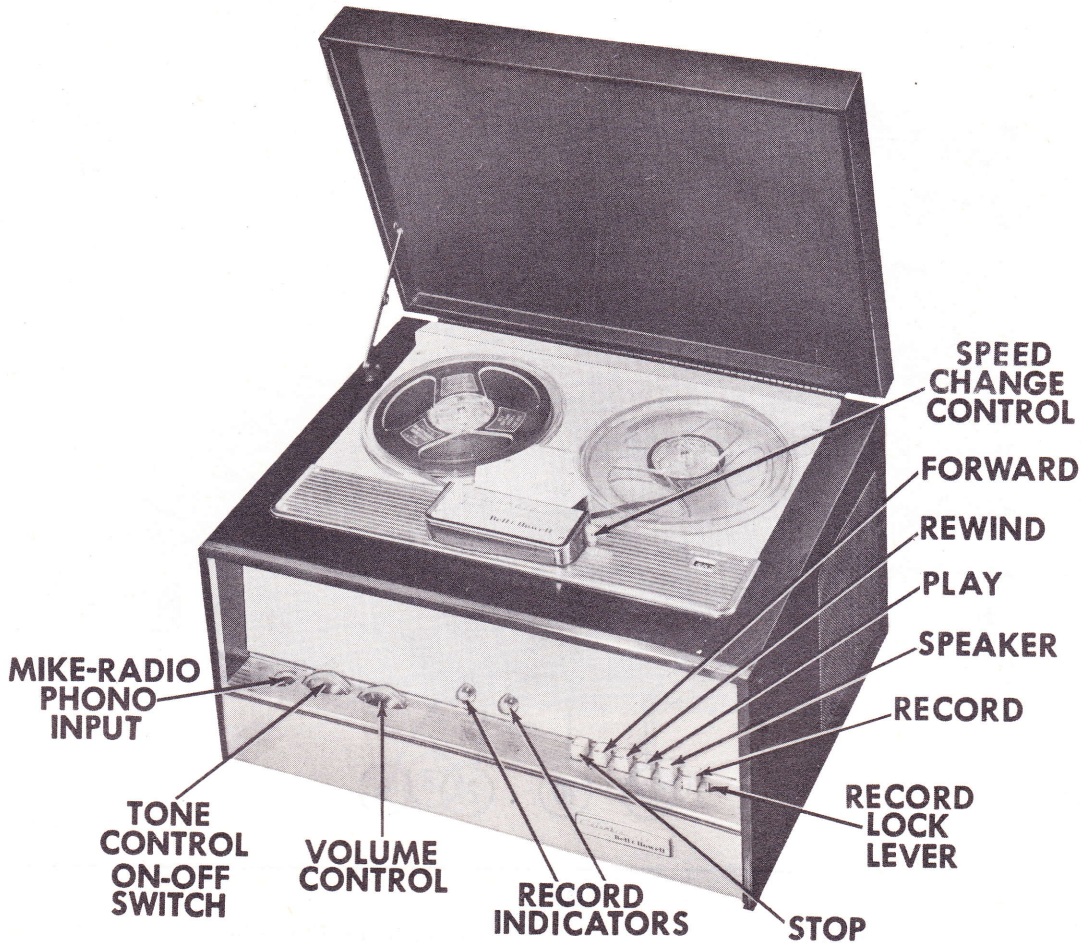




COLUMBIA-BELL & HOWELL  
MODEL 355



COLUMBIA-BELL & HOWELL  
MODEL 355

Figure 1

GENERAL INFORMATION

The Model 355 Columbia Bell & Howell Tape Recorder features Stop, Forward, Rewind, Play, and Record modes of operation merely by pressing a button. A speaker push button is also provided for monitoring programs or for using the recorder as a P. A. System. This recorder is of the dual-track type, giving two full length recordings on a single reel of recording tape. Any size reel up to 7" can be used. Two neon recording indicators simplify the recording level setting. New recordings can be made on previously recorded tape since the erase head is automatically connected when the "Record" button is pressed or the same recording may be played back indefinitely. Recordings can be made from a radio, television receiver, or phonograph, in addition to those made directly from the microphone. Recordings can be played back through the self-contained speakers or an external speaker may be connected through use of the Speaker Jack.

Model 355 is designed to operate on 115 volts, 60<sup>+</sup>, AC supply only.

CAUTION: Severe Damage Will Result If Connection Is Made To A Direct Current (DC) Line.

Columbia Records Inc.  
799 Seventh Avenue  
New York 19, New York

*This material compiled and published by*

**HOWARD W. SAMS & CO., INC., INDIANAPOLIS, INDIANA**

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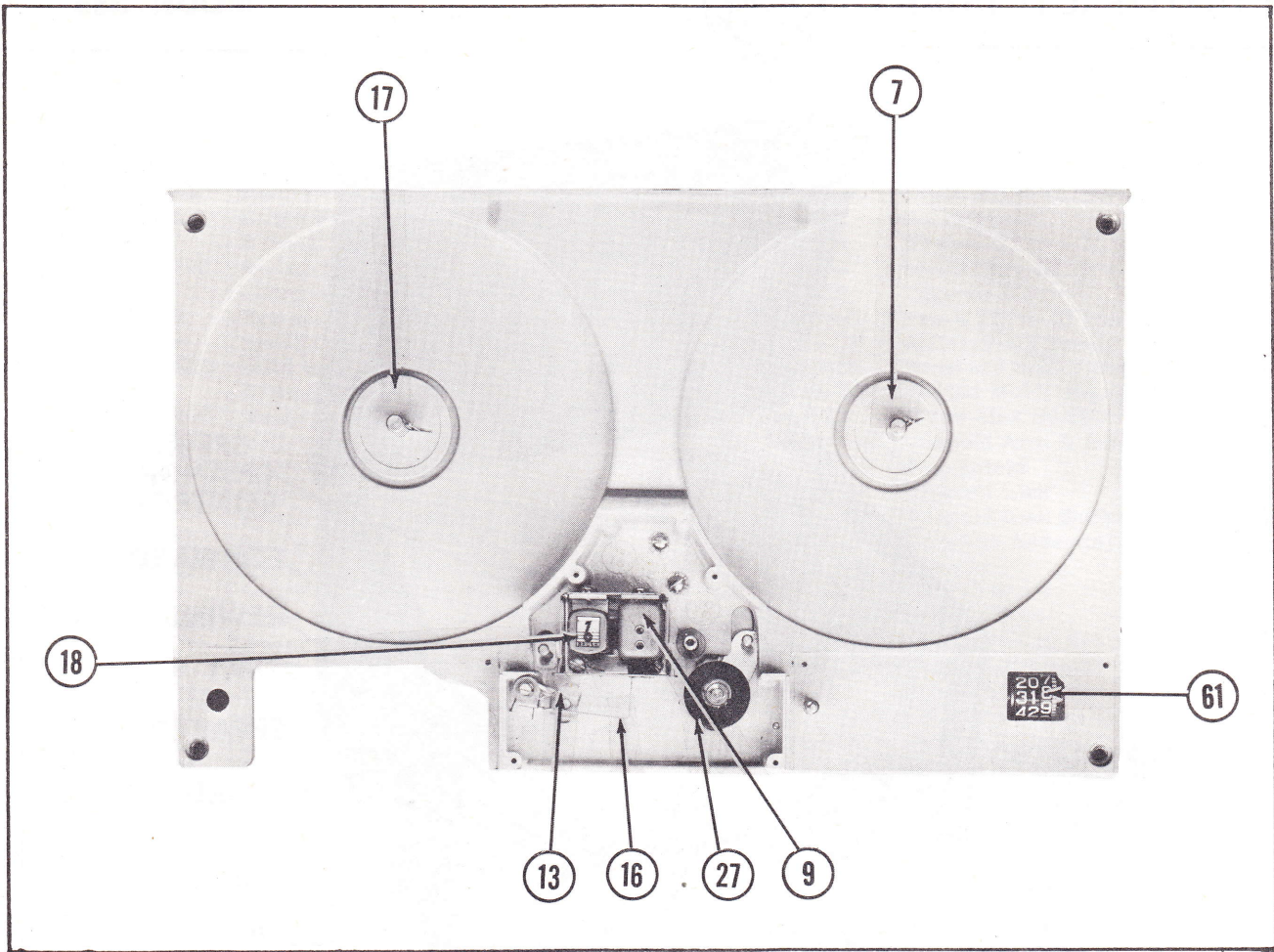


Figure 2

**SPECIFICATIONS**

Reel Size-

Up to 7".

Tracks-

Dual.

Track Selection-

Manual turnover.

Tape Loading-

Drop-in-slot type.

Tape Speed-Play and Record-

7 1/2 and 3 3/4 ips.

Fast Forward-

7" reel in 90 seconds.

Fast Rewind-

7" reel in 90 seconds.

Speakers-

2 electrostatic "tweeters".  
2-8" low-frequency "Woofers".

Recording Time(7" reel)-

1 hour at 7 1/2 ips. (1/2 hour each track)  
2 hours at 3 3/4 ips. (1 hour each track)

Overall Frequency Response-

(Record To Playback At 7 1/2 ips.)  
+2db from 50 to 10,000 cps.

Distortion-

Less than 3% at 4 watts.

Power Output-

8 watts.

Wow and Flutter-

(At 7 1/2 ips.)  
Less than 0.02%.

Audio Inputs-

Microphone, Radio, Phono, TV.

Audio Output-

(a)Internal or Extension Speaker.  
(b)External Amplifier.

Controls-

3 knobs, 6 electric pushbuttons.

