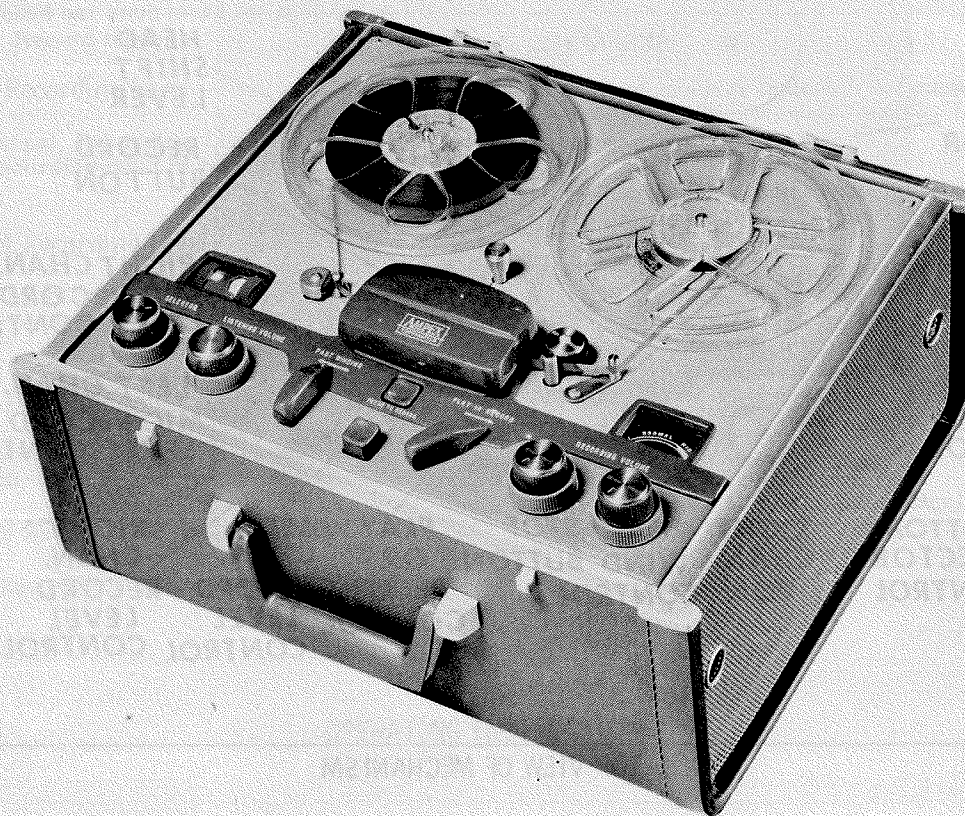




AMPEX MODELS
952, 954, 960



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GENERAL INFORMATION

Ampex Models 952, 954, and 960 tape recorders are universal stereophonic recorders and reproducers. The major differences among the models are in the color and in the mounting. Models 952 and 954 have no portable case; Model 960 has a portable case. Models 952 and 960 are grey; Model 954 is beige.

Ampex tape recorders have a feature for changing the heads for two-track and four-track tapes, and an automatic stop that stops the tape at the end of a reel. These recorders can be played at two tape speeds, 7 1/2 ips or 3 3/4 ips.

Two microphone jacks for recording stereo tapes are provided at the right side of the recorder.

Manufactured by:
Ampex Audio Inc.
1020 Kifer Road
Sunnyvale, Calif.

