power is removed from the drive motor.

LUBRICATION

A light machine oil (SAE #10) should be used to oil the bearings of the drive motor.

On all bearing surfaces, excepting the motor bearings, Houghton STA-PUT No. 320, or equivalent, should be used. On all other surfaces, STA-PUT No. 512, or equivalent, is recommended. STA-PUT can be purchased from E. F. Houghton & Co., 303 W. Lehigh Ave., Philadelphia, Pa.

(Do not oil or grease record separator shaft.)

It is important that the drive motor spindle and the rubber tire on the friction disc as well as that on the idler wheel be kept clean and free from oil or grease, dirt, or any foreign material at all times. Carbon tetrachloride or naphtha is satisfactory for cleaning these parts.

AUTOMATIC OPERATION

The pickup "rest" consists of a post incorporating a button and shaft connecting a switch beneath the motor board. This switch, which controls the power to the drive motor, is actuated by the weight of the pickup and tone arm while going in and out of rest position.

1. Turn the record support on the left-hand side of the changer, to position it for 10- or 12-inch records.
2. Load the records on the supports with the desired selections upward, the last record to be played on top. (Make certain the separator shelf is pushed down when stack is placed on the supports.)
3. Push the "On-Off" knob to the "on" position.
4. Push "Manual-Reject" handle to reject position and release. The mechanism will automatically play in sequence, one side of each record stacked on the supports. After completing the selection on the last record the tone arm will return to rest position and the power will be removed from drive motor.
5. To reject a record being played, push the control handle to "Reject" and release.
6. Lift and turn separator shelf to facilitate the removal of records.
   (Note: For automatic operation, each record is required to have the standard eccentric groove.)

Cautions

Before servicing the automatic changer, inspect the assembly to see that all gears, cams, springs, levers, etc., are correctly assembled and in good working order.

1. Never use force to start or stop the motor or any part of the record changing mechanism.
2. Warped or damaged records may cause the mechanism to jam. When jamming occurs, the safety clutch slips, causing a clicking sound.
3. A cracked or chipped record may damage the sapphire.
4. Warped records may slide on one another while playing and result in unsatisfactory reproduction.
5. Do not leave the records on the record posts or on the turntable as they may warp, particularly in warm climates. Most warped records may be flattened by placing them on a flat surface with a heavy flat article placed on top of them for a few days.
6. If, for any reason, the mechanism stalls, turn off the "On-Off" switch and remove the records from the posts. Start the turntable by turning the switch on and allow the tone arm to complete its cycle.
7. Do not tighten copper-plated, cone-pointed screws until final adjustment has been made.

FUNCTION OF PRINCIPAL PARTS

Trip Lever 29
When the pickup is riding in the eccentric groove, the trip pawl located on the trip lever engages the ratchet lever, starting the cycle.

Ratchet Lever 67
Portion of lever acts as a ratchet and the other portion acts as a stop or catch to hold the drive clutch from engaging.

Ratchet Wheel 90 (Fig. 4)
Acts as part of the safety clutch, which is engaged with the cam pawl during cycle.

Drive Cam, Gear and Pawl 93
Transfers motion from turntable through clutch to main gear.

Turntable Spindle Support 82 (Fig. 4)
Forms a bearing for turntable spindle.

Main Cam 80 (Fig. 4)
Has a series of tracks controlling cycling action.

Record Separator Lever, Link, Crank 85 (Fig. 4)
Transfers motion from the main cam through the stud, lever and link to the separator post during change cycle.

Feed-in Lever Locking Pawl or Latch 130
Provides a means of locking feed-in lever until the pickup has landed on the record, then unlatching and allowing feed-in lever to gently push the pickup into starting groove. (Used only on early RP-177)

Manual-Reject Control Knob and Lever Assembly 102-101-96-95
In "manual" position, it contacts the stud on clutch portion of drive cam thereby preventing the clutch from engaging and starting cycle.
In "automatic" position, it permits operation of the ratchet lever safety clutch and stop switch.
In "start reject" position, it momentarily closes control switch which is shunted across stop switch. It also moves the ratchet lever away from drive cam pawl, permitting the clutch to engage and start cycle.

Muting Switch Actuating Lever 131
Opens pickup muting switch during the playing cycle.

Tone Arm Lever 71
Directs horizontal motion of tone arm. It also incorporates an additional retard lever which stabilizes tone arm while the mechanism is in cycle.

Tone Arm Return Lever 63
Moves the tone arm inward and provides positioning for landing.

Feed-in Lever 38
A small lever under spring tension providing a small amount of force inward on tone arm, after the pickup has landed on record. (Used only on early RP-177)

Tone Arm Elevating Lever 77
Directs vertical motion of tone arm.

Tone Arm Elevating Rod 9 (Fig. 4)
Transfers motion from elevating lever to tone arm.

Record Support Shaft, Cam 124
Functions as a lock for record support belt drum.

Record Support and Separator Drums and Belt Assembly 55-56-125
Forms a mechanical linkage between record support and record separator.

Record Support
Provides a support for the record stack and a handle for record size change.

Record Separator Post and Blade
Functions to support the records and, together with the selector blade, to separate the lowest record of the stack and allow it to drop to the turntable during the change cycle.

Shut-off or Segment Cam 42
Forms a stop for tone arm return lever thereby preventing it from pushing the tone arm in for landing.

Retainer Spring and Plate 128
A small piece of phosphor-bronze functioning as a partial lock which stabilizes the tone arm when in the outermost position.

Stop Bracket (part of Motor Board)
A small piece of spring steel used as a stop, which determines the outermost position of tone arm. (Adjustable.)

Cycle of Operation

The changer can be conveniently rotated through the change cycle by pushing the reject handle and revolving the turntable by hand. Eight turntable revolutions are required for one change cycle. Block up the motor, so it is disengaged fro the drive disc, to permit easier manual rotation of the tur table.

	Function	Explanation
Operator	Turn Record Support to 10" or 12" Position as Desired	1. Separator post positions itself by means of belt drive.
	Place Records on Posts	1. Separator shaft is pushed down against its spring and carries segment-cam out of path of inde finger.
	Push Start Knob	1. Switch connected to start knob momentarily applies power to drive motor until tone arm raised from stop button. 2. Manual-reject lever pushes ratchet lever. 3. Ratchet lever is pushed out of step on main gear shaft and releases drive cam pawl. 4. Drive cam pawl engages cam sprocket and it revolves, carrying drive gear with it.
Automatic Cycle	Tone Arm Rises	1. Main cam and gear revolves with drive gear. 2. Stud on tone arm lever rides in top track on main cam and directs movement of the lever. 3. Tone arm elevating lever rides up on ridge on main cam and pushes tone arm up by mear of elevating rod.
	Tone Arm Moves Out	1. Tone arm lever pushes on trip lever stud. (Feed-in on early RP-177 only) 2. Trip lever moves out. 3. Stud on trip lever, on its outermost swing, pushes feed-in lever into locking pawl (130) (fig. 1) 4. Tone arm return lever is carried along by trip lever stud, and by stud on main cam top trac
	Record Knife Separates Bottom Record from Stack After Gauging Thickness of Record	1. Stud on separator lever follows main cam bottom track and directs the motion of the lever. 2. Through the separator link and crank, the separator lever turns the separator shaft. 3. Knife turns with shaft and strikes edge of bottom record. 4. Separator shaft continues to revolve and teeth on inner circumference of knife ride up c shelf teeth until knife is carried high enough against the action of the coil spring to mov in over top of record.
	Record Drops to Turntable	1. Separator shaft continues to turn until knife supports stack of records and shelf moves ou from under bottom record.
	Tone Arm Moves In	1. Separator shaft reverses rotation. 2. Tone arm lever moves away from trip lever stud. 3. While tone arm lever moves away from stud on trip lever, the retard lever, hinged on ton arm lever, stabilizes tone arm for accurate landing. 4. Tone arm return lever pushes on trip lever stud. 5. Trip lever moves in.
	Tone Arm Lowers Sapphire on to Record	1. Index finger on tone arm return lever moves against separator shaft to insure proper landin position. 2. Tone arm elevating lever rides down on main cam ridge thus lowering the elevating rod an the tone arm. 3. Separator shaft returns knife to original position and allows stack of records to rest on shel
	Sapphire Moves In to Record Groove Record Begins to Play	1. Ratchet lever rides into eccentric step on main gear shaft and blocks drive cam pawl. 2. Pawl is disengaged from drive cam sprocket. (Feed-in on early RP-177 only) 3. Drive gear and main gear stop. 4. Tone arm lever moves into cam to maintain disengagement. 5. As tone arm lever moves to its innermost position, it contacts feed-in latch, unlatching feed-i lever. This allows it to gently push pickup into the first groove of the record.
	Last Record Drops and the Last Selection Is Finished Playing	1. As the mechanism goes into cycle the separator shaft raises, allowing segment cam to engag index finger and prevent tone arm return lever from pushing tone arm in for landing. 2. Tone arm is lowered into rest position. 3. Power is removed from drive motor by the weight of the tone arm resting on stop button whicl opens the stop switch.

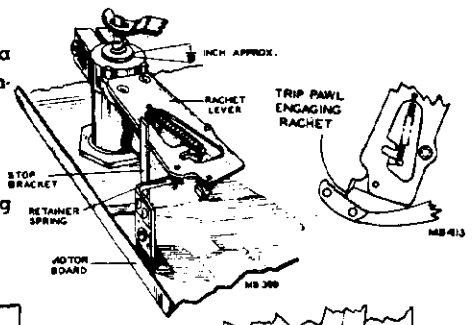
Preliminary Adjustments for Assembling Mechanism

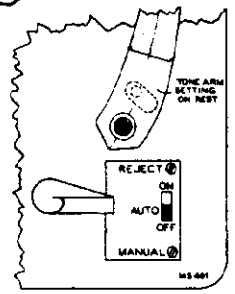
It should be understood that the preliminary adjustments are only approximate and intended to aid in the process of assembling a mechanism in which the major parts have been removed. The final and exact adjustments can be made when the mechanism is completely assembled.

Mounting the Tone Arm:

The assembled tone arm should be mounted with the ratchet lever clamp approximately 1/16" from the end of the pivot arm bushing and against the stop bracket when the tone arm is on the rest as shown in the sketch.

(**Note:** The 1/16" is only a starting point, the important factor is to have the trip pawl engage the ratchet properly.)

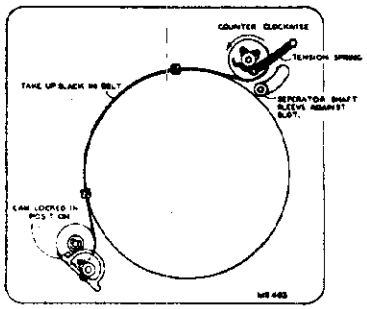


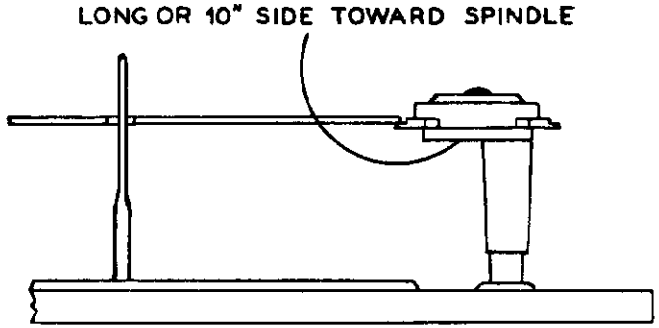


Positioning Record Support Shaft:

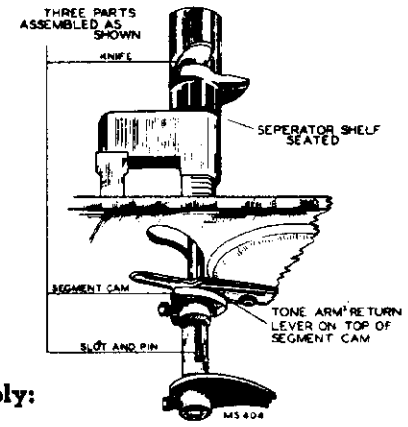
Assemble the record support post with the ten inch side (long side) pointing towards the spindle. Adjust the cam so it is locked in position as shown in the sketch.

Take up all the slack in the belt by turning the separation shaft counter clockwise (viewed from underside) aiding the action of the tension spring when the separator shaft sleeve is against the side of the slot in the motor board nearest the turntable as shown in the sketch.





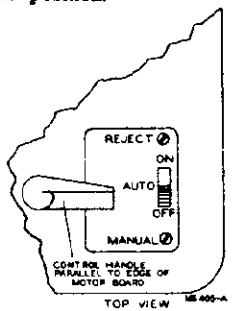
MS 402



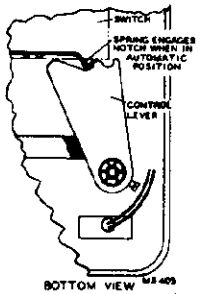
Manual-Reject Lever Mounting:

Place the control handle parallel to the front side of the motor board and pointing towards the "on-off" switch.

Adjust the control lever so the notch engages the spring of the switch as shown in the sketch when the control handle is in the automatic position.



TOP VIEW



BOTTOM VIEW

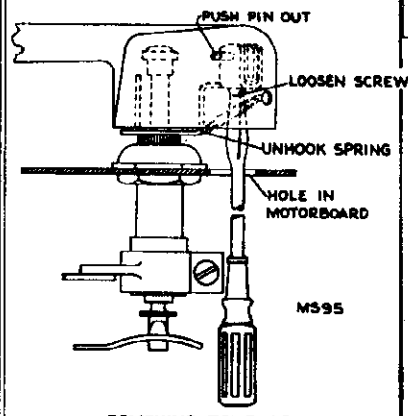
Mounting the Separator Knife and "Shut-off" Cam Assembly:

Turn the record support post to the ten inch position and assemble the separator knife, "Shut-off" cam, and separator shaft pin and bushing assembly approximately in line as shown in sketch. Allow the end of the tone arm return lever to ride on the upper side (towards the motor board) of the "shut-off" cam as shown in sketch.

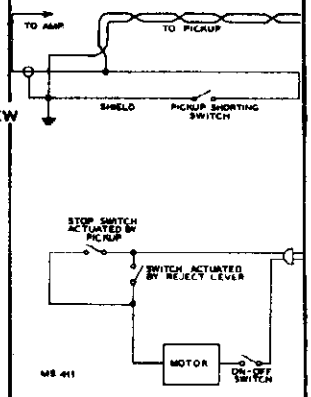
RADIO CORP. OF AMERICA

MODELS RP-177, RP-177A
RP-177B

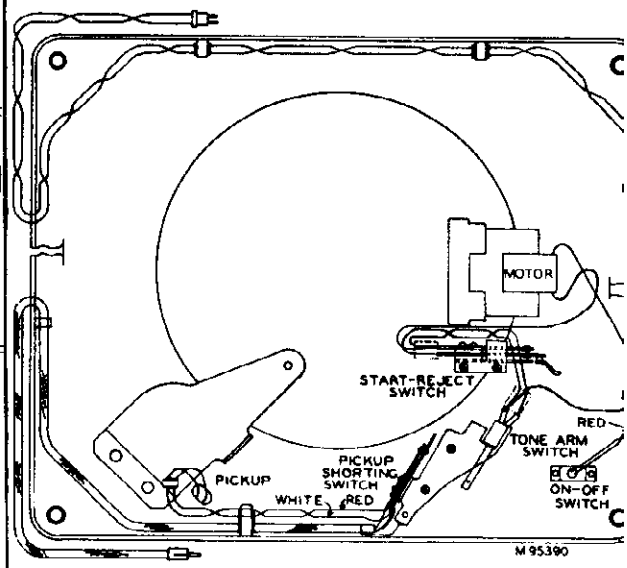
1. Unhook spring
2. Loosen screw
3. Push pin out

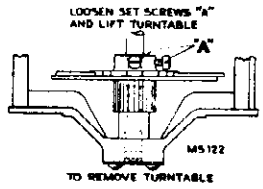


REMOVING TONE ARM

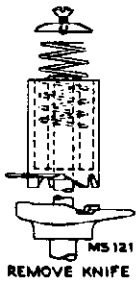


Electrical Connections

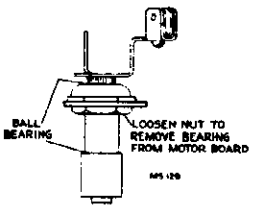




To remove turntable loosen set screws "A" and lift the turntable.



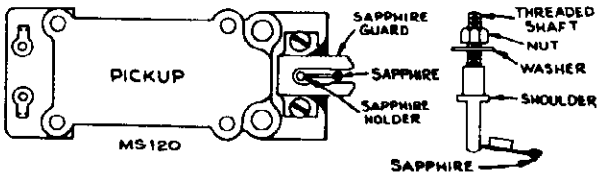
To remove separator knife, loosen top screw and entire assembly can be dismantled as shown.



Do not remove ball bearings from tone arm bearing unless absolutely necessary. If cleaning is necessary immerse entire bearing in cleaning solution such as carbon tetrachloride.

To Remove Tone Arm Bearing:

Replacement of Sapphire:



Caution: Never bend the sapphire support wire.

Extreme care should be used when loosening the sapphire mounting nut so that the twisting motion does not break the crystal.

Remove the two screws holding the sapphire guard in place and remove guard. Remove the small nut and washer on the threaded shaft of the sapphire holder and push the shaft through the hole in the viscoloid until the sapphire holder assembly comes free.

Insert threaded shaft of replacement sapphire holder through viscoloid and replace the washer and nut. Make sure the sapphire is in the correct position. Take hold at the lower end of the shaft with a pair of pliers while tightening the nut, being very careful so as not to strip the threads or break the crystal. Replace the sapphire guard, positioning it by means of the oversize screw slots. Make certain that the sapphire and its supporting wire are centered in the guard. Tighten the guard screws. Before using, check to see that the sapphire projects far enough (approx. .020) beyond the guard so that the guard will not strike the record. If necessary, bend the guard a little.

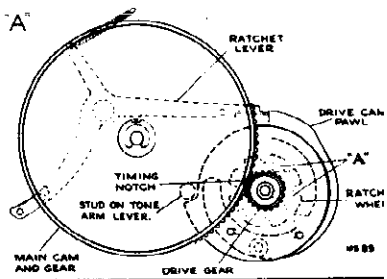
Note: Pickup force should be approximately 1 to 1¼ oz.

Reference Chart for
Automatic Record Changer Adjustments

Mechanism jams. General irregularity of operation.

(Mechanism Timing)

With the ratchet lever and the pawl on the drive shaft cam in playing position as shown, remove the bottom support bracket, link and lever assembly. Remove the "C" washer on the main cam shaft and slip the cam down far enough that it can be rotated with respect to the drive gear. Then rotate it until the timing notch is positioned as shown. Put the main gear back in mesh with the drive gear, replace the "C" washer, place the elevating lever on the cam ridge. Make certain the separator link and lever assembly is in its correct position and replace the bottom support bracket.



MODELS RP-177, RP-177A, RP-177B — RADIO CORP. OF AMERICA

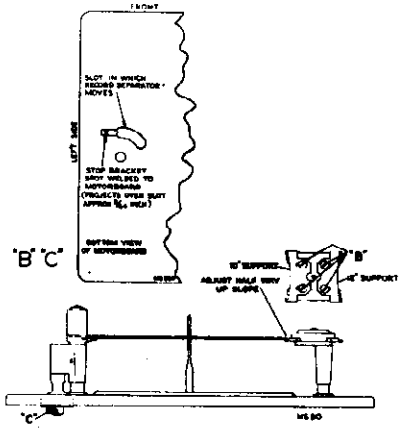
Records strike separator post or fail to stay on record shelf.

(Spacing Between Record Posts)

Turn the record support post to the ten-inch position. Loosen set screws "C," hold the separator post against the end of its slot in the motorboard and turn the belt drum to take up any slack in the belt. Tighten the zinc-plated, blunt-nosed screw and check to see that a ten-inch record fits the posts as shown. Then tighten the copper-plated, cone-pointed screw. Loosen set screws "B" and adjust support shelf so both 10- and 12-inch records set half-way up the slope when support post is turned to their respective positions.

Note:—
A small piece of metal (stop bracket) has been welded to the motor board to improve the separation and dropping of the twelve-inch records.

Bending the metal limits the outward movement of the record separator post, and in so doing makes it possible to equalize the distances between the spindle and the record support and separator posts.

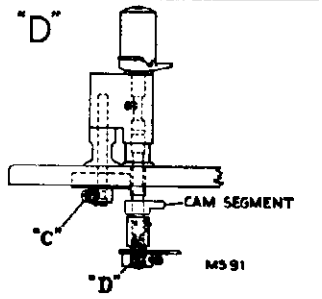


Records do not drop at proper time.

(Record Shelf Timing)

With the record supports turned to ten-inch position, place a ten-inch record on the supports. Loosen the set screws "D" and turn the record separator shaft until the edge of the record-separating knife is 3/32 inch away from the edge of the record. The teeth on the inner circumference of the knife should be resting in the bottom of their slots at the time the adjustment is made. Tighten the zinc-plated blunt-nosed screw first, run through cycle several times as a check, then tighten the cone pointed screw.

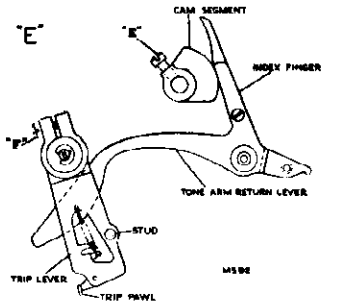
Note: It may be found necessary to deviate slightly from 3/32 inch dimension if twelve-inch records do not drop properly.



Tone arm continues to repeat playing of top record or jams when part way in on record.

(Segment-cam height or radial position)

With record changer in the ten-inch position and the records removed from the posts, loosen the set screw "E." Set the record separator segment-cam so that the index finger of the tone arm return lever rides on the middle of the segment-cam, as shown. Rotate the segment-cam until it is in such a position that the index finger will not ride off either end. Check to see that the index finger rides in over top of the cam when the record shelf is depressed by the weight of one record. Tighten the set screw.



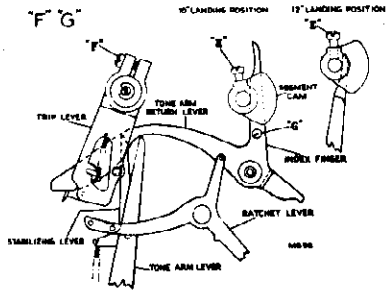
Sapphire does not land at correct point on 10-inch record.

(Tone Arm Position With Respect To Trip Lever)

Correct dimension from outside edge of spindle to sapphire $4\frac{11}{16}$ inches.

With the record changer in the ten-inch position, place a ten-inch record on the turntable and rotate the changer through cycle by hand, until the sapphire is just ready to land. Make certain that the index finger of the pickup arm return lever is against the record separator shaft and that the tone arm trip lever stud is held firmly against the return lever. Loosen the set screw "F" and move the pickup arm to the correct landing position. Maintain correct alignment between ratchet lever and trip pawl, when tightening set screw "F." (Note—Make certain trip lever stud does not come in contact with motorboard while making this adjustment.)

Place a twelve-inch record on the turntable and rotate the changer through cycle until the sapphire is just ready to land. Loosen screw "G" and adjust end of tone arm return lever so it is against separator shaft when pickup is in correct landing position.



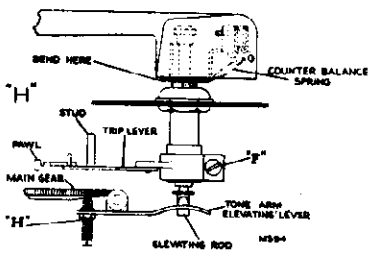
Top of tone arm strikes stack of records or sapphire fails to clear the records on the turntable.

(Tone Arm Height While In Cycle)

Rotate the changer through cycle until the tone arm has risen to its maximum height above the turntable but has not begun to move out. At this point adjust the screw "H" until the distance between the turntable and the sapphire is one and three-sixteenths inches. Tighten the locknut.

(Tone Arm Height While Out of Cycle)

Bend end of tone arm support bracket or pivot arm so the pickup end of tone arm clears the motorboard by 3/32 inch.



RADIO CORP. OF AMERICA

MODELS RP-177, RP-177A
RP-177B

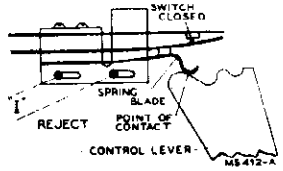
Turntable fails to rotate when the control handle is pushed to "Manual" or "Start-Reject" position.

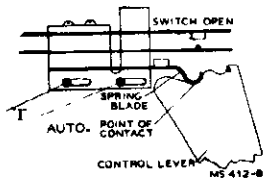
(Control lever and switch position)

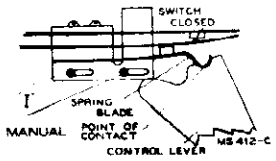
Remove the switch cover.

Loosen the two mounting screws "I" and position the switch so as to conform with the following three conditions.

1. When the control handle is in the "Start-Reject" position, the spring blade should ride up the side of the deep notch in the control lever causing the switch contacts to close. (The control handle should return to "Automatic" position automatically.)
2. When the control handle is in the "Automatic" position the spring blade should engage the deep notch in the control lever and in doing so allow the switch contacts to open.
3. When the control handle is in the "Manual" position, the spring blade should engage the shallow notch in the control lever causing the switch contacts to close and at the same time have "Manual Reject" lever move ratchet lever far enough so as to have free movement of trip lever, thereby preventing engagement between trip pawl and ratchet.





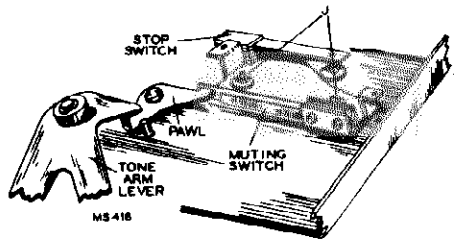


No output.

Noise during cycle.

(Position of pickup shorting switch)

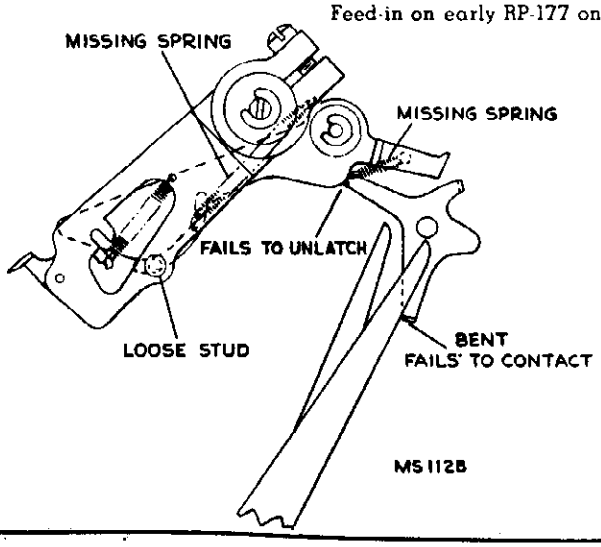
Remove the cover from the switch assembly. Loosen the two mounting screws "J" and position the switch assembly so the shorting switch pawl causes the switch to close during cycle and open while playing records.



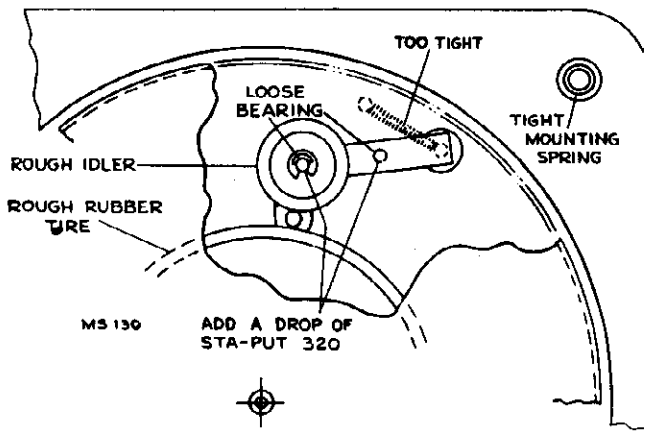
SERVICE HINTS

Incorrect Feed-in:

Feed-in on early RP-177 only.

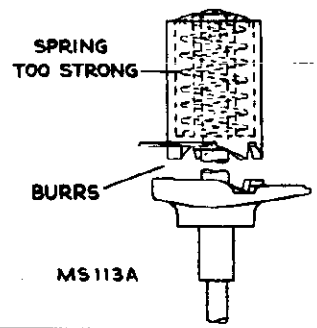


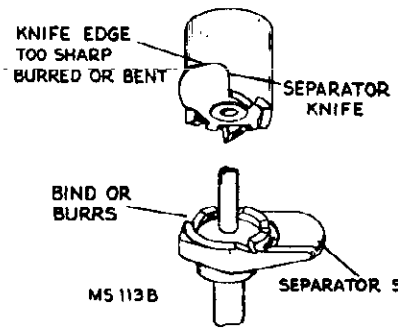
Rumble: **RP-177A and RP-177B use rim drive**

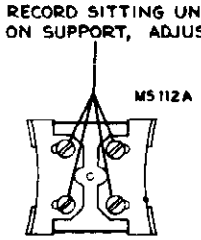


Records Jam or Stack Unsteady:

Record too thick, too thin, warped, or has rough edge.

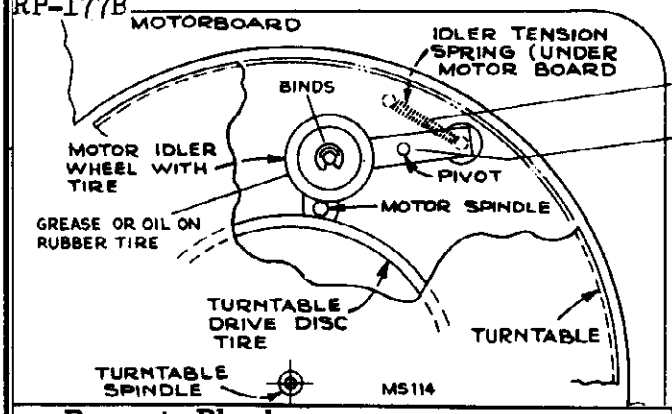






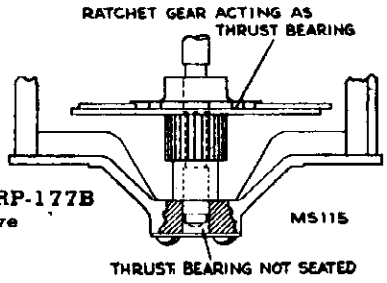
MODELS RP-177, RP-177A, RP-177B

RADIO CORP. OF AMERICA



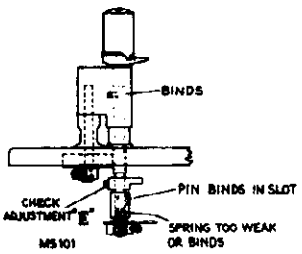
Slow Speed:

Turntable spindle binds on bottom or top bearing.

