TRANSPORT MAINTENANCE

I. Routine: Clean and degauss the entire tape path after each 8 hours of use.

II. Periodic: Each six months (more often if operating in dirty surroundings, the rear of the transport should be cleaned with a paint brush, slightly dampened in Iso-propyl alcohol. Do not use a blower.

III. Lubrication: See Figure 1. Each six months or 1000 hours, whichever occurs first, use only Ampex Oil #3010825, Standard Oil Company Terresso #47, Socony-Mobil Oil Company Oil DTE medium, or Shell Oil Company Turbo #29. Other oils may contain additives that are harmful to the bearings.

A. Capstan and capstan idler bearings.

1. Lift rubber cap from the center of the capstan idler and remove the retaining clip. Remove the idler from its shaft and note the location of any shims or spacers. (They must be installed in the same positions.)
2. Lift the plug button that surrounds the capstan and remove the felt washer beneath it. DO NOT put oil on the felt washer.
3. Apply directly onto the bearing as much oil as it will accept (2 or 3 drops.) Allow a few minutes for the oil to soak in with the capstan motor running. Wipe off excess oil and re-install the plug button.
4. Place 3 drops of oil on the inside surface of the capstan idler bearing, replace on its shaft and wipe off excess oil.
5. Replace the retaining clip and the rubber plug, then clean the capstan and idler with Iso-propyl alcohol.
6. Lubricate the rear capstan bearing through the oil hole shown in Figure 1. Use exactly 4 drops.

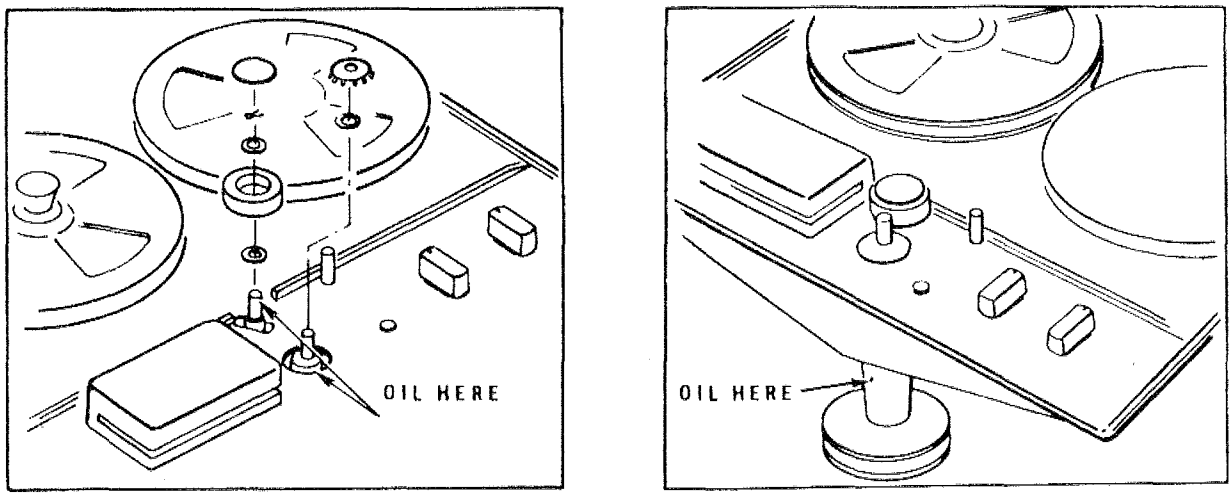


FIGURE 1, CAPSTAN AND IDLER LUBRICATION

7. Drive motor lubrication: Each 2500 hours, or 1 year, whichever occurs first, the drive motor must be lubricated.
   a. Remove the back plate; 3 nuts and 1 cotter pin, and lay it aside. Remove the belt.
   b. Remove the four screws holding the drive motor and slide it slightly to the rear.
   c. An oil inlet cup is on each end of the motor housing. Apply 4 or 5 drops of oil to each, and re-assemble.

IV. Tension Measurements and Adjustments

A. Test equipment required:

Feeler gauge 0.015 inch.
Spring scale 0-16 ounces
Spring scale 0-6 pounds
30-40 inches of non-stretch nylon cord.
EIA reel, 2-1/4" hub

B. Reel tensions: To measure tension on a reel that is taking up tape, stop the reel using the cord and spring scale. Measure the tension required to hold the reel stopped.

To measure tension on a reel that is supplying tape, pull against the reel with the cord and spring scale and measure the amount of pull required.

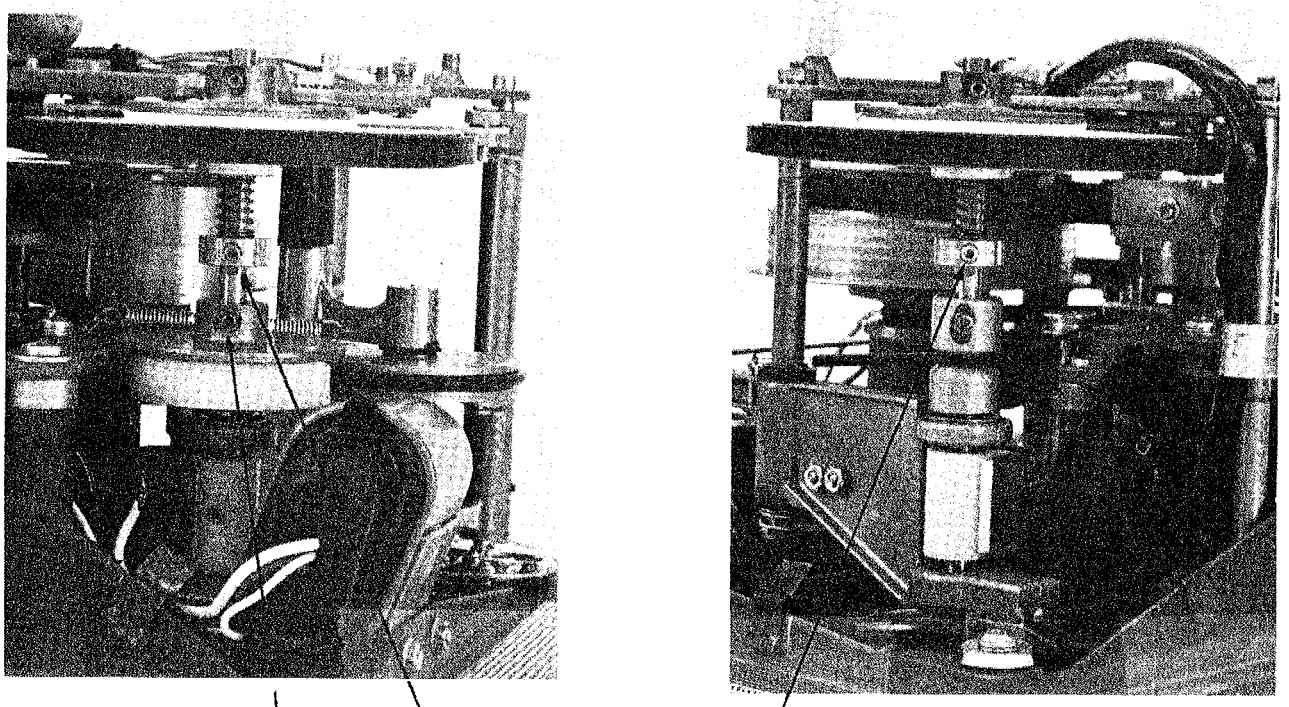
Supply Reel

Play hold back	4-5 ounces
Rewind torque	5-6 ounces
Fast forward holdback	.5-1 ounce

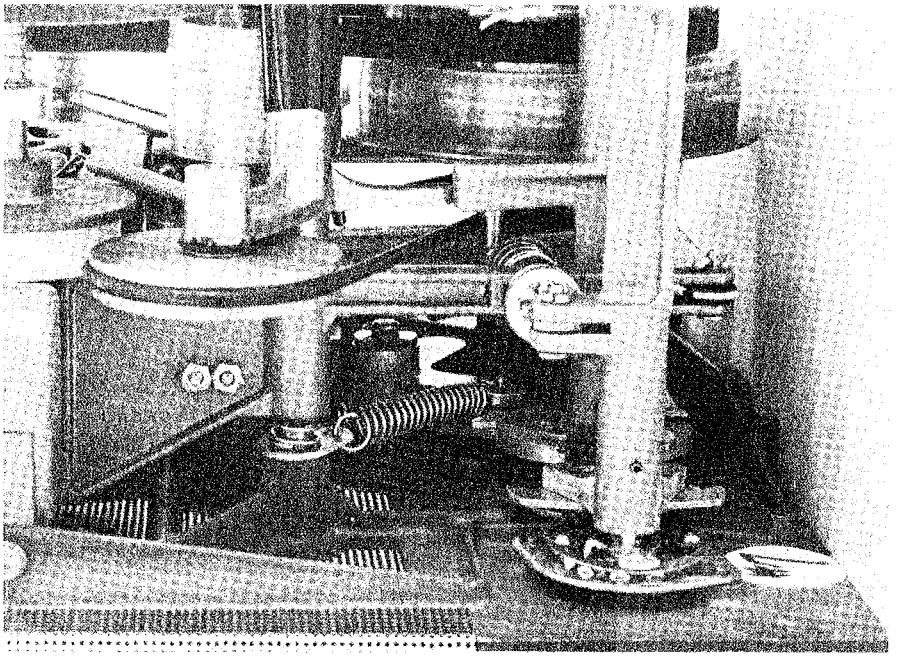
Take-up Reel

Play take-up	2-3 ounces
Fast forward torque	5-6 ounces
Rewind hold back	.5-1 ounce

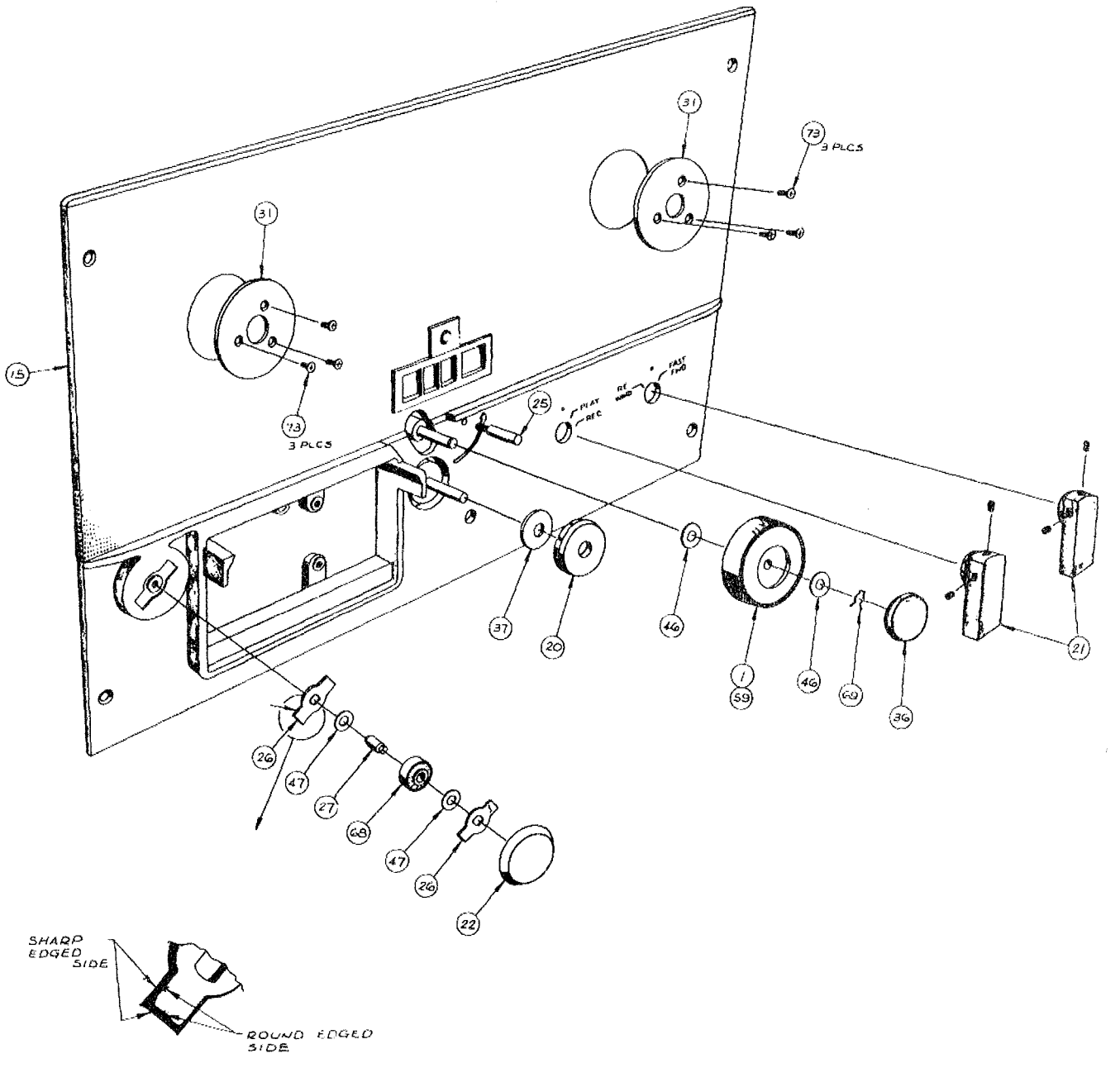
Adjustment points are shown in Figure 2. Increasing the spring tension at any of the adjustment points will result in more torque being applied.



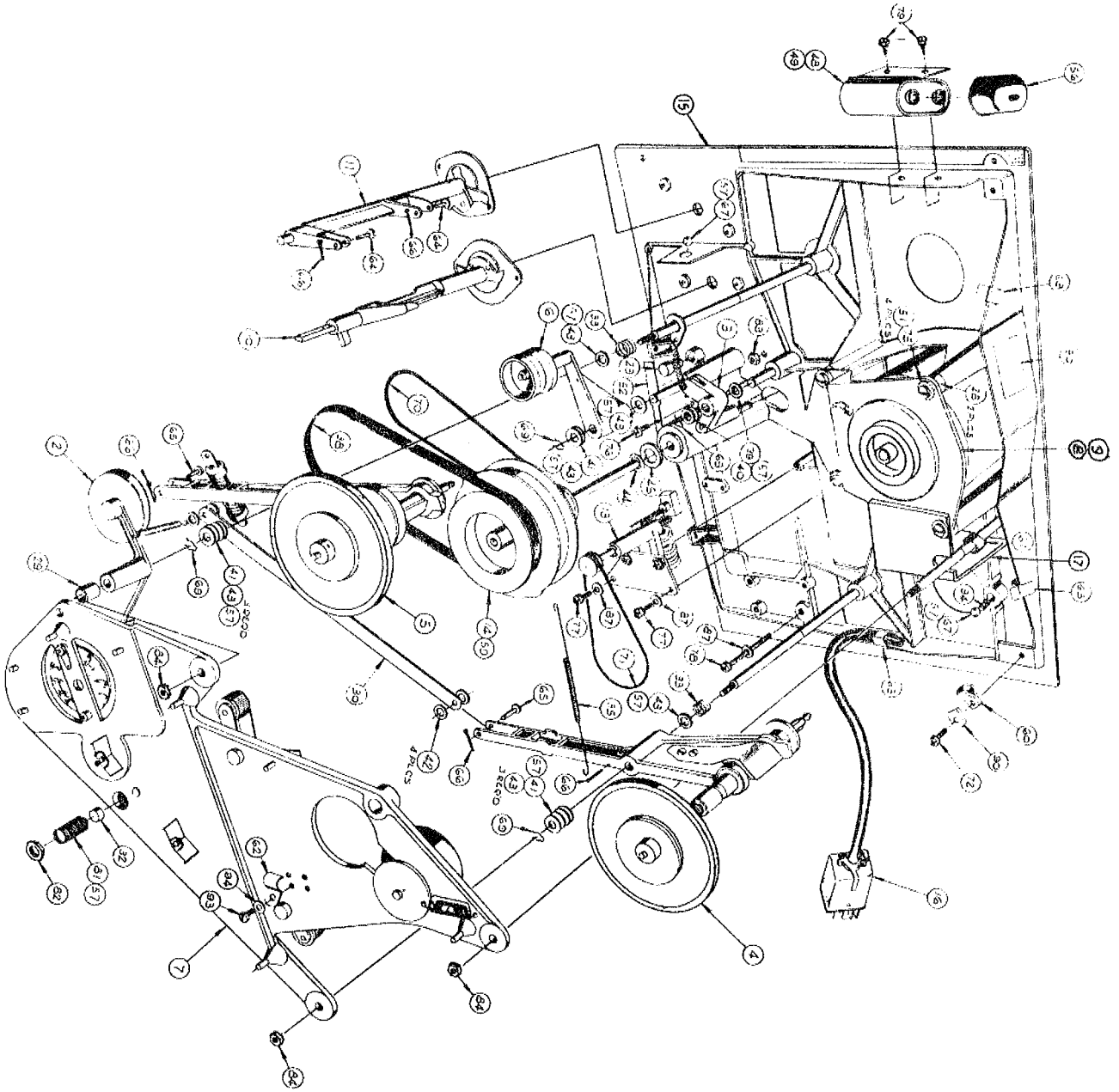
C. Capstan idler pressure:
   1. Tie a loop of nylon cord, 4 or 5 inches in diameter, and put it around the capstan idler shaft. Hook the 0-6 pound spring scale onto the loop.
   2. Put the machine in play and let your thumb gently ride the surface of the revolving idler.
   3. Pull the spring scale in the direction that the idler retracts. Watch the spring scale.
   4. When you feel the idler stop rotating, note the reading on the spring scale. The correct reading is 5±.5 pounds. There is no capstan idler pressure adjustment on the AG-600. If the pressure is incorrect, change the capstan idler pressure spring.



CAPSTAN IDLER PRESSURE SPRING



Tape Transport Assembly, Front



Tape Transport Assembly, Back

ELECTRONIC MEASUREMENTS AND MAINTENANCE

I. Test Equipment
   A. Audio frequency generator
   B. VTVM

II. Test Conditions
   A. Line output terminated in 600 ohms.
   B. Input through dummy plug, not accessories.
   C. Heads cleaned and demagnetized.
   D. All tests made using a professional grade tape (Ampex 444, Ampex 641, or equivalent.)

III. Routine Measurements: Once each 3 months an overall frequency response check and a signal to noise ratio measurement will give a good over view of electronic alignment and condition. If these two measurements meet their specification, further electronic alignment is usually not necessary.

If the machine does not meet its specifications for either of these two measurements, then proceed with a complete electronic alignment.

A. Overall Frequency response
   1. Thread bulk erased tape.
   2. 500 Hz input at 1 volt.
   3. Output connected to VTVM; Repro level control set at op level.
   4. Output selector to INPUT adjust for -10dBm on VTVM.
   5. Start the machine RECORD, switch output selector to REPRODUCE.
   6. While thus recording and reproducing simultaneously change the input frequency throughout the response range for the machine undergoing measurement. Response should be:

7-1/2 ips:	±2db, 60 - 10 kHz
	+-4db, 30 - 15 kHz
3-3/4 ips:	±2db, 50 -7.5 kHz

Some possible causes of inadequate frequency response are:

Dirty heads
Head azimuth misadjusted
Incorrect bias
Record calibration not set properly
Reel tension off
Inferior tape
Magnetized heads
Equalization incorrect
Head heights differ
Signal source not accurate

IV. Signal to Noise Measurement
A. Input: 500Hz at 1 volt.
B. Output: 600ohm load into VTVM.
C. With the output selector set to INPUT, increase the record level to 6db above operating level, (+10dBm on VTVM)
D. Record 2 or 3 minutes at this level.
E. Rewind, disconnect the signal input, and record again at the same level. This will erase the saturated signal. The residue will be noise. Noise cannot be measured at this time as bias radiation will give an erroneous reading.
F. Rewind, and playback the erased tape. Measure the noise level on the VTVM and add -10dBm (6dBm excess recording level and 3dBm output strapping.) For example: if the VTVM reads -47dBm add -10dBm; -57dBm. This is the signal to noise ratio.
G. Repeat for the other transport speed and for all channels at both speeds.

