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AG-350 & AG-355 Recorder/Reproducer

Operation and Maintenance Manual

ISSUED: JANUARY 1966

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LIST OF EFFECTIVE PAGES

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Section 1

DESCRIPTION

1.1 GENERAL

Ampex Models AG-350 and AG-355 Magnetic Tape Recorders and Reproducers are derived from the famous Ampex Series 350 equipment. Using the basic transport made famous by the Series 350, these machines are equipped with solid state electronic circuitry which provide high quality performance coupled with a long, dependable, operating life.

The Model AG-350 (see Fig. 1-1) is a recorder and reproducer, while the Model AG-355 is a reproduce-only equipment. Either is available in a two channel or single channel version.

Three mounting arrangements are available. The equipment may be ordered mounted in a console as shown in Fig. 1-1 or portable cases, or unmounted (to be installed in racks or in custom consoles).

1.2 TAPE TRANSPORT

The tape transport (see Fig. 1-2) handles 1/4-inch magnetic tape on reels up to 10-1/2 inches in diameter. Two tape speeds are available -- either 3-3/4 and 7-1/2 inches per second (ips) or 7-1/2 and 15 ips.

Tape motion is controlled by pushbutton switches adjacent to the head assembly, while selection of tape speed and reel size is provided by two toggle switches. Manually operated tape

Fig. 1-1 Ampex Model AG-350, Two Channel, Recorder/Reproducer Console Mounted

lifters, actuated when the head gate is open will remove the tape from contact with the heads during fastwinding operation.

Fig. 1-2 Tape Transport, with Head Assembly

1.3 ELECTRONIC ASSEMBLY

On record/reproduce equipment, one electronic assembly (see Fig. 1-3) is provided for each channel. This assembly contains all circuitry for recording and reproducing one channel of program material. Plug in equalizer modules are inserted in receptacles, beneath a cover on the front panel; equalization is switched automatically when tape speed is selected at the transport. A record selector switch allows recording on any or all channels, or places the electronics in a "safe" condition where no recording is possible. With two channel equipment, one electronic assembly acts as a "master", the other as a "slave"; the master assembly controls power application to the entire system, and also controls the record function of the system. A vu meter provides a visual monitoring function for record, reproduce, and bias levels.

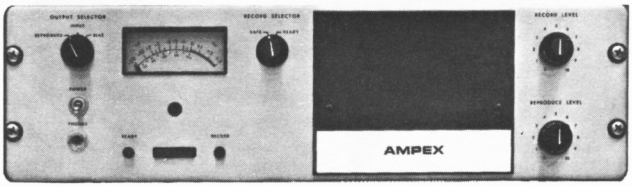

Fig. 1-3 Record/Reproduce Electronic Assembly

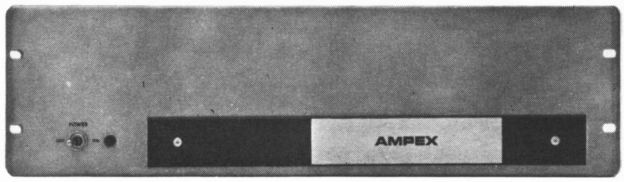

Fig. 1-4 Reproduce-only Electronic Assembly

One electronic assembly (see Fig. 1-4) containing either one or two audio reproduce modules and one power supply module, is provided with reproduce-only equipment. Equalization components are built into the assembly, so no plug-in modules are provided; equalization switching is automatic, controlled by the tape speed switch. The vu meter on this assembly is an optional accessory.

All assemblies can be strapped to provide either a +8 dbm or +4 dbm output into a 600 ohm line. A switch on the back panel provides internal termination of 600 ohms for test procedures or if the equipment is to feed a high impedance load.

1.4 HEAD ASSEMBLIES

The head assembly for a single channel recorder/reproducer contains three head stacks -- erase, record, and reproduce. Each stack contains one head, either full track or half track.

Standard head assemblies for two channel recorder/reproducers are also in three stacks, containing two track erase, two track record, and two track reproduce heads. A special four stack head assembly is available, containing a two track erase head, two track record head, 1/4 track reproduce head, and two track reproduce head. A switch selects either the 1/4 track or two track reproduce head.

NOTE

The 1/4 track reproduce head stack contains two heads of proper width and spacing to reproduce four track stereophonic recordings.

Single channel reproduce-only equipment utilizes a head assembly with one stack, containing either a full-track or half track reproduce head. On two channel reproduce-only units, a two stack assembly -- containing a 1/4 track and two track reproduce head -- is provided.

1.5 ACCESSORY EQUIPMENT

1.5.1 Line Input

On record/reproduce equipment, an accessory receptacle is provided on the back panel of the electronic assemblies for optional plug-in units. No accessory unit is required if the equipment is to be fed from an unbalanced line. If a balanced line input is desired, either of two input transformers must be plugged into this receptacle One of these optional accessories (Catalog No. 4580116-01) is a balanced bridging transformer with unity gain; the other (Catalog No. 4580116-02) is a balanced matching transformer with a 14 db gain.

A microphone preamplifier (Catalog No. 4010040-01) can also be inserted in this receptacle to allow recording directly from a microphone.

A switch on the back panel of the electronic assembly allows the selection of unbalanced line (no accessory unit employed) or the optional accessory that is used.

1.5.2 Remote Control Unit

Operation of the tape transport can be remotely controlled by an optional remote control unit. This unit is available in two versions. One (Catalog No. 01-96510-01) is a desk type unit, completely wired and ready to plug into the remote control receptacle on the tape transport control box; this unit is supplied with a 30 foot interconnecting cable. The other remote control (Catalog No. 01-96520-01) is mounted on a panel, suitable for a custom console installation. The panel is wired, but no interconnecting cable is furnished.

If remote control is not used, a dummy plug (provided) must be inserted in the connector on the transport.

1.5.3 Motor Drive Amplifier

A motor drive amplifier can be plugged into a receptacle on the transport to provide a precise a-c drive for the capstan motor. If such an amplifier is not used, a dummy plug (provided) must be inserted in the receptacle.

1.6 SPECIFICATIONS

1.6.1 Tape Transport.

Tape Width	1/4-inch
Tape Speed	Two speeds: Either 3-3/4 and 7-1/2 ips or 7-1/2 and 15 ips.
Maximum Reel Size	10-1/2-inch NAB, will operate with reel sizes as small as 5 inches.
Start Time	Tape will accelerate to selected speed within 0.1 second after the play pushbutton is pressed.
Stop Time	Tape will not travel more than the indicated distance after the stop pushbutton is pressed: 15 ips -- 2 inches 7-1/2 ips -- 1 inch 3-3/4 ips -- 1/2 inch
Speed Accuracy	±0.2%, which corresponds to 3.6 seconds in a 30 minute recording.

1.6.2 Electronics

Input	100,000 ohms unbalanced. Will accept input signal levels as low as -18 dbm for normal recording level.
Output	Will feed a 600 ohm line, balanced or unbalanced, with a nominal output level of +8 dbm or +4 dbm (depending on internal strapping). Maximum playback output level before clipping is at least +28 dbm.

