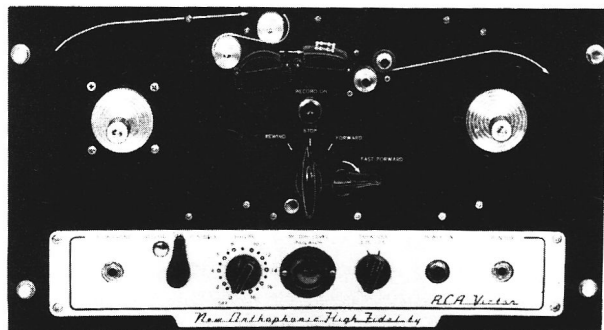




RCA VICTOR



Tape Recorder
Model TR-1
 Chassis No. E-930860-1
SERVICE DATA
 — 1955 No. 15 —

ISSUED BY
 GENERAL SERVICE DEPARTMENT
 RCA VICTOR COMPANY, LTD.
 MONTREAL, CANADA

SPECIFICATIONS

POWER INPUT115 volts, 60 cycles, 90 watts

RECORDING SPEEDS

7½" per second or 3¾" per second, interchangeable with no tools required

REWIND SPEED

1200 ft. of tape (full 7 inch reel) rewound in 40 seconds

TUBE COMPLEMENT

- 1 RCA 12AX7Audio Amplifier
- 2 RCA 12AU7Audio Amplifier
- 3 RCA 6E5Recording Level Indicator
- 4 RCA 6X4Rectifier
- 5 RCA 12AU7Oscillator

DIMENSIONS (Overall)

Height 10½", Width 19", Depth 11"

MOTORS (2) ...Shaded pole, 115 volts, 60 cycles

WEIGHT26 lbs.

FREQUENCY RESPONSE

At 3¾" per second: from below 50 cps to 5 kc ±2 db

At 7½" per second: 50 cps to 10 kc ±2 db

FLUTTERless than 0.3%

INPUT IMPEDANCE

Microphone Input: High impedance for crystal microphone or equivalent

Radio/Phono Input: High impedance for phono pickup or detector output of tuner

OUTPUT IMPEDANCES: High impedance (combined with "Radio/Phono" input) Monitor: for high impedance earphones

DESCRIPTION

Model TR-1 High-Fidelity Tape Recorder is a tape recorder/reproducer for use in conjunction with an external audio amplifier and reproducer. The heavy metal panel is designed for standard 19" rack or cabinet mounting. It is capable of recording speech or music from a microphone, phonograph pickup or radio tuner at a tape speed of 3.75 or 7.5 inches per second. The microphone input can be mixed with the input from phonograph pickup or radio tuner. Speed selection is accomplished by change of capstan and roller; no tools are required.

The oscillator circuit has been designed to have a very stable output level; this eliminates the necessity for a readjustment of bias with change of oscillator tube. A separate erase head is used to minimize radiation to the recording head.

Three stages of resistance-coupled amplification are provided for recording from a tuner or record player. The third stage is primarily for

equalization and impedance matching. A pre-amplifier stage is provided for high impedance microphone input. The hum level is very low, due primarily to the use of a d-c heater supply for the amplifier tubes. A monitor jack permits monitoring the recorder without disturbing the output circuit. A type 6E5 "eye" tube is used to provide recording level indication. The rectified input to this tube is designed to have a slight time-delay, thus affording a stable, yet accurate, indication of recording level.

The function switch permits the input jack to be used also as audio output jack during playback. In the playback position, the output of the head is transformer-coupled to the grid of the first amplifier stage. This stage incorporates inverse feedback for equalization. The volume control is not used during playback, thus allowing full control of volume by the controls of the external audio amplifier.

CAPSTAN CHANGE

The recorder comes with a 7½" per second capstan and pressure roller on the machine. Also included is a set of 3¾" per second capstans and pressure rollers. These are designated as follows:

3¾" per second — the smallest metal capstan and the largest rubber pressure roller.

7½" per second — the largest metal capstan and the smallest rubber pressure roller.

To change, first unscrew the knurled thumb screws and remove the capstan and pressure roller. Unscrew in a counterclockwise direction. Be sure that both the capstan and pressure roller are clean before attempting to put them on. If a piece of dirt or grit gets under the capstan, it will not run true and will cause excessive wow and flutter. If the pressure roller binds, the same result may be expected.

NOTE: Be sure to use the longest of the two thumb screws on the metal capstan.

THREADING MACHINE

Place a reel of unused tape on the left reel hub using the reel retainer provided to secure it in place. Pull off about 2 ft. of tape, thread over and around the top tape guide roller, then around the lower tape guide roller, over the erase head, and the record playback head, between the capstan and pressure roller and then thread on the right hand empty reel.

STARTING RECORDER

After selecting speed at which it is desired to record, and loading the machine with tape, turn on amplifier switch, which is the second knob from the left. Place the left hand knob in "RECORD" position and allow to warm up for about 10 to 20 seconds.

CONNECTING A MICROPHONE

Any high impedance microphone of good quality can be used. It must be equipped with a telephone type plug connector. The microphone cable should be of the low-capacity, well shielded variety. The microphone connector on the amplifier is of the shorting type, silencing the microphone pre-amplifier when no microphone is used. Insert microphone connector into input marked "MIC" on the left side of the panel.

Start recorder by placing REWIND-STOP-FORWARD knob in "FORWARD" position. Note that the recording indicator light is now on. Adjust the recording volume to proper level.

The proper recording level is usually indicated when the recording eye just closes on the peaks, that is the loudest parts of the speech or music being recorded. If the output is connected to a monitor amplifier during recording, volume of monitor must be turned down to eliminate feed back.

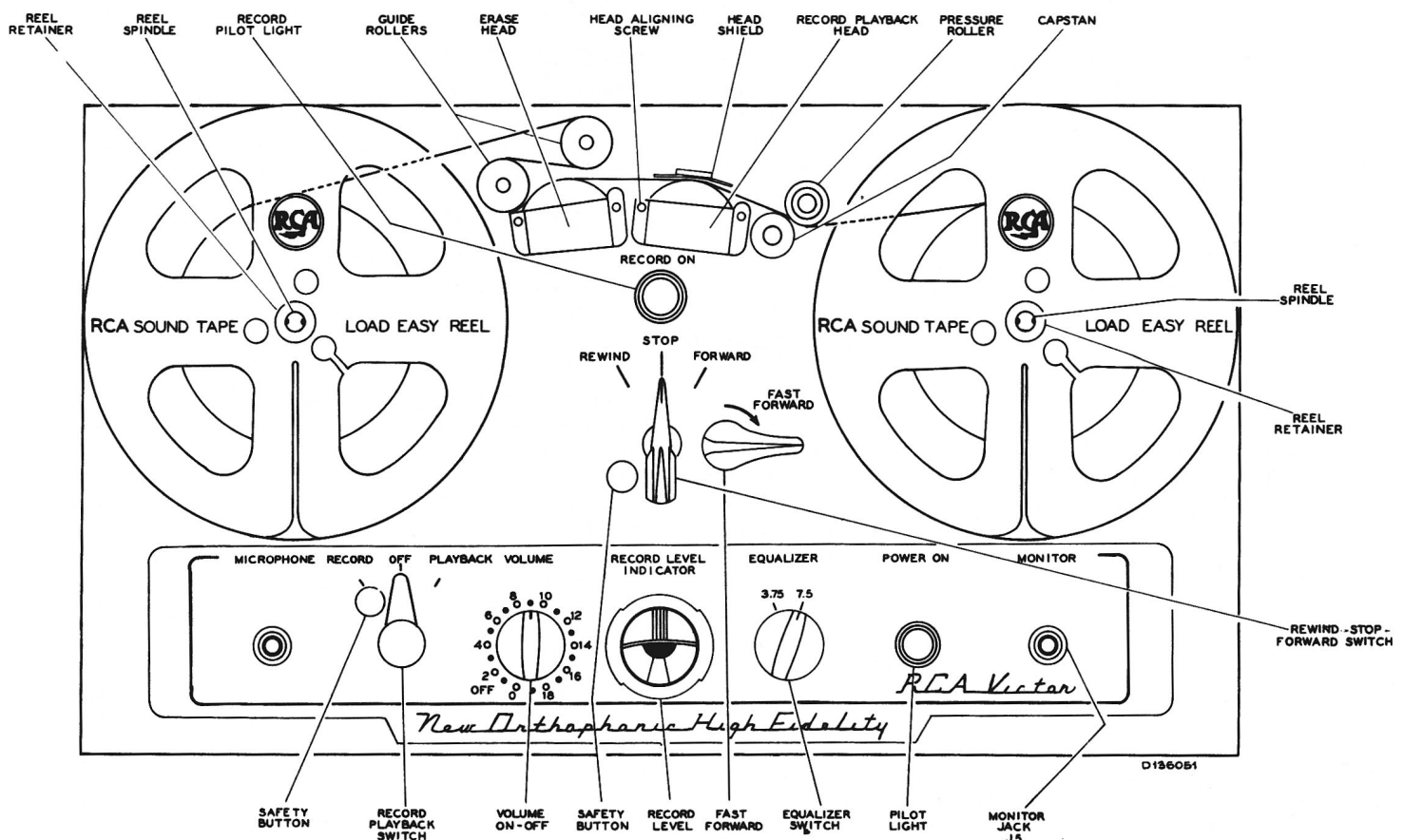


Figure 1 — Front View Showing Location of Controls

RECORDING FROM THE TUNER OR RECORD CHANGER

To make recordings from the radio tuner or record changer, the tuner must be connected to the RECORD/PLAYBACK — INPUT/OUTPUT jack found on the rear of the amplifier. Approximately 0.2 volt is required at the phono input to make a closed-eye recording.

