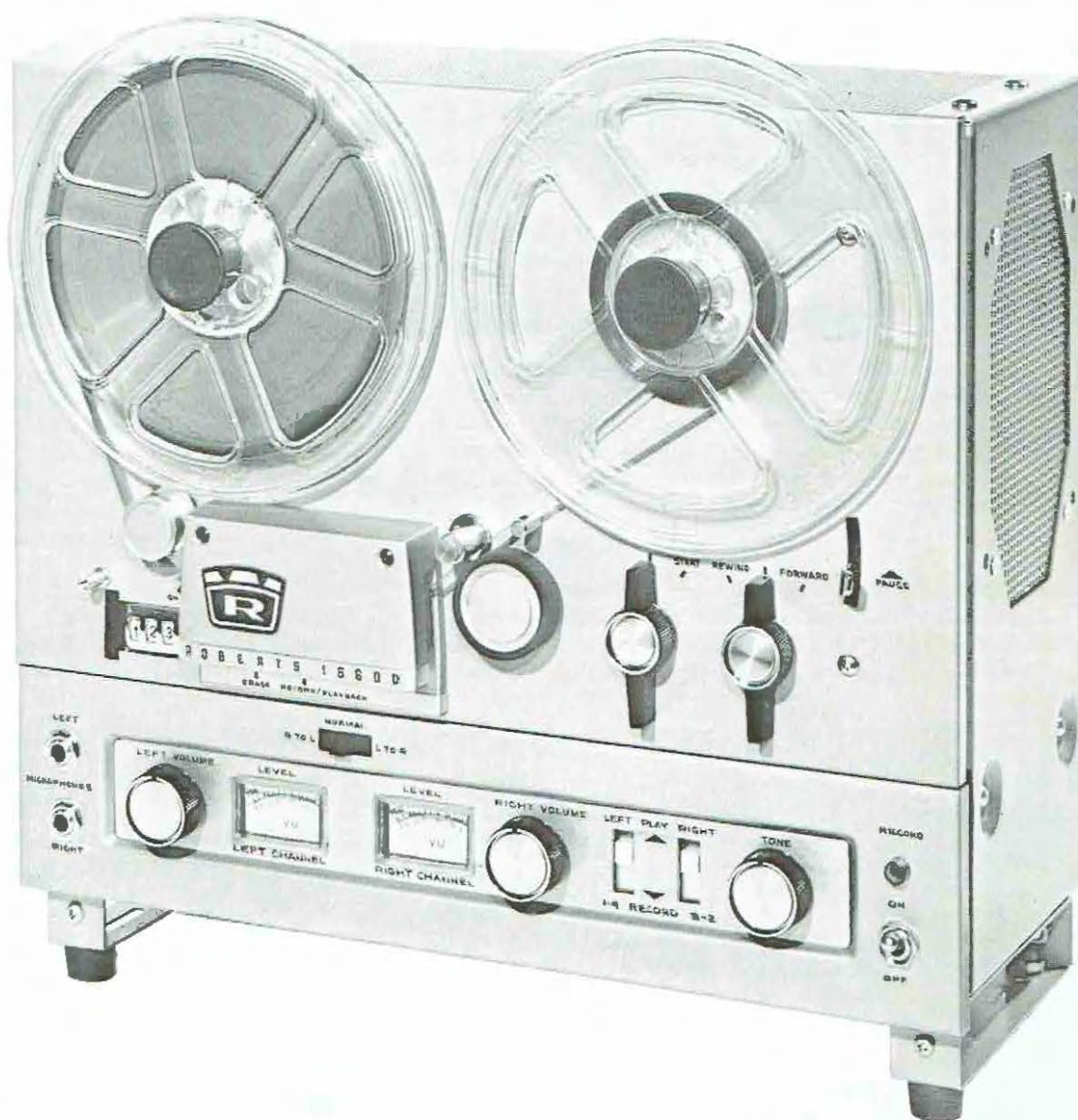




SERVICE MANUAL

1640-1650-1660D-1670 TAPE RECORDERS



ROBERTS ELECTRONICS

DIVISION OF RHEEM MANUFACTURING CO.
5922 BOWCROFT STREET.
LOS ANGELES, CALIF., 90016

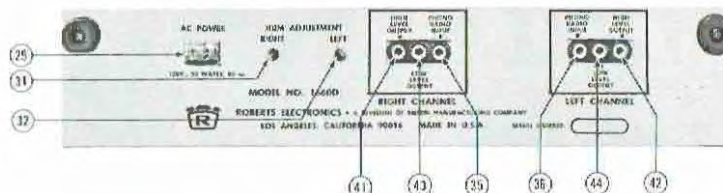
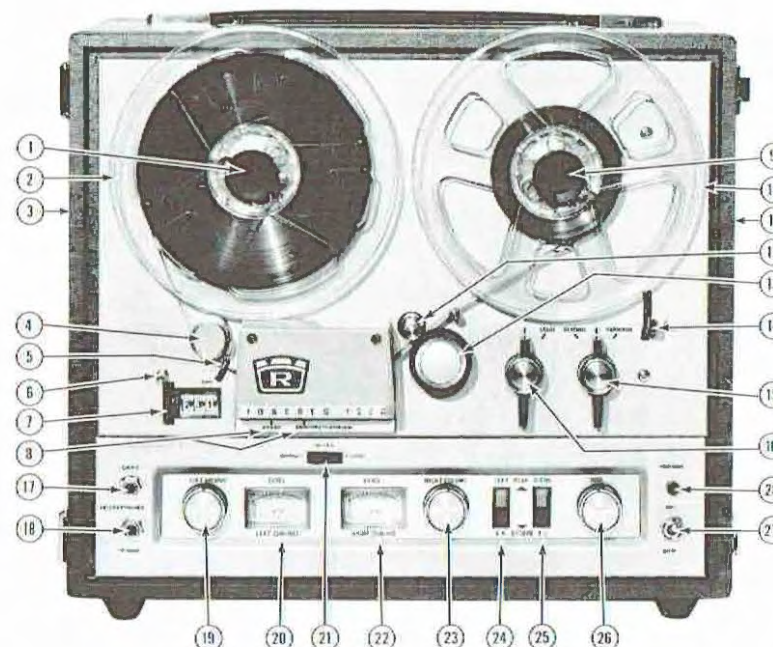
\$2.50

OPERATIONAL FEATURES

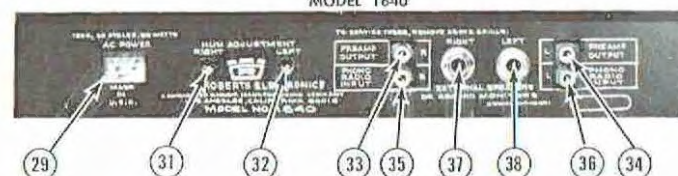
MODELS 1640, 1650, 1660D, 1670. (KEYED TO ILLUSTRATION AT RIGHT)

1. Supply Reel Holder
2. Supply Reel
3. Left Channel Speaker
(Not in 1660D. Outboard in 1670)
4. Tape Guide Roller
5. Automatic Shut-Off Lever
6. Drive Capstan Storage Post
7. Index Counter
8. Editing Guide
9. Take-up Reel Holder
10. Take-up Reel
11. Right Channel Speaker
(Not in 1660D. Outboard in 1670)
12. Drive Capstan
13. Pinch Wheel
14. Pause Lever
15. Rewind/Fast Forward Control
16. Stop/Start Control
17. Left Channel Microphone Input
18. Right Channel Microphone Input
19. Left Channel Volume Control
20. Left Channel VU Meter
(Dual Purpose Meter on Model 1640)
21. Model 1640: Left/Right VU Meter Switch
Models 1650 and 1670: Monitor-Normal-Mute
Speaker Switch
Model 1660D: R/L - Normal - L/R Channel Transfer
Switch
22. Right Channel VU Meter
(Not in Model 1640)
23. Right Channel Volume Control
24. Left Channel Play/Record Switch
25. Right Channel Play/Record Switch
26. Tone Control
27. Power Switch
28. Record Indicator Light
29. Power Cord Connection
30. Stereo Headphone Jack (1650 & 1670)
31. Right Hum Adjustment
32. Left Hum Adjustment
33. Right Channel Preamp Output (1640, 1650, 1670)
34. Left Channel Preamp Output (1640, 1650, 1670)
35. Right Channel Phono/Radio Input
36. Left Channel Phono/Radio Input
37. Right Channel Speaker Output (1640, 1650, 1670)
38. Left Channel Speaker Output (1640, 1650, 1670)
39. Right Channel Tweeter Output (1650, 1670)
40. Left Channel Tweeter Output (1650, 1670)
41. Right Channel High Level Output (1660D only)
42. Left Channel High Level Output (1660D only)
43. Right Channel Low Level Output (1660D only)
44. Left Channel Low Level Output (1660D only)

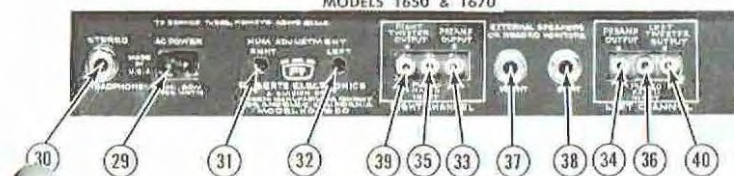
IDENTIFICATION CHART



MODEL 1640



MODELS 1650 & 1670



FUNCTIONS OF CONTROLS

Power Switch:

Moving the power switch to the "ON" position applies power to the motor and amplifier. In the "OFF" position, power is cut off to the entire unit.