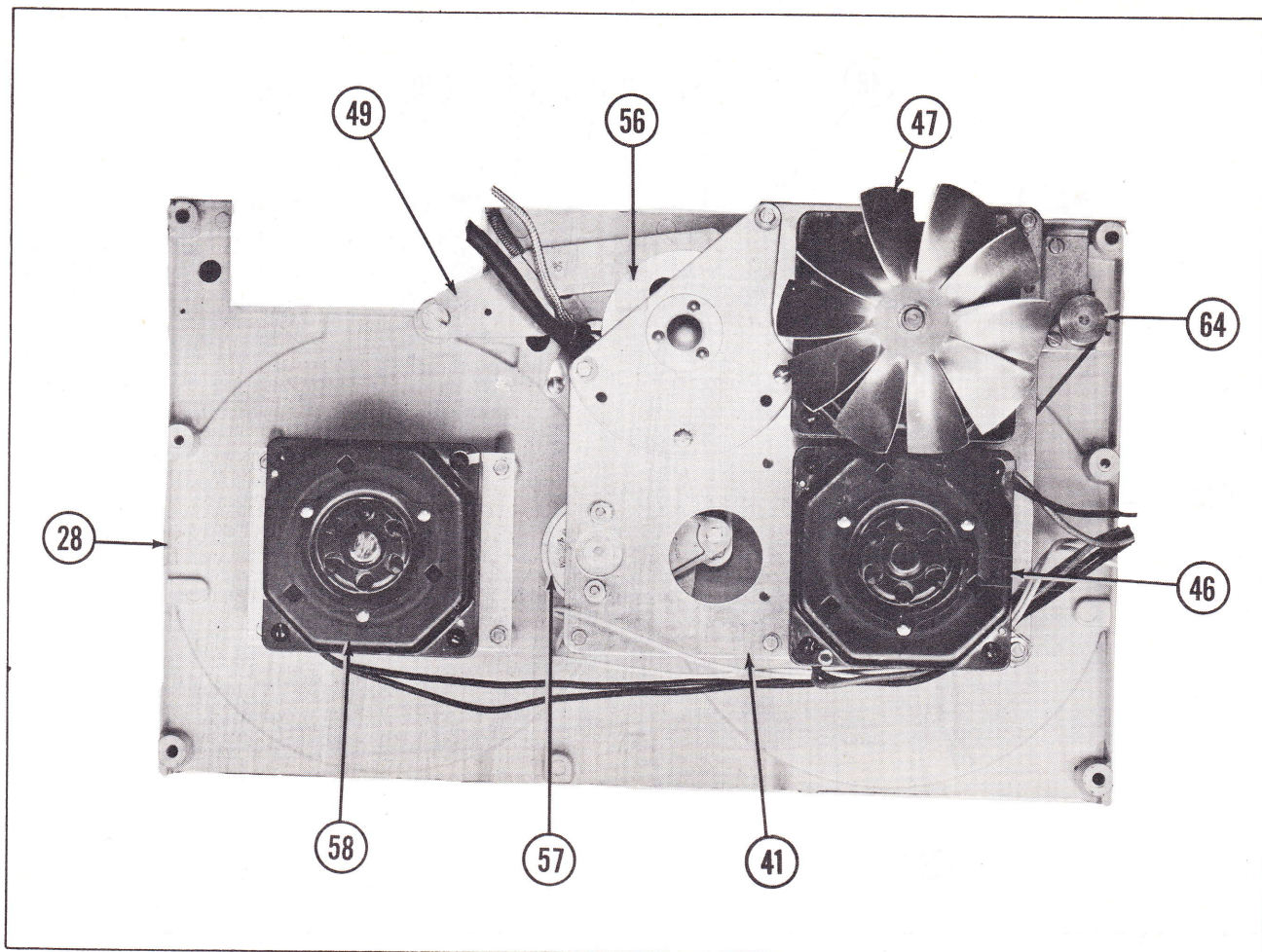


Figure 3

### OPERATING INSTRUCTIONS

#### Making Connections-

Turn the "tone" control to the left to "Off" and plug the power cord into a convenient wall outlet of the proper rating.

#### Threading The Tape-

With the "Stop" button depressed, place an empty reel on the right hand (take-up) spindle. Place a full reel of tape on the left hand (supply) spindle so that the reel will turn counterclockwise when tape is pulled from the reel. Make certain that the reel springs on the spindles engage one of the slots in the hubs of the reels and that the reels are fully seated. Reel out about two feet of tape and feed the loose end up into the empty reel on the right spindle. Thread the tape into one of the slots in the outer surface of the hub. Hold the loose end between the fingers and slowly rotate this reel counterclockwise through a couple of revolutions. While taking up slack in the tape between the two reels the tape will automatically drop into the tape slot.

#### To Record From Microphone-

1. Insert the microphone plug into the "Mic. - Radio-Phono" input jack.

2. Turn the "Off-Tone-On" control to the right until a click is heard and allow approximately 30 seconds for the unit to warm up. "Power on" condition is indicated by indirect illumination of the lucite knobs from behind the front panel.

3. Unlock and push the "Record" button. Observe the "Record Level" indicator lamps while speaking into the microphone. Occasional flickering of the "Distortion" lamp indicates a good, high level of recording, however, continuous glowing or flashing in this lamp indicates that the "Volume" control setting must be reduced. Be sure that the "Normal" lamp glows fairly full and steady or you may not be recording properly, if at all.

NOTE: The "Tone" control is inoperative when recording.

#### Mic. -Radio-Phono Input-

This two-circuit, front-panel input jack provides a 220,000 ohm high-impedance input for the microphone and a low-impedance input for recording from a radio, phonograph or TV set. A two-conductor attachment cord is supplied in the storage compartment. This cord is terminated at one end with a jack plug and at the other with two alligator clips to enable you to make connection to various equipment for recording or monitoring.

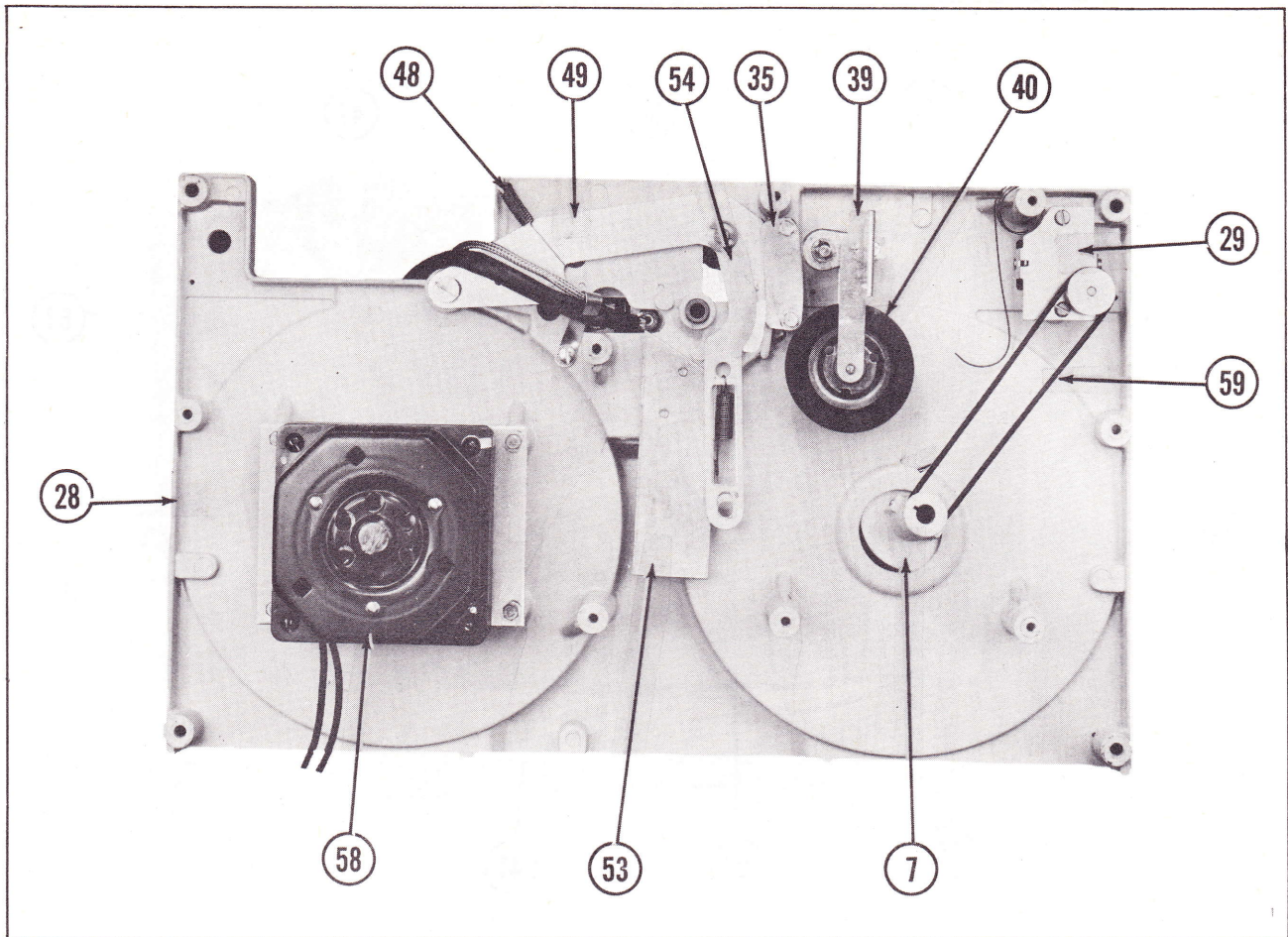


Figure 4

To Record From Radio,  
TV, Or Phonograph-

1. Take the radio-phono attachment cord from the storage compartment.
2. Turn off power to the recorder.
3. With the two alligator clips on the end of the radio-phono attachment cord, connect across the amplifier output or voice coil on the speaker of the radio, phono, or TV set.
4. Insert the plug of the radio-phono cord into the Mic.-Radio-Phono input jack on the front panel of the recorder .
5. Proceed with the recording as described in "To Record From Microphone".