NOTE: The phono and mike inputs are automatically disconnected when the machine is used for playback. Therefore, it is possible to connect the unit permanently without affecting the operation of other units.



Figure 2 — Recording Level Indication

DUAL TRACK RECORDING

This instrument is a dual track recorder in which only half width of the tape is used in recording. This means, that 2 hours of recording can be had at 3 3/4" per second or 1 hour of recording at 7 1/2" per second when using a 7" reel of tape.

To use the second half of the tape, remove the full reel of tape that is now on the right hand reel, turn around and place it on the left hand side. Place the empty reel on the right side and proceed as before.

TO ERASE A RECORDING

When a new recording is made over a previously recorded tape, the old recording is automatically erased from the track that is being recorded, as the new recording is made. The recording on the other half of the tape is not affected.

To erase a recording without recording anything new on the tape, proceed to record as normally, except turn the volume control down.

TO REWIND

When rewinding, never allow the tape to run back over the record and erase heads. Instead, before placing the REWIND-STOP-FORWARD switch in "REWIND" position, place the tape over the top of the head shield, thus avoiding excessive wear on the heads.

TO PLAYBACK

1. Set the RECORD-PLAYBACK switch to "PLAYBACK."
2. Set the tape in motion on the recorder mechanism by turning the REWIND-STOP-FORWARD switch to the "FORWARD" position.
3. Adjust the volume control on the tuner unit for the desired volume.

TIPS ON RECORDING

When using the microphone for speech, hold it away from the mouth at approximately 6" and speak in a normal tone. Speak across the microphone and not directly into it. Do not place the microphone on a hard surface as it will pick up undesirable vibration, which will be transmitted to the tape.

NOTE: When recording from the microphone some method should be used to silence the input from a tuner if connected. This may be done by turning the tuner function switch to "phono."

When recording an orchestra — arrange the instruments so that the loudest instruments are the farthest away from the microphone; also, space the instruments so that a natural blending is achieved.

HOW TO SPLICE TAPE

Although plastic tape is quite durable, it can be broken or torn. This is relatively simple to correct. Overlap both ends of the broken tape simultaneously and cut at an angle (Step No. 1). On a flat surface, butt the cut ends of the tape together (Step No. 2) — glossy side up — fasten the two ends together with a piece of splicing tape, such as Scotch No. 41 Splicing Tape (Step No. 3).

CAUTION: Do not use ordinary cellulose tape because it will bleed through causing the tape to stick together. Trim the splicing tape even with the edge of the recording tape, then rewind as usual.

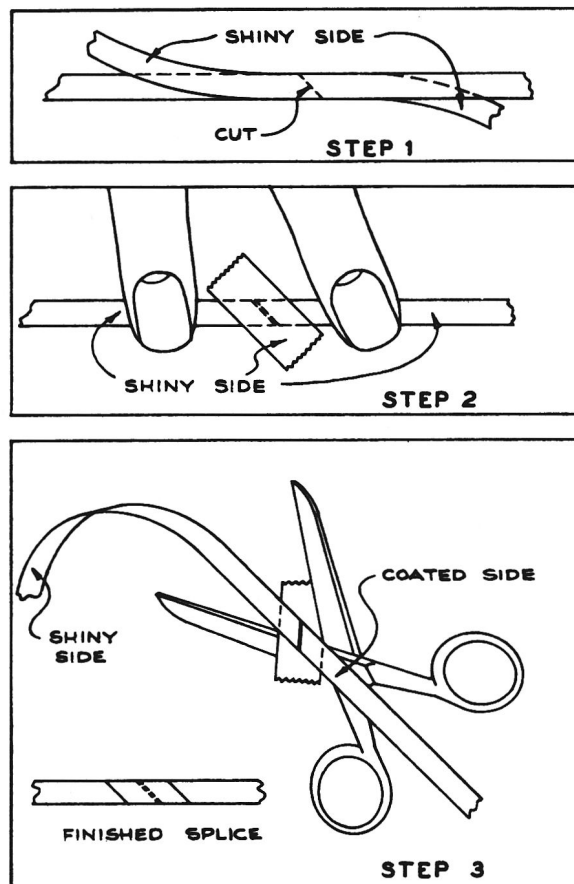


Figure 3 — Tape Splicing

SERVICING THE TAPE DRIVE MECHANISM

HEAD ALIGNMENT

The primary purpose in head alignment is to provide the maximum frequency response. For this purpose, it is not necessary to adjust the erase head.

In general, the procedure consists of aligning the record playback head with a one mil standard alignment tape. Several definite steps should be followed and these are outlined below:

The record playback head is mounted to the front panel by two screws in a hinge arrangement.

1. With an audio voltmeter or oscilloscope connected to the output of the playback amplifier, play back at $7\frac{1}{2}$ " per second a portion of the alignment tape. Adjust the volume of the playback amplifier until a convenient reading is obtained.
2. Again start the tape running over the head and while observing the output reading, adjust the **LEFT HAND** head mounting screw (Fig. 4-Ref. No. 1) for maximum reading. When this maximum has been reached, the head is properly aligned.

NOTE: It is advisable to first loosen the left hand mounting screw to make sure that when adjusting you will pass through the maximum reading. Final adjustment of the left hand screw should leave the head set for maximum reading.

HEAD COVER ADJUSTMENT FOR HUM

The **RECORD/PLAYBACK** head is equipped with a shield (Fig. 4-Ref. 2). Adjustment of this cover to reduce hum is as follows:

By rocking the head shield back and forth, a variation in the hum level will be noticed. Adjust the head shield to the position which gives lowest hum by pressing alternate ends of the

head shield. The shield will remain in this position. This is done with the volume control turned to maximum and the tape mechanism stopped, no tape over the head, and **RECORD-PLAYBACK** switch in "PLAYBACK" position. It is possible to use either an a.c. VTVM at the **RECORD/PLAYBACK** — **INPUT/OUTPUT** jack or a pair of high impedance phones plugged in the monitor jack. Realign the head after this hum adjustment.

CAUTION: Never let the head cover drop on the head. This not only affects the hum adjustment, but also the head alignment.

GENERAL DESCRIPTION

Capstan Drive System

Two independently supported rubber-bonded idler wheels transmit the motor torque to the capstan shaft drive hub. Each is supported on a sliding suspension permitting wheels to equalize their position in two dimensions. The supporting arms are lightly spring loaded to hold the wheels in the proper position.

Severe mechanical shocks to the recorder can force the rear idler wheel out of position and hang its arm up on one of the motor mounting screws. It may easily be pushed back into place.

Takeup System

A sliding suspension arm supports a rubber-bonded idler wheel in contact with the takeup motor shaft and the takeup shaft drive wheel. This position is maintained by a spring between the sliding arm and the bottom panel of the recorder. Rotation of the drive motor imparts torque through the idler wheel to the takeup shaft. The takeup shaft receives its torque from the friction coupling between the large dural drive wheel, driven from the rubber idler wheel, and