Flutter and Wow Measured according to ASA Z57.1 1954, measuring all components from 0.5 to 200 cps.	15 ips; not more than 0.11% rms 7-1/2 ips, not more than 0.14% rms 3-3/4 ips, not more than 0.18% rms
Overall Frequency Response (500 cps reference)	15 ips -- ±2 db 30 to 18,000 cps 7-1/2 ips -- ±2 db 40 to 10,000 cps +2 -4 db 30 to 15,000 cps 3-3/4 ips -- ±2 db 50 to 7,500 cps

Overall Signal-to-Noise Ratio

Type of Head	15 ips	7-1/2 ips	3-3/4 ips
Full Track	60 db	60 db	55 db
Half Track or Two Track	55 db	55 db	50 db

Signal-to-noise is measured from peak record level, which is 6 db above normal operating level, to unweighted noise. Noise is measured while erasing a 500 cps tone which is recorded at peak record level, using a filter to attenuate noise outside of the audio spectrum.

Even-Order Distortion	The second harmonic distortion of a 500 cps signal recorded at normal record level is less than 0.4%

1.6.3 General

Power Requirements	105-125 volts a-c, 60 cps (equipment available for 50 cps operation).
Power Consumption	Approximately 2.5 amperes at 117 volts a-c for a two channel record/reproduce equipment.
Magnetic Tape	Specifications are based on the use of professional quality magnetic tape, such as Ampex No. 631 or equivalent.

Section 2

INSTALLATION

2.1 UNPACKING

2.1.1 Console Mounted Equipment

Equipment ordered with the console is shipped with all assemblies mounted on the console, and connections completed between those assemblies. The console lies flat on its back in the shipping package, with the tape transport rotated 90° in the console so that it is in the horizontal position during transit.

Open the shipping container completely, and be sure the casters are screwed fully in so that the studs will not be bent when the recorder is tilted to the upright position. Place a board in position to block the casters. Grasp the console at the rear members between the electronic housing and the tape transport (see Fig. 2-1) and raise the console up and forward so that it comes to the vertical position, resting on the four casters.

Manually support the transport, and loosen the knurled knob on the left inner side of the console. Position the transport horizontally and retighten the knob.

Examine the equipment for any sign of damage incurred in transit. If any such damage is noted, report it immediately to your Ampex distributor and the transportation company involved.

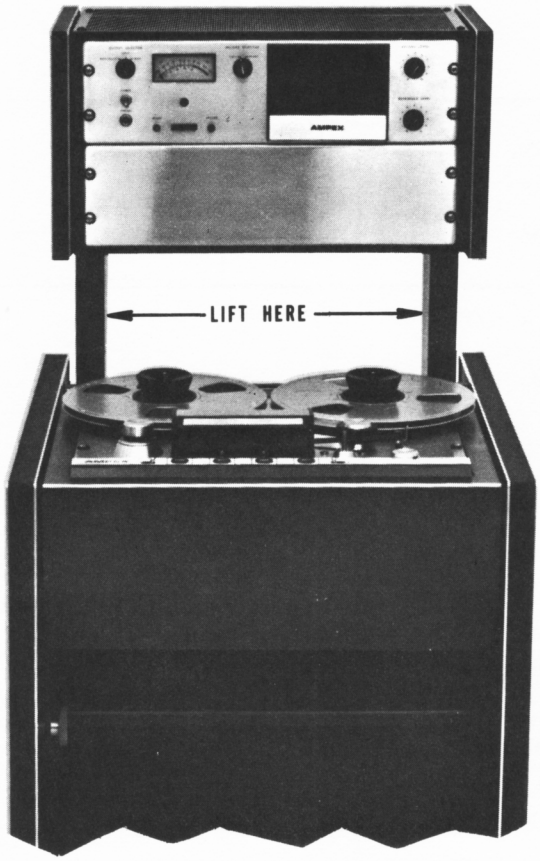

Fig. 2-1 Lift Points, Console Mounted Equipment

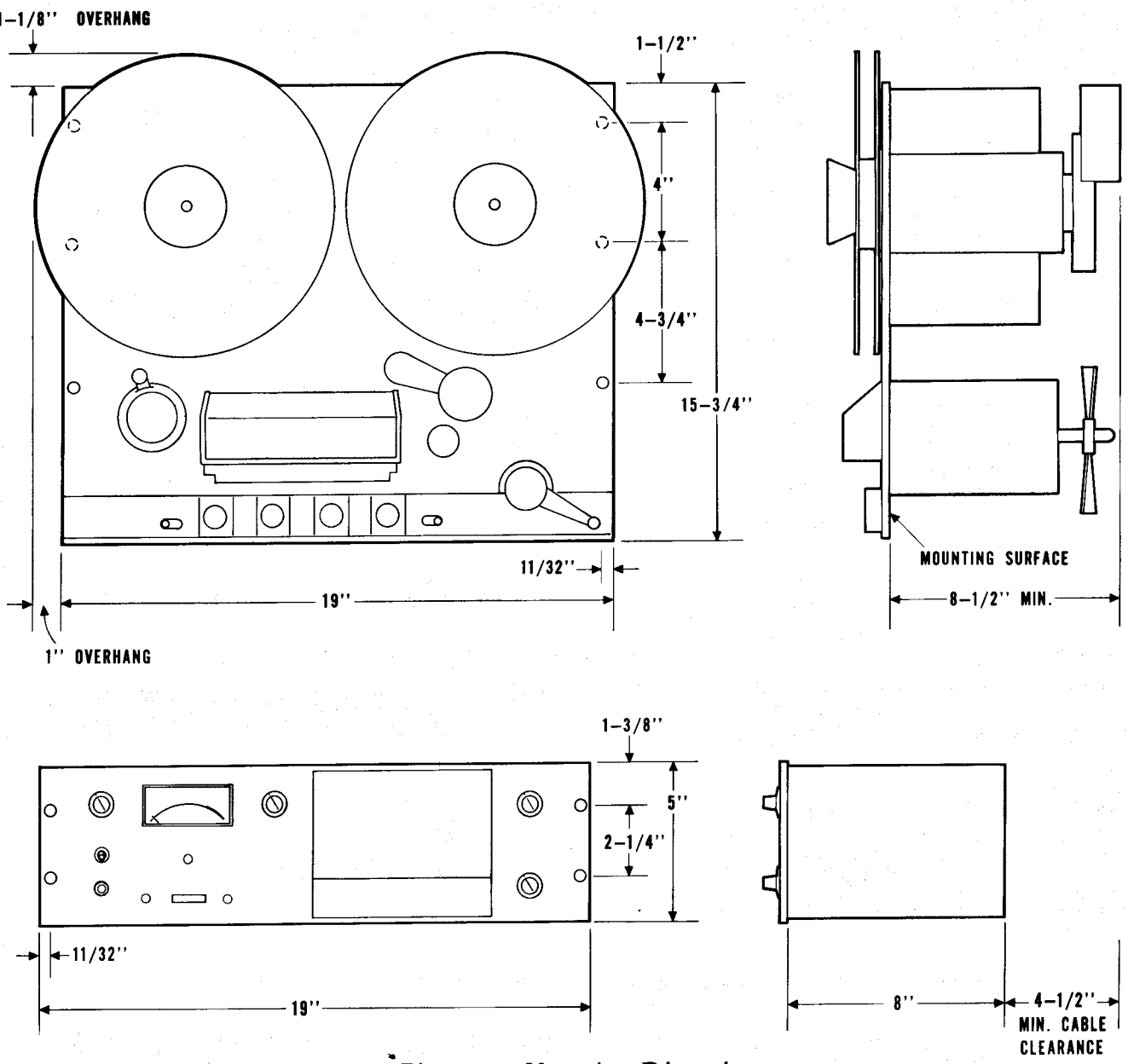

Fig. 2-2 Mounting Dimensions

2.1.2 Unmounted Equipment

Unmounted equipment is shipped with the tape transport and electronic assemblies packaged separately. Unpack each case, checking for shipping damage. If any has occurred, report it immediately to your Ampex distributor and the transportation company involved.