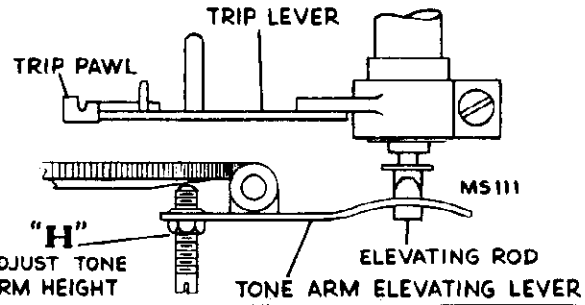


RP-177A and RP-177B use rim drive

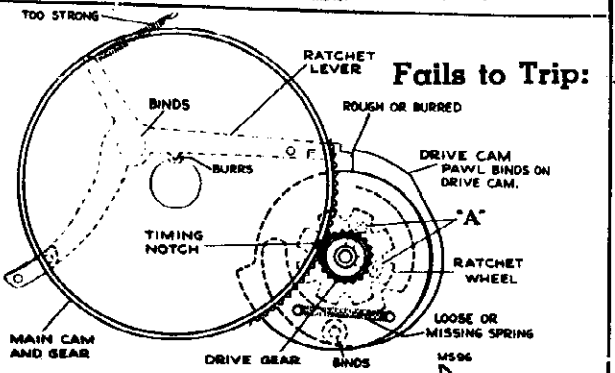
Repeats Playing of Last Record:

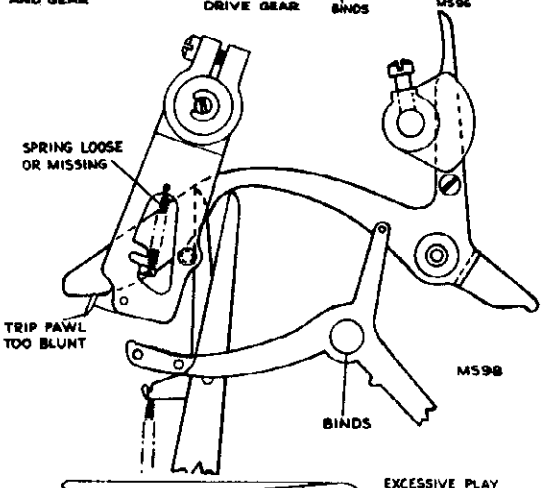


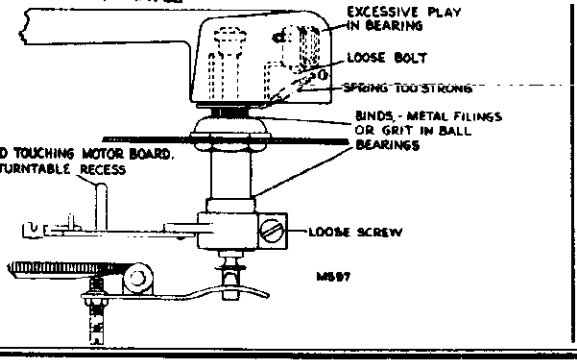
Tone Arm Touches Record on Separator Shelf:



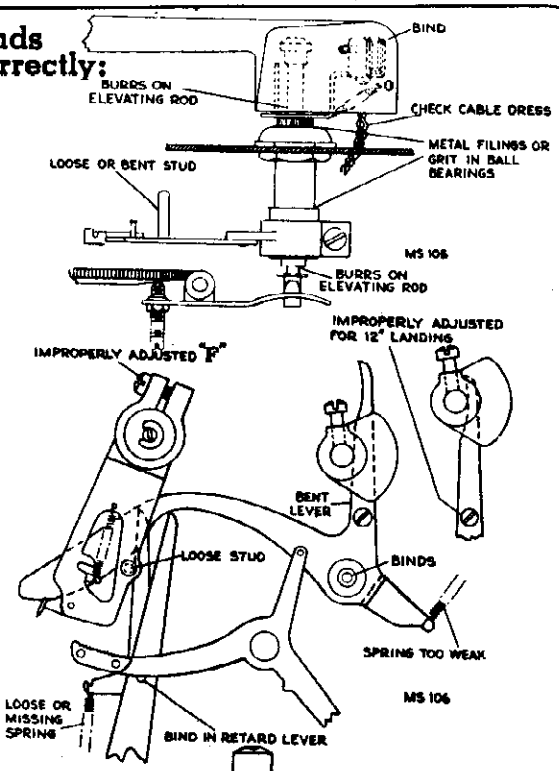
Fails to Trip:

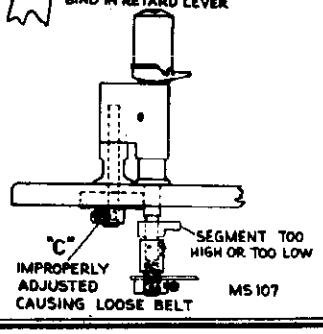






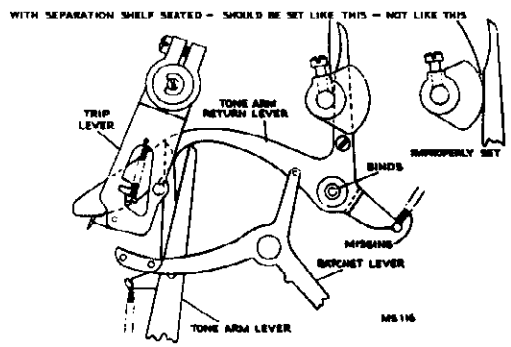
Lands Incorrectly:

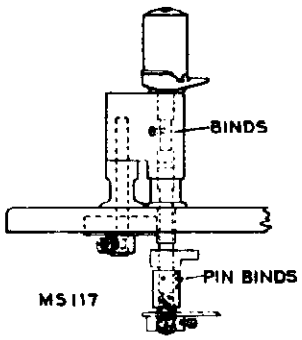


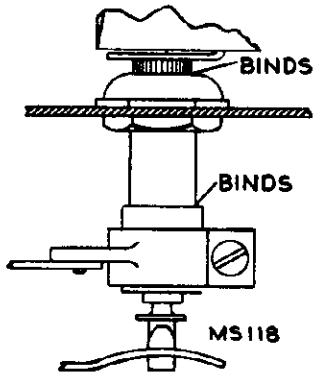


RADIO CORP. OF AMERICA MODELS RP-177, RP-177A RP-177B

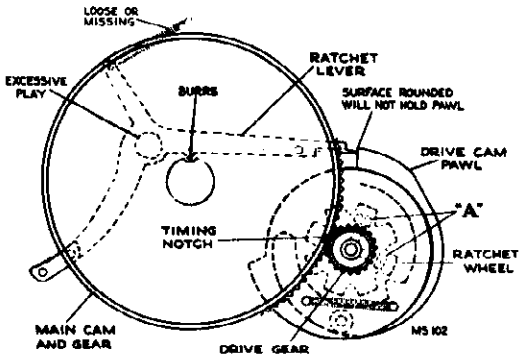
Tone Arm Continues to Come Down in Rest Position:

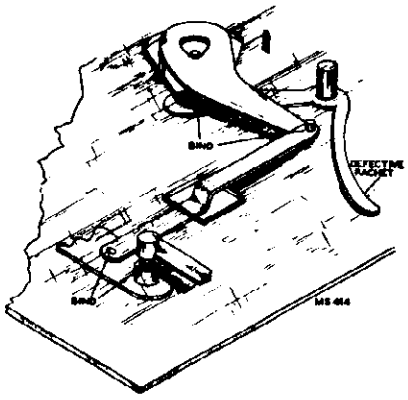


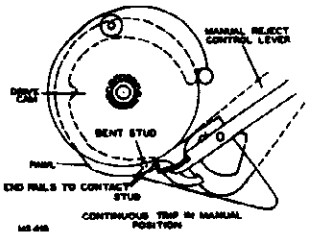




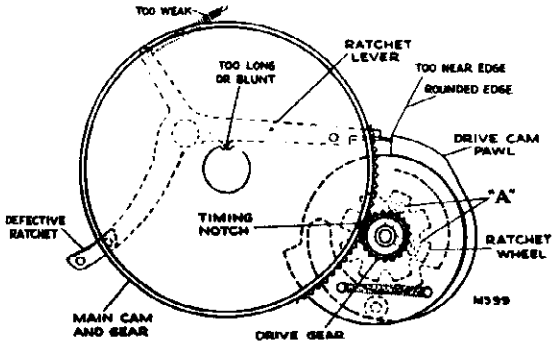
Trips Continuously:

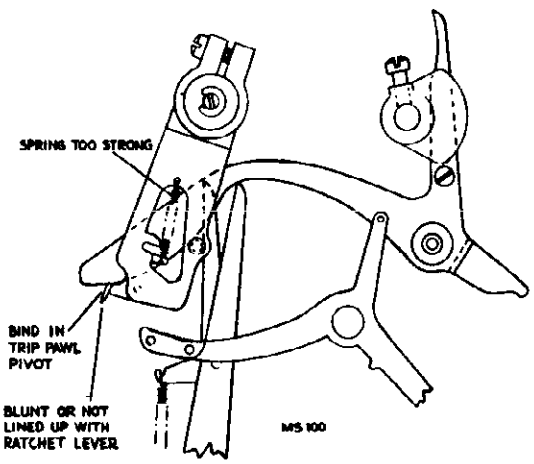




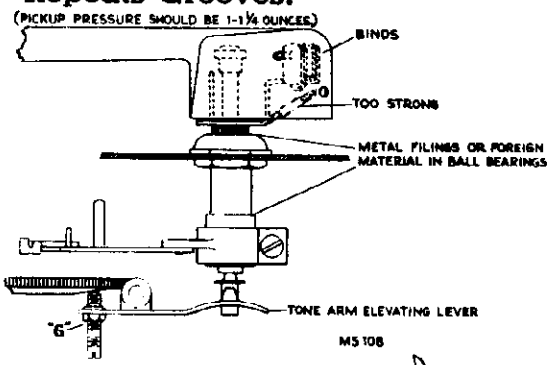


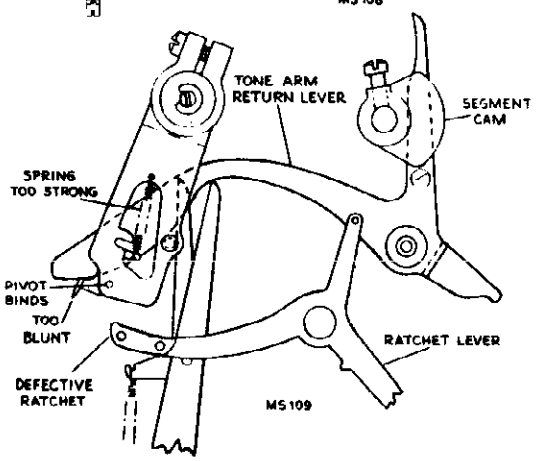
Trips Early:





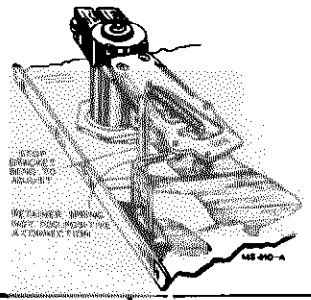
Repeats Grooves:





RADIO CORP. OF AMERICA

Tone Arm Lands Incorrectly on Rest, Drifts Off of Rest, or Jumps Suddenly When Moving in for Landing:



1. Bend bracket for tone arm limit stop.
2. Bend retainer spring which contacts stud on trip lever, so tone arm is stabilized while on rest or in the outermost position. Do not make too positive contact or motion of tone arm will start with a sudden jump.

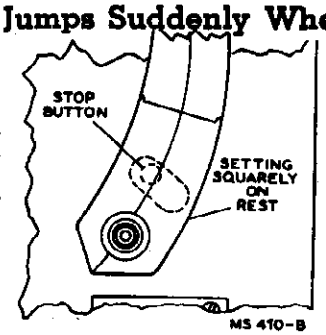


FIG. 4

RADIO CORP. OF AMERICA MODELS RP-177, RP-177A RP-177B

CHANGES—DIFFERENCES

Pivot Arm Spring:

On early RP-177 the pivot arm spring (Ref. No. 4) was anchored to a stud (Ref. No. 3) in the rear of the tone arm. On RP-177A and late RP-177 a curved spring (Stock No. 73198) clips into the rear of the tone arm to which the pivot arm spring is anchored.

Feed-in Adjustment:

On early RP-177 a feed-in provision was used to cause the sapphire to enter the starting groove of the record after the tone arm had landed. This feature was found to be unnecessary and is not used on RP-177A or late RP-177, however, the feed-in adjusting disc may be found on late RP-177.

Stock No.	Ref. No.		Stock No.	Ref. No.	
72655	35	Disc	71548	127	Spring
70873	38	Lever	—	130	Lever
71550	39	Spring			

Used only on early RP-177, also screws and washers to mount above item

The major differences between the two models is in the method of drivi the turntable. This requires different turntables, motors, motor boarc motor mountings and idler wheels. In RP-177 the motor drives a rubb tired disc which is attached to the turntable and spindle, in RP-177A t motor drives an idler wheel which engages with the inside rim of the tu table. In RP-177 the record separator swivel (14), record separator supp (16) and record support base (120) are gold finish whereas in RP-17 they are finished the same color as the motor board.

Record supports (113 & 114) are metal in RP-177 and molded plastic RP-177A.

The on-off switch (22) ratchet lever spring (66) and tone arm lever spri (71A) have been changed slightly.

RP-177B is identical to RP-177A except the crystal pickup

RP 177

Motor drives rubber tired disc which is attached to turntable.

Record separator swivel and record separator support are gold finish.

Early production has feed-in adjustment.

RP 177A

Motor drives idler wheel which engages with inside rim of turntable.

Record separator swivel and record separator support are finished the same color as the motor board.

Does not have feed-in adjustment.

RP-177B

Same as RP-177A except pickup.

Eccentric groove diameter	3⅜" nominal
Eccentricity	.125" ± .008"
(causes tone arm swing of	.250" ± .016")

The Replacement Parts Listed Below Bear the Same Reference Number as the Corresponding Parts used on RP-177. Refer to RP-17 Parts List for All Other Parts which are Identical. Refer to "CHANGES—DIFFERENCES"

REPLACEMENT PARTS

STOCK No.	Ref. No.	DESCRIPTION
		RP 177A
73198		Spring—Curved spring for anchoring pivot arm coil spring.
*73311	14	Swivel—Record separator swivel and shaft.
32875	22	Switch—"On-Off" switch.
72372	66	Spring—Ratchet lever spring (.170" O.D. x 11 32"—80 Turns).
73053	67	Lever—Ratchet lever.
71550	71A	Spring—Tone arm lever spring (.106" O.D. x 1⅜"—82 turns).
*73306	91	Screw—#8-32 x 5/16" fillister head set screw for ratchet wheel.
71181		Spring—Hairpin spring to fasten drive idler wheel.
71179	97	Wheel—Drive idler wheel.
*73307	107	Turntable—Turntable and spindle assembly complete with rubber mat.
*73313	107A	Mat—Rubber mat for turntable.
*73317	111	Washer—⅛" O.D. x .195" I.D. flat washer for mounting record supports.
*73314	113	Support—Record support for 12" records.
*73315	114	Support—Record support for 10" records.
*73316	115	Shelf—Record support shelf and shaft.
*73309	118	Grommet—Rubber grommet to mount motor (3 required).
*73318	120	Base—Record support base.
*73308	121	Motor—117 volt, 60 cycle motor complete with idler wheel.
†	121G	Spring—60 to 50 cycle conversion spring.
71180	122	Spring idler wheel tension spring.
*73305	123	Screw—#10-32 x ⅜" fillister head set screw for record support shaft cam—cone point (2 required).
*73312	126	Motor board—Motor board complete with pickup rest, welded, staked or riveted parts less operating parts.
*73310		Fastener—Snap fastener for mounting motor (3 required).
		RP-177B
		Same as RP-177A except
70339	61	Crystal—Crystal cartridge complete
70915	61c	Sapphire—Sapphire and holder assembly

* This is the first time this Stock No. has appeared in Service Data.
† These parts are not stocked.

MODELS RP-177, RP-177A, RP-177B

RADIO CORP. OF AMERICA

RP-177 REPLACEMENT PARTS

Stock No.	Ref. No.	DESCRIPTION
72397	1	Arm—Pickup arm shell only less crystal, cable and pivot arm
70905	2	Pin—Pivot pin
39674	3	Stud—Pivot arm spring stud
71099	4	Spring—Pivot arm spring (.187" O.D. x 3/4"—24 turns)
71098	5	Clamp—"U" clamp to lock pivot arm in position
71097	6	Screw—#4-40 x 1/4" long self tapping screw to lock pivot clamps
72414	7	Screw—#6-32 x 1/4" oval head screw for record separator cap
72415	8	Cap—Record separator cap
70909	9	Rod—Pusher rod including rubber cushion
38607	9A	Cushion—Rubber cushion for pusher rod
70895	10	Spring—Record separator spring—upper (.622" O.D. x 1-11/16"—13½ turns)
2917	11	Washer—"C" washer for lift rod, drum and belt, tone arm return lever, link, tone arm lever and main cam
*72416	12	Knife—Record separator knife
*72413	13	Shelf—Record separator shelf and shaft
*72399	14	Swivel—Record separator swivel and shaft
*72400	15	Screw—Record separator swivel and shaft screw
*72589	16	Support—Record separator support
†	17	Screw—#10 x 3/8" self tapping screw
70890	18	Nut—9/16-32 hex nut for record separator support
71280	19	Shaft—Record separator bottom shaft
71103	20	Pin—Drive pin for record separator shaft end bushing
71106	21	Cover—Metal cover for "On-Off" switch
72407	22	Switch—"On-Off" switch
72591	23	Escutcheon—Index escutcheon
†.....	24	Nut—Hex nut #4-40
72588	25	Screw—#4-40 x 5/16" binder head screw for "On-Off" switch
†.....	26	Insulation—Two small pieces of spaghetti
70906	27	Arm—Pivot arm and shaft
72402	28	Screw—#10-32 x 5/8" fillister head screw for trip lever
70858	29	Lever—Trip lever less spring
71543	30	Spring—Trip lever spring (.135" O.D. x 21/32"—58 turns)
3658	31	Ball—Steel ball (3/32" dia.)
70886	32	Nut—3/4-32" hex nut for pickup arm pivot bearing
72585	33	Bushing—Pivot arm bushing (upper)
70911	34	Bushing—Pivot arm bushing (lower)
72655	35	Disc—Feed-in adjusting disc
5042	36	Screw—#8-32 x 1/8" set screw for lower pivot arm bushing
72408	37	Screw—#8-32 x 1/4" binder head screw for feed-in adjusting disc
70873	38	Lever—Feed-in lever
71550	39	Spring—Feed-in adjusting disc spring (.160" O.D. x 1 3/8"—82 turns)
20165	40	Washer—"C" washer for ratchet lever, manual operating lever, manual detent lever and feed-in lever and tone arm lift lever
32869	41	Screw—#10-32 x 5/16" fillister head screw for tone arm control lever
70848	42	Cam—Shut-off or segment cam, fastens on record separator shaft
70855	43	Cover—Stop switch cover
†.....	44	Washer—Lockwasher #4
†.....	45	Screw—Round head screw #4-40 x 3/16" long
70876	46	Switch—Stop and muting switch, mounted on bracket
†.....	47	Nut—Hex nut #6-32
†.....	48	Washer—Lockwasher #6
72820	49	Rest—Pickup arm rest
.....	50	Screw—Self tapping screw #10-3/8" long
32943	51	Nut—Pickup stop switch button speed nut
71102	52	Button—Pickup stop switch button
32869	53	Screw—#10-32 x 5/16" fillister head screw for record separator drum flat end
72562	54	Screw—#10-32 x 5/16" fillister head set screw for record separator drum —cone point
70898	55	Drum—Record separator drum
70900	56	Belt—Record separator to support belt
71279	57	Nut—Speed nut to hold cable, rear of pivot arm
71095	58	Nut—Speed nut to hold cable, rear of arm
38458	59	Nut—Speed nut to hold cable, front of arm
72584	60	Cable—Pickup cable, twisted pair
72551	61	Crystal—Crystal cartridge complete
38452	61A	Guard—Needle guard
70341	61B	Nut—Mounting washer and nut for sapphire
72345	61C	Sapphire—Sapphire and holder assembly
37763	61D	Screw—#2-56 x 1/8" screw for needle guard
70912	62	Screw—#4-40 x 3/8" binder head screw to mount crystal (2 required)
70847	63	Lever—Tone arm return lever
72401	63A	Screw—Tone arm return lever screw
70884	64	Washer—Bearing washer for tone arm return lever
71726	65	Spring—Tone arm return lever spring (.218" O.D. x 1 1/2"—48½ turns)
71549	66	Spring— ratchet lever spring (.180" O.D. x 7/8"—54½ turns)
73053	67	Lever—Ratchet lever
†.....	68	Washer—Steel washer O.D. 1/2" I.D., .193", T .020"
70877	69	Washer—.280" I.D. x 7/16" flat washer for link, tone arm lever and main cam
71547	70	Spring—Tone arm lever tension spring (.218" O.D. x 1½"—48½ turns)
70858	71	Lever—Tone arm lever less spring
71549	71 A	Spring—Tone arm lever spring (.180" O.D. x 7/8"—54½ turns)
72420	72	Brace—Bottom support for tone arm lift lever and main cam
71544	73	Spring—Drum and belt tension spring (.255" O.D. x 1¾"—27½ turns)
†.....	74	Washer—#6 lockwasher
†.....	75	Screw—#6-32 x 5/16"
39691	76	Screw—#10-32 x 7/8" fillister head screw for adjusting tone arm lift lever
38631	77	Lever—Tone arm elevating lever
71104	78	Nut—#10-32 hex locknut for tone arm lift lever adjusting screw
†.....	79	Washer—Washer, O.D. 7/16", I.D. 3/16", T 1/32"
70864	80	Cam—Main cam
*72409	81	Screw—#8-32 x 1/4" binder head screw for turntable spindle support
70891	82	Support—Turntable spindle support bearing
70880	83	Plate—Spring thrust plate for turntable
70883	84	Screw—#6-32 x 5/16" round head screw for turntable spring plate
70852	85	Link—Record separator shaft link and lever
70849	86	Bushing—Record separator shaft and bushing
71100	87	Screw—#10-32 x 5/16" round head screw for link
31118	88	Screw—#10-32 x 5/16" fillister head screw for link or for automatic—manual—reject detent lever
70850	89	Spring—Record separator shaft bottom spring (.290" O.D. x 1.35"—14¾ turns)
38624	90	Ratchet—Ratchet wheel (drive cam sprocket) for turntable drive
38626	91	Screw—#8-32 x 1/4" fillister head set screw for ratchet wheel
70854	92	Spring—Drive shaft cam and pawl spring (.195" O.D. x 1-3/16"—42 turns)
70853	93	Cam—Drive shaft cam and pawl
70879	94	Washer—Washer for cam and pawl
72403	95	Lever — Automatic — manual — reject operating lever
72406	96	Link—Link for automatic—reject—manual operating and detent levers
36274	97	Wheel—Idler wheel
33726	98	Washer—"C" washer for idler wheel and arm
70863	99	Arm—Motor idler arm—less wheel
39996	100	Washer—Fibre washer for idler wheel
72404	101	Lever—Automatic—manual—reject detent lever
72586	102	Lever—Reject lever (handle)
†.....	103	Screw—Hex. head 6-32 x 1/4" self-tapping screw
72410	104	Switch—Manual shorting switch
72411	105	Cover—Manual shorting switch cover
†.....	106	Screw—#4-40 x 1/8" round head machine screw
72421	107	Turntable—Turntable including rubber mat less drive disc and tire
70866	107A	Mat—Rubber mat only for turntable
73054	108	Spindle—Turntable spindle drive less tire
37873	108A	Tire—Rubber drive tire
72587	109	Screw—#10-32 x 3/4" oval head screw for record support cap
72423	110	Cap—Record support cap
†.....	111	Washer—Approx. 7/16" O.D., 3/16" I.D., .030 T
70881	112	Screw—#10-32 x 3/8" binder head screw for record supports
72418	113	Support—Record support for 12" records
72417	114	Support—Record support for 10" records
72419	115	Shelf—Record support shelf and shaft
72708	116	Cable—Shielded output cable complete with pin plug
31048	116A	Plug—Pin plug for shielded output cable
71546	117	Spring—Idler arm tension spring (.187" O.D. x 7/8"—31 turns)
34388	118	Grommet—Rubber grommet to mount motor (2 required)
30870	119	Plug—2-prong male plug for power cable
72590	120	Base—Record support base
38612	121	Motor—105-125 volts, 60 cycle
39749	121G	Spring—60 to 50 cycle conversion spring
71545	122	Spring—Motor tension spring (.192" O.D. x 1½"—58 turns)
39772	123	Screw—#10-32 x 5/16" fillister head set screw for record support shaft cam—cone point
70845	124	Cam—Record support shaft cam
70899	125	Drum—Record support drum
72398	126	Motorboard—Motorboard sub-assembly complete with all welded, staked and riveted parts—less operating parts
71548	127	Spring—Feed-in control spring (.160" O.D. x 11/16"—52 turns)
72412	128	Plate—Anti-drift spring and plate for tone arm (retainer spring)
38873	129	Spring—Conical spring to mount record changer (4 required)
†.....	130	Lever—Feed-in lever locking pawl or latch. Part of motorboard
†.....	131	Lever—Muting switch actuating lever. Part of motorboard.

† These parts are not stocked.

* This is the first time this Stock No. has appeared in Service Data.

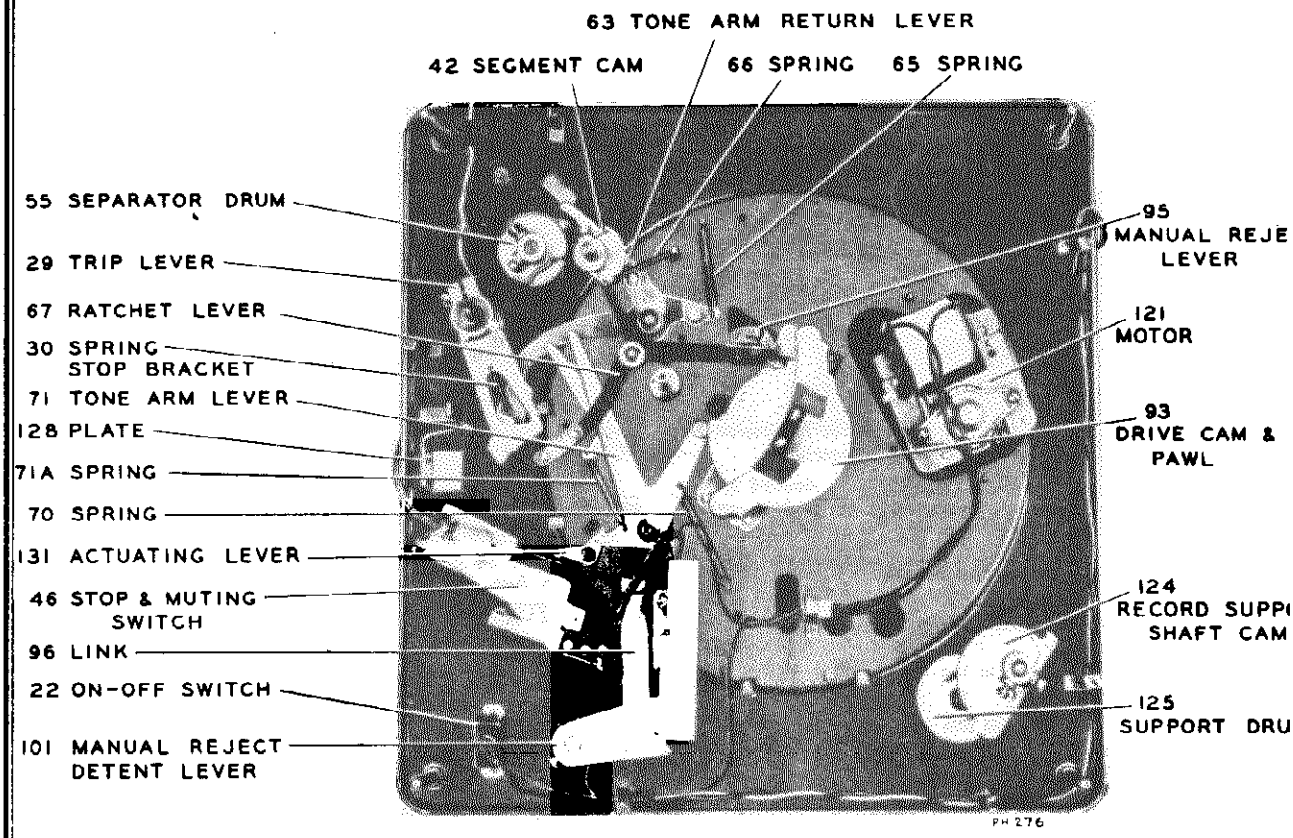
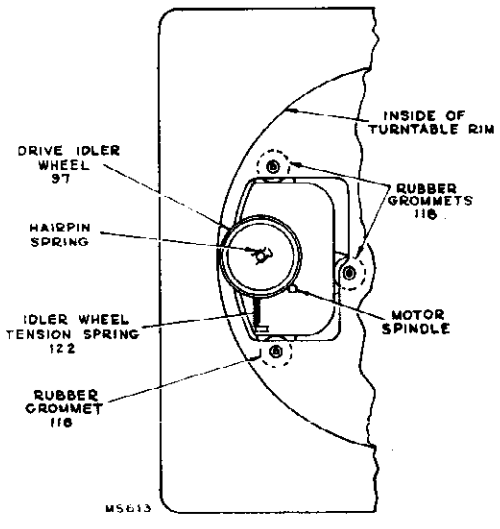


FIG. 5
Bottom view RP-177A, RP-177B



Turntable drive RP-177A, RP-177B

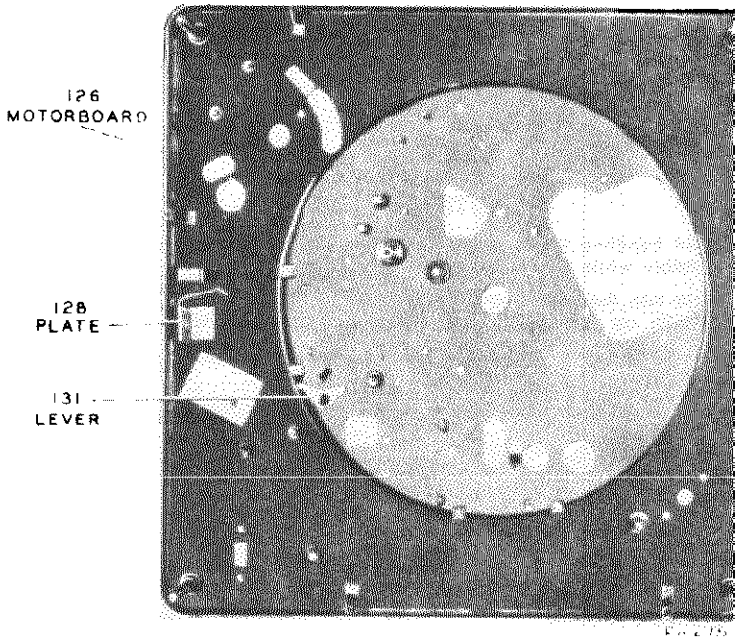


FIG. 6
Bottom view RP-177A, RP-177B (motorboard only)

MODEL RP-178 RADIO CORP. OF AMERICA

FEATURES

1. This mechanism is designed to play automatically a series of twelve 10-inch or ten 12-inch standard records of the 78 r.p.m. type.
2. It will play manually records up to 12 inches in diameter.
3. Tripping system is of "eccentric" type, insuring reliable automatic operation on all records made to RMA proposed standards.
4. It is a simple operation of sliding the record support to change from 10- to 12-inch records or vice versa.
5. Cycling mechanism is disconnected completely while records are being played. This reduces the load on the drive motor, thereby reducing the tendency for "wow" or rumble.
6. Low noise sapphire point pickup cartridge.

AUTOMATIC OPERATION

1. With the power switch in the off position slide the record support shelf as required for 10- or 12-inch records.
2. Place the records to be played in a stack with desired selections upward and in proper sequence with the last record on top. Load them on the changer by placing them over the center post and resting on the record support shelf. Place record stabilizing clamp on top of the record stack.
3. Turn power switch on and press the reject button. The changer will play automatically one side of each record in the stack.
   The tone arm can be moved to the rest position any time the mechanism is not in cycle.
4. Turn the power switch off, lift the stabilizing clamp and remove the stack from the turntable by placing fingers of both hands directly opposite and under the stack. Then lift straight up "don't tilt" or squeeze stack.

MANUAL OPERATION

1. Slide the record support shelf in towards the center post for 10-inch or away from the center post for 12-inch position.
2. Place the record to be played on the turntable and turn the power switch on.
3. Place the pickup on the start of the record.

   Note: **The mechanism should be allowed to complete cycle before attempting to move tone arm to the rest position.**
4. Turn power switch off manually.
5. Remove the record by raising straight up without tilting.

CAUTIONS

1. Avoid handling the tone arm or sliding the record support assembly while mechanism is in cycle.
2. Never turn the power switch off, leaving the mechanism in cycle for an extended period of time.
3. Do not allow the records to remain on supports when not in use.
4. Do not allow oil or grease to come in contact with any rubber parts.
5. Do not install instrument near source of heat. Excessive heat may damage the pickup cartridge.

LUBRICATION

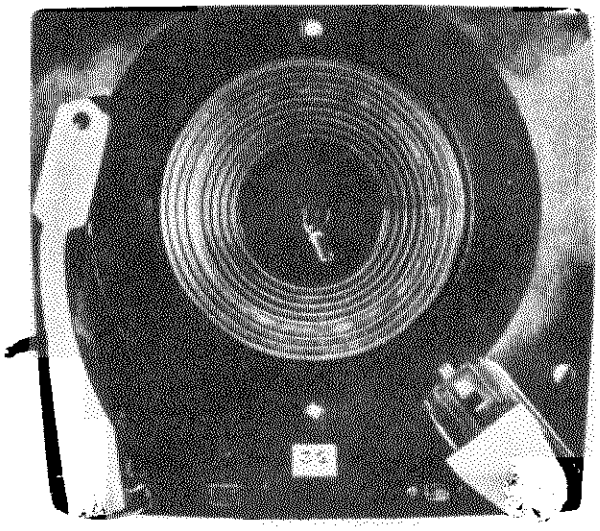
Motor

Motor is lubricated at factory to provide normal operation for a long period of time.

If it becomes necessary to lubricate, use SAE #10 motor oil to saturate the felt wicks on the motor bearings.

Main Bearing

Use STA-PUT #512 or SAE #30 motor oil.



Slides and Levers

Use STA-PUT #512.

STA-PUT can be purchased from E. F. Houghton & Co., 303 W. Lehigh Ave., Phila., Pa.

FUNCTION OF PRINCIPAL PARTS

Trip Lever—67

When the sapphire is riding the eccentric groove, the trip pawl engages the ratchet lever, starting cycle.

Ratchet Lever—63

Portion of the lever acts as a ratchet and the other portion incorporates a catch for the stud on the cycling cam carriage. The engagement of this stud prevents the mechanism from going into cycle.

Center Post—32

The center post performs the function of supporting and aids in the separation of the records.

Tone Arm Return Lever and Latch—53B

The tone-arm return lever, together with the latch, locks and stabilizes the tone arm in its outermost position. It also gives the necessary inward motion to the tone arm.

Cycling Cam Carriage—50A

This carriage provides a movable support for the cycling cam.

Tone Arm Director Lever—71

The roller on one end of this lever follows a channel in the cycling cam and thereby pulls on the cable directing the vertical and outward motion of the tone arm.

Locating Lever—12

The sloped portion of the lever forms a stop for the stud on the tone arm return lever thereby determining the landing position of the pickup.

Record Push Cam Gear Assembly—5, 7

Provides a means of coupling the push cam to the rack lever.

Record Support—1A, B, C, D

Provides a support for the edge of the records and a mounting for the record push cam.

Rack Lever—10

One end of the lever follows the eccentric elevated portion of the cycling cam causing the lever to move in and out from the center of the mechanism. The teeth on the rack lever engage the teeth in the record push cam gear producing a rotary motion necessary to push the record off the step in the center post.

Record Push Cam—4

The oval shaped cam located in the record support, rotates during change cycle. This cam engages and pushes the record from the step in the center post.

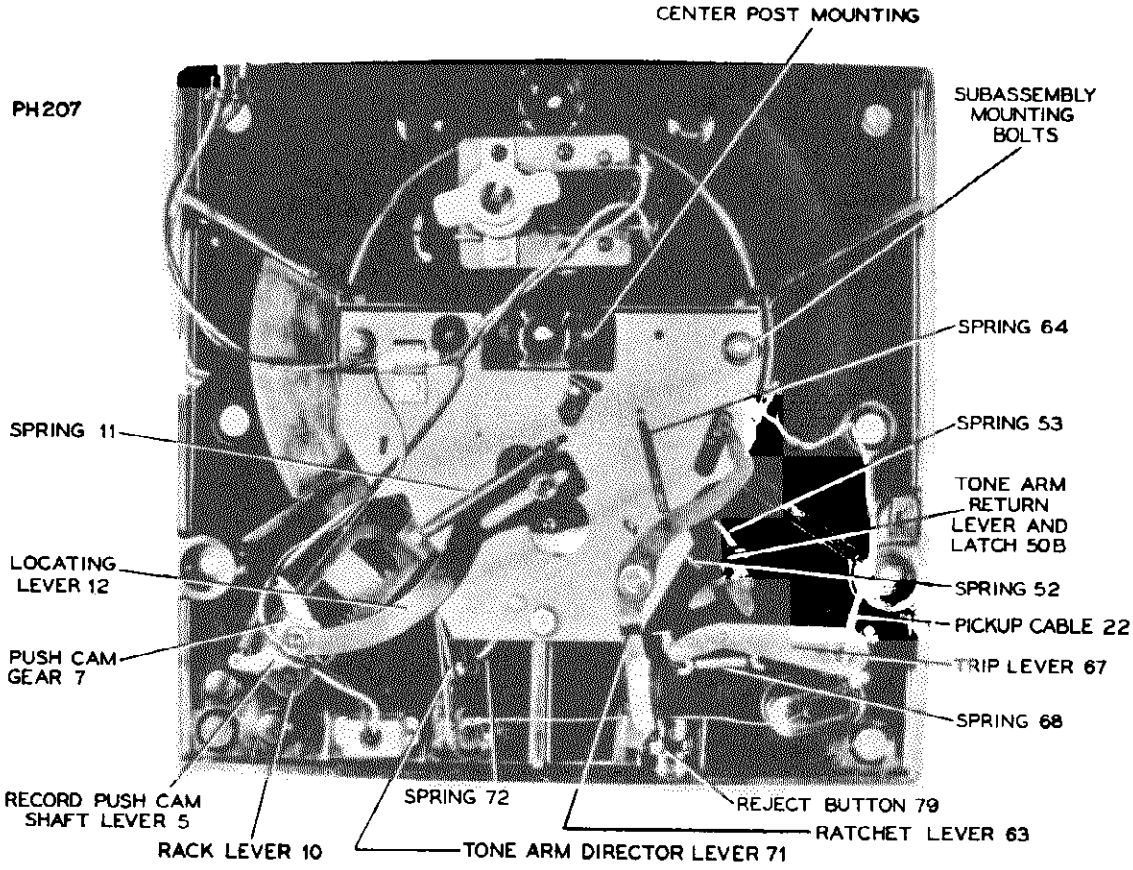


Figure 1

ADJUSTMENTS

Tone arm (out of cycle) height adjustment

1. Rotate the turntable until the change cycle is completed.
2. Move the tone arm to a position off the edge of the record and allow it to rest freely in air.
3. Bend portion of the tone arm bracket so that the sapphire is 3/16 inches above the flat surface of the motorboard. (Figure 3.)

Tone arm height adjustment while in change cycle

1. Press the reject button and rotate the turntable by hand until the pickup has raised, to the maximum height in the change cycle.
2. Turn the adjustment screw "A" until the sapphire is 1⅛ inches above the turntable.
   This adjustment will permit the pickup to land and play one record placed on the turntable. At the same time it prevents the tone arm from touching the record resting on the centerpost while the mechanism is going through cycle.
   (If this height cannot be reached by the adjustment screw, take up on the cotter pin.) (Figures 4 and 5.)