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C393

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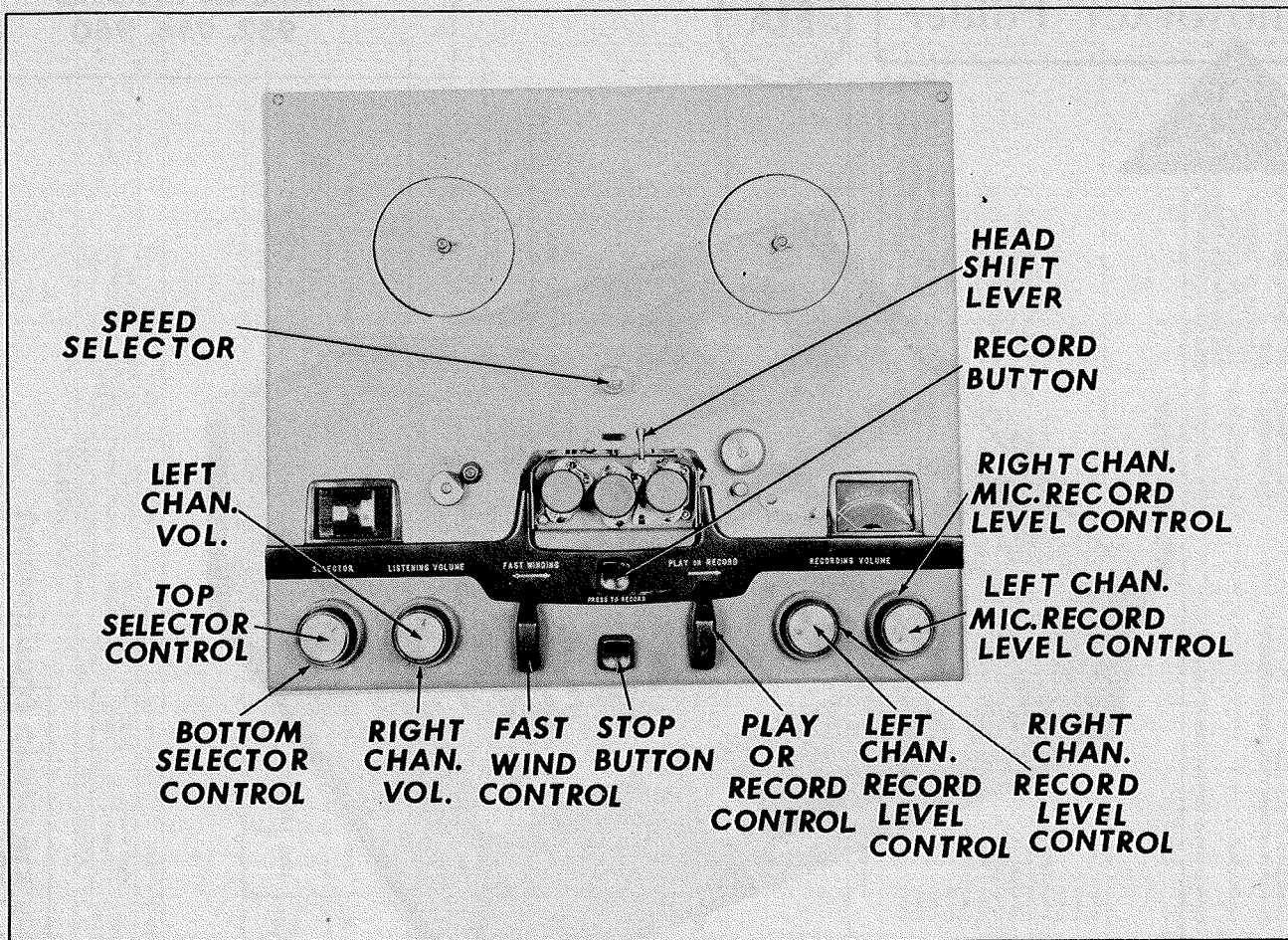


FIG. 1 TOP VIEW OF MECHANISM

SPECIFICATIONS

Heads:

Separate stacked heads for record, playback, and erase. Special two-channel playback head has built-in shift control for accommodating either four-track or two-track tapes.

Rewind Time:

Less than 90 seconds for 1, 200-foot reel.

Record Inputs:

High-impedance line input (radio-TV-phonograph auxiliary), 0.3 volt rms for program level; high-impedance microphone inputs.

Playback Output:

Approximately 1/2 volt rms from cathode follower when program level tapes are being played.

CONTROLS, BUTTONS, AND INDICATORS

Top Selector

Top Selector control turns on the power and selects desired monitor or playback functions.

Bottom Selector

Bottom Selector control selects single or stereo record and the recording level meter for the left or right channel.

Left Channel Volume

Left Channel Volume control adjusts volume of left channel when recorded tapes are being played back.

Right Channel Volume

Right Channel Volume control adjusts volume of right channel when recorded tapes are being played back.

Fast Winding

Fast Winding bar knob quickly moves tape forward or backward.

Stop

Stop button stops tape in any mode and releases Record button when it is locked in the Record position.

Record

Record button places tape recorder in the Record position.

Play-Record

Play-Record bar knob locks the unit in the Play (reproduce) or Record mode.

Left Channel Recording Level

Left Channel Recording Level control adjusts left-channel recording level of radio, phonograph, or tuner.

Right Channel Recording Level

Right Channel Recording Level control adjusts right-channel recording level of radio, phonograph, or tuner.

Left Channel Microphone Recording Level

Left Channel Microphone Recording Level control adjusts left-channel microphone recording level.

Right Channel Microphone Recording Level

Right Channel Microphone Recording Level con-

trol adjusts right-channel microphone recording level.

Recording Level Meter

Recording level meter indicates the recording level of the left or right channel as selected by the Bottom Selector control.

Tape Counter

Tape counter indicates the position of the tape.

Speed Control

Speed control button selects tape speeds: up for 7 1/2 ips, down for 3 3/4 ips.

NOTE: Recorder must be on when speeds are changed.

Head Shift

HeadShift control selects tape tracks: down for two-track tape, up for four-track tape.

Automatic Stop

Automatic stop arm automatically stops the tape at the end of a reel.

OPERATING INSTRUCTIONS

Tape Threading

1. Place a reel of tape on the left-hand turntable; Place an empty reel on the right-hand turntable. Be sure the protrusion around the base of each turntable engages the corresponding slots on the reel hub.
2. Thread the tape between tape holdback (9) and tape guide (8), across the tape heads, between capstan idler (4) and capstan (38), and across automatic stop arm (12A). See photograph of unit on the first page for an example of proper tape threading.