2.1.3 Equipment in Portable Cases

The portable models are mounted in two cases. Remove the cases from the shipping container and examine for shipping damage. If any has occurred, report it immediately to your Ampex distributor and the transportation company involved.

2.2 MOUNTING

When the equipment is ordered with the console or portable cases, all assemblies are mounted in position at the factory.

Other equipment can be mounted in standard 19-inch racks, or in custom cabinets. Mounting dimensions are given on Fig. 2-2. The major limitation in such mounting is that the tape

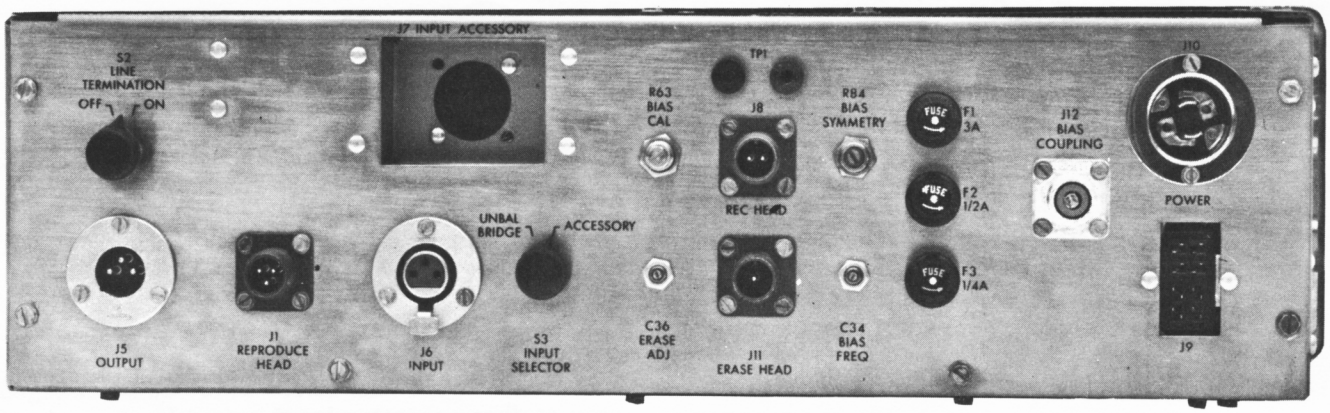

Fig. 2-3 Back Panel, Record/Reproduce Electronics Assembly

transport and electronic assemblies must be located so that it is not necessary to lengthen the head cables as supplied. Adequate ventilation must be provided.

2.3 INTERCONNECTING THE ASSEMBLIES

2.3.1 Console Mounted Equipment

All assemblies shipped in a console are interconnected at the factory. It is therefore necessary only to connect the signal leads (refer to paragraph 2.4) and the power cable (refer to paragraph 2.5). If because of maintenance or other reasons it becomes necessary to interconnect assemblies in the console, follow the instructions given in paragraph 2.3.2. Route the cables from the transport to the electronic assemblies through the hollow uprights, with power and control cables in the right upright (as viewed from the back), and signal input-output and head cables through the left upright.

2.3.2 Unmounted Equipment

After mounting such equipment, make the following connections between the assemblies. Back panel receptacles on the electronic assemblies are shown in Figs. 2-3 and 2-4.

a. Connect the control cable, which is captive at the tape transport to receptacle J9 at the back of the electronic assembly. If this is a two channel equipment, connect this cable to J9 at both electronic assemblies.

b. Connect the captive head cables to the applicable connectors on the back of each electronic assembly. If this is a two channel equipment, the cables are marked with the head track to which they are connected. Track 1 is that farthest from the top plate of the transport.

c. If this is a two channel equipment, connect the jumper cable (provided) between BIAS COUPLING connectors J12 on the electronic assemblies.

d. On reproduce-only equipment, connect the captive cable on each audio module to J3 or J4 on the power supply module (see Fig. 2-4).

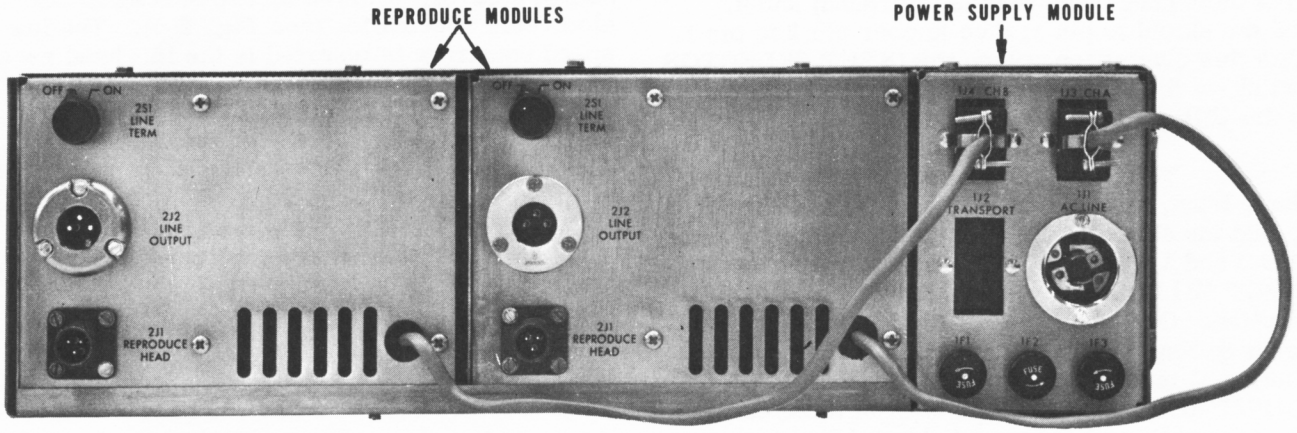

Fig. 2-4 Back Panel, Reproduce-only Electronic Assembly (Two Channel)

2.3.3 Equipment in Portable Cases

On portable equipment place the case containing the tape transport to the right of that containing the electronics. Unlatch and remove the front cover and the side access door on the transport case and uncoil the connecting cables. Unlatch and remove the front and back covers on the electronic case, and connect the cables from the transport to the receptacles at the back of the electronic assemblies. These connections are the same as those for unmounted equipment (refer to paragraph 2.3.2).

2.4 CONNECTING SIGNAL LINES

2.4.1 General

Input and output receptacles are standard XL connectors, female and male respectively, located on the back panel of the electronics assembly. Mating plugs for these receptacles are provided with the equipment.

