

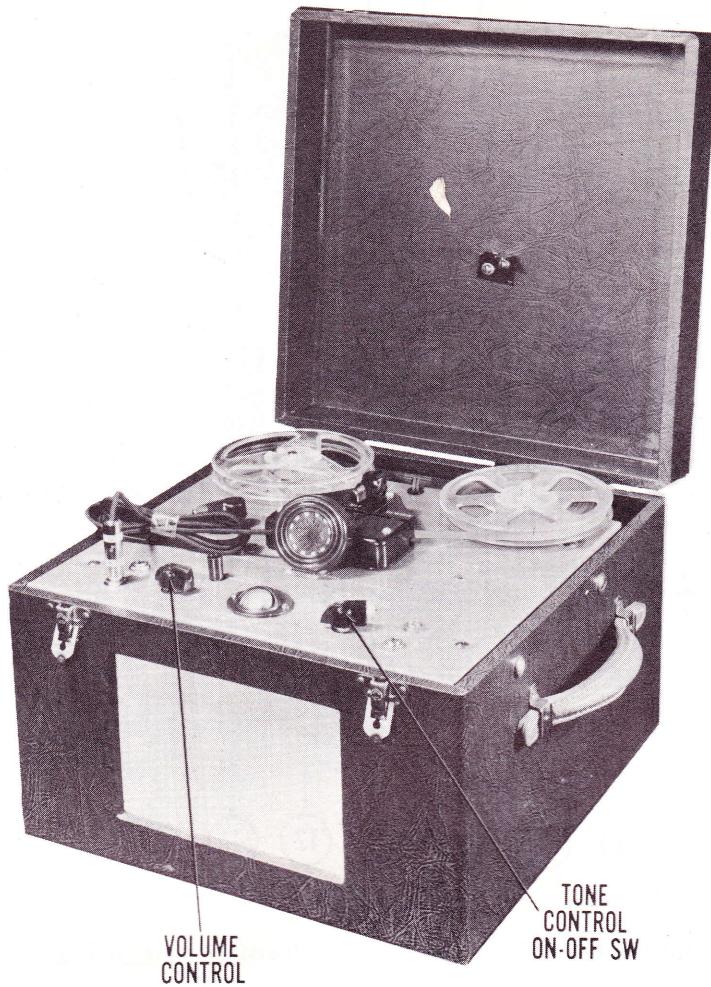
KNIGHT  
MODELS 96-144, 96-499KNIGHT  
MODELS 96-144, 96-499

Figure 1

## GENERAL INFORMATION

The Knight Models 96-144 and 96-499 Tape Recorders are designed to magnetically record on a 5" or 7" reel of 1/4" wide tape, two tracks instead of one which doubles the playing time with no loss in frequency response or quality. These models 96-144 and 96-499 Recorders are identical except for the speed. Model 96-144 is 7-1/2" per second while the Model 96-499 is 3-3/4" per second.

Model 96-144 - 7-1/2" per second - 7" reel - 1/2 hour playing time one track, or 1 hour playing time - two track operation.

Model 96-499 - 3-3/4" per second - 7" reel - 1 hour playing time one track or, 2 hours playing time - two track operation.

These Recorders incorporate two Inputs - Radio and Microphone, two Outputs - Ext. Amplifier and Ext. Speaker, Fast Forward and Fast Rewind. The Knight Recorders may also be used as a P.A. System.

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*This material compiled and published by*

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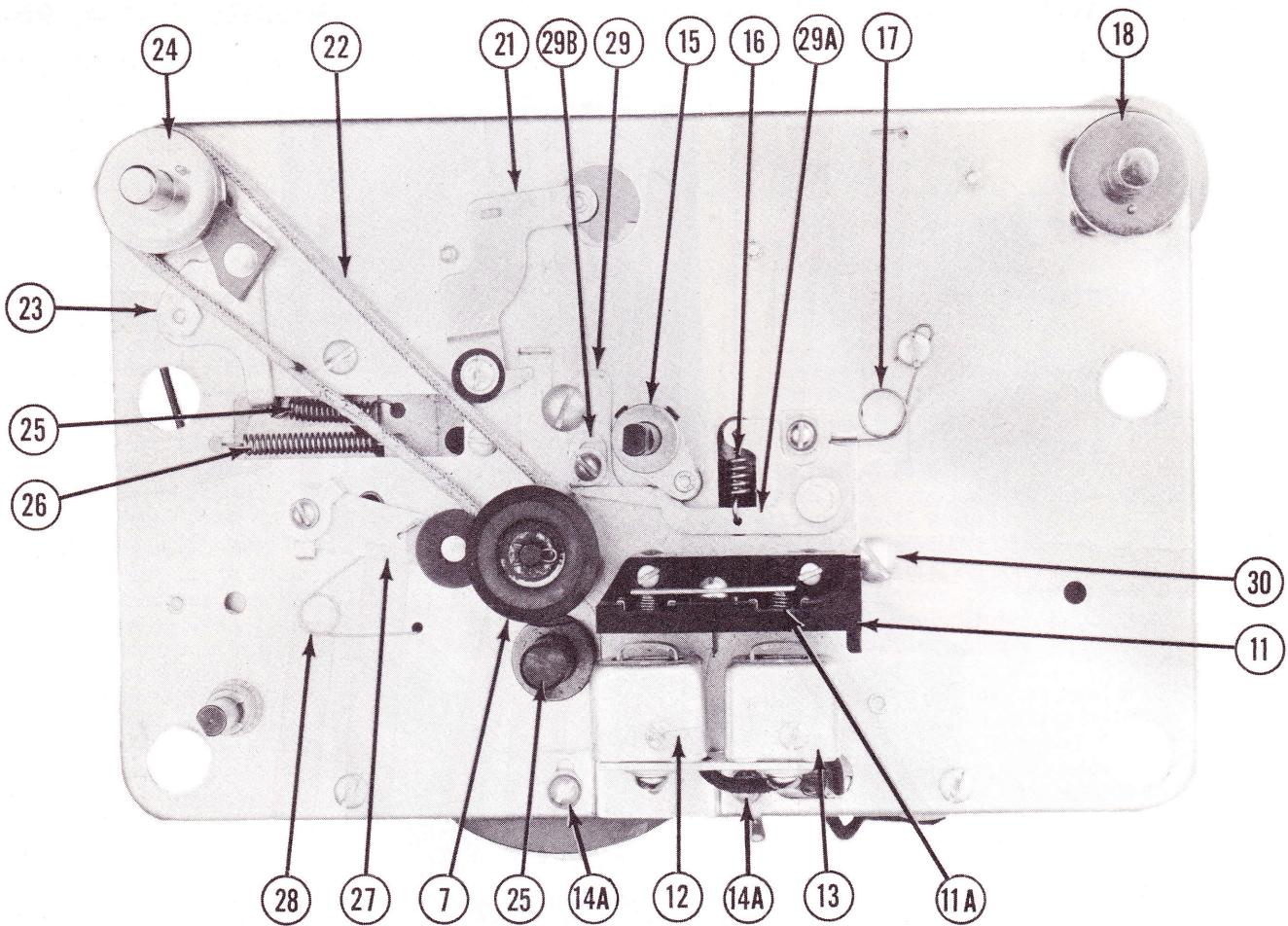