Volume:

A separate volume control is provided for each channel. The volume control varies the playback volume, and the record level when making a recording.

Tone:

The tone control setting determines the frequency response of both amplifiers. Tone controls do not work during record.

VU Meters:

The VU Meters are used to monitor the record level when recording, and to balance stereo play. Meter indication should be between -3 and -7 for best recording results.

Record Switches:

To operate, depress either or both record switches, then turn the stop/start control to "start." This holds the record switch in record mode.

When the stop/start control is returned to "stop," the record switch automatically snaps back to play mode.

Channel Transfer Switch: (1660-D)

This switch internally transfers the output of one channel over to the input of the other channel. A microphone or radio/phono addition is added to the transfer receiving channel during recording.

The process may be repeated back and forth between channels to make a multiple recording.

Tape Lifter:

The tape lifter is under the head cover and is operated by the stop/start control. When the stop/start control is in

stop mode, the lifter pushes the tape away from the heads to prevent excessive wear during the fast rewind and fast forward operations. This also mutes the sound during these modes.

Stop-Start:

Starts tape movement in "Play" or "Record" position. Stops tape movement when moved to the "Stop" position.

Rewind-Fast Forward:

Fast Forward position advances the tape onto the take-up reel at a fast rate of speed. Rewind position winds the tape onto the feed reel at a fast rate of speed.

Pause Lever:

In the "Up" position, pinch roller is moved away from capstan, and take-up torque is removed from take-up spindle. Tape stops instantly. This permits an adjustment of the record level without tape movement. When lever is returned to "Down" position, the tape movement begins.

Index Counter:

Provides a means of locating desired selections on a reel of tape without skipping and hunting.

Hum Adjustment Controls:

On the rear panel next to the A.C. Receptacle are two openings, these are the Right and Left Channel hum adjusting Potentiometers. They are screw driver adjustments. Without tape on the unit, turn the volume up full and adjust the controls for minimum hum on each channel.

Auto-Stop Switch:

When tape holds the auto-stop switch "Up," the motor circuit is completed and the motor runs. If the tape breaks, runs out, is of insufficient tension, the switch lever falls, breaking the circuit, shutting off the motor.

INPUT AND OUTPUT JACKS

Microphones:

A microphone input is provided for each channel. These input jacks are located on the front panel to the left of the left channel volume control.

Note: When using the Phono-Radio inputs, the microphone plugs must be removed from the microphone jacks.

Phono-Radio Input:

Each channel is provided with a Phono-Radio input for making direct recordings from a radio, phonograph, or tuner. These inputs are located on the rear panel.

Outputs:

1660D . . . There are two high and two low level preamp outputs, each adjustable by the volume controls. These outputs are used to connect the recorder playback system to an external power amplifier. The output jacks are located on the rear panel.

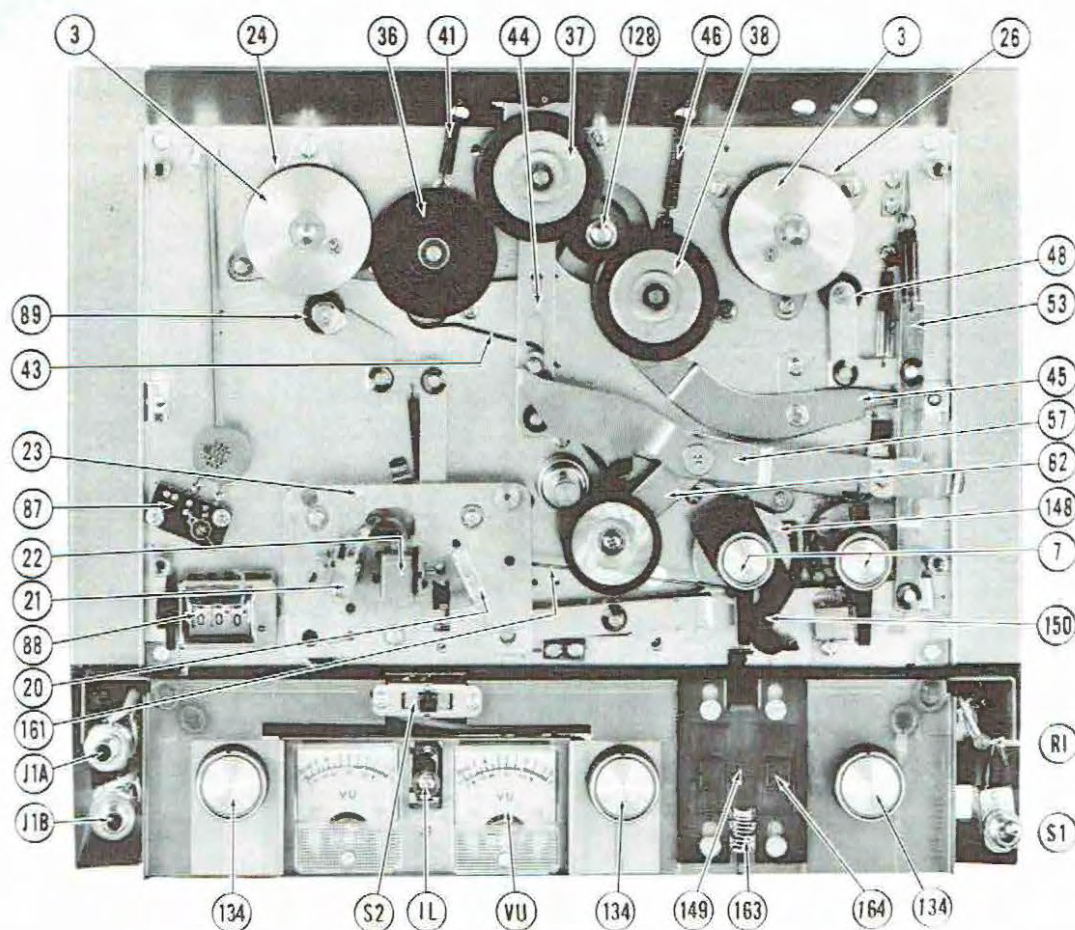
The high level outputs are used with standard tube type amplifiers that have tuner, auxiliary or other high level inputs.

The low level outputs are for solid state amplifiers. Tests will show which is best for each individual case.

The high and low level outputs are low impedance cathode follower outputs allowing for longer interconnecting cables without line losses.

1640 . . . On the rear panel are two external speaker jacks and two high impedance preamp outputs.

1650 & 1670 . . . Has the same outputs as the 1640, plus two phono type jacks for extension speakers to work with the internal speakers. There is also a stereophone jack.



PARTS IDENTIFICATION

Fig. 2. Top View of Tape Transport.

OPERATING INSTRUCTIONS

Hook-Up Procedures: (1660-D)

1. The outputs, high and low level are cathode follower, low impedance preamp outputs.

The instructions of the external power amplifier and/or tuner should be followed. However as a rough guide the following may be helpful.

Interconnect . . .

High Level Output . . . to . . . Tube amplifier,
 a. High level input
 b. Auxiliary input
 c. Preamp input
 d. Tuner input

Low Level Output . . . to . . . Transistor amplifier,
 a. Input
 b. Preamp input
 c. Tuner input
 d. Auxiliary input

Rad/Phono Input . . . to . . . Tuner Output
 to . . . Amplifier Tape Out
 to . . . Amplifier Preamp Out
 to . . . Phono, Ceramic Cartridge
 to . . . Phono, Preamp Out
 to . . . parallel with TV speakers
 to . . . parallel with Radio speakers

Threading the Tape:

1. Place a full reel of tape on feed spindle. Place an empty reel on takeup spindle. Secure reels in place with rubber reel holders provided.
2. Unwind about 14 inches of tape from feed reel. Hold a section of tape taut and thread per photo. Make sure tape pulls automatic tape shutoff switch arm up to "On" position.
3. Insert free end of tape into one of the radial slots in hub of takeup reel. Hold tape end in place and turn reel several turns counterclockwise to secure tape to the reel.

To Make a Stereo Recording:

1. Connect recorder to 110-125 volt 60 cycle power source with power cord provided. Turn power switch to "Power On."
2. Thread the tape. Set Index Counter to zero.
3. Connect signal source to proper input.
 a. If microphones are used connect them to microphone jacks. Level will be controlled by the volume controls.