On console mounted equipment, remove the back panels from the electronic housing and the transport housing. Insert the signal lines through the hole on the inward side of the left upright (as viewed from the back of the recorder) that supports the electronic housing. Route the lines up through this hollow upright, then fan them out from the rear of the upright to the applicable electronic assembly. (After entering the upright, these lines follow the same path as the head cables.) Note that the power cable should also be connected before reinstalling the back panels (refer to paragraph 2.5).

2.4.2 Input Connection and Switching

To connect an unbalanced line input, wire the signal leads to pins 2 (ground) and 3, and the shield to pin 1; then jumper pin 2 to pin 1. With this connection, place the INPUT SELECTOR switch on the back of the electronic assemblies in the UNBAL BRIDGE position.

To connect a balanced line or microphone input, wire the signal leads to pins 2 and 3, and the shield to pin 1 (ground); do not jumper pins 2 and 1. With this connection, place the INPUT SELECTOR switch in the ACCESSORY position. One of the optional input transformers or the optional microphone preamplifier (refer to Section 1) must be inserted in octal socket J7 (INPUT ACCESSORY) at the back of the electronic assemblies whenever a balanced line input is used.

2.4.3 Output Connection, Strapping, and Switching

To obtain an unbalanced line output, wire the signal leads to pins 2 (ground) and 3. and the shield to pin 1; then jumper pins 1 and 2.

For a balanced line output, wire the signal leads to pins 2 and 3 and the shield to pin 1; do not jumper pins 1 and 2.

The equipment is shipped from the factory strapped for a +8 dbm operating level output into a 600 ohm line. This can be changed to a +4 dbm operating level output by removing the top service cover from the electronic assembly and re-strapping the terminal board in the upper back corner above the LINE TERMINATION switch. Restrap the board as indicated on the schematic diagrams (see Figs. 7-3 or 7-6).

In most instances, the LINE TERMINATION switch on the back panel of the electronic assemblies is to be left in the OFF position except during tests and adjustments. However, if the equipment is to drive a high impedance load (2,000 ohms or more) leave that switch in the ON position.

2.5 CONNECTING POWER

The power cable, which is provided, connects from receptacle J10 on the back of the master electronic assembly to the power source. On console mounted equipment, route this cable in the right hand upright (as viewed from the back) to the electronic assembly.

2.6 INSTALLING PLUG-IN EQUALIZERS

Receptacles for the plug-in equalizer modules (record/reproduce equipment) are located behind a cover, secured by two screws to the electronic assemblies (see Fig. 2-5). The low speed equalizer is inserted in the left hand recep-

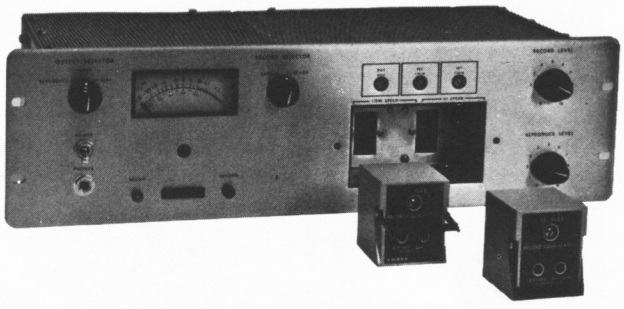

Fig. 2-5 Plug-in Record/Reproduce Equalizers

tacle (as viewed from the front), the high speed equalizer in the right hand receptacle. Equalizer modules are marked for the tape speed with which they are to be used, and for the type of equalization (NAB, CCIR, etc.).

Reproduce-only equipment does not employ plug-in equalizers, the circuits are built into the electronic assembly.

2.7 INSTALLING ACCESSORY ITEMS OR DUMMY PLUGS

2.7.1 Electronic Assemblies

As previously noted, either of two transformers for a balanced line input or a microphone preamplifier can be inserted in octal socket J7 on the back panel of the electronic assembly. When any such accessory is used the INPUT SELECTOR switch is placed in the ACCESSORY position. No dummy plug is required if an accessory is not used; the INPUT SELECTOR switch is simply placed in the UNBAL BRIDGE position.

2.7.2 Tape Transport

2.7.2.1 Motor Drive Amplifier

A precision amplifier for the capstan motor can be connected at J503S on the tape transport control box. The a-c power to the amplifier is taken at pins 1 and 4 of this connector, and the precision frequency a-c drive for the capstan motor is delivered to pins 5 and 8.

NOTE

If a motor drive amplifier is used, change fuse F1 on the back panel of the master electronic assembly to a 5 ampere fuse.

If a motor drive amplifier is not employed, a dummy plug (provided) must be inserted in J503S or the capstan motor will not operate.

2.7.2.2 Remote Control

An optional remote control unit (refer to Section 1) can be connected to receptacle J502S on the control box of the tape transport. If a remote control is not used, a dummy plug (provided) must be inserted in this receptacle or the transport will not operate.

Section 3

OPERATING INSTRUCTIONS

3.1 OPERATING CONTROLS AND INDICATORS

3.1.1 Tape Transport (See Fig. 3-1)

Speed Toggle switch	Selects fast (Λ) or slow (V) tape speed. Electronic equalization automatically changed with speed.
Rewind pushbutton	Places tape in motion in rewind mode from takeup to supply reel. Actuates rewind when tape is stationary, or in motion in the play, record, or rewind modes.
Fast forward pushbutton	Places tape in motion in fast forward mode from supply to takeup reel. Actuates fast forward when tape is stationary, or in motion in the play, record, or rewind modes.
Stop pushbutton	Stops tape motion from any mode. Drops out record mode when applicable.
Play pushbutton	Places tape in motion in the reproduce (play) mode. Must be pressed before the equipment can be placed in record mode.
Reel toggle switch	Selects large (O) or small (o) reel size. Changes tape tension in accordance with selection.

3.1.2 Electronic Assembly (See Fig. 3-2)

OUTPUT SELECTOR rotary switch	Selects signal "reproduced" from the tape, the "input" record signal, or the "bias" current for monitoring at the vu meter. Connects reproduced or record signal to output connector and monitor jack.
*POWER toggle switch	Controls application of a-c line power to all electronic assemblies and the tape transport.

*RECORD pushbutton	Places preselected channels in the record mode. Has no effect unless the record selector switch is in the "ready" position and the play pushbutton (on the tape transport) has been previously pressed.
RECORD SELECTOR rotary switch	Selects "safe" condition, where channel cannot be placed in the record mode, or "ready" condition where channel can be placed in record mode.
READY indicator light	Indicates channel is ready to start recording.
RECORD indicator light	Indicates channel is operating in the record mode.
VU meter	Indicates reproduce, record, or bias level as selected by the output selector switch. Meter lights act as power indicator.
RECORD LEVEL rotary switch	Adjusts record level.
REPRODUCE LEVEL rotary switch.	Adjusts reproduce level.

*Provided on master electronic assembly only.