Figure 2

#### OPERATING INSTRUCTIONS

##### Preparing the Knight for Recording -

1. Insert the line cord in a convenient wall receptacle of the proper rating.

2. Place a reel of tape on the right hand spindle in such a manner that when the tape is pulled, the reel will turn clockwise. Make sure the pin on the spindle engages a slot of the reel.

NOTE: This recorder requires tape with Type B winding, i.e. the (dull) magnetic coated side faces out on the reel. In case the (dull) side of the tape faces in on the reel (Type A wound tape) it can be changed to Type B for use on this recorder by winding the tape with a half twist. The two types are identical except the way in which they are wound on the tape.

3. Place an empty reel on the left hand spindle (24).

4. Pull about 2 feet of tape from the supply reel, drop the tape into the slot between the trim covers (4 and 6). Guide the tape into any one of the three openings at the center of the empty reel. Use a pencil to hold the tape in place, then turn the reel several turns clockwise to secure the tape to the reel and to remove all slack in the tape.

5. Turn the Off-On-Tone Control on. This supplies power to the entire recorder.

##### To Make a Recording -

1. After the recorder has been properly prepared for recording, connect the microphone to the "Mike" jack.

2. Press down on the Record button above the volume control.

3. Turn the "Volume" control clockwise until the incoming signal causes the Record Level Indicator Eye to close on high peaks only.

NOTE: Correct recording volume is very important. Too weak a signal, which does not cause the Recording Indicator to close will result in weak playback and high background noise. Too strong a signal, causing the Indicator to overlap will result in distortion during playback.

4. Turn the tape mechanism control knob (1) to Play-Record position. Any sound now entering the microphone will be recorded on the tape.

NOTE: Make sure "Skip Forward" control is in the "Normal" position, if not the mechanism will not operate.

##### To Record Direct From Radio -

1. If a recording from a radio is desired, it is recommended that a connector cord be connected to the

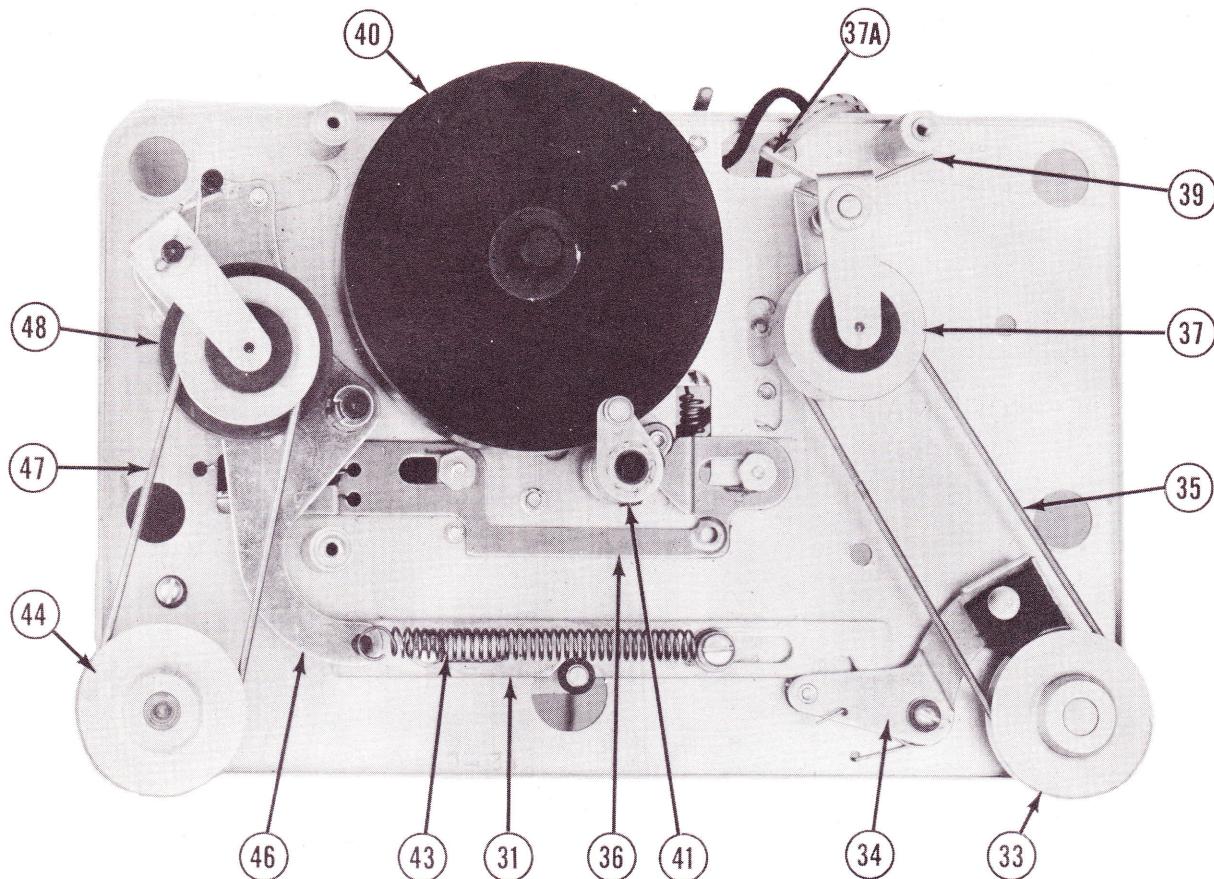


Figure 3

speaker voice coil of the radio, by means of alligator clips, and the other end (using a standard phono plug) of the cord plugged into the "Radio" Input.