SPECIFICATIONS

Tape Speed	Full Track	Half Track	Qtr. Track
7-1/2 ips	60 db	55 db	55 db
3-3/4 ips	55 db	50 db	50 db

If equipment fails to meet its specification, some possible causes are:

Magnetized heads
Non-symmetrical bias
Head cables rubbing on moving parts
Dirty heads
Head gate open
Pinch roller/capstan dirty
Head height adjustment incorrect

Excessive noise can be isolated to either the record or reproduce system. To check reproduce only noise:

1. Set reproduce amplifier to operating level.
2. With no tape on the machine activate the PLAY mode.
3. Measure reproduce noise on VTVM.
   7-1/2 ips, and 3-3/4 ips = -50dBm on VTVM scale (60db down from signal level used on signal/noise measurement)

V. Reproduce System
   A. Thread standard alignment tape.
   B. Adjust head azimuth
   C. Set equalization and reference level on all channels per instructions on the alignment tape
   D. Repeat for other transport speed using correct alignment tape.

VI. Record System: Remove cover plate on front of the electronic units. Bias adjustment:
   A. Input at 1 volt as follows:
      7-1/2 ips; 500Hz
      3-3/4 ips; 250Hz
   B. Thread blank tape and start the machine in RECORD, output selector set for REPRODUCE.
   C. Adjust the BIAS ADJ control to a maximum reading on the VU meter.
   D. Repeat for all channels.

VII. Record Head Azimuth Adjust
   A. Input at 1 volt as follows:
      7-1/2 ips, 15kHz
      3-3/4 ips, 7.5 kHz
   B. Start the machine in record, output selector on REPRODUCE
   C. Lower the record level 10db to prevent saturating the tape.
   D. Adjust the record head azimuth for a maximum reading on the VU meter.

III. Record Level
   A. Reproduce level control set at operating level.
   B. Use the same input as for adjusting bias and blank tape.
   C. Start the machine in RECORD, output selector set to REPRODUCE.
   D. With the Record Level Control, set the VU meter to zero (4dBm on VTVM)
   E. Switch the output selector to INPUT. Adjust REC CAL (record calibrate) to zero VU on the VU meter.

IX. Record Equalization: Record equalization is the same procedure as the overall frequency response measurement and must be performed for both speeds and all channels.

Section 4

TRANSPORT MAINTENANCE

4.1 ROUTINE MAINTENANCE

4.1.1 CLEANING

Cleaning the heads and other components in the tape path, as described in Section 6, must be accomplished after each 8 hour operating period, or oftener if visual inspection indicates the need.

Visually inspect the back of the tape transport each month. Use a brush or small vacuum cleaner to remove any accumulation of dirt or dust. Except at the clutches, or near bearings, the brush can be moistened with Iso-Propyl alcohol.

CAUTION

Do not use the blower action of the vacuum cleaner, or any other compressed air device, in cleaning. Dust might be forced into bearings or other rotating parts.

4.1.2 DEMAGNETIZING

Demagnetization of the magnetic heads, as described in Section 6, and other components in the tape path, must be accomplished on a daily basis, or oftener if there is any suspicion that this procedure is necessary.

4.1.3 LUBRICATING

4.1.3.1 Oil To Be Used

The only oil to be used is Ampex Lubricating Oil No. 087-579 or a commercial equivalent. The Ampex oil is available in 1-1/2 ounce containers under Catalog No. 4010825 (Oil No. 825). Commercial equivalents which can be used are Essco Standard Oil Company's Tresso 47 and Socony Mobil Oil Company's DTE Medium.

Lubrication requires removal of the tape transport from the portable cases or custom console.

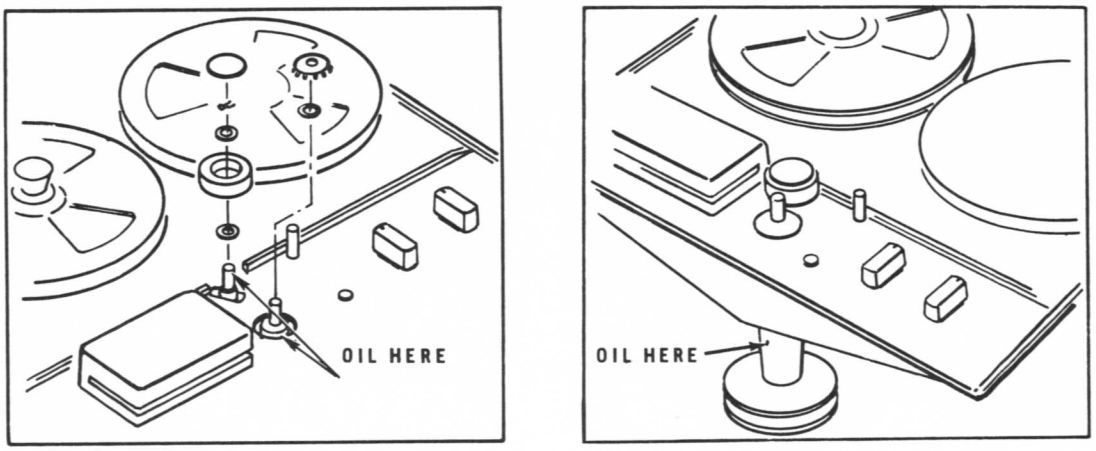


Fig. 4—1. Lubricating Capstan and Capstan Idler Bearings

4.1.3.2 Capstan and Capstan Idler Bearings

These bearings are to be lubricated after each 1,000 hour operating period, or each six months (whichever occurs first). In the following procedure, refer to Fig. 4-1.

Step 1: Pry off the rubber cap in the center of the capstan idler.

Step 2: Remove the hairpin retainer that secures the idler on its shaft. Being careful not to lose any of the washers or shims, which must be replaced in the exact original positions, lift the capstan idler from its shaft.

Step 3: Pry off the plug button which is around the capstan, and remove the felt washer which is beneath it. (Do not put the lubricant on the felt washer.)

Step 4: Use as much of the recommended oil as the capstan bearing will accept, carefully wiping off any excess oil. Replace the felt washer and the plug button around the capstan.

Step 5: Place all washers and shims in their original positions, and slide the capstan idler back on its shaft. Place two drops of oil around the inner bearing surface, and manually rotate the idler to work the oil in. Wipe off any excess oil. Replace the hairpin retainer and the rubber cap.

Step 6: Carefully clean the rubber tire of the capstan idler with Iso-Propyl alcohol to remove any trace of oil or contamination from your fingers.

Step 7: Lubricate the lower bearing of the capstan through the oil hole shown in Fig. 4-1. Use exactly four drops of oil at this point.

4.1.3.3 Drive Motor Bearings

Upper and lower drive motor bearings are to be lubricated after each 5,000 hour operating period, or every two years (whichever occurs first). Lubrication requires that the drive motor be removed from the transport (refer to paragraph 4.3).

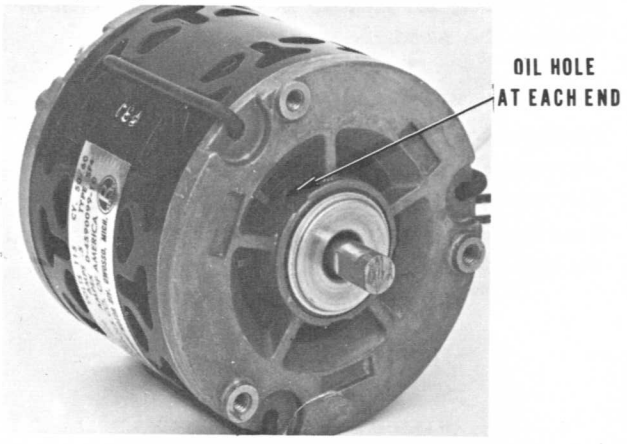


Fig. 4—2. Lubricating Drive Motor Bearings

An oil hole is provided at each end of the motor (see Fig. 4-2). Use four or five drops

of oil for each bearing, rotating the motor shaft to work the oil in. Wipe off any excess oil before re-installing the motor.

4.2 CHECKOUT AND ADJUSTMENTS

4.2.1 TEST EQUIPMENT REQUIRED

Feeler Gauge, .015 inch.
Spring Scale, 0 to 16 ounces.
Spring Scale, 0 to 6 pounds.
Empty Reel, EIA 2-1/4-inch hub.
Cord or string, approximately 30 inches long, with small loop formed in one end.
Ampex Standard Flutter Tape:
7-1/2 ips Catalog No. 01-31326-01
3-3/4 ips Catalog No. 01-31336-01
Flutter Bridge, D & R Model FL3-D or equivalent.
Normal hand tools used by technician.

4.2.2 CHECKING TAPE TENSIONS

4.2.2.1 General

Tension of the magnetic tape in the various operating modes is measured indirectly by determining the amount of drive torque and holdback torque at each reel. Torques on the turntable which is reeling in the tape in a given mode are measured by holding the spring scale stationary against the drive force; those at the turntable supplying tape are taken by measuring the force required to turn the reel in its normal direction of rotation (see Fig. 4-3).

Torques are shown here both in ounce-inches and in ounces. If an EIA reel, with a 2-1/4-inch diameter hub is used, the ounce indication on the spring scale is directly applicable. If any other hub size is used, multiply the spring scale indication by the hub radius to arrive at the ounce-inch figure.

4.2.2.2 Tension at Supply Turntable

Step 1: Place the empty reel on the supply turntable and apply power to the equipment.

Step 2: Leaving the loop at the free end, wrap the cord around the reel hub in a counter-clockwise direction.

Step 3: Place the hook on the spring scale through the loop in the cord.

Step 4: Hold the scale stationary and turn the REWIND-FAST FWD control to the REWIND position. Tap lightly on the reel (to ensure a true reading) and note the indication of the spring scale. Correct indication is shown on Table 4-1. (As shown on the table, this reading will hereinafter be designated as the rewind takeup tension.)

Step 5: With the spring scale still attached to the cord, turn the REWIND-FAST FWD control to the FAST FWD position.

Step 6: Pull the scale slowly from the reel, which will turn counter-clockwise. Take the reading with the scale in slow but steady motion. Correct indication is shown on Table 4-1. (This will be designated hereafter as the fast forward holdback tension.)

Step 7: Return the REWIND-FAST FWD control to the straight up (dot) position.

Step 8: Turn the PLAY-REC control to the PLAY position and again pull the scale from the reel. Take the reading with the scale in slow but steady motion. Holdback torque is shown on Table 4-1. (This will be designated hereafter as the play holdback tension.)

Step 9: Return the PLAY-REC control to the straight up (dot) position.

This completes the checks at the supply turntable. Adjustment procedures are described under Adjusting Tape Tensions, paragraph 4.2.3.

4.2.2.3 Tension at Takeup Turntable

Step 1: Place the empty reel on the takeup turntable and apply power to the equipment.

Step 2: Leaving the loop at the free end, wrap the cord around the reel hub in a clockwise direction. Place the hook on the spring scale through the loop.

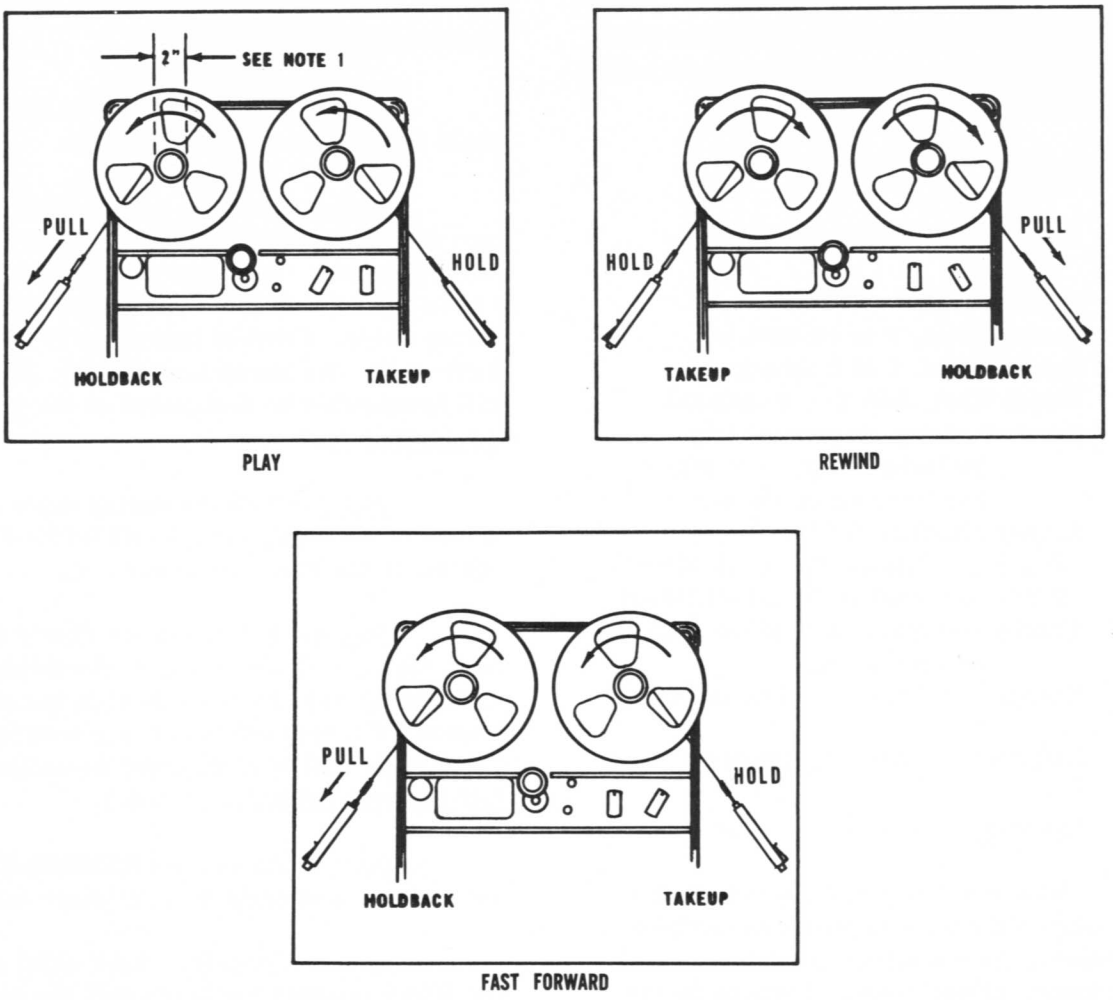


Fig. 4—3. Measuring Tape Tensions

Step 3: Hold the spring scale stationary and turn the PLAY-REC control to the PLAY position. Tap lightly on the reel (to ensure a true reading) and note the indication of the spring scale. Correct indication is shown on Table 4-1. (This will be designated hereafter as the play takeup tension.)

Step 4: Return the PLAY-REC control to the straight up (dot) position. Hold the scale stationary and turn the REWIND-FAST FWD control to the FAST FWD position. Tap lightly on the reel while noting the scale indication. Correct indication is shown on Table 4-1. (This will be designated hereafter as the fast forward takeup tension.)

Step 5: Turn the REWIND-FAST FWD control to the REWIND position. Pull the scale slowly from the reel, which will turn in a clockwise direction. Take the reading with the scale in slow but steady motion. Holdback torque is shown on Table 4-1. (This will be designated hereafter as the rewind holdback tension.)

Step 6: Return the REWIND-FAST FWD control to the straight up (dot) position.

This completes the torque checks at the takeup turntable.

4.2.3 ADJUSTING TAPE TENSIONS

4.2.3.1 General

Holdback torques in the rewind and fast forward modes of operation are determined by the friction between the holdback brake pads and

TURNTABLE	MODE	TORQUE		DESIGNATION
		Ounce-inches	Ounces (EIA Reel)	
Supply	Play	5.6-6.8	5-6	Play Holdback
	Fast Fwd.	0.75-1.25	0.67-1.1	Fast Fwd. Holdback
	Rewind	5.6-6.8	5-6	Rewind Takeup
Takeup	Play	2-3.5	1.75-3.1	Play Takeup
	Fast Fwd	5.6-6.8	5-6	Fast Fwd. Takeup
	Rewind	0.75-1.25	0.67-1.1	Rewind Holdback

Table 4-1. Tape Tension Indications

plastic sleeves on the turntable shafts. These tensions are not adjustable, and corrective action requires the replacement of the spring-mounted holdback brake assembly.

The adjustment of other tensions requires access to the back of the transport, so the equipment must be removed from its portable case or other mounting.

4.2.3.2 Adjusting Torques at Supply Reel

The play holdback and rewind takeup tensions are determined by the positioning of the supply collar, and both are adjusted simultaneously. The range of adjustment is limited by the fact that the rubber tire on the supply clutch must be completely engaged by the tire on the rewind idler (in the rewind mode).

Step 1: Loosen the set screw on the supply collar (see Fig. 4-4).

Step 2: Push the collar up against the spring to increase torque, or down to decrease torque.

Step 3: Being sure the set screw is opposite the flat portion on the turntable shaft, tighten the set screw.

Step 4: Recheck play holdback and rewind takeup torques (refer to paragraph 4.2.3).

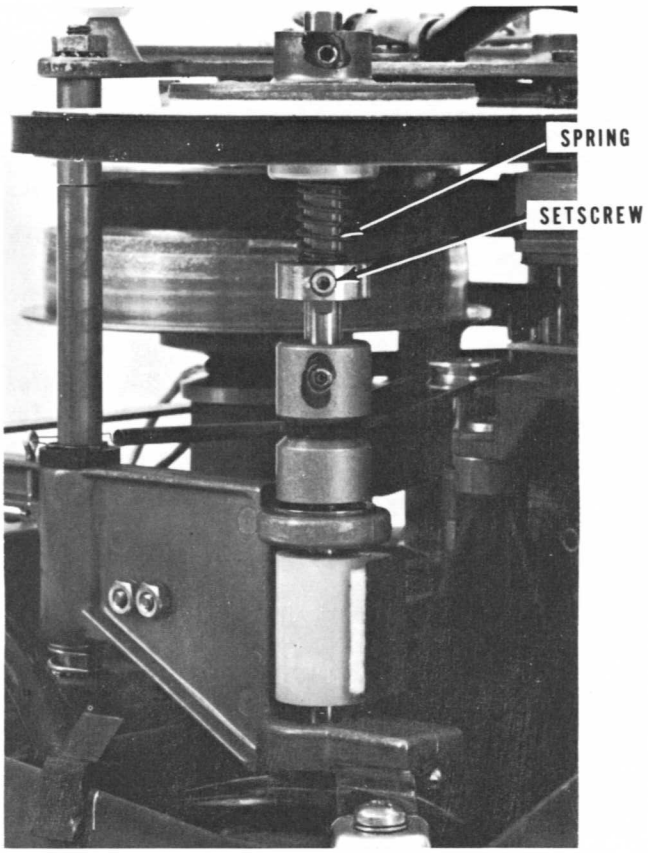


Fig. 4—4. Adjusting Torque, Supply Turntable

Step 5: Repeat Steps 1 through 4 as necessary to achieve torques within quoted tolerances.

If proper torques cannot be achieved, it is an indication that the spring is applying incorrect force, or that the felt facing on the clutch

disc is worn or contaminated with oil and dirt. Replacement of the spring or the felt facing is required.