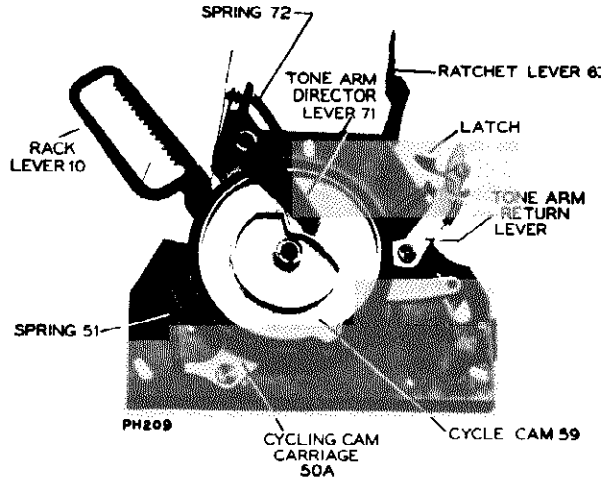


Figure 2

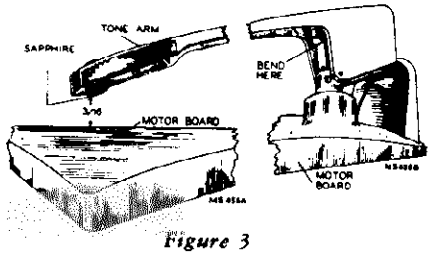


Figure 3

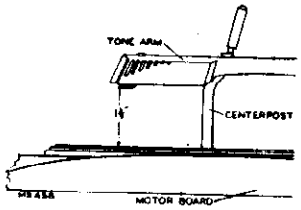


Figure 4

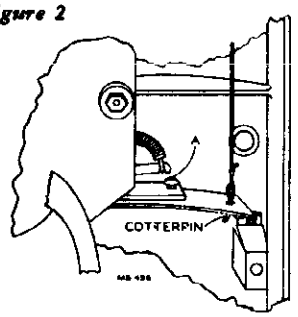


Figure 5

Pickup landing adjustment

1. Slide the record support as required for playing 10-inch records.
2. Place a ten-inch record on the turntable and rotate the turntable by hand until the sapphire is just ready to land.
   Loosen set screws "B" (Figure 6).
3. Hold the trip lever to keep it from moving while the pickup is moved to the start of the record.
4. Tighten the black screw "B" and allow the mechanism to run through cycle automatically. If landing is correct, tighten copper plated screw "B." (Figure 6.)
   (Note) No separate 12-inch landing adjustment is necessary.

Record push cam and gear assembly adjustment

1. Have the mechanism out of cycle.
2. With the push cam in place and the record support in the 10-inch position, assemble and engage the teeth of the push cam gear with the rack lever so the eye in the lever is approximately in line with the centerpost as shown in drawing. (Figure 7.)
3. Set the push cam parallel to the front edge of the record support, make certain the thin edge of the cam is on the left side, viewed from the front or centerpost side of the support. (Figure 8.)

Removing the turntable

1. Loosen the two screws mounting the centerpost. (Figure 10.)
2. The centerpost, turntable and thrust bearing can now be easily lifted out.

Replacing the turntable

1. Slip the turntable over the lower end of the centerpost until it comes against the stop or ears. (Figure 9.)
2. Place the thrust bearing and washers on the bottom end of the centerpost and place the centerpost and turntable in position as shown. (Figure 9.)
3. Turn the spindle so the step in the centerpost is away from the record support. (Figure 11.)
4. Tighten the two mounting screws. (Figure 10.)

Turntable centering

If for any reason the sub-assembly had been removed from the motorboard it is necessary to re-center the turntable.

1. Loosen the three sub-assembly mounting bolts. (Figure 12.)
2. Place the turntable in place with the center post extending down through the mounting as shown. (It is not necessary to have the thrust bearing in place for this operation.) (Figure 9.)
3. Center the turntable in respect to the recess in the motorboard by shifting the position of the sub-assembly slightly. (Figure 11.)
4. Tighten the nut on the end of the square head mounting bolt. (Figure 12.)
5. Remove the turntable and tighten the other two mounting bolts. (Figure 12.)

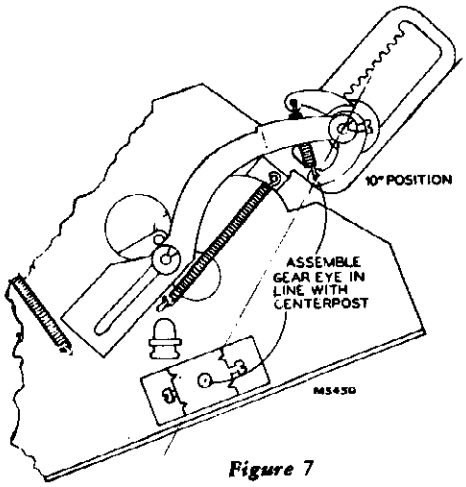


Figure 7

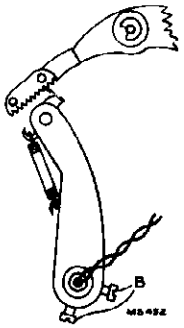


Figure 6

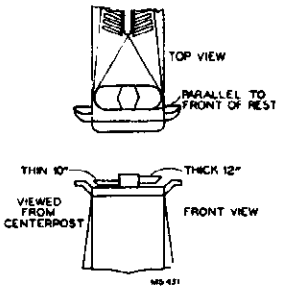


Figure 8

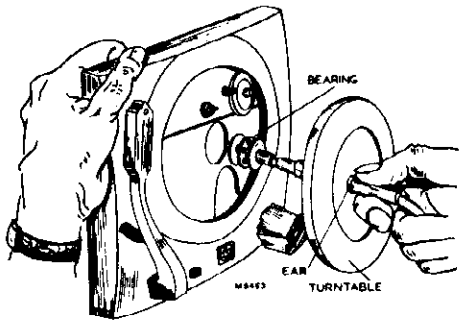


Figure 9

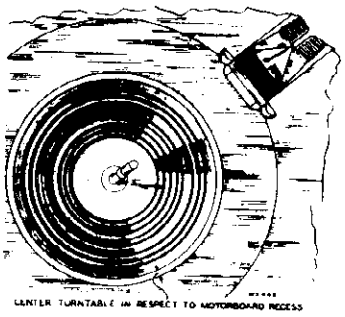


Figure 11

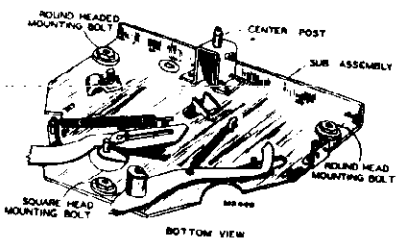


Figure 12

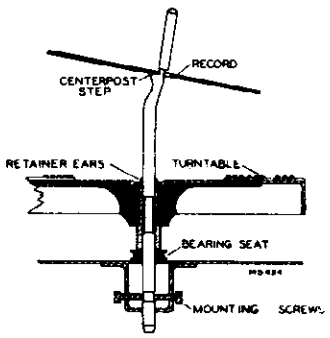
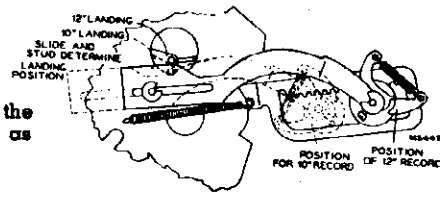


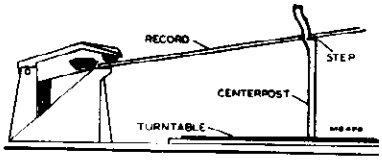
Figure 10

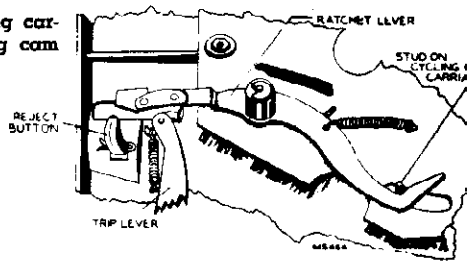
CYCLE OF OPERATION

Operator

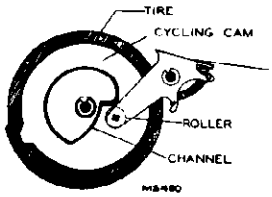
Function	Explanation
Lift and slide the record support to 10 or 12 inch position as desired	1. Record support locks in position and at the same time the record push cam and gear rotates and assumes a position as required for 10- or 12-inch records.
Place the stack of records over the center post	1. The lower record of the stack is sitting on the step in the centerpost, and the edge is resting on the record support.
Push reject button	1. The end of the reject button extending through the motorboard contacts and moves ratchet lever. 2. Ratchet lever unlatches stud which is mounted on cycling carriage. This allows the tension spring to pull the cycling cam against the rotating knurled roller and start cycle.

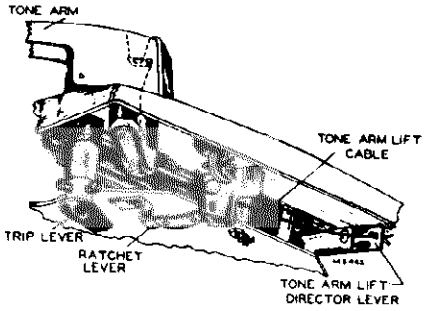




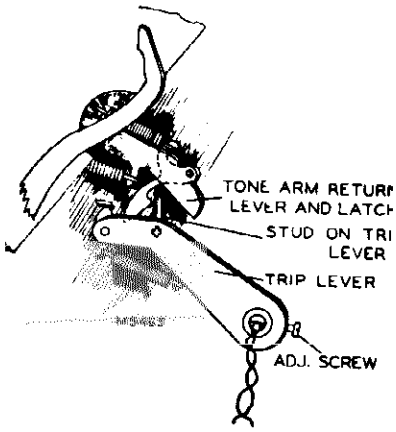


Automatic Cycle





Function	Explanation
Tone arm rises and moves out	1. As the cycling cam rotates the small roller on the tone arm director lever follows the channel in the cam and in so doing pulls on the cable connected to the tone arm. 2. The hole in the motorboard provides a guide for the tone arm cable. It is so placed as to allow the cable to pull at an angle slightly off 90 degrees thus giving the necessary rising and outward motion of the tone arm. 3. The trip lever which is rigidly connected to the tone arm through the tone arm pivot shaft is moved out with the tone arm. 4. The tone arm return lever has moved out slightly ahead of the trip lever. The tone arm return lever together with the small latch assumes such a position so as to engage the stud on the trip lever and stabilize the tone arm in its outermost position.

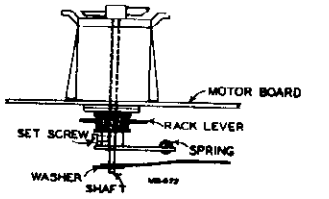


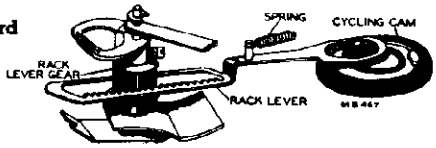
MODEL RP-178

RADIO CORP. OF AMERICA

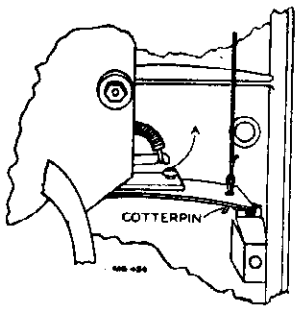
CYCLE OF OPERATION

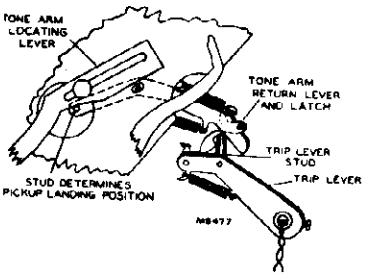
Function	Explanation
The record push cam together with the "step" in the centerpost separates the lower record of the stack allowing it to drop to the turntable	1. While the cycling cam is continuing to rotate, the rack lever is being pushed outward by the small eccentric elevated cam, with which it is engaged. 2. The teeth in the rack lever being engaged with record push cam gear, converts the sliding action of the rack lever into a rotary motion. 3. The rotary motion of the record push cam pushes the record off the step in the centerpost.



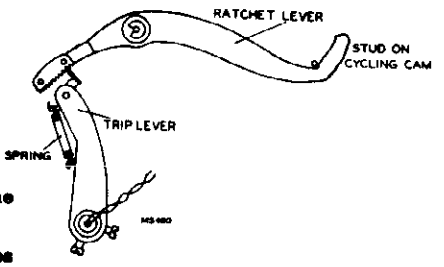


Tone arm moves in and lands on record	1. As the cycling cam is returning to normal position, the tone arm director lever is gradually allowing a slack in the tone arm cable. 2. While the tone arm director lever is gradually allowing slack in cable, the tone arm return lever is tending to retain the tension on the cable by returning the tone arm to the landing position. 3. The distance the tone arm return lever travels, while moving the pickup in for landing, is determined by the contact between the tone arm locating lever and the stud on the tone arm return lever. 4. After the tone arm return lever has moved the tone arm to the landing position the tone arm director lever continues to move and allow enough slack in the cable so the pickup can sit down on the start of the record.





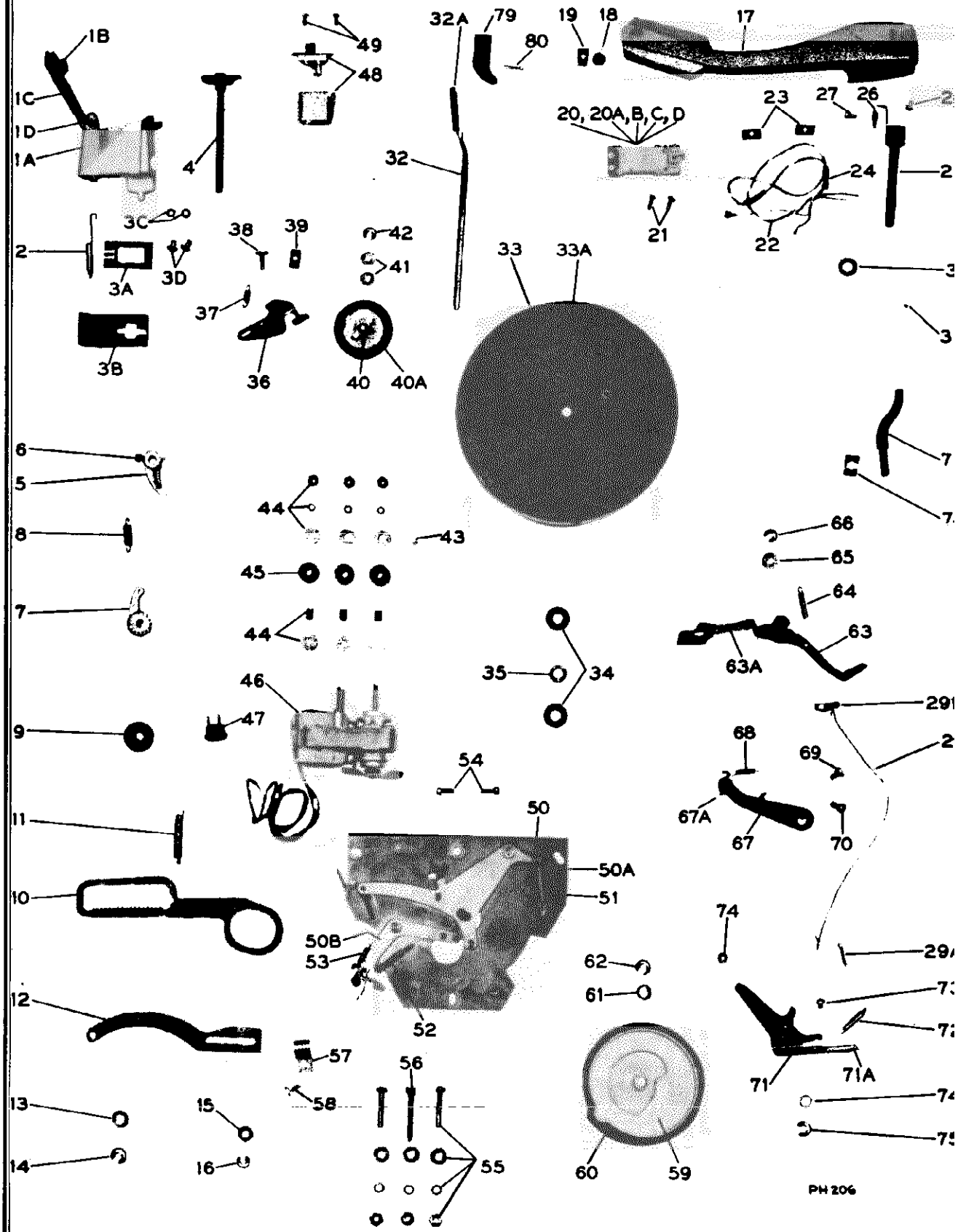
Sapphire moves into record groove. Record begins to play	1. As the sapphire moves into the playing groove, the cycling cam becomes disengaged from the rotating knurled roller as the roller falls into the step in the cam. 2. The change cycle is completed as the stud on the cycling cam carriage becomes engaged with the ratchet lever. This engagement prevents the cycling cam from contacting the knurled roller, starting a new cycle.



The record plays	1. After the playing of the record, the pickup moves into the eccentric groove. 2. The movement of the pickup in the eccentric groove causes the trip pawl to engage the ratchet lever starting a new cycle. (The mechanism plays one side of each record in the stack then repeats the playing of the last record until the pickup is manually placed on the rest or the power removed from the mechanism.)

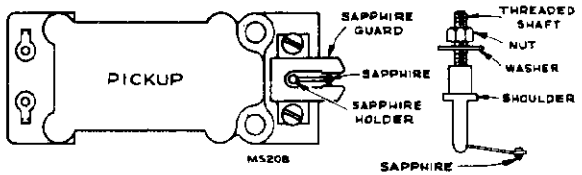
RADIO CORP. OF AMERICA

MODEL RP-1



Photograph of Parts

REPLACEMENT OF SAPPHIRE



Caution: Never bend the sapphire support wire.

Extreme care should be used when loosening the sapphire mounting nut so that the twisting motion does not break the crystal.

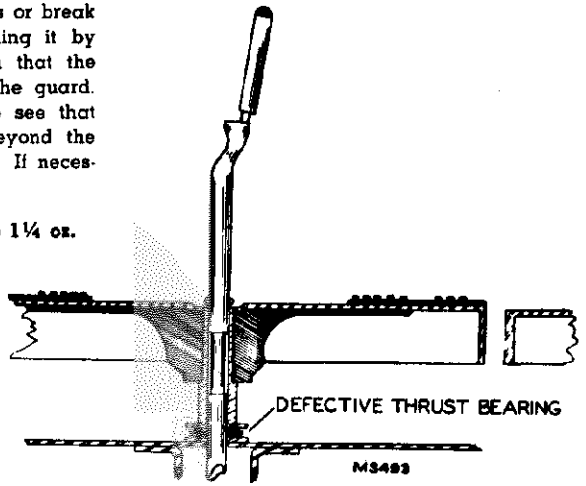
Remove the two screws holding the sapphire guard in place and remove guard. Remove the small nut and washer on the threaded shaft of the sapphire holder and gently push the shaft through the hole in the armature shaft until the sapphire holder assembly comes free.

Do not use force as the crystal may be broken.

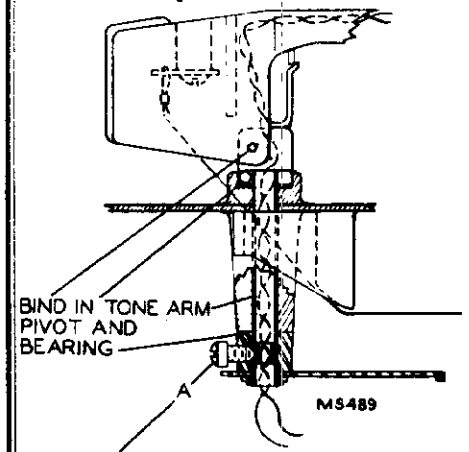
Insert threaded shaft of replacement sapphire holder through armature shaft and replace the washer and nut. Make sure that the sapphire is in the correct position. Take hold at the lower end of the shaft with a pair of pliers while tightening the nut, being very careful so as not to strip the threads or break the crystal.. Replace the sapphire guard, positioning it by means of the oversize screw slots. Make certain that the sapphire and its supporting wire are centered in the guard. Tighten the guard screws. Before using, check to see that the sapphire projects far enough (approx. .020) beyond the guard so that the guard will not strike the record. If necessary, bend the guard a little.

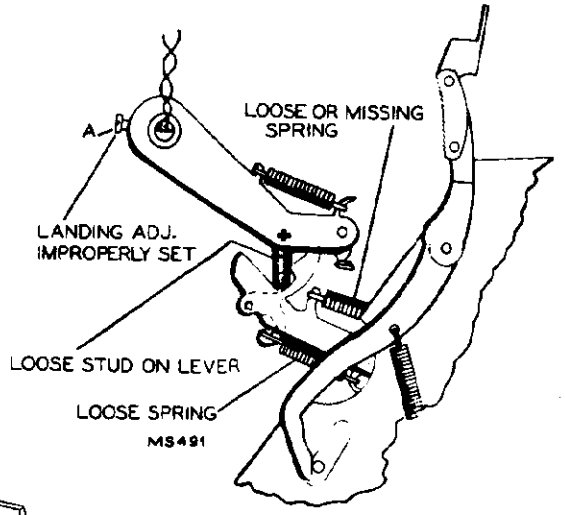
Note: Pickup pressure should be approximately 1 to 1¼ oz.

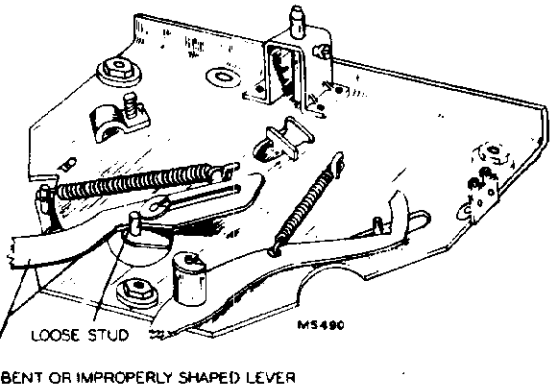
Rumble

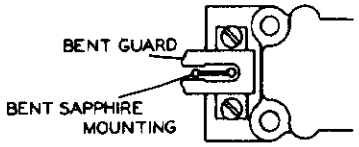


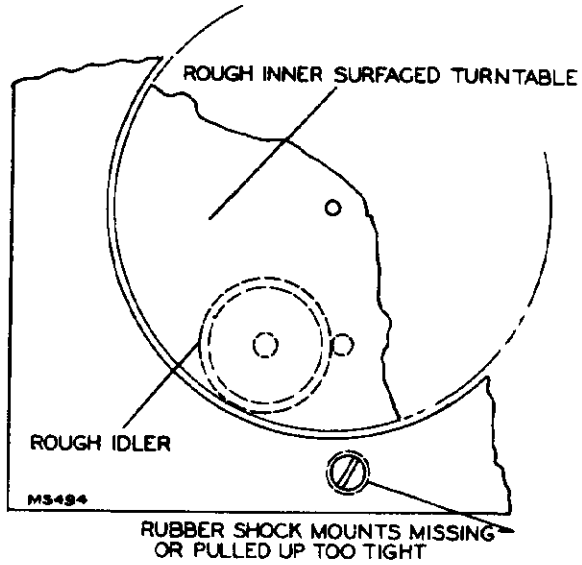
Improper Pickup Landing



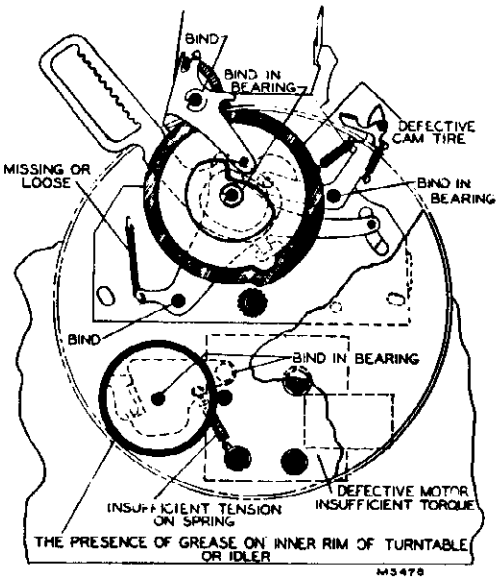


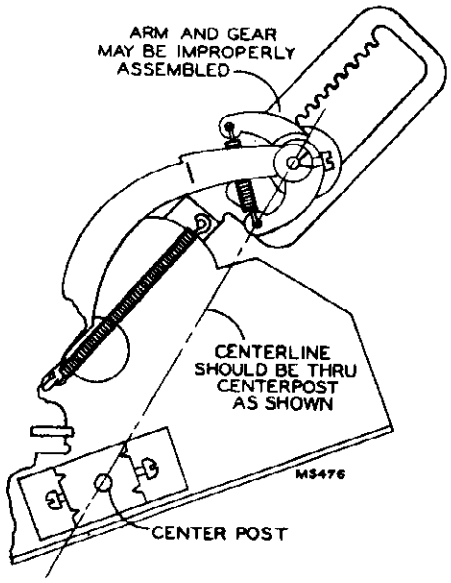




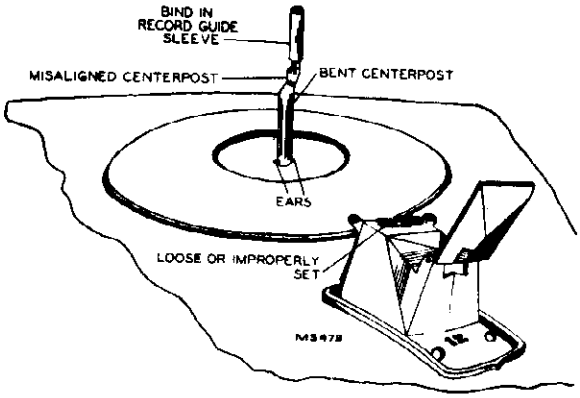


Changer Will Not Complete Cycle

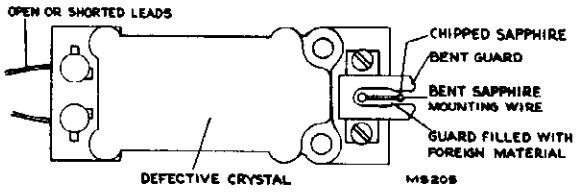




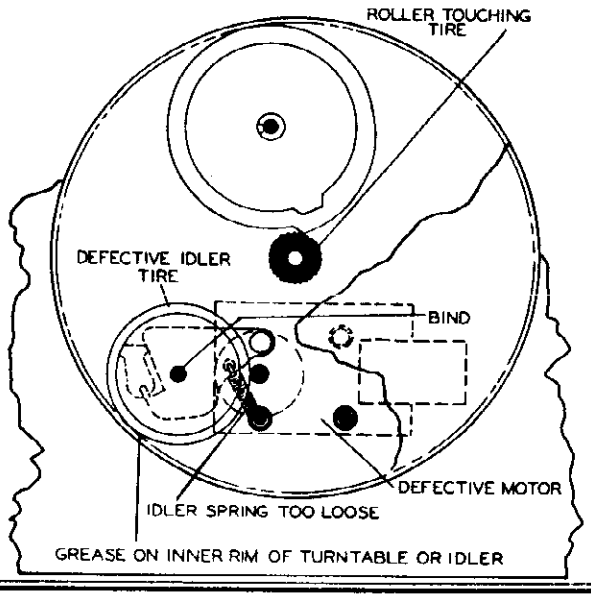
Records Do Not Separate or Drop Properly