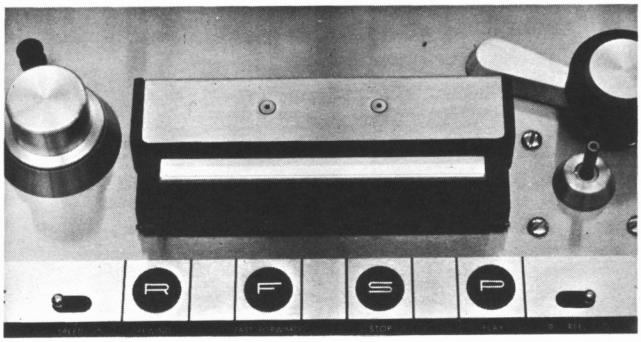

Fig. 3-1 Operating Controls, Tape Transport

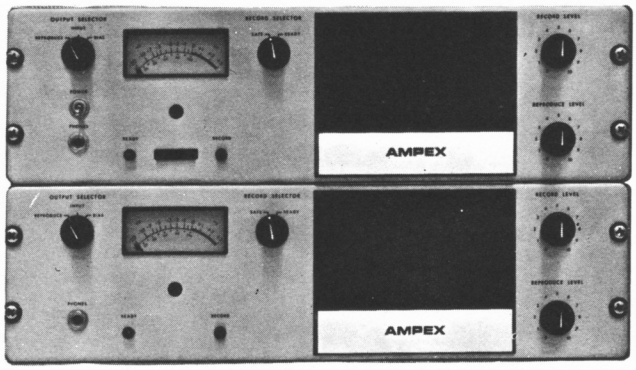

Fig. 3-2 Operating Controls and Indicators, Record/Reproduce Electronic Assembly

3.2 POSITIONING TRANSPORT

On console-mounted equipment, the operator can tilt the transport to suit his preference by loosening the knurled knob (see Fig. 3-3), tilting the transport to the desired position, and tightening the knob.

3.3 TAPE THREADING

The tape threading path is shown in Fig. 3-4. Open the head gate and thread the tape on the guides. When threading is completed, with the tape anchored to the takeup reel hub, turn the takeup reel manually until the supply reel starts to rotate; this removes all tape slack and ensures that the takeup tension arm is not contacting the safety switch.

3.4 APPLYING POWER

To apply power to the complete system, simply place the POWER toggle switch on the master electronic assembly in the up position.

3.5 SELECTING REEL SIZE

If 10-1/2 inch NAB reels are used, place the REEL toggle switch in the large reel (O) position; if 7 inch reels (or smaller) are employed, place this switch in the small reel (o) position.

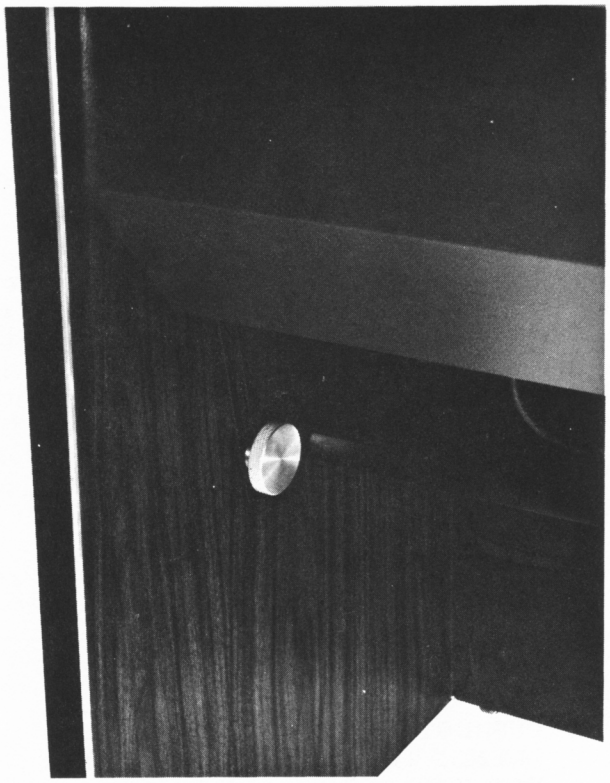

Fig. 3-3 Tape Transport Positioning Knob, Console

NOTE

Reels on the two turntables must be the same size and type, or the tape may be stretched or broken.

3.6 SELECTING TAPE SPEED

Standard tape speed pairs available on this equipment are either 3-3/4 and 7-1/2 ips or 7-1/2 and 15 ips. Depending on the particular recorder and the tape speed desired, place the SPEED toggle switch in the fast (Λ) or slow (V) position.

3.7 RECORDING

Step 1: Thread blank tape, or tape recorded with program material not necessary to save, on the recorder. Close the head gate after threading is completed.

NOTE

If a previously recorded tape was recorded on equipment with a different head configuration, it is possible that the old recording will not be completely erased. Such tape should be bulk erased before being rerecorded.

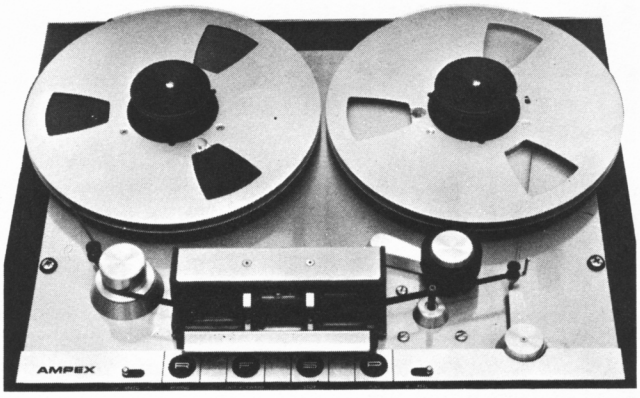

Fig. 3-4 Tape Threading Path

Step 2: Apply power to the equipment.

Step 3: Select the tape speed desired and place the REEL toggle switch in the position appropriate to the reels being used.

Step 4: Place the RECORD SELECTOR switch in the READY position for the channel(s) on which the recording is to be made. If certain channels are not to record, leave the RECORD SELECTOR on those channels in the SAFE position.

Step 5: Place the OUTPUT SELECTOR switch in the INPUT position. Using a rehearsal run or test signal, adjust the RECORD LEVEL control so that the vu meter indicator swings to 0 on the meter dial on most program peaks (maximum peaks can result in a swing to +2 or +3 on the meter.

Step 6: At the tape transport press the Play pushbutton to start tape in motion. Then press the record pushbutton on the master electronic assembly. All channels which were in the ready condition will be placed in the record mode (the RECORD indicator will light).

NOTE

In monitoring the record run, the input signal can be compared with the signal actually being recorded and reproduced from the tape, by turning the OUTPUT SELECTOR from the INPUT to the REPRODUCE position and vice versa.

Step 7: At the completion of the recording, press the STOP pushbutton (on the tape transport) to stop tape motion and remove the equipment from the record mode.

3.8 REPRODUCING (PLAYING BACK)

Step 1: Thread the recorded tape on the transport. Close the head gate when threading is completed.

Step 2: Apply power to the equipment. Place all RECORD SELECTOR switches in the SAFE position.

Step 3: Select the tape speed which corresponds to that at which the tape was recorded. Place the REEL switch in the position appropriate for the size of reel being used.

Step 4: Place the OUTPUT SELECTOR switch in the REPRODUCE position.

NOTE

This switch must be positioned as described or there will be no reproduce output.

Step 5: At the tape transport, press the PLAY pushbutton. Tape will be placed in motion in the reproduce mode. Adjust the REPRODUCE LEVEL control for proper output level.