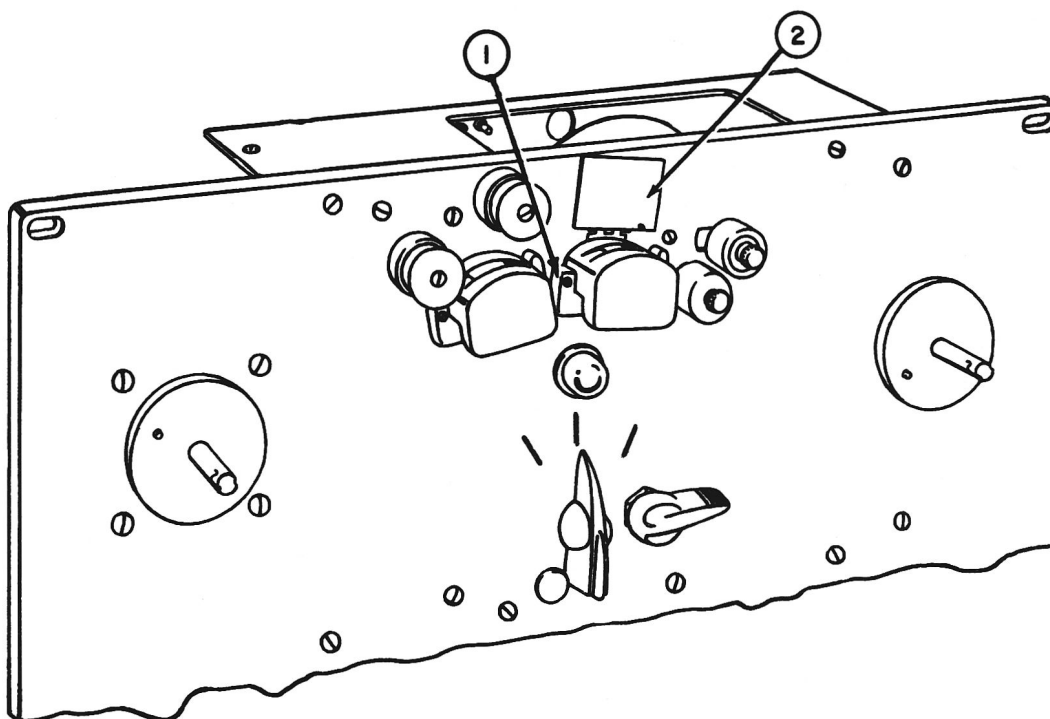


Figure 4 — Front View of Mechanism

the disc-type friction clutch assembly. The tension of this clutch, and therefore the torque transmitted is a function of the pressure exerted by the neoprene washer on the felt pads. Tightening the knurled split nut increases this pressure and therefore the driving torque and in turn the tape tension. A spring-wire linkage is actuated during rewind which pulls against the aforementioned spring and lifts the idler wheel away from the takeup motor shaft by $1/16"$. Contact is maintained between the idler wheel and the takeup shaft. When the mechanism is switched from "REWIND" to "STOP," the linkage relaxes and the spring returns the idler wheel to contact with the drive motor shaft. This motor shaft is not turning, therefore the idler wheel is prevented from turning and thus stops the free rotation of the drive wheel on the takeup shaft.

Adjustments to this system consist of so positioning the linkage to accomplish the above results. Care should be taken that, when readjusting the actuator on the control shaft, the switch position is not affected. To check this, place the recorder with its panel horizontal (reel shafts vertical) and operate the control knob (with power applied to mechanism) between "REWIND" and "STOP." The return spring should have adequate tension to return the idler wheel to its normal position. The torque transmitted to the takeup shaft should be adjusted to 6 to 7 inch-ounces.

Rewind System

The rewind motor is equipped with a unidirectional and adjustable friction drag system mounted to the rear of the motor on its shaft. When the recorder is running "FORWARD" with tape threaded in the normal manner, this motor is not energized, and the motor rotates clockwise as a simple shaft. The friction drag system operates to impart tension in the tape. When the recorder is set to "REWIND," the motor is ener-

gized and runs counter-clockwise. The friction drag is released when the motor shaft is running in this direction. Its unidirectional characteristics are achieved through the use of a pawl and ratchet with a self-energizing pawl spring. Adjustments to this friction drag system are made in a similar manner to that described above under "Takeup System." The friction drag should be about 3 to 4 inch-ounces.

The pawl spring, wrapped around the ratchet disc, and riding in a groove, acts as a self-energizing brake band to pull the pawl into the ratchet disc by the friction felts, as in the takeup the pawl during rewind. The pawl travel, in release, is stopped by a pin in the pawl mounting bracket which allows the pawl to clear the ratchet by about $1/32$ inch.

The amount of drag (tension in tape) is determined by the amount of pressure exerted on the ratchet disc by the friction felts, as in the take-up system. Always loosen the set screw in the split nut before adjusting and retighten before running or measuring.

REPLACEMENT OF DRIVE IDLERS

Turn unit upside-down with the rear of the unit facing toward you. Remove the rear switch shield (Fig. 5-Ref. No. 1). Remove drive idler springs (Ref. No. 2). Remove the two nuts from the drive idler assembly (Ref. No. 3). Remove the front drive idler. Change either one or both drive idlers as needed. Replace drive idlers. Replace nuts and tighten. Replace drive idler springs. Replace rear switch shield.

ADJUSTMENT AND REPLACEMENT OF FAST FORWARD IDLERS

Remove the takeup assembly (Fig. 5-Ref. 4). Remove all springs (Fig. 6-Ref. 1) attached to the end plate. Remove end plate (Fig. 6-Ref. 2). The

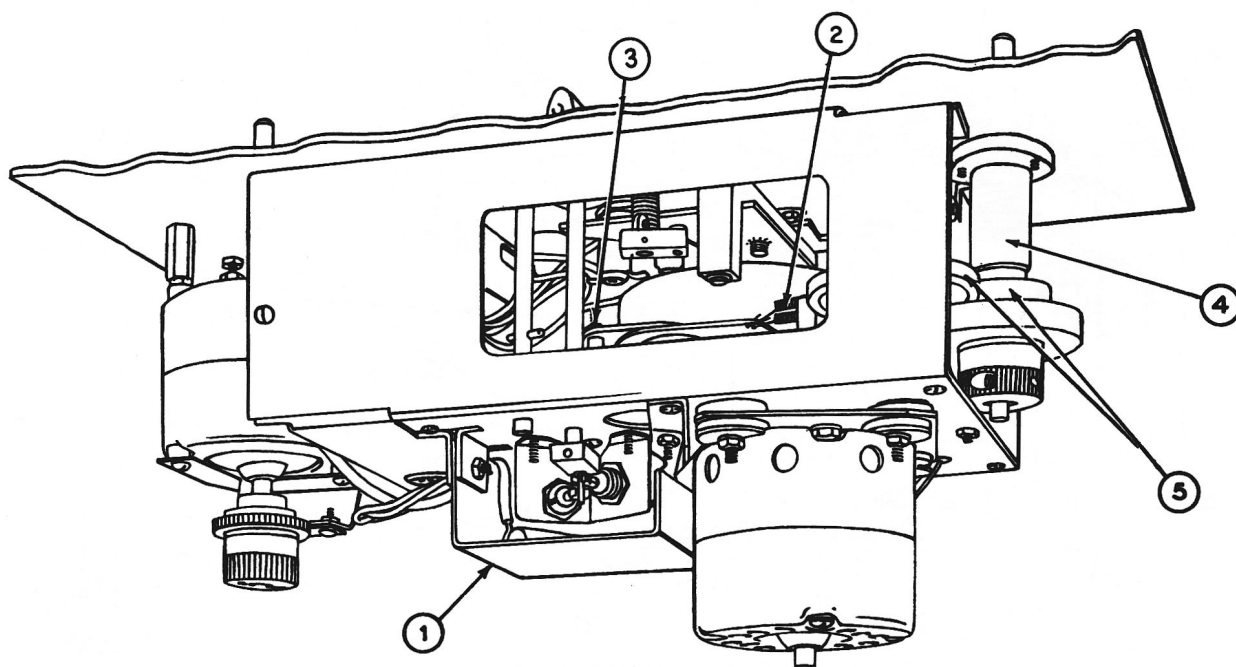


Figure 5 — Bottom View of Mechanism

fast forward idler is now accessible for replacement. After replacing fast forward idler, replace end plate and assembly. Adjusting fast forward idler is accomplished by the two screws on the top front of the end plate. The fast forward idler should be adjusted so that it does not turn when unit is in normal forward speed. The clearance between the fast forward idler and the takeup wheel (Fig. 5-Ref. 5) should be approximately 1/16 of an inch or less. It must not touch except in "FAST FORWARD." By the same procedure, the clearance between the drive motor shaft and fast forward idler should be approximately 1/16 of an inch. Adjust the screws that hold the micro-switch (Fig. 6-Ref. 3) so that the switch turns on after the fast forward idler engages the drive shaft and the fast forward takeup wheel.

REPLACEMENT OF TAKEUP IDLER AND ADJUSTMENT

Remove the takeup assembly. Remove nuts (Fig. 6-Ref. 4) on takeup idler assembly. Remove assembly (Fig. 5-Ref. 5). Remove hair pin spring from idler hub and remove or change idlers (Fig. 6-Ref. 6). Replace idler assembly. Replace takeup assembly. It is necessary to adjust the stop plate located between mounting holes on the takeup idler assembly. This adjustment is very necessary as it determines the sequence of the takeup idler engaging the takeup friction assembly. With the machine still upside-down, adjust the stop plate so it just clears the takeup assembly arm and tighten with an Allen head wrench. Sometimes it is necessary to adjust the linkage adjustment so there is no lag in the switching from rewind to

stop, or from forward to stop. This is accomplished by tightening or loosening an elastic stop nut (Fig. 7-1) located on the oscillator cover.