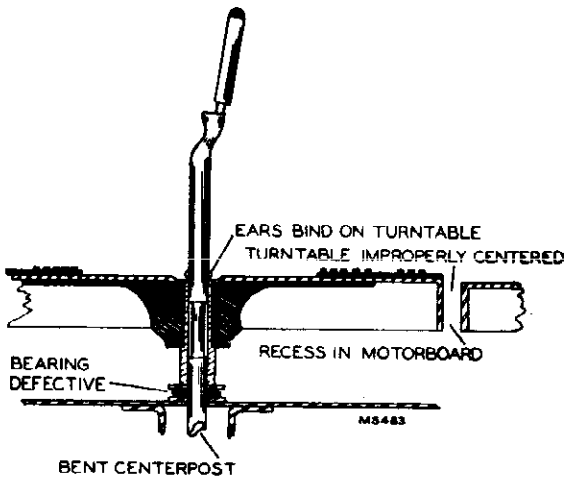


Distorted Output



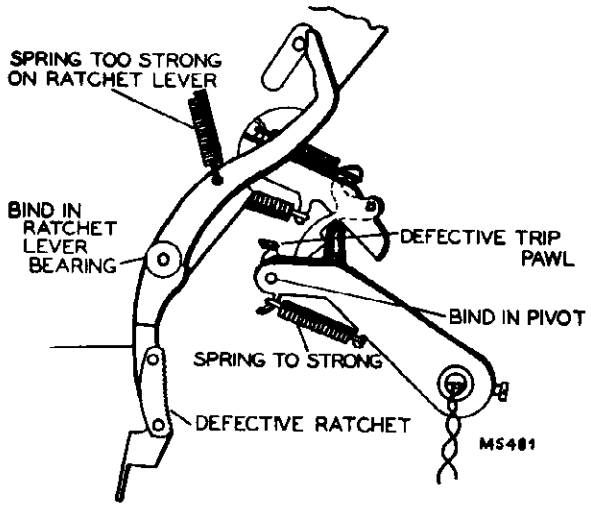
"Wow" or Slow Turntable Speed

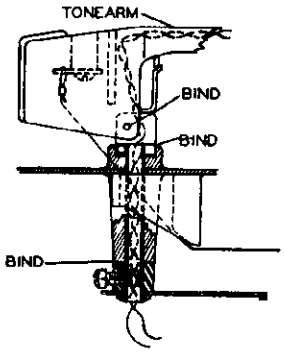


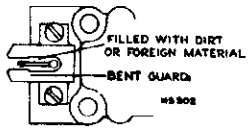


MODEL RP-178 **RADIO CORP. OF AMERICA**

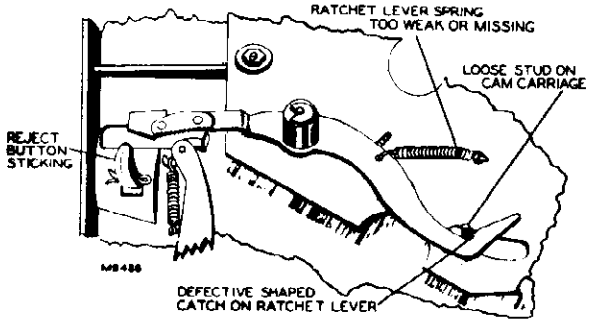
Pickup Repeats Grooves



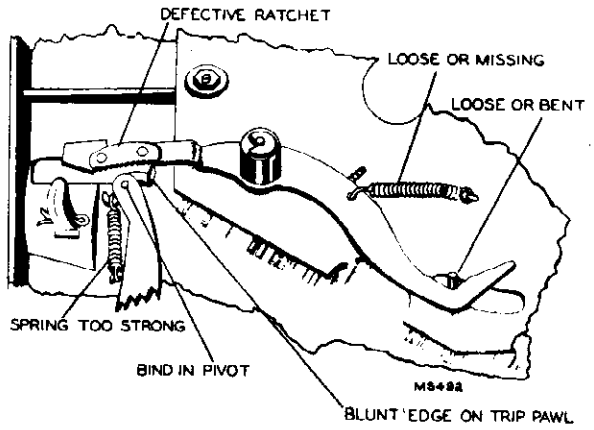




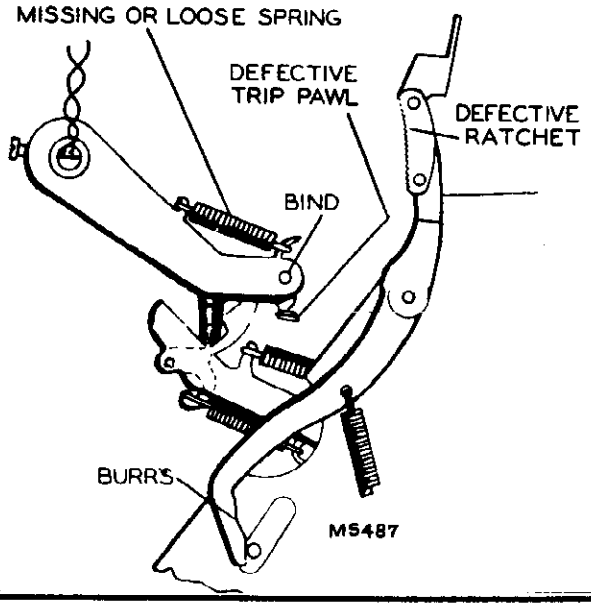
Continuous Tripping

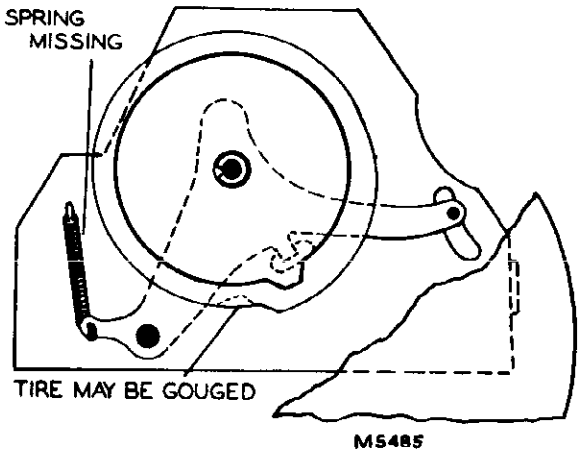


Premature Tripping



Failure To Trip or Go Into Cycle



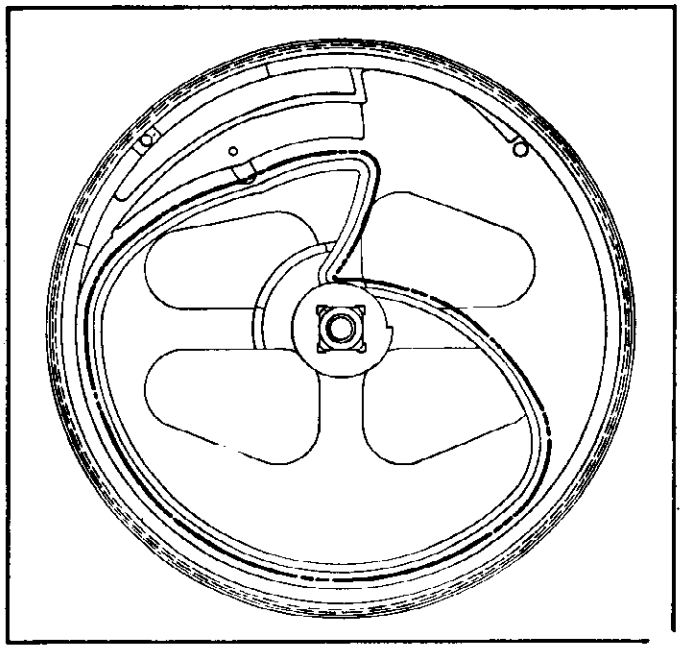


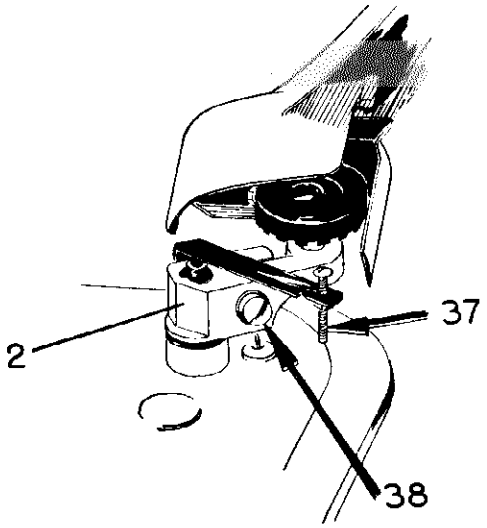
REPLACEMENT PARTS

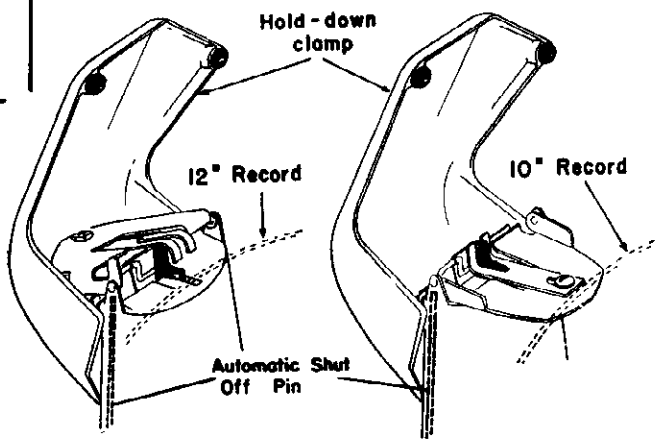
REF. No.	STOCK No.	DESCRIPTION
		OPERATING ASSEMBLIES
1A 1B 1C 1D	*72390	Record Support Assembly 1A, complete with rubber cushion 1B, top clamp 1C, and pins 1D
2	*72357	Spring—Record support and clamp spring (.200" O.D. x 1-31/32"—37¼ turns)
3A 3B 3C 3D	*72391	Plate—Clamp 3A, plates 3B (1 set) for record support assembly including lockwashers 3C and screws 3D
4	*72356	Cam—Record separator cam and shaft
5	*72360	Lever—Record push cam shaft lever, upper
6	*72353	Screw—#8-32 x 5/16" filister head screw for Item #5
7	*72361	Lever—Record push cam shaft lever, lower (gear and lever, assembly)
8	*72362	Spring—Record push cam shaft levers connecting spring (.242" O.D. x 1"—19½ turns)
9	*72354	Washer—flat washer (29/32" O.D. x .22.." I.D.) between rack lever and record separator cam
10	*72371	Lever—Rack lever
11	*72370	Spring—Rack lever spring (.233" O.D. x 1-11/16"—53 turns)
12	*72352	Lever—Tone arm locating lever
13	70877	Washer—Brass washer (7/16" O.D. x .280" I.D.) to mount locating lever to record separator cam shaft
14	35969	Washer—"C" washer to fasten locating lever to record separator cam shaft
15	*72351	Washer—brass washer (7/16" O.D. x .195" I.D.) to mount locating lever to sub-base stud
16	33726	Washer—"C" washer to fasten locating lever to sub-base stud
17	*72338	Arm—Pickup arm shell only
18	*72344	Jewel—Pickup arm decorative jewel
19	38458	Nut—Speed nut to hold jewel
20	72551	Crystal—Crystal cartridge complete (including sapphire and guard)
20A	72345	Sapphire—Sapphire and holder assembly
20B	70341	Nut—Mounting washer and nut for sapphire
20C	38452	Guard—Needle guard
20D	37763	Screw—#2-56 x 1/8" screw for needle guard
21	70912	Screw—#4-40 x 3/8" binder head screw to mount crystal in arm (2 required)
22†	.....	Cable—Pickup cable (twisted pair)
23	38458	Nut—Speed nut to hold pickup cable
24†	.....	Sleeving—Sleeving to protect pickup cable
25	*72339	Shaft—Pickup arm shaft
26	*72341	Pivot—Pivot pin 26B, and screw 26A for pick-up arm shaft
27	*72342	Screw—#4-40 x 3/16" filister head machine screw for locking pivot screw
28	*72340	Screw—#8-32 x ¼" round head machine screw to hold lift cable tie plate
29	*72343	Cable—Pickup arm lift cable complete (including tie plate and cotter pin)
29A	*72386	Pin—Cotter pin to fasten lift cable
29B	.....	Plate—Tie plate nut stocked separately, lift cable (Part of 29)
30	10941	Ball—Steel ball (1/8" dia.) for pickup arm shaft
31	*72348	Washer—Thrust washer (.580" O.D. x .300" I.D.) for pickup arm shaft
32	*72346	Spindle—Turntable spindle or center post
32A	.....	Guide—Record guide (Part of 32)
33	*72355	Turntable—Turntable complete with knurled bushing and rubber mat
33A	*72564	Mat—Rubber mat only for turntable
33B	.....	Roller—Knurled roller (Part of 33)
34	*72350	Washer—thrust washer (.750" O.D. x .285" I.D.) for turntable spindle (2 required)
35	*72349	Bearing—Thrust bearing
36	*72395	Arm—Idler wheel arm and mounting lever
37	*72393	Spring—Idler spring (.195" O.D. x 11/16"—17 turns)
38	*72388	Stud—Mounting stud for idler wheel arm
39	38458	Nut—Speed nut to hold idler wheel arm stud
40	*72396	Wheel—Idler wheel including tire
40A	.....	Tire—Rubber tire for idler wheel (not sold separately)
41	39996	Washer—Fibre dampening washer for idler wheel (2 required)
42	33726	Washer—"C" washer to fasten idler wheel
43†	.....	Lug—To hold spring 37 (not stocked)
44	*72387	Mounting—Motor mounting hardware consisting of 6 (six) washers, 3 (three) spacers, 3 (three) lockwashers and 3 (three) nuts
45	*72384	Grommet—Rubber grommet for mounting motor (3 required)
46	72394	Motor—117 volt, 60 cycle motor
47	30870	Plug—2 prong male plug for motor
48	32875	Switch—"On-Off" switch with cover
49	*72389	Screw—Mounting screws for power switch (2 required)
50	*73071	Base—Sub-base assembly complete with cam mounting plate and tone arm return lever and latch less springs
50A	.....	Plate—Cam mounting carriage (Part of 50)
50B	.....	Lever—Tone arm return lever and latch (Part of 50)
51	*72367	Spring—Cam mounting plate spring (.195" O.D. x 1.167"—38¼ turns)
52	*72375	Spring—Return lever spring (.195" O.D. x 7/8"—26 turns)
53	*72374	Spring—Return lever latch spring (.165" O.D. x 9/16"—28 turns)
54	*72363	Screw—#8-32 x 7/16" filister head screw to fasten center post (2 required)
55	*72347	Hardware—One set of mounting hardware to mount sub-base consisting of 2 screws, 3 washers, 3 lockwashers and 3 nuts
56	*72364	Screw—#10-32 x 1½" square head screw to mount sub-base
57†	.....	Clamp
58†	.....	Screw
59	*72368	Cam—Main cam (including rubber tire)
60	*72369	Tire—Rubber tire only for main cam
61	70877	Washer—Brass washer (7/16" O.D. x .280" I.D.) to mount main cam
62	35968	Washer—"C" washer to fasten main cam
63	*72377	Lever—Ratchet lever, complete with ratchet teeth
63A	.....	Ratchet—Ratchet teeth (Part of 63)
64	*72372	Spring—Ratchet lever spring (.170" O.D. x 1-1/32"—80 turns)
65	*72351	Washer—Brass washer (7/16" O.D. x .195" I.D.) to mount ratchet lever
66	33726	Washer—"C" washer to fasten ratchet lever
67	*72358	Lever—Trip lever with trip pawl less spring
67A	.....	Pawl—Trip pawl (Part of 67)
68	*72359	Spring—Trip lever spring (.165" O.D. x 7/8"—62 turns)
69	32869	Screw—#10-32 x 5/16" filister head machine screw for trip lever
70	39772	Screw—#10-32 x 5/16" filister head set screw for trip lever
71	*72378	Lever—Tone arm lift director lever
71A	.....	Spring—Spring leaf (Part of 71)
72	*72376	Spring—Pickup lift cable lever spring (.195" O.D. x 1-3/32"—40¼ turns)
73	*72379	Screw—#8-32 x 3/16" round head adjusting screw for lift lever
74	*72380	Roller—Cable lever roller
75	*72381	Washer—Flat washer (½" O.D. x .290" I.D.) to mount lift lever
76	35969	Washer—"C" washer to fasten lift lever
77	*72383	Rest—Tone arm rest
78	33225	Nut—Speed nut for mounting tone arm rest
79	*72385	Lever—Reject lever
80	*72386	Pin—Cotter pin to fasten reject lever
	*72382	Motor board—Plastic motor board only, less all operating parts

* This is the first time this Stock No. has appeared in Service Data.

† These parts are not stocked.







C-10 AND C-10M

Ref. No.	Part No.	Description
3	21372	Ball Retainer Assembly
4	21016	Center Post Assembly
9	21010	Changer Drive Assembly
10	12757	Idler Wheel Assembly
11	21360	Ball Retainer Assembly
12	20126	Release Arm Spring
13	20508	Release Arm Assembly
15	12354	Positive Tripping Lever
17	21260	Tone Arm Lift Post Assembly
18	21257	Detent Lever Assembly
21	21107	Tripping Lever Assembly
22	21287	Spring
23	21113	Spring
24	21391	Connecting Lever
25	16026	"C" Washer
27	16064	"C" Washer
28	21003	Control Knob Arm Assembly
29	21377	AC Switch
31	20509	Stop Lever Assembly
35	21075	Rubber Bumpers
36	21393	Spring
39	21388	Connecting Rod
41	21386	Trunnion Support
41	21387	Hinge
41	21390	Pin
42	20127	Spring, Push off Lever
19	21256	Tone Arm Guide Assembly
—	21254	Selector Bar Assembly (Under 13)
—	12761	Spring—(Under 13)
—	20570	Spring, (Fastened to Switch Post)
—	16027	"C" Washer, (Holds No. 9)
—	22067	Grommet—for motor mounting
—	21327	Spring (on top side of selector bar Assembly)
—	21253	Cam Assembly
—	21394	Automatic Shut off Pin
34	22043	Motor Assembly Only
—	21309	Selector Block—Part of 21253
—	21324	Slide spring, for 21309
37	16151	Height Adjusting screw 5-40x⅝
38	16106	Clamp screw, 10-32x⅝
		Crystal Cartridge: Order by number on Defective Unit.

C-10 ONLY

Ref. No.	Part No.	Description
26	21396	Tripping Arm Assembly
45	21252	Push-off Assembly with Base
8	21070	Record Clamp Assembly
2	21259	Tone Arm Carrier Assembly
1	20578	Tone Arm only, (less crystal)
7	21258-C	Turntable Assembly, Brown (Flocked)
40	21395	Automatic Stop Lever Assembly
5	16107	Plug Button
6	20571	Control Knob
33	20572	Idler Pulley Holder

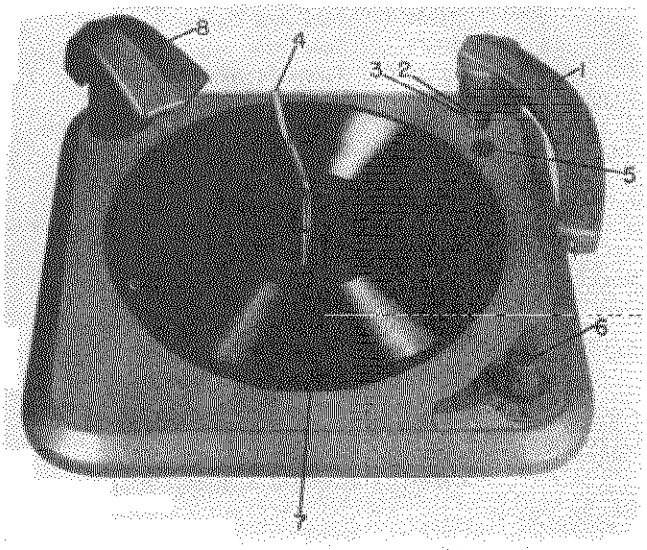
C-10M ONLY

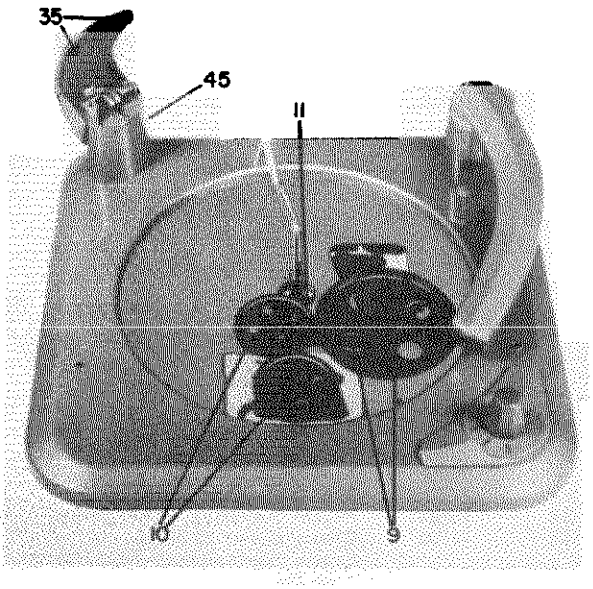
26	21411	Tripping Arm Assembly
8	21252-A	Push-off Assembly with Base
8	21070-A	Record Clamp Assembly
2	21259-A	Tone Arm Carrier Assembly
6	20571-A	Control Knob
5	16107-A	Plug Button
1	20578-A	Tone Arm only, (less crystal.)
7	21258-E	Turntable Assembly, Grey (Flocked)
44	21417	Spring
40	21414	Automatic Stop Lever Assembly

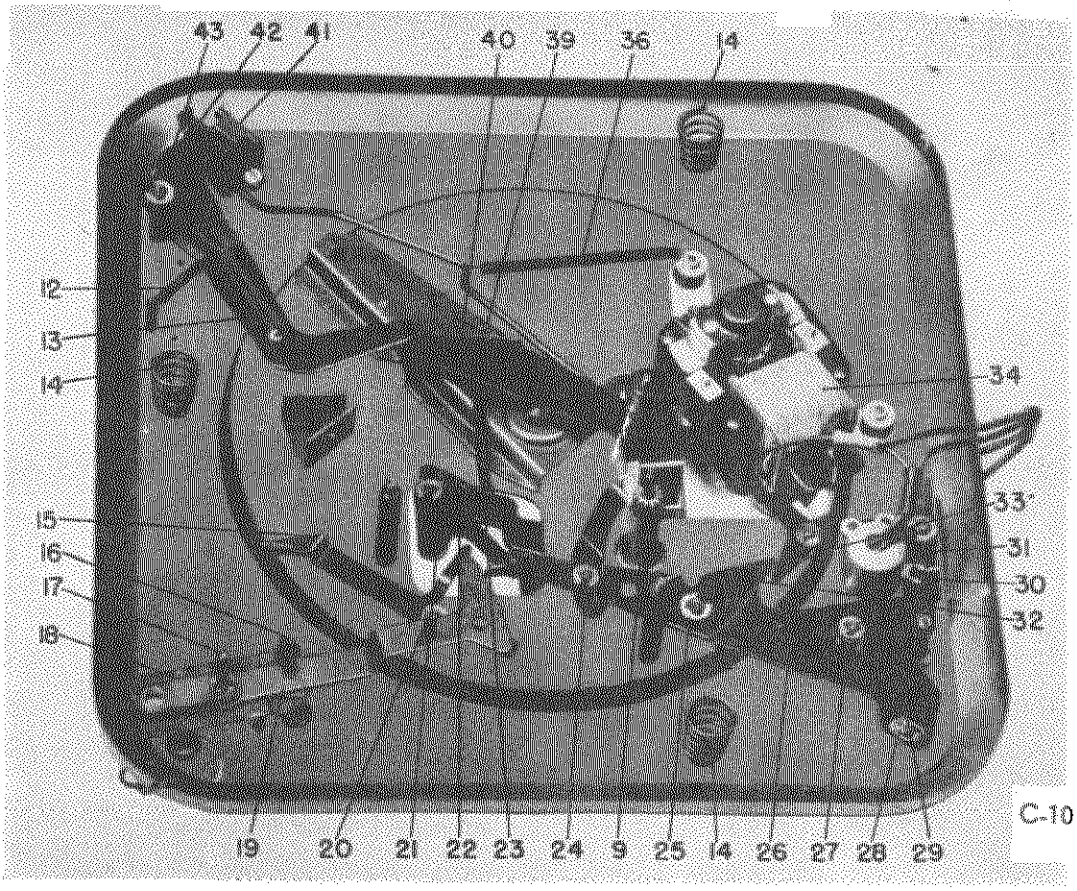
MODELS C-10, C-10M — RUSSELL ELECTRIC CO.

SERVICE AND ADJUSTMENT NOTES

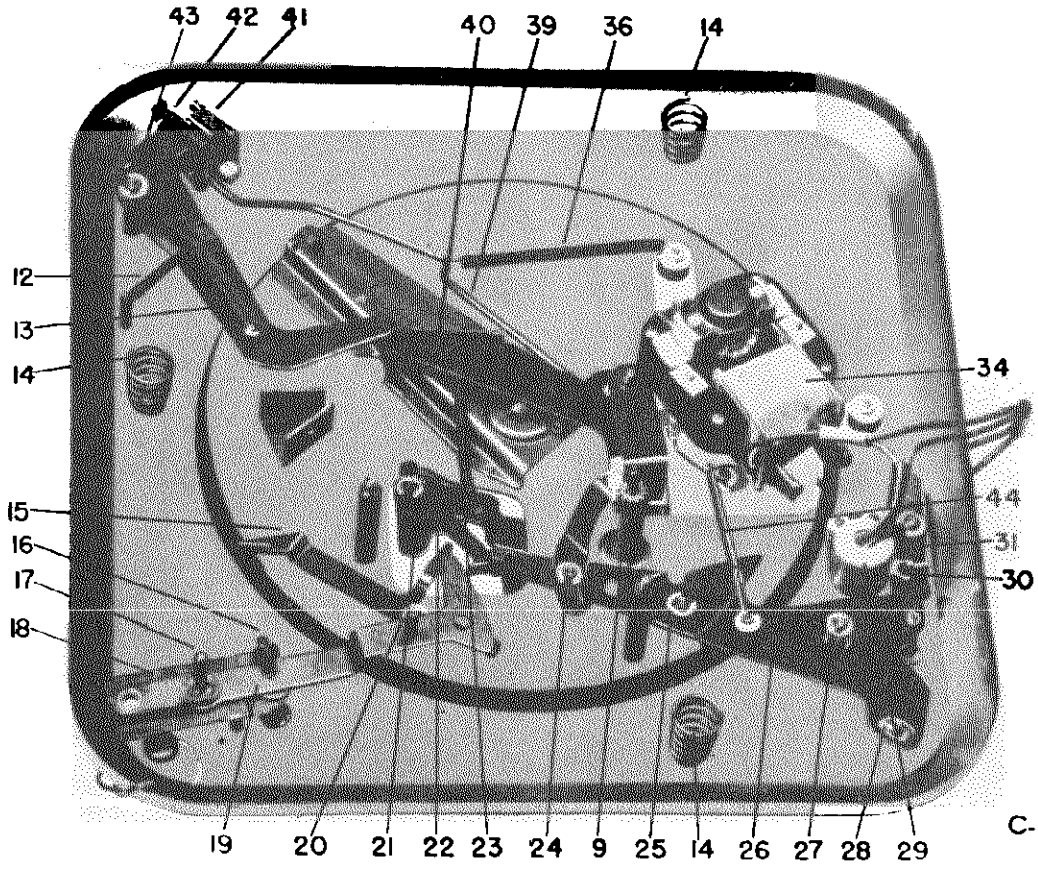
1. TONE ARM, ACTION NOT FREE	(a) Bent detent lever assembly (18). (b) Pin 20 must follow course of heavy dotted line in view of bottom of gear. (See fig. 4.). Pin must not be on other side of ridge. (c) Tone arm lead too tight.
2. TONE ARM, FAILURE TO SET DOWN PROPERLY.	(a) After completing cycle adjust lift pin screw (37) for correct height of tone arm. Bottom of tone arm should be even with top of turntable. (b) Bent tone arm lift lever. (This lever holds screw 37).
3. TONE ARM DROPS TOO FAR IN OR MISSES RECORD.	(a) Minor adjustment—Thru hole (5) in base plate near pickup arm post. Turn screw very slightly to right or left. (b) Major adjustment—Loosen lock screw 38 and slip tone arm bracket to compensate.
4. CLICKING NOISE.	(a) Missing ball retainer assembly (11).
5. FAILURE TO TRIP.	(a) Adjust screw on detent lever assembly (18). (b) Bent or loose positive tripping lever (15), or tripping lever assembly (21). (c) Defective or missing springs (22) or (23).
6. CYCLES TOO SOON OR CONTINUOUSLY.	(a) Weak spring (22).
7. RECORD JAMS BETWEEN SHELF AND SPINDLE.	(a) Bent spindle (4).
8. RECORD FAILS TO DROP FROM SHELF.	(a) Check spring (42).
9. STALLS WHEN REJECTING RECORD.	(a) Adjust idler wheel on changer drive assembly to make better contact with drum.
10. TURNTABLE SPEED SLOW OR IRREGULAR.	(a) Same as No. 9 above.
11. JERKY ACTION DURING CYCLE.	(a) Same as No. 9.
12. NO AUTOMATIC SHUT-OFF, OR FAILS TO PLAY LAST RECORD.	Broken spring No. 36. Bent rod No. 39 sticking automatic shut-off pin or hinge (41).
13. ADJUSTMENT (For C-10 Only)	If changer jams after last record is played, bend lever No. (33) about 10/1000 of an inch in direction of switch.






43
42
41
40
39
36
14
12
13
14
34
15
16
17
18
33
31
30
32
19
20
21
22
23
24
9
25
14
26
27
28
29

C-10


43
42
41
40
39
36
14
12
13
14
34
15
16
17
18
44
31
30
19
20
21
22
23
24
9
25
14
26
27
28
29

C-10M

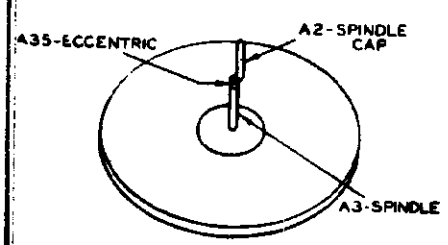


FIG. 1

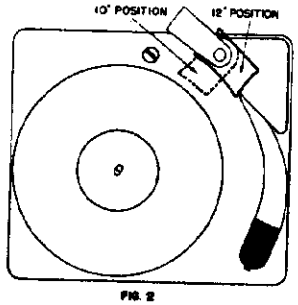
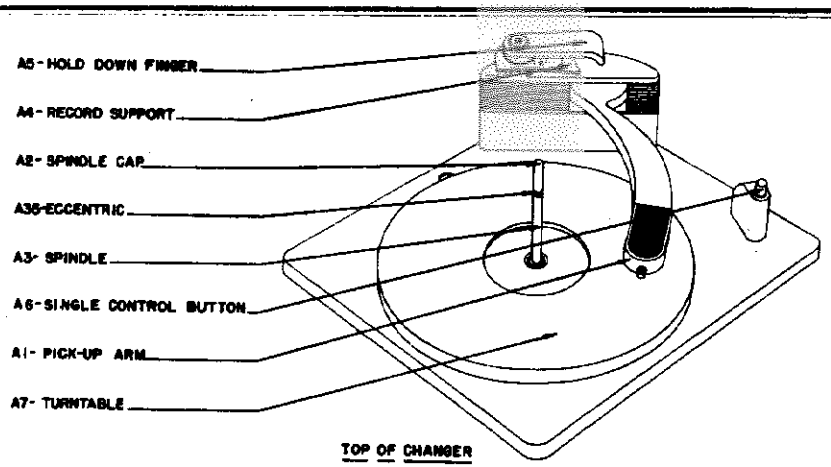
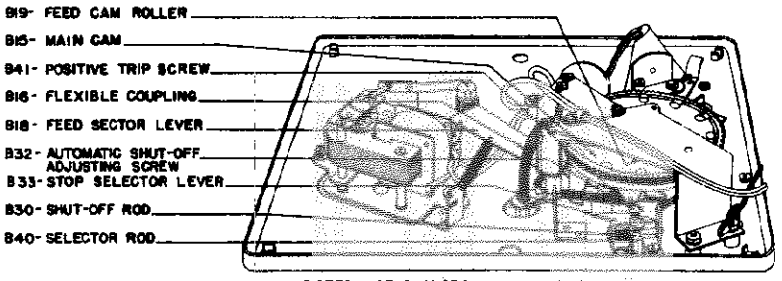
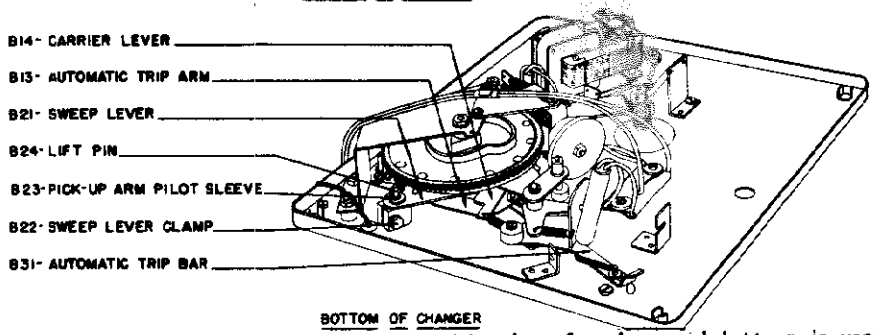


FIG. 2



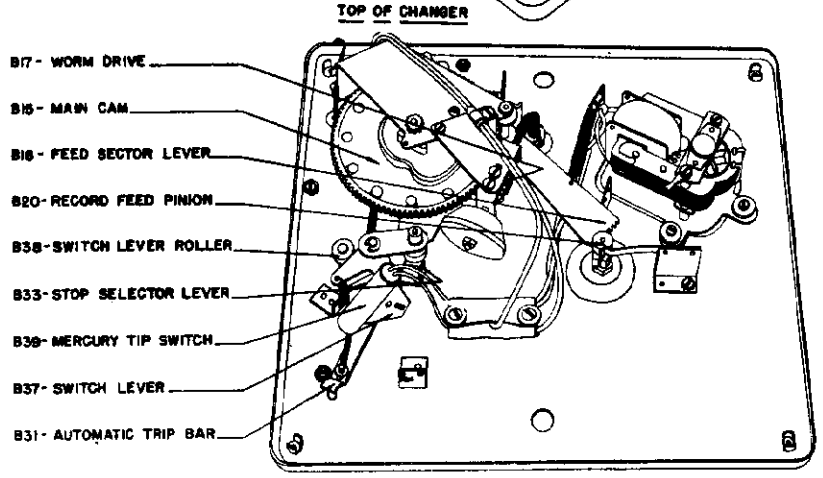


BOTTOM OF CHANGER



BOTTOM OF CHANGER

TOP OF CHANGER



BOTTOM OF CHANGER

A combination of numbers and letters is used in the illustrations and in the descriptions to facilitate locating parts in the illustrations. Parts with the prefix letter 'A' will be found in the illustration of the top of the record changer. Parts with the prefix letter 'B' will be found in the illustration of the bottom of the changer.

DESCRIPTION OF OPERATION

The Model 204 Record Changer is designed to automatically change a series of records of standard commercial dimensions, with a minimum of record wear, and to manually play any standard record up to twelve inches in diameter. The unit features Automatic Shut-off and Single Button Control.

AUTOMATIC OPERATION

Loading:

(1) Turn the Spindle Cap (A-2) until it is as completely out of line with the Spindle (A-3) as possible. (See Figure 1.)

(2) If ten-inch records are to be played, rotate Record Support (A-4) to extreme left, and for twelve-inch record operation, rotate Record Support (A-4) to extreme right, as indicated

(3) Place stack of records over Spindle Cap (A-2) and on Record Support (A-4).
NOTE: Maximum load is 12 ten-inch records or 10 twelve-inch records.
(4) Swing Hold-down Finger (A-5) so that it rests on top record.

Starting:

To start operation, press Pick-up Arm (A-1) down, thus depressing Single Control Button (A-6).

Automatic Shut-off:

After playing the last record, the Pick-up Arm (A-1) will return to rest position on the Control Button and the motor power will be automatically shut off.

Reject Records:

In order to reject a record, depress the Single Control Button (A-6)

Manual Stopping:

To discontinue operation before the Automatic Shut-off goes into effect, remove any records remaining on Record Support (A-4) and depress Single Control Button (A-6).

Unloading:

(1) Rotate Spindle Cap (A-2) until it is aligned with Spindle (A-3).
(2) Turn Hold-down Finger (A-5) aside.
(3) Lift records, tilting slightly to clear Record Support (A-4).

MANUAL OPERATION

Starting:

(1) Make sure Spindle Cap (A-2) is aligned with Spindle (A-3).
(2) Place record over Spindle (A-3) and on to turntable (A-7).
(3) Place Pick-up Arm (A-1) on outer edge of record. This will start motor.

CAUTION

(1) DO NOT bend or strain the Spindle Cap (A-2) when loading or unloading records.
(2) DO NOT force the Pick-up Arm (A-1) while in cycle.
(3) DO NOT overload the changer. The maximum load is either 12 ten-inch records or 10 twelve-inch records.
(4) DO NOT leave records on Record Support (A-4) when turning off set, or warpage of the records will result.

DESCRIPTION OF CHANGE CYCLE

The Model 204 Record Changer is an automatic cam type changer, featuring Single Button Control Automatic Shut-off and Eccentric Spindle Record Selection.

Operation

(1) Single Button Control:

Initial depression of the Single Button Control (A-6) causes a lateral motion of the Automatic Trip Bar (B-31) which in turn tilts the Mercury Tip Switch (B-39) to the CONTACT or ON position thus supplying power to the motor. The motion of the Automatic Trip Bar (B-31) causes the Carrier Lever (B-14) and its attached Drive Wheel (A-10) to come in contact with the rim of the Turntable. The consequent revolving motion of the Drive Wheel (A-10) is transmitted to the Main Cam (B-15) through a Flexible Coupling (B-16) and Worm Drive (B-17) assembly.

(2) Cycling:

A single revolution of the Main Cam (B-15) results in complete automatic cycling of the changer. This includes selection of record from stack, lifting Pick-up Arm (A-1) from rest position and setting needle on edge of record. Upon completion of the revolution, the Automatic Trip Cam (B-13) engages with the block on the Trip Lever and pulls the Carrier Lever (B-14) back to its original position so that the Drive Wheel (A-10) is no longer engaged with turntable rim.

(3) Record Feed:

The lower side of the Main Cam (B-15) controls record selection. Motion of the Feed Cam Roller (B-19) about the cam results in a backward and forward movement of the Feed Sector Lever (B-18) thus engaging the Record Feed Pinion (B-20). This in turn causes the Eccentric (A-35) to first rotate to proper position for record selection and to then return, allowing record to drop over Spindle (A-3).

(4) Pick-up Arm Movement:

The upper side of the Main Cam (B-15) controls Pick-up Arm (A-1) movement. Lift is effected by motion of the Lift Pin (B-24) along the upper horizontal face of the cam as it rotates. Direction is controlled by engagement of the Main Cam (B-15) with the Sweep Lever Pinion (B-29). The Sweep Lever (B-21) is attached to the Pick-up Arm (A-1) by means of a Clamp (B-22) around Pick-up Arm Pivot Sleeve (B-23). A boss projecting from the upper side of the Main Cam (B-15) displaces the Stop Lever (B-25) at the end of the change cycle, thus permitting the Pick-up Arm to proceed across the record.

(5) Positive Trip Action:

As the Pick-up Arm approaches the Spindle (A-3), the Sweep Lever (B-21) hits the Positive Trip Screw mounted on the Carrier-Trip Lever Assembly (B-14). This action reengages the drive wheel with the turntable rim and starts a new cycle.

(6) Pawl Trip Action:

Any reversal of the direction of the Sweep Lever (B-21) travel before positive trip action takes place causes the Sweep Lever (B-21) to push forward a Pawl mounted on the opposite side of the Trip Lever from the Positive Screw. This movement also has the effect of reengaging the Drive Wheel (A-10) to start a new cycle.

(7) Ten or Twelve-Inch Operation:

Adjusting the Record Support (A-4) to the ten-inch or twelve-inch position lowers the Selector Rod (B-40) a definite degree. The length of the extension of this rod determines the position of the Stop Selector Lever (B-33) which in turn controls the Stop Lever (B-25). The latter is the means of regulating the distance the Sweep Lever (B-21) and its attached Pick-up Arm (A-1) travel before the Pick-up Arm (A-1) is lowered to the edge of the record.

(8) Automatic Shut-off:

Release of the Record Hold-down Finger (A-5) lowers the Shut-off Rod (B-30) and forces the Stop Selector Lever (B-33) completely clear of the Stop Lever (B-25). The latter is then able to move into a position which completely blocks any forward motion of the Sweep Lever (B-21). Consequently, the Sweep Lever (B-21) cannot perform its usual function of actuating the Switch Lever (B-37). Thus, the Switch Lever Roller (B-38) remains in the path of the Stop Lever (B-25). On completion of the cycle, the Stop Lever (B-25), in returning to rest position, hits the Switch Lever Roller (B-38) and tilts the Mercury Tip Switch (B-39) to the OPEN or OFF position.

Lubrication:

No lubrication should be necessary. However, in case of squeaks or stiffness of operation, a drop of any good light machine oil on the bearings, motor, and at other pivot points should be applied. A light application of grease to the worm also might help.

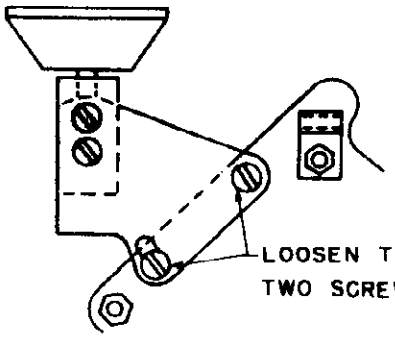


FIG. 1

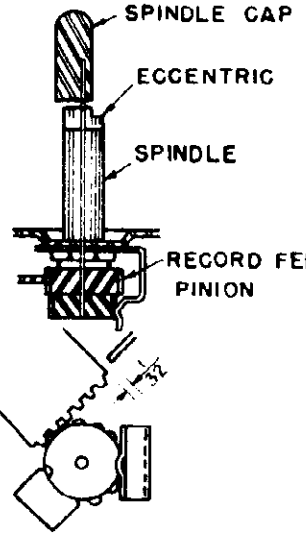


FIG. 2

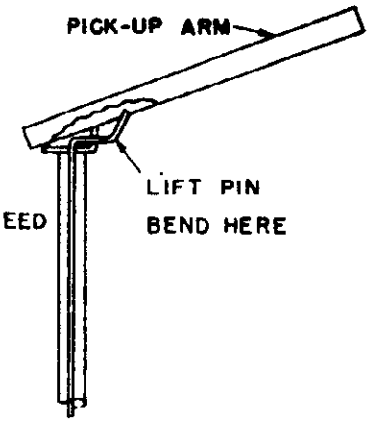


FIG. 3

SERVICE ADJUSTMENT TIPS

IF CHANGER TRIPS BEFORE COMPLETION OF THE RECORD:

Turn the Positive Trip Screw (B41) clockwise.

IF CHANGER FAILS TO TRIP AFTER COMPLETION OF THE RECORD:

Turn the Positive Trip Screw (B41) counter-clockwise.

IF THE DROP POINT OF THE PICK-UP ARM IS NOT AT PROPER POINT ON THE RECORD:

Loosen the screw on the Sweep Lever Clamp (B22) slightly and reposition the Pick-Up Arm (A1) with respect to Sweep Lever.