2. Better quality recording from a radio set can be obtained by connecting to the output of the second detector (usually right across the volume control of the radio set). This kind of connection may be desirable in some cases, because any circuit deficiencies in the amplifier of the radio will not be included in the recording.

#### To Record From Record Player -

1. Connect the output leads of the crystal pickup to the Radio Input jack through the connecting cable.
2. If the player has a magnetic cartridge connect to the output of the preamplifier.

#### To Stop the Recorder -

The recorder may be stopped at any time by turning the mechanism control (1) to "Off". This stops the movement of the tape and removes the power to the motor.

#### Two Track Recording -

1. The Knight is designed for two channel recordings, therefore, after a reel of tape has been recorded a second track may be recorded on the same reel, which doubles the playing time with no loss of frequency response or quality.

NOTE: Recordings are made on 1/2 the tape width at a time; thereby, resulting in two channel recording.

2. This two channel operation is accomplished by removing the reels from the recorder, turning them over, then placing the full reel of tape on the Feed Reel spindle (18) and the empty reel on the Take Up spindle (24).

3. Thread the tape and proceed with the recording in the same manner as previously described.

4. After this track has been recorded the first track of recording is ready to be played without rewinding.

5. To Play the first track of recording place the full reel on the Feed Reel spindle and the empty reel on the Take Up spindle. Thread the tape making sure the (dull) side of the tape faces the heads, then set the control as described under "To Play a Recording".

#### To Rewind The Tape -

1. To rewind a portion of the tape, or an entire channel of recording for playback, the tape must be rewound to the starting point of the recording.
2. First make sure the recording light just above the Tone control is out. If not, depress the record button above the Volume control.
3. Turn the mechanism control (1) to "Rewind".

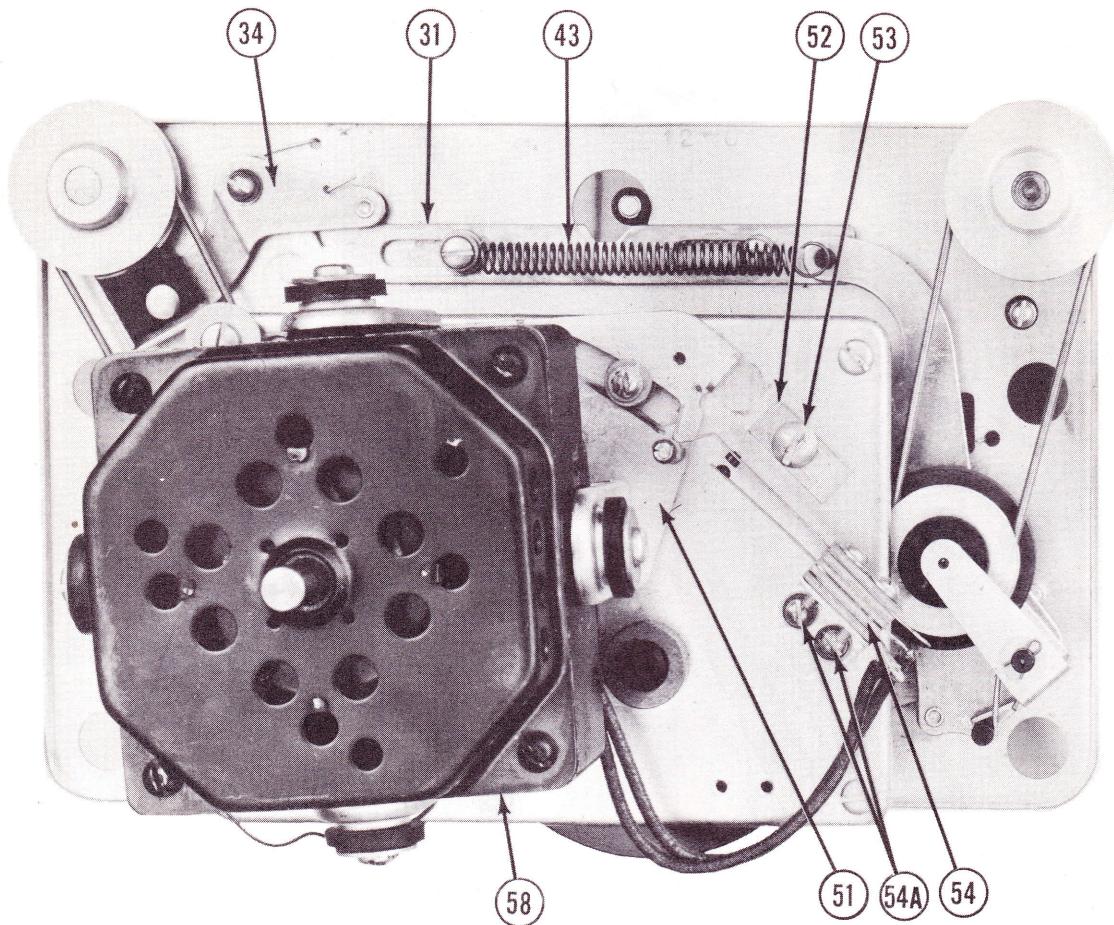


Figure 4

#### To Play a Recording -

1. Make sure the tape is threaded properly.
2. Be sure the record light over the Tone control is out.
3. Turn the mechanism control (1) to Play-Record position.
4. Set the volume and tone controls at desired levels.

#### Fast Forward -

The control marked "Skip Forward-Neutral-Normal" on the left side of the upper control panel enables you to skip forward at high speed to any desired section of the tape. This control is to be used only when the tape is moving forward in the play position. Turn the control to the left through the "Neutral" position and into the "Skip Forward" position holding it there until the desired place on the tape is reached. Then release the control by allowing it to spring back into "Neutral". Then, move the control back into "Normal".