Double-Track Recording-

The Columbia-Bell & Howell is designed so that only 1/2 the tape width is recorded at a time, thereby resulting in double-track recording. This double-track operation is accomplished in the following manner:

1. After a reel of tape has been recorded, i. e. all the tape wound on to the take-up reel, depress the "Stop" button. This stops all movement of the tape.
2. Remove the reels from the recorder, turning the full reel over and placing it on the left

spindle and the empty reel on the right spindle.

3. Properly thread the tape and proceed with the recording.
4. After the second track has been recorded the first track is ready to be played, without re-winding, as follows:
  - (a) Place the full reel of tape on the left spindle and the empty reel on the right spindle.
  - (b) Thread the tape making sure the dull side faces the play-record head.
  - (c) Set the controls as described under "To Play A Recording".

To Play A Recording-

1. Thread the tape as described under "Threading The Tape".
2. Turn the "Off-Tone-On" control to the right and allow about 30 seconds for warm up.
3. Depress the "Play" button until it is latched into position.
4. Adjust the "Volume" and "Tone" controls for desired level.

To Edit And Splice Tape-

NOTE: Since it is impossible to edit and splice one track without affecting the other, recordings

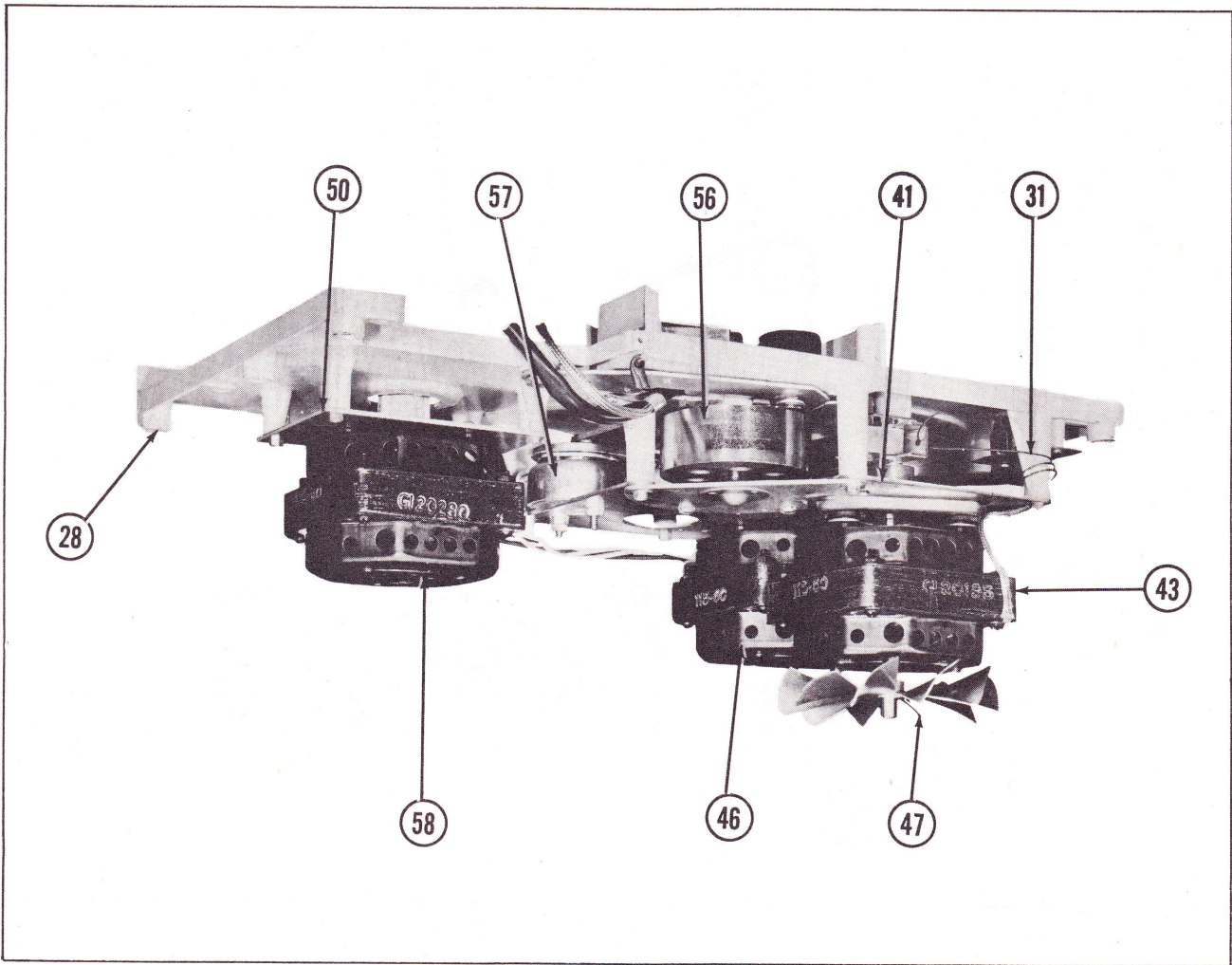


Figure 5

which are to be edited should be limited to one track only.

1. The tape may be edited by cutting out unwanted portions, or by joining selections into another sequence. Announcements may be inserted between selections, etc. Unused sections of tape can be spliced together for re-use.

(a) Cut tape at 60° angle with an overlap so ends will line up. (Cutting tape at 60° angle will eliminate detection of splice on recording.)

(b) Align both ends of tape, with glossy side up.

(c) Cover aligned ends with splicing tape, evenly and securely.

(d) Trim off excess splicing tape. (Cut into the recording tape very slightly.) This eliminates possibility of a sticky splice.

#### To Use External Speaker-

Any size speaker of the permanent magnet type, having a 3.2 ohm voice coil, may be used by connecting the alligator clips of the radio-phono cord across the voice coil of the external speaker and then inserting the radio-phono cord plug (same type as speaker plug) into the "Speaker" jack.

#### Fast Forward And Fast Rewind-

High-speed forward or rewind can be obtained by pressing the desired button. These functions are used primarily in locating a desired portion of a recording in a few seconds. You may press the "Forward" or "Rewind" button while in "Play" or "Record" positions but you cannot switch to other functions until you have first pressed the "Stop" button.

**IMPORTANT:** When pressing the "Stop" button... hold it down until the reels come to a complete stop.

#### To Use Recorder As A Public Address System-

To operate this recorder as a public address unit, insert the microphone plug into the "Mic. -Radio-Phono" input and turn the power on. At the back of the amplifier move the "Tape Drive" switch to "Off". Unlock and press the "Record" and "Speaker" buttons. While speaking into the microphone adjust the "Volume" and "Tone" controls to the desired level.

The public address program may be recorded by leaving the "Tape Drive" switch in the "On" position. Then, proceed with the program as described above.

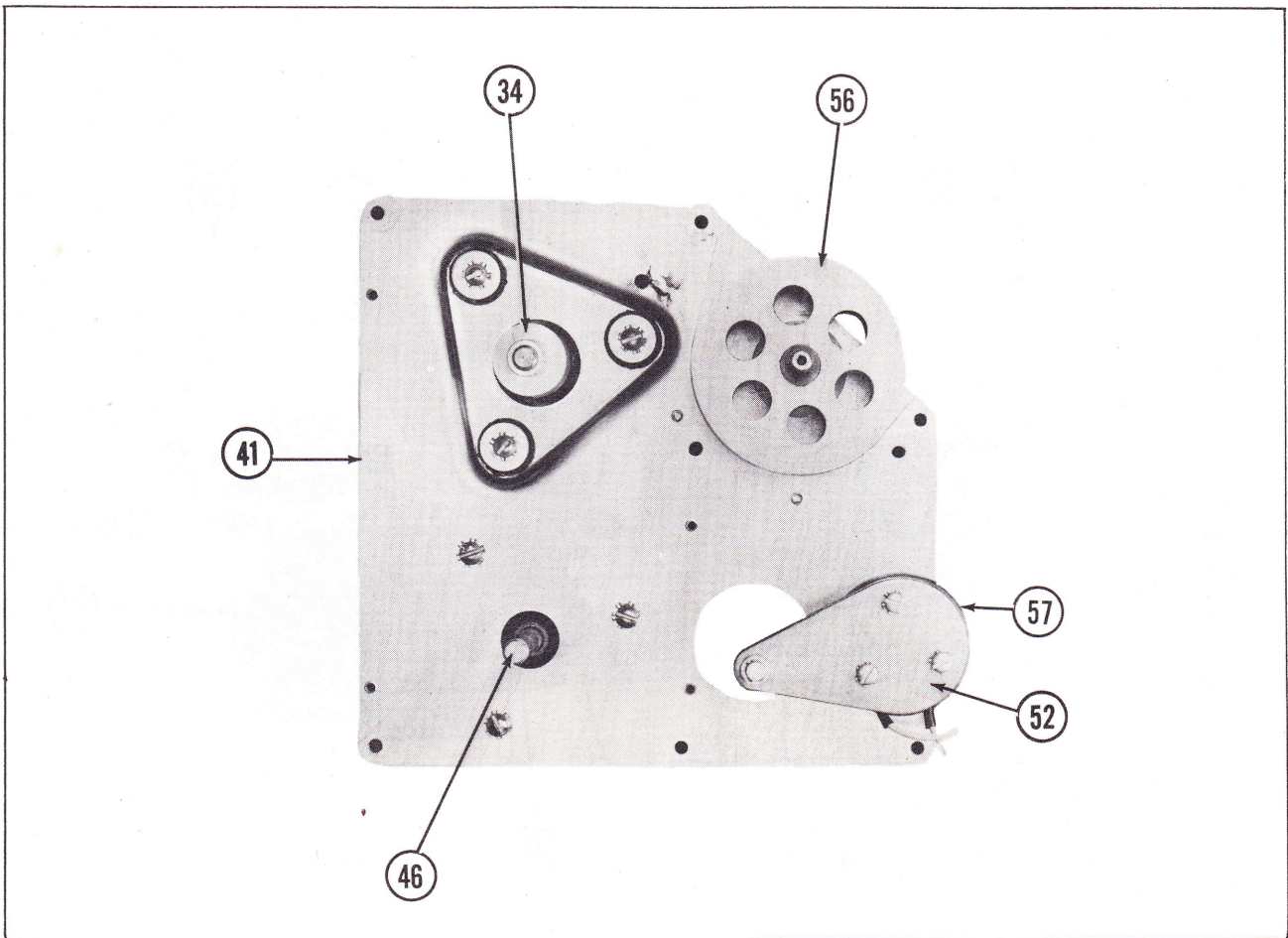


Figure 6

Program Indicator -

This odometer-type indicator registers "000" to "999" and will save much guesswork when trying to locate a desired portion of a pre-recorded tape. The reading of the indicator may be noted as the recording is being made so that reference to any given point on the tape may be made very rapidly. When a recorded tape has been so logged or referenced, always "zero" the indicator before starting to play the recording. This should be done before tape is threaded on the take-up reel. Press the "Forward" button and observe the indicator. Use the "Stop" button when approaching "000" and then the last few digits can be turned off manually by spinning the take-up reel with the fingers.