IF THE TURNTABLE SPEED IS LOW:

Make sure the Drive Wheel does not strike the rim of the turntable. If necessary, readjust eccentric bushing on the Drive Wheel. (NOTE: This adjustment should be exceedingly slight as a large movement may cause continous trip.)

Check for grease or oil on the Idler Wheel of the Motor and inside of turntable. Wipe with carbon techrachloride.

Check for sticky Idler Wheel plate on the Motor. Free with a screw-driver.

IF THE CHANGER STALLS IN CYCLE:

Remove any grease on the Drive Wheel or inside of turntable with carbon tetrachloride.

Check the mesh of the Worm Drive (B17) and Main Cam (B15) for proper clearance. Loosen screws on main bracket and tighten. (See Figure 1).

Check for binding in the Spindle Assembly (See Figure 2). Disassemble Index Collar and record Feed Pinion (B20), remove Spindle Cap (A2), Eccentric (A35) and Eccentric Rod.

Check for freeness and remove binds.

The following cautions should be observed in reassembling the Spindle Assembly:

(a) Reassemble with a maximum end play of .005" between Eccentric (A35) and Spindle Cap (A2).

(b) The Eccentric (A35) should be in line with the Spindle (A3) when the changer has completed its cycle.

(c) The Feed Sector Lever (B18) should mesh with the Record Feed Pinion (B20) as shown in Figure 2.

(d) Align Spindle Cap (A2) with Spindle (A3) in detent position.

IF THE RECORDS FAIL TO DROP:

Check the meshing of the Feed Sector Lever (B18) with the Record Feed Pinion (B20). Reset as shown in Figure 2.

IF THE FIRST RECORD DOES NOT PLAY:

Readjust the end of the Lift Pin (B24) so that the needle will play the first record (See Figure 3).

(NOTE: Do not bend Lift Pin (B24) too much as this will prevent playing of top record on full stack.)

Make certain that the pick-up lead does not hit the top of the Lift Pin (B24) or hinge.

IF THE AUTOMATIC SHUT-OFF FAILS TO OPERATE:

Make certain that the Automatic Shut-Off Adjusting Screw (B32) mounted on the Stop Selector Lever (B33) makes contact with the Shut-Off Adjusting Rod (B30) when the Stabilizer Finger (A5) is released. Adjust as required. Check leads on Mercury Switch (B39) for interference with the Switch Lever motion. Check Mercury Switch (B39) continuity.

IF A GRINDING NOISE OCCURS DURING THE CYCLING OPERATION:

The Worm and Main Cam Assemble are misaligned. Loosen the two small screws indicated on Figure 1; adjust the worm for closer approximation with the cam; tighten screws; lubricate worm and cam teeth.

CAUTION: It is essential to leave some play between the two parts or a definite bind will develop.

Always check through 360° movement of the cam by hand operation of the turntable before turning on the motor after an adjustment.)

IF A HIGH FREQUENCY BUZZ OCCURS DURING RECORD PLAY:

A slight burr or dust particular may be impeding the motion of the motor armature. With the motor turned on, move the armature up and down several times by hand. This will usually wear off any obstruction.

IF AUDIBLE NOISE INCREASES DURING RECORD PLAY:

The shipping bolt is secured too tightly to permit the necessary compliance between the mounting board and the record changer. Loosen the bolt slightly.

IF A METALLIC CLICKING IS HEARD DURING CYCLING:

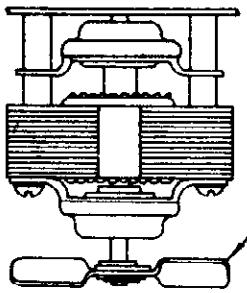
There is excess horizontal end play in the Drive Spring Assembly. Loosen the two screws indicated in Figure 1, adjust the drive assembly for approximately .010 " horizontal end play, tighten the screws and lubricate worm and cam teeth.

CAUTION: It is essential to leave at least .010 "end play or a bind will result. Always check through 360° rotation of the cam by hand operation of the turntable before turning on the motor after an adjustment.

IF A CONTINOUS BUZZING OCCURS: (EXTERNAL FAN-TYPE MOTOR ONLY)

The motor fan may be slightly bent and the pitch disturbed. Bend the fan slightly in either direction until the noise disappears.

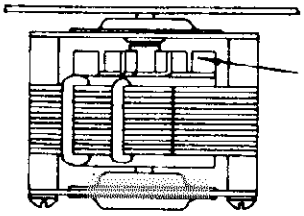
HOW TO IDENTIFY THE RECORD CHANGER MOTORS FOR CONVERSION TO 50 CYCLE OPERATION:



ALLIANCE

FAN-TWO BLADE TYPE-
ON BOTTOM OF ROTOR

USE PKG. #57311



GENERAL INDUSTRIES

FAN-BLACK OXIDIZED-
ON TOP OF ROTOR

USE PKG. #57312

ALSO MADE WITH FAN AT TOP AND BOTTOM OF ROTOR.

1. Remove the radio from the carton.

2. The record changer drawer CANNOT be opened until the shipping screws holding the record changer drawer are removed at the rear of the radio.

3. Pull the record changer drawer out as far as it will go.

4. Go to the left side of the radio and examine the motor from the underside of the record changer drawer. It may be necessary to remove a cardboard cover before the motor can be seen.

5. Compare the motor with the two illustrations above and determine the motor used. The main distinguishing points of each motor are given at the right of each illustration.

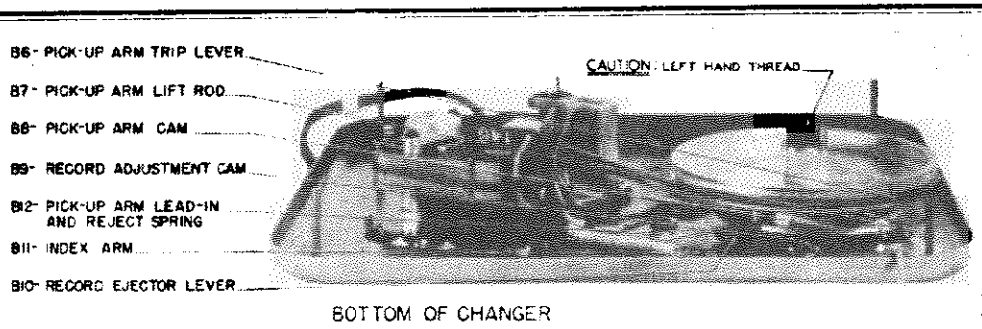
6. When the correct motor has been determined, the correct conversion spring will be found in the package identified by the part number given at the right of the motor illustration.

7. Instructions for installing the spring will be found in the envelope containing the spring.

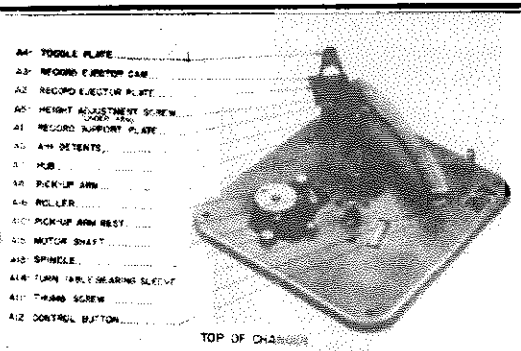
8. Before repacking the radio, secure the record changer by replacing the shipping screws at the rear of the record changer drawer.

PART NUMBER	DESCRIPTION
R59743	Arm - Pick-up - Painted
R49521	Ball Bearing Assy.
R52911	Ball - Steel
R52963	Bushing - Drive Shaft
R59737	Bushing - Record Support
R52958	Bushing - Retainer Drive
R59731	Button - Finger
R52941	Cam Assy.
R59752	Carrier & Trip Lever Assy.
R52895	Drive Shaft Assy.
R52896	Drive Spring Assy.
R52933	Eccentric Assy.
R52929	Feed Sector Assy.
R59740	Finger - Record Stab.
R59750	Grommet - Pick-up Lead
R59741	Housing - Manual Control
R52931	Indexing Collar Assy.
R59751	Indexing Spring Assy.
R59763	Lever - Starting
R59739	Lockwasher
R59772	Lockwasher
R52950	Lockwasher - Alignment Bracket
R52961	Lockwasher - Cam Lever Stud
R52960	Lockwasher - Cam Stud
R52902	Lockwasher - Drive Spring
R52894	Lockwasher - Motor
R52959	Lockwasher - Spindle
R59742	Manual Control Pin Assy.
R59785	Mercury Switch Assy. - New Style
R59744	Motor
R59745	Mounting - Vibration
R52897	Nut - Alignment Bracket
R52962	Nut - Cam Stud
R52954	Nut - Carrier Lever Stud
R52927	Nut - Spindle
R59746	Pick-up Arm Hinge Assy.
R59747	Pin - Hinge
R59749	Pin - Lift
R52926	Pinion Assy.
R59730	Record Support Housing Assy.
R52936	Retainer - Pick-up Lead
R59732	Rod - Auto. Shut-off
R52930	Roller - Feed Cam

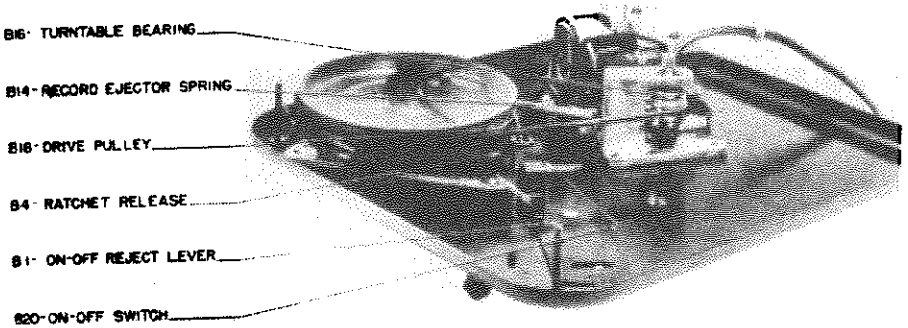
PART NUMBER	DESCRIPTION
R59733	Screw
R59776	Screw
R52910	Screw - Cartridge Att.
R59771	Screw - Drive Mech.
R52921	Screw - Record Support Stop
R59774	Screw - Self Tapping
R59775	Screw - Self Tapping
R52899	Screw - Set
R52943	Spacer - Feed Sector
R52892	Spindle Assy.
R52934	Spindle Cap Assy.
R52947	Spring - Carrier Lever
R59748	Spring - Counterbalance
R59766	Spring - Control Button
R59736	Spring - Finger
R52948	Spring - Mounting
R59764	Spring - Pull-In
R52945	Spring - Record Feed
R59765	Spring - Stop Lever
R59768	Spring - Switch Actuating
R59769	Spring - Switch Bracket Return
R59767	Spring - Trip Bar
R59760	Spacer - Motor
R59757	Stop Lever Assy.
R59759	Stop Selector Lever & Bracket Assy.
R59754	Stop Selector Rod Assy.
R52956	Stud - Carrier Lever Pivot
R59761	Support - Record
R59758	Sweep Lever Assy.
R59786	Switch Bracket Assy. - New Style
R59753	Switch Lever Assy.
R59755	Trip Bar Assy.
R59729	Turntable
R52900	Washer
R59734	Washer
R59738	Washer
R52955	Washer "C"
R59735	Washer "C"
R59777	Washer "C"
R59770	Washer - Spring
R59773	Washer - Starting Lever
R52898	Worm Assy.
R52826	Crystal Cartridge (Astatic L-70)



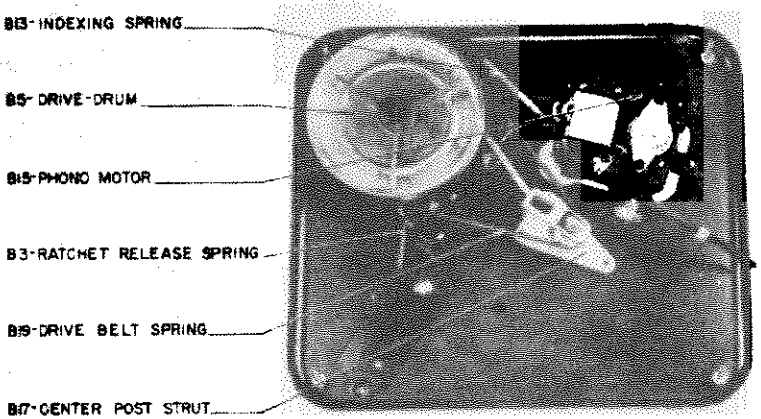
BOTTOM OF CHANGER



TOP OF CHANGER



BOTTOM OF CHANGER



BOTTOM OF CHANGER

PART NUMBER	DESCRIPTION
R52860	#4-40 Screw Hex Head Slotted (Pick-up Arm Hub)
R52848	C Balance Spring (Pick-up Arm)
R52849	Leadin and Reject Spring (Pick-up Arm)
R52850	Pick-up Arm Rest Assembly
R52851	Felt Washer (Turntable Bearing)
R52852	Spindle Assembly
R52853	On-Off Switch
R52854	Flat Washer (Turntable Bearing)
R52855	C Clip (Power Cord)
R52856	Screw-Th. Cutting #8-32x5-16 Spec. Hex Head
R52857	Screw-Th. Cutting #6-32x5-8 Hex Head & Washer (Motor Mount)
R52858	Pulley Bearing
R52859	Shoulder Rivet (On-Off Reject Lever)
R52861	Dog Ratchet Release Spring
R52862	Pick-up Arm Lift assembled to Pick-up Arm Shaft
R52863	Pick-up Arm Hub Final Assembly
R52864	Drive Drum (Machined)
R52824	Tone Arm only
R52865	Plastic Insert (Crystal Cartridge)
R52866	Screw - #4-40 Fillister Head (Crystal Cartridge)
R52823	Turntable Assembly Spun
R52867	Hair Pin Clip (Release Bracket Stud)
R52868	Speed Nut Fastener (Center Post Strut)
R52869	Slotted Headless Set Screw (Drive Pulley)
R52870	Record Ejector Cam
R52871	Cam Cover Washer (Ejector)
R52872	Washer (Release Bracket Stud)
R52873	Ball Bearing Thrust (Pulley)
R52874	Toggle Plate Bumper
R52875	Indexing Spring
R52876	Toggle Plate Spring
R52877	Record Ejector Spring
R52878	Spring Friction Pad (Cam Assembly)
R52879	Cam Stud (Left Hand Thread)
R52880	Pick-up Arm Cam with Spring
R52881	Acorn Nut (Ejector Cam)
R52882	Motor Mtg. Bushing
R52826	Pick-up Crystal - Astatic L-70
R52822	Belt-Drive
R52883	Clip-Spring (Center Post Strut)
R52760	Motor-60 cycle
R52988	Toggle Plate & Bumper Assy.

A combination of numbers and letters is used in the illustration and in the description to facilitate locating parts in the illustrations. Parts with the prefix letter 'A' will be found in the illustration of the top of the record changer. Parts with the prefix letter 'B' will be found in the illustration of the bottom of the changer.

DESCRIPTION OF OPERATION

The Model 206 Record Changer is designed to automatically change a series of records of standard commercial dimenions, with a minimum of record wear, and to manually play any standard record up to twelve inches in diameter.

AUTOMATIC OPERATION

Loading:

(1) On the Pick-up Arm Hub (A-7) are two detents marked A and H. Hold the Hub, move the Pick-up Arm (A-8) sidewise and engage the groove marked A for Automatic Operation.
(2) Adjust the Record Support (A-1) for 10 inch or 12 inch records by rotating it one-half revolution in either direction. The wide shelf is for 10 inch records, the narrower for 12 inch records.
(3) Flip the Toggle Plate (A-4), which hinges between the 10 inch and 12 inch positions on the Record Support (A-1) toward the back.
(4) Place the stack of records on the Spindle (A-13) allowing them to rest on the Record Support.
(5) Flip the Record Hold-Down Finger over on to the top of the records. This must be done to provide the necessary tension to allow the records to drop correctly.

Starting:

Push the Record Changer Control Button (A-12) to the 'ON' position. If the changing action does not start at once, push the Control Button to the 'Reject' position and release.

Reject Records:

Merely press the Control Button to the 'Reject' position and release.

Shut Off:

(1) With the Pick-up Arm (A-8) resting on a record, move the Control Button (A-12) to the 'OFF' position.
(2) Lift the Pick-up Arm and place it on its rest.

Unloading:

Flip the Toggle Plate (A-4) toward the back, away from the Spindle (A-13). The records can then be lifted from the turntable.

MANUAL OPERATION

Starting:

(1) Move the Pick-up Arm (A-8) sidewise into the detent marked H.
(2) Rotate the Record Support (A-1) to the 12 inch position.
(3) Flip the Toggle Plate (A-4) toward the back.
(4) Place the selected record over the Spindle (A-13) and down on the turntable.
(5) Move the Control Button (A-12) to the 'ON' position.
(6) Let the Pick-up Arm raise and lower. The Pick-up Arm can then be placed by hand on the starting edge of any size record.

CAUTION

(1) DO NOT force the Pick-up Arm while in cycle.
(2) DO NOT overload changer. The maximum load is either 12 ten-inch records or 10 twelve inch records.
(3) DO NOT leave records on Record Support (A-1) when turning set off, or warpage of the records will result.

DESCRIPTION OF CHANGE CYCLE

The Model 206 Record Changer is an automatic ejection lever type changer, featuring a Single On-Off Rejection Control Lever.

Operation:

(1) Single Control Lever:

Initial movement of the Control Button (A-12) to the 'ON' position turns on the Motor Power Switch (B-20) and simultaneously flips the Ratchet Release (B-4). This allows the Pick-up Arm Cam Dog (B-8) to engage the Drive Drum (B-5) bosses causing the Pick-up Arm (B-8) to rotate.

(2) Cycling:

A single revolution of the Pick-up Arm Cam (B-8) results in complete automatic cycling of the changer. This includes selection of record from stack, lifting Pick-up Arm (A-8) home position and setting stylus on lead-in groove of record. Upon completion of one revolution, the Cam Dog hits against the Ratchet Release (B-4) and is lifted to its original position, free of the Drive Drum (B-5).

(3) Record Feed:

The outer edge of the Pick-up Arm Cam (B-8) moves the Record Ejector Lever (B-10) in a horizontal direction causing the Record Ejector Plate (A-2) to move towards the spindle and return, pushing the next record off the shelf and on to the turntable.

(4) Pick-up Arm Movement:

The upper side of the Pick-up Arm Cam (B-8) controls Pick-up Arm (A-8) movement. Lift is effected by motion of the Lift Rod (B-7) along the upper edge of the cam as the latter rotates. Direction is controlled by engagement of the Pick-up Arm Cam (B-8) with the Pick-up Arm Cam Follower Stud, which guides the Pick-up Arm Trip Lever (B-6). The Pick-up Arm Trip Lever (B-6) is staked to the Hub (A-7) which controls horizontal movement of the Pick-up Arm (A-8).

At completion of cycling the Pick-up Arm Cam (B-8) comes to rest in such a position that the Pick-up Arm Cam Follower Stud has a large area for free movement permitting the Pick-up Arm (A-8) to proceed across the record.

(5) Trip Action:

As the Pick-up Arm (A-8) approaches the spindle, the eccentric groove of the record causes an oscillating action of the Pick-up Arm Trip Lever (B-6) against the Ratchet Release (B-4). This in turn releases the Pick-up Arm Cam Dog (B-8) and cycling begins.

(6) Reversal Trip Action:

Any reverse of direction of the Pick-up Arm (A-8) travel before the eccentric groove of the record is reached causes the Pick-up Arm Trip Lever (B-6) to operate the Ratchet Release (B-4) and cycling commences.

(7) Ten or Twelve Inch Operation:

Adjusting the Record Support Plate (A-1) to the ten inch or twelve inch position rotates the Record Adjustment Cam (B-9) which in turn re-sets the Pick-up Arm Cam Follower Stud, and consequently the dropping point of the Pick-up Arm (A-8).

(8) Reject Lever:

Movement of the Reject Button (A-12) during play flips the Ratchet Release (B-4) and cycling commences immediately. Thus, a record can be rejected during play.

Adjustments:

(1) A-H; Automatic and Home Recordings:

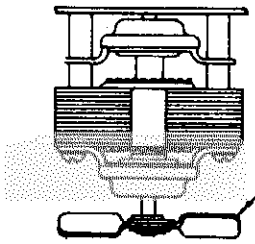
On the Pick-up Arm Hub (A-7) are two Detents (A-6). By holding Hub (A-7) and moving Pick-up Arm (A-8) sidewise, either position can be selected. Position 'A' gives us completely automatic operation with the cycling commencing as the stylus approaches within 1-7/8" of the spindle (A-13). Position 'H' moves the Pick-up Arm (A-8) inward in reference to the Pick-up Arm Trip Lever (B-6) thereby permitting the stylus to traverse nearer the spindle without tripping the cycling mechanism. This permits playing of smaller than standard recordings.

(2) Pick-up Arm Height:

If the stylus does not ride on the record or if it is not raised high enough to clear the top record of a stack this adjustment must be made. Raise Pick-up Arm (A-8) and after releasing the lock nut on the Height Adjustment Screw (A-5), rotate the screw clockwise to lower the Pick-up Arm (A-8), and counterclockwise to raise it. Be certain that locknut is then locked securely.

Lubrication:

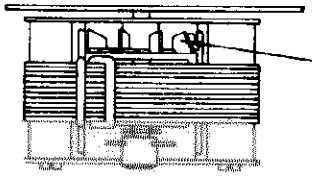
No lubrication should be necessary. However, in case of squeaks or stiffness of operation, a drop of any good light machine oil on the bearings, motor, and at other pivot points should be applied. A light application of grease to the cam also might help.



ALLIANCE

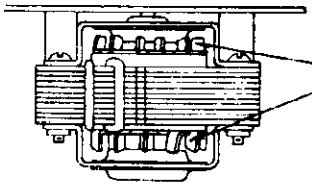
FAN-TWO BLADE TYPE-
ON BOTTOM OF ROTOR

USE PKG. #57311



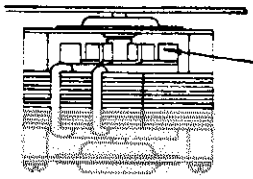
GENERAL INDUSTRIES

FAN-BLACK OXIDIZED-
ON TOP OF ROTOR
USE PKG. #57312
ALSO MADE WITH FAN AT TOP AND BOTTOM OF ROTOR.



RUSSELL MOTORS

FAN-BRASS-ON TOP AND
BOTTOM OF ROTOR.
USE PKG. #57309



SAMPSEL

FAN-CADMIUM PLATED-
ON TOP OF ROTOR.
USE PKG. #57310

HOW TO IDENTIFY THE RECORD CHANGER MOTORS FOR CONVERSION TO 50 CYCLE OPERATION.

1. Remove the radio from the carton.
2. The record changer drawer CANNOT be opened until the shipping screws holding the record changer drawer are removed at the rear of the radio.
3. Pull the record changer drawer out as far as it will go.
4. Go to the left side of the radio and examine the motor from the underside of the record changer drawer.
5. Looking at the motor from this direction will give you the same view as shown in the illustration in at the left.
6. Compare the motor with the four illustrations above and determine the motor used. The main distinguishing points of each motor are given at the right of each illustration.
7. When the correct motor has been determined, the correct conversion spring will be found in the package identified by the part number given at the right of the motor illustration.
8. Instructions for installing the spring will be found in the envelope containing the spring.
9. Before repacking the radio, secure the record changer by replacing the shipping screws at the rear of the record changer drawer.

OPERATING INSTRUCTIONS

SETTING FOR SIZE OF RECORDS: Setting of Record Support Arm (see Fig. 1) determines size of record that may be placed on the changer and may be accomplished in the following manner.

To set for 10" records grasp the Record Support Arm as shown in Fig. 1. Lift the edge closest to the Center Post and slide the entire top of the arm forward toward the center of the changer as far as it will go, (a slight pressure may be required to move it all the way). Lower Record Support Arm and it should **lock** into a level position.

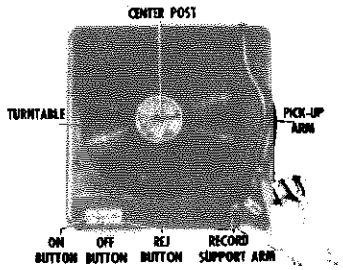


Fig. 1

To set for 12" records grasp the Record Support Arm as shown in Fig. 1. Lift the edge closest to the Center Post and slide the entire top of the arm away from the center of the changer as far as it will go. Lower Record Support Arm and it should **lock** into a level position.

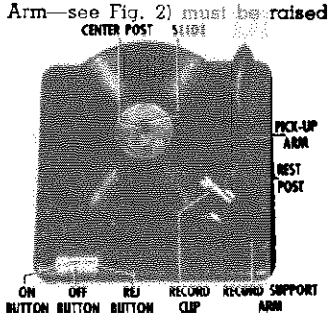
NOTE: Always be sure Record Support Arm is properly **locked** in, otherwise improper operation will result.

PICK-UP ARM AND NEEDLE: The new Stewart-Warner "Strobo-Sonic" Pick-up Arm has been designed to faithfully reproduce your records with a minimum of "surface scratch" and "needle talk." It incorporates a special "retractable" type needle which protects the needle, cartridge and record if arm is accidentally dropped or undue pressure is applied to Pick-up Arm.

Check to see that pick-up cartridge has a "floating" action. If it is ever found in a "retracted" position merely slide the cartridge until it is centrally located and it should regain its "floating" action.

A special long-life needle (good for many thousands of playings) is included with this changer. Care should be exercised to see that the point is always protruding slightly beyond the metal guard at bottom of the cartridge. Should the needle become damaged or worn, it may be removed by releasing the small set screw visible and accessible at the front of the cartridge. These needles can be purchased from your dealer by requesting Stewart-Warner Part 505717. Always insert needle in the cartridge so that flattened surface on the shaft faces the set screw. Single play steel needles or cactus needles must not be used when records are changed automatically.

PLACING RECORDS ON THE CHANGER: The Record Clip (located on the head of the Record Support Arm—see Fig. 2) must be raised until it is straight up before attempting to load records on the changer. Also check to be sure the Slide Center Post is all the way down.



Place records on the Center Post so that center of record rests on the off-set in the Center Post and outer rim of record rests on step of properly positioned Record Support Arm. Then lower the Record Clip so that it rests on the top record

The changer is capable of handling fourteen 10 inch records or twelve 12 inch records of the 78 revolutions-per-minute type. **Do not attempt to mix 10 and 12 inch records;** the records must be all one size for each loading and may consist of fewer than listed above.

STARTING THE CHANGER: Turn on the radio before attempting to start the changer and be sure that controls on radio panel are properly set for phonograph operation.

To start the changer, press down on the "ON" button. This will turn motor on and Turntable will start rotating. Then, depress the **"REJ"** button momentarily to start the changing mechanism. All records which are loaded on the changer will then be played in sequence.

CONTROLLING THE VOLUME: Use the volume control on the radio control panel to adjust the volume of the phonograph.

In event a radio station is heard when listening to the phonograph, you can eliminate this interference by turning the Tuning Control knob to a different position (select a position which is between stations).

CONTROLLING THE TONE: The tone control on radio control panel is used to select most pleasing tone.

REJECTING A RECORD: If you wish to stop playing a record and start playing the next one, merely depress the **"REJ"** button momentarily and the changer will drop the next record.

STOPPING AND UNLOADING: It is not advisable to stop the changer when it is in the process of changing a record. Wait until the Pick-up Arm lands on the record and then press down on the **"OFF"** button. The motor will then be automatically turned off and the Turntable will stop rotating. Lift the Pick-up Arm and place it on the Rest Post.

Record Clip must be raised to straight up position before removing the entire stack of records from the Turntable. Then place the fingers of both hands under opposite edges of the bottom record. Do not apply pressure to the top record with your thumbs. Lift the stack of records straight up following the contours of the Center Post.

PLAYING RECORDS MANUALLY: Standard records or home recorded records may be played individually if desired. Set the Record Support Arm in the 12" position as described in a previous section. This arrangement provides the space necessary to lower the record over the Center Post and down onto the Turntable.

After the record has been placed on the Turntable, depress the **"ON"** Button. This starts the Turntable rotating and the Pick-up Arm may then be placed on the record. When the record is finished, the mechanism will automatically start playing it over again unless the "OFF" button is depressed so as to stop the changer.

PLAYING REVERSE RECORDINGS: This record changer may be used to play records which are recorded from the center outward toward the rim. Merely proceed as described in preceding section entitled "Playing Records Manually" with the exception that the Pick-up Arm

CAUTIONS: Observe the following precautions in order to insure proper operation.

1. Never use force to stop or start the changer.
2. Never change position of Record Support Arm while changer is in cycle.
3. Always grasp Pick-up Arm at sides, never under the cartridge, as that may force cartridge to remain in the "retracted" position. Should this happen, merely slide cartridge until it is centrally located and it should regain its floating action.
4. Never leave the Pick-up Arm and needle resting on a record when radio is turned off.
5. Be sure Record Support Arm is properly locked in a level position otherwise improper operation results.
6. Be sure that Slide in Center Post is all the way down.
7. Do not leave records on the supports for an extended period of time as they may warp.
8. Exercise care not to bend the Center Post.

DESCRIPTION OF CYCLE

In order to observe the operation of the changer mechanism, it will be necessary to remove the Turntable. This may be accomplished by taking out the three small Screws located on top of the Turntable near the Center Post. Changer may now be put thru its cycle by first depressing the "REJ" Button and then manually rotating the bushing to which the Turntable was formerly attached.

FUNCTION	EXPLANATION
STARTING (Fig. 3) Depressing "ON" Button (1).	1. Turns Power Switch (5) on. 2. Motor (6) operates Idler Wheel (7) to rotate Turntable. 3. Turntable rotates Clutch and Turntable Shaft (8).
CYCLING Depressing "REJ" Button (3).	1. Actuates Reject Link (10). 2. Moves Reject Arm (11). 3. Disengages Reject Lever (13) from Clutch Arm (15), allowing arm to contact rotating Clutch and Turntable Shaft (8) which starts the entire mechanism thru its change cycle.
Function of Pinion Gear (17).	1. Rotates Main Drive Gear (18). 2. Top Drive Roller (19) actuates Main Slide (20).
DISPLACEMENT OF A RECORD (Fig. 4) Record Selection.	1. Main Slide (20) moves toward right rear corner of changer. 2. Ejector Roller (22) engages a notch in Ejector Arm (23) and moves this arm plus Ejector Link (24) as well as attached Ejector Lever (26). 3. Ejector Lever (26) engages with a slotted hole in Channel (27) and moves attached Record Support Arm (29) away from Center Post (32). This movement allows bottom record of a stack to drop from the second step on Record Support Arm (29) to the first step.
Record Ejection.	1. Main Slide (20) now reverses its direction and proceeds toward left front corner. 2. Attached Ejector Roller (22) moves Ejector Arm (23) plus Ejector Link (24) and Ejector Lever (26). 3. Ejector Lever (26), which engages a slotted hole in Record Support Channel (27), moves attached Record Support Arm (29) toward the Center Post (32). This movement pushes bottom record until it clears the off-set in the Center Post (32) and drops down to the Turntable.
MOVEMENT OF PICK UP ARM (Fig. 5) Raising Pick-up Arm (43).	1. When Main Slide (20) moves toward right rear corner, Lift Roller (39) engages and pushes Lift Lever (40) down. 2. Lift Lever (40) actuates Lift Rod (41) which in turn causes Pick-up Arm (43) to rise. 3. Height of Pick-up Arm may be changed by shifting the Height Adjustment Screw (44).
Lateral motion of Pick-up Arm (43) toward Center Post (32).	1. When Main Slide (20) reverses its dircetion and moves toward left front corner of changer, Return Slide (48) pulls on Stud (49) which is a part of the Link Assembly (50). Since the Link Assembly is attached to Follower Arm and Pick-up Shaft (51), it controls the approach of the Pick-up Arm (43) to the record. 2. Set down point of Pick-up Arm may be changed by shifting the Horizontal Adjustment Screw (54).

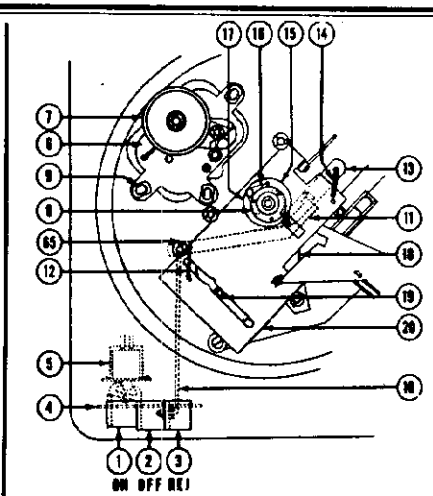


Fig. 3

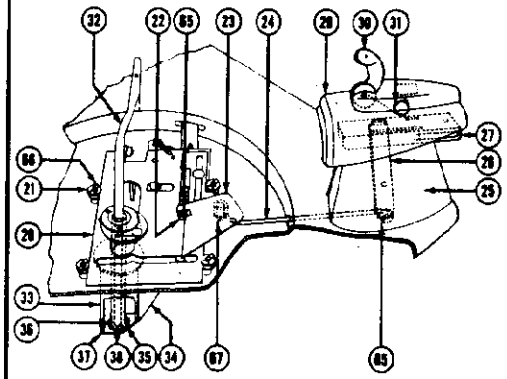


Fig. 4

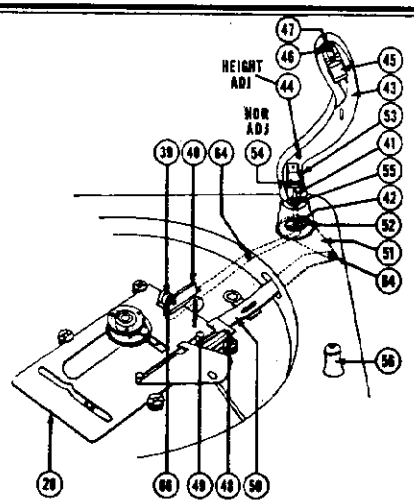


Fig. 5

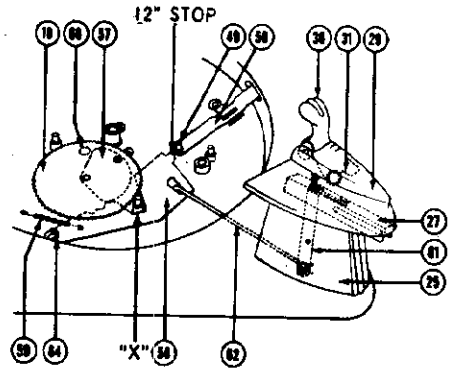


Fig. 6

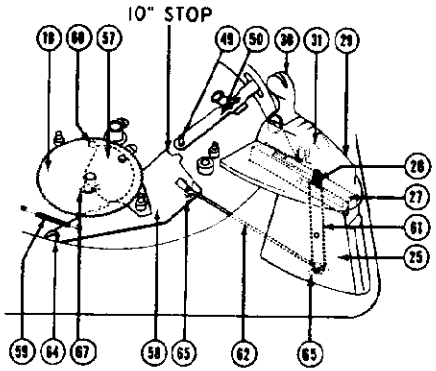


Fig. 7

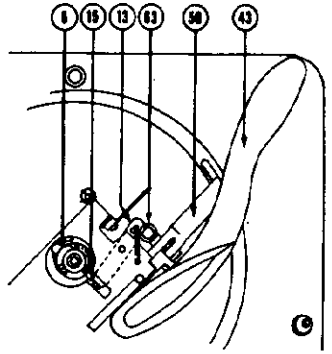


Fig. 8

Lowering Pick-up Arm (43) to the record.