Step 6: To stop tape motion, press the STOP pushbutton on the tape transport.

3.9 USING FASTWINDING MODES

NOTE

It is recommended that the head gate be opened, and tape thus lifted from the heads, whenever a fastwinding mode is used.

Whenever tape is threaded and power is applied, tape can be shuttled quickly from one reel to the other by using the fastwinding modes -- controlled by the Rewind and Fast forward pushbuttons. These pushbuttons can be pressed alternately (tape will slow to a stop, then start in the reverse direction) when editing or cueing. To stop the equipment from the fastwinding modes, press the STOP pushbutton (if tape is allowed to run completely off either reel, automatic stop will occur).

CAUTION

WHEN USING A FASTWINDING MODE, DO NOT PRESS THE STOP AND PLAY PUSHBUTTONS IN SUCH RAPID SEQUENCE THAT TAPE MOTION CANNOT STOP BEFORE THE CAPSTAN IDLER CLAMPS THE TAPE TO THE CAPSTAN. IF MOTION DOES NOT STOP BEFORE THE PLAY PUSHBUTTON IS PRESSED, THE TAPE WILL PROBABLY BE BROKEN OR STRETCHED.

Section 4

TRANSPORT MAINTENANCE

4.1 ROUTINE MAINTENANCE

4.1.1 Cleaning

Cleaning components in the tape path is described in Section 6. It is extremely important that such cleaning be accomplished after each eight-hour operating period, or oftener if visual inspection indicates the need.

NOTE

On console-mounted equipment the transport can be rotated for servicing. Simply loosen the knurled knob (see Fig. 3-3) and tilt the transport on its pivot so that the turntable side moves up and forward. Use care not to place undue strain on the head cables during this procedure.

Visually inspect all components at the back of the transport each month. Use a small brush, or a small vacuum cleaner, to remove any accumulations of dirt or dust. If more comprehensive cleaning is required, Iso-Propyl alcohol may be used.

CAUTION

DO NOT USE THE BLOWER ACTION OF A VACUUM CLEANER OR ANY OTHER COMPRESSED AIR DEVICE IN CLEANING, BECAUSE DUST MIGHT BE BLOWN INTO BEARINGS OR OTHER ROTATING PARTS. ALSO, IF ALCOHOL IS USED, DO NOT ALLOW IT TO DRIP OR SPRAY INTO SUCH CRITICAL PARTS.

4.1.2 Head Demagnetization

Demagnetization of the heads, explained in Section 6, must be accomplished on a daily basis, or oftener if there is any suspicion that such action is necessary.

4.1.3 Lubrication

4.1.3.1 General

Lubrication of the capstan drive motor and the capstan idler bearing is required each three months or after each 1,000-hour operating period, whichever occurs first. No lubrication of any other components is required.

Ampex lubricating oil (Part No. 4010825), Caloil OC-11, or Shell Turbo #29, can be used.

4.1.3.2 Capstan Drive Motor

Lubrication of the drive motor requires its removal from the tape transport.

Step 1: Disconnect motor plug J504P from receptacle J504S at the transport control box.

Step 2: Remove the capstan idler from its arm by loosening the Allen head set screw and lifting the rubber-tired idler from the arm. This exposes one of the motor mounting screws.

Step 3: Remove the cone-shaped dust cap that surrounds the capstan by inserting a knife blade or some similar pointed instrument between the base of the cap and the transport and gently prying it up.

Step 4: Manually support the drive motor while removing the four mounting screws at the front of the transport. Using care not to bump or scrape the capstan, remove the motor.

Step 5: Some drive motors have an oil hole located on the motor end bell; fill the oil reservoir through this hole. Ashland drive motors are lubricated by putting 10 drops of the recommended lubricant at the base of the capstan (motor) shaft (do not overlubricate); three passages are provided for the oil to reach the bearings. Wipe off any excess oil.

Step 6: Replace the motor, capstan dust cap, and capstan idler. Reconnect the motor plug.

NOTE

The capstan idler must be properly positioned in relation to the tape, so thread tape on the equipment and position the idler so that the tape is centered on the tire. Visual alignment is adequate. Check idler pressure (refer to paragraph 4. 2. 4) after replacement.

If the equipment is not used for some time, the motor bearing might become dry. Because it takes some time for the lubricant to reach the bearing from the reservoir, even if the latter is filled, it is then necessary to lubricate the bearing directly.

Step 1: Pry off the capstan dust cap as explained in Step 3 of the regular lubricating procedure. This exposes the motor bearing.

Step 2: Apply not more than four drops of the recommended lubricant on the bearing.

Step 3: Replace the dust cap and use pressure sensitive tape or a rubber band to hold the takeup tension arm away from its rest position (so it does not contact the safety switch).

Step 4: Apply power. The drive motor will operate. Allow a fifteen minute warm up period, then stop operation.

Step 5: Allow the motor to cool, then remove the dust cap and inspect the bearing. If it appears dry, repeat the lubrication (Step 2).

4. 1. 3. 3 Capstan Idler

To lubricate the idler, pry off the dust cap on the idler hub. Place not more than three drops of the recommended lubricant on the felt washer exposed when the cap was removed. Do not overlubricate or oil might be thrown during operation.

CAUTION

IF ANY OIL IS SPILLED OR THROWN ON THE RUBBER TIRE OF THE IDLER, CLEAN IT IMMEDIATELY USING ISO-PROPYL ALCOHOL. OIL WILL CAUSE DETERIORATION OF THE RUBBER.

4.2 CHECKOUT AND ADJUSTMENT

4. 2. 1 Test Equipment Required

Spring scales as necessary to measure 5 - 6-1/2 ounces, 12 - 17 ounces, and 4-1/2 - 5-1/2 pounds.

Length of cord or twine, approximately 30 inches long, with small loop formed in one end.

NAB reel, empty

Flutter meter, D and R Model FL3-D or equivalent.

Ampex Standard Flutter Tape

3-3/4 ips	No. 01-31336-01
7-1/2 ips	No. 01-31326-01
15 ips	No. 01-31316-01

Usual tools used by technician

4. 2. 2 Takeup and Supply Tension

Tape tension is measured indirectly by determining the takeup and supply reel motor torques in the play mode. These torques are adjusted by positioning sliders on resistors in the transport control box.

Step 1: Apply power to the equipment and place an empty NAB reel on the supply turntable. Check that the REEL switch is to the right (toward the large circle).

Step 2: Wind the length of cord or twine counterclockwise on the hub of the empty reel, leaving the loop in the cord at the free end.

Step 3: Use pressure sensitive tape or a rubber band to hold the takeup tension arm away from its rest position, so that it does not contact the safety switch.

Step 4: Insert the hook on the appropriate spring scale (see Step 5) in the loop on the cord. Hold the scale stationary and press the Play pushbutton.

Step 5: Still holding the scale stationary, tap lightly on the reel (to ensure a true reading) and note the scale indication. It should be between 5 and 6-1/2 ounces.

NOTE

When a four position head assembly is used, the reading in Step 5 should be between 4 and 4-1/2 ounces.