4.2.3.3 Adjusting Torques at Takeup Reel

The adjustment for play takeup tension is made by adjusting the play takeup collar clearance as described in paragraph 4.2.7. When the clearance is adjusted correctly the tension should be within tolerance; if not, the felt facing on the clutch disc may be worn or contaminated with oil and dirt, or the spring below the clutch may be applying incorrect force. Replacement of the felt or spring is then necessary.

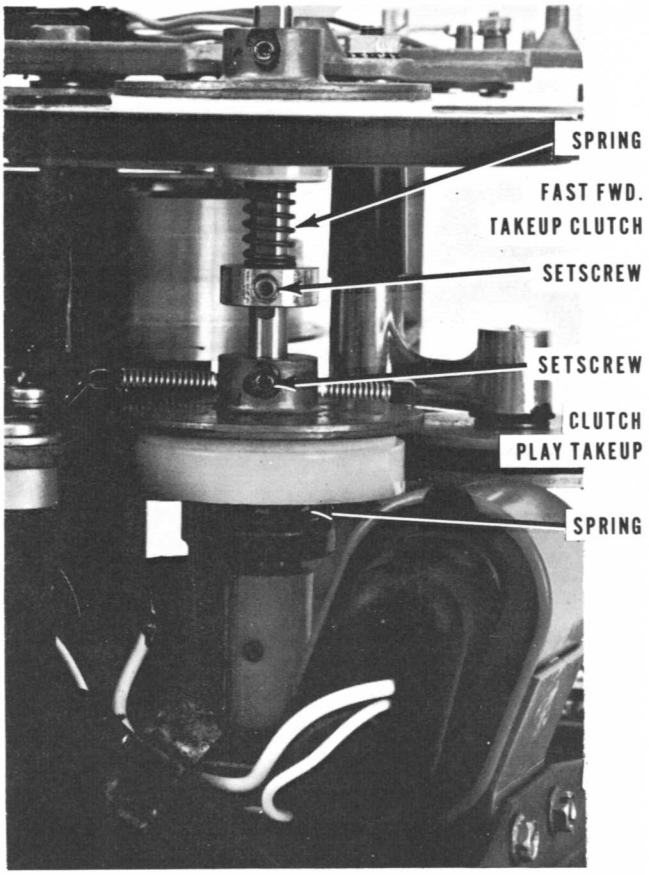


Fig. 4—5. Adjusting Torque, Takeup Turntable

The adjustment for play takeup tension is made by adjusting the play takeup clutch clearance as described in paragraph 4.2.7. When the clearance is adjusted correctly the tension should be within tolerance; if not, the felt facing on the clutch disc may be worn or contaminated with oil and dirt, or the spring below the clutch may be applying incorrect force. Replacement of the felt or spring is then necessary.

To adjust the fast forward takeup clutch, proceed exactly as described under Adjusting Tensions at Supply Reel, paragraph 4.2.5.2.

4.2.4 CHECKING FLUTTER AND WOW

4.2.4.1 Checking

Ampex Standard Flutter Tapes are prepared on very precise equipment for each tape speed. The rms flutter content of these tapes is less than .03%, which for all practical purposes can be disregarded when flutter measurements are taken. Flutter tapes are prepared for specific tape speeds, and--since flutter bridges will accept only 3,000 cycle signals--cannot be used at other speeds.

Flutter bridges are sensitive to some extent to amplitude modulation, which can occur if poor head-to-tape contact exists or if drop-outs of signal occur. Heads should therefore be cleaned and demagnetized before flutter measurements are taken.

As a flutter tape is used over a long period of time--approximately 200 plays--the flutter indication will rise, although the flutter on the equipment may be unchanged. This is caused by increased drop-outs, demagnetization of the signal in the repeated passes over the heads, and by physical deformation of the tape due to tensions, changes in temperature and humidity, etc.

Standard tapes should not be rewound before storage, because the tape pack and tension within the reel might cause physical deformation such as edge damage, stretching, etc. Extremes in temperature and humidity must also be avoided in storage areas. Finally, standard tapes must not be stored near sources of magnetic fields, such as motors, generators, permanent magnet loudspeakers, etc., or partial erasure of the signal may result.

Flutter measurement is made as follows:

Step 1: Remove all connections to the equipment, except that for the power.

Step 2: To thread the standard flutter tape on the equipment place the flutter tape on the takeup turntable and rewind to an empty reel on the supply turntable. Then make the flutter measurements. (This allows the flutter tape to be stored without rewinding.)

CAUTION

Whenever the standard flutter tape is threaded on the equipment, use care not to place the equipment in the record mode, or the tape will be erased.

Step 3: Connect the flutter bridge to the OUTPUT connector.

Step 4: Turn the PLAY-REC control to the PLAY position.

Step 5: Adjust the level on the flutter bridge as instructed in the applicable manual.

Step 6: Switch the flutter bridge to the discriminator adjustment, and adjust the trimmer for a minimum reading on the flutter bridge meter.

Step 7: Switch the flutter bridge to readout at 0.5 to 250 cps, and read the flutter as indicated on the flutter bridge meter.

Step 8: When the flutter measurement is completed, allow tape motion to continue in the play mode until the tape is completely wound on the takeup reel. Mark the reel "Rewind Before Using" and store it in a safe place.

4.2.4.2 Correcting Excess Flutter and Wow

Flutter can be caused by any component in the transport that affects tape motion. It is manifestly impossible in this manual, therefore, to delineate specific causes and remedies.

Possible causes of excess flutter include:

Excessive or erratic play hold back tension.

Drive motor not in synchronism--this can be caused by low line voltage (less than 105 volts); excessive play takeup tension; a dragging belt tensioning idler; incorrect drive motor thrust; defective drive motor starting capacitor; bearings in drive motor or capstan in need of lubrication; or a defective drive motor.

Capstan Idler--The idler tire may be dented by being allowed to engage the capstan for an extended period when the equipment is not operating, or the bearing may be defective. Running the recorder in the play mode for two or three hours will usually restore the tire to normal. If not, or if the bearing is defective, replace the idler.

Drive Belt--The drive belt may be dirty or worn.

Rewind idler not disengaging from motor pulley--This could be caused by a contaminated rewind idler guide.

Tape Scrape--Can be caused by warped or damaged reels, or incorrect turntable height.

	ROTATIONAL PERIOD	
COMPONENT	7-1/2 ips	3-3/4 ips
Capstan	9.5 cps	4.8 cps
Capstan Idler	1.6 cps	0.8 cps
Motor Pulley	30 cps	30 cps
Drive Belt	5.6 cps	2.8 cps
Motor	30 cps	30 cps
Rotary Guide	3.8 cps	1.9 cps

Table 4-2: Rotational Periods of Components

If a variable filter with low and high frequency cutoff is available, excessive flutter can be isolated to certain frequencies. This is accomplished by connecting the filter to the flutter bridge. Starting at (for example) 2 cycles per second, tune both the low frequency and high frequency cutoff controls to the same frequency. Measure flutter and record it. Proceed in this manner in one octave steps to 250 cps. Comparing the results with the table, Rotational Periods of Components, may then isolate the offending

assembly.

Note that if flutter disturbance is introduced by components in the supply turntable assembly, the frequency of the flutter will vary--being low when the supply reel is full of tape and progressively increasing with reel rotation as the tape pack diminishes. It is very rare for the takeup reel to contribute appreciably to flutter, as it is effectively isolated from the heads by the capstan and capstan idler.

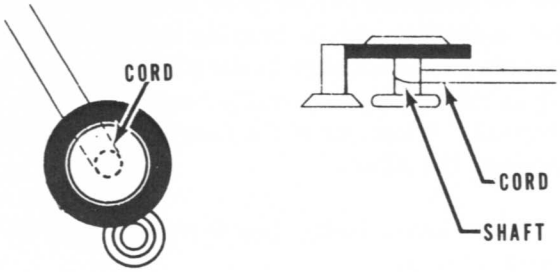


Fig. 4—6. Measuring Capstan Idler Force

4.2.5 CAPSTAN IDLER PRESSURE

To check the capstan idler pressure against the capstan, tie the two ends of the cord or twine together to form a continuous loop. Position the loop around the capstan idler, so that it is on the shaft between the idler and the arm (see Fig. 4-6).

Apply power to the equipment. Insert the hook on the 0 to 6 pound spring scale in the loop, and pull it taut in the direction of normal capstan idler movement (90° to the arm); the scale will thus be approximately over the tape position indicator counter.

Place the equipment in the play mode. Pull on the scale in the direction of normal capstan idler movement until the idler is pulled from contact with the capstan. Take the scale indication just as the idler loses contact with the capstan (the idler rotation will stop at that point). The scale should indicate 5 pounds, ±0.5 pound.

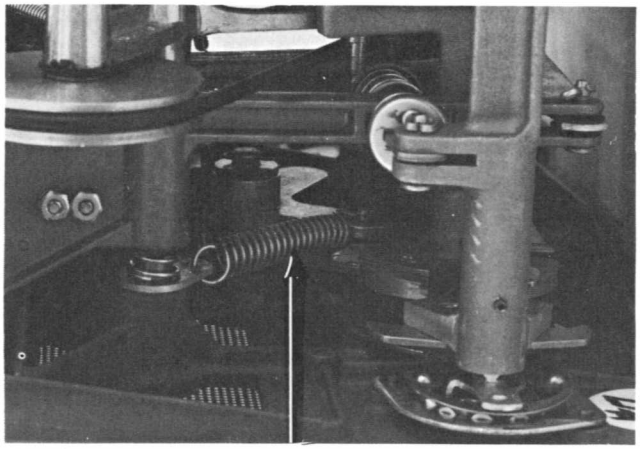


Fig. 4—7. Capstan Idler Pressure Spring

There is no adjustment for idler pressure. If it is incorrect, it indicates that the pressure spring (see Fig. 4-7) is applying incorrect force and must be replaced.

4.2.6 ADJUSTING CAPSTAN THRUST

The capstan thrust is obtained by a hardened steel ball which presses against a nylon disc. The required end play of .003 to .005 inch is obtained as follows:

Step 1: Coat the nylon thrust disc liberally with wheel bearing grease (sub zero) and insert it in the threaded hole in the subplate over the capstan shaft (see Fig. 4-8).

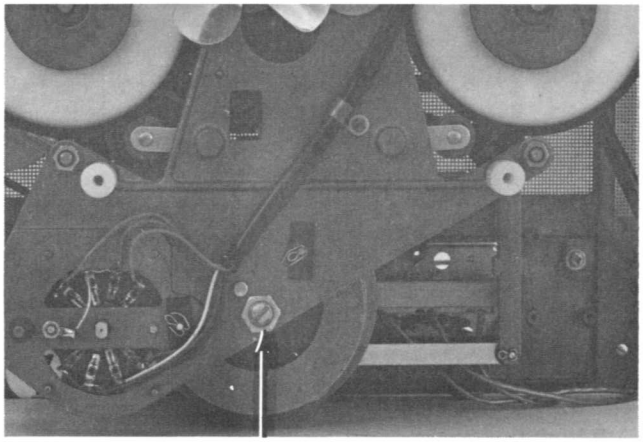


Fig. 4—8. Adjusting Capstan Thrust

Step 2: Insert the set-screw and run it down until it bottoms against the thrust disc.

Step 3: Maintaining a slight downward pressure on the set screw, back the screw off

1/4 turn.

Step 4: Carefully tighten the locking nut on the set screw, being sure the adjustment--which should be in the required range--does not change.

4.2.7 ADJUSTING PLAY TAKEUP CLUTCH CLEARANCE

The play takeup clutch assembly consists of an aluminum disc faced with felt and a clutch plate which is spring-loaded against the disc. A clearance of .015 inch is required between the end of the oilite bearing (which goes through the clutch plate) and the bottom of the disc. This clearance cannot be directly measured with a gauge, but can be set quite accurately by the following procedure.

Step 1: Loosen the set screw on the hub of the disc (see Fig. 4-5). Insert a .015 feeler gauge between the thrust washer (that rides on the inner race of the lower ball bearing of the takeup turntable pivot) and the oilite bushing (Item 7, Takeup Arm Exploded View).

Step 2: Press the aluminum disc down until it bottoms firmly on the end of the bushing, holding it in that position while tightening the set screw.

Step 3: Remove the feeler gauge. The action of the conical spring will move the bushing from the disc, thus giving the required clearance.

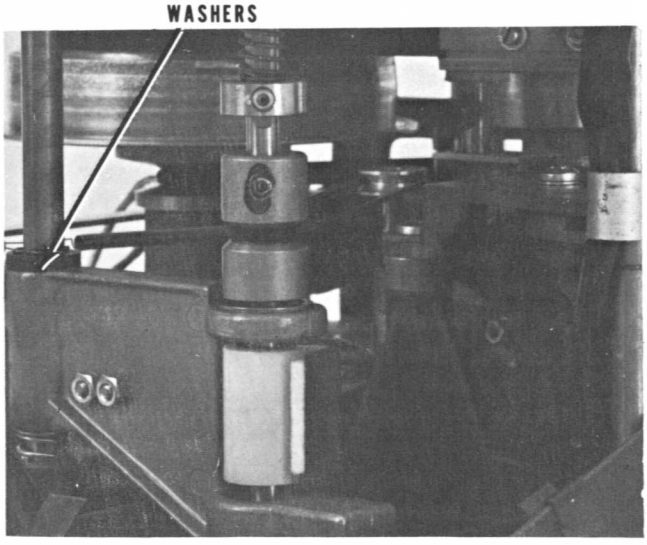


Fig. 4—9. Adjusting Turntable Height

4.2.8 ADJUSTING TURNTABLE HEIGHT

The distance from the top surface of the turntable to the metal grille is adjusted to 0.125 inch (±.008). The height is adjusted by the placement of lamicoid washers (see Fig. 4-9). The number (or thickness) of these washers may be increased or decreased as required to obtain proper turntable height.

4.3 DISSASSEMBLY

4.3.1 GENERAL

During the disassembly of any part, always note the number, type, and location of washers, shims, etc. Should small hardware become lost or damaged, a kit containing an assortment of such hardware is available from Ampex (Catalog No. 4010897-02).

4.3.2 REMOVING SUBPLATE

Removing the subplate is a necessary preliminary to any further disassembly of parts beneath the tape transport casting. First, remove the three nuts that secure the subplate (see Fig. 4-10). Then remove the cotter pin and clevis pin that holds the slide lever to the lower yoke of the rewind/fast forward actuator. This will free the subplate. Do not remove or loosen the adjustment screw which controls capstan thrust; if the setting of this screw is inadvertently changed, the adjustment procedure described in paragraph 4.2.8 must be followed.

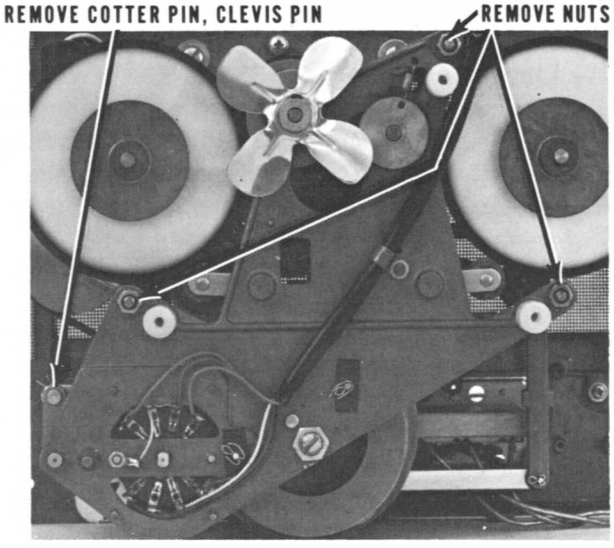


Fig. 4—10. Removing Subplate

NOTE

The nylon thrust discs beneath the subplate are coated with grease and will normally remain in position when the plate is lifted. However, be sure they do not fall from the subplate.

Re-installing the subplate will be most easily accomplished if the PLAY-REC control is turned to the PLAY position.

4.4 PRINCIPLES OF OPERATION

4.4.1 GENERAL

The tape transport mechanism employs a single-speed synchronous motor and a system of pulleys, belts, and clutches to drive the capstan and the turntables. The three modes of tape motion (PLAY, REWIND, and FAST FORWARD) are selected by two controls located on the top panel of the tape transport. (The neutral position for each control is marked by a dot.)

The bracketed numbers in the following discussion refer to parts shown in Fig. 4-11.

Power is applied to the drive motor when the POWER switch on the front panel of the electronic assembly is turned to the ON position. The capstan (16) begins to rotate immediately, being driven by a nylon belt (3) between the motor pulley (8) and the capstan flywheel. A second belt (14) running in a groove in the capstan flywheel drives the play takeup pulley (13). The shock relief brake rollers (2 and 12) are engaged against the rubber-tired fast forward and rewind clutches (4 and 9). Both turntables are motionless, and the machine is in the standby condition.

Since the capstan is rotating when the machine is in standby, the tape will accelerate to full play speed almost instantly when the PLAY-REC switch is operated.

4.4.2 PLAY MODE

When the PLAY-REC switch is placed in the PLAY position, the following mechanical action occurs:

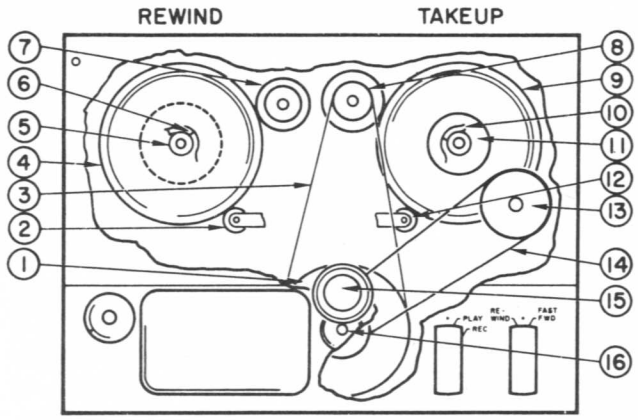


Fig. 4—11. Mechanical Operation, Simplified

1. The play takeup pulley (13) and belt (14) are brought to bear on the play takeup clutch (11).

2. The shock relief brake roller (12) is released from the fast forward clutch tire (9).

3. The capstan idler (15) engages the capstan (16), which drives the tape, pulling it from the supply turntable and feeding it to the takeup turntable.

4. The shock relief brake roller (2) on the supply side remains engaged against the rewind clutch tire, and slippage occurs between the clutch and disc assembly. The friction produced in this slippage, and the friction produced by the rewind holdback brake (6) operating on the plastic drum (5) provide the required holdback tension.

4.4.3 REWIND MODE

The REWIND-FAST FORWARD control cannot be operated unless the PLAY control is in neutral. When the REWIND-FAST FORWARD control is turned to REWIND:

1. Both shock relief brake rollers 2 and 12) are released.

2. The rewind idler (7) is clamped between the motor pulley (8) and the rewind clutch tire, and the rewind turntable is driven.

3. Holdback tension is provided by

the holdback brake (10) on the takeup assembly as tape is pulled from the takeup turntable.

4.4.4 FAST FORWARD MODE

When the REWIND-FAST FORWARD control is turned to FAST FORWARD:

1. Both shock relief brake rollers (2 and 12) are released.

2. The rubber-tired fast forward clutch (9) is brought to bear on the motor pulley (8) and drives the takeup turntable.

3. Holdback tension is produced by the holdback brake (6) on the rewind assembly.

Section 5

ELECTRONIC MAINTENANCE

5.1 PREVENTIVE MAINTENANCE

Preventive maintenance for the electronic assemblies consists of making the overall performance checks (refer to paragraph 5.2) at scheduled intervals to determine that the equipment is operating within specifications.