1. When Main Slide (20) has almost reached its front left position, Lift Roller (39) disengages Lift Lever (40).
2. This releases the upward pressure on Lift Rod (41) and allows Pick-up Arm (43) to set down on the record.

SETTING FOR DESIRED RECORD SIZE
Record Support Arm (29) set to 12" position.
(Fig. 6)

1. When changer starts to cycle, Cam (57) under Main Drive Gear (18) actuates the Index Plate (58).
2. Index Plate (58) moves toward center of changer until it contacts lower right roller stud (see point "X" in Fig. 6).
3. Projection on end of Index Plate (58), designated as the "12 STOP," is now directly in the path of Stud (49) on Link Assembly (50).
4. As Pick-up Arm approaches record it moves Link Assembly (50) and attached Stud (49) until the stud comes in contact with the "12" STOP" (see Fig. 6)—this determines the correct set-down point of Pick-up Arm for 12" records.
5. After Pick-up Arm is lowered to the record, then Bottom Drive Roller (60) under Main Drive Gear (18) displaces the Index Plate (58) so that "12" STOP" projection disengages Stud (49) and permits Pick-up

Record Support Arm (29) set to 10" position. (Fig. 7)	1. When Record Support Arm (29) is shifted to this position it moves Channel (27) which actuates Index Lever (61). That allows Index Link (62) to control the 10" setting of Index Plate (58). 2. When the changer starts to cycle, Index Plate (58) moves toward center of changer until it is stopped by Index Link (62). 3. Notch at end of Index Plate (58), designated as the "10" STOP," is now in the path of Stud (49) on Link Assembly (50). 4. As Pick-up Arm approaches record it moves Link Assembly (50) and attached Stud (49) until the stud comes in Contact with the "10" STOP" (see Fig. 7)—this determines the correct set-down point of Pick-up Arm for 10" records. 5. After Pick-up Arm is lowered to the record, then Bottom Drive Roller (60) under Main Drive Gear (18) displaces the Index Plate (58) so that the "10" STOP" disengages Stud (49) and permits Pick-up Arm to proceed across the record.
CHANGING A RECORD (Fig. 8) Pick-up Arm (43) approaches end of record.	1. Trip Roller (63) on Link Assembly (50) approaches and moves Reject Lever (13) so that this lever releases Clutch Arm (15). 2. As Clutch Arm (15) is released, it engages the rotating Clutch and Turntable Shaft (8) which starts the entire mechanism thru its change cycle.
REJECTING A RECORD Depressing "REJ" Button (3).	1. This starts the change cycle as described above under "CYCLING" and permits the next record to be played.
STOPPING Depressing "OFF" Button (2).	1. Turns Switch (5) to off position and Motor (6) stops.

PARTS LIST

DIAG. NO.	PART NO.	DESCRIPTION
1	505947	"ON" Button
2	505948	"OFF" Button
3	505949	"REJ" Button
4	505950	Push Button Shaft
5	505758	Switch—"ON-OFF"
6	505758	Motor 115V; 60 cyc.
	505750	Motor 115V; 50 cyc.
7	505951	Idler Wheel
8	505952	Clutch and Turntable Shaft
9	505953	Clip—Motor Mounting
10	505954	Reject Link
11	505955	Reject Arm
12	505956	Reject Arm Spring
13	———	Reject Lever (part of item 20)
14	505957	Reject Lever Spring
15	———	Clutch Arm (part of item 17)
16	505958	Clutch Arm Spring
17	505959	Pinion Gear (includes Clutch Arm and Clutch Arm Spring)
18	505960	Main Drive Gear
19	505961	Top Drive Roller
20	505962	Main Slide (includes Reject Lever, Ejector Roller, Reject Lever Spring, Lift Roller, and Return Return Slide)
21	505963	Main Slide Roller
22	505964	Ejector Roller
23	505965	Ejector Arm
24	505966	Ejector Link
25	505967	Record Post Assembly (includes Eject Lever, Index Lever, Channel and Channel Spring)
26	———	Ejector Lever (part of item 25)
27	———	Channel (part of item 25)
28	505968	Channel Spring
29	505969	Record Support Arm (includes Record Clip and Record Clip Spring)
30	———	Record Clip (part of item 29)
31	———	Record Clip Spring (part of item 29)
32	505970	Center Post
33	505971	Turntable Main Bearing
34	505972	Main Bearing Bracket

DIAG. NO.	PART NO.	DESCRIPTION
35	505973	Ball Bearing Retainer
36	505974	1/8" Ball Bearings
37	505975	Center Post Support Plate
38	505976	Screw—#4-40 x 3/16"
39	505977	Lift Roller
40	505978	Lift Lever
41	505979	Lift Rod
42	505980	Lift Rod Spring
43	505981	Pick-up Arm (less Cartridge)
44	———	Height Adjustment Screw (part of item 43)
45	505100	Crystal Cartridge (includes needle)
46	505717	Needle
47	505716	Set Screw for Needle
48	———	Return Slide (part of item 20)
49	———	Stud (part of item 50)
50	505982	Link Assembly (includes Trip Roller)
51	505983	Follower Arm and Pick-up Shaft
52	505984	Index Spring
53	505985	Pick-up Hinge Assembly
54	———	Horizontal Adjustment Screw (part of item 53)
55	505986	Set Screw
56	505987	Rest Post
57	———	Cam (part of item 18)
58	505988	Index Plate
59	505989	Index Plate Spring
60	505990	Bottom Drive Roller
61	———	Index Lever (part of item 25)
62	505991	Index Link
63	———	Trip Roller (part of item 50)
64	505992	Shoulder Bushings
65	505993	1/8" Spring Clip
66	505994	3/16" Spring Clip
67	505995	1/4" Spring Clip
	505996	Turntable
	505976	Screw—#4-40 x 3/16" for Turntable
	500968	Plug for Phono. Pick-up Cable
	501031	Plug for Phono. Motor Cable
	505997	Rubber Bushing for Mtg. Record Changer
	505998	Screw for Mtg. Record Changer
	505999	Spring for Mtg. Record Changer

TROUBLE SHOOTING CHART

SYMPTOM	CAUSE	REMEDY
Turntable fails to start after depressing "ON" Button (1).	1. No Power.	Check to determine if there is power at the wall outlet by disconnecting radio power cord and connecting a lamp to same outlet.
	2. Idler Wheel (7) not engaging Turntable.	Check to see that pivot lever under Idler Wheel (7) is free. Also be sure that spring which pulls Idler Wheel (7) toward Turntable is hooked to motor frame and has sufficient tension.
	3. Defective Switch (5).	Check continuity across switch contacts. Replace switch if necessary.
	4. Defective Motor.	Check and replace if necessary.
	5. Binding in changer mechanism.	For analysis of fault see symptom entitled "Changer Stops While Changing a Record."
Changer refuses to cycle after depressing "REJ" Button (3).	1. Reject Link (10) unhooked.	Reconnect as shown in Fig. 3.
	2. Bent Reject Arm (11).	Reject Arm (11) must be flush with record changer base plate. Bent-up end of Reject Arm (11) should contact a projection on Reject Lever (13) when the Reject Button is depressed. Straighten Reject Arm so that it operates freely and properly engages Reject Lever.
	3. Clutch Arm (15) not engaging Clutch and Turntable Shaft (8) when released by Reject Lever (13).	Check for broken, loose or missing Clutch Arm Spring (16). Replace or rehook this spring as shown in Fig. 3. Also note whether Clutch and Turntable Shaft (8) is seated so that Clutch Arm (15) engages clutch teeth. Hold Clutch Arm (15) away from Center Post and allow Clutch and Turntable Shaft (8) to drop all the way down. Then tighten Center Post Screw (38) located at bottom of changer. Center Post (32) should have at least .050" end play when this screw is tight.
Changer stops while changing a record.	1. Grease on Idler Wheel (7) or Turntable rim.	Clean with carbon tetrachloride.
	2. Idler Wheel (7) not engaging Turntable properly.	Check to see that pivot lever under Idler Wheel (7) moves freely. Also be sure that spring which pulls Idler Wheel (7) toward Turntable is properly engaged and has sufficient tension.
	3. Binding in changer mechansim.	Remove the three screws located on top of the Turntable near the Center Post (32) so that Turntable may be lifted off. Then depress "REJ" Button (3) and rotate Clutch and Turntable Shaft (8) **clockwise** by hand. Check all parts for binding action. Be sure Main Slide Rollers (21) are free.
	4. Binding between shoulder on Center Post (32) and top surface of Turntable Shaft (8).	There should be at least .005" end play in Center Post (32). Pinion Gear (17) and Clutch and Turntable Shaft (8) should be pushed down as far as possible and be sure that they are not binding against surrounding parts.
	5. Low line voltage.	Line voltage should not be less than 100 volts.
	6. Operating temperature too low.	If the changer has been stored in a cold room, the Turntable speed may be slower than normal.
	7. Weak Motor (6).	If, after checking the above six items, the changer continues to stall, it may be assumed that the Motor (6) has low torque and should be replaced.
Changer cycles continuously.	1. Reject Lever Spring (14) unhooked, broken or miss-	Rehook or replace Reject Lever Spring (14) in correct position as shown in Fig. 3.

	2. Binding of reject mechanism so that Reject Lever (13) fails to engage and hold Clutch Arm (15).	Remove any binding between the following parts: "REJ" Button (3), Reject Link (10), Reject Arm (11) and Reject Lever (13). Check for burrs on contacting surfaces at bent-up portion of Reject Arm (11) and bent-down projection of Reject Lever (13).
	3. Pinion Gear (17) improperly set in respect to Main Drive Gear (18).	To obtain correct setting of these gears, refer to section entitled "Timing Adjustment of Pinion Gear" on Page 8.
Record fails to drop off of Support Arm at correct time during the change cycle.	1. Record Support Arm (29) improperly "locked" in 10" or 12" position.	Be sure Record Support Arm (29) is properly set as outlined in the section entitled "Setting For Size of Records" on Page 1. Care should be exercised that Record Support Arm (29) **"locks" in a level position.**
	2. Record size not standard.	A standard 10" record has a diameter of 9-7/8" ± 1/32" and a standard 12" record has a diameter of 11-7/8" ± 1/32".
	3. Ejector mechanism bent or loose.	Check for bent, loose or unhooked Ejector Link (24). Ejector Arm (23) should, at all times, contact Ejector Roller (22) on Main Slide (20); see Fig. 4 for location of these parts.
	4. The distance from Center Post (32) to Record Support Arm (29) is incorrect.	Using a **new** and **standard** record as a gauge, place it so that it rests on the off-set of the Center Post (32) and edge is at the **top step** of Record Support Arm (29). There should be a clearance of 1/32" between edge of record and back of this step. If that clearance is insufficient, loosen the three screws holding the Record Post Assembly (25) at base of changer and move the entire Record Post Assembly away from the Center Post. Be sure that Record Support Arm (29) is so placed that the curvature of the step matches the curve of the record—both corners of the Arm must be equidistant from the edge of the record. Recheck to see that clearance has been maintained after screws are retightened.
Multiple dropping of records OR Records drop at wrong time and land on Pick-up Arm.	1. Hole in record too large.	Records with badly worn center hole should be discarded.
	2. Slide in top of Center Post (32) has failed to return to its lowest position.	Clean out any foreign matter that might prevent free movement of slide at top of Center Post.
	3. The distance from Center Post (32) to Record Support Arm (29) is incorrect.	Using a **new** and **standard** record as a gauge place it so that record rests on off-set in the Center Post and edge rests on **top step** of Record Support Arm. There should be a clearance of 1/32" between edge of record and back of top step. If this clearance is insufficient loosen the three screws holding the Record Post Assembly (25) at base of the changer and move the entire Record Post Assembly toward the Center Post. Be sure that Record Support Arm is so placed that the curvature of the step matches the curve of the record—both corners of the arm must be equidistant from the edge of the record. Recheck to see that clearance has been maintained after screws are retightened.
Pick-up Arm (43) fails to move during change cycle.	1. Lift Lever (40) bent so that it fails to engage Lift Rod (41).	Straighten tip of Lift Lever (40) so that it contacts and actuates the Lift Rod (41) during the change cycle. (See Fig. 9).
	2. Binding between Pick-up Arm Hinge Assembly (53) and hub.	There should be from .005" to .010" end play between Pick-up Arm Hinge Assembly (53) and the hub on base plate. Loosen Set Screw (55) and adjust for proper clearance. If necessary, readjust set-down point by means of Horizontal Adjustment Screw (54).
	3. Return Slide (48) is too loose.	Return Slide (48) must have enough tension to pull Link Assembly (50) to the proper stop position. If it is too loose it will be necessary to replace the entire Main Slide (20). For a description of the function of these parts see section entitled "Lateral Motion of Pick-up Arm toward Center Post" on Page 2.
	4. Stud (49) binding against Ejector Arm (23).	There should be about 1/32" clearance between top of Stud (49) and bottom of Ejector Arm (23) when the Stud passes under the arm. Bend Ejector Arm (23) to provide this clearance.

Pick-up Arm and Needle fail to contact first record.	1. Height of Pick-up Arm (43) is incorrectly set.	With changer mechanism in normal playing position, turn Height Adjustment Screw (44) **counter-clockwise** (see Fig. 5) until Pick-up Arm lands properly on first record.
	2. Leads to Crystal Cartridge are tightly drawn causing binding of Pick-up Arm.	Be sure electrical leads to Crystal Cartridge (45) have sufficient slack to allow Pick-up Arm (43) to move freely.
Top of Pick-up Arm (43) striking Record Support Arm (29) or stack of records while changer is cycling.	1. Height of Pick-up Arm (43) is incorrectly set.	When Pick-up Arm is elevated to the highest point during the change cycle, turn Height Adjustment Screw (44) **counter-clockwise** (see Fig. 5) until Pick-up Arm clears Record Support Arm (29).
Needle strikes edge of record as Pick-up Arm approaches set-down point OR Arm strikes Rest Post during change cycle.	1. Height of Pick-up Arm is incorrectly set.	With Pick-up Arm in the position where it is approaching a full stack of 12 ten inch records, turn Height Adjustment Screw (44) **clockwise** (see Fig. 5) until Needle clears edge of top record.
Pick-up Arm (43) sets down at wrong starting point on record.	1. Crystal Cartridge (45) off center in its mounting bracket.	Slide Cartridge (45) until it is centrally located in the supporting bracket at front of Pick-up Arm (43).
	2. Incorrect adjustment of set-down point.	With the changer turned off, depress the "REJ" Button (3) and rotate Turntable by hand until needle approaches its set-down point. Then, insert a screwdriver in the hole at rear of Pick-up Arm (43) and turn Horizontal Adjustment Screw (54) clockwise to move arm away from Center Post or counter-clockwise to move arm towards Center Post (see Fig. 5 for location of this adjusting screw). Should it be found that Pick-up Arm (43) cannot be moved sufficiently by the foregoing adjustment, it will be necessary to loosen Set Screw (55) and reposition the Pick-up Arm Hinge Assembly (53) on Pick-up Shaft (51). Fine adjustment can then be made by turning Horizontal Adjustment Screw (54) until Pick-up Arm has reached the desired point. CAUTION: When tightening Set Screw (55) be sure that there is from .005" to .010" end play between Pick-up Arm Hinge Assembly (53) and hub on base plate.
	3. Index Plate Spring (59) broken, loose or missing.	Rehook or replace Index Plate Spring (59).
Pick-up Arm (43) sets down in the 10" position when playing 12" records.	1. Record Support Arm (29) improperly "locked" in the 12" position.	Be sure Record Support Arm (29) is properly set for 12" operation as outlined in the section entitled "Setting for Size of Records" on Page 1. Care should be exercised that Record Support Arm (29) **"locks" into a level position.**
	2. Bent Index Link (62).	Straighten Index Link (62) so that Index Plate (58) is in the position shown in Fig. 6 with notch in plate **at point "X"** resting against stud of slide roller.
Pick-up Arm (43) sets down in 12" position when playing 10" records.	1. Record Support Arm (29) improperly "locked" in 10" position.	Be sure Record Support Arm (29) is properly set for 10" operation as outlined in the section entitled "Setting for Size of Records" on Page 1. Care should be exercised that Record Support Arm (29) is pushed towards the Center Post as far as it will go and **"locks" into a level position.**
	2. Index Link (62) is too long.	Bend Index Link (62) so that Index Plate (58) is in the position indicated by the title "10" Stop" in Fig. 7. CAUTION: Care should be exercised not to bend Index Link too much as it might cause Pick-up Arm to set

Pick-up Arm does not set down at same position consistently.	1. Plates at base of Pick-up Shaft (51) fail to return to position where notches coincide.	Remove any burrs on edge of plates at bottom of Pick-up Shaft (51) so that Index Spring (52) will return these plates to the position where the notches in each coincide as shown in Fig. 9.
	2. Index Spring (52) broken, improperly hooked or missing.	Rehook or replace as shown in Fig. 9.
	3. Binding between Pick-up Arm Hinge Assembly (53) and hub.	There should be from .005" to .010" end play between Pick-up Arm Hinge Assembly (53) and the hub on the base plate. Loosen Set Screw (55) and adjust for proper clearance. If necessary, readjust set-down point by means of Horizontal Adjusting Screw (54).
	4. Excess play in Pick-up Arm Link Assembly (50).	There should be no appreciable play between Link Assembly (50) and Follower Arm (51) at point of attachment If necessary, replace Shoulder Bushing (64).
Improper "tracking" of needle with record—needle slips out of grooves and skips portions of record.	1. Foreign matter in record grooves.	Clean record with record brush or soft camel hair brush.
	2. Badly worn record.	Examine record for scratches that may have destroyed continuity of grooves.
	3. Needle (46) may not be properly protruding from metal guard at bottom of Crystal Cartridge (45).	Bend Needle (46) downward until the tip protrudes 1/32" beyond metal guard at base of cartridge.
	4. Badly worn needle (46).	Examine needle for worn tip and replace if necessary. To remove the old Needle (46) release the small set screw visible and accessible at front of the cartridge. When installing a new needle, always insert it in the cartridge so that flattened surface on its shaft faces the set screw.
	5. Crystal Cartridge (45) locked in a retracted position.	Shift position of Crystal Cartrige (45) until it is centrally located in its mounting bracket. This will allow the cartridge to regain its "floating" action.
	6. Stud (49) binding against Ejector Arm (23).	There should be about 1/32" clearance between top of Stud (49) and bottom of Ejector Arm (23) when the stud passes under the arm. Bend Ejector Arm (23) to provide this clearance.
	7. Binding between Pick-up Arm Hinge Assembly (53) and hub.	There should be from .005" to .010" end play between Pick-up Arm Hinge Assembly (53) and the hub on base plate. Loosen Set Screw .005" end play when this screw is tight.
Changer cycles before record is finished playing.	1. Trip (63) engages Reject Lever (13) too early.	When the Needle is 1 3/4" away from the edge of Center Post (32), Trip (63) should start to engage Reject Lever (13) thus releasing Clutch Arm (15) which permits changer to cycle. See Fig. 8 for relative position of parts. If trip point occurs too early, loosen the two screws holding trip (63) and move it in a direction away from the Center Post. Then, retighten screws.

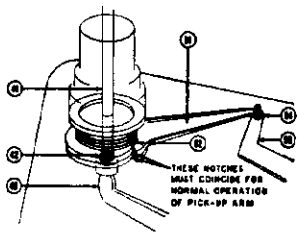


Fig. 9

Changer fails to cycle after playing a record.	1. Trip (63) does not properly engage Reject Lever (13) when Pick-up Arm reaches end of record.	When the Needle is 1 3/4" away from the edge of Center Post (Trip (63) should start to engage Reject Lever (13) thus releasing Clu Arm (15) which permits changer to cycle. See Fig. 8 for relative posit of parts. If trip fails to engage Reject Lever, loosen the two screws ho ing Trip (63) and move it toward the Center Post. Then, retighten scre
	2. Clutch Arm (15) not engaging Clutch and Turntable Shaft (8) when released by Reject Lever (13).	Check for broken, loose or missing Clutch Arm Spring (16). Replace rehook as shown in Fig. 3. Also note whether Clutch and Turntc Shaft (8) is seated so that Clutch Arm (15) engages clutch teeth. H Clutch Arm (15) away from Center Post and allow Clutch and Turntc Shaft (8) to drop all the way down. Then tighten Center Post Screw located at the bottom of changer. Center Post should have at le .005" end play when this screw is tight.
Slow Turntable speed.	1. Grease on Idler Wheel (7) or Turntable rim causing slipping.	Clean surfaces with carbon tetrachloride.
	2. Idler Wheel (7) not properly engaging Turntable.	Check to see that pivot lever under Idler Wheel (7) is free. Also be s that spring which pulls Idler Wheel (7) toward Turntable is hooked motor frame and has sufficient tension.
	3. Binding at Clutch and Turntable Shaft (8).	Remove Turntable and check for binding of shaft. Also check clearar between shaft and shoulder of Center Post. There should be at le .005" end play between Center Post Shoulder and Turntable Shaft. sure that Pinion Gear (17) and Clutch and Turntable Shaft (8) are pusl down as far as possible.
	4. Line voltage is too low.	Line Voltage should not be less than 100 volts.
	5. Operating temperature too low.	If the changer has been stored in a cold room, the Turntable sp may be slower than normal.
	6. Faulty Motor.	If, after checking the above five items, Turntable speed is still too sl then it may be assumed that the Motor is at fault and should be replac
Rumble or "wow".	1. Changer not floating freely on its mounting springs.	Be sure the three hold-down screws used for mounting the chan have been loosened sufficiently to allow the entire unit to float fre
	2. Improper motor mounting.	Be sure that Motor (6) is mounted on rubber bushings.
	3. Worn tire on Idler Wheel (7).	Examine Idler Wheel for flat spots on tire and replace entire whee required.
Noisy Operation.	1. Clicking noise resulting from incorrect timing of Pinion Gear (17).	To obtain correct setting of Pinion Gear, refer to section entitled "Tim Adjustment of Pinion Gear" on Page 8.
	2. Lack of lubricant.	See "Lubrication" on Page 8.
	3. Binding at some point in changer mechanism.	Remove Turntable and depress "REJ" Button (3). Then, rotate Clutch Turntable Shaft (8) **clockwise.** Observe action of mechanism to loc components that are causing binding and attendant noise.

PROCEDURES FOR REMOVAL AND REPLACEMENT OF MAJOR PART

NAME OF ITEM	METHOD OF REMOVING OR REPLACING
Crystal Cartridge (45).	To remove this part, hold Pick-up Arm in a vertical position and grasp Crystal Cartridge (45) near the fr Then push the cartridge down toward rear of Pick-up Arm (43) and, at the same time, pull it away f the arm. Do not attempt to unsolder lead connections—merely slip the "quick disconnect" electrical c nectors off of prongs at rear. To replace a cartridge, insert it in the arm so that flat spring hooks over lip of mounting bracket. Tl pull it outward slightly and at the same time pull forward until the two ears on the bracket fit into "V" groove in the body of cartridge. Be sure cartridge is centrally located and has a "floating acti Also be sure that needle protrudes 1/32" beyond metal guard.
Needle (46).	To remove the Needle, loosen small Set Screw (47) visible and accessible at front of cartridge. A Needle may be installed by inserting it so that flattened side of shaft faces the set screw.
Pick-up Arm (43).	To remove the Pick-up Arm, disconnect leads from crystal cartridge as described above. Then use a scr driver to disengage flexible ends of hinge at the pivot point. Replacement of the Arm is accomplished re-engaging the hinge at the same point.
Follower Arm and Pick-up Shaft (51).	To remove this part, take out screw that holds Lift Lever (51) to bracket at base of changer. Lift Rod will then drop out—be careful not to lose Lift Rod Spring (42). Remove screw that holds Link Assembly to Follower Arm and loosen Set Screw (55). Entire Follower Arm assembly may then be withdrawn bottom of changer. To replace the arm, apply the reverse procedure.
Record Support Arm (29	This part is held in place by two screws located in Record Support Channel (27) which is located immedic below the Record Support Arm (29). To reach these screws, move arm forward or backward as requ
Drive Mechanism.	To disassemble mechanism, proceed as follows: 1. Remove Turntable by taking out three screws located near the Center Post (32). 2. Take-out Screw (38) located at base of changer and Center Post may then be withdrawn. 3. Lift out Clutch and Turntable Shaft (8); also remove Pinion Gear (17). 4. Disconnect Ejector Link (24) from Ejector Lever (26) by taking off Spring Clip (65). Then, swing Ej Lever (26) to one side. 5. Remove hairpin type Spring Clip (66) on each stud of the Main Slide Rollers (21). Main Slide can now be taken out of the mechanism. 6. All remaining parts are easily accessible.

MODEL A-505650 STEWART-WARNER CORP.

NAME OF ITEM	METHOD OF REMOVING OR REPLACING
Drive Mechanism.	The Drive mechanism may be reassembled by reversing the above procedure and exercising the following precautions: 1. Before replacing Main Slide (20), be sure that Top Drive Roller (19) and Bottom Drive Roller (60) are in position. Also see that Stud (49) is in front of upward projection on base plate and fits into slot in Main Slide (20). 2. Be sure Return Slide (48) is in the position shown in Fig. 5 so that "L" shaped section does not contact Stud (49). 3. When replacing Pinion Gear (17), hold end of Reject Lever (13) away from Center so that gear can drop all the way down. Correct placement of Pinion Gear (17) is very important and is described in Steps 1 and 2 of the next section entitled "Timing Adjustment of Pinion Gear". When replacing Clutch and Turntable Shaft, hold Clutch Arm (15) away from center until shaft is properly seated. 4. After Center Post has been installed and Screw (38) at base is tightened, check for .005" clearance between shoulder on Center Post and top of Clutch and Turntable Shaft (8).
Timing Adjustment of Pinion Gear.	Proper operation of the changer mechanism requires the establishment of a definite timing relation between Pinion Gear (17), Main Drive Gear (18), Clutch Arm (15) and Reject Lever (13). To position these parts for correct timing, proceed as follows: 1. Rotate Main Drive Gear (18) until Top Drive Roller (19) is **centrally** located in cross slot of Main Slide (20); see position in Fig. 3. In this position the roller is equidistant from either end of the slot. 2. Mesh Pinion Gear (17) with Main Drive Gear (18) so that "Brass Rivet" on Clutch Arm (15) is directly opposite Reject Lever (13) as shown in Fig. 10. 3. After installing Clutch and Turntable Shaft (8) rotate it **counter-clockwise.** Clutch Arm (15) will be partially displaced. At the point of maximum displacement, tip of Clutch Arm (15) should be in line with **front edge** of Reject Lever (13) as shown in Fig. 11. a. If Reject Lever (13) engages Clutch Arm (15), as shown in Fig. 10, when Clutch Arm is at point of maximum displacement then Pinion Gear (17) must be re-meshed one tooth clockwise. b. If Reject Lever (13) is in the position shown in Fig. 12, when Clutch Arm is at point of maximum displacement, then Pinion Gear (17) must be re-meshed one tooth counter-clockwise. c. If necessary, fine adjustment of Reject Lever and Clutch Arm position may be accomplished by making a slight bend in tip of lever until it is flush with tip surface of Clutch Arm as shown in Fig. 11. 4. After Pinion Gear (17) is correctly meshed, rotate Clutch and Turntable Shaft **clockwise** so that the mechanism goes thru its change cycle. As cycle is completed, Reject Lever (13) should engage Clutch Arm (15) as shown in Fig. 10. Clutch and Turntable Shaft (8) will then be fully disengaged and rotates independent of the changer mechanism.
Turntable Main Bearing (33)	Turntable Main Bearing (33) is held in position by three screws which are located on top surface of base plate and will be accessible only upon removal of the entire changer mechanism. After taking out these screws then remove Center Post Support Plate (37) and exercise care to avoid loss of the six Ball Bearings (36). When replacing the Turntable Main Bearing (33) be sure to check for correct spacing between Center Post (32) and Record Support Arm (29).

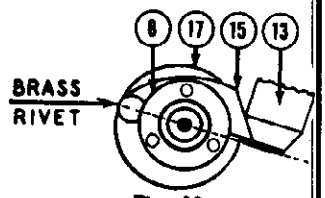
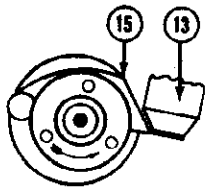


Fig. 10



Clutch Arm (15) and Reject Lever (13) shown in correct timing position.
Fig. 11

Fig. 12

LUBRICATION

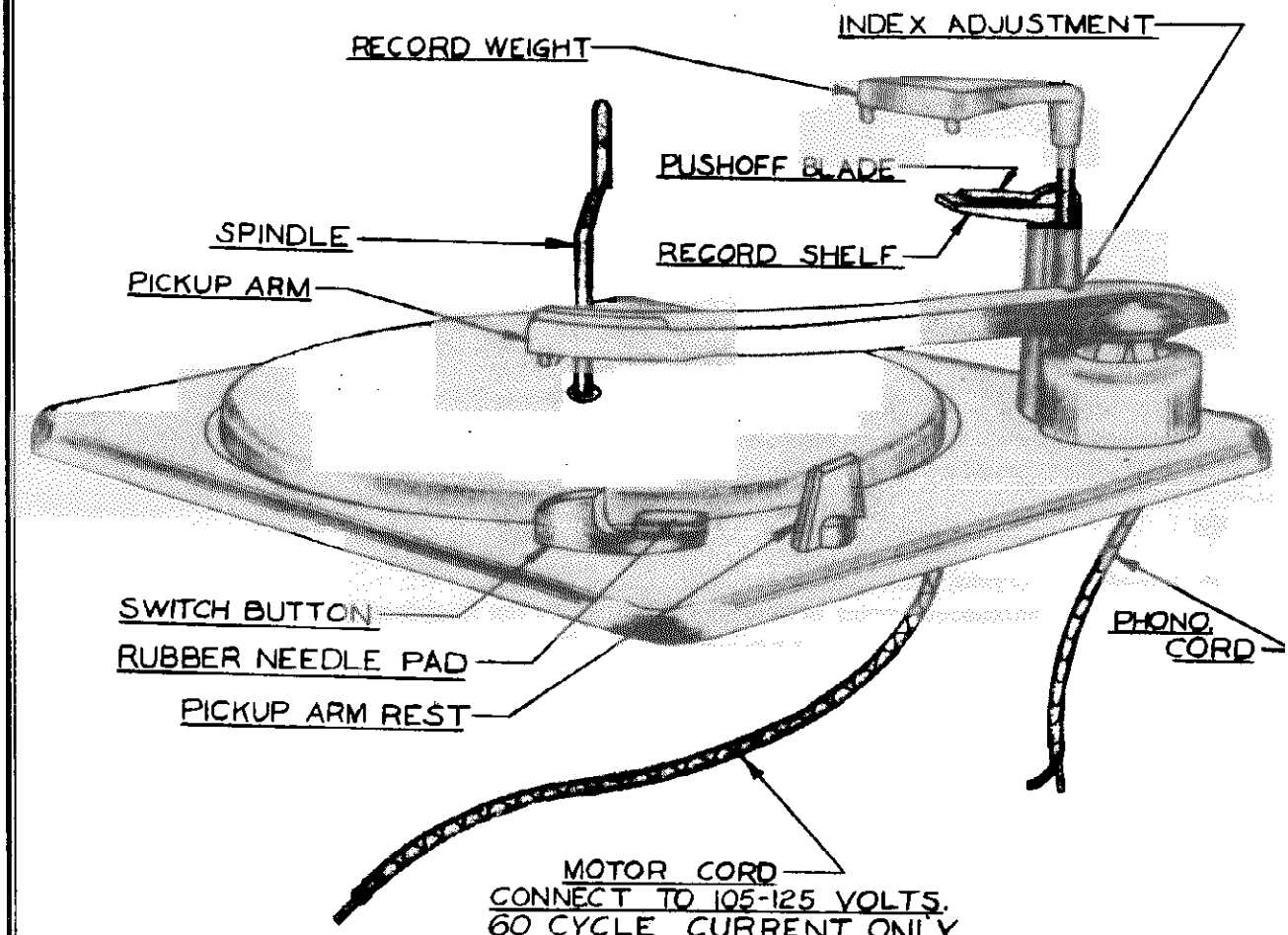
The record changer leaves the factory completely oiled and lubricated. Under normal conditions this should be adequate for the life of the product. When operated under extreme conditions of dust or heat, lubrication should be performed as required and in accordance with the following recommendations.

Use fine oil on Main Slide Rollers and other bearing surfaces with the exception of the bearing for Clutch and Turntable Shaft (8) and upper part of Turntable Main Bearing (33) which have "Oilite" bearings and require no lubricant.

Use light cup grease to lubricate Ball Bearings (36) and Ball Bearing Retainer (35) at base of Turntable Main Bearing (33).

DO NOT ATTEMPT TO OIL THE MOTOR UNDER ANY CIRCUMSTANCES.

WEBSTER CHICAGO CORP. MODEL 1



The Webster-Chicago Model 148 is a single post, spring-cushioned spindle, automatic record changer.

Model 148 features the exclusive Webster-Chicago Velocity Trip mechanism. The pickup arm is not actuated by "lead-in" springs and there is a minimum of lateral pressure. The arm travels freely in either direction. This lack of lateral pressure or inertia add immeasurably to the life of records and is considered to be as important as extra light vertical pressure, which in some instances would result in poor tracking at extremely low or high frequencies.

When set for automatic operation, Model 148 will continue to repeat a single record placed on the turntable (or the last record of a stack) until the Control Knob is returned to the STOP position.

MODEL 148 WEBSTER CHICAGO CORP.

OPERATION

MOTOR

Connect the motor cord to a source of 105-115 volt 60 cycle current only. If it is desired to operate the changer on 50 cycle current, a special motor pulley (Part No. 17X412-11) must be used in place of the one supplied with the changer in order to drive the turntable at the required speed of 78 R.P.M.

Do not under any circumstances connect the motor to a source of direct current or alternating current of any other frequencies.

PICKUP

The high impedance crystal cartridge supplied may be of the fixed permanent point or removable needle type. If it is the latter, use a needle which is not more than $^{11}/_{16}$ inches long for most satisfactory results.

Some desirable qualities of a good needle are faithful reproduction, low surface scratch or hiss, long wearing qualities, minimum record wear and rugged construction.

The Webster-Chicago Nylon Needles are particularly adaptable for use with your Webster-Chicago "148". Do not use single play or cactus needles for automatic operation. Such needles require frequent replacement or sharpening and are not designed to play a full stack of records.

OPERATION — AUTOMATIC

1. Turn the Record Shelf forward or back for ten or twelve inch records.
2. With the record ballast weight lifted and turned forward out of position, place up to ten 12" records or twelve 10" records on the spindle so that the bottom record rests on the step of the spindle and on the Record Shelf.
3. Turn the record ballast weight and lower it until it rests on the top record.
4. Move the control knob from the STOP position (nearest the pickup arm rest) to the START-REJECT position (farthest from the pickup arm rest) and release. The control will then drop back into the automatic playing position and mechanism will continue to operate automatically until the control is moved to the STOP position.
5. To reject any record while playing in the automatic position, move the control knob momentarily to the START-REJECT position and release.

NOTE: The mechanism may be turned off at any time or during any portion of the change cycle by moving the control knob to the STOP position.

The pickup arm may be moved horizontally at any time without damage to the mechanism. However, the pickup arm cannot be returned to the pickup arm rest until the change cycle has been completed.

After the last record has been played, the entire stack may be removed from the turntable at one time. The simplest procedure is as follows:

a. Place the pickup arm on the pickup arm rest.
b. Lift and turn the record ballast weight out of position.
c. Place the fingers of both hands under opposite edges of the bottom record.
d. Do not apply pressure to the top record. (Keep your thumbs free.)
e. Lift the stack of records straight up following the contours of the spindle. This permits the stack of records to follow the curve of the spindle without binding and greatly facilitates the removal of the stack.