Speed Change -

This recorder operates at two speeds - 7 1/2 or 3 3/4 inches-per-second. The "Speed Change" knob will enable you to play or record tape at either speed. For 3 3/4" operation, take hold of the knob and turn it gently to the left, pull out, and release. To restore the setting to 7 1/2", take hold of the knob as before, turn it gently to the left, push in, and release.

**ADJUSTMENTS**

Play/Record Head Adjustment -

It is very important that play-record head (9) be lined up perfectly with the tape. If it is not, low

output, loss of high frequencies or track overlap may result.

**IMPORTANT:** The heads have been aligned and locked in place at time of manufacture and should require no further adjustment, unless it becomes necessary to install a new head.

To adjust, make a tape recording of a 3000 cycle signal on a good unit. Place this on the unit that the head is to be aligned on. Connect an output meter or AC voltmeter across the speaker voice coil. Play the 3000 cycle tape, rock play-record head (9) back and forth, loosening two screws (1) will allow you to do this, and notice a variation in the output voltage at the voice coil. Tighten screws (1) in the position of highest output.

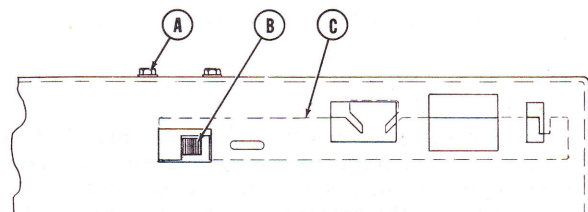


Figure 7

Memory Switch Adjustment-  
(To Correct Imbalance In Braking)-

Remove amplifier chassis from case. Just above toggle on front of amplifier are two nuts (A) (See Fig. 7). Loosen these two nuts. Press the "Rewind" button to the bottom. Pull toggle of (B) to extreme right on switch assembly. Position entire switch assembly with left side of toggle just touching the latch bar (C) as shown in Fig. 7, then tighten the two nuts (A).

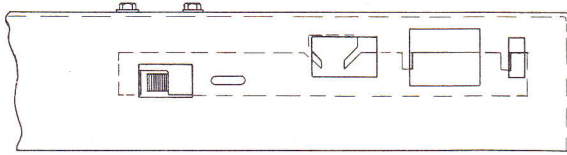


Figure 8

To check the adjustment, press the "Forward" button and observe new position of the toggle. It should then be in the extreme left position with the latch bar just touching the right side of the toggle as shown in Fig. 8.

LUBRICATION

The Columbia-Bell & Howell has been lubricated at time of manufacture and this should be sufficient for the life of the recorder. In case of extreme use or if parts are replaced, spread a thin film of Lubriplate on the pivot points of levers. Parts such as pressure roller (27), idler wheel (40), and flywheel assembly (56) are provided with generous-size oilite bearings and require no further attention.

**CAUTION:** Do not oil the motor bearings unless absolutely necessary as excess oil will only be thrown off and get on the pulleys and rollers. Always use as little oil as possible. If any oil should get on the pulleys or rollers wipe off with a petroleum solvent, such as alcohol.

CLEANING

The erase head, play/record head, capstan, and pressure roller are subject to an accumulation of tape coating oxide which is worn off the tape as it passes these parts. If left unattended the playing and recording qualities of the recorder will be affected. Periodically clean these surfaces with a soft cloth and alcohol.

TROUBLE CHART

SYMPTOM	CAUSE	REMEDY
Broken reel spring (4).	Defective spring (4).	Replace spring. Turn spindle (7 or 17) until spring is on top of spindle. With long end of #8 allen wrench reach over spindle motor, locate and engage head of allen set screw (6) in top of hub between motor and Mechanical Housing (28). Give allen wrench one-half turn to left to loosen screw and pull out broken spring from the top of Mechanical Housing (28). Insert new spring and tighten set screw.  NOTE: When placing new spring in position- push all the way in, then back out about 1/32" before tightening allen set screw.
Tape reel rubs on front panel.	Spindle hub (7-17) out of alignment.	(a)Remove reel spring (4), as above.  (b)Turn spindle until reel spring slot is under spindle. With #8 allen wrench reach over spindle motor, locate and engage head of allen set screw in hub between motor and front panel. Give allen wrench one-half turn to left to loosen screw.  (c)Slide hub slightly outward on spindle away from front panel and tighten set screw. Put empty reel on spindle and check for clearance between reel and panel and also for alignment of reel hub with tape feed from capstan.  (d)Install reel spring (see "Replace Spring" above).

Take-up or Rewind sluggish or inoperable.

**IMPORTANT:** Tape is an elastic medium of recording. Stretching this tape will introduce "wow" and "flutter" (distortion) for in excess of the design specifications to which the recorder is manufactured. Fast tape transport in both directions is a highly desirable feature but must not be achieved at the sacrifice of fidelity of the

TROUBLE CHART Con't.

SYMPTOM	CAUSE	REMEDY
		<p>recorded tape. For this reason the "take-off" must be a gentle action with positive control of the transport function particularly at the ends of the tape.</p> <p>NOTE: A full 7" reel of 1200 feet of tape can be transported in either direction in about 40 seconds. Due to the gentle take-off action a slight manual assistance may be necessary to start the reels. By this means positive control is maintained and the tape may be repositioned at any point with great accuracy and with no loss of overall fidelity.</p>
Takeup or Rewind sluggish (continued) .	<p>1. Low supply voltage.</p> <p>2. Drive Belt (59) between take-up motor and PROGRAM INDICATOR odometer pulley is too tight.</p> <p>3. Defective odometer.</p> <p>4. Spindle motor bearing out of Alignment due to rough handling during shipment.</p>	<p>1. Check line voltage. Should be between 105 and 125 volts AC.</p> <p>2. Stretch drive belt (59) slightly.</p> <p>3. Remove drive belt (59) from odometer pulley (64) and turn pulley with fingers through several revolutions. If pulley does not turn freely at any point of revolution replace odometer.</p> <p>4. Tap end of spindle sharply with wooden or plastic handle of screwdriver.</p>
Tape speed erratic .	<p>1. Capstan drive slipping due to oil or dirt on drive surfaces.</p> <p>2. Tape wound around capstan; oil or dirt on pressure roller.</p>	<p>1. Clean drive surface using a small lintless, soft cloth (cheesecloth or equivalent) dipped lightly in carbon tetrachloride, alcohol, or lighter fluid. With drive running, hold cloth against motor drive wheel (34), idler wheel (40), and capstan flywheel (56).</p> <p>2. Remove two screws in front of recording-head cover plate (5). If tape is wound around capstan peel or cut it off.</p> <p>CAUTION: Be extremely careful not to scratch or mar surface of capstan. Use soft cloth dipped in carbon tetrachloride, alcohol, or lighter fluid to clean surface of capstan and pressure roller. Use pipe-stem cleaner dipped lightly in one of above fluids to wipe off any tape dust from face of brush "redheads". Replace cover plate and screws.</p> <p>NOTE: Do not turn screw in too tightly.</p>
Hum in playback .	<p>1. Congested wiring.</p> <p>2. Recorded signal lever too low.</p>	<p>1. Separate wires in back of recorder to make certain none comes against moving parts. Check that all plug-in connections are securely in place. Reverse the power cord plug in wall socket.</p> <p>2. Press "PLAY" button and set "VOLUME" for preferred listening level. Place "SPEED CHANGE" knob in "NEUTRAL" (between the 3 3/4 and 7 1/2 ips.) Hum should disappear indicating too low an input signal lever was used for recording. Set proper input level when recording.</p> <p>NOTE: It should never be necessary to raise the "VOLUME" control setting above "3" or "4" when recording. If hum persists observe the following:</p>



TROUBLE CHART - Con't.

SYMPTOM	CAUSE	REMEDY
	3. AC hum pickup from power equipment (transformers), fluorescent fixtures, etc.	3. Avoid operating the recorder in the proximity of such devices and/or provide a good electrical ground for the amplifier chassis.
	4. Hum pickup from associated signal equipment.	4. (a) Switch input connections. (b) Provide a common metallic bond between all associated equipment and ground system securely.  (c) If signal output voltage of associated equipment is characteristically low use shielded lead between signal source and recorder input.
	5. Defective vacuum tube.	5. Check and replace faulty tube.
Does not erase properly.	Pressure Pad Worn.	Remove recording-head cover plate (5) and examine felt pad on pressure levers. Replace if worn. Peel off old pads and mount new ones (from envelope stapled in Instruction book) using Du Pont clear cement or equivalent.
Does not record properly.	1. Faulty operating procedure.  2. Pressure pad worn.  3. Distorted recording.	1. Refer to "Operating Instructions". Also observe "REMEDY" column under "Hum In Playback" of this chart.  2. Examine for worn pads and replace if necessary (see replacement directions above).  3. Try recording with microphone supplied with the recorder. If clean recording can be made with "mike" check for mismatched impedance in hookup of associated equipment.