REPLACEMENT OF PRESSURE ARM ASSEMBLY

Remove takeup assembly and housing (Fig. 5-Ref. 4). Remove all springs from end plate. Remove end plate. Unhook pressure arm spring (Fig. 7-Ref. 2). Remove pressure roller, then unscrew shaft screw located just above the name plate on front panel. The pressure arm assembly is then removed through the end left open by the disassembly. Normally, there are no adjustments. However, check alignment of pressure roller shaft and if not in line, proceed as in the adjustment for pressure roller shaft given on page 7.

SPEED CHECK

Place a special strob disc (see reproduction below) on the metal drive capstan (metal roller at 7½" only). Viewed under a fluorescent light with the mechanical unit turned on, spokes will appear to form on the strob disc as it is turning. If these spokes turn counterclockwise, the unit is too slow. If they turn clockwise, at a faster rate than two revolutions per minute, it is too fast.

The first item to check is the condition of the drive idlers for cleanliness. Check end play of the capstan flywheel. If it is too tight or loose, adjustment is made by loosening or tightening the adjusting set screw on the rear panel (Fig. 7-Ref. 3). Recheck the pressure roller pressure; this should be one pound. To adjust this, either stretch or remove loops from the pressure arm springs (Fig. 7-Ref. 2).

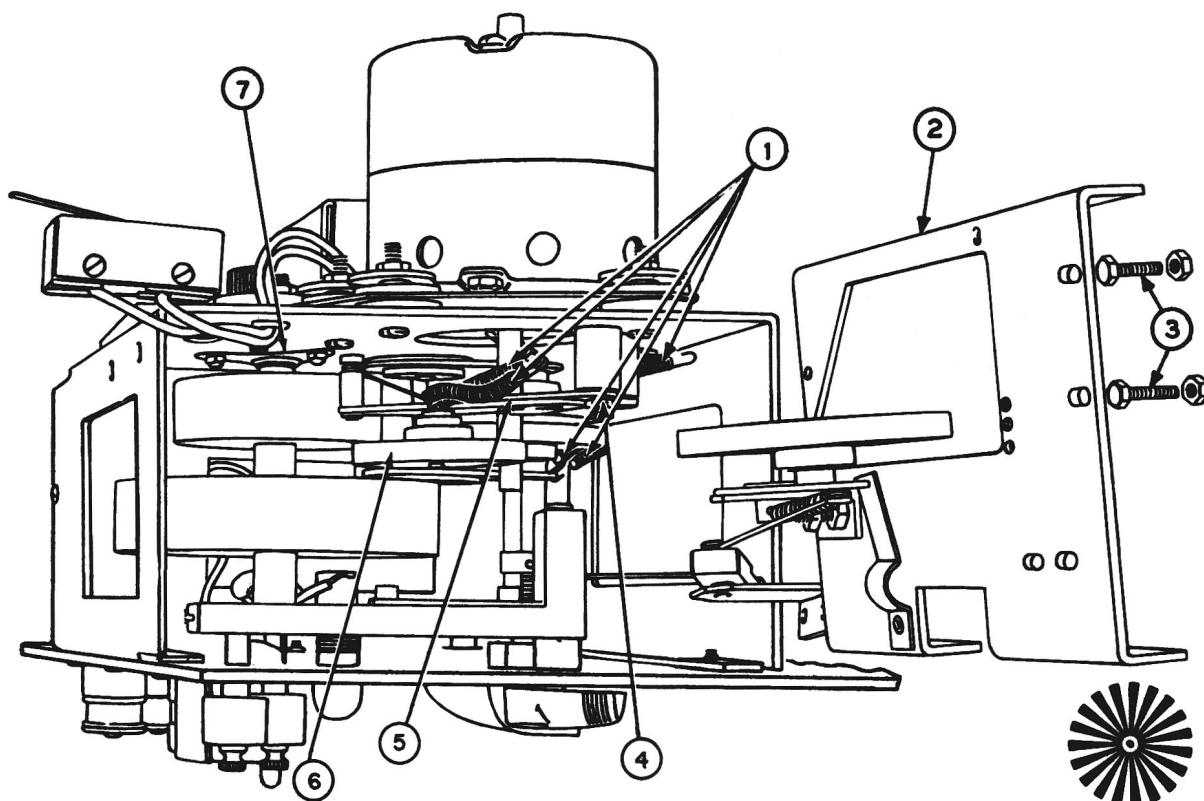


Figure 6 — Right End View of Mechanism

Strob Disc

ADJUSTMENT OF TAPE TENSION

The torque transmitted to the takeup shaft (right-hand reel) should be adjusted to 5 or 6 inch-ounces. This is done by loosening or tightening the knurled split-nut (Fig. 7-Ref. 4) as required to provide the proper drag. The drag may be measured by means of a one pound spring balance attached to the free end of a string wrapped several times around the hub of a 7" tape reel mounted in the normal manner on the takeup hub. The "inch-ounce" of torque is the number of ounces pull registered on the spring balance multiplied by the distance in inches from the center of the takeup shaft to the tangency of the string coming off the reel. Measure with power "ON" and recorder running "FORWARD." Readjust by loosening the socket-head setscrew in the knurled split-nut first, then rotate this nut. Lock the nut with the setscrew after each adjustment and before measuring result.

The tension on the rewind reel should be adjusted to 3 or 4 inch-ounces; adjustment (Fig. 7-Ref. 5) is made in a similar manner to that described for the takeup reel. The drag on the rewind reel should be made with the recorder set to "STOP" and with no tape on the recorder; the string on the reel should pull the reel in a clockwise direction.

ALIGNMENT OF PRESSURE ROLLER

Sometimes it is necessary to adjust the pressure roller for lateral alignment. To do this, remove the pressure roller and use a hollow shafted tool to very carefully bend the pressure roller shaft either to the right or to the left until the pressure roller will not cause the tape to move either toward or away from the front panel.

NOTE: USE EXTREME CARE TO AVOID BREAKING THE SHAFT.

ALIGNMENT OF REAR THRUST BEARING HOUSING

Check alignment before adjusting. With unit placed front panel down remove the set screw (Fig. 7-Ref. 3) and look at the small ball bearing to see if it is centered in the hole. If not, tap the housing in whichever direction it takes to align it. Replace bearing screw and adjust to a minimum of .005 inch end play.

REPLACEMENT OF FLYWHEEL BEARINGS

Remove knobs. Remove capstan and pressure roller. Remove front panel. When the front panel is loose, unsolder the leads to the recording indicator lamp. Remove bearing retainer (Fig. 6-Ref. 7) and replace bearing. Reassemble the unit.

NOTE: Bearing retainer should be tightened until bearing is held firmly yet is free to move.

It is sometimes necessary to realign the bearings even though they are self-aligning bearings. To do this, turn the machine on and tap lightly on the flywheel with a wooden mallet or screwdriver handle until the bearings are lined up and the flywheel is running free without binding. It may then be necessary to readjust for flywheel end play.

CLEANING HEADS

Due to the loss of oxide from the tape, it is necessary to clean the residue deposited on the head from time to time to insure good recording. This is done with a soft cloth, saturated in carbon tetrachloride. This should be done after each 15 or 20 hours of playing time.

NOTE: Care should be exercised in using carbon tetrachloride as saturation can cause damage to the tape and to the "Oilite" bearings.