5.2 OVERALL PERFORMANCE CHECKS

5.2.1 GENERAL

These checks should be performed at scheduled intervals to determine whether alignment is required. Alignment procedures are described in paragraphs 5.3 and 5.4.

In all these checks, blank tape is specified. However, it is permissible to use tape that has been recorded with material not necessary to save (that material will be erased during the recording part of the check).

NOTE

Always bulk-erase tape that was prerecorded on equipment employing a head configuration different from the equipment under test.

5.2.2 TEST EQUIPMENT REQUIRED

Signal Generator, Hewlett-Packard Model 200C or equivalent.
Bias Filter (see Fig. 5-1).
A-C Vacuum Tube Voltmeter, Hewlett-Packard Model 400D or equivalent.
Bandpass Filter (see Fig. 5-2).
Wave Analyzer (if available).

5.2.3 TEST CONDITIONS

Line output terminated in 600 ohms for all checks
Input through dummy plug (not accessory item)
Heads cleaned and demagnetized before starting
Covers installed on electronic assemblies
All checks made using professional grade magnetic tape (Ampex No. 631

or equivalent)

5.2.4 OVERALL FREQUENCY RESPONSE CHECK

This check can be made while simultaeously recording and reproducing if a bias filter (see Fig. 5-1) is available. If this is not the case, record the tape, rewind, and then make the response run.

Step 1: Connect the signal generator to pins 1 and 3 of an INPUT connector (either input A or B may be used). Set the generator to 500 Hz at a nominal 1 volt level.

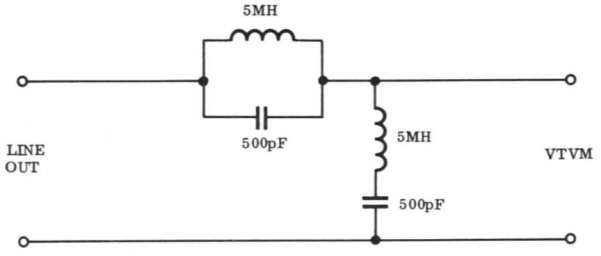


Fig. 5—1. Bias Filter Schematic Diagram

Step 2: Connect the bias filter to the OUTPUT connector, with the vtvm connected to the output of the filter.

Step 3: Place the OUTPUT SELECTOR switch, on the front panel of the electronic assembly, in the INPUT position. Adjust the applicable RECORD LEVEL control to achieve a -10 dbm output as indicated on the vtvm. Then turn the OUTPUT SELECTOR switch to the REPRODUCE position.

Step 4: At the tape transport, select the desired tape speed. Select the corresponding equalization at the electronic assembly.

Step 5: Thread blank tape on the equipment and place tape in motion in the record mode.

Step 6: While thus simultaneously recording and reproducing, change the frequency of the signal generator in discrete steps through the response spectrum applicable to the tape speed (refer to Section 1). Response, as indicated on the vtvm, should remain within specifications.

Step 7: Repeat Steps 4, 5, and 6 for the second speed.

Step 8: If this is two-channel equipment, repeat the entire procedure for the second channel.

Inadequate frequency response can result from any of the following causes:

a. Heads in need of cleaning (refer to Section 6).
b. Heads in need of demagnetization (refer to Section 6).
c. Head azimuths incorrectly adjusted (refer to paragraphs 5.3.6 and 5.3.8).
d. Bias level incorrectly adjusted (refer to paragraph 5.3.7).
e. Reproduce equalization incorrectly adjusted (refer to paragraph 5.3.7).
f. Record calibration incorrectly adjusted (refer to paragraph 5.3.7).
g. Record equalization incorrectly adjusted (refer to paragraph 5.4.1).
h. Play holdback tension incorrectly adjusted (refer to Section 4).
i. Record and playback heads not adjusted to same height (refer to Section 6).
j. Magnetic tape not professional grade.
k. Signal generator output not flat over response spectrum.

5.2.5 OVERALL SIGNAL-TO-NOISE CHECK

This check requires the use of an output bandpass filter, shown in schematic form on Fig. 5-2.

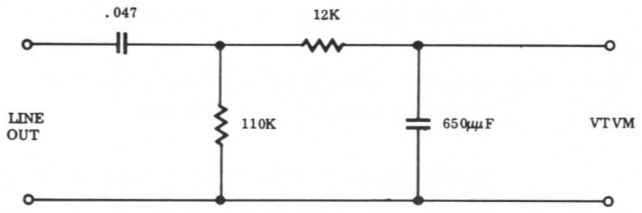


Fig. 5—2. Bandpass Filter Schematic Diagram

Step 1: Connect the signal generator to an INPUT connector (either input A or B can be used). Set the generator to 500 Hz at a nominal 1 volt level.

Step 2: Connect the bandpass filter to the OUTPUT connector, with the vtvm connected to the output of the filter.

Step 3: Place the OUTPUT SELECTOR switch in the INPUT position, and adjust the applicable RECORD LEVEL control to achieve a +10 dbm output as indicated on the vtvm.

Step 4: At the tape transport, select the desired tape speed. Select the corresponding equalization at the electronic assembly.

Step 5: Thread blank tape on the equipment, and start tape in motion in the record mode. Record a section of the tape with the 500 Hz signal.

Step 6: Stop tape motion and rewind the tape to the beginning of the recording made in Step 5.

Step 7: Remove the signal generator from the input. Turn the OUTPUT SELECTOR switch to the REPRODUCE position.

Step 8: Start tape in motion in the record mode with no input signal. The noise level, while thus erasing the 500 Hz signal, will be indicated on the vtvm.

NOTE

The signal-to-noise ratio is computed from peak record level, which is 6 db higher than normal record level. Therefore, 10 db must be added to the vtvm indication in Step 8 to determine the actual signal-to-noise ratio, which should meet or exceed specifications (refer to Section 1).

Step 9: Repeat Steps 4 through 8 for the second speed.

Step 10: If this is two-channel equipment, repeat the entire procedure for the second channel.

An inadequate signal-to-noise ratio can result from any of the following causes:

a. Heads in need of demagnetization (refer to Section 6).
b. Heads in need of cleaning (refer to (Section 6).
c. Bias waveform not symmetrical (refer to paragraph 5.4.3).
d. Fields from nearby motors, generators, etc.
e. Head cables rubbing against moving parts on tape transport.
f. Record and playback heads not adjusted to same height (refer to Section 6).
g. Magnetic tape not professional quality.

To check reproduce noise, remove the tape from the transport. Connect the vtvm through the bandpass filter to the output connector. Place the tape transport in the play mode. Table 5-1 lists reproduce signal-to-noise for different speeds and track configurations.

Tape Speed	Head	Reproduce S/N (from 3% level)
7-1/2 ips (NAB)	Full Track	62 db
	Half Track, Two Track, Quarter Track	60 db
7-1/2 ips (CCIR)	Full Track	62 db
	Half Track, Two Track, Quarter Track	57 db
3-3/4 ips (200U sec)	Full Track	62 db
	Half Track, Two Track, Quarter Track	60 db

Table 5-1. Reproduce Signal-to-Noise

5.2.6 OVERALL DISTORTION CHECK

An accurate check of distortion requires the use of a wave analyzer to measure individual distortion products. (An instrument which measures total harmonic distortion will be influenced by tape noise and modulation noise in addition to

actual distortion.) Also, the signal generator must have very low distortion (less than 0.1%) or addition and cancellation effects can occur.

To check distortion, record a 500 Hz signal on blank tape at normal operating level. On playback, the second harmonic content should not exceed 0.4%, and the third harmonic content should be between 0.6% and 1.1%.

The most common cause of high second harmonic distortion is a magnetized record head, but it could also result from a malfunctioning record or reproduce amplifier, or a non-symmetrical bias waveform.

Third harmonic distortion is dependent on the type of magnetic tape, the bias setting, and the accuracy with which the "normal recording level" is adjusted. A typical reel of tape will have a 500 Hz third harmonic content of 0.8% at operating level, but this might range as high as 1.1% or as low as 0.6%.

5.3 NORMAL ALIGNMENT PROCEDURES

5.3.1 STANDARD ALIGNMENT TAPES

In aligning the equipment, the playback function is first aligned to a standard by using an Ampex Standard Alignment Tape. The record function is then aligned by using the playback circuit as a reference.

Standard tapes are precisely recorded in an Ampex laboratory under stringently controlled conditions. They must be handled and stored with proper care if they are to retain their usefulness over extended periods of time. Heads and tape guides should be cleaned and demagnetized before the standard tape is installed on the equipment, and the tape should not be stored where temperature and humidity extremes occur. Also, the standard tape should be stored under the conditions existing after a normal play run - not after being rewound. After extensive use, the response of the standard tape will begin to fade, for example the head azimuth alignment tone may be down as much as 2 db.

5.3.2 TEST EQUIPMENT REQUIRED

D-C Voltmeter, 20,000 ohms-per-volt.
A-C Vacuum Tube Voltmeter, Hewlett-Packard Model 400D or equivalent.
Signal Generator, Hewlett-Packard Model 200C or equivalent.
Wave Analyzer (if available).
Electronic Counter (if available).
Bias Filter (see Fig. 5-1).
Bandpass Filter (see Fig. 5-2).
Normal tools used by technician.
Ampex Standard Alignment Tapes as applicable.

7-1/2 NAB: No. 01-31321-01
7-1/2 CCIR: No. 01-31323-01
3-3/4 ips (120 usec): No. 01-31331-01
3-3/4 ips (200 usec): No. 01-31334-01

5.3.3 ALIGNMENT CONDITIONS

Line output terminated in 600 ohms.
Input through dummy plug (not accessory item).
Heads cleaned and demagnetized.
Covers installed on electronics unless otherwise indicated.
Alignment made with professional grade magnetic tape (Ampex No. 631 or equivalent).

5.3.4 INTRODUCTION TO NORMAL ALIGNMENT PROCEDURES

Procedures described in paragraphs 5.3.5 through 5.3.8 will usually suffice to correct any deficient operation revealed by the Overall Performance Checks (refer to paragraph 5.2). Other adjustment procedures, usually not required or required only after corrective maintenance, are included in paragraph 5.4.

If the equipment will be operated most of the the time at one tape speed, with the other used only infrequently, that speed should be used for the first alignment run - where bias level is set and record level is calibrated. Reproduce equalization can then be adjusted for the second speed.

When both speeds are to be used alternately, alignment should be started with the 7-1/2 ips speed, which provides optimum setting for bias and record levels.

5.3.5 CHECKING POWER SUPPLY VOLTAGE

There is no adjustment for the power supply. However, its proper operation can be easily checked at an input accessory socket at the back of the electronic assembly.

Step 1: Remove one of the dummy plugs from either INPUT ACCESSORY (J5 or J7) at the back of the electronic assembly.

Step 2: Apply power to the equipment.

Step 3: Place the equipment in the record mode (it is not necessary to thread tape on the transport).

Step 4: Check the voltage from pin 5 (positive) of the accessory socket (at the top, count counterclockwise from the key of the socket) to chassis ground, using the d-c voltmeter. It should be from 22 to 24.5 volts.

5.3.6 REPRODUCE HEAD AZIMUTH ALIGNMENT

In adjusting head azimuth, the vu meter on the electronic assembly can be used. This is particularly convenient for two-channel equipment, because it allows measuring the output of each head simultaneously and therefore provides easy determination of the optimum setting.

Standard alignment tapes for 3-3/4 and 7-1/2 ips tape speeds have all tones (except the last) recorded at 10 db below operating level. It will therefore probably be necessary to turn the reproduce level control full clockwise (not to exceed an indication of 0 on the vu meter) in Step 7. This control, which is screwdriver adjusted, is located beneath the small cover, secured to the front panel by two screws, so that cover must be removed.

CAUTION

Do not tamper with any screw on the head assembly other than the one for azimuth adjustment.

Step 1: Remove the screw which secures the head cover, and lift the head cover off. Remove the two screws located at the back (reel side) of the head assembly, and lift the head shield off.

Step 2: Apply power to the equipment. At the tape transport, select the tape speed at which the adjustment is to be made. Select the corresponding equalization at the electronic assembly.

Step 3: Place the RECORD SELECTOR switch on the electronic assembly in the SAFE position.

CAUTION

To prevent accidentally entering the record mode and thus erasing the standard tape, be sure the RECORD SELECTOR switch on each electronic assembly is in the SAFE position.

Step 4: Place the OUTPUT SELECTOR switch on each electronic assembly in the REPRODUCE position.

Step 5: Thread the standard alignment tape applicable to the tape speed, on the tape transport.

NOTE

Voice announcements on the standard tape can be monitored through headsets plugged into the PHONES jack, or through an external amplifier/loudspeaker connected to the output.

Step 6: Place the standard tape in motion in the reproduce mode. As the first tone on the tape is reproduced, adjust the REPRODUCE LEVEL control(s) to achieve a convenient indication on the vu meters.

Step 7: The second tone on the tape is for use in setting the reproduce head azimuth. As this tone is reproduced turn the azimuth adjustment screw on the reproduce head (see Fig. 5-3) to achieve a maximum indication on the vu

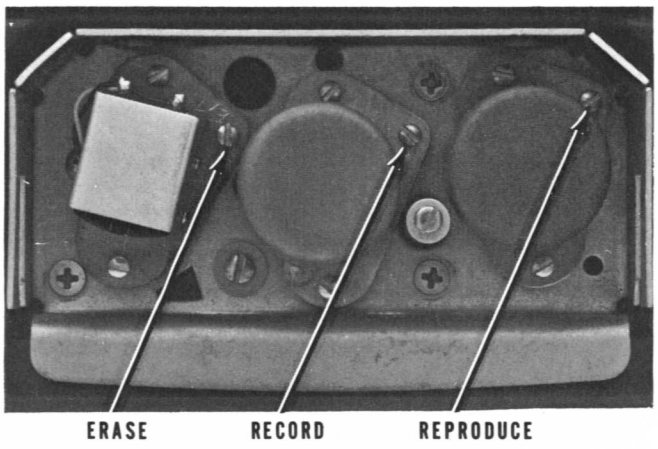


Fig. 5—3. Head Azimuth Adjustments

meters. If this is two-channel equipment, adjust to the optimum setting for the two heads in the stack.

NOTE

When the head azimuth is far out of adjustment, minor peaks may be observed on each side of the correct setting. Proper adjustment will be unmistakable because it will result in an output obviously higher than the minor peaks.

Step 8: Re-install the head shield and head cover. Leave test equipment connected, the front panel cover removed, standard tape threaded, if reproduce/record alignment is to be made.

5.3.7 REPRODUCE/RECORD ALIGNMENT

Step 1: Connect the vtvm to the OUTPUT connector. Then repeat Steps 2, 3, 4, and 5, paragraph 5.3.6.

Step 2: Start the standard tape in motion in the reproduce mode. As the first tone is reproduced adjust the REPRODUCE LEVEL control to achieve a convenient reference indication on the vtvm.

Step 3: Following the first tone on the standard tape, there are a series of tones for use in checking reproduce high frequency equalization. As these tones are reproduced, adjust the appropriate HI FREQ EQUAL control (at the back of the electronic assembly) to achieve the flattest possible response within specifications. However, reproduce response must be within ±2 db of the theoretical curves on Fig. 7-21.

NOTE

When a standard tape is reproduced by a half track or two track head, readings below 700 Hz (7-1/2 ips) or 500 Hz (3-3/4 ips) are invalid. The tape is recorded full track, and the "fringing" effect causes high indications at the lower frequencies. This effect does not occur when tapes are recorded and reproduced using heads of the same configuration.

Step 4: As the final tone on the tape is reproduced, adjust the REPRODUCE LEVEL control to achieve a +4 dbm indication on the vtvm. The equipment vu meter should indicate 0 (±3/4 db).

NOTE

The setting of the REPRODUCE LEVEL control in Step 4 must not be changed until record level is calibrated in Step 13.

Step 5: Allow the standard tape to continue in motion in the reproduce mode until it is completely wound on the takeup reel. Move that reel to the supply turntable and the standard tape reel to the takeup turntable. Place the equipment in the play mode and wind the standard tape back to its reel.

Step 6: Leave the vtvm connected to the OUTPUT connector. Connect the signal generator to the INPUT connector (either A or B input can be used).

Step 7: Set the signal generator to provide a nominal 1 volt rms output at the appropriate frequency listed:

7-1/2 ips	500 Hz
3-3/4 ips	250 Hz

Step 8: Thread blank tape on the transport.

Step 9: At the electronic assembly, place the OUTPUT SELECTOR switch in the REPRODUCE position and the RECORD SELECTOR switch in the RECORD position. (If this is two-channel equipment, leave the RECORD SELECTOR on the second electronic assembly in the SAFE position so that it will not record.)

Step 10: Remove the small cover, secured by two screws, from the front of the electronic assembly.

Step 11: Start the equipment in the record mode and adjust the applicable RECORD LEVEL control to achieve a convenient indication on the vtvm.

Step 12: Adjust the BIAS ADJUST control to achieve a peak indication on the vtvm.

Step 13: Set the signal generator to 500 Hz at a nominal 1 volt level. Adjust the RECORD LEVEL control to achieve a +4 dbm indication on the vtvm.

Step 14: Turn the OUTPUT SELECTOR switch to the INPUT position. Adjust the RECORD CAL control to achieve a 0 indication on the equipment vu meter.

Step 15: Repeat Steps 1, 2, 3, and 5, for the second tape speed, using the appropriate standard alignment tape and HI FREQ EQUAL control.

Step 16: If this is two-channel equipment, repeat the entire procedure for the second channel.

5.3.8 RECORD HEAD AZIMUTH ADJUSTMENTS

Equipment vu meters can be used in making this adjustment.

CAUTION

Do not tamper with any screw on the head assembly other than the one for azimuth adjustment, or it may become necessary to adjust head height.

Step 1: Connect the signal generator to the INPUT connector (either input A or B may be used). On two-channel equipment, connect the signal generator to the input of both channels.

Step 2: Set the signal generator to a nominal 1 volt rms output level at the appropriate frequency listed:

7-1/2 ips	15,000 Hz
3-3/4 ips	7,500 Hz

Step 3: At the electronic assembly, place the RECORD SELECTOR switch in the RECORD position and the OUTPUT SELECTOR switch in the INPUT position.

Step 4: Adjust the RECORD LEVEL control(s) to achieve a -10 indication on the vu meter(s). Turn the OUTPUT SELECTOR switch to the REPRODUCE position.

Step 5: Thread blank tape on the transport.

Step 6: Start the equipment in the record mode (both channels of two-channel equipment).

Step 7: While thus simultaneously recording and reproducing, adjust the record head azimuth (see Fig. 5-3) to achieve a maximum indication on the vtvm. If this is two-channel equipment, adjust to the optimum setting for the two heads in the record stack.

NOTE

Minor peaks may be observed on each side of the correct setting. Proper adjustment will be unmistakable, however, because it will result in an output obviously higher than the minor peaks.

5.4 INFREQUENTLY REQUIRED ALIGNMENT PROCEDURES

5.4.1 RECORD EQUALIZATION

The adjustment will be simplified by using the bias filter, shown in schematic form on Fig. 5-1. If the filter is not used, a trial-and-error method must be employed, where the tape is first recorded at different settings of the REC EQUALIZATION control and then reproduced to determine the correct setting. This will require several record and reproduce runs before the proper adjustment is finally determined.

Step 1: Connect the bias filter to the OUTPUT connector, connect the vtvm to the output of the filter.

Step 2: Connect the signal generator to the INPUT connector (either input A or B may be used). Set it to 500 Hz at a nominal 1 volt level.

Step 3: Apply power to the equipment. At the tape transport select the tape speed to be used. Select the corresponding equalization at the electronic assembly.

Step 4: Remove the small cover secured by two screws to the front panel of the electronic assembly.