OPERATION — MANUAL

1. Turn the Record Shelf to the TWELVE inch position (this is not essential but permits more clearance in loading and unloading records.)
2. Place a record on the turntable.
3. Move the control knob from the STOP position to the AUTOMATIC position, then toward the spindle to the MANUAL position, as indicated by the arrow on the control knob.

   No harm will result if the knob is accidentally moved to the START-REJECT position. If a twelve inch record is on the turntable, the arm will automatically index to the edge of the record. If a ten inch record is on the turntable, the needle will be set down gently on the rubber pad and the arm may be moved to the edge of the record.
4. Place the needle gently on the edge of the record. Particular care should be exercised if your pickup has a sapphire point needle. Although the sapphire is very hard and long wearing, it is extremely brittle and may be fractured or chipped if dropped on the record.
5. To stop the mechanism at any time, move the control knob to the STOP position.

SERVICE INFORMATION

All units are accurately adjusted, lubricated and tested at the factory. However, service repairs and adjustments sometimes become necessary. This bulleti... should be studied carefully before making any adjustments or replacing parts.

Service parts are available from your Webster-Chicago distributor. All parts must be ordered by piece part number and also record changer model and production number, stamped on the under side of the main plate.

The functions and most probable misadjustments of the main assemblies are as follows (reference numbers refer to the exploded views on pages 14 and 16):

THE AUTOMATIC TRIP FAILS TO FUNCTION

The Main Cam Assembly (32) and Actuating Gear (31) are the heart of the record changer. The Main Cam Assembly drives the mechanism associated with the action of the Pickup Arm (7) and the Record Selector assemblies. It, in turn, is driven by the gear train (28, 29, 30) and the Turntable which is rim driven by the phonograph motor.

The Main Cam Assembly and Actuating Gear is put in motion or "tripped" by means of the "automatic" trip or by the manually operated "reject" trip. When the movement of the Pickup Arm toward the spindle is greater than ⅛" in ½ revolution of the turntable, the Automatic Trip Arm (35) trips the Velocity Trip and Roller Assembly (33). This releases the Actuating Pawl on the Main Cam Assembly (32), allowing it to engage th Main Cam Actuating Gear (31) and driving through the change cycle. The pressure from th Automatic Trip Arm required to actuate the tri mechanism is negligible.

The Automatic Trip Arm follows the movement c the Pickup Arm through a weighted friction clutc (34). This clutch must be kept free of oil an grease. If the clutch does not cause the Automati Trip Arm to trip the mechanism, clean the clutc parts with carbon tetrachloride. This clutch shoul operate the trip mechanism without placing ur due drag on the movement of the pickup arm.

Also check for:

1. Velocity Trip and Roller Assembly (32) bind ing.
2. Slight burr on end of the Actuating Pawl o on the underside of the hook end of the Veloc ity Trip and Roller Assembly.
3. Actuating Pawl stuck (part of Main Cam As sembly (32) engaged by the hook end of th Velocity Trip and Roller Assembly (33).
4. Automatic Trip Arm (35) bent and not hittin the Velocity Trip and Roller Assembly (33).
5. Automatic Trip Arm (35) fails to touch th Velocity Trip and Roller Assembly.
6. Velocity Trip and Roller Assembly (33) rub bing on the underside of the Main Cam Actu ating Gear (31).
7. No velocity lead-in groove or eccentric groov in the center of record.

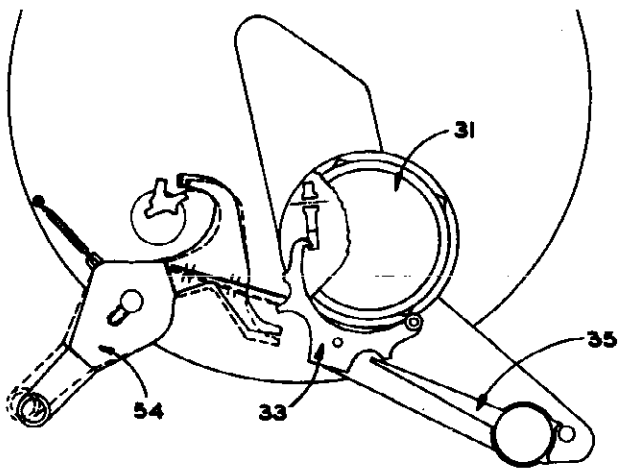
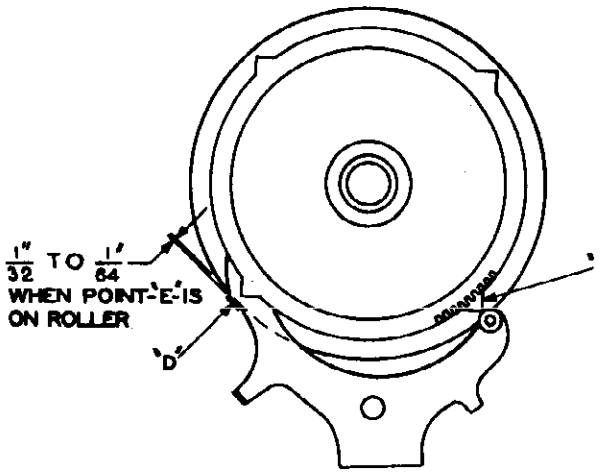


Fig. 1



ADJUST IF NECESSARY BY BENDING AT POINT "D".

Fig. 2

8. Foreign matter in record groove.
9. Badly worn record.
10. Badly bent or worn needle.

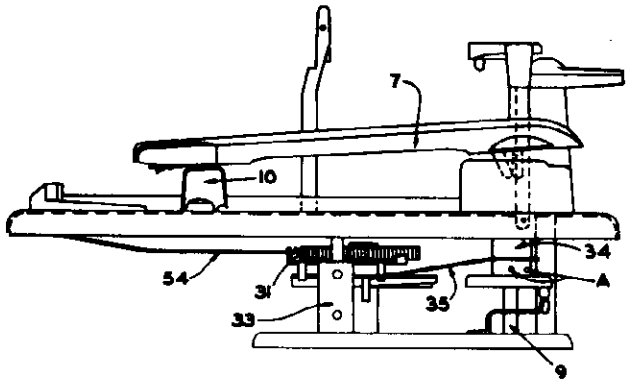


Fig. 3

IF THE "REJECT" TRIP FAILS TO FUNCTION

When the control knob is moved to the extreme START-REJECT position, the hair spring of the Reject Trip Lever Arm (54) actuates the Velocity Trip and Arm Assembly, putting the change mechanism in cycle. See Fig. 1.

Check for:

1. "Reject" trip hair spring of Lever 54 bent or broken.
2. Velocity Trip and Roller Assembly (33) binding.
3. Actuating Pawl stuck (part of Main Cam Assembly 32).

IF THE MECHANISM CONTINUES TO CYCLE

At the completion of the change cycle, the Actuating Pawl is disengaged from the Main Cam Assembly Actuating Gear by the hook end of the Velocity Trip and Roller Assembly, which has been returned to its normal position by the reset points on the Main Cam Drive Gear, Fig. 2.

If the clearance between the lip on the Velocity Trip Lever and the edge of the Main Cam is too small, it will prevent the hooked end of the Velocity Trip Lever from engaging the trigger. Adjust the clearance between the lip ("D" of Fig. 2) on the Velocity Trip Lever and the Main Cam to be within $\frac{1}{32}$" and $\frac{1}{64}$" when the roller is contacting the point of one of the reset points on the Actuating Gear.

Also check for:

1. Velocity Trip and Roller Assembly (33) rubbing on Main Cam Actuating Gear (31).
2. Manual Trip Lever (54) binding.
3. "Disengage Roller" broken on Velocity Trip and Roller Assembly (33).

PICKUP ARM LIFT TOO HIGH OR TOO LOW

The vertical movement of the pickup arm is controlled by the angle of the pickup arm raising lever (37 and Fig. 4). The needle should approach the top record of a full stack of 10" records on the turntable with approximately $\frac{1}{16}$" clearance.

To adjust:

1. Put a full stack of 10" records ON THE TURNTABLE.
2. Trip the "Start-Reject" control and rotate the turntable clockwise until the needle clears the top record of the stack by about $\frac{1}{16}$"
3. Be sure the notch in the pickup arm raising disc engages the pickup arm raising lever.
4. If the needle does not clear the top record or if it raises too high, adjust by bending the pickup arm raising lever (37) at points X and Y as indicated in Fig. 4.

CAUTION: All adjusting bends should be made slowly, using slight but firm, easy pressure.

Be sure the set screws in the Pickup Arm Raising Disc (36) are not loose and are properly positioned in the alignment holes as explained in the paragraph on Needle Setdown Indexing.

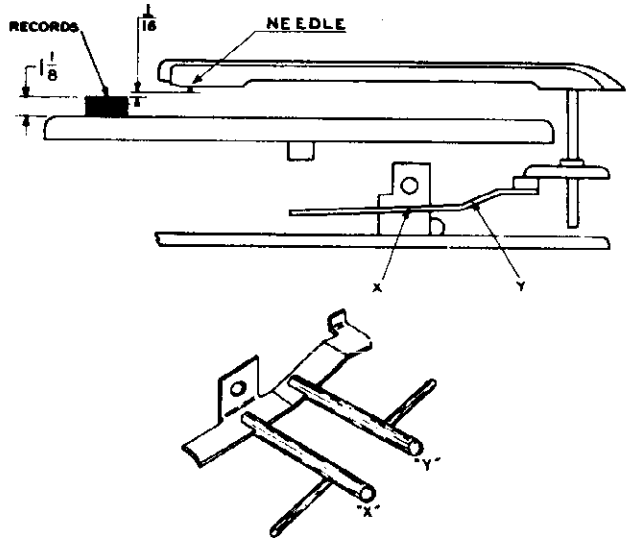


Fig. 4

NEEDLE SET DOWN INDEXING INCORRECT

The horizontal movement of the pickup arm (7) is controlled by the eccentric excursion of the Pickup Arm Raising Lever (37) moving the Pickup Arm Raising Disc (36) when actuated by the Main Cam Assembly (32). The eccentric screw (part of 8). accessible through the top of the pickup arm (7), should take care of any normal position adjustment. Turn this screw clockwise to index the needle in toward the spindle and counter-clockwise to index the needle out away from the spindle.

Should further adjustment be necessary, proceed as follows:

1. Set the eccentric screw, just mentioned, to a middle position.
2. Set the Record Shelf (4) to the 10" position.
3. Operate the mechanism by revolving the turntable manually until the needle drops to within 1/8" of a ten inch record on the turntable.
4. Be sure the notch in the Pickup Arm Raising Disc (36) engages the Pickup Arm Raising Lever (37).
5. The No. 8 Bristol set screws "A" of the Pickup Arm Raising Disc (36, Fig. 3) have pointed ends which fit into off center holes in the Pickup Arm Pivot (9). Alternately loosen one screw and tighten the other until the needle rests above the record lead-in groove at the desired point. Be sure that both set screws are tight when this adjustment is completed.
6. Complete the change cycle of the mechanism and place the pickup arm on the Pickup Arm Rest (10). The tongue of the Pickup Arm Raising Disc (36) should now rest against the post which supports the sub plate assembly. If the pickup arm does not rest in the proper position on the pickup arm rest, bend the tongue closer to or away from this post until the pickup arm is correctly positioned.

   REMEMBER: Always slight but firm, easy bends!
7. Turn the Record Shelf to 12" and check the needle drop on a twelve inch record. Make any additional adjustments with the eccentric screw mentioned previously.

PICKUP ARM DROPS OFF REST

The upturned end of the Pickup Arm Pivot Shaft Bracket (Fig. 3) prevents the Pickup Arm from falling off the Pickup Arm Rest. There should be 1/64" clearance between the tongue of the Pickup Arm Raising Disc (36) and the bottom of the groove formed by the Bracket and the Base Plate Post. Bend the Bracket end up or down to secure proper positioning of the Disc tongue and the Pivot bracket. Be careful to bend the end only or the Bracket will bind on the Pickup Arm Pivot Shaft. The Bracket should not be too high or the Disc tongue will rub on it when the needle approaches the edge of a 12" record, causing "glide in" on the first few grooves of the record.

ERRATIC INDEXING

Indexing in either the 10" or the 12" position is controlled through the presence or absence of pressure from the Compression Spring (45), on the Pickup Arm Raising Lever bracket, forcing the stud to travel the inside edge or the outside edge of the groove in the bottom of the Main Cam. The compression on this spring is changed as the Record Shelf is changed from the 10" to the 12" position. Improper adjustment of the spring tension will result in erratic indexing.

In the 12" position, the spring should be just free. In the 10" position the compression of the spring holds the stud of the Pickup Arm Raising Lever against the outside edge of the groove. If the compression tension needs adjustment:

1. Turn the Record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable clockwise until the push off Blade reaches its farthest forward position. At this point the cam follower will be at the highest point on the Main Cam ("A" of Fig. 5).
3. Loosen the lock bolts of (41) and (42).
4. Be sure that the Record Shelf is held in the extreme 12" position while adjusting the Record Shelf and Push-off Blade fingers.
5. At the same time, push the Push-off Blade forward as far as possible and push the Push-off Blade and Record Shelf Assembly downward tight against the Housing (6).
6. Position the Record Shelf finger and the Toggle Assembly (41) so the 12" finger of the Push-off

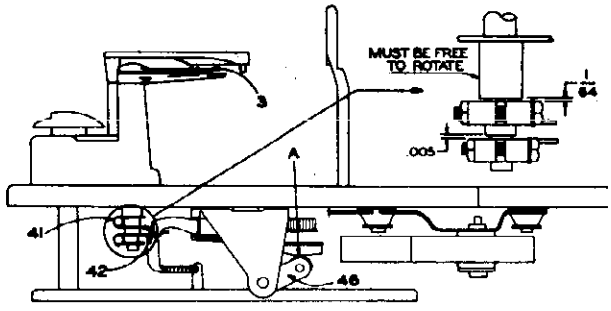


Fig. 5

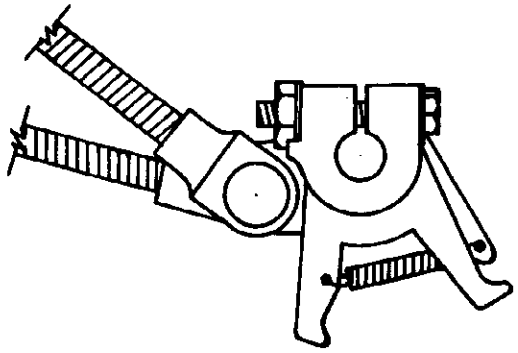


Fig. 6

Blade finger (42) looks like Fig. 6. A visual spacing of approximately 1/64 between the rounded edge of the toggle assembly and the Push-off Blade finger when viewed directly from the bottom of the record changer is required. See Fig. 6. Since these two parts lie on different planes, this adjustment must be made by observation only.

7. While holding the Push-off Blade and Record Shelf Assembly tight against the Housing (6), push the Index Toggle Assembly (41) against the spacer (40) and tighten the lock bolt.
8. Tighten the Push-off Blade bracket lock bolt, leaving approximately 1/64" clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger bracket (42).

RECORD FAILS TO DROP

The record must leave the spindle step just prior to or at least by the time it leaves the record shelf. If the spindle is too far from the record shelf, the record will hang up on the spindle step and fail to drop.

To adjust:

Press down on the edge of the turntable nearest the Record Shelf to secure proper spacing. DO NOT bend the spindle itself. Also be sure a standard record is used when making this adjustment. A standard 10" record has a diameter of 9 7/8" ± 1/32". A standard 12" record measures 11 7/8" ± 1/32" in diameter.

If the changer still fails to drop records, put the mechanism in cycle and watch the movement of the Push-off Blade. If it fails to protrude beyond the edge of the Record Shelf when at its greatest forward position, adjust the Push-off Blade finger position:

1. Turn the Record Shelf (4) to the 12" position.
2. Trip the Reject control and rotate the Turntable until the Push-off Cam Follower reaches the highest point on the Main Cam ("A" of Fig. 6).
3. Loosen the Push-off Blade finger (42) clamp bolt.
4. Push the Push-off Blade forward as far as possible and hold the Push-off Blade and Record Shelf assembly downward tight against the housing (6).
5. Tighten the Push-off Blade finger clamp bolt (42), leaving 1/64" vertical clearance between the shoulder of the Record Shelf shaft and the Push-off Blade finger (42).

CHANGE CYCLE STARTS BEFORE END OF RECORD

If the Trip Assembly chatters while the changer is running or if the changer cycles before the entire record is played, there is probably insufficient clearance between the hook end of the Velocity Trip and Roller Assembly and the actuating gear. This clearance should be adjusted to be within 1/32" to 1/64" by bending the lever at point "C" as shown in Fig. 7.

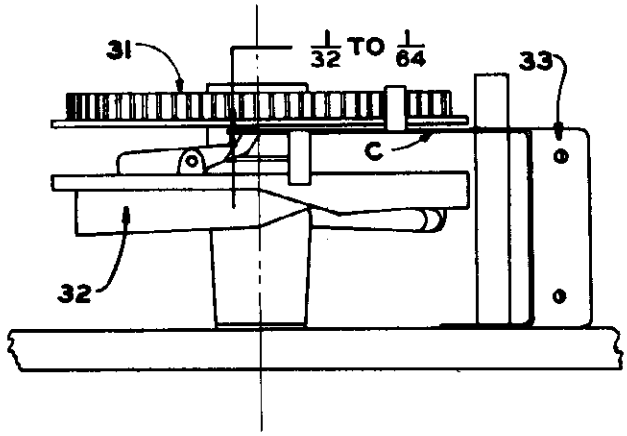


Fig. 7

REPLACEMENT OF PARTS

TO REPLACE PICKUP CARTRIDGE

A Pickup cartridge can be most easily replaced by first removing the Pickup Arm.

1. Hold the Pickup Arm firmly with left hand.
2. Remove the spring from between the pins of the hinge bracket.

3. Using a tool such as a screwdriver, press in on one of the blue steel Pickup Arm hinge brackets while lifting up on the arm. This will release the Pickup Arm Hinge pin.
4. Repeat on the other pickup arm bracket.
5. The Pickup Arm, when released from the hinge brackets, may then be turned over and laid on the turntable for easy access to the cartridge.

TO REPLACE THE PICKUP ARM

The Pickup Arm may be replaced in its bracket as follows:

1. Hook the roller on the rear of the hinge assembly under the Pickup Arm lift stop, inside the Housing (6).
2. Using a pair of long nose pliers, place the pickup arm hinge brackets, one at a time, over the pins in the Pickup Arm Pivot Shaft (9) bracket.

The retaining spring need not be replaced unless the unit is to be re-shipped.

In performing this operation, be sure that the pickup cord lies outside of the hinge and does not become wedged in the bracket.

TO REMOVE THE SUB-PLATE ASSEMBLY

In the event that it becomes necessary to replace any of the major parts in the sub-plate assembly, the entire assembly should first be removed from the Main Plate.

1. Remove the spindle which is held in by a cotter pin under the sub plate.
2. Remove the Turntable.
3. Remove the Pickup Arm.
4. Remove the three No. 8 32 x ½" screws holding the sub-plate posts to the Main Plate.
5. Carefully detach the Sub-Plate assembly from the Main Plate.

TO REPLACE THE SUB-PLATE ASSEMBLY

Reverse the above procedure making certain that all parts fall into their proper positions.

Particularly note the Selector Lever and Selector Lever Compression Spring to see that they are in position with the lever through the slot in the Pickup Arm Raising Lever Bracket.

LUBRICATION

Model 148 Record Changers leave the factory completely oiled and lubricated. Under normal conditions this should be sufficient for approximately one year or 1,000 hours of operation. When operated under extreme conditions of dust or heat, this operation should be performed more frequently as required.

NOTE: AVOID EXCESSIVE LUBRICATION.

Do not permit any oil or grease to get on the rubber Idler Drive Wheel or the Motor Sleeve, on Turntable Drive rim or on the Automatic Trip Arm clutch. Any oil or grease on these points should be removed using Carbon Tetrachloride.

The Recommended lubricants and points of lubrication are as follows:

A — No. 10 OIL (Apply With Small Oil Can Or Medicine Dropper)

1. Motor Bearings. Saturate top and bottom felts.
2. Pickup Arm Shaft. Drop one drop each to bottom bearing point, bracket hole through Main Base Plate.
3. Ball Bearing Assembly.
4. Idler Wheel Felt.

B — LUBRIPLATE (Apply With Small Brush)

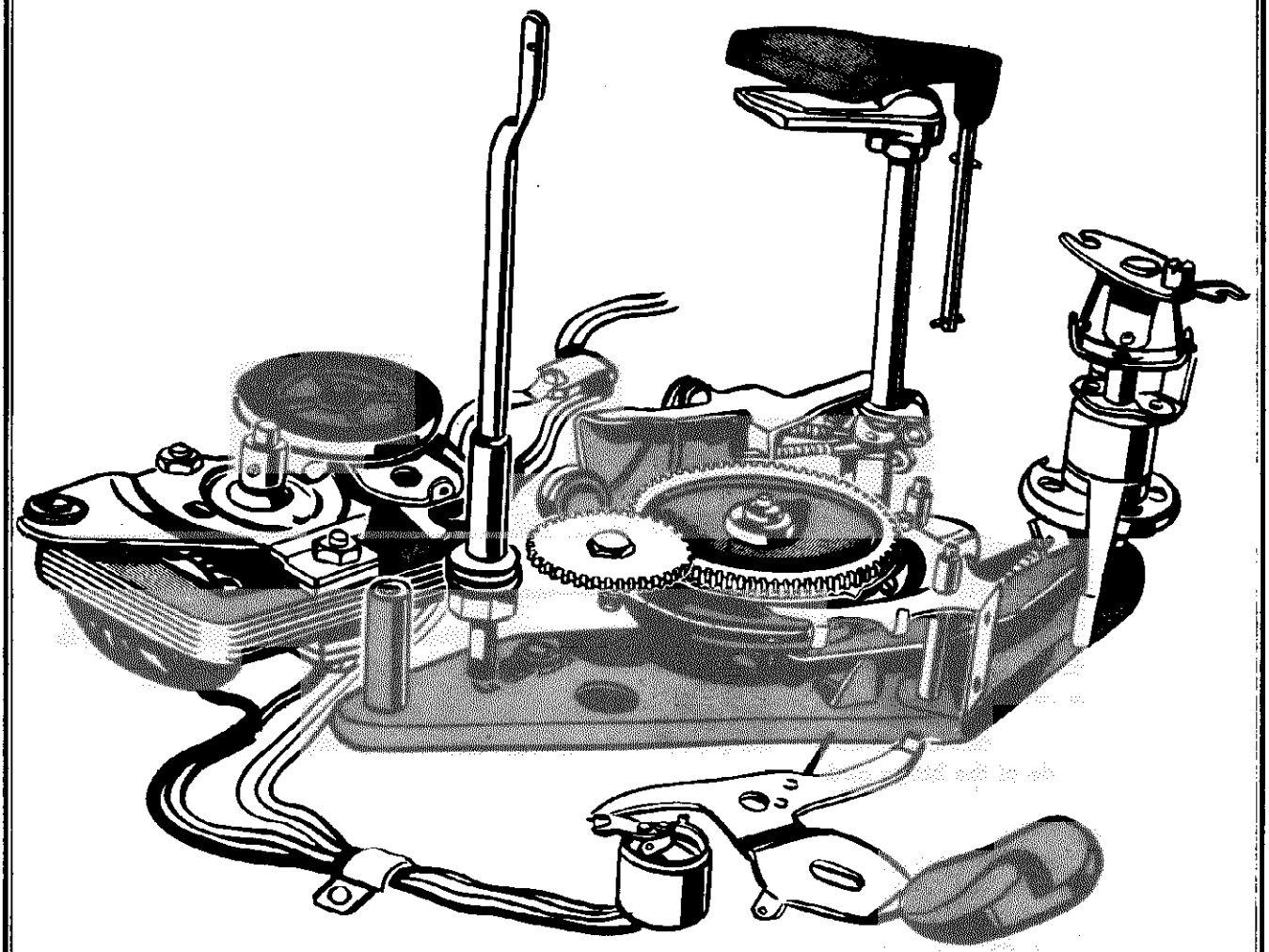
1. Idler Wheel Link.
2. Turntable Shaft Stud.
3. Pickup Arm Hinge Pins.
4. Knife edge of Pickup Arm Raising Lever.
5. Main Cam Bearing. (It is necessary to remove the sub-plate assembly to Lubriplate this bearing.)

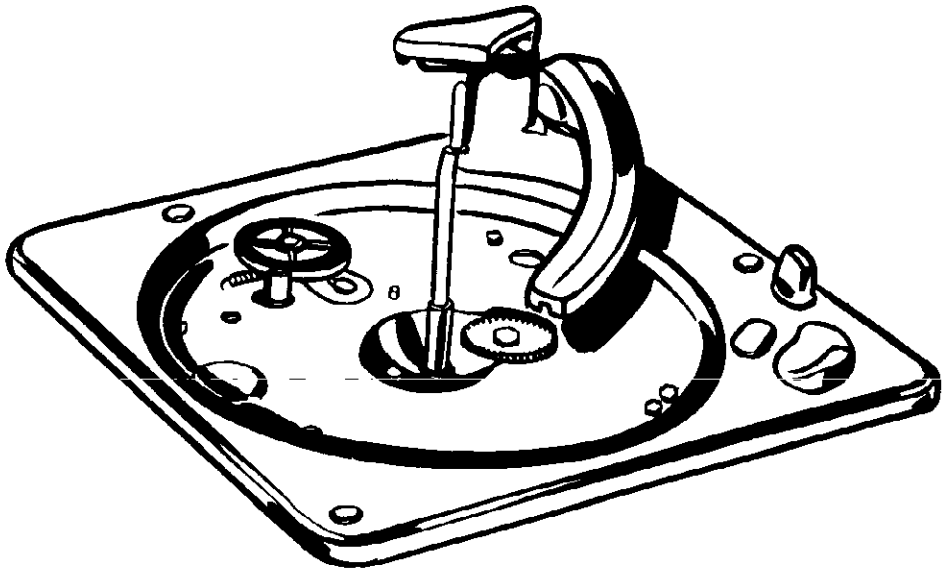
C — STA-PUT (Apply With Small Brush)

1. Teeth of Main Cam Actuating Gear.
2. Track of Main Cam Gear.
3. Teeth of Large and Small idler gears.
4. Raising lever Bracket bearing surfaces.

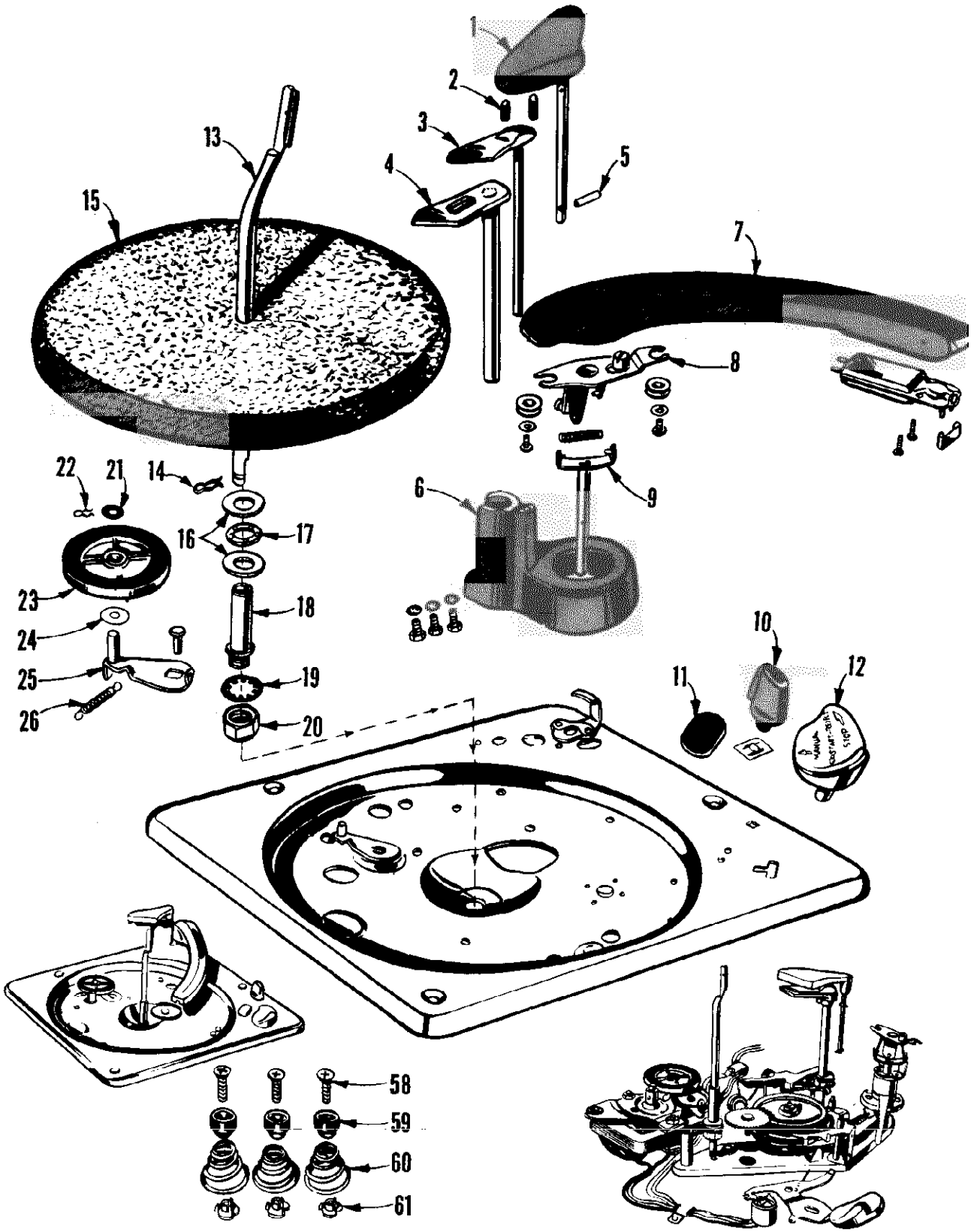
MODEL 148

WEBSTER CHICAGO CORP.





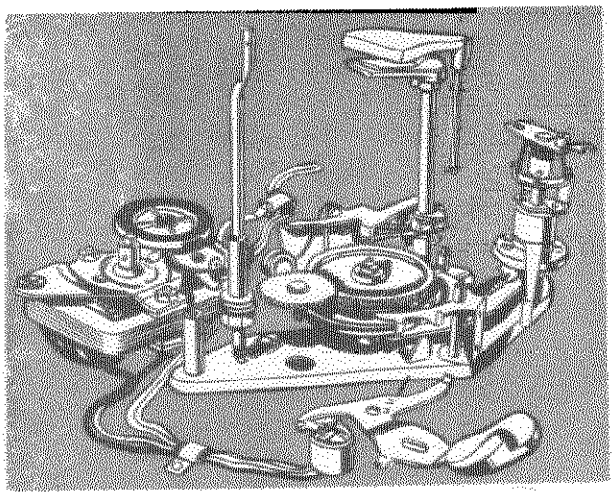
Cut Away View

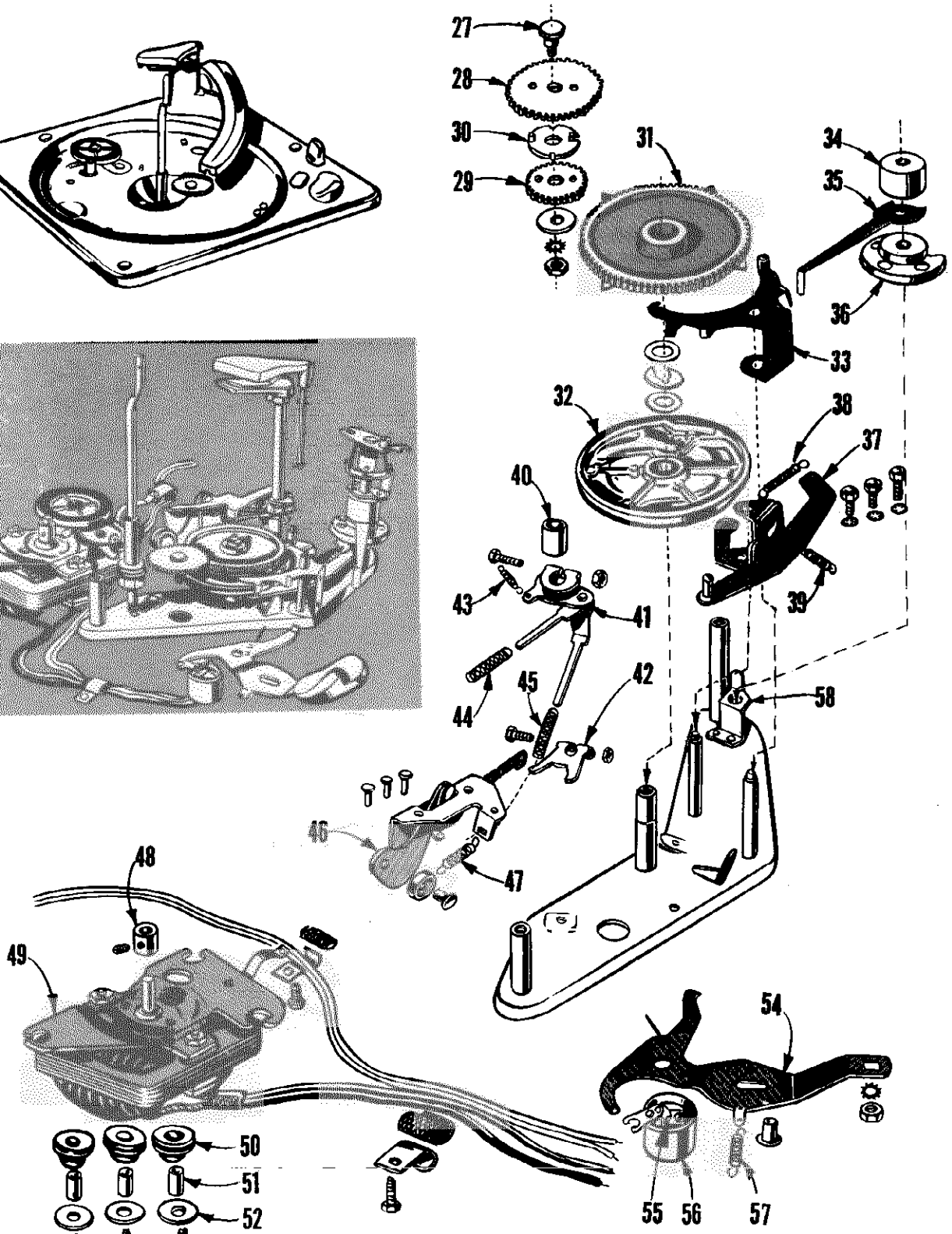


Exploded View — Above Main Plate

MODEL 148

WEBSTER CHICAGO CORP.