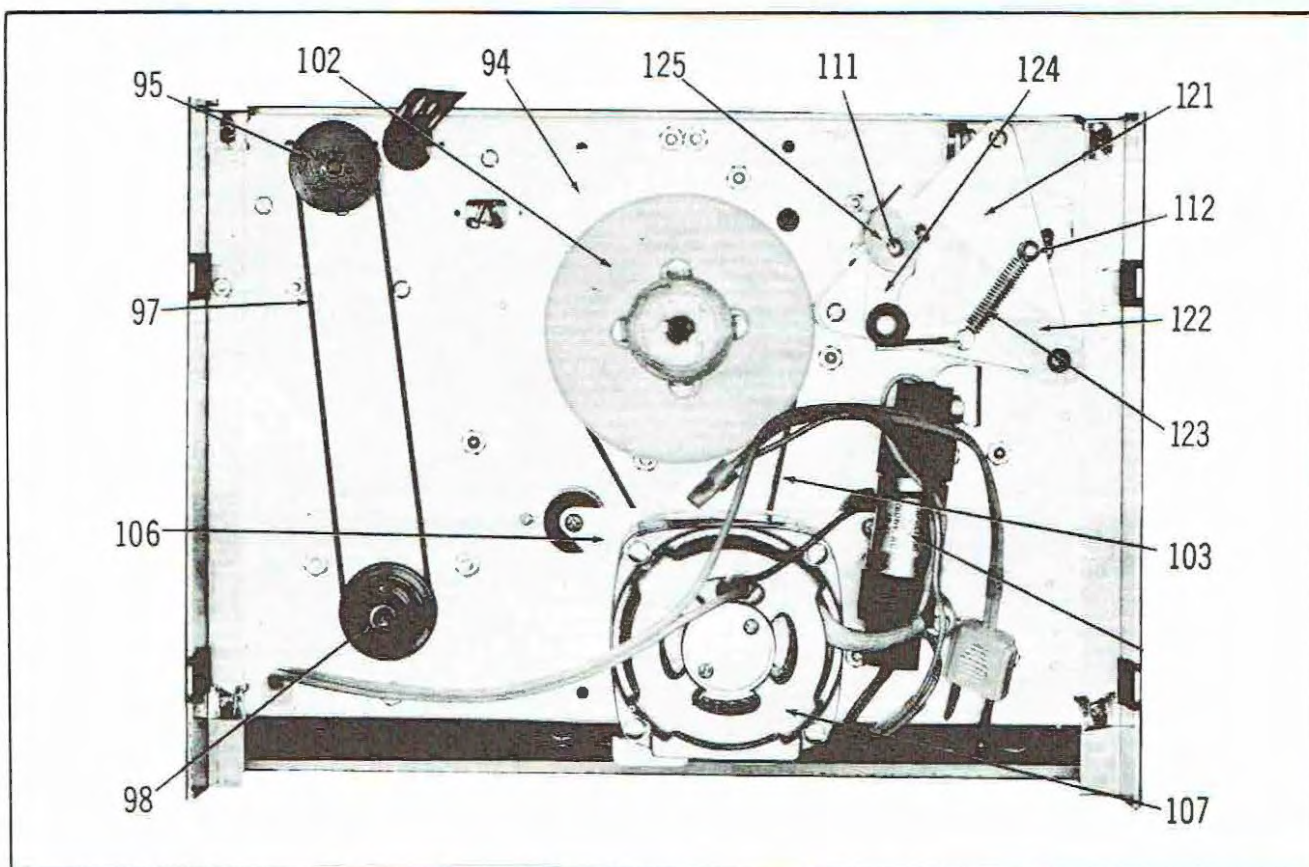


Fig. 3. Bottom View of Tape Transport.

- b. If a phono or radio source is used connect their outputs to the respective channel Phono-Radio input jacks. Level will be controlled by the volume controls.
4. Push Pause Lever to "Up" position.
5. Hold record switches depressed.
6. Turn start/stop control to "Start" position. This holds the record switches down in record mode.
7. Start signal source to set recording level. VU Meters should read -3 to -7 on the average.
8. Release the Pause Lever (down) to start tape. Tracks 1 and 3 are now being recorded.
9. When recording is completed, or when the end of the reel of tape is reached, return start/stop control to "Stop" position. Record switches are automatically released to return to play position.
10. To record tracks 2 and 4, remove full reel from take-up spindle, turn over and place on supply spindle. Proceed as in steps 2 - 9.
4. Turn Start-Stop knob to "Start" position. Adjust volume for each channel. Both tracks of a 2-track stereo tape or tracks 1 and 3 of a 4-track stereo tape will now be played.
5. Tape may be advanced rapidly or rewound, after Start-Stop knob is placed in "Stop" position, by using Fast Forward-Rewind knob.
6. To play tracks 2 and 4 of a 4-track stereo recording after tracks 1 and 3 have been completed, do not rewind tape. Remove full reel from takeup spindle, turn it over, and place on feed spindle. Proceed as in Steps 2-5 above.

To Play a Stereo Recording:

1. Connect recorder to proper power source with power cord provided. Turn power switch to "Power On."
2. Thread the tape. Set Index Counter to zero.
3. Locate desired starting point by using Fast Forward-Rewind knob while observing Index Counter.

Monaural Recording and Playback:

Proceed as indicated for stereo operation but use only jacks, controls and switches for one channel. Volume controls for the unused channel should be set at zero.

To record four monaural tracks, use left channel first, recording track 1. Reverse tape by removing full reel from takeup spindle, turning it over, and placing it on the feed spindle. Continue to use left channel while recording track 4. Reverse tape and use right channel to record track 3. Reverse tape again and continue to use right channel in order to record track 2.

To play back four monaural tracks, use the same sequence of tape sides and recorder channels as when recording.

SOUND-WITH-SOUND RECORDING

This is a procedure by which you may record your favorite orchestra on one channel, and then play or sing with the recording in such a manner as to make the playback sound as though you were "right there" with the orchestra. Or it may be used for language study, with the teacher's voice on one channel and your responses which may be erased and re-recorded as often as desired) on the other channel. ROBERTS Language Laboratory Tapes, available from your Roberts dealer, have the instructor's voice pre-recorded in this manner in four different languages.

PROCEDURE:

1. Make a master recording on Track 1, using Left channel only. Turn Right channel volume controls to zero and follow procedure under "To Make a Stereo Recording," using Left channel only.
2. Rewind tape.
3. Record on Track 3, using Right channel only while listening to Track 1.
4. Rewind tape.
5. Play back recording, as in stereo play. Master recording will be heard on Left channel and added recording will be heard on the Right channel.
6. Track 3 may be erased and rerecorded without disturbing master track by repeating Steps 2 through 4.

SOUND-ON-SOUND RECORDING (1660D ONLY)

1. Make original recording on Track 1 using Left channel only. Turn Right channel volume control to zero and follow procedure under, "To Make a Stereo Recording."
2. Rewind tape to beginning of original recording.
3. Set Channel Transfer Switch to "L to R" position.
4. Push Pause Lever up to "Stop" position.
5. Hold Right Record Switch depressed and turn Start-Stop knob to "Start" position.
6. Connect Right channel microphone. Apply signal to microphone and adjust the Right channel volume control for approximately half the normal recording level reading on the Right channel VU Meter.
7. DO NOT READJUST THE RIGHT CHANNEL VOLUME CONTROL AFTER PRESETTING FOR THE MICROPHONE RECORDING LEVEL. ($\frac{1}{2}$ normal)
8. Release Pause Lever and make a trial recording of the Left channel transfer and the Right channel microphone added.
9. Adjust the Left channel volume control only, while watching the Right channel VU Meter reading. The Right channel VU Meter should be reading full normal. Half of the reading will be the Left channel transfer and the other half, the Right channel microphone.
10. Rewind the tape, play the trial recording. If the test run was satisfactory, proceed with the final recording by repeating Steps 2 through 9.
11. Playback recording. Sound-On-Sound recording is on Track 3 (Right channel) so volume controls for Left channel should be set to zero. (NOTE: The original Track 1 recording of the Left amplifier is still intact at this point, so Steps 2 through 9 may be repeated if the final recording was not satisfactory.)
12. The above process may be repeated, using Track 3 as the original recording and add more material to it for a multiple recording. In this case the Channel Transfer Switch should be set at "R to L" position, and the Left channel microphone input will be used.

ASSEMBLY — DISASSEMBLY

Assembly (mounting): (1660-D)

1. Check for clearance, (deck & preamps, reels, ease of operation, etc.). Transfer cutout pattern from template to panel. Cut out panel opening.
2. Remove side angle brackets from metal cage.
3. Install unit into panel cutout.
4. Reinstall side angle brackets onto metal cage, and press up against underside of panel.
5. If panel is $\frac{1}{2}$ " or more thick, fasten angle brackets from underside with wood screws, into panel.
6. If panel is less than $\frac{1}{2}$ " thick use fancy headed bolts and nuts clear through panel.

For Access to Top of Tape Deck:

1. Remove Start-Stop knob and Fast Forward-Rewind knob.
2. Remove 3 transport deck mounting screws, capstan bushing storage post.
3. Pry out pinchwheel cap, take out pinchwheel mounting screw, and lift off pinchwheel.
4. Remove both reel tables after taking out reel table screws. Note number of fibre spacers under reel tables as they are removed.
5. Lift off transport deck panel.

MAINTENANCE INSTRUCTIONS

LUBRICATION

Lubricate the following parts every three months when the recorder is subjected to heavy usage, every six months under moderate usage, and once a year under conditions of occasional use.

1. Feed and take-up spindle shafts with two drops of light machine oil on each shaft.
2. Rewind idler bearing and wind idler bearing, with two drops of light machine oil on each bearing.

3. Apply a liberal amount of light grease to each roller and on all levers and cams.

4. Saturate the felt washer in the retaining cup of the drive capstan with light machine oil.

Caution: Do not allow grease or oil to remain on any of the drive surfaces, or on plastic surfaces or any part touching the tape.

CLEANING

The capstan, pinchwheel, tape guides, and record/play head and erase head accumulate a tape oxide coating as

the tape passes these parts. Clean these parts periodically with a soft cotton swab dipped in alcohol.

MECHANICAL ADJUSTMENTS

1. Record-Play Head

Height—Loosen the two mounting nuts at the side of the head mounting bracket. Move the head so that the top pole piece is even with the top edge of the tape. Gently tighten the nuts.