Step 6: If the indication in Step 5 is incorrect, turn power off, remove the cover on the transport control box, and adjust the slider on resistor R505 (see Fig. 4-1) as applicable. Correcting a high reading requires that the slider short a lesser part of the resistor, correcting a low reading requires that more of the resistor be shorted. After adjustment, re-apply power and check the torque. Repeat as necessary to obtain the readings quoted.

WARNING

FULL LINE VOLTAGE IS PRESENT IN THE CONTROL BOX WHEN POWER IS APPLIED. DO NOT MAKE THIS ADJUSTMENT WITH POWER ON.

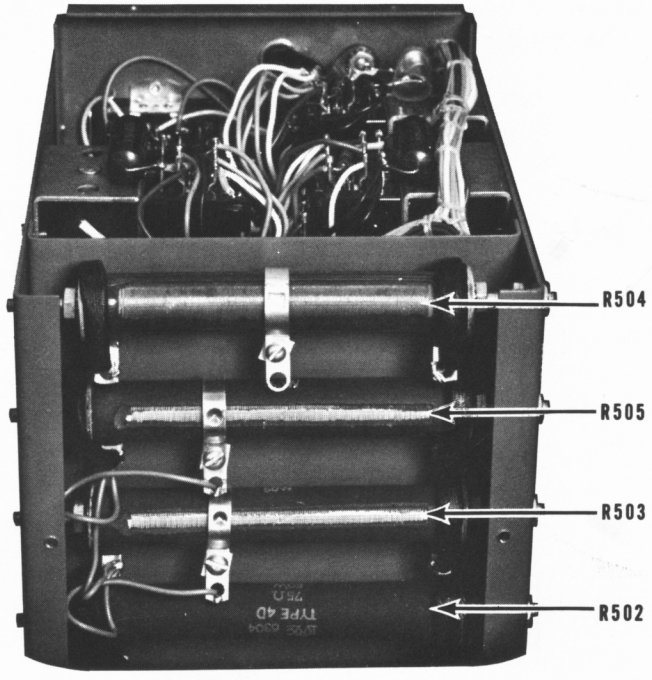

Fig. 4-1 Tape Tensioning Resistors

Step 7: To check proper adjustment, place the REEL SIZE switch to the left (toward the small circle) and recheck motor torque. The indication should be from 2-1/2 to 3-1/2 ounces (still on the NAB hub). If not, readjust the torque until it is within tolerances for both the large and small reel positions of the REEL switch.

Step 8: Repeat the entire procedure at the takeup turntable. Note that the cord should be wrapped clockwise on the reel hub, and that adjustment is made at the slider of R503 (see Fig. 4-1). Scale INDICATION should be the same as for the rewind turntable.

4.2-3 Brakes

Brakes are adjusted with no power applied to the equipment. Since the braking force is different for each direction of rotation (to provide the brake differential) the force must be checked and adjusted for each direction.

Step 1: Place an empty NAB reel on the supply turntable.

Step 2: Wind the cord or twine counterclockwise on the reel hub, leaving the loop at the free end of the cord.

Step 3: Insert the hook on the appropriate spring scale (see Step 4) through the loop at the end of the cord.

Step 4: Being sure the cord does not touch either reel flange, pull on the scale to make the reel rotate counterclockwise. Take the reading with the scale in slow, steady motion. It should be from 12 to 17 ounces.

NOTE

The initial force required to start the reel in rotation will be excessively high. Do not take the reading until the reel is in slow, steady rotation.

Step 5: If the indication in Step 4 is incorrect, adjust the "high" braking force with the two nuts indicated in Fig. 4-2. Run the nuts in to increasing braking force, out to decrease. Be sure both nuts are turned in and out an equal number of turns.

Step 6: Wrap the cord on the supply reel in the clockwise direction and repeat Steps 3 and 4, using the appropriate scale. The indication should be 1/2 that obtained for the counterclockwise rotation (+2 -1 ounce). If necessary, adjust the

"low" braking force at the point indicated in Fig. 4-2.

Step 7: Repeat the entire procedure at the take-up turntable. Note that the high braking force acts when this reel is rotated clockwise. Indications should be within the same tolerances quoted for the supply brake.

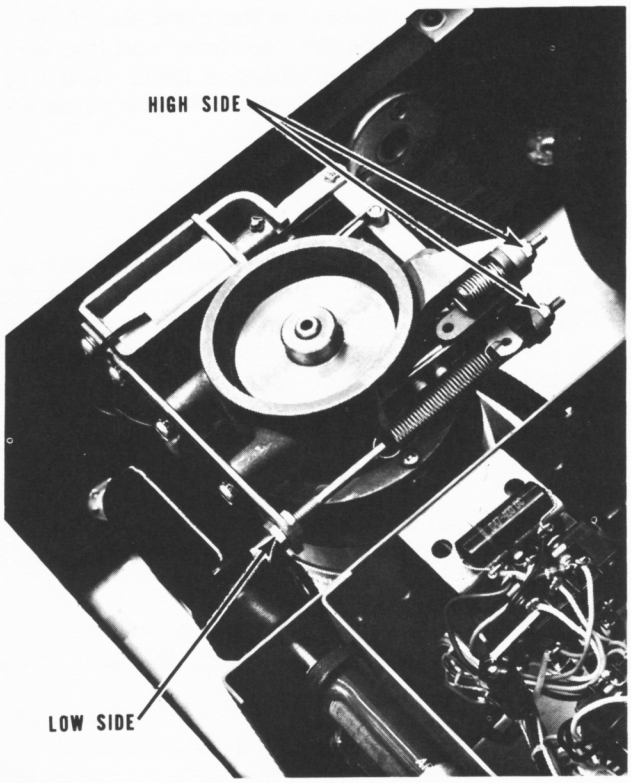

Fig. 4-2 Brake Adjustment Points

4.2.4 Capstan Idler Force

The force of the capstan idler against the capstan is determined by a pressure spring on the capstan solenoid. It is adjusted by a lock nut on the capstan solenoid spade bolt. If the recorder is operated in areas where line voltage is low, read the discussion following the step-by-step procedure before making any adjustments.

Step 1: Apply power to the equipment and use pressure sensitive tape or a rubber band to hold the takeup tension arm away from its rest position (so it does not contact the safety switch).

Step 2: Tie the two ends of the cord or twine together, so that it forms a continuous loop. Place one end of the loop over the capstan idler and position it on the idler shaft (between the idler and arm, see Fig. 4-3).

Step 3: Press the Play pushbutton. The idler will move to contact the capstan and both will rotate.

Step 4: Insert the hook on the appropriate spring scale (see Step 5) through the loop of cord, and pull the cord taut at a 90° angle to the idler arm.

Step 5: Pull on the scale and take the reading just as the idler loses contact with the capstan (the idler will stop rotating at that point). The scale indication should be 5 pounds (±1/2 pound).

Step 6: If the indication in Step 5 is incorrect, adjust the lock nut on the capstan solenoid as required to achieve a reading within tolerances. Running the nut in will increase pressure, out will decrease.

Step 7: After the adjustment is completed, check that the solenoid will bottom (if not, the idler can be easily pushed away from the capstan). If the solenoid does not bottom, the locknut must be run out until bottoming is possible.