Step 5: Set the signal generators to provide a 1 volt rms output at the applicable frequency listed:

7-1/2 ips	15,000 Hz
3-3/4 ips	8,000 Hz

Step 6: Thread blank tape on the equipment. Place the OUTPUT SELECTOR switch in the INPUT position and adjust the RECORD LEVEL control to achieve a -10 dbm indication on the vtvm.

Step 7: Start the equipment in the record mode. Turn the OUTPUT SELECTOR switch to the REPRODUCE position.

Step 8: While thus simultaneously recording and reproducing, change the frequency of the signal generator over the top end of the response spectrum for this tape speed (refer to Specifications in Section 1). Adjust the applicable REC EQUALIZATION control (LOW speed or HIGH speed) for the flattest possible high frequency response, in reference to 500 Hz, in accordance with specifications.

Step 9: Repeat Steps 3, 4, 5, and 6 for the second speed.

Step 10: If this is two-channel equipment, repeat the entire procedure for the second channel.

5.4.2 BIAS OSCILLATOR FREQUENCY ADJUSTMENT

This adjustment is made at the factory using an electronic counter. If such a counter is available, connect it across R41 on the record printed wiring board (with the record head connected). Place the equipment in the record mode (on one channel at a time if this is two-channel equipment). Adjust the tuning slug in transformer T1 (also on the record printed wiring board) to achieve a bias frequency as close as possible to 100,000 Hz.

NOTE

If this is two-channel equipment, the frequencies of the bias oscillators in the two electronic assemblies must be identical within ±1,000 Hz.

If an electronic counter is not available, do not attempt to adjust the bias oscillator frequency, except on two-channel equipment when a beat frequency becomes noticeable. If this should occur, slowly and carefully adjust the tuning slugs, alternating between the two oscillators, until the beat frequency is eliminated.

5.4.3 BIAS SYMMETRY ADJUSTMENT

This adjustment is made at the factory using a signal generator with a second harmonic distortion less than 0.2%, and a wave analyzer. The BIAS SYM control, on the back panel of the electronics assembly, is adjusted for minimum second harmonic distortion of a 500 Hz signal, placing only one channel at a time in the record

mode.

If a wave analyzer is not available, do not change the factory setting of this control unless some component in the bias and erase oscillator requires replacement. After completing such corrective maintenance, monitor the output through a high gain amplifier and loudspeaker (or headset) while simultaneously recording and reproducing with no input signal. Adjust the BIAS SYM control for minimum popping or hissing noise.

NOTE

If the BIAS SYM control has no audible effect, simply leave it in the mid-position.

5.5 PRINCIPLES OF OPERATION

5.5.1 GENERAL

A block diagram of the record/reproduce circuits is presented in Fig. 5-4. Complete schematic diagrams are provided in Section 7 for available versions of the equipment.

5.5.2 RECORD CIRCUIT

The signal to be recorded is connected to either or both receptacles J4 (input A) or J6 (input B), and is then routed in INPUT ACCESSORY sockets J5 or J7 respectively. Dummy plugs (provided) or optional accessory input transformers or microphone preamplifiers (refer to Section 1) must be inserted in J5 or J7 to complete the signal path.

Note that one side of the signal path is connected to the accessory sockets at pin 4, leaves the socket at pin 3 and is connected across the RECORD LEVEL control, returns to the accessory socket at pin 6, and finally leaves at pin 7. This connection allows the record level controls to be inserted between the two amplifier stages in the microphone preamplifier, when that optional accessory is used. The preamplifier can thus function as a variable gain device which will accommodate a wide variety of microphones.

Following the accessory socket and level control the two inputs are connected together through a resistive mixing circuit. The signal is then routed to the base of amplifier stage Q8. Note that the collector load for Q8 consists of the base circuit of emitter follower stage Q9.

Following Q9 there are two signal paths. The record signal is connected to contacts of EQUALIZATION switch S2, which select either the HIGH speed or LOW speed record equalization circuit. This circuit consists of resistor R29 shunted by resistor R56 and either capacitor C25 (high speed) or C26 (low speed) as selected by the switch. The record monitor signal is connected, through resistor R51 and the RECORD CAL control R50, to contacts of the OUTPUT SELECTOR switch. When that switch is in the INPUT position, the signal proceeds through the final three stages of the reproduce circuit (refer to paragraph 5.5.3) to the vu meter and output line for monitoring and calibration purposes.

Emitter follower stage Q10 follows the record equalization circuit in the record signal path. The signal is then amplified in a constant current amplifier stage formed by Q11 and Q12. In this amplifier, Q12 acts as current booster for Q11 and the circuit presents a relatively high a-c impedance (to provide a current that is insensitive to the changes in head impedance which occurs with changes in frequency), but a relatively low d-c impedance (so that the d-c operating voltage may be fully utilized). The signal then proceeds through a bias trap (L1, C15), is mixed with the a-c bias, and is delivered to the record head.

The record amplifier is made operative through contact sets of the RECORD SELECTOR switch S4, and PLAY-RECORD switch S5. Closing these contacts in the record mode shifts the d-c bias on transistor Q10, causing it and subsequently Q11 and Q12 to conduct; when the contacts are open the three transsistors are cut off. Thus the amplifier is inoperative in any but the record mode.

Transistors Q13 and Q14 form the bias and erase oscillator. This is a conventional push-pull circuit connected as a tuned flip-flop. Operating voltage is delivered only when the equipment is in the record mode, through contact sets of the RECORD SELECTOR and PLAY-RECORD switches. Symmetry of the output

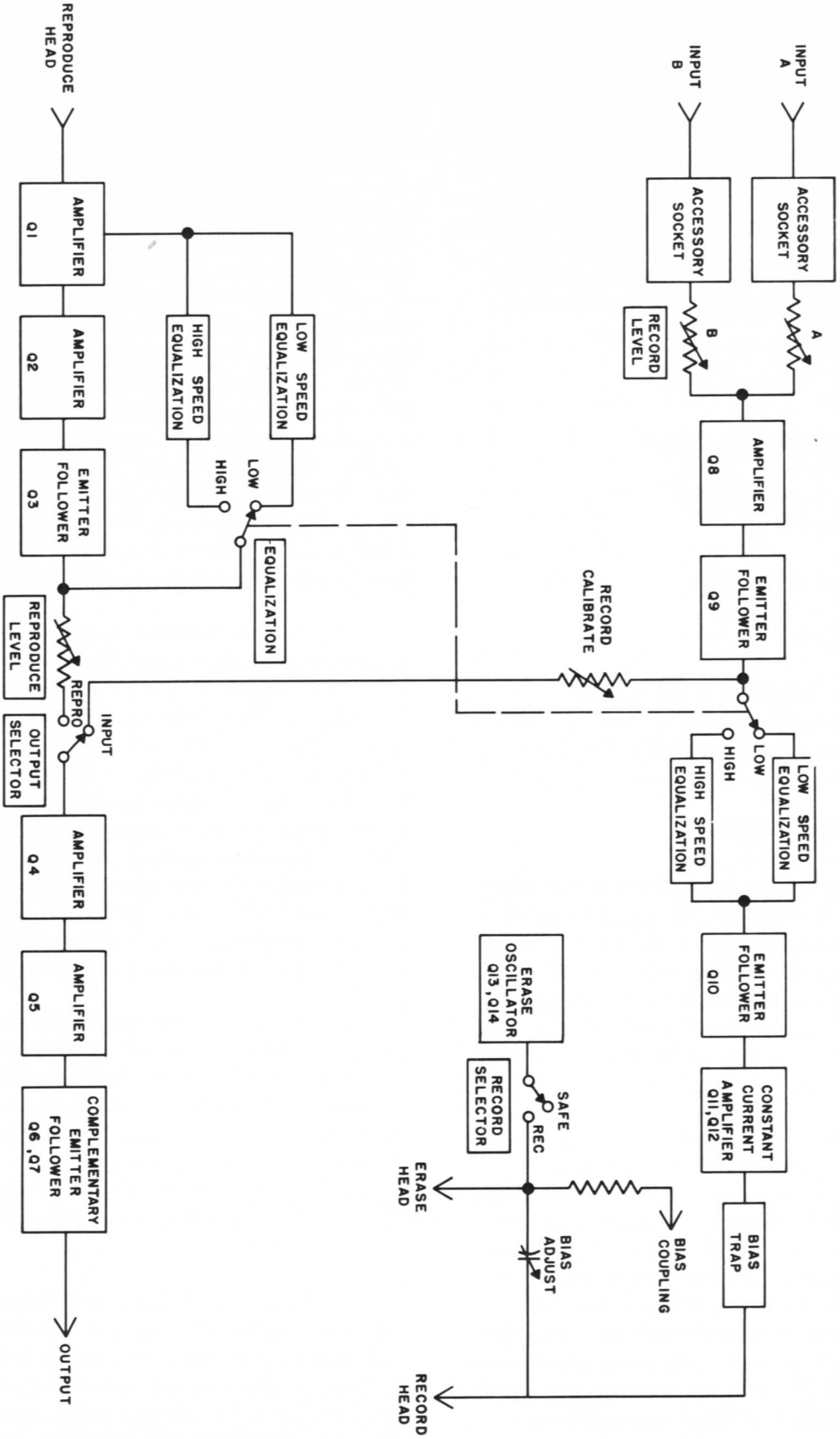


Fig. 5—4. Block Diagram, Electronic Circuit

401756A

waveform is adjustable at variable resistor R62, while the frequency is adjustable by a tuning slug in transformer T1 (nominal bias frequency is 100,000 Hz).

The output of the bias and erase oscillator is taken from the secondary of T1 to RECORD SELECTOR switch S4. When that switch is in the RECORD position the bias current is delivered through capacitor C28 to the erase head, and is adjusted at capacitor C27, mixed with the record signal and delivered to the record head. Also, a bias line is run through resistor R58 to pin 7 of receptacle J11. In two channel equipment this pin is connected to the output of the bias oscillator in the second electronic assembly; the coupling locks the frequencies of the two oscillators together so that no beat frequency is generated.

5.5.3 REPRODUCE CIRCUIT

From the reproduce head, the signal from the tape is routed through two amplifier stages (Q1 and Q2) and an emitter follower stage (Q3). Reproduce equalization is connected through contacts of EQUALIZATION switch S2, from the emitter of Q3 to the emitter of Q1. Variable resistors R47 (high speed) and R48 (low speed) are used.

Following emitter follower Q3 is the REPRODUCE LEVEL control, R49. The signal then proceeds through contacts of OUTPUT SELECTOR switch S3, which must be in the REPRODUCE position during playback. (Note that when this switch is in the INPUT position, the record monitor circuit is connected to the final three stages for calibration and monitoring of the record signal.)

After the OUTPUT SELECTOR switch, there are two amplifier stages (Q4 and Q5), and a complementary emitter follower output stage Q6/Q7. The output is transformer-coupled to the vu meter and OUTPUT connector J3. Headsets with impedances of 4 ohms or more can be used to monitor the output, either record or reproduce, at PHONES jack J2, which is connected in series with resistor R52 across the primary of the output transformer.

5.5.4 POWER SUPPLY CIRCUIT, DOMESTIC EQUIPMENT

The a-c power line voltage is connected to the master electronic assembly. One side of the line is fused by F1, and line power is then connected through power switch S1 across the primary of power transformer T3.

Diodes CR2 and CR3 provide full wave rectification in the center tapped secondary of T3. Transistor Q15 is a series (emitter follower) power transistor. Regulation is achieved by Zener diode VR1 which holds the base, and thus the emitter, of Q15 at a constant potential (23.4 volts, ±5%).

5.5.5 POWER SUPPLY CIRCUIT INTERNATIONAL EQUIPMENT

The only difference between this circuit and that in the domestic equipment is in the power input. In the international version, a selector switch on the back panel of the electronic assembly must be positioned in accordance with the a-c power line voltage - either 115 volts or 230 volts.

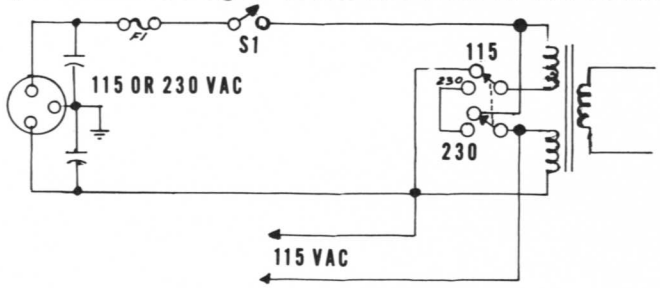


Fig. 5—5. Power Input Circuit, International Equipment

A simplified diagram of the international power input circuit is shown on Fig. 5-5. Line power is connected to receptacle J10. The line is switched by power switch S1 and fused by F1.

The a-c power is connected across the two primary windings of power transformer T3. Note, however, that the 115V - 230V switch is connected between the two primary windings. In the 230V position of this switch the windings are connected in series across the power line. The 115 volts a-c at the junction of the two windings is routed to the transport. In the 115V position of the switch, the two windings are connected in parallel, and both sides of the line are routed to the transport.

Section 6

HEAD ASSEMBLY

6.1 GENERAL

There are three head stacks on this equipment - erase, record, and reproduce from left to right in the tape threading path. The heads in each stack can be full track (for single channel operation) or two track (for single channel half track or stereophonic two track operation). Note that there is no half track head as such, a complete two track assembly is provided for such equipment (one head is not connected).

Two track stereophonic heads can be of two varieties--either standard two track or quarter track.

6.2 ROUTINE MAINTENANCE

6.2.1 CLEANING

The most important routine maintenance procedure is to keep the equipment clean. Magnetic tape itself is a major source of contamination, depositing oxide on every component which it contacts. If these deposits, and accumulations of air-borne dust, are not removed at regular intervals, flutter and wow will increase and frequency response will decrease.

Clean magnetic heads, and all other components in the tape threading path, after each eight hour operating period. The procedure is as follows:

Step 1: Remove the screw which secures the head cover in position and lift the head cover from the equipment.

Step 2: Remove the two screws located on the back (reel side) of the head assembly, and lift the head shield from the equipment.

CAUTION

Use only the recommended solvent to clean the heads, using a cotton-tipped applicator. Do not let the solution drip or spray on plastic finishes or parts, or on the tire of the capstan idler. Also, do not use metal tools which will scratch the heads.

Step 3: Clean each head with Ampex Head Cleaner, Catalog No. 4010823 or 087-007.

Step 4: Clean the tape guides, capstan, and capstan idler with denatured alcohol (which is available at any drugstore). Do not use the head cleaning solution on these components.

6.2.2 DEMAGNETIZING HEADS

Head assemblies occasionally acquire a degree of permanent magnetization which can result in increased noise and distortion, and a partial erasure of high frequency signals on recorded tapes. Demagnetize the heads after each eight hour operating period, at the same time the heads are cleaned. This is easily accomplished using an Ampex Head Demagnetizer, Catalog No. 4010820.

In the procedure described below, it is assumed that the head cover and shield have been removed to clean the heads.

Step 1: Turn power off at the recorder, and remove any tape that is on or near the equipment (tape will be partially erased by the action of the demagnetizer).

Step 2: Cover the tips of the demagnetizer with electrician's tape, or some similar tape (to prevent scratching the heads), and plug the demagnetizer into a source of 110 - 120 volt, a-c power.

Step 3: Bring the tips of the demagnetizer into very light contact with the head, positioned so the tips straddle the gaps in the center of the head.

Step 4: With a slow, smooth motion, run the tips up and down the stack several times, then slowly withdraw the demagnetizer (slow withdrawal is required for effective demagnetization).

Step 5: Repeat Steps 3 and 4 at all heads.

Step 6: Withdraw the demagnetizer at least three feet from the recorder before unplugging it. Replace the head shield and cover.

6.3 ADJUSTMENT PROCEDURES

6.3.1 HEAD AZIMUTH

Reproduce and record head azimuth adjustments are described as part of the electronic checkout procedure in Section 5.

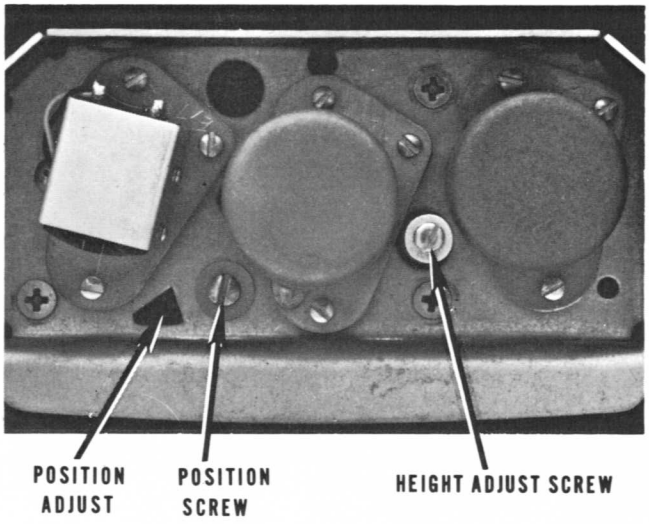


Fig. 6—1. Tape Guide

6.3.2 TAPE GUIDE POSITION

The tape guide between the record and reproduce heads (see Fig. 6-1) can be adjusted both for height and position.

To check if the height of the guide is correct, remove the head cover and shield (refer to Steps 1 and 2, paragraph 6.2.1). Thread tape on the equipment and place it in motion in the play mode at 7-1/2 ips. Visually check the tape movement across the guide; it should track directly in the middle of the sleeve with no deviation from a straight line as it enters and leaves the guide. If it appears necessary to adjust the height it is done by running the screw at the top of the guide in (to lower or out (to raise).

To check the position of the tape guide, place a wooden rule (or other straightedge which will not scratch the heads) between the faces of the record and reproduce head stacks. The rule should just touch the sleeve on the tape guide. If adjustment is necessary, loosen the position screw (see Fig. 6-1). A positioning lever is accessible through a small triangular-shaped aperture; use a small screwdriver or similar tool to move the lever so the guide is in the correct position.

6.3.3 HEAD HEIGHT

6.3.3.1 General

Head heights are precisely adjusted at the factory, and there should be no reason for readjustment unless a head stack is changed. The procedure must be performed carefully and exactly. Also, check the height of the tape guide (refer to paragraph 6.3.2) to make sure it is correct before adjusting head heights.

6.3.3.2 Full Track and Half Track Heads

Step 1: Remove the head cover and head shield (refer to Steps 1 and 2, paragraph 6.2.1).

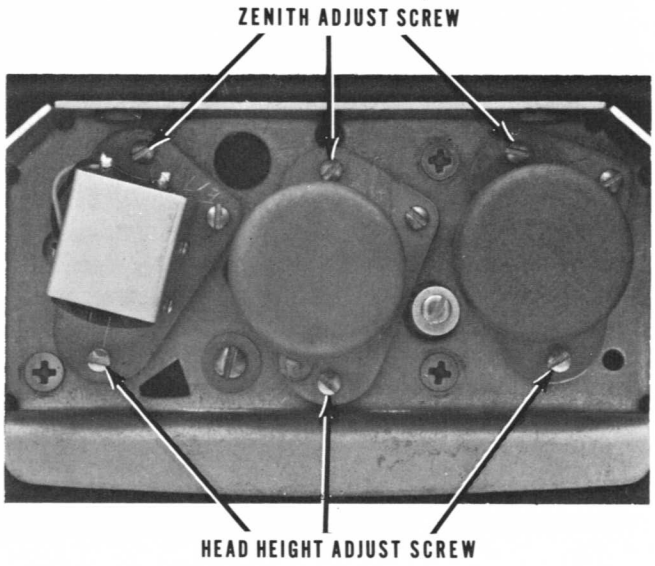


Fig. 6—2. Head Adjustments

Step 2: Adjust the head height and azimuth until it is approximately correct by turning all three screws on the head mounting an equal number of turns.