Azimuth—Place a prerecorded azimuth alignment tape on the recorder. While playing tape alternately tighten upper and loosen lower head mounting nuts or vice versa until position of maximum output is found.

2. Erase Head

The erase head height is adjusted in the same manner as the Record-Play head.

3. Brake Shoes

When brake shoes become worn, loosen the mounting screws and rotate the shoes a few degrees until a new brake surface is exposed to the supply and take-up reel discs.

4. Rewind Idler Wheel

To bring the wheel in alignment with the rewind reel shaft adjust both the idler load spring and the rewind roller. The pressure on the knurled motor bushing should be about 50 grams during the rewind operation.

5. Pinch Wheel

To bring the wheel in alignment with the capstan shaft adjust the pinch wheel load spring. The pinch wheel pres-

sure should be between 1,000 and 1,150 grams when the unit is operating at $7\frac{1}{2}$ ips.

6. Rewind Intermediary Idler

Adjust the intermediate wheel spring to obtain about 50 grams of pressure equally exerted to both the rewind idler wheel and the rubber ring on the supply reel shaft assembly. Make adjustment in the rewind mode.

7. Supply Spindle Tension

A change in torque is accomplished by either adding another metal washer next to the one in the clutch assembly which increases tension, or by removing the existing one which has the reverse effect. See exploded view for location.

The required tension is determined by placing a standard seven inch reel with a two and one fourth ($2\frac{1}{4}$) inch hub diameter on the supply spindle. The reel should have twenty six feet of leader tape wound on it. Attach the end of the leader tape to a scale with a range of 0 to 250 grams. Position the scale vertically with respect to the reel horizontal axis. Exert a steady pull. The required torque should be between 145 grams and 160 grams.

8. Take Up Spindle Tension

The procedure is identical as the supply spindle, except the required torque is between 180 grams and 220 grams.

GENERAL TEST PROCEDURES

NOTE: Whenever an external test instrument is used from an amplifier output, an 8 ohm resistor should be placed across the amplifier output or the test instrument input, if the use of the test instrument disengages the amplifier speakers.

If Preamp outputs are used for measurements, use a 270K 1W load resistor.

During Record mode, an internal 8 or 10 ohm dummy load resistor is automatically inserted to replace the speakers.

Anytime a high level signal is used, the waveform should be checked for distortion on an oscilloscope.

Output:

Play back at full volume and tone, a 700 cps tone, recorded at 0 db, as measured on an external laboratory type VU Meter.

Measure the output on the same type external VU Meter with the recorder terminated into 8 ohms.

Square the resultant voltage reading from the VU Meter and divide by 8 ohms to get the RMS power output in watts. ($P = E^2/R$).

Signal-To-Noise:

Play back a 700 cps tone pre-recorded at 0 db, as measured on an external laboratory type VU Meter.

Adjust the recorder volume control until an external VU Meter from the output reads 0 db.

Without changing the recorder volume control setting, stop the tape motion with the Pause Lever and read the external VU Meter. The VU Meter is now reading residual noise only, no signal.

The reading in db of the residual noise level at that volume setting is the signal/noise ratio at 0 db level.

Frequency Response:

NOTE: First clean and demagnetize and adjust azimuth of the heads.

Set the counter to '000' and record a -12 db line input 700 cps tone at -10 db as measured on an external VU Meter. (If input meter not available, set recorder volume control $\frac{1}{4}$ turn open and adjust the oscillator output, for -10 db amplifier output.)

Record the 700 cps tone at -10db for 10 digits on the counter, then change tones on the oscillator for 10 digits per tone, without changing the oscillator output level or the recorder volume control setting.

The tones to be recorded after the 700 cps reference tone are 50, 100, 250, 500, 1000, 2.5K, 5K, 7.5K, 10K, 12.5K, 15K, 16K, and 17K cps for 10 digits each.

After recording above, rewind the tape to the beginning '000', and set the tone control for the 'flat' setting for the speed that is being used.

Play the 700 cps tone reference frequency at the beginning of the tones and adjust the recorder volume for an output of -10db on an external VU Meter. Do not change the volume or tone control settings after the 700 cps -10db is set.

Read the external VU Meter every 10 digits as the tone changes from the 50 cps to 17K cps.

The variation \pm from the -10db, 700 cps reference frequency original setting, is the frequency response, which may be plotted on log paper for a curve or simply by the numbers.

Wow And Flutter:

Play back a 3000 cps standard prerecorded wow and flutter test tape, that guarantees a wow and flutter within .07%, and read the effective value on a wow and flutter meter.

SPEC'S & PROCEDURES

Hum

At max volume -30 db (-40 db at preamp)

At min. volume -60 db

Signal-to-Noise Record to Play -43 db min.

Pre-recorded -44 db min.

Wow & Flutter .2% max at $7\frac{1}{2}$

.3% max at $3\frac{3}{4}$

Tone Control -12 db at 10KC

+13 db at 10KC

Head Current (OSC, Freq. 100kc)

Erase 12 MA to 15 MA

Bias .54 MA to .56 MA

Record .029 MA to .031 MA @ 1KC

Power consumption at 117 V.A.C. 60 cps 55W (1660D) 80W (1640-1650-1670)

Erasure Record/Play at 0 db, 1000 cps

-42 db using 1KC filter

Fuse: $1\frac{1}{2}$ A. 250V.

Gain from standard operating level pre-recorded tape

$7\frac{1}{2}$ ips volume full .4 volts at preamp minimum

4MV at 700 cps head input = .25 volts at preamp minimum

2 MV at mike for 0 level record

125MV at phono for 0 level record

Crosstalk

Record Ch #1 at 0 db, 700 cps

Play Ch #2 at same setting that Ch #1 is set at for .25 V output on Ext. meter at preamp output -55 db min.

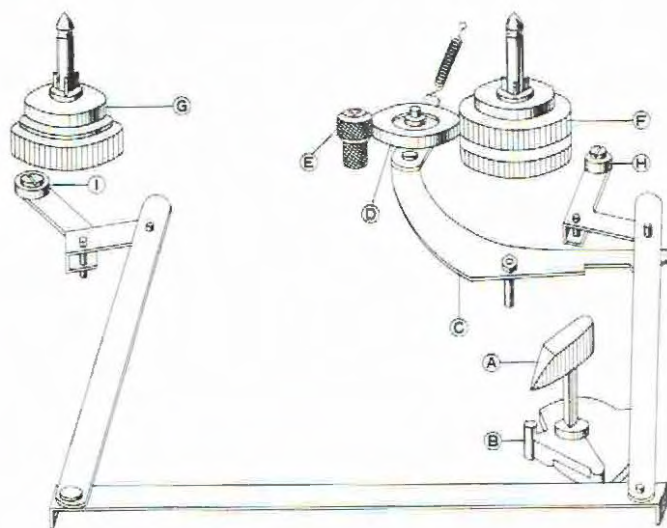
Cross Channel Rejection

Record both channels at 0 db, 700 cps

Play tape and set both channels to .25 V at preamp output

Reverse tape and play -55 db minimum

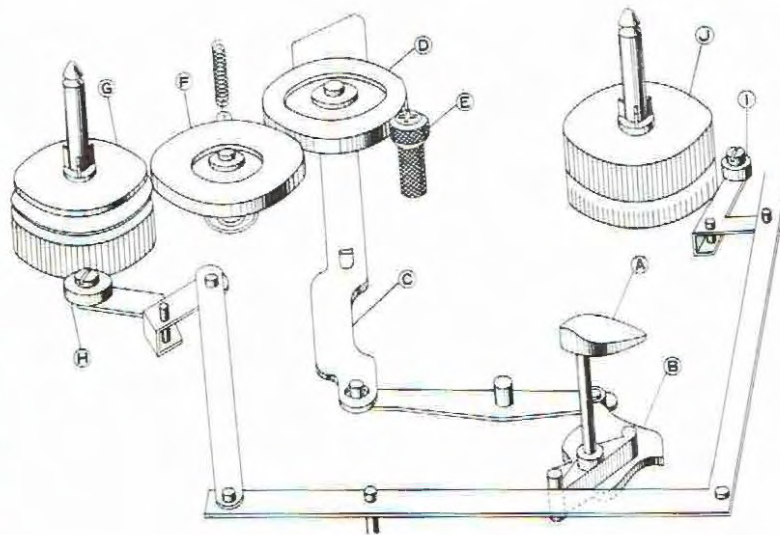
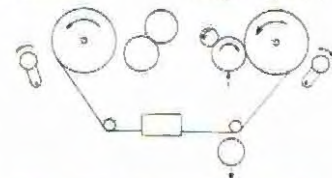




FAST-FORWARD MECHANISM

Turn the **FAST FWD-REWIND knob (A)** to "FAST FWD" position, and the cam (B) under the knob pushes up the Lever (C). The Idler (D) moves in to the space between the Plastic Roller (F) above the Take-Up Reel Spindle and the upper part of the rotating motor drive bushing to transmit the motor rotation to the take-up reel spindle. At the same time, the brakes (H) and (I) come off the reel spindle to free the Supply Reel Spindle (G), thereby allowing fast winding of the tape onto the take-up reel.