#### To Play a Recording Through an External Amplifier -

1. Prepare a shielded cable with the proper plugs, connecting one end of the cable to the Amplifier Output of the recorder and the other end to the "phono"

input of any good radio set, or high-fidelity record player amplifier.

#### To Play a Recording Through an External Speaker -

1. Any external PM speaker having a 3.2 ohm voice coil may be plugged into the External Speaker jack output. When an external speaker is plugged in, the internal speaker is automatically disconnected.

#### Using the Knight Recorder as a P.A. System -

1. Plug the microphone into the Radio jack.
2. Be sure the recording light above the tone control is out.
3. Keep the microphone as far as possible from the unit to avoid feed back or "howl" and adjust the tone and volume controls to your requirements.

#### ADJUSTMENTS

#### Motor Power Switch - (See Figure 4) -

1. The Off-On-Tone control when turned on supplies power to the entire mechanism, however, the motor will not run until the mechanism control knob (1) is turned to either Record-Play or Rewind Position, causing the switch (51) to make contact. Therefore the switch contacts should be open when the mechanism is in "Stop" position.

To adjust the motor switch, turn the mechanism control to the "Stop" position. Loosen the two screws (54A) and adjust the switch to the center of the bakelite pin on the motor swing plate (51). Continue to move the switch until there is approximately  $1/16''$  gap between the contacts. Tighten the screws (54A).

#### The Forward Stop Lug - (See Figure 4) -

The forward Stop lug (52) should be set so the motor swing plate assembly (51) comes to a rest position against it as soon as the motor pulley (57) makes firm contact with the flywheel (40). Excessive pressure against the flywheel will prevent the motor from starting when the control lever is turned to the "Play-Record" position. Insufficient pressure will result in slippage causing "Wow". The best setting is to adjust the forward Stop lug (52)  $1/16''$  from the edge of the swing plate (51) at the point when the drive roller begins to touch the flywheel.

There is no motor plate stop adjustment in the "Rewind" position; however, the rewind drive pulley (37) is located in a hanger whose position is adjusted by bending the Stop lug (37A), see Figure 3, against the swing plate pushing in a manner that will allow a clearance between the drive roller (57) and the rewind pulley (37) in the "Stop" position. This will also allow the drive roller to engage the drive pulley in the "Rewind" position. In this position, the rewind drive pulley hanger lug (37A) is moved away from the stop. The rewind drive pulley (37) is firmly held against the motor drive pulley (57) by the torsion spring (39) that needs no adjustment.

#### Pressure Lever and Arm Adjusting Plate -

Set the pressure lever (15), see Figure 2, so that it is perpendicular to the pressure arm (29A) when the control knob is in the Record-Playback position. Also adjust the arm adjusting plate (29B) so it will clear the pressure arm (29A) by  $1/64''$  when in this position.

#### Detent Lever (38) - (See Exploded View) -

The roller of the detent lever (38) should be adjusted so that it will engage the detent lever (36) at point X, as shown in the exploded view, when the control is in the "Off" position.

#### Motor Transfer Lever (41) -

The motor transfer lever (41) should be adjusted when the control is in the "Off" position. To adjust the transfer lever (41) loosen its set screws and move the motor plate (51) until the motor drive pulley (57) is midway between the rewind drive pulley (37) and the flywheel (40), then tighten the screws.

#### Head Pressure -

The head pressure is adjusted by means of the two screws (14A) in the slotted holes in the head bracket (14). See Figure 2. To make the adjustment, turn the control knob (1) to "Record-Play" position. Loosen the screws (14A) then adjust the head into the tape guide block (11) until the pressure pads (11A) show a movement of slightly less than  $1/32''$  on the reverse side of the tape guide (11).

#### Head Alignment -

The lateral movement of each head is done by moving the heads in the required direction by means of the screws in the slotted holes that hold the heads to the head bracket (14). The position should be such that there is no hanging up of the tape pressure guide when the control lever is turned to the "Off" position.

Make sure after the heads are adjusted that they are parallel with the tape as it is pulled past the heads.

#### **TROUBLES**

##### Irregular Speed "Wow" -

1. Felt pressure pads (11A) in tape guide assembly (11) worn.  
(a) Replace with new pads.
2. Oil or grease on drive roller (57), flywheel assembly (40), or pressure roller (7).  
(a) Clean with alcohol.
3. Head pressure too great (see adjustment on "Head Pressure"). Be careful not to disturb the head alignment.
4. Check pressure roller lever (15) to see if it is perpendicular to the pressure arm (29A). When in the "Record-Play" position. See Adjustments on "Pressure Lever and Arm Adjusting Plate".
5. Drive roller (57) or pressure roller (7) eccentric. Allow mechanism to run for 20 minutes. If after this time the rollers are still eccentric, replace with new rollers.
6. Motor shaft binding. Motor shaft should turn freely when the control knob is in the "Off" position. If necessary, realign bearings by tapping motor lightly with a wooden mallet.
7. Detent spring (26) not properly connected. See Figure 2. If spring (26) is not connected, the detent slide (36) will not be held against the detent lever (38) resulting in the motor drive pulley (57) not being held in firm contact with the capstan.