Exploded View — Below Main Plate

REPLACEMENT PARTS LIST

Illustration No.	Part No.	Part Name and Description
1	11X288	Record Weight Assembly
2	24P013	Record Weight Cushion
3	42X183	Push Off Blade
4	42X184	Record Shelf
5	27P157	Record Weight Groove Pin
6	42P182	Housing
7	49X021	Pickup Arm Less Cartridge and Hardware
8	21X258	Pickup Arm Hinge Assembly
		Speed Nut
10	49P090	Pickup Arm Rest including
11	24P004	Needle Pad
12	49X089	Control Knob
13	11X283	Spindle including Pawl
14	50P204	Spindle Retaining Clip
15	11X138-C	Turntable
16	25P269	Turntable Bearing Washer
17	11X058	Turntable Bearing
18	41P414	Turntable Stud
19	25P333	Lock Washer
20	26P687	Turntable Stud Nut
21	25P030	Felt Washer
22	50P125	Idler Retaining Clip
23	11X003	Idler Drive Wheel
24	25P046	Idler Fibre Washer
25	11X068	Idler Line Assembly
26	46P112	Idler Tension Spring

Illustration No.	Part No.	Part Name and Description
27	41P333	Shoulder Screw
28	47P024	Large Idler Gear
29	47P023	Small Idler Gear
30	45P342	Idler Gear Coupler
31	11X032	Main Cam Actuating Gear
32	11X033	Main Cam
33	11X047	Velocity Trip and Roller Assembly
34	41P576	Clutch Weight
35	46P568	Automatic Trip Arm
36	11X227	Pickup Arm Raising Disc
37	11X046	Pickup Arm Raising Lever and Bracket with Springs
38	46P044	Raising Lever Tension Spring
39	46P139	Raising Lever Tension Spring
41	11X287	Index Compression Lever and Toggle Assembly
42	11X312	Push-off Blade Finger
43	46P044	Tension Spring
44	46P151	Compression Spring
45	46P152	Compression Spring
46	11X284	Cam Lever and Bracket Assembly
47	46P158	Tension Spring
48	17X412-12	Sleeve — 60 Cycle
48	17X412-11	Sleeve — 50 Cycle
49	15X090-1	Motor Assembly — 117 Volt, 60 Cycle
50	25P363	Rubber Shock Mounts
51	41P592	Motor Mount Sleeve
52	25P367	Motor Mount Spacer
53	26P312	Motor Mount Screw
54	11X291	Trip Lever and Wire Assembly
55	32X045	A. C. Switch
56	32X039	Switch Cover
57	46P117	Tension Spring
58		Pickup Arm Pivot Bracket

ZENITH RADIO CORP.

MODELS S-14004
S-14007

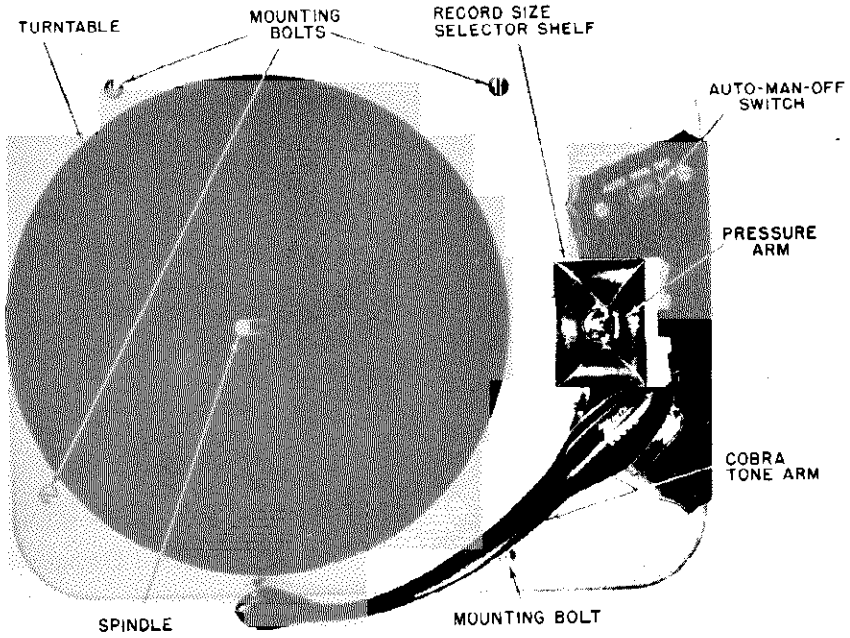


Fig. 1. S14004 and S14007 Record Changers.

GENERAL

The Models S14004 and S14007 record changers are used in Zenith Models 7R887 and 6R880 respectively. These changers are designed to play 12 ten inch or 10 twelve inch records automatically. Odd size and warped records must be played manually. Mechanically the changers are alike. There are slight electrical differences. Model S14004 receives the solenoid energizing voltage from the receiver proper while the S14007 supplies its own energizing voltage from a separate winding on the motor. When servicing these changers, check the schematic diagrams as to the electrical differences. The mechanical operation and adjustments of both changers are identical. To load for automatic operation, set the record size selector shelf to either ten or twelve, depending on th size of the records to be played. Lift the pressure arm ar place a stack of records over the spindle. Lower the pre sure arm until it rests on the record stack. Set the AUTC MAN-OFF switch to AUTO and press the record chanc button on the receiver panel. The record changer will plc the complete selection of records, and will repeat the la record until turned off. For manual operation set th AUTO-MAN-OFF switch to MAN, place a record on th turntable and set the needle on the starting groove of th record. To turn the changer off, set the AUTO-MAN-OI switch to OFF, and place the tone arm in the rest positio

DESCRIPTION OF CYCLING

The motor driven idler wheel rim drives the turntable. Closing the contacts of the trip switch or the record change switch allows current to flow through the solenoid. The magnetic field of the energized solenoid attracts the trip pawl lever which releases the gear pawl tooth and allows it to engage the rotating turntable gear. This action starts the clutch gear to turn. A stud on the clutch gear engages the tone arm lift lever which engages the tone arm stud and raises the tone arm. The tone arm lift lever also applies the tone arm brake which prevents coasting and erratic landing of the needle. The clutch gear moves the tone arm actuating lever and laterally swings the tone arm off the turntable. During the lateral swing of the tone arm, the record ejector link and arm assembly operates the record push plate and when the tone arm moves to its maximum outward position, the record push plate ejects the record and allows it to drop on the turntable. The clutch gear then moves the tone arm actuating lever which swings the tone arm over the starting groove of the record. The tone arm swings 1 inch nearer the spindle with 10 inch records than it does with 12 inch. This difference in inward swing is controlled by the discriminator lever assembly. When the record size selector shelf is turned to the 10 or 12 inch position, its shaft moves the discriminator cam and sets the discriminator lever assembly for the correct inward swing of the tone arm. After the tone arm swings over the startir groove of the record, the tone arm lift lever lowers it ar releases the brake. As the clutch gear completes the rev lution, the gear pawl tooth bracket hits the trip pawl ar the action removes the gear pawl tooth from the path the turntable gear, causing the clutch gear to stop ar complete the cycle.

The velocity trip depends on the ratio of oscillations the trip switch contact to the rate of movement of the tor arm. As the record is played, the tone arm lever mov slowly inward. The oscillating lever comes in contact wi the ratchet on the tone arm lever and then moves out befo the ratchet can drag the oscillating lever and close the tr switch contacts. When the record is completed and th needle enters the oscillating groove, the inward speed the tone arm increases. This makes it impossible for th oscillating lever to move out of the ratchet in time and as result is dragged inward, closing the trip switch contacts an starting the next cycle.

The S14004 and S14007 record changers use th famous Cobra pickup. Previously published service manua Z800 and Z801 explain in detail the theory and operatic of the Cobra pickup. If these manuals are not availabl they may be obtained from your Zenith distributor.

MODELS S-14004, S-14007

ZENITH RADIO CORP.

RECORD CHANGER MOUNTING CLIPS

Clamp on pivot clips are used to mount the record changer in the cabinet. The changer is released by applying an upward pressure to the slotted ends of the clips (see Fig. 3) until the clips pivot to a vertical position. When the changer is installed, the clips are pivoted back to the horizontal or holding position.

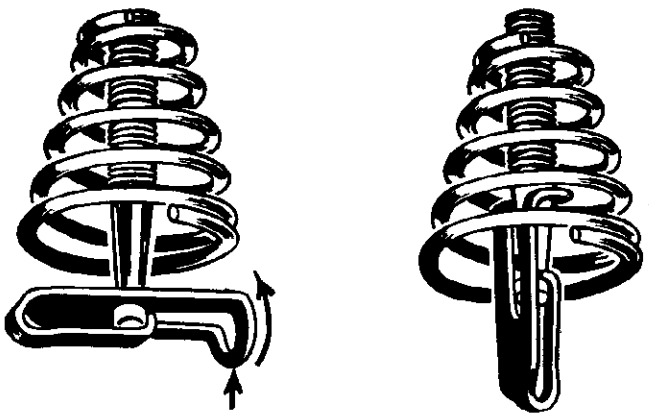


Fig. 3. Record Changer Mounting Clip.

LUBRICATION

Sta-Put grease No. 512 (light grease of the vaseline type) is used for lubrication throughout. Fig. 5 indicates the various lubrication points. Do not apply grease to the top surface or teeth of the clutch gear.

ADJUSTMENTS

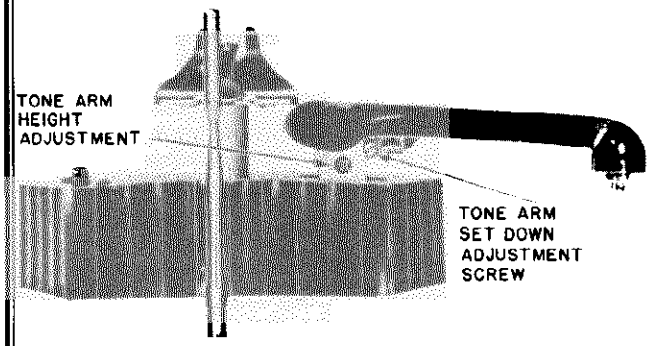


Fig. 2. Tone Arm Set Down and Height Adjustment.

TONE ARM SET DOWN ADJUSTMENT

The landing position of the needle on the record is determined by the setting of the tone arm set down adjustment screw (see Fig. 2). Clockwise rotation of the screw moves the tone arm in, while counter-clockwise rotation moves it out.

TONE ARM HEIGHT ADJUSTMENT

The tone arm height adjustment determines the vertical rise of the tone arm. If the tone arm does not rise sufficiently, the record changer will not play a full load of 12 ten inch records. If, on the other hand, the tone arm is raised too high, it may hit the records on the record shelf. Set the adjustment screw so that the needle clears 12 unwarped ten inch records on the turntable. The tone arm housing must not hit the underside of the records on the record shelf when the changer is cycled after adjustment.

TRIP SWITCH ADJUSTMENT

The tone arm lever must be moved so that its ratchet does not engage the oscillating switch lever. With a pair of long nose pliers simultaneously bend the stationary contact and guide spring until the spacing between the trip switch contacts is 1/16 inch to 3/32 inch. The contact spring must always rest against the heavier guide spring after adjustment.

ZENITH RADIO CORP. MODELS S-14004 S-14007

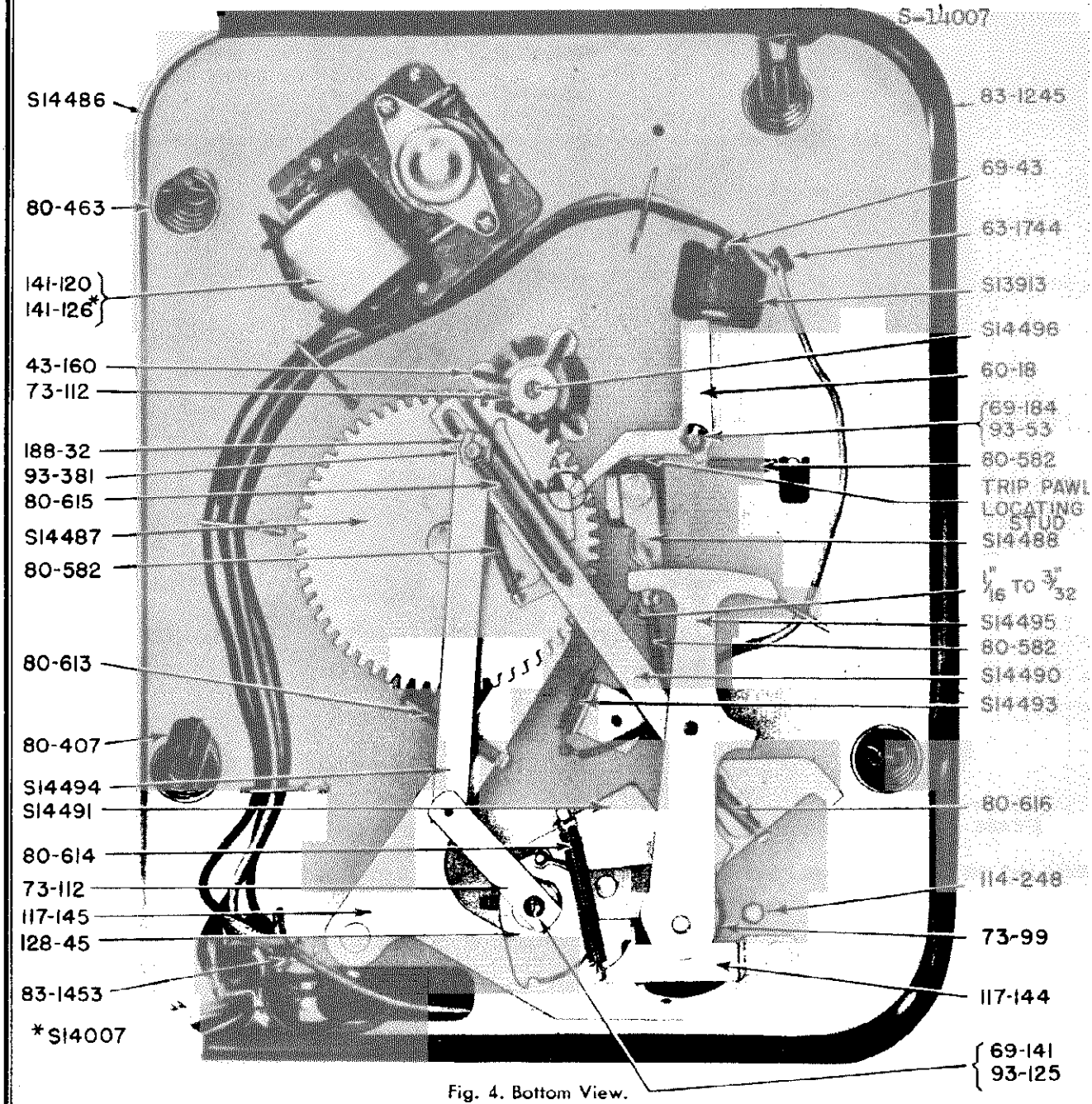


Fig. 4. Bottom View.

SLAB HEAD SET SCREWS

For maximum rigidity, the spindle, discriminator cam and tone arm lever are locked in position with slab head screws. A slab head set screw wrench is available as Zenith part No. 68-8.

REMOVING THE TONE ARM ASSEMBLY

The complete tone arm assembly can be removed by loosening the two slab head holding screws and pulling the unit out. When the tone arm assembly is installed, the cone points of the slab head screws must enter the indentations previously made. A new assembly does not have these indentations, and must be assembled as follows:

1. See that the changer mechanism is out of cycle.
2. Turn the tone arm set down adjustment screw (see Fig. 2) as far as it will go in the clockwise direction.
3. Insert the tone arm support shaft through its mountin hole.
4. Place a 12 inch record on the turntable and hold th Cobra tone arm housing against the edge of th record. Move the tone arm lever (Part No. S14495) t its maximum outward position. These two positior must be maintained during the next operation.
5. See that the tone arm lever bushing has approximatel .005 inch play and tighten the slab head screws.
6. Adjust the tone arm set down adjustment screw (se Fig. 2) for proper landing of the needle.

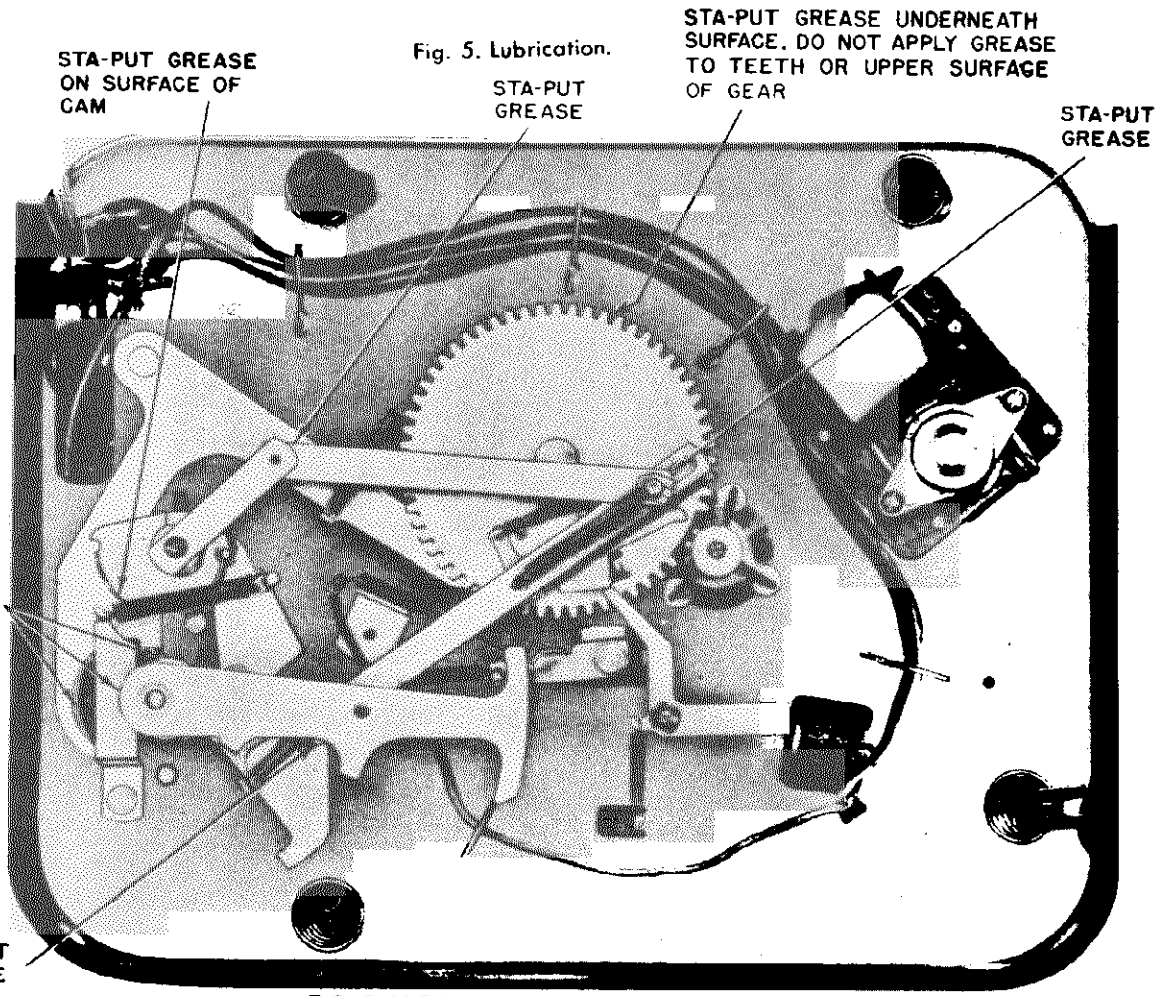
REMOVING THE RECORD SHELF

The record shelf is removed by unscrewing the slab hea screw at the bottom of its shaft and the machine screw whic holds the record ejector link. When the unit is assemblec see that the changer is out of cycle and turn the slotte shaft until the record push off plate is retracted into i housing before attaching the record ejector link.

MODELS S-14004, S-14007

ZENITH RADIO CORP.

Fig. 5. Lubrication.



TROUBLE SHOOTING

SQUEAKS OR NOISES DURING PLAYING OF RECORDS.

a. Friction between the records on the turntable and the spindle will occasionally cause squeaks. A thin coat of wax applied to the spindle will remedy this condition.

b. Check lubrication.

RECORD IS NOT HEARD ALTHOUGH CHANGER OPERATES.

a. See that the Phono Radio switch is on Phono.
b. Check receiver audio by listening to radio.
c. Check the phono oscillator tube.
d. Check Needle Cartridge.
e. Check Tone Arm Housing for broken leads.

PRESSING RECORD CHANGE BUTTON ON RECEIVER PANEL DOES NOT START RECORD CHANGE CYCLE.

a. See that the AUTO-MAN-OFF switch is set to AUTO.
b. Check Record Change Switch.
c. Check electrical continuity of solenoid circuit.
d. Check the solenoid energizing voltage.

RUMBLE AND MICROPHONICS DURING REPRODUCTION.

a. Changer not "floated" properly. Remove packing strip. Loosen mounting bolts.

b. Motor retaining rings rubbing on the idler wheel.

c. Motor leads pulled too tight preventing motor from "floating" freely.

d. Noisy phono oscillator tube.

e. Impression on Idler Wheel.

NEEDLE FAILS TO CLEAR MAXIMUM LOAD OF RECORDS ON THE TURNTABLE.

a. Check Tone Arm height adjustment.

TONE ARM SETS DOWN TOO FAR IN OR OUT ON RECORD.

a. Check Tone Arm set down adjustment.

TONE ARM SET-DOWN POSITION VARIES.

a. Check Tone Arm Brake and Spring.
b. Tone Arm pivots loosely.

CHANGER CONTINUES TO CYCLE.

a. Check the trip switch adjustment.
b. Check Record Change switch.
c. Trip Pawl sticks.

CHANGER WILL NOT CYCLE UPON COMPLETION OF RECORD.

a. See that the AUTO-MAN-OFF switch is set to AUTO.

b. Be certain that the record has an eccentric center groove.

c. Check the Trip Switch.
d. Check the solenoid energizing voltage.

SOLENOID FAILS TO TRIP MECHANISM

a. Check the pawl lever positioning stud. The tip of the pawl must be in approximately the same position in relation to the gear pawl tooth lever as indicated at "A" in Fig. 4. If the position is not the same as indicated, the positioning stud can be bent slightly.

b. Tension on the trip pawl actuating spring too high.

MECHANISM JAMS

a. Burr or sharp point on the gear pawl tooth. Smooth out with a small file.

ZENITH RADIO CORP.

MODELS S-14004
S-14007

NUMERICAL PARTS LIST

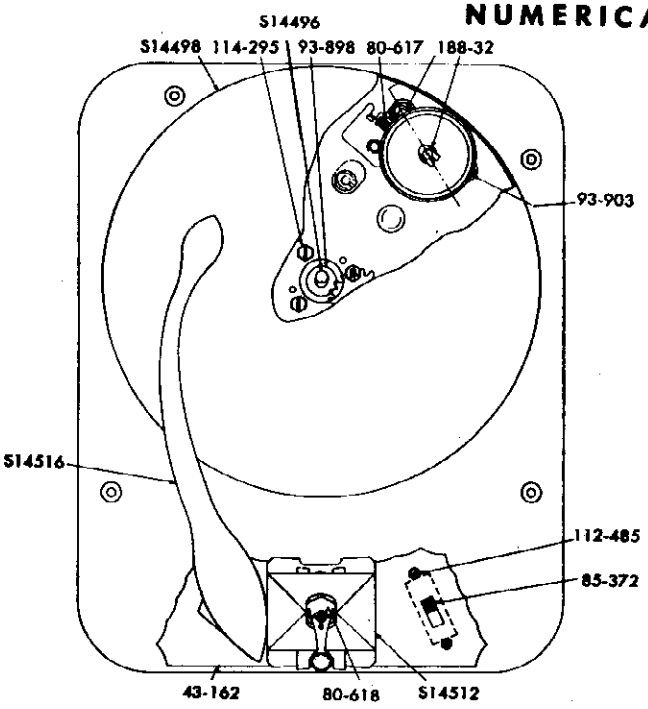


Fig. 6. Parts Identification, Top View.

12-1444	Socket Mounting Bracket
12-1477	Tone Arm Mounting Bracket (Upper)
56-144	Socket Retaining Pin
78-561	Cartridge Socket
80-605	Socket Tension Spring
80-609	Landing Adjusting Spring
83-1121	Felt Strip (Bumper)
93-899	Steel Washer—N.P.
112-619	No. 2-32 x 5/16 in. R.H. Self Tapping Screw—Steel—Cad. Pl.
17-81	Cable Clamp (S14004)
17-88	Cable Clamp (S14007)
23-22	A.C. Wire Connector
24-458	Switch Cover (S14007)
43-160	Turntable Gear Housing
43-162	Record Ejector Housing
56-239	Groove Pin Type No. 4 (3/32 in. D X 3/8 in. lg.) (S14004)
56-240	Groove Pin Type No. 2 (1/16 in. D X 1/4 in. lg.) (S14004)
58-166	6 Prong Plug (S14004)
60-18	Trip Pawl
61-125	Idler Wheel
63-1744	Resistor
69-43	No. 8-32 x 3/8 in. R.H.M.S.—Steel N.P.
69-141	No. 5-40 x 1/4 in. R.H.M.S.—Steel N.P.
69-184	No. 8-32 x 1/4 in. R.H.M.S.—Steel—Cad.
69-262	No. 8-32 x 1/2 in. Phillips R.H.M.S.—Steel
73-99	No. 8-32 x 1/4 in. Slab Hd. Set Screw—Cone-point (2 used)
73-112	No. 8-32 x 1/2 in. Slab Hd. Set Screw—Cup-point (2 used)
80-582	Pawl Spring (3 used)
80-610	Switch Contact Spring
80-613	Lift Pin Lever Spring
80-614	Brake Spring
80-615	Tone Arm Link Spring (Long)
80-616	Tone Arm Link Spring (Short)
80-617	Idler Wheel Spring
80-618	Pressure Arm Spring
80-619	Tone Arm Swivel Spring
80-645	Tone Arm Height Adjusting Spring
85-372	Three Position Slide Switch
93-53	1/64 x 11/64 in. x 3/8 in. Steel Washer—N.P.
93-125	No. 6 Int. Lockwasher
93-381	1/32 in. x 7/32 in. x 3/8 in. Steel Washer—Cad.
93-678	Idler Wheel Stud Fishpaper Washer—Small
93-781	No. 8 Split Lockwasher—Steel N.P.
93-876	Fibre Washer
93-898	Steel Washer
93-900	Fibre Washer (3 used)
93-903	Steel Washer—Copper Flash (3 used)
93-927	Idler Wheel Stud Washer—Large
93-928	Idler Wheel Stud Washer—Small
93-929	Idler Wheel Stud Fishpaper Washer—Large
93-930	Idler Wheel Stud Felt Washer
94-620	Stop Bushing
97-298	Trip Pawl Stud
97-301	Clutch Gear Retaining Stud
112-485	No. 4-40 x 1/4 in. B.H.M.S.—Steel—Black Zinc Plate (2 used)
114-248	No. 6-20 x 5/32 in. Hex. Hd. Slotted S.T. Screw—Steel—Cad. (4 used)
114-295	No. 8-32 x 5/16 in. Hex. Hd. Slotted S.T. Screw—Steel—Cad. (4 used)
117-144	Brake Lever
117-145	Tone Arm Lift Lever
125-61	Rubber Grommet (3 used)
125-65	Pressure Arm Grommet
128-45	Discriminator Cam
141-120	A.C. Phono Motor—110 V. 60 cycle (S14004
141-126	A.C. Phono Motor—110 V. 60 Cycle (S14007
148-83	Tone Arm Housing only
S11473	Cobra Cartridge and Needle Assembly
S14516	Cobra Tone Arm Assembly—complete
S14673	Hinge Plate Socket and Stop Assembly
S14674	Hinge Plate Assembly—complete
S14675	Shielded Wire Cable
148-96	Record Ejector Arm
148-97	Record Pressure Arm
149-60	Magnet Core
188-32	Retaining Ring (5 used)
199-85	Tone Arm Sleeve
S13913	Magnet Coil Assembly (Solenoid)
S14487	Clutch Gear Assembly
S14488	Oscillating Lever and Gear Assembly
S14490	Tone Arm Actuating Lever Assembly
S14491	Discriminator Lever Assembly
S14493	Trip Switch Assembly
S14494	Record Ejector Link and Arm Assembly
S14495	Tone Arm Lever Assembly
S14496	Record Spindle Assembly
S14498	Turntable Assembly (Flock Finish)
S14499	Ejector Cam Shaft Assembly
S14510	Record Support Plate and Post Assembly
S14512	Pressure Arm and Mounting Assembly
S14513	Tone Arm Shaft Assembly
S14514	Tone Arm Bracket and Lift Pin Assembly
S14515	Cable and Plug Assembly (S14004)
S14682	Idler Wheel Stud and Washer Assembly
S14691	Cable and Plug Assembly (S14007)

MODELS S-14004, S-14007

ZENITH RADIO CORP.

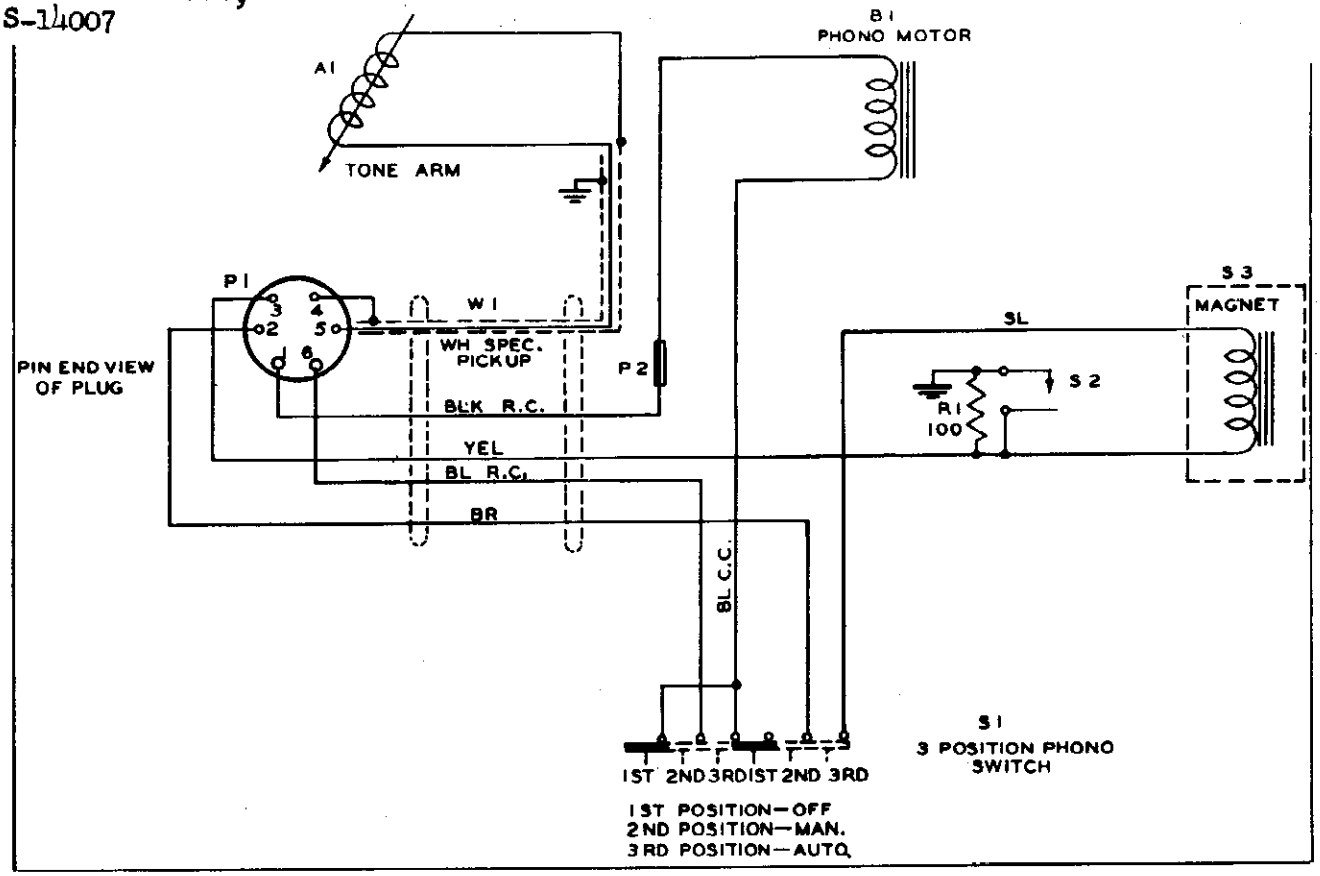


Fig. 7. Schematic Diagram S14004 Record Changer.

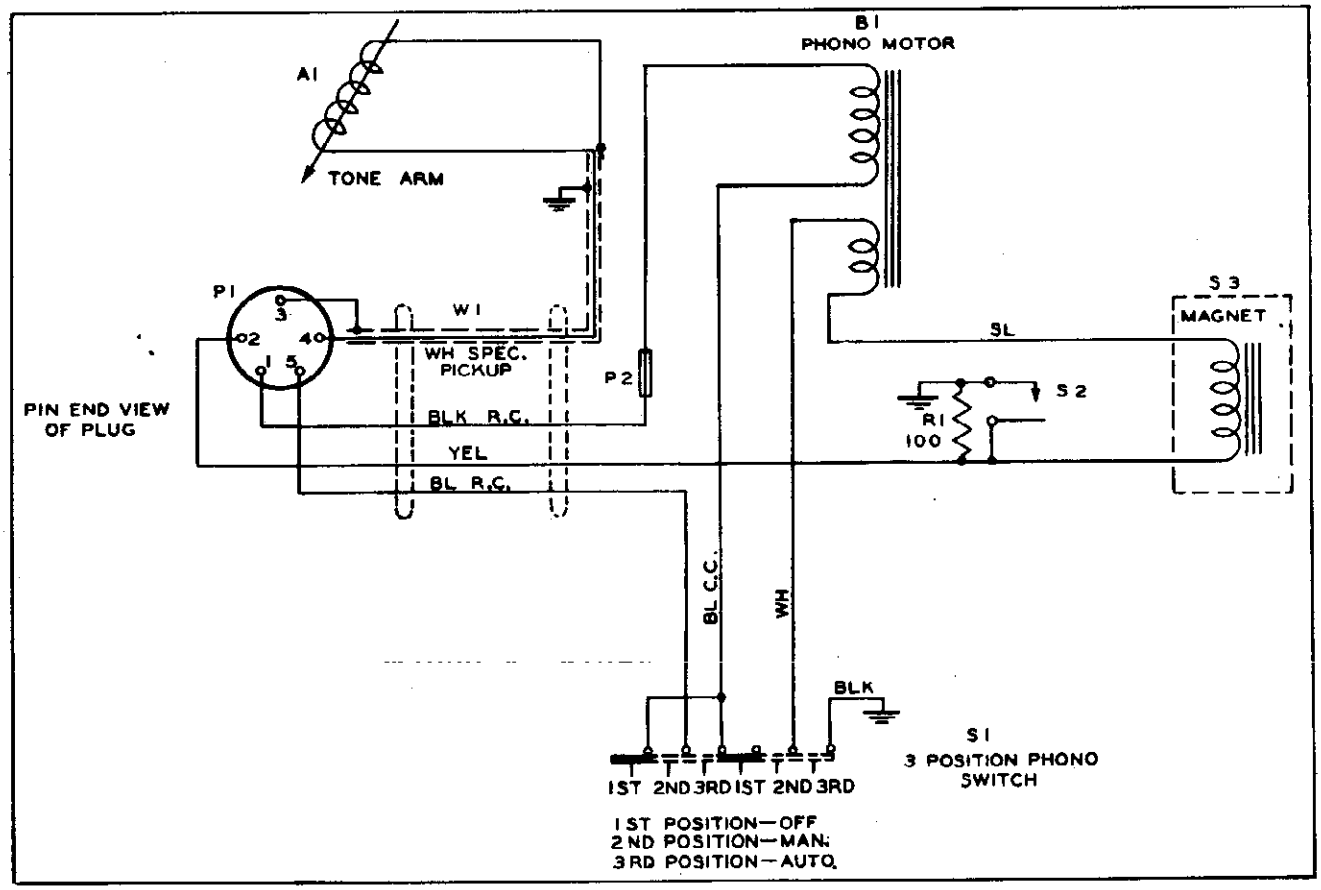


Fig. 8. Schematic Diagram S14007 Record Changer.