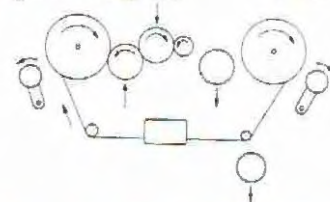
Free Rotation High-Speed Rotation



REWIND MECHANISM

Turn the **FAST FWD-REWIND knob (A)** to "REWIND" position, and the cam (B) under the knob pushes the Lever (C) up. The Idler (D) moves into the space between the upper part of the rotating Motor drive bushing (E) and the Intermediate Pulley (F) to transmit the high-speed rotation of the motor through the intermediate pulley to the Supply Reel Spindle (G). At the same time, Brakes (H) and (I) come off the reel spindle to free the take-up reel spindle (J), thereby rewinding the tape into the supply reel at a fast speed.

High-speed Rotation Free Rotation



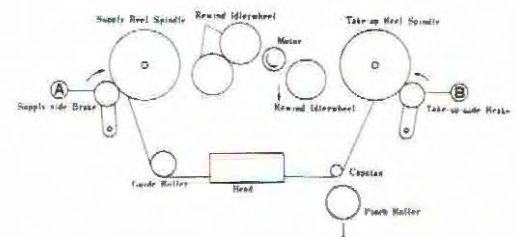
Modes of Operation	Pinch Roller	Take-up Idler Wheel	Rewind Idler Wheel	Take-up-side Brake	Supply-side Brake
(a) STOP	×	×	×	○	○
(b) FAST-FORWARD	×	○	×	×	×
(c) REWIND	×	×	○	×	○
(d) RECORDING PLAYBACK	○	○	×	×	×

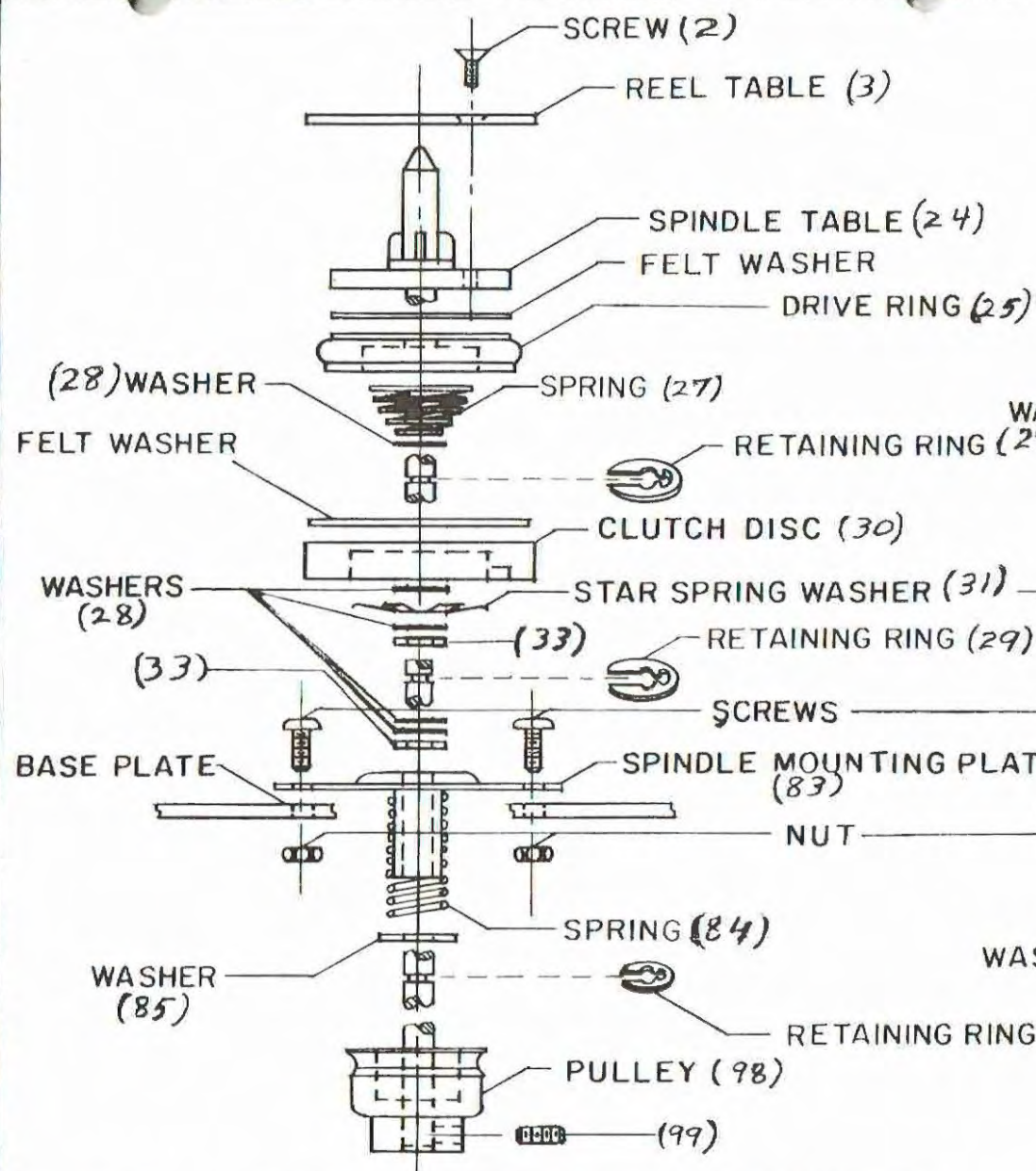
NOTES : ×-marks indicates "open" and
○-marks "engaged"

STOP CONTROL

Push the Stop lever to "STOP" position, brake rubber (A), and (B) depress reel spindles to stop rotation of the reel spindles.

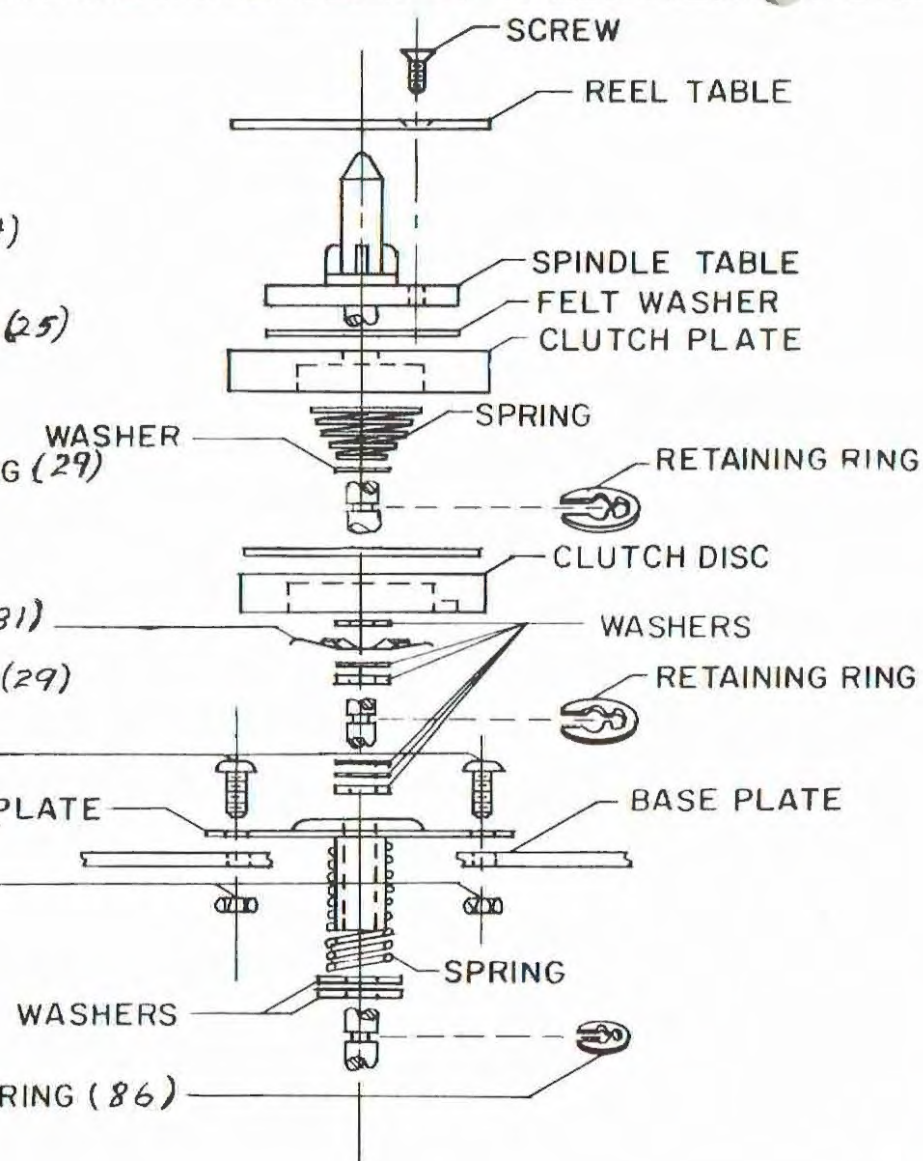
As brake rubber depresses the plastic rollers under the reel spindles, no friction works on the tape itself.