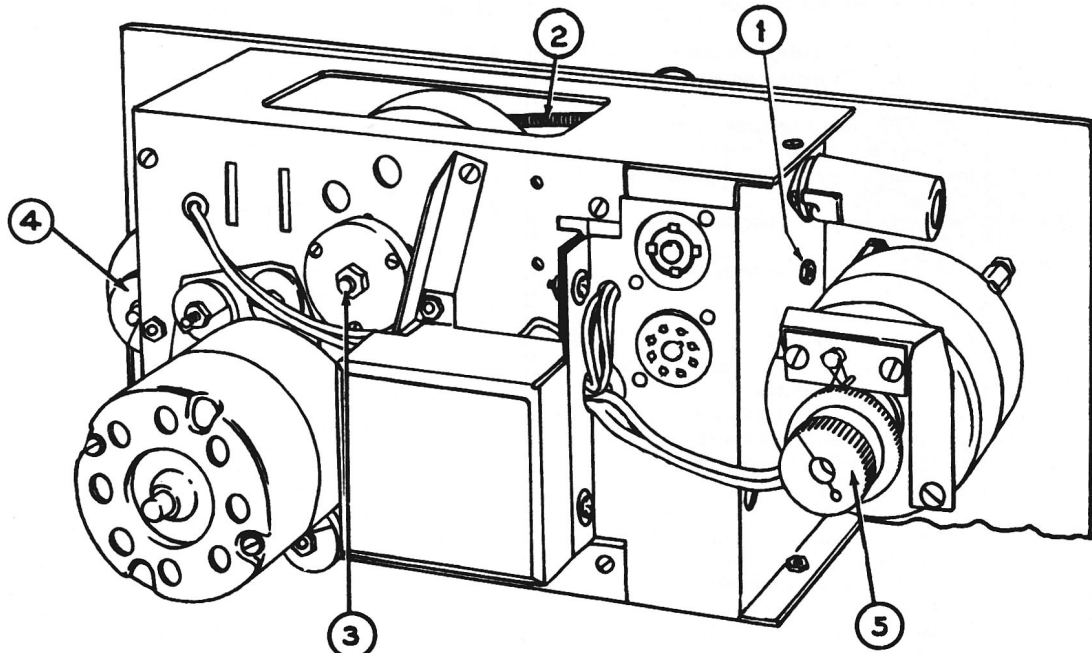


Figure 7 — Rear View of Mechanism

SYMBOL NO.	STOCK NO.	DESCRIPTION	SYMBOL NO.	STOCK NO.	DESCRIPTION
AMPLIFIER ASSEMBLY			R5, R6	502415	Resistor—Fixed, composition, 150,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C1	100781	Capacitor—Fixed, mica, .0025 mfd., 400 v.	R7	502347	Resistor—Fixed, composition, 47,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C2	59928	Capacitor—Fixed, electrolytic, 25 mfd., 25 v.	R8	502215	Resistor—Fixed, composition, 1500 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C3, C4	100783	Capacitor—Fixed, paper, .1 mfd., 400 v.	R9	512410	Resistor—Fixed, composition, 100,000 ohms, $\pm 10\%$, 1 w.
C5	204817	Capacitor—Fixed, paper, .25 mfd., 400 v.	R10	207954	Control—"On-Off" volume control (Includes S1)
C6	73920	Capacitor—Fixed, paper, .005 mfd., $\pm 10\%$, 400 v.	R11	502327	Same as R4
C7A, B, C	207960	Capacitor—Fixed, electrolytic, 15-15-10 mfd., 450 v.	R12	502210	Resistor—Fixed, composition, 1000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C8	73553	Capacitor—Fixed, paper, .05 mfd., 450 v.	R13	502310	Resistor—Fixed, composition, 10,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C9	100775	Capacitor—Fixed, paper, .1 mfd., 400 v.	R14	71084	Resistor—Fixed, composition, 3900 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C10	73553	Same as C8	R15	512410	Same as R9
C11	59928	Same as C2	R16	502447	Resistor—Fixed, composition, 470,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C12	100780	Capacitor—Fixed, paper, .01 mfd., 400 v.	R17	502347	Same as R7
C13	100781	Same as C1	R18	71084	Same as R14
C14 to } C16 Incl. } C17A, B }	100780	Same as C12	R19	502410	Same as R3
			R20	502347	Same as R7
			R21, R22	502447	Same as R16
			R23	502215	Same as R8
			R24	502310	Resistor—Fixed, composition, 10,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C18	99121	Capacitor—Fixed, electrolytic, 1000 mfd., -10 $+40\%$, 15 v.	R25	502347	Same as R7
C19	53921	Capacitor—Fixed, paper, 0.5 mfd., $\pm 10\%$, 600 v. DC	R26	100782	Control—Eye level adjustment control
C20, C21	100783	Refer to "Mechanical Unit" (Ill. 64)	R27	502347	Same as R7
C22, C23	39659	Capacitor—Fixed, mica, .002 mfd., $\pm 5\%$, 500 v. DC	R28	502610	Resistor—Fixed, composition, 10 megohms, $\pm 10\%$, $\frac{1}{2}$ w.
C24	73561	Capacitor—Fixed, paper, .01 mfd., $\pm 10\%$, 400 v.	R29, R30	502510	Resistor—Fixed, composition, 1 megohm, $\pm 10\%$, $\frac{1}{2}$ w.
C25, C26	73557	Capacitor—Fixed, paper, .1 mfd., $\pm 10\%$, 600 v.	R31	502356	Resistor—Fixed, composition, 56,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
C27	39659	Capacitor—Fixed, mica, .002 mfd., $\pm 5\%$, 500 v.	R32	512339	Resistor—Fixed, composition, 39,000 ohms, $\pm 10\%$, 1 w.
C28, C29	205864	Capacitor—Fixed, mica, 50 mmf., $\pm 5\%$, 500 v.	R33	34473	Resistor—Fixed, composition, 2000 ohms, $\pm 10\%$, 10 w.
CR1	99508	Rectifier—Selenium rectifier	R34	45295	Control—Filament voltage adjustment control
CR2, CR3	207963	Rectifier—Selenium diode rectifier Type 1U1	R35	207882	Resistor—Fixed, composition, 1 ohm, $\pm 5\%$, $\frac{1}{2}$ w.
I1	11891	Lamp—Pilot lamp	R36, R37	502322	Resistor—Fixed, composition, 22,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
I2	91749	Refer to "Mechanical Unit" (Ill. 117B)	R38	512310	Resistor—Fixed, composition, 10,000 ohms, $\pm 10\%$, 1 w.
J1	68592	Connector—Female, 8 contact	R39	502110	Resistor—Fixed, composition, 100 ohms, $\pm 10\%$, $\frac{1}{2}$ w.
J2	64397	Connector—Female connector—4 contact	S1	—	Part of R10
J3	—	Part of Record/playback head	S2A to } S2E Incl. } S3A, B }	100771	Switch—Record playback switch
J4	—	Part of Erase head			
J5	35787	Jack—Phono jack—single contact, input/output		57603	Switch—Rotary switch, single section, 2 position, 4 circuit, 2 contacts
J6	100778	Jack—Phono jack—shorting type, mic. output	S4A, B, C	207876	Refer to "Mechanical Unit" (Ill. 62)
J7	207958	Jack—Phono jack—open circuit monitor	S5	207935	Refer to "Mechanical Unit" (Ill. 119)
L1	207955	Coil—Equalizer coil	T1	207962	Transformer—Input
L2	207883	Coil—Oscillator coil	T2	207961	Transformer—Power transformer
M1	207942	Refer to "Mechanical Unit" (Ill. 67)	AMPLIFIER MISCELLANEOUS		
M2	100770	Refer to "Mechanical Unit" (Ill. 33)	100779		Nut— $\frac{3}{8}$ -32 x $\frac{1}{2}$ knurled nut (round) for monitor & mic. input jack
P1	35383	Connector—Male, 8 contact	19820		Plate—Capacitor mounting plate (phenolic)
P2	100784	Connector—Male, 4 contact	56359		Shield—Tube shield for V5
P3, P4	208029	Receptacle—Head receptacle	57751		Socket—Pilot lamp socket
R1	502447	Resistor—Fixed, composition, 470,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.	100777		Socket—Tube socket, 7 pin, miniature for V3
R2	502522	Resistor—Fixed, composition, 2.2 megohm, $\pm 10\%$, $\frac{1}{2}$ w.	94880		Socket—Tube socket, 9 pin, miniature for V1 & V2
R3	502410	Resistor—Fixed, composition, 100,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.	100785		Washer—Flat fibre washer for mounting Filament Voltage control R34
R4	502327	Resistor—Fixed, composition, 27,000 ohms, $\pm 10\%$, $\frac{1}{2}$ w.			