##### Motor Runs but Mechanism Will Not Operate -

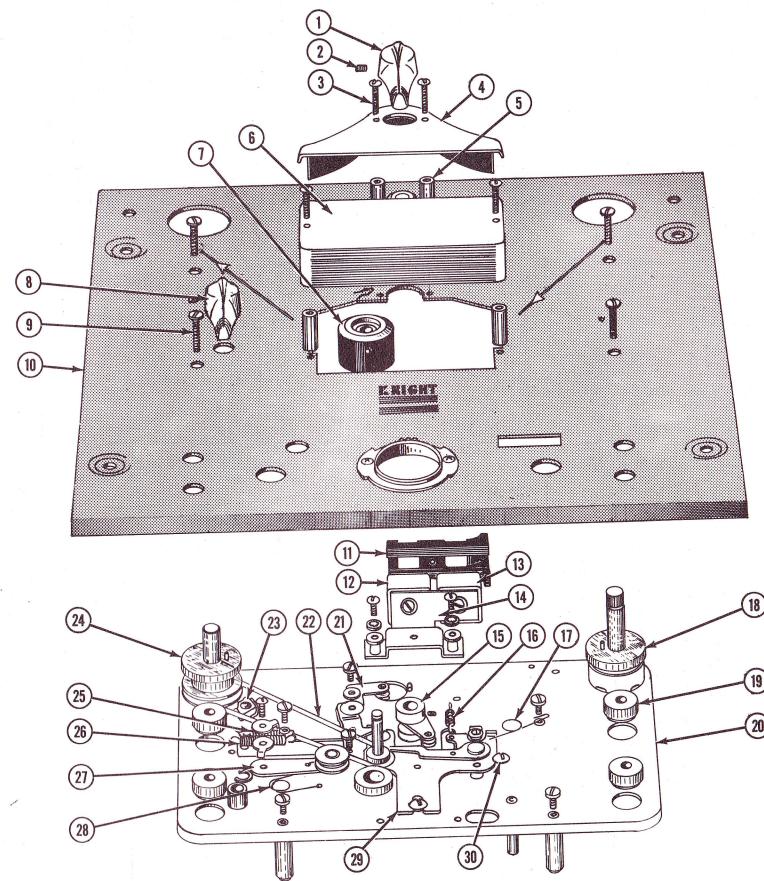
1. Motor transfer lever (41) not adjusted properly. See Adjustments on "Motor Transfer Lever", and "The Forward Stop Lug".
2. Drive roller (57) defective.
3. Fast Forward control in "Neutral" position.  
(a) Turn control to "Normal".

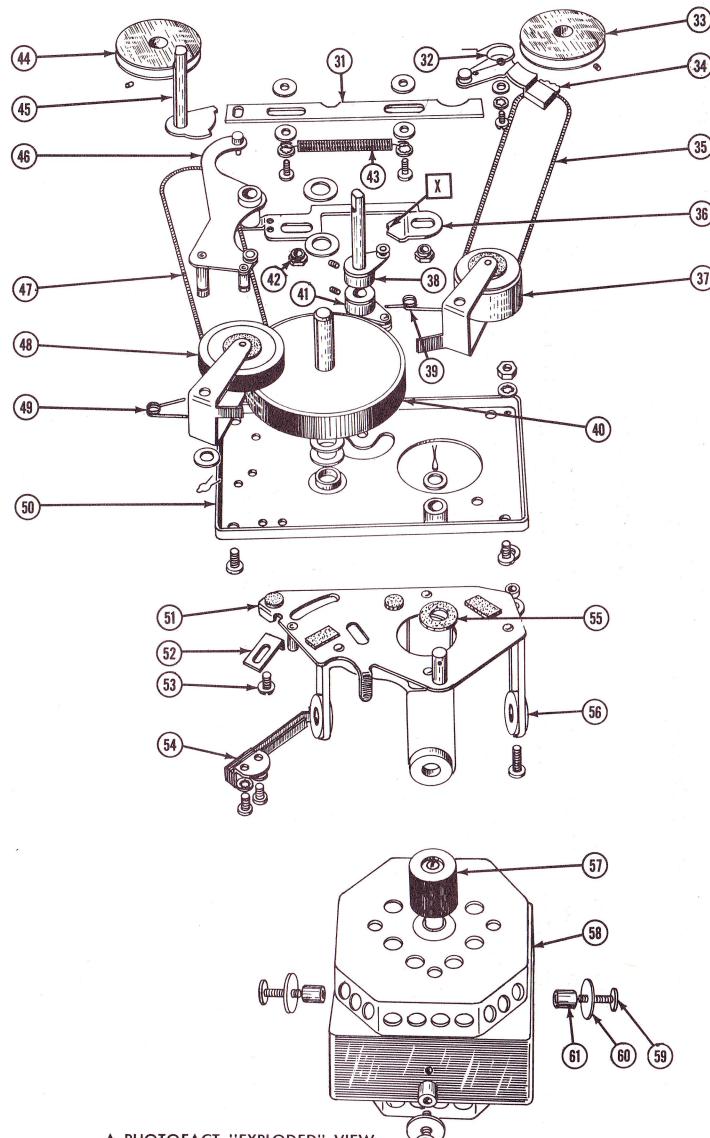
##### Mechanism Runs Forward But Will Not Rewind -

1. Check drive belt (35) for being broken or loose. Replace.
2. Motor transfer lever (41) not adjusted properly. See adjustment on "Motor Transfer Lever (41)".

##### Mechanism Rewinds But Will Not Run Forward -

1. Forward stop lug (52) out of adjustment. See Adjustment on "Forward Stop Lug".





A PHOTOFAC "EXPLODED" VIEW  
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Control Knob and Shaft Turns But Mechanism Fails To Run in Either Direction -

1. Motor transfer lever-(41) loose on shaft. Readjust as described under "Motor Transfer Lever".

Mechanism Fails to Run in Fast Forward -

1. Check drive belt (47) to see if it is properly connected.
2. Mechanism control (1) not in the Play-Record position. The mechanism must be in the Play-Record position before power is supplied to the motor and also for the drive pulley (57) to engage the capstan which in turn drives the fast forward pulley (48).

Slow Speed -

1. Low operating temperature.
2. Head pressure too great. See "Head Pressure" adjustment.
3. Flywheel (40) shaft binding. Check to see that the screws holding the mounting plates (20) and (50) together are tight and that the plates are not warped.
4. Motor shaft binding. Realign bearings by tapping lightly on the motor.