SUPPLY REEL SPINDLE ASSEMBLY

#62-49

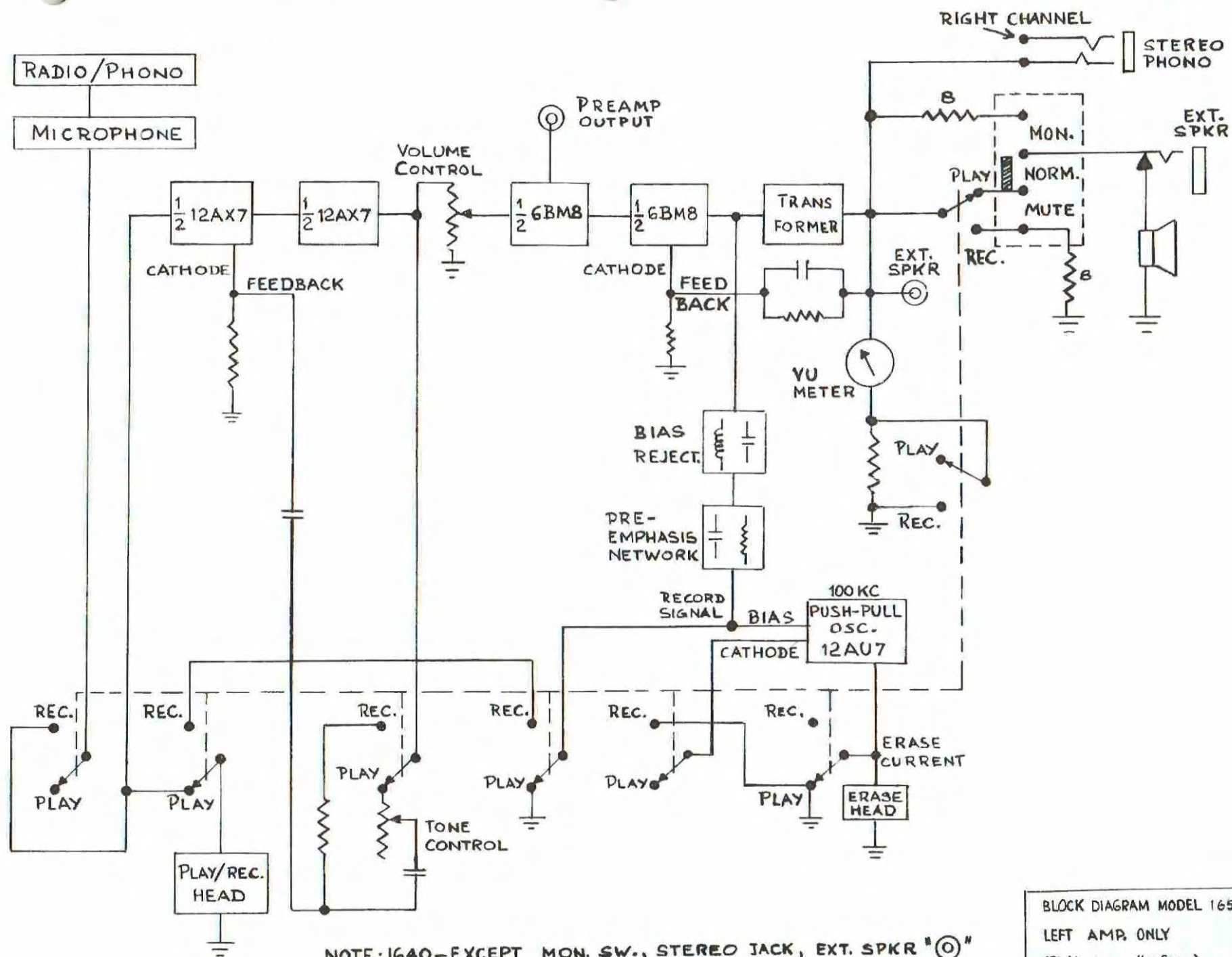


TAKE-UP REEL SPINDLE ASSEMBLY

#62-50

5-20-64	A	
DATE	REV.	APP.

(Right Preamp the Same)



BLOCK DIAGRAM MODEL 1650-1670
 LEFT AMP. ONLY
 (Right amp. the Same)

NOTE: 1640-EXCEPT MON. SW., STEREO JACK, EXT. SPKR "⊙"

PLAYBACK PROBLEMS

1. NO SOUND.

- (a) Pilot light and tubes do not light up and the motor does not run.
 - (1) Defective fuse.
 - (2) Defective A.C. cord or its connection.
 - (3) Defective power switch.
- (b) Pilot light and tubes do not light up but the motor does run.
 - (1) Defective power transformer.
 - (2) Defective connection in power transformer primary leads.
- (c) Tubes lit, but no sound from either channel, (not even faint hum).
 - (1) Defective rectifier tube.
 - (2) Power supply component defective.
- (d) One channel normal, other channel dead, (not even faint hum).
 - (1) Speaker open or disconnected.
 - (2) External speaker jack defective.
 - (3) Output tube defective.
 - (4) Output circuit defective.
 - (5) Output transformer defective.
- (e) One channel normal, other channel has faint hum but no signal sound.
 - (1) Defective head or head connection.
 - (2) Defective input or preamp tube.
 - (3) Incorrect voltages.
 - (4) Open coupling capacitor or shorted grid.

2. SOUND BUT WITH LOUD HUM.

- (a) Hum controllable with volume control.
 - (1) Improper head lead shield grounding.
 - (2) Misadjusted hum controls.
 - (3) Defective input tubes.
 - (4) Improper head lead or input tube grid lead positioning.
 - (5) Leaky coupling capacitor.
 - (6) Ground loop between external equipment and recorder.
 - (7) High resistive solder joint at ground connection.
- (b) Hum not controllable with volume control.
 - (1) Defective driver or output tubes.
 - (2) Leaky coupling capacitor between driver and output tube.
 - (3) Defective power supply filter.
 - (4) High resistive solder joint at ground connection.

3. LOW VOLUME.

- (a) Record sensitivity normal according to the VU Meter.
 - (1) Dirty heads.
 - (2) Tape threaded with oxide side away from the head.
 - (3) Defective head.
 - (4) Defective tape lifter.
- (b) Record sensitivity also low according to the VU Meter.
 - (1) Defective amplifier tube if only one side low.
 - (2) Defective rectifier tube if both sides low.
 - (3) Defective plate resistor causing low voltage.
 - (4) Defective output transformer.
 - (5) Leaky feedback capacitor.

4. DISTORTION.

- (a) At low volume.
 - (1) Defective tube.
 - (2) Incorrect plate voltages.
 - (3) Leaky coupling capacitor.
- (b) At any volume but worse at high volume.
 - (1) Same as 4 (a).
 - (2) Defective loudspeaker.
 - (3) Defective feedback network.
 - (4) Bad wow and flutter in tape transport. (see deck problems).

RECORDING PROBLEMS (Prerecorded tapes play alright)

1. NO RECORD.

- (a) VU Meter not working in record mode.
 - (1) Defective microphone.
 - (2) Input jack contact poor.
 - (3) R/P slide switch not functioning.
- (b) VU Meter reads alright in record mode.
 - (1) Defective R/P head.
 - (2) Broken wire in record circuit.
 - (3) Defective record current circuit component.

2. DISTORTION.

- (a) VU Meter & amplifier monitor normal.
 - (1) Faulty oscillator bias voltage.
 - (2) Defective record current circuit component.
- (b) VU Meter normal but amplifier monitor distorted.
 - (1) Excessive signal input.
 - (2) Defective R/P slide switch.
 - (3) Defective microphone or radio/phonograph.
 - (4) VU Meter reading incorrectly.

3. ERASE PROBLEM.

- (a) No erase.
 - (1) Faulty erase head.
 - (2) Faulty erase cable or connection.
 - (3) Open erase coupling capacitor.
 - (4) Tape lifter not functioning.
- (b) Poor erase.
 - (1) Dirty erase head.
 - (2) Defective erase head.
 - (3) Low erase voltage.
 - (4) Defective head elevation.

4. HIGH BACKGROUND NOISE LEVEL ON TAPE. (hiss, scratchy)

- (a) Hiss.
 - (1) Magnetized heads.
 - (2) Defective tape.
 - (3) 'Hash' on oscillator output waveform.
 - (4) Direct current leaking to heads.
- (b) Rumbling.
 - (1) Defective tape.
 - (2) Distorted oscillator output waveform.
 - (3) Excessive tape pressure against heads.
 - (4) Excessive tape 'wrap' around heads.