COLUMBIA-BELL & HOWELL  
MODEL 355

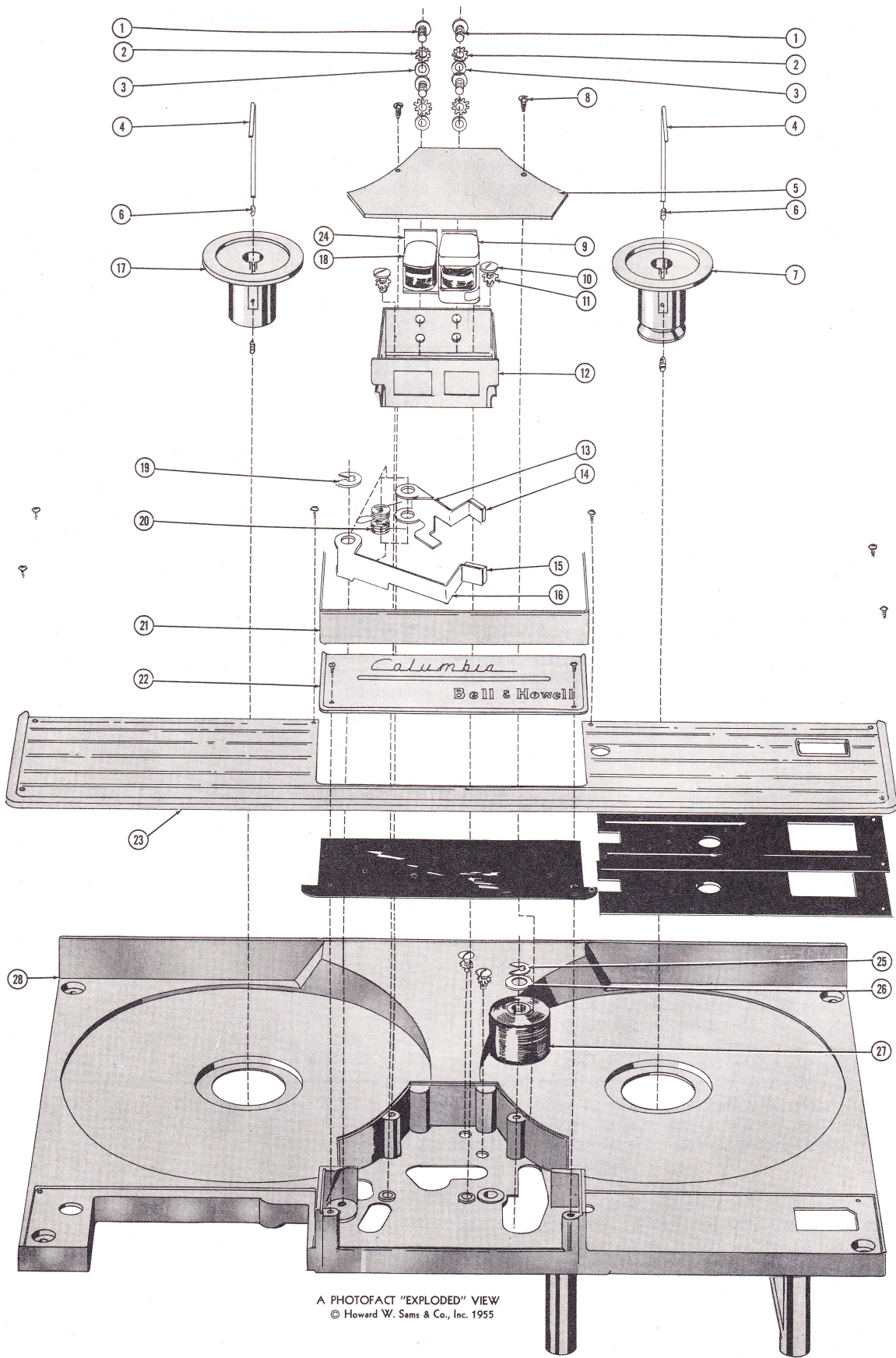


Figure 9A. Exploded View Of Parts Above Baseplate.

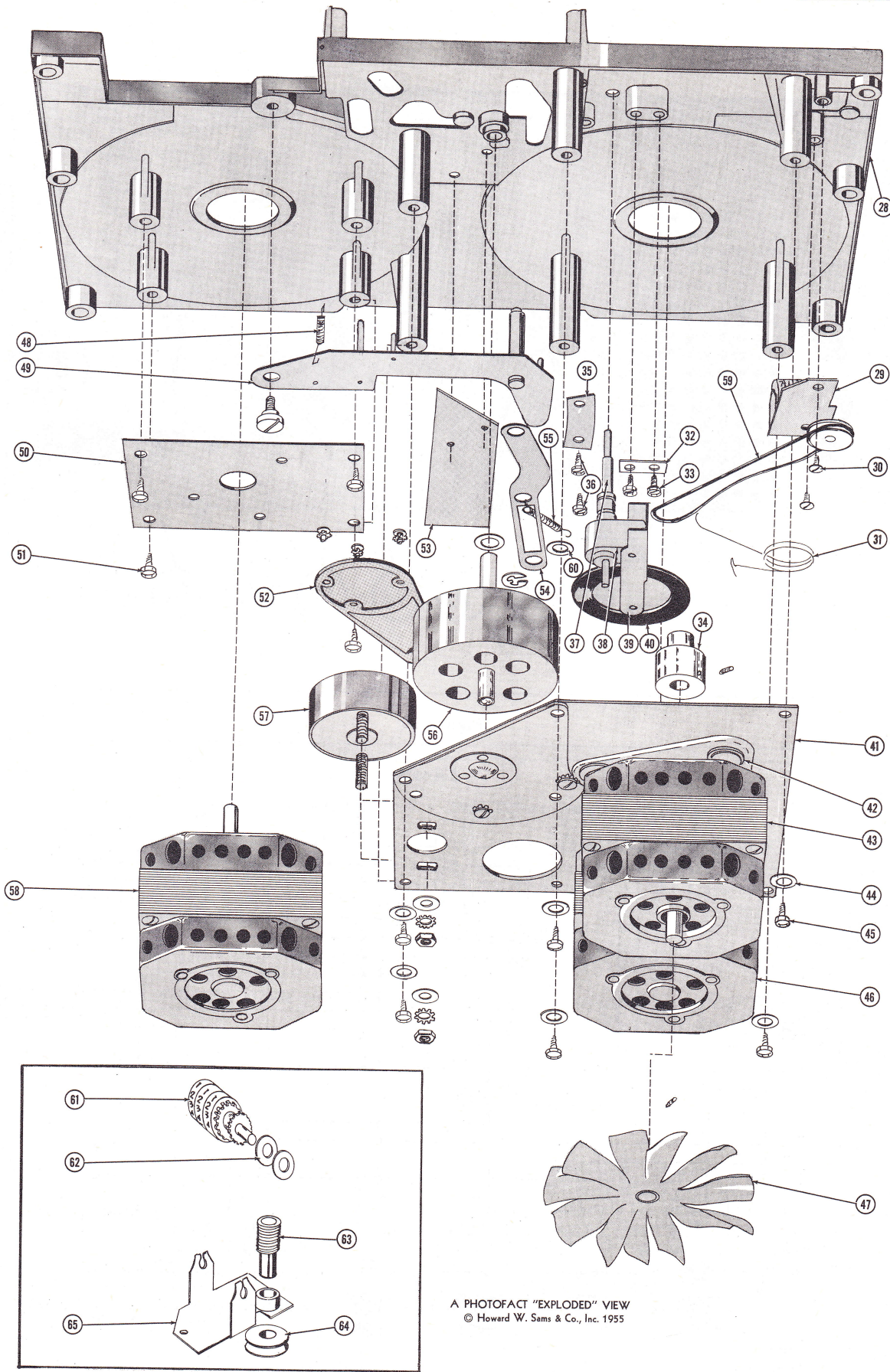


Figure 9B. Exploded View Of Parts Below Baseplate.