Step 3: Thread tape on the transport and place it in motion in the play mode at 7-1/2 ips.

Step 4: Turn the head height adjusting screw (see Fig. 6-2) counter clockwise until the head laminations are even with the top edge of the tape.

Step 5: Carefully counting the precise number of turns required, turn the head height adjusting screw clockwise until the head laminations are even with the bottom edge of the tape.

Step 6: Turn the head height adjusting screw counterclockwise exactly half the number of turns noted in Step 5. This will center the heads on the tape.

Step 7: Adjust head azimuth (refer to Section 5) and head zenith (refer to paragraph 6.3.4. Note that there may be some interaction between the height and zenith alignments.

6.3.3.3 Quarter Track Heads

Step 1: Perform Steps 1, 2, and 3, paragraph 6.3.3.2.

Step 2: Adjust the head height adjusting screw until the mu-metal portion of the top head in the stack is exactly even with the top edge of the tape.

NOTE

For a quarter track erase head, after performing Step 2, turn the head height adjusting screw 1/8 turn (45°) in a counterclockwise direction, thus moving the top of the erase head slightly above the top edge of the tape. This is required because the erase head is slightly wider than the record and reproduce heads.

6.3.4 HEAD ZENITH

The tape must contact the head equally well at the top and bottom of the stack. To check this adjustment (designated as head zenith) use a grease pencil or crayon to lightly cover the face of the head. Thread tape on the equipment and start it in motion in the play mode at 7-1/2 ips, and allow it to run for approximately ten seconds. Lift the tape from the head and examine the coating. The area which has been cleaned by the tape should be equally clean at the top and bottom of the tape contact area.

If the adjustment appears necessary,

adjust the zenith adjusting screw (see Fig. 6-2) in small increments. Running the zenith adjusting screw out, will move the top of the head out (toward the tape). Running the zenith adjusting screw in will move the top of the head in (away from the tape). Recheck and re-adjust as required, using the grease pencil method, until zenith is correct.

Check head height and azimuth alignment after adjusting the head zenith.

6.4 CORRECTIVE MAINTENANCE

6.4.1 REMOVING COMPLETE HEAD ASSEMBLY

Step 1: Disconnect all head cables from the electronic assemblies.

Step 2: Remove the head cover and head shield.

Step 3: Remove the three screws (see Fig. 6-3) which secure the head assembly to the transport casting.

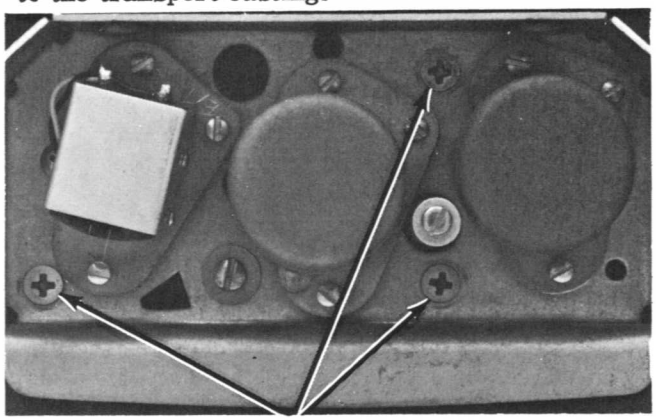


Fig. 63. Removing Complete Head Assembly

Step 4: Lift the head assembly from the transport, guiding the cables out through the hole in the casting.

6.4.2 CHANGING HEAD STACK

Step 1: Remove the complete head assembly from the transport (refer to paragraph 6.4.1).

Step 2: Remove the cover on the cable assembly bracket (item 10, Figs. 7-11, through 7-14).

Step 3: Unsolder the leads of the head stack to be replaced from the terminals in the cable assembly bracket.

Step 4: Being careful not to lose the springs beneath the head mounting, remove the three screws (head zenith, head height, head zenith, see Fig. 6-2) which secure the head stack to the base assembly. Lift the head stack from the base, guiding the leads through the hole in the base.

Step 5: Insert the leads on the new head assembly through the hole in the base, and mount the new assembly on the base. Use the three screws removed in Step 4, inserting the mounting springs between the head stack and base.

Step 6: Twist the leads from the new head assembly and cut them to length, stripping them 1/8-inch. Lay the leads in the terminals (do not wrap) and solder them in position. (Correct connections are shown on Figs. 7-11 through 7-14).

Step 7: Replace the cover on the cable assembly bracket, remount the entire head assembly on the transport, and re-connect all head cables to the electronic assemblies.

Step 8: Check and adjust head height (refer to paragraph 6.3.3), head zenith (refer to paragraph 6.3.4), and head azimuth (refer to Section 5).

MODEL AG-600 RECORDER/REPRODUCER
Single Channel
Catalog No. 4010063

-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	DESCRIPTION	Ampex Part No.
x												NAB, Full Track, Unmounted, 60 Hz	4010063-01
	x											NAB, Full Track, Portable, 60 Hz	4010063-02
		x										NAB, Half Track, Unmounted, 60 Hz	4010063-03
			x									NAB, Half Track, Portable, 60 Hz	4010063-04
				x								NAB, Full Track, Unmounted, 50 Hz	4010063-05
					x							NAB, Full Track, Portable, 50 Hz	4010063-06
						x						NAB, Half Track, Unmounted, 50 Hz	4010063-07
							x					NAB, Half Track, Portable, 50 Hz	4010063-08
								x				CCIR, Full Track, Unmounted, 50 Hz	4010063-09
									x			CCIR, Full Track, Portable, 50 Hz	4010063-10
										x		CCIR, Half Track, Unmounted, 50 Hz	4010063-11
											x	CCIR, Half Track, Portable, 50 Hz	4010063-12
1	1	1	1									Tape Transport, 60 Hz	4020187-01
				1	1	1	1	1	1	1	1	Tape Transport, 50 Hz	4020187-02
1	1			1	1			1	1			Head Assembly, Full Track	4020191-01
		1	1			1	1			1	1	Head Assembly, Half Track	4020191-02
1	1	1	1									Electronics Assembly, NAB, Master	4020257-01
				1	1	1	1					Electronics Assembly, NAB, Int'l	4020257-03
								1	1	1	1	Electronics Assembly, CCIR, Int'l	4020257-06
1	1	1	1	1	1	1	1	1	1	1	1	Head Cover Assembly	4041023-01
2	2	2	2	2	2	2	2	2	2	2	2	Knob, hold down, black	4130028-20
	1		1		1		1		1		1	Case, portable	4150233-01
1	1	1	1	1	1	1	1	1	1	1	1	Shield, head cover	4290430-10
1	1	1	1	1	1	1	1	1	1	1	1	Reel, standard, 7-inch, blank	4690069-10
1	1	1	1	1	1	1	1	1	1	1	1	Instruction Manual	4890175
1	1	1	1	1	1	1	1	1	1	1	1	Microphone Preamplifier	4010066-01
1	1	1	1	1	1	1	1	1	1	1	1	Cord Set, power, 8 foot	084-027
1	1	1	1	1	1	1	1	1	1	1	1	Magnetic Tape, 1200 feet, 1-1/2 mylar (blank)	763-191
1	1	1	1									Plug Kit	4050256-10
				1	1	1	1	1	1	1	1	Plug Kit	4050256-40
2	2	2	2	2	2	2	2	2	2	2	2	Connector, audio, 3 socket, female	145-009
				1	1	1	1	1	1	1	1	Fuse, 0.5 ampere, slo-blo	070-026
1	1	1	1	1	1	1	1	1	1	1	1	Connector, telephone plug	149-004

MODEL AG-600 RECORDER/REPRODUCER
Dual Channel
Catalog No. 4010064

-01	-02	-03	-04	-05	-06	-07	-08	-09	-10	-11	-12	DESCRIPTION	Ampex Part No.
x												NAB, Two Track, Unmounted, 60 Hz	4010064-01
	x											NAB, Two Track, Portable, 60 Hz	4010064-02
		x										NAB, Quarter Track, Unmounted, 60 Hz	4010064-03
			x									NAB, Quarter Track, Portable, 60 Hz	4010064-04
				x								NAB, Two Track, Unmounted, 50 Hz	4010064-05
					x							NAB, Two Track, Portable, 50 Hz	4010064-06
						x						NAB, Quarter Track, Unmounted, 50 Hz	4010064-07
							x					NAB, Quarter Track, Portable, 50 Hz	4010064-08
								x				CCIR, Two Track, Unmounted, 50 Hz	4010064-09
									x			CCIR, Two Track, Portable, 50 Hz	4010064-10
										x		CCIR, Quarter Track, Unmounted, 50 Hz	4010064-11
											x	CCIR, Quarter Track, Portable, 50 Hz	4010064-12
1	1	1	1									Tape Transport, 60 Hz	4020187-01
				1	1	1	1	1	1	1	1	Tape Transport, 50 Hz	4020187-02
1	1			1	1			1	1			Head Assembly, two track	4020192-01
		1	1			1	1			1	1	Head Assembly, quarter track	4020194-01
1	1	1	1									Electronics Assembly, NAB, Master	4020257-01
1	1	1	1	1	1	1	1	1	1	1	1	Electronics Assembly, NAB, Slave	4020257-02
				1	1	1	1					Electronics Assembly, NAB, Int'l	4020257-03
								1	1	1	1	Electronics Assembly, CCIR, Slave	4020257-05
								1	1	1	1	Electronics Assembly, CCIR, Int'l	4020257-06
1	1	1	1	1	1	1	1	1	1	1	1	Head Cover Assembly	4041023-01
1	1	1	1	1	1	1	1	1	1	1	1	Cable Assembly, Electronics Interconnect	4050098-01
2	2	2	2	2	2	2	2	2	2	2	2	Knob, hold down, black	4130028-20
	1		1		1		1		1		1	Case, portable	4150232-01
1	1	1	1	1	1	1	1	1	1	1	1	Shield, head cover	4290430-10
1	1	1	1	1	1	1	1	1	1	1	1	Reel, standard, 7-inch, blank	4690069-10
1	1	1	1	1	1	1	1	1	1	1	1	Instruction Manual	4890175
1	1	1	1	1	1	1	1	1	1	1	1	Cord Set, power, 8 foot	084-027
1	1	1	1	1	1	1	1	1	1	1	1	Magnetic Tape, 1200 feet, 1-1/2 mylar (blank)	763-191
2	2	2	2	2	2	2	2	2	2	2	2	Microphone Preamplifier	4010066-01
1	1	1	1									Plug Kit	4050256-20
				1	1	1	1	1	1	1	1	Plug Kit	4050256-50
4	4	4	4	4	4	4	4	4	4	4	4	Connector, Audio, 3 socket, female	145-009
2	2	2	2	2	2	2	2	2	2	2	2	Connector, telephone plug	149-004
				1	1	1	1	1	1	1	1	Fuse, 0.5 ampere, slo-blo	070-026

Item	Fig. No.	-01	-02	DESCRIPTION	Ampex Part No.
		x		Tape Transport, 60 Hz	4020187-01
			x	Tape Transport, 50 Hz	4020187-02
1	7-1	1	1	Pulley Assembly, capstan idler	4030024-10
2	7-2	1	1	Arm Assembly, play takeup	4030025-10
1	7-3	1	1	Pulley Assembly, play takeup idler	4040174-10
2	7-3	1	1	Arm	4040598-10
3	7-3	1	1	Spring, play takeup engage	4270070-10
4	7-3	2	2	Washer, lamicoid	4440025-10
5	7-3	2	2	Washer, thrust	4440027-10
7	7-3	1	1	Retainer, hair pin	431-006
3	7-2	1	1	Arm Assembly, capstan idler	4030027-10
1	7-4	1	1	Arm Sub-Assembly	4040158-10
2	7-4	1	1	Anchor	4230062-10
3	7-4	1	1	Release Roller, capstan idler	4250049-10
4	7-4	1	1	Spring, capstan idler	4270074-10
4	7-4	1	1	Rewind Arm Assembly	4030083-01
1	7-5	1	1	Arm and Bearing Assembly	4030194-10
2	7-5	1	1	Disc Assembly, drive clutch	4040165-20
3	7-5	1	1	Plate Assembly, clutch	4040166-10
4	7-5	1	1	Brake Assembly, holdback	4040167-10
5	7-5	1	1	Shaft Assembly, turntable	4041018-01
6	7-5	1	1	Collar, holdback, brake	4220054-20
7	7-5	1	1	Collar	4220055-20
8	7-5	1	1	Collar, clutch spring	4220098-01
9	7-5	1	1	Spring, clutch	4270111-01
10	7-5	1	1	Shield, clutch, lower	4290176-01
11	7-5	1	1	Shield, clutch, upper	4290177-01
12	7-5	2	2	Washer, thrust	4440062-20
16	7-5	3	3	Steel Ball, .094 dia.	420-028
17	7-5	1	1	Ball Bearing, thrust	421-234
5	7-2	1	1	Takeup Arm Assembly	4030084-01
1	7-6	1	1	Arm and Bearing Assembly	4030194-10
2	7-6	1	1	Disc Assembly, drive clutch	4040165-10
3	7-6	1	1	Disc Assembly, drive clutch	4040165-20
4	7-6	1	1	Plate Assembly, clutch	4040166-10
5	7-6	1	1	Brake Assembly, holdback	4040167-10
6	7-6	1	1	Shaft Assembly, turntable	4041018-01
7	7-6	1	1	Collar, holdback brake	4220054-20
8	7-6	1	1	Collar, clutch spring	4220098-01
9	7-6	1	1	Link, turntable pivot control	4230068-10
10	7-6	1	1	Disc, play takeup clutch	4250044-10
11	7-6	2	2	Spring, turntable pivot	4270063-10
12	7-6	1	1	Spring, play takeup clutch	4270069-10
13	7-6	1	1	Spring, clutch	4270111-01
14	7-6	1	1	Shield, clutch, lower	4290176-01
15	7-6	1	1	Shield, clutch, upper	4290177-01
16	7-6	3	3	Washer, thrust	4440062-20
17	7-6	2	2	Washer, turntable pivot spring retainer	4440072-10
22	7-6	3	3	Steel Ball, .094 dia	420-028
23	7-6	1	1	Ball Bearing, thrust	421-234
24	7-6	1	1	Bushing, porous	422-004
6	7-2	1	1	Arm Assembly, capstan belt idler	4030085-01
1	7-7	1	1	Arm Sub-Assembly	4040936-01
2	7-7	1	1	Idler Assembly, capstan belt	4041022-01
3	7-7	1	1	Shaft, capstan belt idler	4210305-01
4	7-7	4	4	Washer	4440300-01
5	7-7	3	3	Washer	4440301-01
6	7-7	1	1	Retainer, "E" ring	430-067
7	7-7	1	1	Socket Setscrew, 6-32 x 1/4	477-035
7	7-2	1	1	Plate Assembly	4030086-01
1	7-8	1	1	Idler Assembly, rewind	4030033-10
2	7-8	2	2	Brake Assembly, shock relief	4040160-10
3	7-8	1	1	Lever, brake actuator	4230060-10
4	7-8	1	1	Lever, play mode brake relief	4230061-10
6	7-8	1	1	Spring, rewind idler	4270058-10
7	7-8	1	1	Spring, play takeup brake release	4270059-10
8	7-8	2	2	Spring, clevis pin	4270060-10
9	7-8	2	2	Spring, brake, shock relief	4270061-10

Item	Fig. No.	-01	-02	DESCRIPTION	Ampex Part No.
10	7-8	1	1	Sub-Plate	4330190-10
11	7-8	2	2	Washer, brake shock self actuator	4440064-10
12	7-8	1	1	Switch Deck, 3 position	4620197-01
20	7-8	1	1	Pin, straightheaded, 0.125 dia. x 0.469	400-007
21	7-8	1	1	Pin, straightheaded, 0.124 dia. x 0.953	400-016
22	7-8	1	1	Pin, straightheaded, 0.125 dia. x 0.563	400-030
23	7-8	2	2	Pin, cotter, .063 dia. x 0.5	401-005
24	7-8	2	2	Retainer, hairpin	431-002
8	7-2	1		Motor Assembly, 60 Hz	4030087-01
9	7-2		1	Motor Assembly, 50 Hz	4030087-02
1	7-9	1		Pulley, motor, 60 Hz	4250069-01
2	7-9		1	Pulley, motor, 50 Hz	4250072-01
4	7-9	1	1	Motor, drive (Redmond)	4590099-30
5	7-9	1	1	Plate, drive motor mounting	4980231-10
10	7-9	1	1	Shaft, fan	4210146-01
11	7-9	1	1	Flywheel	4250071-01
10	7-2	1	1	Arm Assembly, play control	4030176-30
-	-	1	1	Play Actuator Arm	4040696-20
-	-	1	1	Switch, play-record (S5)	4620035-10
11	7-2			Arm Assembly, rewind and fast forward control	4030177-30
-	-	1	1	Rewind Actuator Arm	4040697-20
-	-	1	1	Detent, Switch	4620035-10
12	7-2	1	1	Speed Shift Assembly	4030180-01
1	7-10	1	1	Bracket Assembly	4041020-01
2	7-10	1	1	Shaft, speed shift	4210240-20
3	7-10	1	1	Shaft, speed shift bracket	4210307-01
4	7-10	1	1	Arm, speed shift	4230125-01
5	7-10	1	1	Fork, belt shift	4230236-01
6	7-10	2	2	Clamp, shift fork	4260106-01
8	7-10	4	4	Spring, shifter	4270112-01
9	7-10	4	4	Ball, 0.250 dia	420-020
13	7-2	1	1	Counter Assembly	4040695-10
-	-	1	1	Button, reset	4100158-10
-	-	1	1	Counter	4140015-10
-	-	1	1	Plate, counter mounting	4330191-10
14	7-2	1	1	Flywheel Assembly, capstan	4041019-01
16	7-2	1	1	Cable Assembly, captive	4050099-01
-	-	1	1	Connector, plug, male; 12 contacts (P1)	145-443
19	7-1	1	1	Knob, speed shift	4100060-01
20	7-1	1	1	Cap, capstan	4100061-01
21	7-1	2	2	Knob, control	4100157-10
22	7-1	1	1	Cap, tape guide	4100159-20
23	7-2	1	1	Button, record safety	4100062-01
24	7-2	1	1	Pad, shift fork	4130045-01
25	7-1	1	1	Guide, tape	4210005-10
26	7-1	2	2	Bar, tape guide	4210237-10
27	7-1	1	1	Pin, tape guide	4210238-10
28	7-2	2	2	Spacer, motor mounting	4220058-10
29	7-2	1	1	Spacer, play takeup arm	4220099-01
30	7-2	1	1	Link, turntable pivot	4230066-10
31	7-1	2	2	Turntable, reel	4250040-10
32	7-2	1	1	Disc, capstan thrust	4250041-20
33	7-2	2	2	Spring, turntable	4270062-10
34	7-2	1	1	Spring, turntable center detent	4270071-10
35	7-2	1	1	Spring, belt idler tension	4270113-01
36	7-1	1	1	Cap, capstan idler	4290098-10
37	7-1	1	1	Seal, capstan, dust	4280024-10
38	7-2	1	1	Belt, capstan drive	4310065-01
39	7-2	a/r	a/r	Washer, lamicoid	4440025-10
40	7-2	a/r	a/r	Washer, lamicoid	4440025-20
41	7-2	a/r	a/r	Washer, lamicoid	4440025-30
42	7-2	4	4	Washer, lamicoid	4440025-50
43	7-2	a/r	a/r	Washer, lamicoid	4440025-80