NOTE: When the tape is threaded on the unit according to the path described in the foregoing, the top half of the tape is the left channel and the bottom half is the right channel. This statement applies to two-channel stereo tape only. Monaurally, the same tape always records or plays on the top half in a left to right direction. Remembering that the top of the tape is to the left will help the operator remember the position of the controls.

To Record Monaurally with a Microphone

1. Place the Top Selector control and the Bottom Selector control in the single position. If the Bottom Selector control is not put in the single position, the full width of the tape and any program on the reverse half of the tape will be erased.

2. Connect a high-impedance microphone to the left input jack (front jack on the side of the unit).
3. Adjust microphone recording level on recording level meter by using the Left Channel Microphone Level control (Top control).
4. Set tape position indicator (61) at 0-0 with fingertip (move in either direction).
5. Simultaneously, depress Record button and turn Play or Record knob until it clicks into position and holds. Changes in level may be made at any time during a recording by using the Left Channel Microphone Level control (Top control).

NOTE: When stopping the tape, always use the Stop button; never attempt to stop the recorder by using the bar knobs (6).

To Play Back Monaural Tapes

1. Place Top Selector control in single position.
2. Thread tape as described under "Threading Tape."
3. Move Play-Record bar knob clockwise until it clicks into position. Do not depress Record button; depressing it will start tape erasure.
4. Turn Left Channel Volume control to desired sound level.

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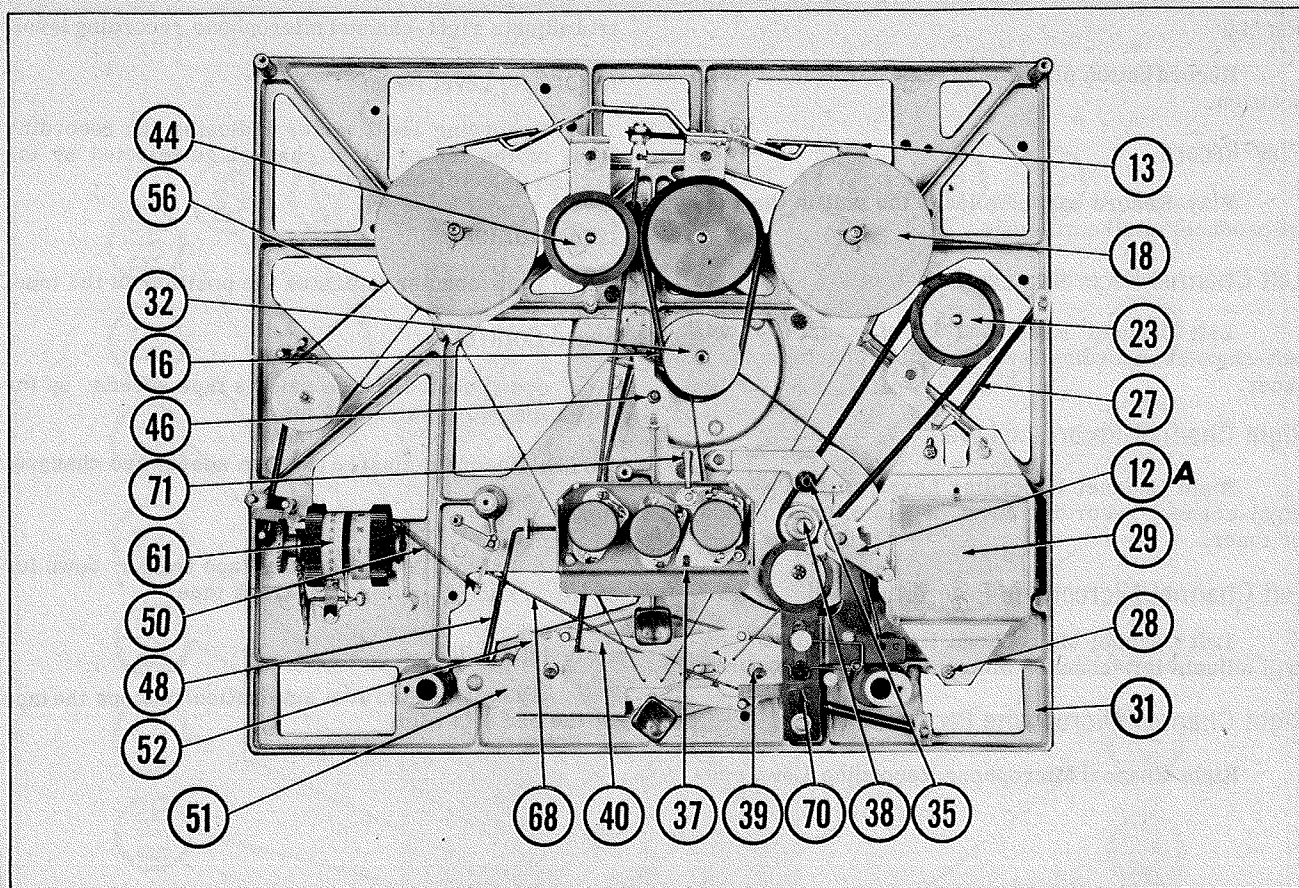


FIG. 2 TOP VIEW OF BASEPLATE WITH COVER ASSEMBLY REMOVED

NOTE: Head shift rod (71) should be down when half-track or two-track stereo tapes are being played back. When four-track stereo tapes are being played back, head shift rod (71) must be up.