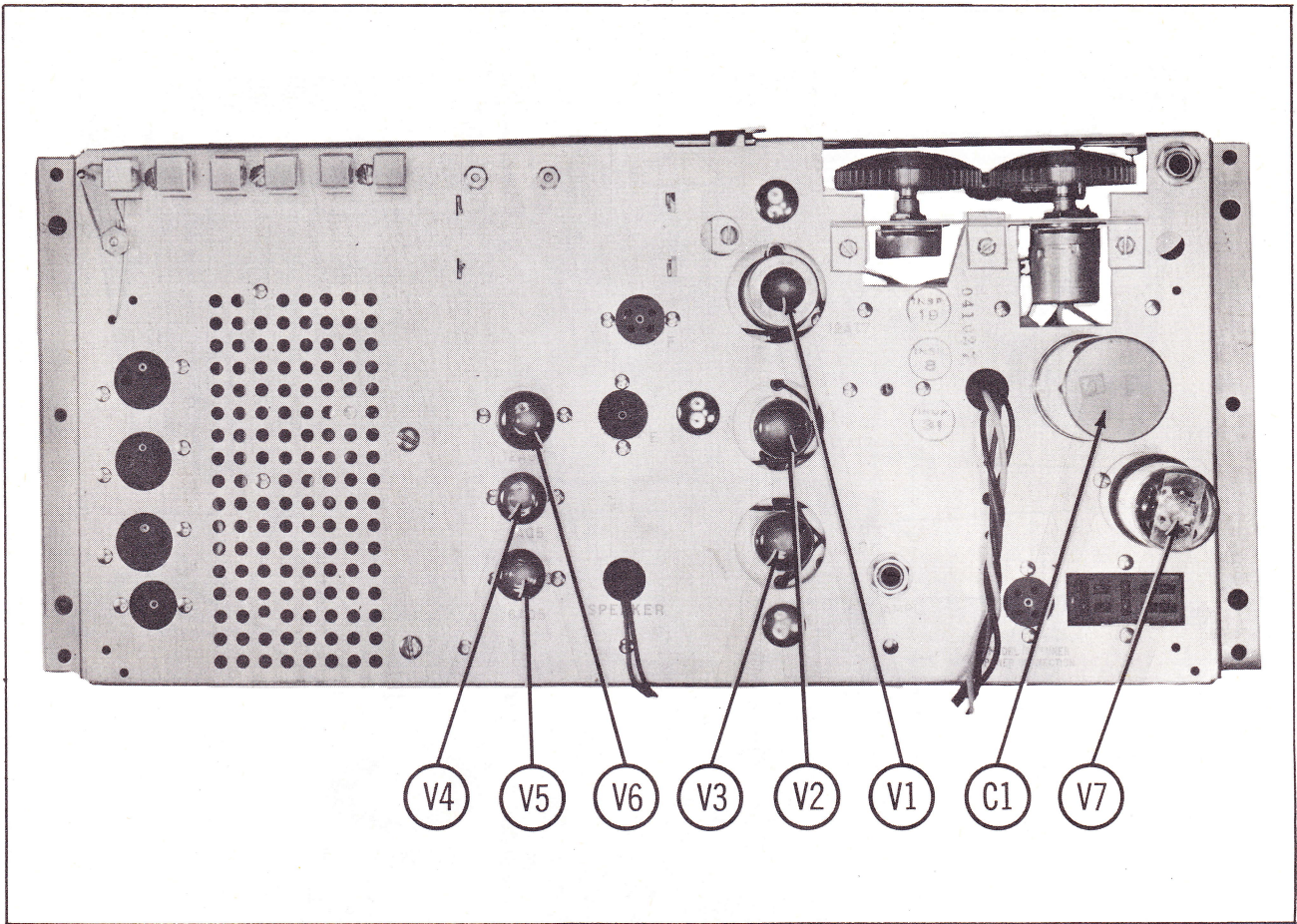
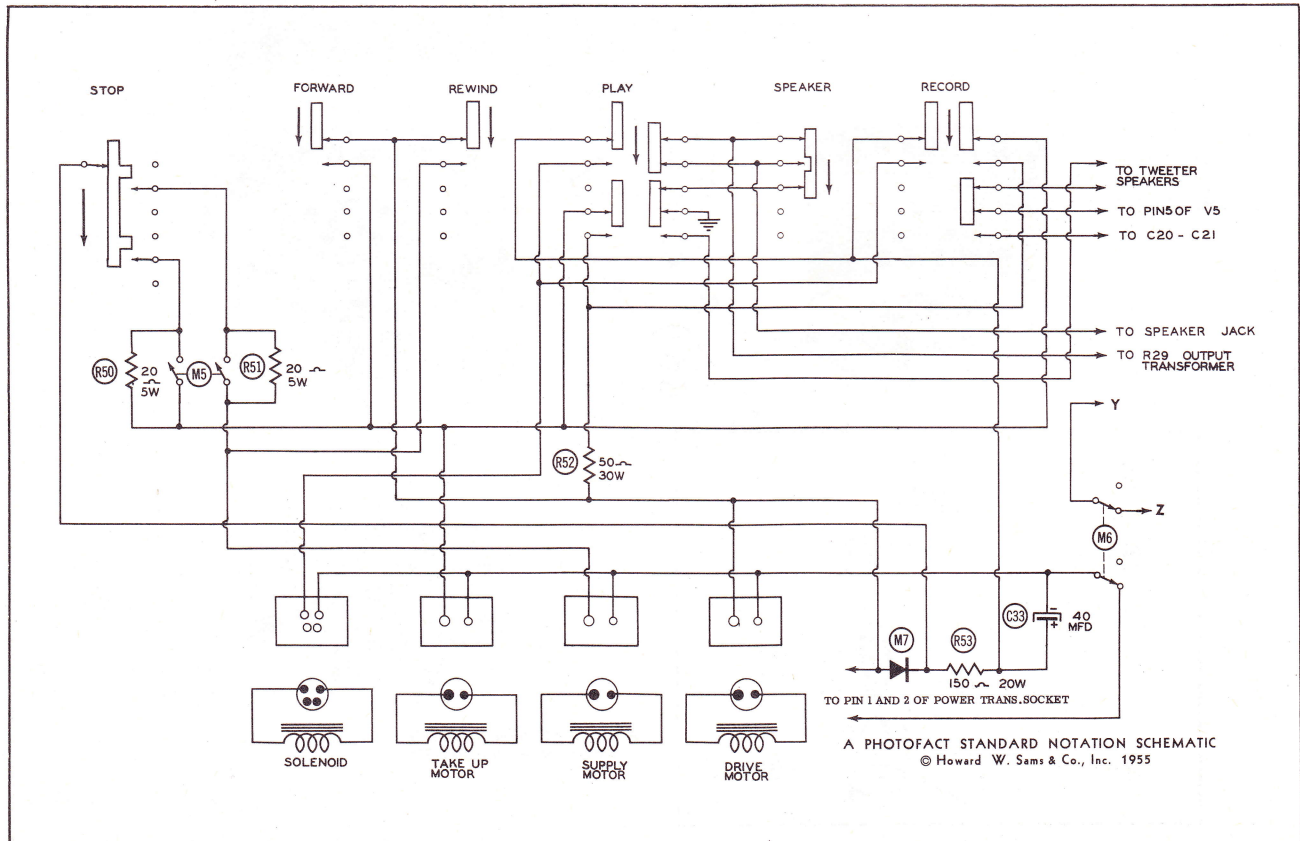
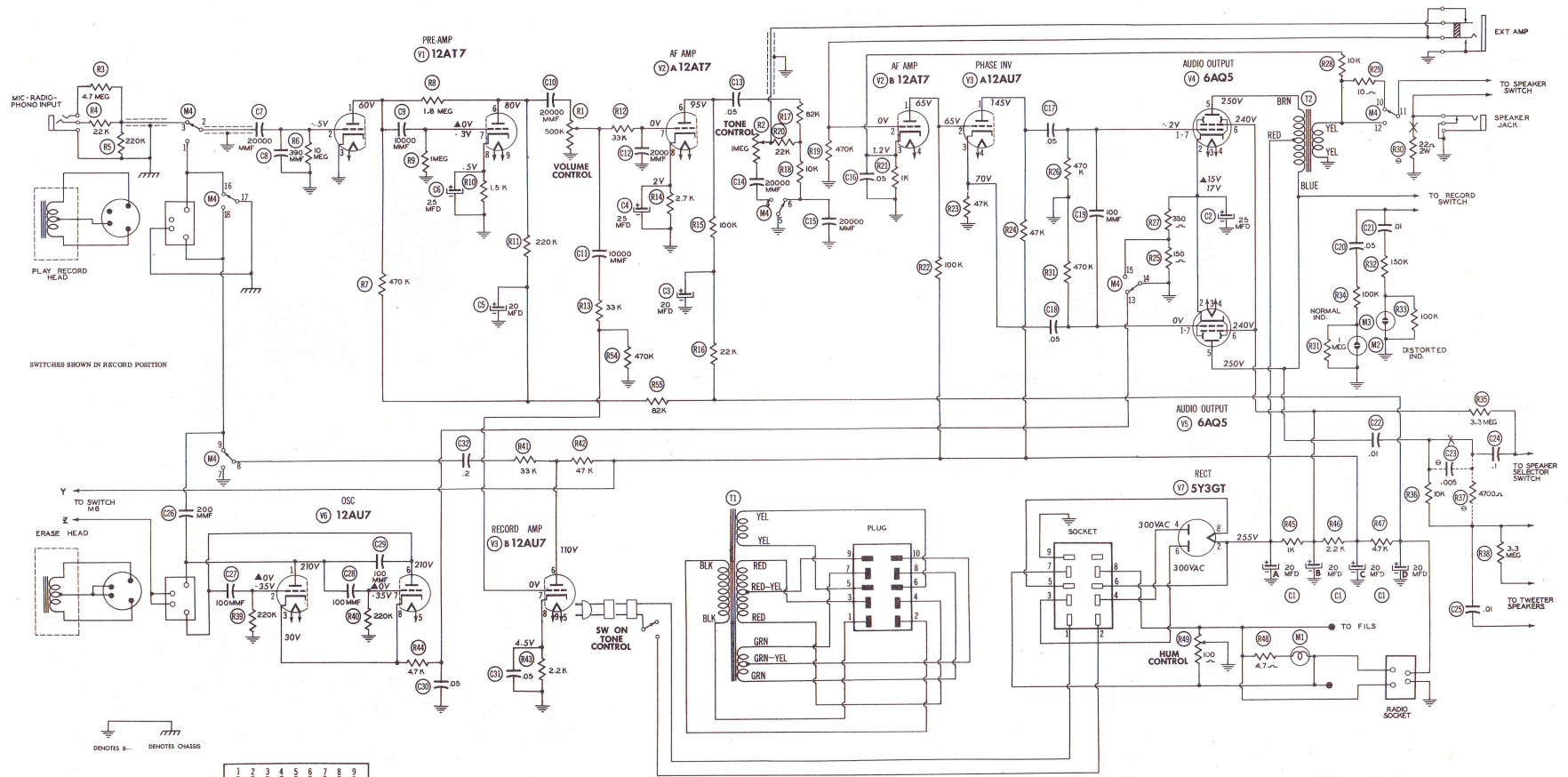


Figure 10

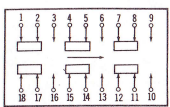


AC WIRING DIAGRAM



SWITCHES SHOWN IN RECORD POSITION

⊖ DENOTES B-  
⊕ DENOTES CHASSIS



SEE PARTS LIST FOR ALTERNATE VALUE ON APPLICATION

RESISTANCE READINGS

Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V-1	12A17	100KΩ	10Meg	0Ω	20Ω	20Ω	100KΩ	1Meg	1.8KΩ	20Ω
V-2	12A17	100KΩ	470KΩ	1KΩ	20Ω	20Ω	100KΩ	100KΩ	2.7KΩ	20Ω
V-3	12A17	150KΩ	100KΩ	47KΩ	20Ω	20Ω	150KΩ	470KΩ	2.2KΩ	20Ω
V-4	6AQ5	470KΩ	250Ω	20Ω	20Ω	100Ω	1KΩ	470KΩ		
V-5	6AQ5	470KΩ	250Ω	20Ω	20Ω	100Ω	1KΩ	470KΩ		
V-6	12A17	15.0KΩ	200KΩ	4.7KΩ	20Ω	20Ω	15.0KΩ	220KΩ	4.7KΩ	20Ω
V-7	5Y3GT	∞	100KΩ	∞	420Ω	∞	400Ω	∞	100KΩ	

ALL MEASUREMENTS TAKEN IN "RECORD" POSITION UNLESS OTHERWISE DESIGNATED.  
 \* MEASURED IN "PLAY" POSITION.  
 † MEASURED FROM PIN 2 OF V1.