Item	Fig. No.	-01	-02	DESCRIPTION	Ampex Part No.
44	7-2	1	1	Washer, cambric	4440027-10
45	7-2	1	1	Washer, capstan flywheel	4440068-01
46	7-1	2	2	Washer, thrust	4440101-01
47	7-1	2	2	Washer, spacer	4440287-10
48	7-2		1	Capacitor, 3 mfd	4540308-10
49	7-2	1		Capacitor, 2.5 mfd	4540309-10
51	7-2	4	4	Washer, differential mounting	4440069-10
52	7-2	1	1	Spring, leaf, record lock	4270056-20
53	7-2	3	3	Foot, tape transport	4130046-01
56	7-2	1	1	Boot, capacitor	032-082
64	7-2	2	2	Pin, clevis, 1/8 dia x 11/32	400-004
65	7-2	5	5	Pin, clevis, 1/8 dia x 13/32	400-005
66	7-2	5	5	Pin, cotter, 1/16 dia x 1/2	401-005
67	7-2	2	2	Ball, 5/16 dia.	420-004
68	7-2	1	1	Ball Bearing	421-117
69	7-2	5	5	Retainer, hair pin	431-006
70	7-2	1	1	"O" Ring	432-010
71	7-2	1	1	"O" Ring	432-016
95	7-2	1	1	Fan, 3-inch dia.	591-160

Ref. No.		-01	-02	-03	-04	-05	-06	DESCRIPTION	Location	Ampex Part No.
		x						Electronics Assembly, NAB Master		4020257-01
			x					Electronics Assembly, NAB Slave		4020257-02
				x				Electronics Assembly, NAB International		4020257-03
					x			Electronics Assembly, CCIR Master		4020257-04
						x		Electronics Assembly, CCIR Slave		4020257-05
							x	Electronics Assembly, CCIR International		4020257-06
C1		2	2	2	2	2	2	Capacitor, tantalum; 10 mfd, ±20%, 6 vdcw	Repro. P.W.B.	037-398
C2		1	1	1	1	1	1	Capacitor, mica; 390 pfd, ±5%, 500 vdcw	Repro. P.W.B.	034-288
C3		1	1	1	1	1	1	Capacitor, electrolytic; 100 mfd, -10+75%, 12 vdcw	Repro. P.W.B.	031-191
C4		1	1	1	1	1	1	Capacitor, mica; 100 pfd, ±5%, 500 vdcw	Repro. P.W.B.	034-177
C5		4	4	4	4	4	4	Capacitor, tantalum; 15 mfd, ±20%, 15 vdcw	Repro. P.W.B.	037-446
C6		x	x	x	x	x	x	Same as C5	Repro. P.W.B.	
C7		3	3	3	3	3	3	Capacitor, tantalum; 3.9 mfd, ±20%, 25 vdcw	Repro. P.W.B.	037-445
C8		x	x	x	x	x	x	Same as C5	Repro. P.W.B.	
C9		x	x	x	x	x	x	Same as C5	Repro. P.W.B.	
C10		x	x	x	x	x	x	Same as C7	Rec. P.W.B.	
C11		1	1	1	0	0	0	Capacitor, mylar; .018 mfd, ±5%, 100 vdcw	Rec. P.W.B.	055-105
C12		1	1	1	1	1	1	Capacitor, mylar; 0.1 mfd, ±10%, 100 vdcw	Rec. P.W.B.	055-106
C13		1	1	1	1	1	1	Capacitor, mica; 20 pfd, ±5%, 500 vdcw	Rec. P.W.B.	034-944
C14		x	x	x	x	x	x	Same as C1	Rec. P.W.B.	
C15		1	1	1	1	1	1	Capacitor, mica; 500 pfd, ±5%, 300 vdcw	Rec. P.W.B.	034-933
C16		x	x	x	x	x	x	Same as C7	Rec. P.W.B.	
C17		1	1	1	1	1	1	Capacitor, mylar; 6800 pfd, ±5%, 100 vdcw	Rec. P.W.B.	055-103
C18		2	2	2	2	2	2	Capacitor, mylar; 5600 pfd, ±5%, 100 vdcw	Rec. P.W.B.	055-102
C19		x	x	x	x	x	x	Same as C18	Rec. P.W.B.	055-102
C20		1	1	1	1	1	1	Capacitor, mylar; 7500 pfd, ±5%, 50 vdcw	Rec. P.W.B.	055-212
C21		1	1	1	1	1	1	Capacitor, mylar; .01 mfd, ±5%, 100 vdcw	Bk. Panel	035-732
C22		1	1	1	1	1	1	Capacitor, electrolytic; 500 mfd, -10+100%, 15 vdcw	Fr. Panel	031-297
C23		2	2	2	2	2	2	Capacitor, electrolytic; 1 mfd, -10+75%, 25 vdcw	Bk. Panel	031-294
C24		x	x	x	x	x	x	Same as C23	Bk. Panel	
C25		1	1	1	1	1	1	Capacitor, variable; 25 pfd to 280 pfd, 350 vdcw	Fr. Panel	4540314-01
C26		2	2	2	2	2	2	Capacitor, variable, 50 pfd to 380 pfd, 350 vdcw	Fr. Panel	4540314-02
C27		x	x	x	x	x	x	Same as C26	Fr. Panel	
C28		1	1	1	1	1	1	Capacitor, mica, .0025 mfd, ±5%, 500 vdcw	Fr. Panel	034-994
C29		1	1	1	1	1	1	Capacitor, 2 section, electrolytic; 1000-500 mfd, 35 vdcw	Bk. Panel	4550147-02
C30		1	1	1	1	1	1	Capacitor, 4 section, electrolytic; 500-500-200-200 mfd, 25 vdcw	Bk. Panel	4550147-01
C31		3	-	3	3	-	3	Capacitor, ceramic; .005 mfd, -20+80%, 1400 vdcw	Pwr. Rec.	030-465
C32		x	-	x	x	-	x	Same as C31	Pwr. Rec.	
C33		-	-	-	-	-	-	(On tape transport--motor capacitor)		
C34		x	1	x	x	1	x	Same as C31	Bk. Panel	
CR1		1	1	1	1	1	1	Diode, silicon; small signal, switching	Rec. P.W.B.	013-599
CR2		2	2	2	2	2	2	Diode, silicon; large signal rectifier	Bk. Panel	013-678
CR3		x	x	x	x	x	x	Same as CR2	Bk. Panel	
DS1		1	1	1	1	1	1	Lamp, meter	Fr. Panel	4610081-01
DS2		1	1	1	1	1	1	Lamp, record	Fr. Panel	4610082-01
F1		1		1	1		1	Fuse, slo-blo; 0.75 ampere (For 115 vac operation, see Note 1)	Chassis	070-048
J1		3	3	3	3	3	3	Connector, telephone jack	Bk. Panel	143-127
J2		1	1	1	1	1	1	Connector, telephone jack	Fr. Panel	148-015
J3		1	1	1	1	1	1	Connector, telephone jack	Chassis	4630041-10
J4		2	2	2	2	2	2	Connector, audio; 3 sockets, female	Chassis	146-998
J5		2	2	2	2	2	2	Socket, octal	Bk. Panel	150-023
J6		x	x	x	x	x	x	Same as J4	Chassis	
J7		x	x	x	x	x	x	Same as J5	Bk. Panel	
J8		x	x	x	x	x	x	Same as J1	Bk. Panel	
J9		x	x	x	x	x	x	Same as J1	Bk. Panel	
J10		1	-	1	1	-	1	Connector, ac, 3 pins, male	Chassis	147-396
J11		1		1	1		1	Connector, receptacle, 12 sockets, female	Bk. Panel	146-009
J11			1			1		Connector, receptacle, 8 sockets, female	Bk. Panel	146-003
L1		1	1	1	1	1	1	Inductor, fixed; 5 millihenries, ±5%	Rec. P.W.B.	051-342
M1		1	1	1	1	1	1	Meter, vu	Fr. Panel	4140019-01
P1		-	-	-	-	-	-	(On cable captive at tape transport)		
Q1		4	4	4	4	4	4	Transistor, silicon; npn, low noise, low level	Repro. P.W.B.	014-698

Ref. No.	-01	-02	-03	-04	-05	-06	DESCRIPTION	Location	Ampex Part No.
Q2	x	x	x	x	x	x	Same as Q1	Repro. P.W.B.	
Q3	4	4	4	4	4	4	Transistor, silicon; pnp	Repro. P.W.B.	014-652
Q4	x	x	x	x	x	x	(Same as Q3)	Repro. P.W.B.	
Q5	x	x	x	x	x	x	Same as Q1	Repro. P.W.B.	
Q6	1	1	1	1	1	1	Transistor, silicon; npn, 2N3706	Repro. P.W.B.	014-585
Q7	2	2	2	2	2	2	Transistor, silicon; pnp, 300 mw	Repro. P.W.B.	014-611
Q8	x	x	x	x	x	x	Same as Q1	Rec. P.W.B.	
Q9	x	x	x	x	x	x	Same as Q3	Rec. P.W.B.	
Q10	x	x	x	x	x	x	Same as Q3	Rec. P.W.B.	
Q11	x	x	x	x	x	x	Same as Q7	Rec. P.W.B.	
Q12	3	3	3	3	3	3	Transistor, silicon; npn, 800 mw	Rec. P.W.B.	014-247
Q13	x	x	x	x	x	x	Same as Q12	Rec. P.W.B.	
Q14	x	x	x	x	x	x	Same as Q12	Rec. P.W.B.	
Q15	1	1	1	1	1	1	Transistor, silicon, npn; power, 40250	Bk. Panel	014-587
R1	3	3	3	3	3	3	Resistor, fixed, comp; 270,000 ohms,±10%,1/2w;RC20GF274K	Repro. P.W.B.	041-077
R2	3	3	3	3	3	3	Resistor, fixed, comp; 82,000 ohms,±10%, 1/2w;RC20GF823K	Repro. P.W.B.	041-071
R3	1	1	1	1	1	1	Resistor, fixed, comp; 1,800 ohms,±10%,1/2w;RC20GF182K	Repro. P.W.B.	041-051
R4	4	4	4	4	4	4	Resistor, fixed, comp; 100,000 ohms,±10%,1/2w;RC20GF104K	Repro. P.W.B.	041-072
R5	1	1	1	1	1	1	Resistor, fixed, comp; 39,000 ohms,±10%,1/2w;RC20GF393K	Repro. P.W.B.	041-067
R6	4	4	4	4	4	4	Resistor, fixed, comp 220 ohms,±10%,1/2w;RC20GF221K	Repro. P.W.B.	041-040
R7	x	x	x	x	x	x	Same as R4	Repro. P.W.B.	
R8	2	2	2	2	2	2	Resistor, fixed, comp; 2,200 ohms,±10%,1/2w;RC20GF222K	Repro. P.W.B.	041-052
R9	4	4	4	4	4	4	Resistor, fixed, comp; 22,000 ohms,±10%,1/2w;RC20GF223K	Repro. P.W.B.	041-064
R10	3	3	3	3	3	3	Resistor, fixed, comp; 10,000 ohms,±10%,1/2w;RC20GF103K	Repro. P.W.B.	041-060
R11	2	2	2	2	2	2	Resistor, fixed, comp; 560,000 ohms,±10%,1/2w;RC20GF564K	Repro. P.W.B.	041-081
R12	x	x	x	x	x	x	(Same as R11)	Repro. P.W.B.	
R13	1	1	1	1	1	1	Resistor, fixed, comp; 330,000 ohms,±10%,1/2w; RC20GF334K	Repro. P.W.B.	041-078
R14	2	2	2	2	2	2	Resistor, fixed, comp; 1,000 ohms,±10%,1/2w; RC20GF102K	Repro. P.W.B.	041-048
R15	1	1	1	1	1	1	Resistor, fixed, comp; 4,700 ohms,±10%,1/2w; RC20GF472K	Repro. P.W.B.	041-056
R16	2	2	2	2	2	2	Resistor, fixed, comp; 15,000 ohms,±10%,1/2w; RC20GF153K	Repro. P.W.B.	041-062
R17	x	x	x	x	x	x	Same as R14	Repro. P.W.B.	
R18	x	x	x	x	x	x	Same as R8	Repro. P.W.B.	
R19	2	2	2	2	2	2	Resistor, fixed, comp; 680 ohms,±10%,1/2w; RC20GF681K	Repro. P.W.B.	041-046
R20	3	3	3	3	3	3	Resistor, Fixed, comp; 430 ohms,±5%,1/2w; RC20GF431J	Repro. P.W.B.	041-379
R21	2	2	2	2	2	2	Resistor, fixed, comp; 10 ohms,±10%,1/2w; RC20GF100K	Repro. P.W.B.	041-032
R22	x	x	x	x	x	x	Same as R21	Repro. P.W.B.	
R23	x	x	x	x	x	x	Same as R2	Rec. P.W.B.	
R24	x	x	x	x	x	x	Same as R2	Rec. P.W.B.	
R25	1	1	1	1	1	1	Resistor, fixed, comp; 390,000 ohms,±10%,1/2w; RC20GF394K	Rec. P.W.B.	041-079
R26	3	3	3	3	3	3	Resistor, fixed, comp; 33,000 ohms,±10%,1/2w; RC20GF333K	Rec. P.W.B.	041-066
R27	x	x	x	x	x	x	Same as R16	Rec. P.W.B.	
R28	1	1	1	1	1	1	Resistor, fixed, comp; 330 ohms,±10%,1/2w; RC20GF331K	Rec. P.W.B.	041-042
R29	x	x	x	x	x	x	Same as R1	Rec. P.W.B.	
R30	2	2	2	1	1	1	Resistor, fixed, comp; 180,000 ohms,±5%,1/2w; RC20GF184J	Rec. P.W.B.	041-026
R31	x	x	x	-	-	-	Same as R30	Rec. P.W.B.	
R32	x	x	x	x	x	x	Same as R10	Rec. P.W.B.	
R33	x	x	x	x	x	x	Same as R9	Rec. P.W.B.	
R34	x	x	x	x	x	x	Same as R1	Rec. P.W.B.	
R35	x	x	x	x	x	x	Same as R26	Rec. P.W.B.	
R36	x	x	x	x	x	x	Same as R4	Rec. P.W.B.	
R37	x	x	x	x	x	x	Same as R4	Rec. P.W.B.	
R38	x	x	x	x	x	x	Same as R10	Rec. P.W.B.	
R39	1	1	1	1	1	1	Resistor, fixed, comp; 62 ohms,±5%,1/2w; RC20GF620J	Rec. P.W.B.	041-534
R40	x	x	x	x	x	x	Same as R20	Rec. P.W.B.	
R41	x	x	x	x	x	x	Same as R20	Rec. P.W.B.	
R42	2	2	2	2	2	2	Resistor, fixed, comp; 12 ohms,±5%,1/2w; RC20GF120J	Rec. P.W.B.	041-963
R43	x	x	x	x	x	x	Same as R42	Rec. P.W.B.	
R44	x	x	x	x	x	x	Same as R9	Rec. P.W.B.	
R45	x	x	x	x	x	x	Same as R9	Rec. P.W.B.	
R46	1	1	1	-	-	-	Resistor, fixed, comp; 360,000 ohms,±5%,1/2w; RC20GF364J	Bk. Panel	041-590
R46	-	-	-	1	1	1	Resistor, fixed, comp; 2.2 megohms,±10%, 1w; RC32GF225K	Bk. Panel	041-086
R47	4	4	4	4	4	4	Resistor, variable, potentiometer, 50,000 ohms,±20%,1/4w; audio	Bk. Panel	4520151-01
R48	x	x	x	x	x	x	Same as R47	Bk. Panel	
R49	x	x	x	x	x	x	Same as R47	Fr. Panel	4520151-01
R50	x	x	x	x	x	x	Same as R47	Fr. Panel	
R51	x	x	x	x	x	x	Same as R26	Fr. Panel	
R52	x	x	x	x	x	x	Same as R6	Fr. Panel	

Ref. No.	-01	-02	-03	-04	-05	-06	DESCRIPTION	Location	Ampex Part No.
R53	x	x	x	x	x	x	Same as R19	Side Panel	
R54	2	2	2	2	2	2	Resistor, variable; 100,000 ohms, ±10%, 2w; audio taper	Fr. Panel	044-015
R55	x	x	x	x	x	x	Same as R54	Fr. Panel	
R56	1	1	1	1	1	1	Resistor, fixed, comp; 18,000 ohms; ±10%, 1/2w; RC20GF183K	Fr. Panel	041-063
R57	1	1	1	1	1	1	Resistor, fixed, comp; 120 ohms, ±10%, 1/2w; RC20GF121K	Bk. Panel	041-039
R58	1	1	1	1	1	1	Resistor, fixed, comp; 470 ohms, ±10%, 1/2w; RC20GF471K	Fr. Panel	041-044
R59	1	1	1	1	1	1	Resistor, fixed, comp; 56 ohms, ±5%, 1w; RC32GF560J	Fr. Panel	041-565
R60	x	x	x	x	x	x	Same as R6	Bk. Panel	
R61	x	x	x	x	x	x	Same as R6	Bk. Panel	
R62	1	1	1	1	1	1	Resistor, variable, potentiometer, wirewound; 25 ohms ±20%, 2w; linear	Bk. Panel	4520149-10
S1	1	1	1	1	1	1	Switch, toggle	Fr. Panel	120-999
S2	2	2	2	2	2	2	Switch, selector	Fr. Panel	4620196-02
S3	1	1	1	1	1	1	Switch, selector	Fr. Panel	122-016
S4	x	x	x	x	x	x	Same as S2	Fr. Panel	
S5	-	-	-	-	-	-	Play-Record Switch on Tape Transport.		
S6	-	-	1	-	-	1	Switch, slide, DPDT	Bk. Panel	120-510
T1	1	1	1	1	1	1	Coil, oscillator	Rec. P.W.B.	4580196-01
T2	1	1	1	1	1	1	Transformer, output	Side Panel	4580193-01
T3	1	1	-	1	1	-	Transformer, power	Bk. Panel	4580194-01
T3	-	-	1	-	-	1	Transformer, power	Bk. Panel	4580195-01
YR1	1	1	1	1	1	1	Diode, silicon, Zener; 24v, ±5%, 2w	Bk. Panel	013-712
							MISCELLANEOUS COMPONENTS		
	14	14	14	14	14	14	Socket, transistor		150-103
	1		1	1		1	Fuse Post		085-001
	1	1	1	1	1	1	Shield, record p.w.b.		4600054-01
	1	1	1	1	1	1	Shield, input amplifier		4600057-01
	1	1	1	1	1	1	Shield, record		4600058-01
	1	1	1	1	1	1	Shield, reproduce head jack		4600059-01
	-	-	1	-	-	1	Shield, transformer		4600056-01
	1	1	1	1	1	1	Jewel, pilot lamp, red		4110258-02
	2	2	2	2	2	2	Knob, skirted, pointer		6000005-20
	3	3	3	3	3	3	Knob, pointer		6000009-20
	2	2	2	2	2	2	Dummy plug		4030034-30

NOTE 1

For 230 vac operation, change F1 to 0.5 ampere fuse provided in polyethelene bag.