To Record Monaurally from Radio, TV, or Phonograph

1. Place Top Selector control and Bottom Selector control in the single position. If the Bottom Selector control is not placed in the single position, the full width of tape or any program on the reverse half of the tape will be erased.
2. Connect cable from source (radio, TV, or phono) to left input at the rear of the recorder.
3. Adjust recording level on the recording level meter by using the Left Channel Recording Level control (Top Control).

NOTE: Left Channel Level control and Left Channel Microphone Recording Level control can be used simultaneously as a mixer control. Thus, live talent can be added with the microphone while a recording is being made from radio, TV, or phonograph.

To Record Two-Channel Stereo with a Microphone

1. Turn Top Selector control to Stereo position.
2. Turn the Bottom Selector control to the Stereo position.

NOTE: The Stereo position on the Bottom Selector control can be either to the right or to the left. In these positions, the recording levels of the two channels are balanced. When the Bottom Selector is in the left position, the recording level meter will indicate the signal strength on the left channel. When the Bottom Selector is in the right position, the recording level meter will indicate the signal strength on the right channel. The Bottom Selector control can be moved between the left and the right positions at any time during a recording without affecting the recording if visual balance checks are desired.

3. Connect one high-impedance microphone to the input jack at the front. This is the left channel.
4. Connect another high-impedance microphone to the input jack at the rear. This is the right channel.
5. Set the tape position indicator to 0-0.
6. Adjust microphone levels as described in the foregoing Note; use the Left Channel Microphone Recording Level control for the left channel, the Right Channel Microphone Recording Level control for the right channel.
7. Simultaneously, depress the Record button and turn the Play-Record bar knob until it clicks into position and holds.

To Record Two-Channel Stereo from Radio, Phonograph, or Another Tape

1. Follow Steps 1 and 2 in "To Record Two-Channel Stereo with a Microphone."
2. Connect cables from source to left and right input jacks at rear of recorder.
3. Adjust recording levels by using recording level meter (29) as a reference and by using procedure outlined in the Note under "To Record Two-Channel Stereo with a Microphone."
4. Simultaneously, depress the Record button and turn the Play-Record control until it clicks into position and holds.

NOTE: The Left Channel Recording Level and Right Channel Recording Level controls, and the Left Channel Microphone Recording Level and the Right Channel Microphone Recording Level controls may be used as mixer controls; thus, live talent may be added with the two microphones to a stereo recording being made from a radio, phonograph, or other tape.

To Record Sound on Sound

First sound-track recording —right channel.

1. Place Top Selector control in Stereo Right (R) position.
2. Connect microphone to right microphone jack (rear jack).
3. Adjust recording level by using the Right Channel Microphone Recording Level control and recording level meter (29) as a reference.
4. Place the unit in the Record mode, and record the first sound track.
5. After the recording is finished, rewind the tape to the start of the first sound track.

Second composite sound track—sound on sound.

1. Set up the Ampex 2012 amplifier/ speaker or its equivalent.

2. Connect the right-channel output of the unit to any input jack of the amplifier/ speaker except to the tape input. (The tape input is the only input not connected to the output jack below labeled "To Tape Recorder Input."

3. Turn the selector knob on the amplifier/ speaker to compare with the chosen input jack.

4. Connect the phono jack labeled "To Tape Recorder Input" on the amplifier/ speaker to the left-channel input on the unit.

CAUTION: With this monitor method, use only enough volume on the amplifier/ speaker that the volume can be heard, but not enough that the line recording is muddled with the microphone pickup of sound through the air.

5. Connect microphone to left-channel jack at the front of the unit.
6. Place Top Selector control in the Stereo position.
7. Place Bottom Selector control in Single position.
8. Place unit in Play mode. Adjust volume with the Right Channel Volume control; adjust the recording level with the Left Channel Recording Level control until normal recording level is indicated on recording level meter (29).
9. Rewind to the start of the first recording.
10. Adjust microphone, which is plugged into left-channel jack (at front), to normal recording level by using Left Channel Microphone Recording Level control.
11. Place unit in Record mode.

The right channel and the recording on the left channel can be heard at the same time. Sound produced through the microphone will be recorded simultaneously with the sound heard on the amplifier/ speaker.

This system retains the original sound on the right channel. If an error is made or if the operator wishes to rerecord, the tape is rewound, the unit is placed in the Record mode, and the new sound is recorded.