Machine Will Play Back but Does Not Record -

1. Defective microphone.
2. Defective Record-Playback head (12).
3. Defective Amplifier.

High Background Noise (Hiss) -

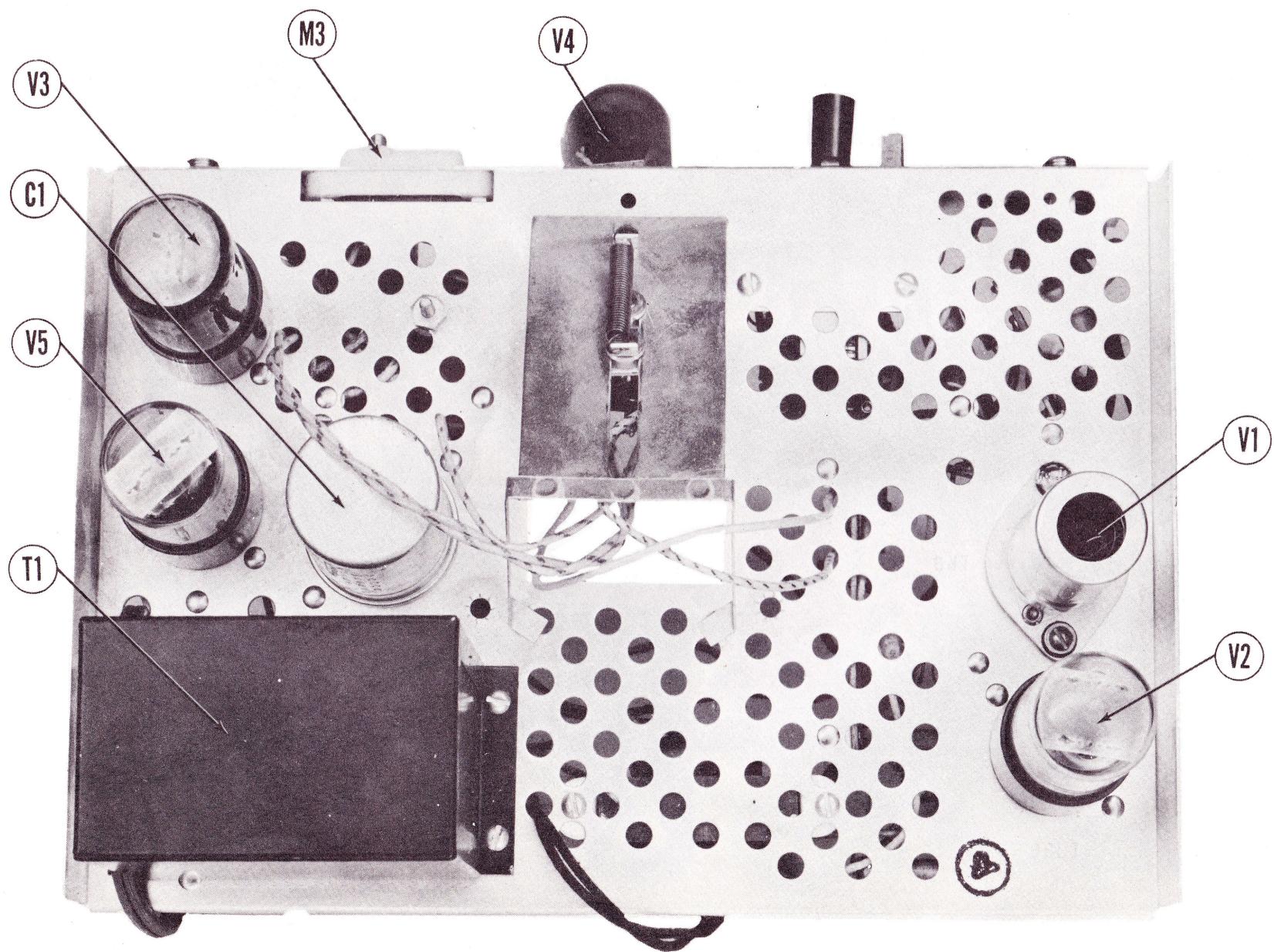
1. Defective bias oscillator tube or circuit.
2. Defective tape.
3. Defective Record-Playback Head.
4. Record head magnetized. Demagnetize with 60 cycle AC air core coil.

Incomplete Erase -

1. Erase voltage power too low.
2. Erase head (13) open. Replace.
3. Record head lamination dirty. Clean with carbon tetrachloride.
4. Record head (13) not making proper contact with felt pressure pad (11A). See "Head Pressure" adjustment.