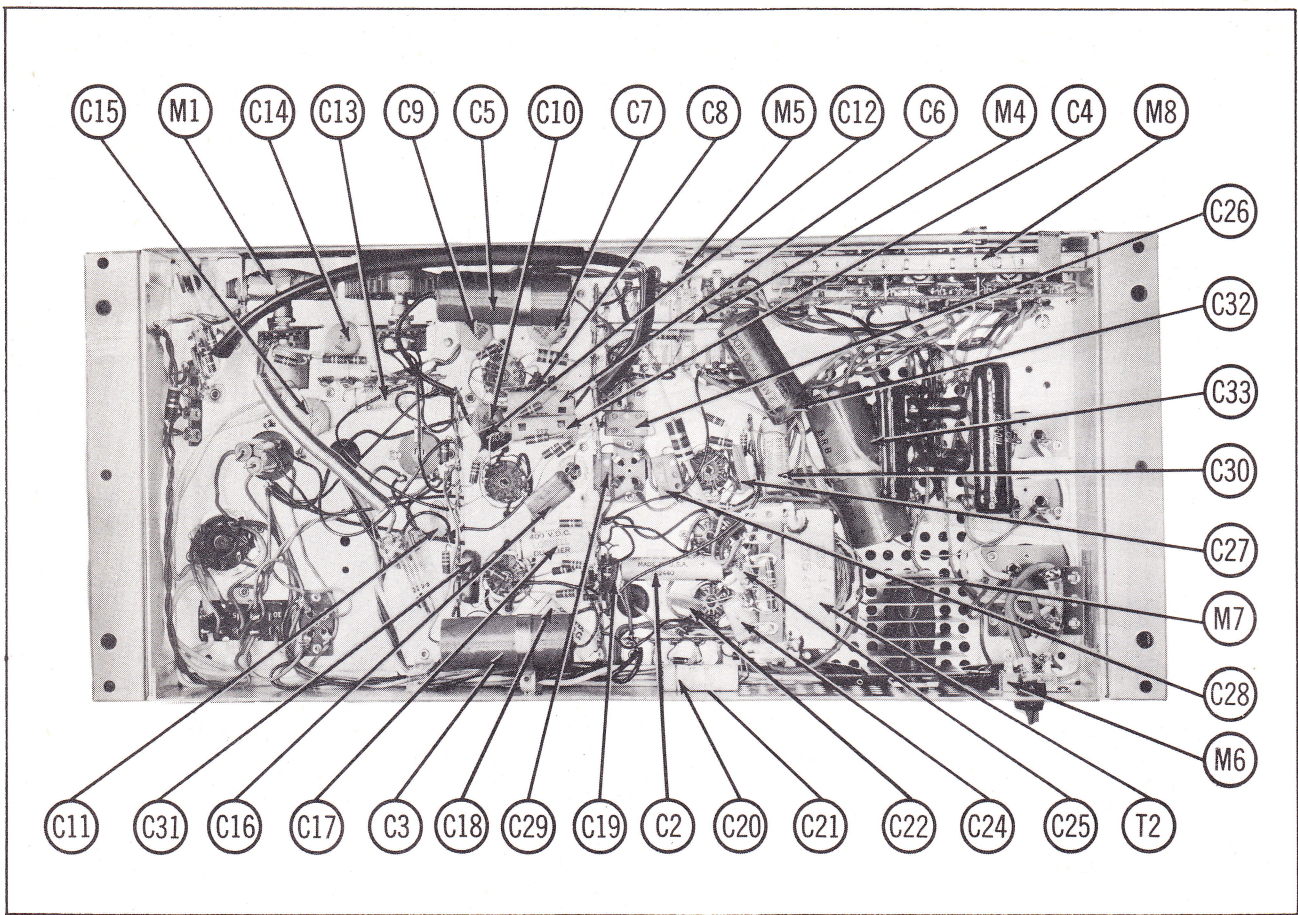


Figure 11

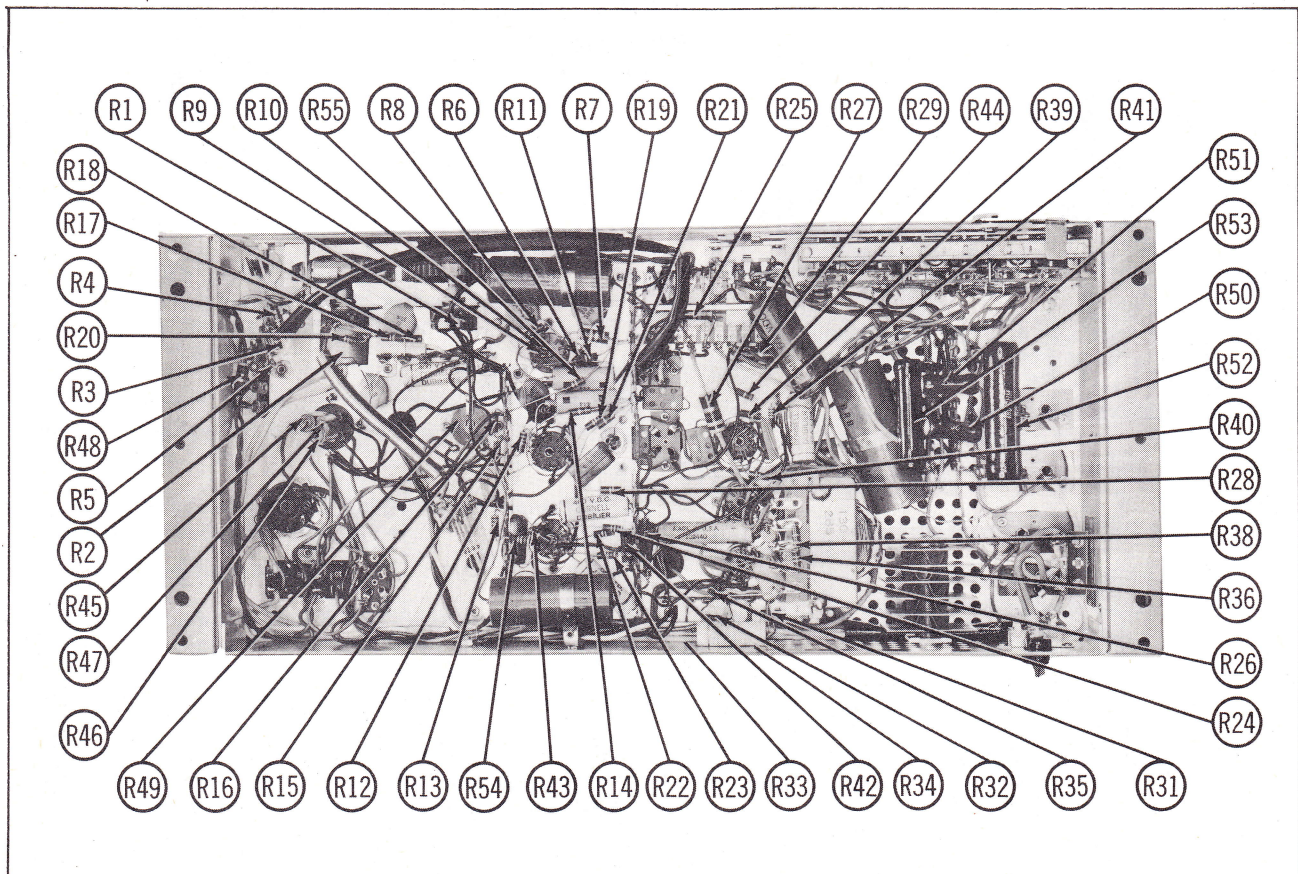


Figure 12

## ELECTRICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
V1	93-2	12AT7, Pre-Amp.	R12	99-22	Resistor, 33K $\Omega$ @ 1/2 W.
V2	93-2	12AT7, AF Amp.	R13	99-22	Resistor, 33K $\Omega$ @ 1/2 W.
V3	93-3	12AU7, Phase Inv. & Record Amp.	R14	99-9	Resistor, 2.7K $\Omega$ @ 1/2 W.
V4	93-4	6AQ5, Output	R15	99-8	Resistor, 100K $\Omega$ @ 1/2 W.
V5	93-4	6AQ5, Output	R16	99-2	Resistor, 22K $\Omega$ @ 1/2 W.
V6	93-3	12AU7, Oscillator	R17	99-11	Resistor, 82K $\Omega$ @ 1/2 W.
V7	93-5	5Y3GT, Rectifier	R18	99-14	Resistor, 10K $\Omega$ @ 1/2 W.
C1A	98-10	Elect. Cap., 20MFD. @450V.	R19	99-17	Resistor, 470K $\Omega$ @ 1/2 W.
C1B		Elect. Cap., 20MFD. @450V.	R20	99-2	Resistor, 22K $\Omega$ @ 1/2 W.
C1C		Elect. Cap., 20MFD. @450V.	R21	99-44	Resistor, 1K $\Omega$ @ 1/2 W.
C1D		Elect. Cap., 20MFD. @450V.	R22	99-8	Resistor, 100K $\Omega$ @ 1/2 W.
C2	98-21	Elect. Cap., 25MFD. @50V.	R23	99-55	Resistor, 47 $\Omega$ @ 1/2 W.
C3	98-26	Elect. Cap., 20MFD. @350V.	R24	99-55	Resistor, 47K $\Omega$ @ 1/2 W.
C4	98-18	Elect. Cap., 25MFD. @6V.	R25	99-19	Resistor, 150 $\Omega$ @ 1 W.
C5	98-19	Elect. Cap., 20MFD. @350V.	R26	99-7	Resistor, 470K $\Omega$ @ 1/2 W.
C6	98-18	Elect. Cap., 25MFD. @6V.	R27	99-40	Resistor, 330 $\Omega$ @ 2 W.
C7	98-30	Cap. Ceramic, 20, 000MMF. @ 10%	R28	99-14	Resistor, 10K $\Omega$ @ 1/2 W.
C8	98-17	Cap. Ceramic, 390MMF. @ 500V.	R29	99-21	Resistor, 10 $\Omega$ @ 2W.
C9	98-15	Cap. Ceramic, 10, 000MMF. @ 500V.	R30	99-62	Resistor, 22 $\Omega$ @ 2W. (Not used in all models)
C10	98-7	Cap. Ceramic, 20, 000MMF. @ 10%	R31	99-10	Resistor, 1Meg. @ 1/2 W.
C-11	98-15	Cap. Ceramic, 10, 000MMF. @ 10%	R32	99-16	Resistor, 150K $\Omega$ @ 1/2 W.
C-12	98-6	Cap. Ceramic, 2, 000MMF. @ 10%	R33	99-8	Resistor, 100K $\Omega$ @ 1/2 W.
C-13	98-8	Cap. Molded, .05MFD. @ 400V.	R34	99-8	Resistor, 100K $\Omega$ @ 1/2 W.
C-14	98-7	Cap. Ceramic, 20, 000MMF. @ 10%	R35	99-65	Resistor, 3.3Meg. @ 1/2 W.
C-15	98-7	Cap. Ceramic, 20, 000MMF. @ 10%	R36	99-14	Resistor, 10K $\Omega$ @ 1/2 W.
C-16	98-20	Cap. Paper Tub., .05MFD. @ 150V.	R37	99-41	Resistor, 4.7K $\Omega$ @ 1/2 W. (Not used in all models)
C-17	98-8	Cap. Molded, .05MFD. @ 400V.	R38	99-65	Resistor, 3.3Meg. @ 1/2 W.
C-18	98-8	Cap. Molded, .05MFD. @ 400V.	R39	99-1	Resistor, 220K $\Omega$ @ 1/2 W.
C-19	98-12	Cap. Mica, 100MMF. @ 10%	R40	99-1	Resistor, 220K $\Omega$ @ 1/2 W.
C-20	98-8	Cap. Molded Paper, .05MFD @ 400V.	R41	99-22	Resistor, 33K $\Omega$ @ 1/2 W.
C-21	98-22	Cap. Molded Paper, .01MFD @ 400V.	R42	99-20	Resistor, 47K $\Omega$ @ 1/2 W.
C-22	98-15	Cap. Ceramic, 10, 000MMF. @ 500V.	R43	99-56	Resistor, 2.2K $\Omega$ @ 1/2 W.
C-23	98-29	Cap. Ceramic, 5, 000MMF. @ 10% (Not used in all Models)	R44	99-41	Resistor, 4.7K $\Omega$ @ 1/2 W.
C-24	98-28	Cap. Molded Paper, .1MFD. @ 150V.	R45	99-43	Resistor, 1K $\Omega$ @ 2 W.
C-25	98-15	Cap. Ceramic, 10, 000MMF. @ 500V.	R46	99-42	Resistor, 2.2K $\Omega$ @ 2 W.
C-26	98-24	Cap. Mica, 200MMF. @ 10%	R47	99-33	Resistor, 4.7K $\Omega$ @ 1 W.
C-27	98-12	Cap. Mica, 100MMF. @ 10%	R48	99-29	Resistor, 4.7 $\Omega$ @ 1 W.
C-28	98-12	Cap. Mica, 100MMF. @ 10%	R49	99-15	Hum Balance Cont., 100 $\Omega$
C-29	98-12	Cap. Mica, 100MMF. @ 10%	R50	99-37	Resistor, 20 $\Omega$ @ 5 W., W. W.