DISASSEMBLY INSTRUCTIONS

All servicing except cleaning of the heads, the tape holdback pad, and the capstan idler, and adjustment of the heads requires removal of the unit from the carrying case.

To Remove Tape Transport from Cabinet

1. Remove four screws from bottom of carrying case.
2. Place tape recorder on its side; grip tape transport with your fingers and slide it out.

To Remove Top Cover

1. Remove eight round knobs and two bar knobs.

2. Remove head cover (2) by squeezing the sides and tilting up and back.
3. Remove tape holdback cover (9), tape guide (8), and capstan idler (4).
4. Remove the speed change knob. Remove the set screw with an Allen wrench.
5. Remove two rear cover plate screws (11B) at rear of top cover; remove the screw under the head cover and the two screws (11A) under the knob.
6. Lift the top cover.
7. To reassemble, reverse the foregoing procedure.

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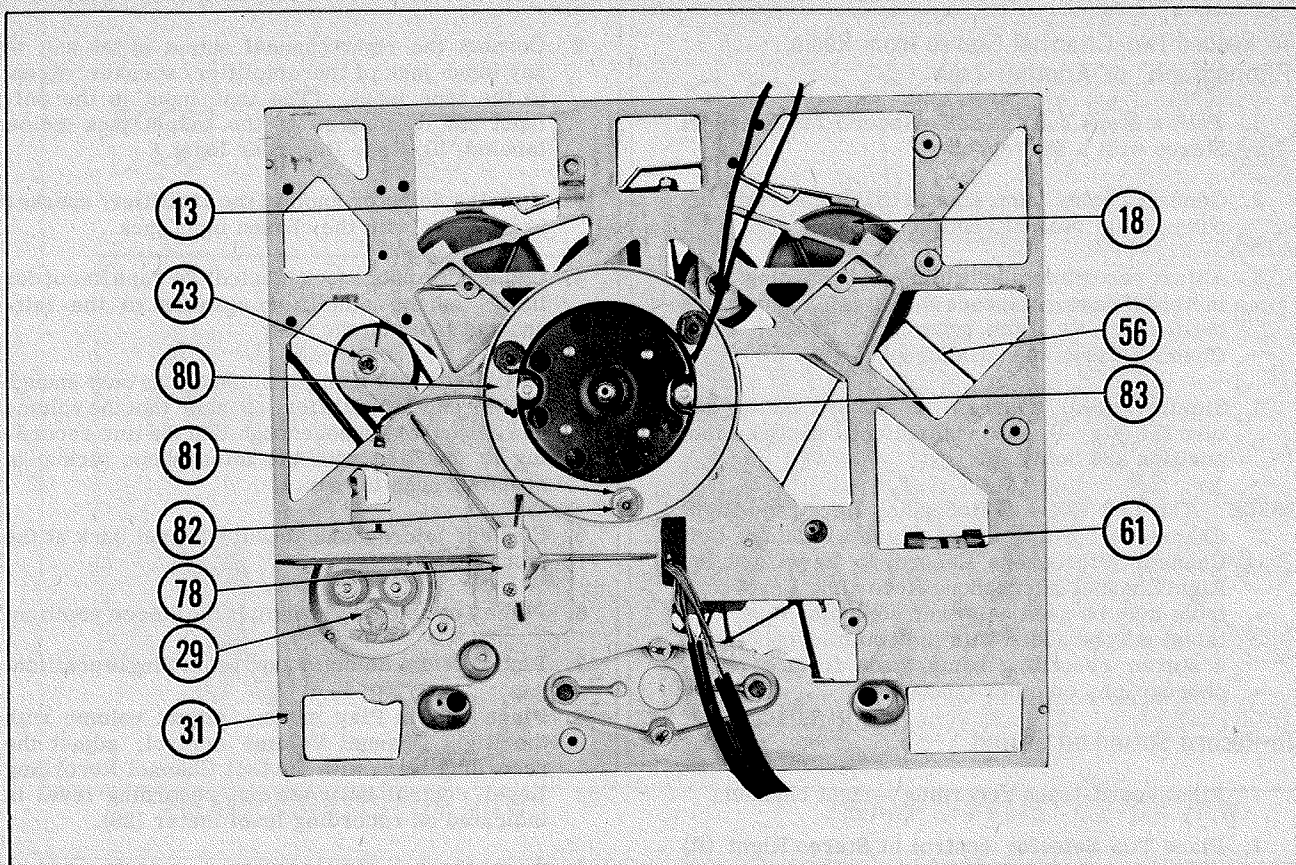


FIG. 3 BOTTOM VIEW OF BASEPLATE

TAPE TRANSPORT PERFORMANCE CHECKS

The mechanical operation of the components of the tape transport is fixed within strict design specifications, and there are no adjustments (except the head assembly, which is aligned during the electronic alignment procedure). However, a few simple checks should quickly determine whether the transport is operating properly or whether corrective maintenance will be required.