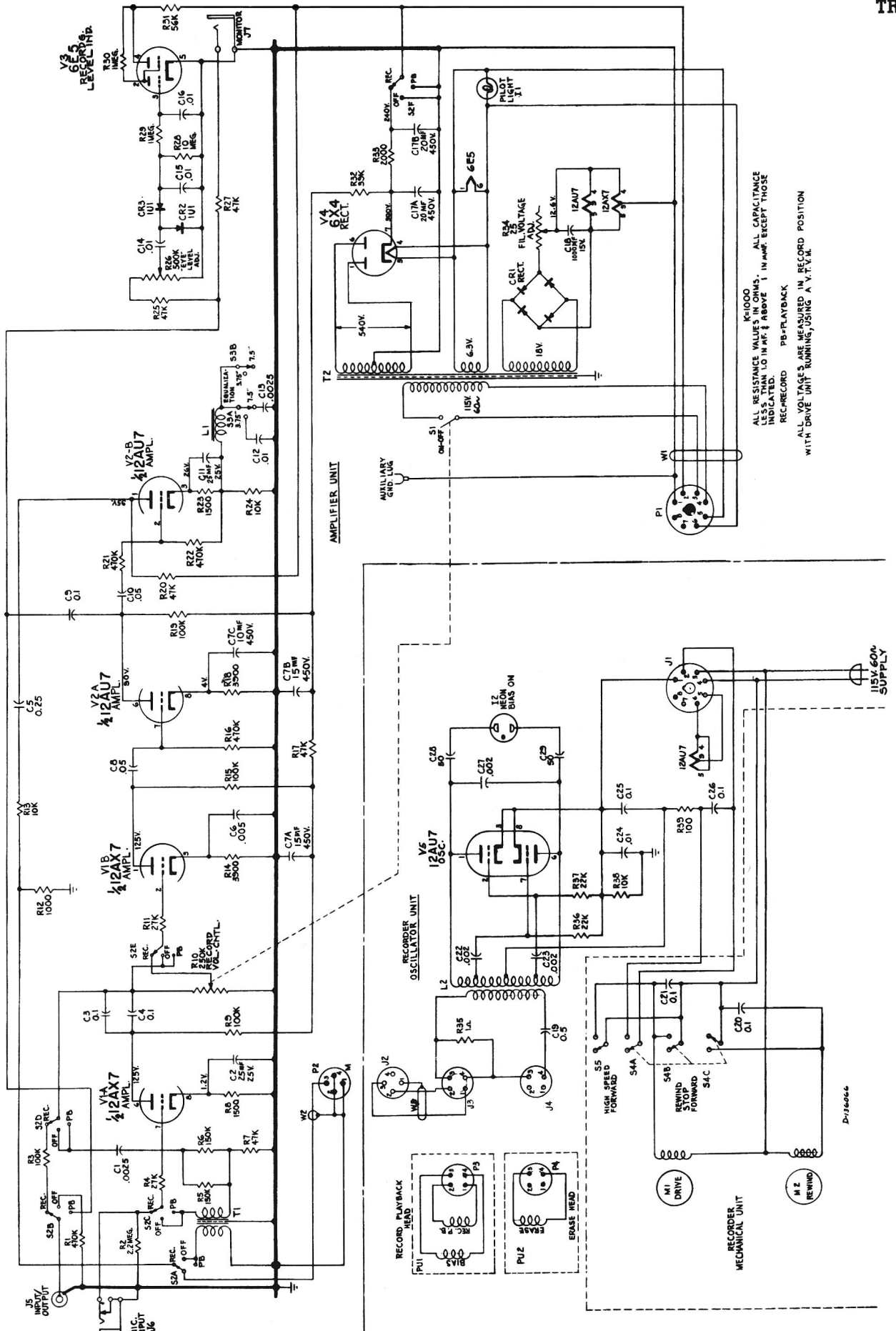


Figure 8 — Schematic Diagram

ILL. NO.	STOCK NO.	DESCRIPTION	ILL. NO.	STOCK NO.	DESCRIPTION
MECHANICAL UNIT			46	207897	Hub—Rewind hub and flange assembly (7/16-20 thread)
1	207917	Screw—Capstan screw, knurled head (#4-36 x 3/8")	47	—	Screw—#6-32 x 3/4 binder hd.
2	207910	Knob—Safety knob and shaft	48	207893	Washer—Felt washer white, 1 1/4" O.D., 7/16" I.D., 1/16" thick
3	207908	Capstan—7 1/2" per second, 60 cycle	49	207898	Ratchet—Rewind hub ratchet
4	207950	Retainer—7" dia. rewind reel retainer	50	—	Screw—Pawl bracket mounting screw
5	207945	Spring—Recording head adjusting spring	51	207899	Bearing—Rewind hub ratchet bearing
6	207919	Head—Erase head half track inside—black (PU2)	52	207903	Spring—Rewind pawl and plate assembly spring
7	207858	Washer—Aluminum washer, .875" O.D., .116" I.D.	53	207893	Washer—Felt washer white, 1 1/4" O.D., 7/16" I.D., 1/16" thick
8	207859	Washer—Fibre washer for guide roller	54	207892	Washer—Brass washer, 1 1/4" O.D., .434 I.D., .025" thick
9	207855	Roller—Flat guide roller and bearing assembly	55	207891	Washer—Sponge washer, 1 1/4" O.D., 7/16" I.D., 1/4" thick
10	207896	Flange—Rewind reel flange assembly with set screw	56	207890	Nut—Locknut assembly with #8-32 x 1/2" long Allen head screw
11	207923	Head—Record/playback head—half track inside (PU1)	57	207886	Arm—Switch arm and pin assembly with set screw
12	207947	Screw—#2-56 x 3/4" fil. hd. to mount heads	58	—	Bracket—Switch mtg. bracket
13	207861	Spacer—Felt spacer for guide roller	59	—	Spacer—Panel spacer
14	207856	Shaft—Guide roller shaft	60	—	Nut—Switch mtg. nut
15	207857	Spacer—Guide roller spacer	61	—	Screw—#6-32 x 2" binder head for idler wheel
16	—	Washer—Lockwasher for record ind. lamp	62	207876	Switch—Toggle switch, DPST, 6/3 amps., 125/250 v., special lever (S4A, B, C)
17	—	Nut—Hex nut for record ind. lamp	64	100783	Capacitor—Fixed, paper, .1 mf., 400 v. (C20, C21)
18	—	Spacer—Rewind motor mounting spacer (long)	65	—	Shield—Switch shield
19	207868	Spacer—Rewind motor mounting spacer (short) with rubber bumper	66	207943	Fan—Motor cooling fan
20	207881	Washer—Felt washer—grey—3/4" O.D., .281" I.D., 1/16" thick	67	207942	Motor—Drive motor and fan, 115 v., 60 cy. 1550 RPM (M1)
21	—	Spacer—Rewind motor mtg. spacer (short)	68	—	Screw—B.H.M.S. for thrust housing
22	207949	Capstan—3 3/4"/sec., 60 cycles	69	207941	Mounting—Rubber shock mounting for drive motor
23	207909	Spring—Pressure arm roller spring	70	207939	Plate—Drive motor mounting plate
24	207912	Washer—Fibre washer for switch shaft	70A	—	Pad—Rubber pad for drive motor mtg.
25	207867	Washer—Fibre washer, 1/2" O.D., 3/16" I.D., 1/64" thick	71	207878	Screw—Set screw, 1/4-20 x 1/2 for thrust bearing
26	207951	Roller—Pressure roller 3 3/4" per second	72	207877	Bearing—Thrust bearing and housing assembly
27	207865	Bearing—Cam follower bearing, .3145" O.D., .1885" I.D., .453" long	73	207940	Spacer—Metal spacer for drive motor mounting plate
28	207863	Plate—Pressure arm plate and shaft assembly	74	207911	Ball—Thrust bearing ball—steel
	207866	Retainer—Hairpin retainer for pressure arm shaft	75	100786	Panel—Back panel
29	207870	Bearing—Capstan shaft oilite bearing front	77	207870	Bearing—Capstan shaft oilite bearing front
30	207872	Washer—Felt bearing washer oil retaining	78	207872	Washer—Bearing washer oil retaining
31	207871	Retainer—Capstan shaft bearing retainer (front)	79	207871	Retainer—Capstan shaft bearing retainer (rear)
32	100789	Screw—#8-32 x 3/16 Allen head cap. screw	80	207884	Wheel—Capstan—flywheel and shaft assembly
33	100770	Motor—Rewind motor, 115 v. 60 cycles (M2)	81	207966	Plate—Idler wheel arm and plate assembly
34	207887	Shaft—Safety shaft and drive lock pin	82	207873	Spring—Idler wheel spring (3 1/4" long, 5/32" O.D.)
35	207907	Shaft—Switch shaft and cam assembly	83	207879	Spacer—Take-up wheel plate spacer (aluminum) 1/2" O.D., .1495" I.D., .718" long
36	—	Spacer—Pawl mounting bracket spacer	84	207890	Nut—Locknut assembly with #8-32 x 1/2" long Allen hd. screw
37	94353	Retainer—.025" thick for .250 dia. shaft with .230" dia. groove steel	85	207875	Plate—Take-up wheel arm and plate assembly
38	207893	Washer—Felt washer white, 1 1/4" O.D., 7/16" I.D., 1/16" thick	86	207891	Washer—Sponge washer, 1 1/4" O.D., 7/16" I.D., 1/4" thick
39	—	Bracket—Pawl mtg. bracket	87	207873	Spring—Idler wheel spring (3 1/4" long, 5/32" O.D.)
40	207904	Catch—Link catch	88	207892	Washer—Brass washer, 1 1/4" O.D., .434" I.D., .025" thick
41	207918	Spring—Rewind spring	89	208028	Wheel—Idler drive wheel
42	207902	Pawl—Rewind pawl and plate assembly			
43	—	Nut—Elastic stop nut			
44	207905	Spring—Link spring			
45	207906	Arm—Actuator arm and shaft assembly			