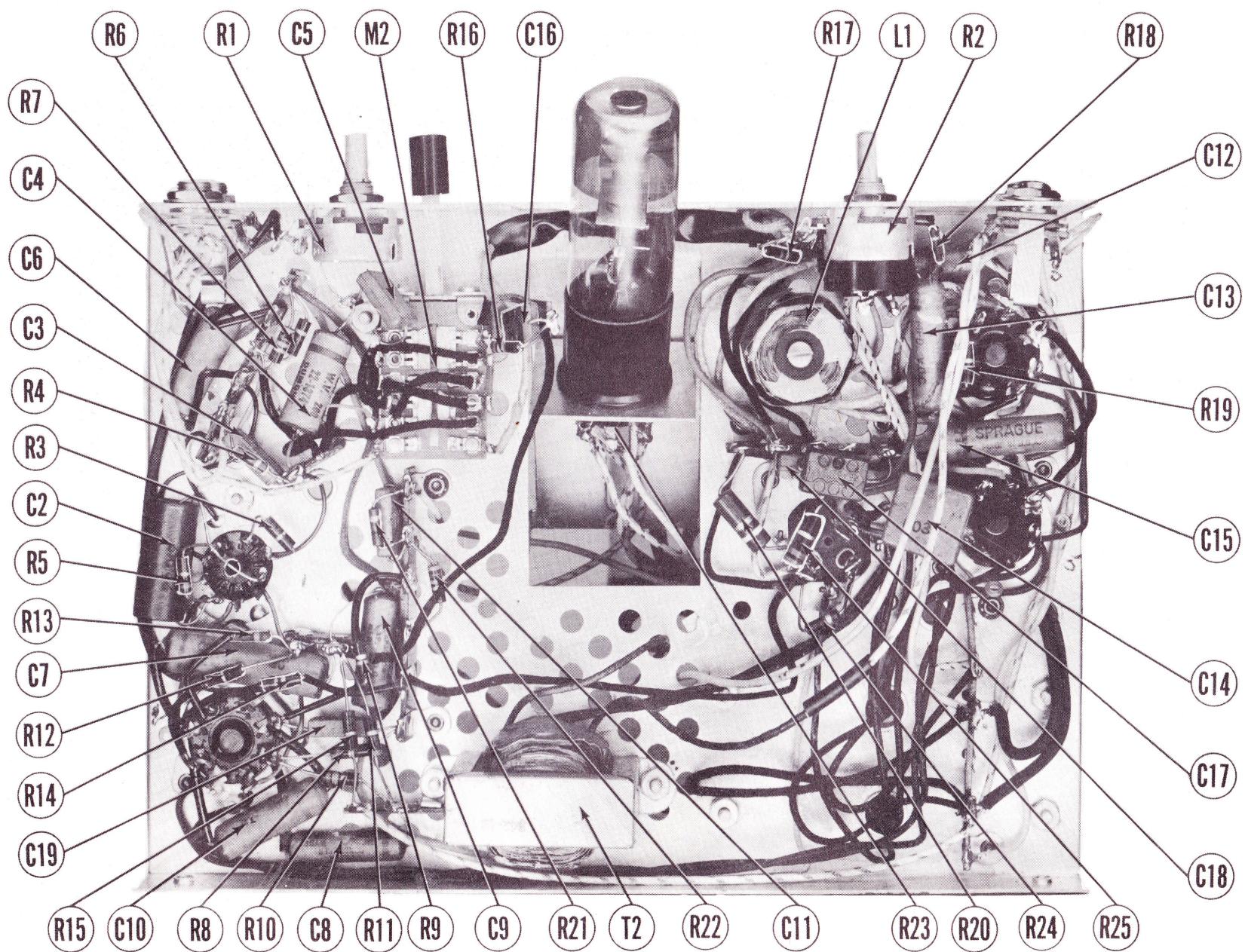
Poor Recording -

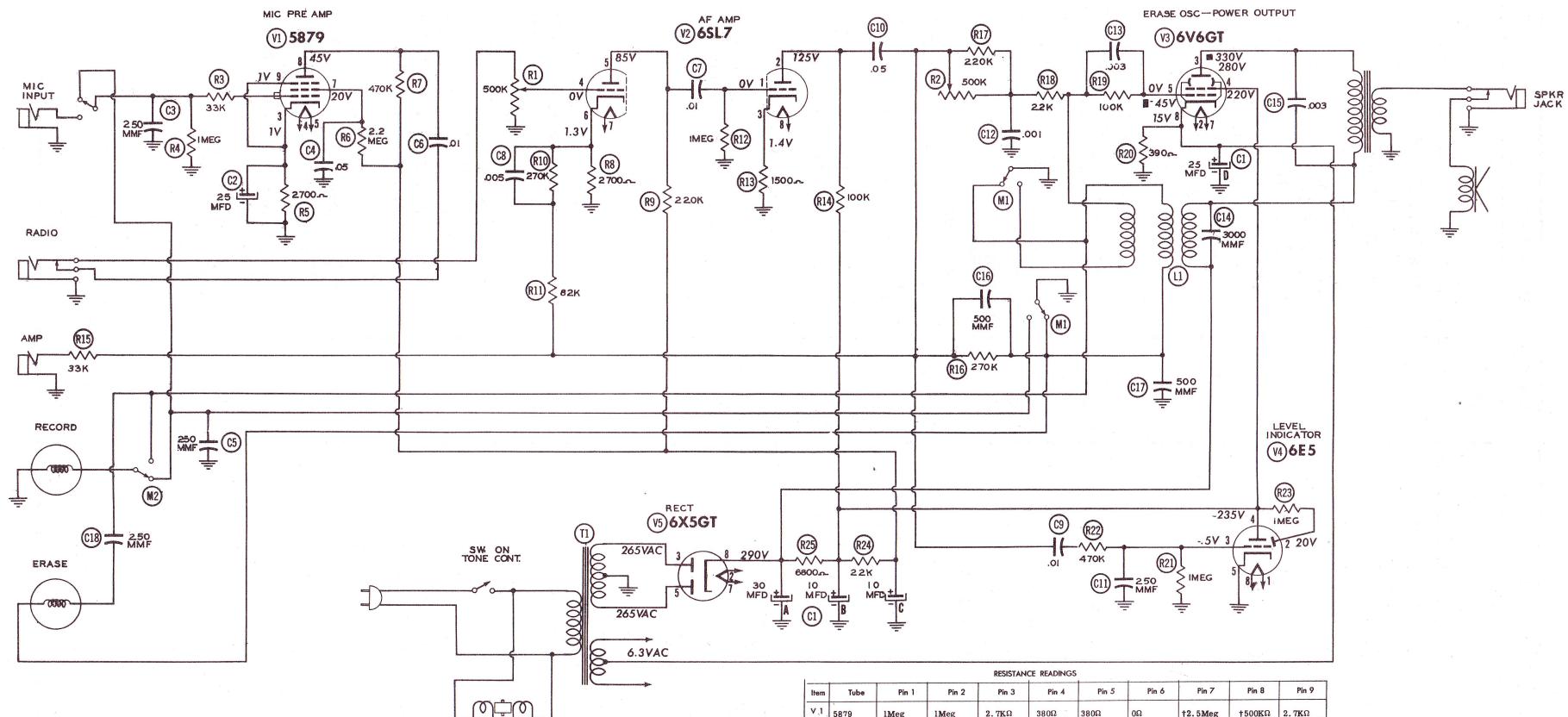
1. Record-Playback head (12) not at right angle to the tape. See "Head Alignment" adjustment.
2. Overloading during recording.
3. Defective or damaged head.
4. Head lamination damaged or worn.
5. Felt pressure pads (11A) worn or missing. Replace.
6. Head pressure too light. See "Head Pressure" adjustment.