Some of the performance checks outlined may be made using alternate methods, depending upon the test equipment required (as detailed at the start of each discussion).

Tape Speed

Test equipment—electronic frequency counter.

1. The most accurate method of measuring tape speed is to reproduce a tape recorded at a frequency between 3,000 and 4,000 cps and to use an electronic frequency counter to determine the reproduced frequency. (A standard flutter tape recorded at 3,000 cps is an example of this type of tape).

NOTE: Tapes recorded on the recorder/reproducer itself and then reproduced will not determine whether the tape is moving at the correct speed.

2. An alternate method of measuring tape speed may be used if an electronic frequency counter

is not available. An approximate tape speed indication may be obtained by timing (with a stop watch) the number of seconds a measured length of tape takes to pass a given point on the transport. Measure the tape in multiples of 7 1/2 ips, and play the tape for at least one minute.

NOTE: Human error, plus the tendency of stop watches to jump or lag when they are started, make this method rather inaccurate.

Tape Tension

Test equipment—an accurate 0-to 8-ounce spring scale and a reel of blank tape.

1. Place the reel of blank tape on the supply turntable. Thread the tape between the tape holdback and the tape guide and over the head assembly, but not between the capstan and capstan idler.
2. Loop the end of the tape by rolling it back over itself several times. Secure the loop with a piece of masking tape or other similar adhesive.
3. Place the hook on the spring scale through the loop; place the Top Selector control in its Monitor position.
4. Turn the Play-Record control until it locks in its clockwise position.

5. Using the spring scale, pull the tape from the supply reel and note the reading on the scale. The reading should be between 2 and 3 ounces while the tape is moving steadily.

Take-up Tension

Test equipment—an accurate 0 to 8 ounce spring an empty tape reel with a 2-inch hub diameter; a length of string (3 to 4 feet).

1. Place the empty reel on the take-up turntable.
2. Anchor the string on the reel, and wrap the string around the reel hub once or twice in a clockwise direction.
3. Tie a loop in the end of the string; place the hook on the spring scale through the loop, and place the Top Selector control in its Monitor position.
4. Turn the Play-Record control clockwise until it locks in position.
5. Let the spring scale follow slowly as the string is being wound on the reel, and take the scale reading. It should read approximately 3 ounce-inches.

NOTE: If the hub is two inches in diameter, the spring scale will indicate directly in ounce-inches. If the hub is smaller, wrap it with tape to the 2-inch diameter level. If the hub is larger, multiply the spring scale reading by the radius of the hub to determine the correct ounce-inch reading.

Brake Tension

Test equipment—an accurate 0-to 8-ounce spring scale. The following procedure applies to both the supply and to the take-up turntable brakes. The brakes

are applied in the stopping position only; therefore, the controls do not have to be manipulated.

1. Remove top cover (11) from the tape transport (see "Disassembly Instructions"), and remove brake release control rods (34).
2. Place the hook on the spring scale through the hole on the brake assembly, or put a string through the hole as a loop for the scale.
3. Using the spring scale, pull the brake in a direction that will move the brake assembly directly away from the turntable. The scale should read from 5 to 8 ounces as the brake barely clears the turntable.
4. Repeat the foregoing procedure on the other turntable.
5. Replace brake release control rods (34).

Capstan Idler Pressure

Test equipment—accurate spring scale capable of measuring up to 3 pounds.

1. Remove top cover from the tape transport (see "Disassembly Instructions").
2. Turn the Play-Record control clockwise until it locks in position.
3. There are two holes in capstan idler arm (35), but only one hole is used. Place the hook of the spring scale through the empty hole.
4. Using the spring scale, pull the capstan idler in a direction that will move the idler away from the capstan. Scale reading should be from 2 pounds to 2 pounds 13 ounces as the idler barely clears the capstan.

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TEST AND ADJUSTMENT PROCEDURE FOR THE AMPLIFIER

Clean All heads

1. Use Ampex Audio Part #823 head cleaner (or equivalent) and a cotton swab on a stick (Q-Tip or its equivalent).

Demagnetize All Heads

1. Use Ampex Audio Part #820 head demagnetizer (or equivalent). Avoid actually contacting the head surfaces with the demagnetizer tips unless the tips are protected by masking tape, transparent tape, etc.

Apply Power and Connect Test Cables

1. Connect AC power plug.
2. Connect output jack to an AC VTVM that will read an rms voltage of 0.002 or less.

Thread Standard Alignment Tape

1. Use standard alignment tape, #5563 (or equivalent), for 7 1/2 ips; #6000 (or equivalent) for 3 3/4 ips.

Place In Play Mode and Check Tape Tracking

Tape must be centered on all three heads. This centering should occur with between one and two laminations visible on each side of the tape on the erase and record heads. On the universal playback head, the upper edge of the tape should coincide with the joint of the mu-metal and copper lamination when the head is in the upper position; and the heads must be parallel to the capstan.