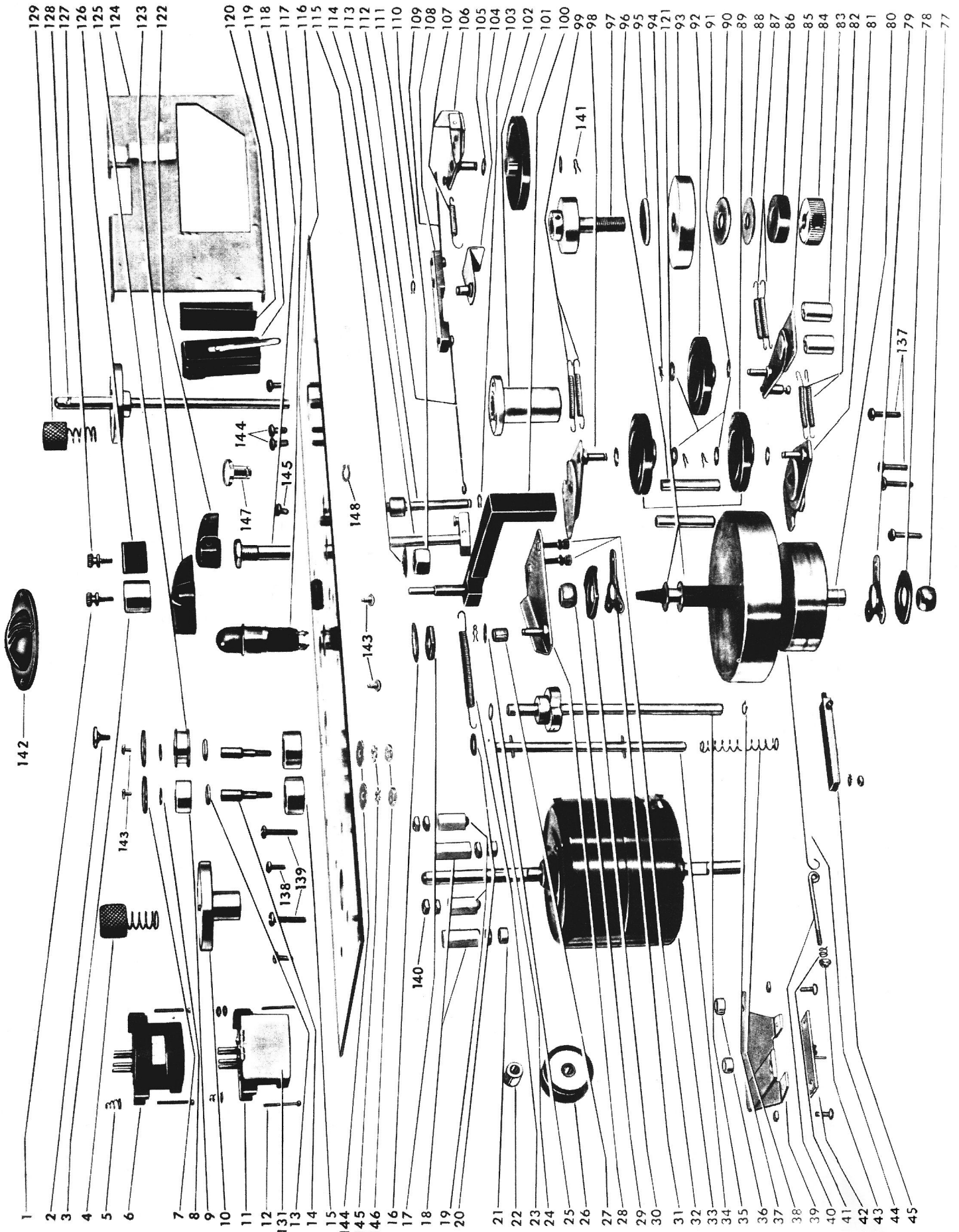
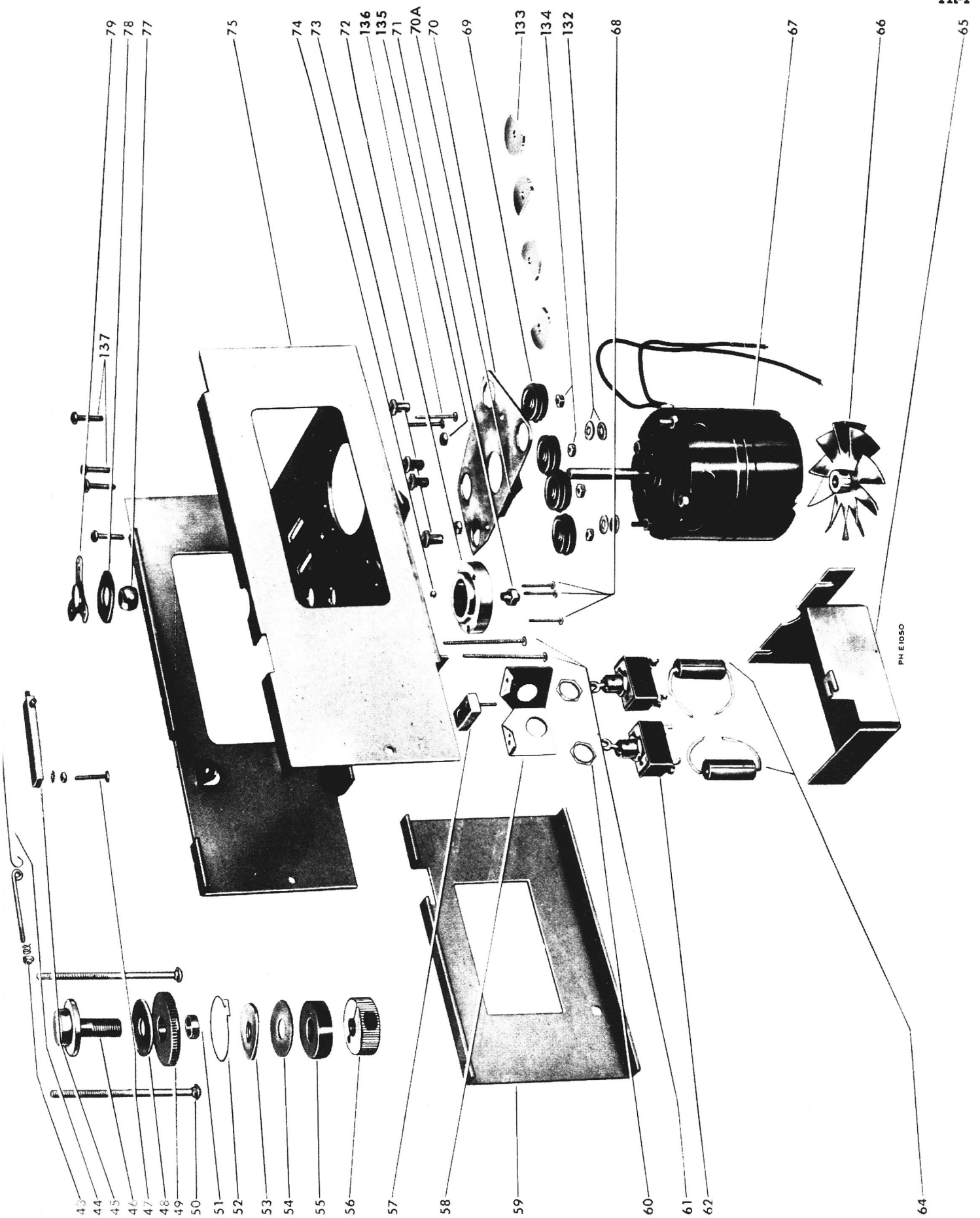


Figure 9 — Exploded View of Mechanism



Exploded View of Mechanism

REPLACEMENT PARTS (Continued)