Item	1 ch. FT	2 ch. HT	2ch. 2T	2 ch QT	DESCRIPTION	Ampex Part No.
	x				Head Assembly, single channel, full track (see Fig. 7-11)	4020191-01
		x			Head Assembly, single channel, half track (see Fig. 7-12)	4020191-02
			x		Head Assembly, dual channel, two track (see Fig. 7-13)	4020192-01
				x	Head Assembly, dual channel, quarter track (see Fig. 7-14)	4020194-01
1	1	1	1	1	Base Assembly, head housing	4030088-01
2	1	1	1	1	Cap, tape guide	4100063-01
3	1	1	1	1	Sleeve, tape guide	4200055-01
4	9	9	9	9	Spring, head mounting	4270024-10
5	1	1	1	1	Spring, tape guide	4270114-01
6	2	2	2	2	Washer, tape guide	4440137-01
9	1	1	1	1	Cover, cable assembly bracket	1232344-01
10	1	1			Bracket and Cable Assembly	1232346-01
10			1	1	Bracket and Cable Assembly	1232346-02
11	1				Head Stack, erase, full track	1232357-01
11			1		Head Stack, erase, two track	1232360-01
11				1	Head Stack, reproduce, quarter track	1232363-01
12	1				Head Stack, record, full track	1232358-01
12			1		Head Stack, record, two track	1232361-01
12				1	Head Stack, record, quarter track	1232363-02
13	1				Head Stack, reproduce, full track	1232359-01
13			1		Head Stack, reproduce, two track	1232362-01
13				1	Head Stack, erase, quarter track	1232363-03
14		1			Head Stack, erase, half track	1232360-01
15		1			Head Stack, record, half track	1232361-01
16		1			Head Stack, reproduce, half track	1232362-01

CABLE ASSEMBLY, ELECTRONICS INTERCONNECTING
Catalog No. 4050098-01
(For two channel equipment)

Ref. No.	-01		
	x	Cable Assembly	4050098-01
P2		Connector, cable, 12 socket, female	144-009
P3		Connector, cable, 12 pin, male, w/clamp	145-443
P4		Connector, cable, 8 socket, female	145-446
		(see Fig. 7-20)	

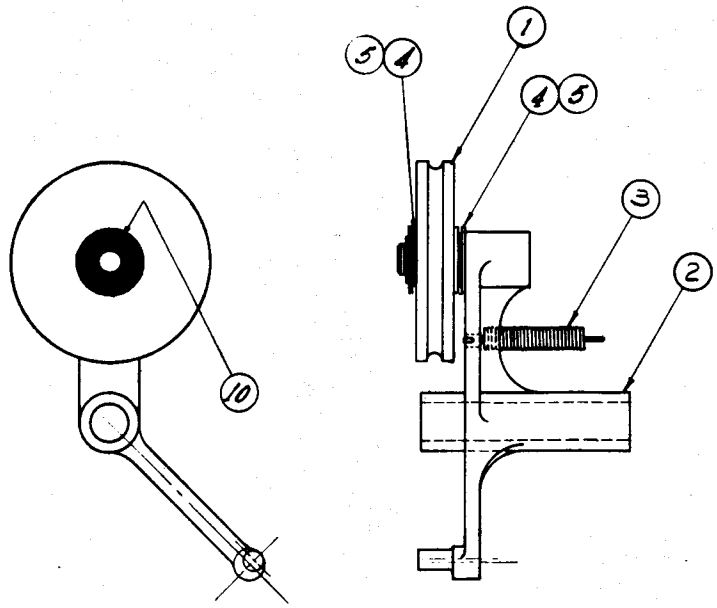


Fig. 7—3. Play Takeup Arm Assembly

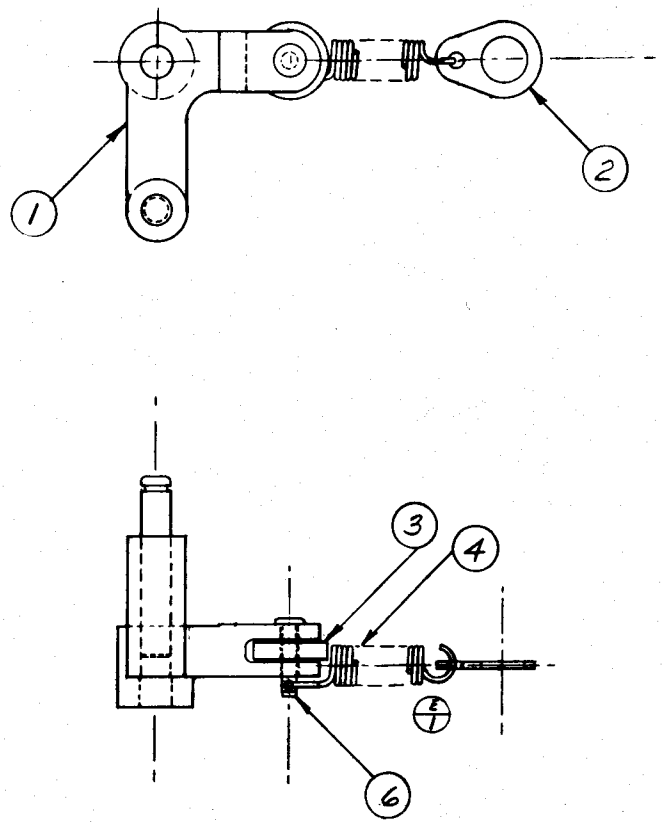


Fig. 7—4. Capstan Idler Arm Assembly

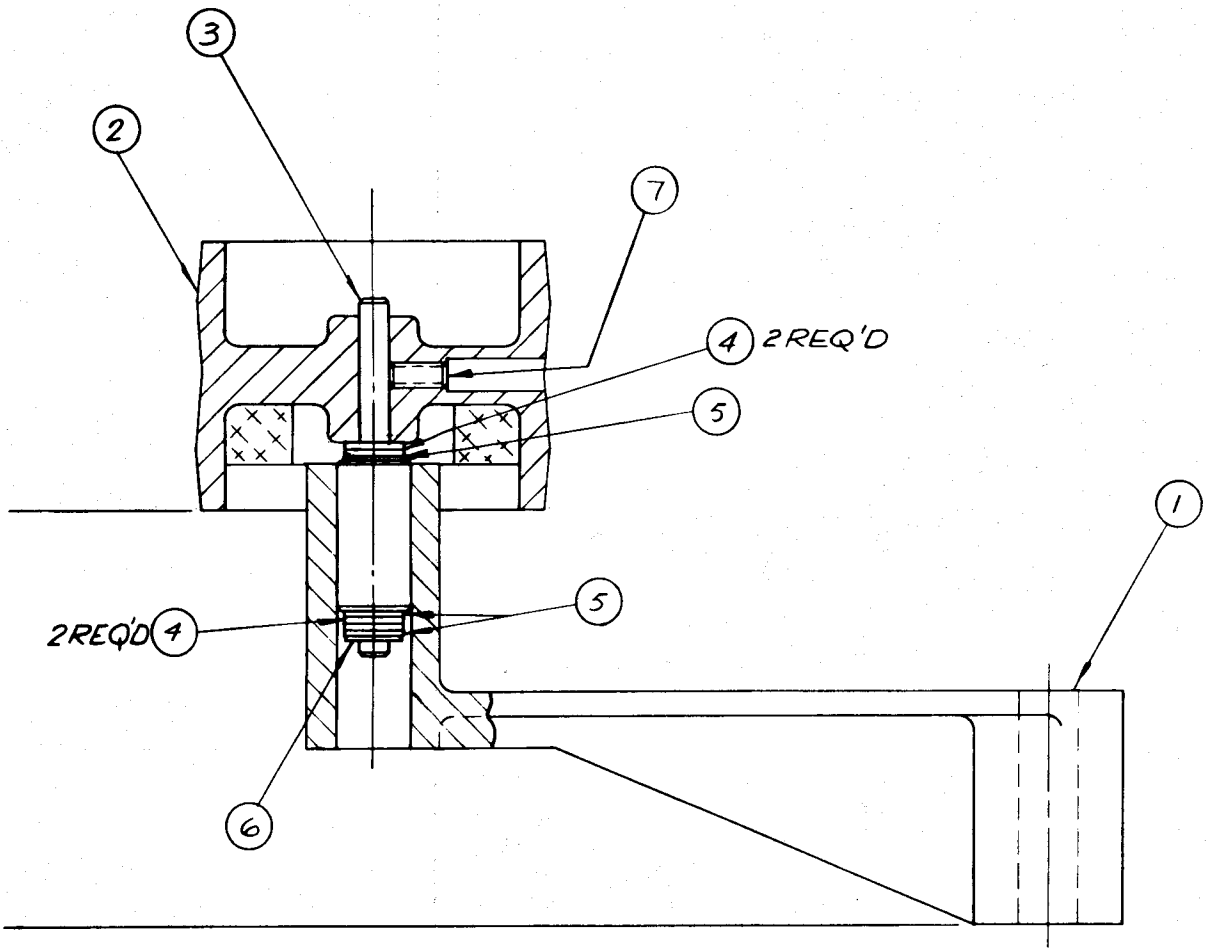


Fig. 7—7. Belt Idler Arm Assembly

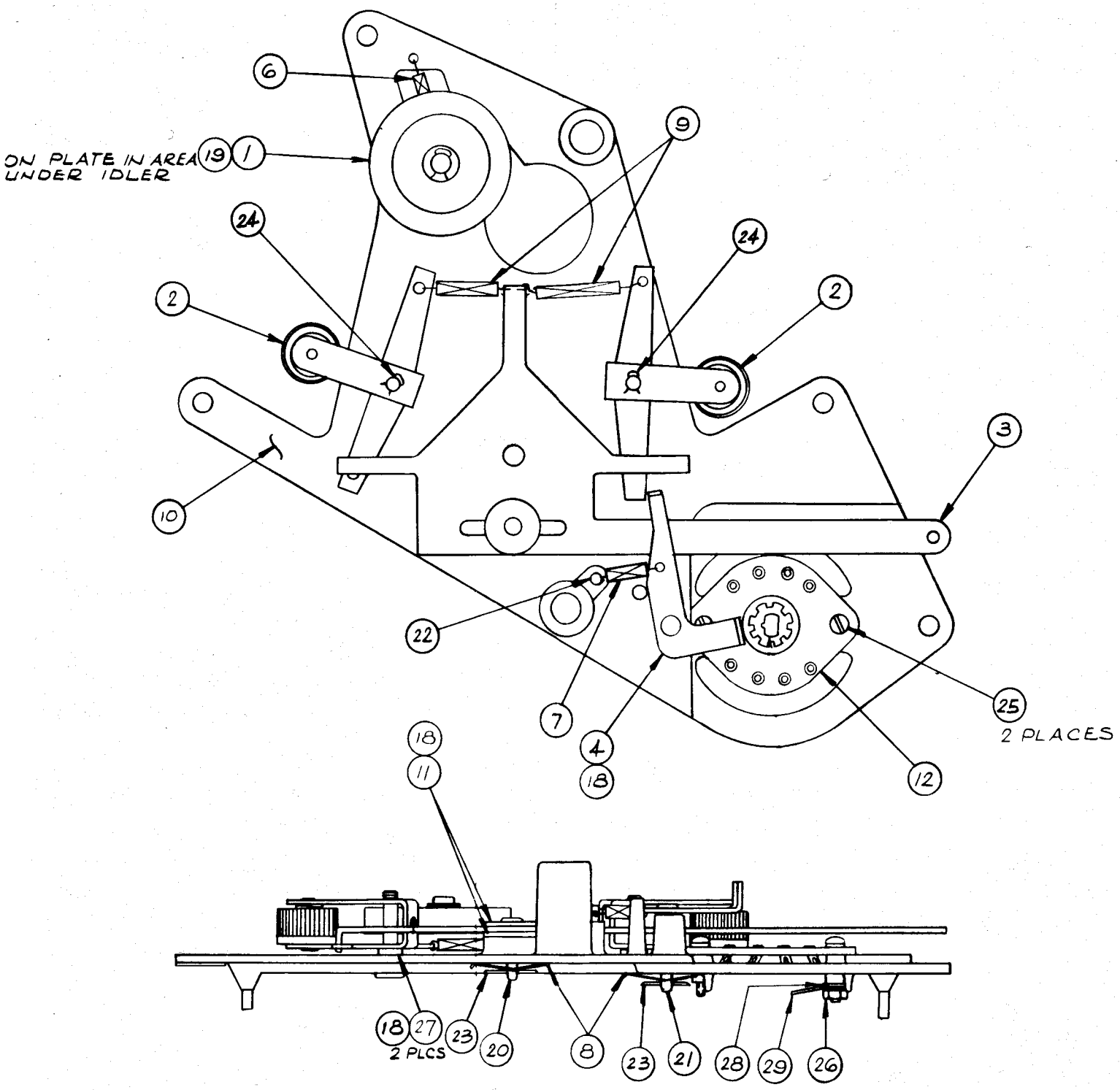


Fig. 7—8. Plate Assembly

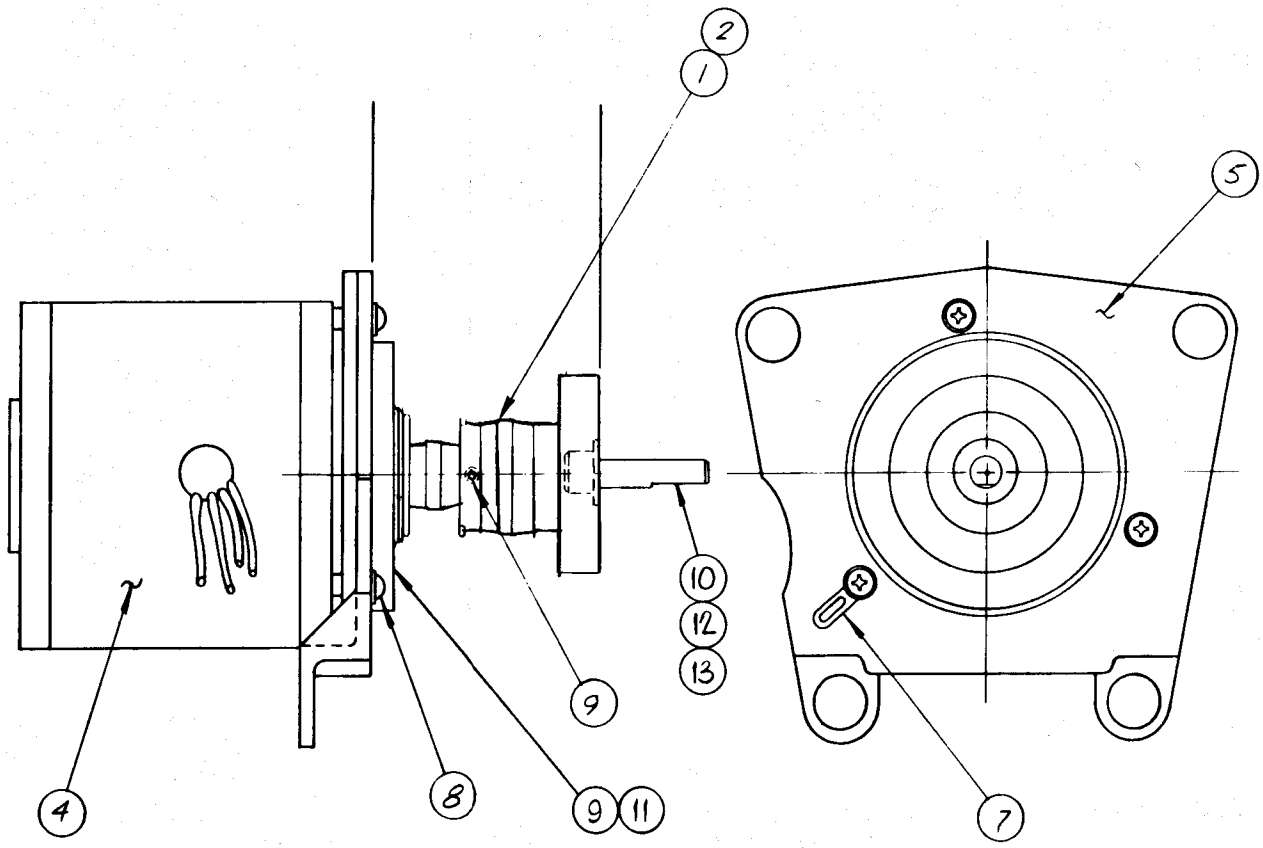


TABLE I	
PART No.	CYCLE
4030087-01	60
4030087-02	50

Fig. 7—9. Motor Assembly

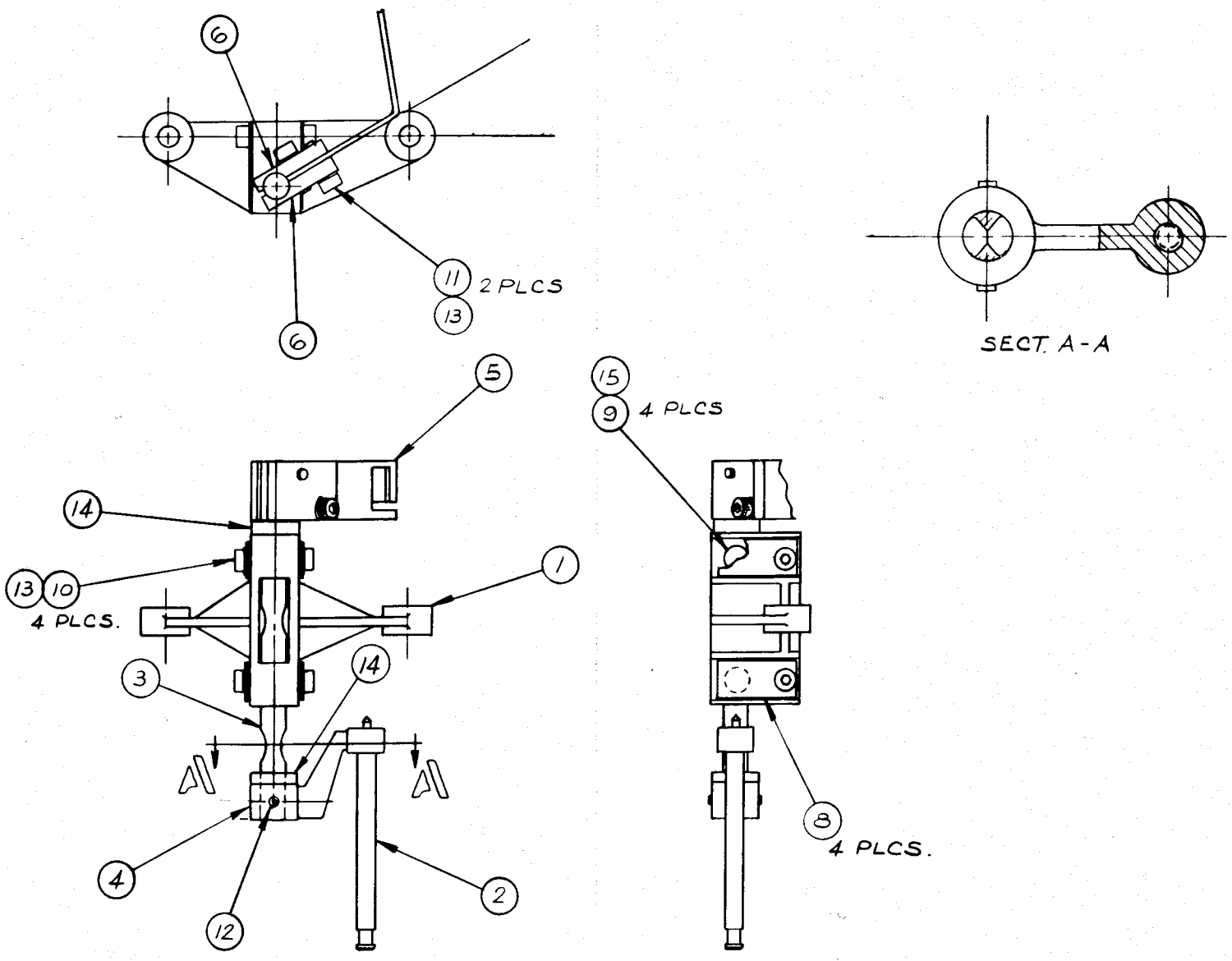


Fig. 7—10. Speed Shift Assembly