Check the operation of all tape motion controls, with the exception of the Record Button, to make certain

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that the tape handles smoothly at all times.

Check Playback Response

1. Set AC VTVM to 0 (1 volt rms) scale.
2. Set Selector Switch to Stereo (Universal Playback lever should be in the down position.)
3. On the 250-cycle tone (second tone on standard tape), adjust the Volume control for -2 dbm (.62 volt rms) on an AC VTVM, and check both left and right channel outputs; levels should be within ± 2 db of each other.
4. Rewind tape to 10,000-cycle tone, align the playback head azimuth by adjusting the right rear screw of the three head mounting screws. If this adjustment is off, the Volume control should be reset.

NOTE: From this point on, do not change the Volume Control setting.

5. Check the frequency response, which should be ± 2 db between 50 and 10,000 cycles per second. Regard each channel response separately. Be sure to allow for the difference in level (if any) between the two channels at 250 cycles.

Playback Noise

1. Stop the tape.
2. Be sure the mu-metal head cover and electronic shield are installed.

3. VTVM should read below -48 dbm, .002V at 7 1/2 ips.

4. VTVM should read below -43 dbm, .005V at 3 3/4 ips.

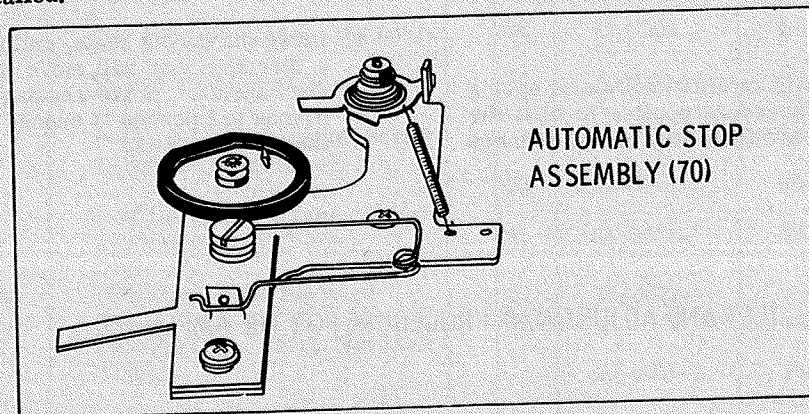
NOTE: It is important to listen for any noises, such as resistor, tube microphonic, etc., noises, which would be objectionable. Since this is an audio recorder, the actual sound is as important as the meter reading.

Record Level Meter Calibration

1. Set audio oscillator to 250 cycles.
2. Place recorder in Record mode, and adjust phono Record Level control for -2 dbm (.62 rms) at output jack of recorder.
3. Adjust Meter Calibrate Control R4 for record level meter reading at upper edge of black mark. With a stereo unit, the bias adjustment may be set to ± 0.25 db to equalize the recording level meter reading between the two channels. If the bias must be adjusted, recheck the over-all frequency response (Step 9 under "Record Function").

Flutter and Wow Check

Flutter and wow should be checked with a flutter meter. Use the recommended procedure of the flutter meter manufacturer. Flutter measurements should be: at 7 1/2 ips, less than 0.2% rms; at 3 3/4 ips, less than 0.25% rms.