5. LOSS OF HIGH FREQUENCIES.

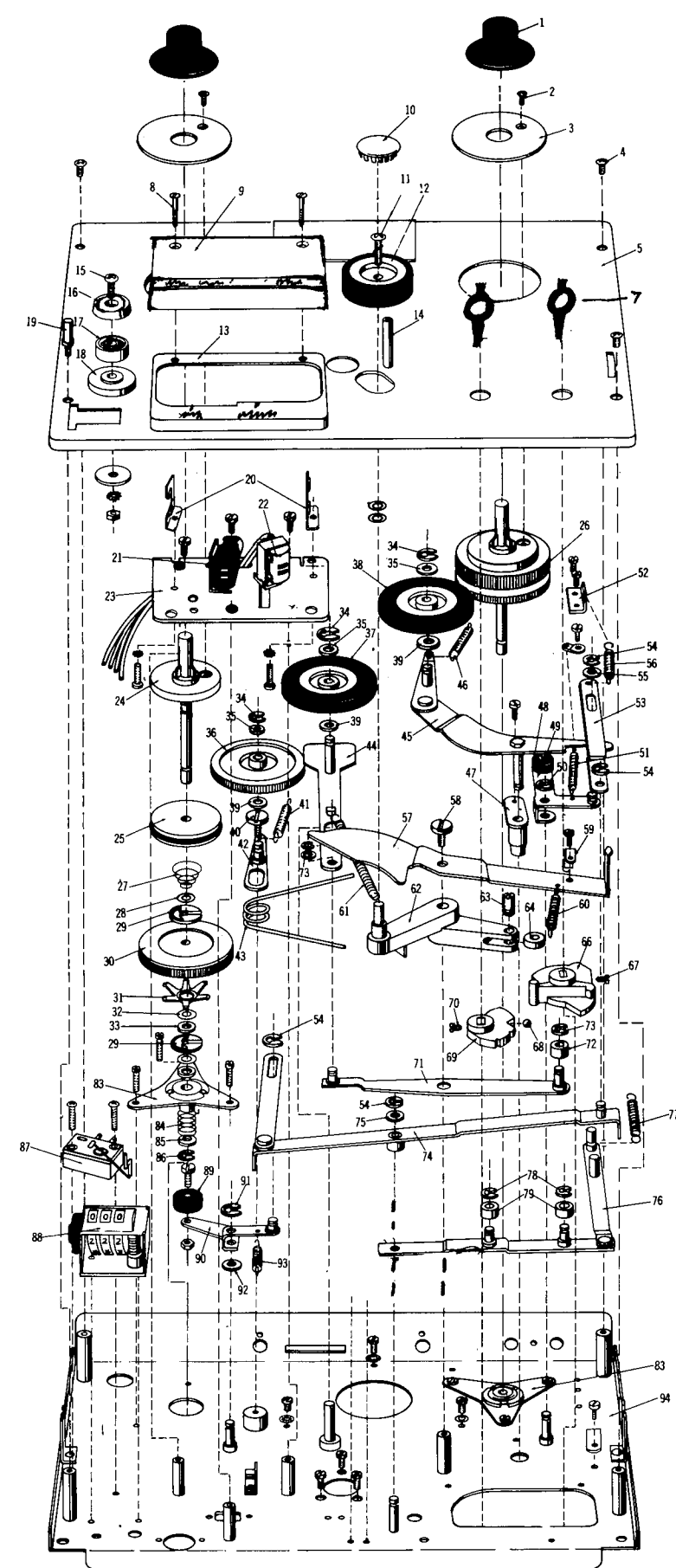
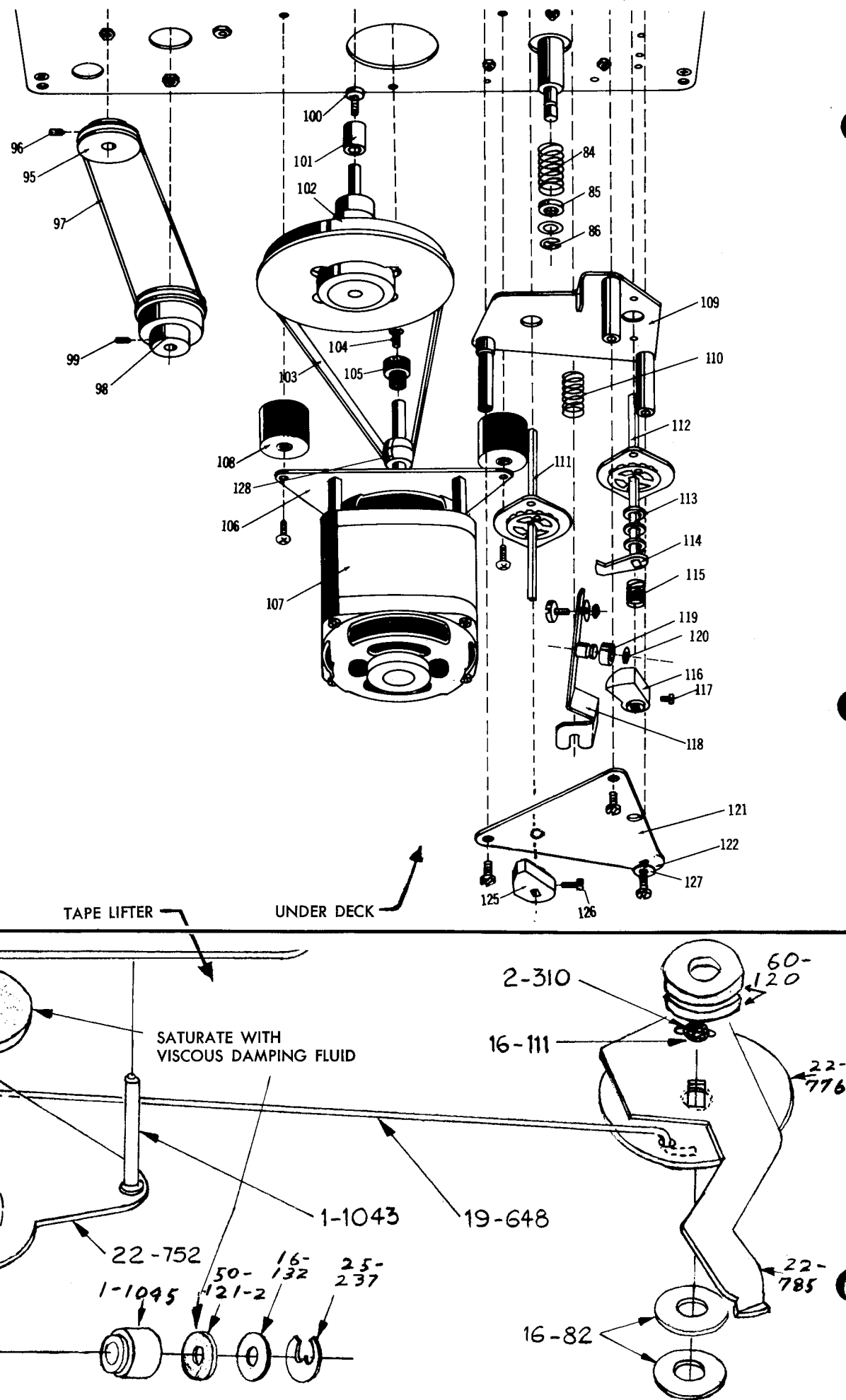
- (a) No sparkle.
 - (1) Dirty heads.
 - (2) Record bias incorrect voltage.
 - (3) Worn heads.

6. LOW SENSITIVITY.

- (a) VU Meter reads normal.
 - (1) Dirty heads.
 - (2) Defective heads.
 - (3) Defective record current circuit component.
 - (4) Defective tape.

7. LOSS OF LOW FREQUENCIES.

- (a) No bass.
 - (1) Mismatch of impedances of input.
 - (2) Incorrect speed. (fast)



PARTS LIST

5-602	1 ohm, 2 watt
5-628	1.5 ohm, 2 Watt
5-592	8.2 ohm, 1 Watt
5-612	180 ohm, 5 Watt
5-550-01	1k, ½ Watt
5-590	1.2k, ½ Watt
5-593	2.2k, 2 Watt
5-518	2.2k, ½ Watt
5-606	4.7k, ½ Watt
5-567	10k, ½ Watt
5-520	12k, ½ Watt
5-603	22k, 2 Watt
5-527	33k, ½ Watt
5-581	47k, ½ Watt
5-564	82k, ½ Watt
5-517	100k, ½ Watt
5-506	220k, ½ Watt
5-606-01	220k D.C., ½ Watt
5-529	470k, ½ Watt
5-519	1 Meg, ½ Watt
5-580	2.2 Meg, ½ Watt
5-504	6.8 Meg, ½ Watt
13-948	100 Humbuck, Pot
13-947-01	250k Volume, Pot
13-1011	500k Tone, Pot
14-796	750 mmf, Capacitor
14-713	450 mmf, Disc Capacitor
14-758	450 mmf, Mica Capacitor
14-711	270 mmf, Disc Capacitor
14-780	150 mmf, Capacitor
14-732	100 mmf, Disc Capacitor
14-781	100 mmf, Dipped Capacitor
14-766	20 mmf, Capacitor
14-785	.001 mf, 1.4kv capacitor
14-765	.05 mf, 600v capacitor
14-746	.03 mf, 600v capacitor
14-741	.02 mf, 600v capacitor

14-750	.01 mf, 1.4kv Capacitor
14-778	.2 mf, 10v Capacitor
14-745	2 mf, 350v Capacitor
62-86	2 mf, motor Capacitor
14-744	25 mf, 50v Capacitor
14-715	40 mf, 450v Capacitor
14-756	50/40/30/30 mf Capacitor
17-378	12AX7 Tube
17-386	12AT7 Tube
17-380-1	12AU7 Tube
17-398-1	6BM8 Tube
17-383	6CA4 Tube
18-424-1	Power Transformer
18-407	Output Transformer
18-410-02	Oscillator Coil
18-426	Bias Reject Coil 25mh
25-207	VU Meter
25-103	Fuse 1.5 Amp
24-513	Lamp, Rec. Indicator
13-938	Switch, Power
13-960	Switch, Auto-Shutoff
13-1009	Switch, Transfer & Monitor
13-905	Switch, meter (1640)
13-1010	Switch, Rec/Play
20-48	Speaker, 8" Coax (1670)
20-25	Speaker, 5 x 7 (1650)
20-44	Speaker, 4 x 6 (1640)
29-7279	Receptacle, A.C. & motor
29-7260	Jack, Microphone
29-7311	Jack, Rec/Play, Erase
29-7284	Jack, Hi/Lo out & Rad/Ph
35-09	Oscillator package
27-328	Cord, A.C.
62-85	Motor
29-7314	Shield, tube
24-509	Lamp, VU Meter
12-1056	Handle, Case
12-1057	Hinge, Case