ILL. NO.	STOCK NO.	DESCRIPTION	ILL. NO.	STOCK NO.	DESCRIPTION
90	207893	Washer—Felt washer white, 1 1/4" O.D., 7/16" I.D., 1/16" thick	124	100788	Panel—Side panel
91	207867	Washer—Fibre washer, 1/2" O.D., 3/16" I.D., 1/64" thick	125	207854	Roller—Guide roller and bearing assembly (flanged)
92	208028	Wheel—Idler take-up wheel and bearing	126	207885	Roller—Pressure roller assembly, 60 cycle—7 1/2/sec.
93	207889	Wheel—Idler take-up wheel and bearing assembly	127	207916	Screw—Pressure roller screw knurled head (#4-36 x 5/16")
94	207866	Retainer—Hair pin retainer for take-up wheel arm & plate assembly	128	207894	Shaft—Take-up shaft and bayonet spindle assembly
95	207893	Washer—Felt washer white, 1 1/4" O.D., 7/16" I.D., 1/16" thick	128A	207901	Spindle—Take-up shaft spindle nose
96	207880	Spacer—Take-up wheel plate spacer (steel) 5/16" O.D., .146" I.D., 1.418" long	129	207950	Retainer—7" dia. take-up reel retainer
97	207888	Hub—Take-up hub assembly	130	70392	Cord—Power cord & plug
98	207966	Plate—Idler wheel arm and plate assembly	131	207924	Shield—Record/playback head shield
99	207873	Spring—Idler wheel spring (3 1/4" long, 5/32" O.D.)	132	—	Washer—#10 washer for motor mtg.
100	207862	Arm—Pressure arm and shaft assembly	133	207944	Washer—Segment washer for motor mtg.
101	208030	Wheel—High speed forward idler wheel assembly	134	—	Nut—#8 nut for motor mtg.
102	207895	Housing—Take-up housing and bearing assembly	135	—	Nut—#10 nut for motor mtg.
103	94353	Retainer—.025" thick for .250" dia. shaft with .230" dia. groove steel	136	—	Screw—#6 binder head for mtg. take-up wheel arm & plate
104	207934	Bracket—Fast forward lever mounting bracket & stud assembly	136A	—	Screw—#6 flat head for mtg. take-up wheel arm & plate
105	207874	Washer—Red fibre washer for idler wheel (1/2" O.D., .223" I.D.)	137	—	Screw—#8 x 1" for motor mounting
106	207929	Arm—High speed forward wheel arm and bracket assembly	138	—	Screw—#8-32 x 3/8" cross recessed for rewind motor
107	207936	Spring—Fast forward control spring (3/16" O.D. x 2 1/4" extended length)	139	—	Screw—#8-32 x 5/8" cross recessed for rewind motor
108	207930	Lever—Fast forward control lever	140	—	Nut—#8 hex nut for rewind motor
109	207931	Link—Wire link for high speed forward shaft (short)	141	—	Retainer—Hair pin retainer for Ill. #92 & #101
110	207948	Nut—Hex nut, 7/16-20 for fast forward control sleeve	142	207853	Escutcheon—Magic eye escutcheon
111	94353	Retainer—.025" thick for .250" dia. shaft with .230" dia. groove steel	143	—	Screw—#4-32 x 1/4" escutcheon mtg.
112	207932	Link—Wire link for high speed forward shaft (long)	144	—	Screw—#6-32 x 3/8" to mount take-up spindle housing
113	207864	Shaft—Pressure arm assembly shaft	145	—	Screw—#8 x 3/8" screw
114	207928	Shaft—High speed forward control shaft and arm assembly	146	—	Washer—#4 link washer
115	—	Washer—Lockwasher for fast forward control arm sleeve (stocked only on sleeve)	147	207852	Button—Record/playback safety button
116	100768	Panel—Front control panel	148	—	Retainer—Truarc retainer for record/playback safety button
117A	208456	Jewel—Record indicator lamp jewel	MECHANICAL MISCELLANEOUS		
117B	91749	Lamp—Record indicator lamp (neon) (I-2)	100772	Cam—Pressure roller cam	
117C	208458	Socket—Record indicator lamp socket	77360	Grommet—Rubber, 3/16" I.D., 7/16" O.D.	
118	207946	Sleeve—Fast forward control sleeve	100769	Grommet—Rubber, 3/8" I.D.	
119	207935	Switch—Fast forward Micro-switch SPST leaf type actuator (S5)	208456	Jewel—Pilot lamp jewel	
120	—	Insulator—Paper insulator for mounting of microswitch	100776	Knob—Equalizer switch knob or volume control knob	
121	207913	Washer—Capstan spring washer—bronze	207937	Knob—"Record-Off-Playback" control knob complete with setscrews	
122	207937	Knob—"Fast forward" control knob complete with setscrews	100773	Link—Rewind link	
123	207938	Knob—"Rewind-Stop-Forward" control knob	100774	Screw—Set screw, #6-32 x 1/4" for Ill. #45, 46 & 97	
			207926	Screw—#2-56 x 5/32" B.H.M.S., brass, nickel plated	
			207964	Screw—Machine screw, #12-24 x 1/2" long oval hd., steel, cross-recessed	
			207933	Spring—High speed forward adjusting spring	
			207953	Spring—Safety button spring	
			207915	Washer—Felt washer, 1/2" O.D., 7/32" I.D., x 1/16" thick	
			207860	Washer—Flat metal washer for guide roller assembly	

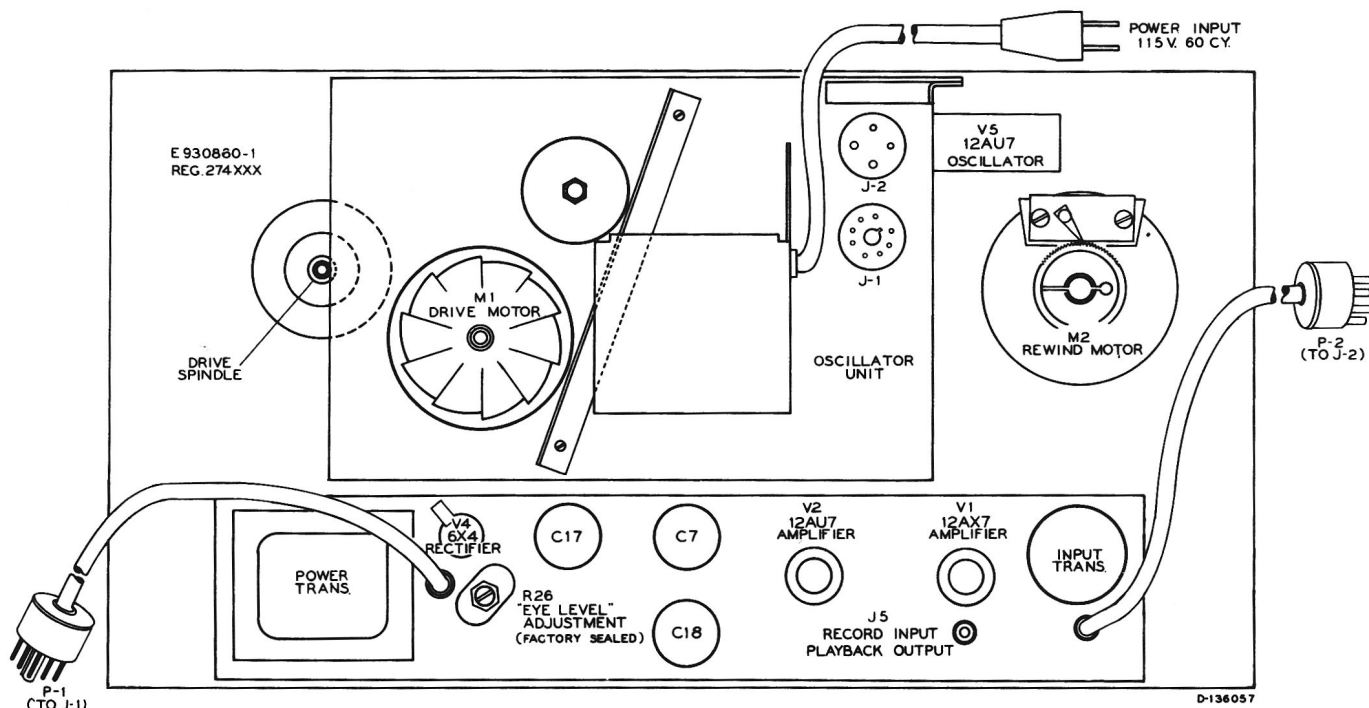


Figure 10 — Back View of Recorder and Amplifier

LUBRICATION

Most bearings in this tape recorder are of the porous bronze type which retain oil over long periods of time. Normally it is necessary only to replace the oil lost by evaporation. The bearings are kept oil damp by their felt pad wicks. The wicks should be oiled, not the shafts or bearings themselves. Use only a high quality motor oil, SAE #30.

Motors — two or three drops of oil on front and back bearings every six months.

Capstan Shaft Bearings — two or three drops of oil on felt pads every six months.

Intermediate Idler Wheels — one drop of oil on felt washers every six months. In rare cases it may be necessary to lubricate sliding surfaces with a non-drying grease such as "Lubriplate".

Takeup Clutch and Rewind Brake — Do not oil unless there is a noticeable squeak, then oil felt pads with one or two drops of oil.

CAUTION — Excess oil will find its way past the various oil-stop barriers and grooves and get onto the friction drive surfaces. If drive surfaces become oily, clean thoroughly with carbon tetrachloride on a rag.

FILAMENT VOLTAGE ADJUSTMENT

A full wave disc type rectifier is used to supply d.c. voltage to the filament of the two amplifier tubes (V1 and V2). An adjustable wire-wound

resistor (R34) permits adjustment of this supply voltage. To adjust — loosen the slider band and move in desired direction to obtain the specified 12.6 volts, retighten the slider band. This voltage should hold within $\pm 5\%$ with rated line voltage.

RECORDING LEVEL INDICATOR ADJUSTMENT

A type 6E5 "magic eye" tube is used to indicate recording level. A potentiometer (R26) located on the back apron of the amplifier chassis permits adjustment of the signal voltage supplied to the "eye" tube. To adjust — supply an audio signal (approx. 1000 cycles) to the input/output jack J5 and adjust R26 so that the eye just closes with 3.5 volts audio signal voltage measured at the junction of R13 (10,000 ohms) and C25 (0.25 mf). This signal voltage must be measured with an a.c. VTVM.

NOTE: This adjustment is sealed at the factory and should not require readjustment unless the seal has been broken.

AUXILIARY GROUND LUG

An auxiliary ground lead is part of the power cable connecting from the main amplifier assembly to the oscillator unit. Under some conditions of external amplifier design, a reduction of hum will be had by fastening the connecting lug of this lead under an oscillator unit chassis screw. Under other conditions it should be insulated with tape.