TROUBLE CHART

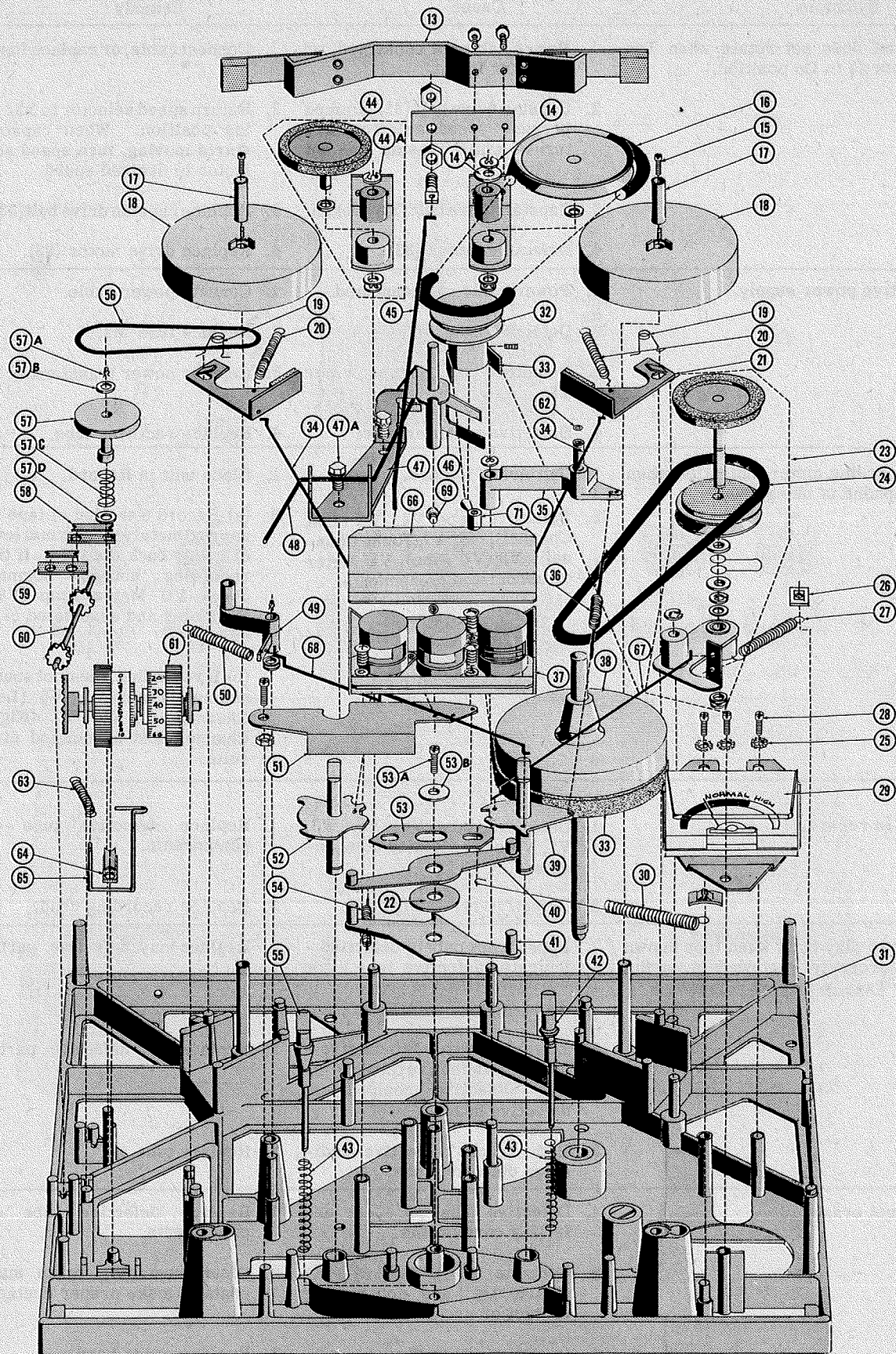
Symptom	Cause	Remedy
Abnormal tape speed.	1. Low line voltage.	1. Line voltage must be at least 105 volts.
	2. Capstan drive belt (33) slips.	2. Clean associated pulley surfaces; replace capstan drive belt (33) if necessary.
	3. Incorrect pressure on capstan idler assembly (4).	3. Replace capstan idler spring (36).
	4. Defective drive motor (83).	4. Replace drive motor (83).
	5. Excessive tape holdback tension.	5. Check tape tension.

TROUBLE CHART (CONT.)

Symptom	Cause	Remedy
Capstan does not rotate when Top Selector is in On position.	1. Power cable not connected, or defective fuse.	1. Connect cable, or replace fuse.
	2. Capstan drive belt (33) jammed because speed selector was turned while capstan was not rotating.	2. Return speed selector to 3 3/4 ips position. When capstan starts moving, turn speed selector to desired speed.
	3. Capstan drive belt (33) broken.	3. Replace capstan drive belt (33).
	4. Defective motor (83).	4. Replace drive motor (83).
Defective power supply.	1. Power cable not connected.	1. Connect power cable.
	2. Defective fuse M2.	2. Replace fuse M2.
	3. Defective power transformer T1.	3. Replace power transformer T1.
	4. Defective rectifier tube.	4. Replace rectifier tube.
No recording meter indication when microphone is being used.	1. Unit not in Record.	1. Place unit in Record.
	2. Defective tube V4, V5 (Left Channel); V6, V7 (Right Channel), V8 (VU Amp), VU Meter or associated components.	2. (a) Record a section of tape at approximately the normal level. Play back the tape. If the recording sounds normal, check VU Meter Amp (V8), VU Meter and associated circuit. (b) If recording does not sound normal, check V4, V5 (Left Channel) or V6, V7 (Right Channel) and associated circuits.
Fails to record.	1. Defective tube V4, V5, V6, V7, V9 or associated components.	1. Replace defective tube or components.
	2. Defective recording head.	2. Replace recording head.
Does not play back when tape known to be properly recorded is on the unit. Tape is moving normally.	1. Upper track only is defective—indicates defective tube V1 or V2; defective components in these stages; defective head.	1. Replace any defective parts.
	2. Lower track only is defective—indicates defective tube V2 or V3 defective components; defective head.	2. Replace any defective parts.
	3. Both tracks defective—indicates defective tube.	3. Replace tube.
Does not erase.	1. Defective tube V9, or defective components.	1. Replace defective tube or components.
	2. Contacts on Record-Play switch M6 are not making contact or are dirty.	2. Clean contacts; make sure contacts make proper contact.
	3. Defective erase head.	3. Replace erase head.

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FIG. 4A EXPLODED VIEW OF PARTS ABOVE BASEPLATE