MECHANICAL PARTS LIST

Ref. No.	Part No.	Description
1	62-31	Reel Holder, Rubber
2	62-93	Screw, Flat Head, 3mm x 6mm Long
3	62-154	Reel Table
4	62-89	Screw, Truss Head Phillips, 4mm (Chrome)
5	22-781	Panel, Deck
6		
7	25-239	Knob (Transport Control)
8		Screw, Head Cover Mounting
9	62-120-08	Head Cover, Upper
10	62-72	Cap, Pinch Wheel
11	62-89	Screw, Truss Head Phillips, 4mm
12	62-42	Pinch Wheel

Ref. No.	Part No.	Description
13	62-120-07	Head Cover, Lower
14	1-1033	Pin, Tape Guide
15	2-205	Screw, Tape Guide Mounting
16	62-87-05	Plate, Tape Guide, Upper
17	62-87-3	Bearing, Tape Guide
18	62-87-04	Plate, Tape Guide, Lower
19	62-41	Post, Capstan, Storage
20	62-109	Guide, Tape
21	62-134	Head, Erase
22	62-166	Head, Record-Play
23	22-644-02	Plate, Head Mount Assembly
24	62-49	Spindle, Supply Assy.
25	62-34	Disc, Spindle, Rewind
26	62-50	Spindle, Take-Up Assembly

MECHANICAL PARTS LIST (Cont'd.)

Ref. No.	Part No.	Description
27	62-53	Spring
28	88-1	Washer
29	62-67	Clip, Retainer
30	88-2	Disc, Spindle Hold Back
31	62-129	Spring, Spider
32	88-1	Washer
33	88-3	Washer, Nylon
34	62-48	Clip, Retainer
35	88-4	Washer, Fiber
36	62-35	Idler, Rewind, Intermediary
37	62-36	Idler, Rubber, Rewind
38	62-36	Idler, Rubber, Forward
39	88-4	Washer, Fiber, Red
40	62-91	Screw
41	62-61	Spring, Rewind, Idler Tension
42	88-5	Lever, Intermediate Rewind Idler
43	62-60	Spring, Rewind Idler Return
44	88-39	Lever, Rewind Idler
45	88-40	Lever, Forward Idler
46	62-54	Spring
47	62-151	Bearing, Forward Lever Mount
48	62-32	Brake Shoe (Large, Soft)
	62-33	Brake Shoe (Small, Hard)
49	88-6	Lever, Forward Brake Act.
50	62-48	Clip, Retaining
51	62-62	Spring, Forward Brake
52	88-7	Bracket, Spring Mount
53	88-8	Link, Forward Brake Act.
54	62-48	Clip, Retaining
55	88-41	Washer
56	62-63	Spring, Brake Lever Return
57	88-9	Lever, Pause
58	88-10	Special Screw, Pause Pivot
59	88-11	Bracket, Pause Locking
60	88-12	Spring, Pause Lever Return
61	62-65	Spring, Pinch Wheel Tension
62	88-13	Lever With Long Stud, Pinch Wheel Act. Assembly
63	88-14	Screw, Special (Part of Item No. 62)
64	88-13	Roller, Cam Follower (Part of Item No. 62)
65		
66	88-15	Cam, Rewind Forward Act.
67	62-89	Screw
68	88-16	Ball, Cam Interlock
69	88-17	Cam, Record-Play Act.
70	62-89	Screw
71	88-18	Lever, Rewind Idler Act.
72	88-21	Roller, Cam Follower, Nylon
73	62-48	Clip, Retaining
74	88-19	Lever, Brake Act.
75	88-04	Washer, Fiber, Red
76	88-20	Lever, Idler Return Act.
77	62-66	Spring, Lever Return
78	62-48	Clip, Retaining
79	88-21	Roller, Cam Follower, Nylon
80	88-22	Insulator, Interlock, Upper
83	62-151	Bearing, Spindle
84	62-114	Spring, Spindle Load
85	88-3	Washer, Spindle
86	62-48	Clip, Retaining
87	13-960	Switch, Auto-Stop
88	62-47	Counter, Index

Ref. No.	Part No.	Description
89	62-32	Brake Shoe (Large, Hard)
90	88-24	Lever, Supply Brake
91	62-48	Clip, Retaining
92	88-04	Washer
93	62-55	Spring
94	62-77	Plate, Deck Mounting
95	62-71	Pulley, Counter, Lower
96		Set Screw
97	62-46	Belt, Counter Drive
98	62-70	Pulley, Counter Drive, Upper
99		Set Screw
100	62-40	Screw, Capstan, Bushing Retainer
101	62-39	Bushing, 7½ ips
102	62-115	Flywheel, Capstan Assembly
103	62-45	Belt, Capstan Drive
104	62-90	Screw
105	62-38	Bushing, Idler Drive
106	62-104	Plate, Motor Mount
107	62-85	Motor, Drive
108	62-102	Mount, Motor, Rubber
109	62-25	Plate, Cam Operating Mount, Upper
110	62-61	Spring, Forward Idler
111	62-68	Shaft and Detent Assembly (Rewind-Fast Forward)
112	62-27	Shaft and Detent Assembly (Record-Play)
113	88-04	Washer, Fiber, Red
114	88-28	Lever, Forward Lock
115	88-29	Spring, Lock Tension
116	88-36	Cam, Record Lever Act.
117	62-89	Set Screw
118	88-31	Lever, Forward Idler
119	88-21	Roller, Cam Follower, Nylon
120	62-46	Clip, Retaining
121	88-32	Plate, Cam Mount, Lower
125	88-36	Cam, Record-Play Linkage
126		Set Screw
127	88-37	Washer, Shoulder
128	62-37	Bushing, Motor Belt Drive, 60 Cycle
128	62-128	Bushing, Motor Belt Drive, 50 Cycle
129	27-706-03	Disc—Upper—Guide
130	62-166-01	Head Shield
131	62-167	Bezel—VU Meter
132	24-512-01	Shell—Rec. Lamp—Amber
133	24-514	Bracket—Meter Lamp
134	25-240	Knob—Amplifier
135	22-778	Bracket—Deck Mount
136	22-779	Panel, Side, Left
137	22-779-01	Panel, Side, Right
138	22-791	Plate, Chassis Back
139	22-793	Bracket—Side Panel Mtg.
140	22-790-01	Plate, Amp Cover
141	22-787	Bracket—Reinforcing
142	22-795	Bracket—Perforated
143	22-789	Bracket—Meter Mount
144	22-574	Spring—Head Azimuth
145	22-595	Plate—Head Bearing
146	22-625	Bracket—Head Mount
147	22-752	Plate—Tape Lifter
148	22-776	Plate—Tape Lifter Adj.

MECHANICAL PARTS LIST (Cont'd.)

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description
149	22-784	Plate—Record Sw.	161	19-648	Rod—Tape Lifter
150	22-785	Bar—Rec. Function	162	19-649	Spring—Tube Hold
151	11-246	Grill—Speaker Cover	163	19-650	Spring—Compression
152	11-247	Grill—Cover Back	164	25-241	Knob, Extension
153	1-1045	Bushing, Tape Lifter			
154	1-1038	Stand-Off, Tape Lifter			
155	1-1043	Pin—Tape Lifter			
156	1-1036	Spacer			
157	3-344	Stud, Tape Lifter			
158	3-346	Bumper Cap			
159	29-7253	Fuse Holder			
160	19-645	Spring, Tape Lifter			

HARDWARE

Ref. No.	Part No.	Description	Ref. No.	No. Part	Description
	2-63	Screw—6/32F x 1/2		16-104	L. Washer, 1/2"
	2-248	Screw—8/32F x 3/8		3-316-01	Bumper, Rubber
	2-224	Screw—8A x 3/4		28-9025	Nut—Tinn—Anchor
	2-233	Screw—8A x 5/8		28-9002	Nut—Hex 3/8
	2-230	Screw—8/32 x 3/8		28-9039	Nut—Speed Tinn 8Z
	3-317	Strain Relief—Heyco		28-9046	Nut—6/32 Keps
	25-237	Ring, Retaining 3/16"		28-9037	Nut—8/32 Keps
	60-120	Washer, Felt 5/8 x 1/4 x 1/16		28-9047	Nut—8/32 Weld
	50-126-09	Washer, .490 x .190 x .035		28-9035	Nut—Tinn 4Z Type U
	16-111	L. Washer, #4 Intern.		28-9036	Nut—Hex 2-56 Brass
	16-126	Washer, Flat #2		62-170	Screw—Switch Mtg.
	16-133	Washer, STL 1/16 x 11/64 x 3/8		2-284	Screw—4B x 1 1/4
	16-110	Washer, CRS .312 x .144 x .030		2-310	Screw—4/40 x 1/4
	16-74	L. Washer, 3/8" Intern.		2-206	Screw—6/32 x 7/16
	16-80	Washer, Concave		2-234	Screw—6/32 x 3/16
	16-94	Washer, Fiber			
	16-130	Washer, 5/8 x .468 x .020			

Replacement parts are available from:

ROBERTS ELECTRONICS
DIVISION OF RHEEM MANUFACTURING CO.
5922 BOWCROFT STREET,
LOS ANGELES, CALIF., 90016