MODELS 96-144, 96-499

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A PHOTOFAC STANDARD NOTATION SCHEMATIC  
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Item	Tube	Pin 1	Pin 2	Pin 3	Pin 4	Pin 5	Pin 6	Pin 7	Pin 8	Pin 9
V 1	5879	1Meg	1Meg	2.7KΩ	380Ω	0Ω	†2.5Meg	†500KΩ	2.7KΩ	
V 2	6SL7GT	1Meg	†120KΩ	1.5KΩ	0Ω	†250KΩ	2.7KΩ	380Ω		
V 3	6V6GT	0Ω	380Ω	†540Ω	†8KΩ	†10KΩ	†7Ω	200KΩ	380Ω	
V 4	6E5	380Ω	†8KΩ	1Meg	†1Meg	0Ω	380Ω			
V 5	6X5	60KΩ	380Ω	540Ω	Inf.	550Ω	380Ω	60KΩ		

■ TAKEN IN RECORD POSITION.  
† MEASURED FROM PIN 8 OF V5.

Mechanical Parts List		Electrical Parts List	
Ref. No.	Description	Ref. No.	Description
1	Control Knob	V1A	5879, Mic. Pre-Amplifier
2	Set Screw for item 1	V1B	6J7, Mic. Pre-Amplifier
3	Plate Mounting Screws	V2	6SL7GT, AF Amplifier
4	Rear Trim Cover	V3	6V6GT, Erase Oscillator-Power Output
5	Trim Cover Spacer	V4	6E5, Level Indicator
6	Front Trim Cover	V5	6X5, Rectifier
7	Pressure Roller	C1A	Filter (Electrolytic), 30 mfd. @ 350 Volts
8	Take up Reel Control Knob	C1B	Filter (Electrolytic), 10 mfd. @ 350 Volts
9	Base Plate Mounting Screw	C1C	Filter (Electrolytic), 10 mfd. @ 350 Volts
10	Base Plate	C1D	Output Cathode (Electrolytic), 25 mfd. @ 25 Volts
11	Tape Guide Assembly	C2	Mic. Pre-Amp. Cathode (Electrolytic), 25 mfd. @ 25 Volts
12	Record Head	C3	Tone Compensation, 250 mmf. @ 500 Volts
13	Erase Head	C4	Mic. Pre-Amp. Screen .05 mfd. @ 400 Volts
14	Head Mounting Bracket	C5	Fixed Trimmer, 250 mmf. @ 500 Volts
15	Head and Pressure Roller Lever	C6	Audio Coupling .01 mfd. @ 400 Volts
16	Pressure Arm Spring	C7	Audio Coupling .01 mfd. @ 400 Volts
17	Roller Plate Return Spring	C8	Tone Compensation, .005 mfd. @ 600 Volts
18	Rewind or Supply Shaft Assembly	C9	Tuning Ind. Coupling, .01 mfd. @ 400 Volts
19	Sub Mounting Plate Spacers	C10	Audio Coupling, .05 mfd. @ 400 Volts
20	Sub Mounting Plate	C11	Tuning Ind. Filter, 250 mmf. @ 500 Volts
21	Pressure Release Lever for Fast Forward	C12	Tone Compensation, .001 mfd. @ 600 Volts
22	Take Up Drive Belt	C13	Tone Compensation, .003 mfd. @ 600 Volts
23	Take Up Brake Assembly	C14	Fixed Trimmer, 3000 mmf. @ 500 Volts
24	Take Up Shaft Assembly	C15	Output Plate, .003 mfd. @ 400 Volts
25	Brake Spring	C16	Oscillator Grid Cap., 500 mmf. @ 500 Volts
26	Detent Spring	C17	Fixed Trimmer, 500 mmf. @ 500 Volts
27	Tension Idler Pulley Assembly	C18	Fixed Trimmer, 250 mmf. @ 500 Volts
28	Tension Spring for item 27	C19	Oscillator Coupling, 250 mmf. @ 500 Volts
29	Roller Plate	R1	Volume Control, 500K ohm, 1/2 Watt
30	Roller Plate Guide Screw and Bushing	R2	Tone Control, 500K ohm, 1/2 Watt
31	Brake and Head Pressure Release Lever	R3	Mic. Pre-Amp. Grid, 33K ohm, 1/2 Watt
32	Tension Spring for Rewind Pulley Brake	R4	Mic. Pre-Amp. Grid, 1 Meg.
33	Rewind Pulley	R5	Mic. Pre-Amp. Cathode, 2700 ohm
34	Supply Reel Brake Assembly	R6	Mic. Pre-Amp. Screen, 2.2 Meg.
35	Rewind Drive Belt	R7	Mic. Pre-Amp. Plate, 470K ohm
36	Detent Slide	R8	AF Amp. Cathode, 2700 ohm
37	Rewind Drive Pulley Assembly	R9	AF Amp. Plate, 220K ohm
38	Detent Lever Assembly	R10	Tone Compensation, 270K ohm
39	Tension Spring for item 37	R11	Tone Compensation, 82K ohm
40	Flywheel Assembly	R12	AF Amp. Grid, 1 Meg.
41	Motor Transfer Lever Assembly	R13	AF Amp. Cathode, 1500 ohm
42	Shouldered Nut	R14	AF Amp. Plate, 100K ohm
43	Tension Spring	R15	Tone Compensation, 33K ohm
44	Fast Forward Drive Pulley	R16	Tone Compensation, 270K ohm
45	Fast Forward Control Cam and Shaft	R17	Tone Compensation, 220K ohm
46	Fast Forward Pivot Lever Assembly	R18	Output Grid, 22K ohm
47	Fast Forward Drive Belt	R19	Output Grid, 100K ohm
48	Fast Forward Drive Pulley Assembly	R20	Output Cathode, 390 ohm, 1 Watt
49	Tension Spring For item 48	R21	Level Indicator Grid, 1 Meg. 1/2 Watt
50	Mounting Plate	R22	Level Indicator Network, 470K ohm
51	Motor Swing Plate Assembly	R23	Level Indicator Plate, 1 Meg.
52	Motor Stop Lug	R24	Decoupling, 22K ohm
53	Stop Lug Adjustment Screw	R25	Filter, 6800 ohm
54	Motor Switch	T1	Power Transformer
55	Felt Washer	T2	Output Transformer
56	Rubber Grommet	SP1	Speaker
57	Motor Pulley	SP2	Cone (3 ohm voice coil)
58	Motor	L1	Erase Oscillator Coil
59	Motor Mounting Screw	M1	Interlock Switch
60	Motor Mounting Washer	M2	Function Switch
61	Motor Mounting Spacer		