C30	98-8	Cap. Molded Paper, .05MFD. @ 400V.	R51	99-37	Resistor, 20 $\Omega$ @ 5 W., W. W.
C31	98-20	Cap. Molded Paper, .05MFD. @ 150V.	R52	99-57	Resistor, 50 $\Omega$ @ 30W., W. W.
C32	98-23	Cap. Paper Tub., .2MFD. @ 600V.	R53	99-5	Resistor, 150 $\Omega$ @ 20W., W. W.
C33	98-14	Elect. Cap., 40MFD. @ 350V.	R54	99-7	Resistor, 470K $\Omega$ @ 1/2 W.
R1	99-35	Vol. Control, 500K $\Omega$	R55	99-11	Resistor, 82K $\Omega$ @ 1/2 W.
R2	99-64	Tone Control, & Sw., 250K $\Omega$	T1	130-3	Power Transformer
R3	99-3	Resistor, 4.7Meg. @ 1/2 W.	T2	130-4	Output Transformer
R4	99-2	Resistor, 22K $\Omega$ @ 1/2 W.	M1	91-17	Pilot Lamp, TS47
R5	99-1	Resistor, 220K $\Omega$ @ 1/2 W.	M2	87-61	Neon Lamp, NE51, Normal Ind.
R6	99-6	Resistor, 10Meg. @ 1/2 W.	M3	87-61	Neon Lamp, NE51, Distorted Ind.
R7	99-7	Resistor, 470K $\Omega$ @ 1 W.	M4	86-18	Play-Record Slide Switch
R8	99-60	Resistor, 1.8Meg. @ 1/2 W.	M5	86-19	Memory Switch Assy.
R9	99-10	Resistor, 1Meg. @ 1/2 W.	M6	86-20	Tape Drive Switch
R10	99-39	Resistor, 1.5K $\Omega$ @ 1/2 W.	M7	130-6	Selenium Rectifier
R11	99-1	Resistor, 220K $\Omega$ @ 1/2 W.	M8	86-22	Push Button Switch Assy.

## MECHANICAL PARTS LIST

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
1	3-2	Screw-Bd. Hd. #5-40 x 3/16	8	11-13	Screw Rd. Hd. Thd. Cut#2-56 x 3/16
2	63-1	Washer-#5 Ext. Tooth	9	188-37	Record-Play Head
3	61-34	Washer- 9/64 x 1/4 x .031	10	3-4	Screw-Bd. Hd. #6-32 x 1/4
4	188-10	Spring-Reel	11	63-4	Washer-#6 Ext. Tooth
5	188-24	Panel-Record Head Cover	12	130-202	Tape Guide
6	41-2	Screw-Set #8-32 x 1/4	13	130-246	Erase Arm
7	188-47	Disc-Takeup Spindle	14	130-330	Erase Head Pad
			15	130-273	Record Head Pad

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MECHANICAL PARTS LIST - Con't.

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
16	130-247	Record and Play Arm	41	130-210	Motor Mounting Plate
17	188-46	Disc-Rewind Spindle	42	89-10	Shock Mount (Lord)
18	188-38	Erase Head	43	90-27	Drive Motor
19	82-7	E-Ring	44	61-39	Washer-3/16 x 7/16 x .032
20	130-209	Spring-Double Torsion	45	18-25	Screw-Hex. Hd. Self T. #8-32 x 1/2
21		Nameplate Support	46	90-29	Take Up Motor
22	355-2	Nameplate- Logo	47	188-58	Fan-4"(5/16 ID hub)Ventilating
23	188-6	Escutcheon Cabinet	48	188-52	Roller Plate Spring
24	130-282	Head Bracket	49	130-201	Pressure Roller Plate
25	82-7	E-Ring	50	130-285	Rewind Motor Mounting Plate
26	130-207	Washer-Pressure Roller	51	18-23	Screw-Hex Hd. Self Tap. #8-32 x 5/16
27	130-264	Roller-Pressure	52	130-S-46	Solenoid Arm & Pin Assembly
28	130-M-235	Mech Housing	53	130-323	Hum Shield
29	130-S-11	Counter Assembly	54	130-240	Solenoid Link
30	13-1	Screw-Bd. Hd. Self. Tap. #6-32 x 1/4	55	188-63	Solenoid Link Spring
31	188-15	Spring-Idler	56	13-S-14	Flywheel Assembly
32	130-206	Speed Changer Shaft Stop	57	130-254	Solenoid
33	18-22	Screw-Hex Hd. Self T. #6-32 x 5/16	58	90-38	Rewind Motor
34	130-231	Drive Motor Pulley	59	130-265	Counter Belt
35	130-296	Roller Plate Guide	60	61-9	Washer-Plain, 265 x 1/2 x .030
36	18-22	Screw-Hex Hd. Self T. #6-32 x 5/16	61	130-S-11	Counter Assembly
37	130-212	Speed Changer Shaft	62	67-9	Spring Washer (3/16 x 3/8 x .006)
38	130-278	Idler Crank	63	130-S-10	Counter Worm Assembly
39	130-211	Idler Link	64	130-252	Counter Pulley
40	130-263	Idler Wheel	65	130-S-43	Counter Frame & Bearing Assy.