The resistance of the solenoid will rise with its temperature during operation, and the voltage required to bottom the solenoid will be greater when it is hot. In areas where power line regulation is poor it is advisable to allow the equipment to operate continuously in the play mode for approximately 30 minutes before making any adjustments to the capstan solenoid. At the factory the solenoid is checked to assure it will bottom at line voltages of 90 volts (cold) and 105 volts (hot).

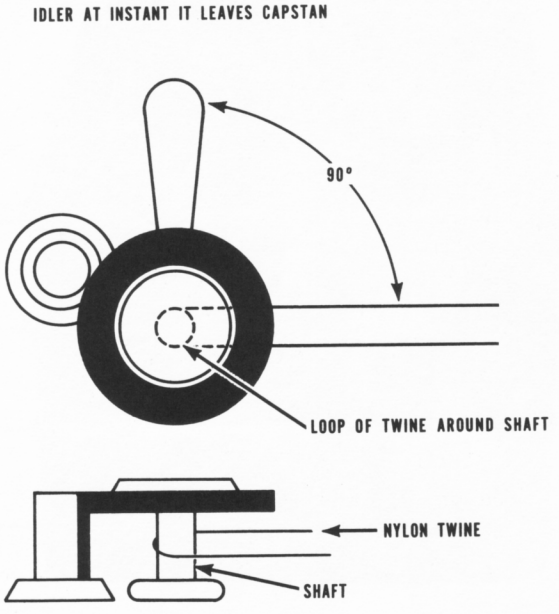

Fig. 4-3 Measuring Capstan Idler Pressure

4.2-5 Flutter and Wow

This check requires that the electronics assembly be previously aligned (see Section 5). An Ampex Standard Flutter Test Tape, applicable to the tape speed involved, and a flutter meter such as the D & R Model FL3-D, are also required.

Ampex Standard Flutter Test Tapes are prepared on very precise equipment, resulting in rms flutter content of less than .03% on these tapes. For all practical purposes, this can be disregarded when making flutter measurements. Flutter test tapes are made for a specific tape speed and, since flutter meters accept only 3,000 cps signals, they cannot be used at other speeds.

Flutter meters are sensitive to some extent to amplitude modulation, such as could occur with poor head-to-tape contact or with signal dropouts. Heads must therefore be cleaned and demagnetized before flutter measurements are taken.

As the flutter tapes are used over a long period of time, the flutter indication will rise -- even though the flutter of the equipment remains unchanged. This is caused by increased drop-outs, demagnetization of the recorded signal by repeated passes over the heads, and physical deformation of the tape due to tensions, changes in temperature and humidity, etc.

Test tapes should not be rewound before storage, because the tape pack and tension within the reel might cause physical damage to the tape -- such as edge damage, stretching, etc. Extremes in temperature and humidity must be avoided in storage areas, and the tape must not be stored near sources of magnetic fields -- such as motors, generators, permanent magnet loudspeakers, etc.

Flutter measurement is made as follows:

Step 1: At all electronic assemblies, place the RECORD SELECTOR switch in the SAFE position. Apply power to the equipment.

Step 2: Connect the flutter meter to the OUTPUT connector of the applicable channel (which channel makes no difference, as long as the electronics are properly aligned).

Step 3: Thread the flutter test tape on the transport, by putting the flutter tape reel on the takeup turntable and rewinding to an empty reel on the supply turntable. (Open the head gate while rewinding so the tape lifters remove the flutter tape from contact with the heads.)

CAUTION

BE SURE ALL RECORD SELECTOR SWITCHES ARE IN THE SAFE POSITION. THIS WILL PREVENT ACCIDENTALLY ENTERING THE RECORD MODE AND THUS ERASING THE TEST TAPE.

Step 4: Start tape in motion in the reproduce mode. Adjust the REPRODUCE LEVEL control on the electronic assembly as required to achieve a 0 vu indication on the vu meter.

Step 5: Adjust the flutter meter level as described in the instruction manual for that equipment.

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

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

Step 8: When the measurement is completed, allow the tape to continue in motion in the reproduce mode until the tape is completely wound on the takeup reel. Store the test tape in that condition.

Flutter can be caused by any component in the tape transport that affects tape motion, and it is manifestly impossible to delineate specific causes and remedies. However, causes of excess flutter include:

Accumulations of dirt or oxide on components in tape threading path.

Drivemotor: Not in synchronism (low line voltage), excessive takeup tension, defective motor capacitor, bearings in need of lubrication (or defective bearings), motor shafts (capstan) bent.

Supply motor: Excessive or erratic hold back tension, dragging brake, shafts bent.

Capstan idler: Defective rubber tire or bearing, wrong capstan idler force against capstan.

Reel idler: Shaft bent, flywheel unbalanced.

Head assembly: Poor tape guiding.

Tape scrape: Warped or damaged reels.

If a sound and vibration analyzer (such as General Radio's Type 1564-A) is available, excessive flutter might be isolated to certain frequencies by connecting the analyzer to the output of the flutter meter. Comparing the results with the rotational periods given on Table 4-1, may then isolate the offending assembly.

Note that if the flutter disturbance is caused by components in the supply motor assembly, the frequency of the flutter will vary -- being relatively low when the supply reel tape pack is large and progressively increasing with reel velocity as the pack diminishes. It is seldom that the takeup motor assembly introduces flutter, because it is effectively isolated from the heads by the capstan and capstan idler; if it should, the frequency would vary inversely to that of the supply motor -- being relatively high with a small tape pack on the takeup reel and progressively decreasing as the pack increased.

Table 4-1. Rotational Periods of Components

	Rotational Period (cps)		
COMPONENT	3-3/4 ips	7-1/2 ips	15 ips
Drive Motor (Capstan)	10	20 10	20
Capstan Idler	0.6	1.2	2.4
Reel Idler	0.8	1.6	3.2

4.2.6 Tape Speed

This equipment utilizes a direct drive, (that is, the capstan is an integral part of the drive motor). Therefore, there is no adjustment for tape speed. As long as the drive motor is running in synchronism with power line frequency, and the capstan and capstan idler are kept clean of grease or oil which could cause slippage, tape speed can be considered within tolerance. Synchronism can be easily checked by use of a strobe light, or a simple neon bulb, driven by the power line which drives the motor. View the flywheel under the strobe device, if the motor is in synchronism the flywheel will appear stationary. The most common cause for a motor not to be in synchronism is low line voltage (below 105 volts). Other causes could be excessive capstan idler force, or high tape tensions.

Actual tape speed, rather than capstan rotation, can be checked using a tape strobe -- such as the Dubbings Electronics Tape Strobe Model AA. This is a hand held, wheel device which is pressed against the tape, moving in the reproduce mode. It should be held between the capstan and head assembly so that the moving tape drives the strobe wheel. The percentage of any tape speed error can then be determined by counting the number of spokes on the strobe which appear to pass a fixed point in a given time. The tape speed error is 0.1% for each seven spokes which appear to pass a fixed point in one minute -- therefore, as many as 10 spokes could pass and speed would still be within tolerance. (On 50 cycle equipment, the speed error is 0.1% for each six spokes that pass the fixed point in one minute.)

4.3 REPLACEMENT OF PARTS

4.3.1 General

All subassemblies of the tape transport can be easily removed from the top plate. Use the parts lists and the assembly drawings in the Parts Lists and Drawings section of this manual as a guide in determining how far each subassembly may be disassembled, because the replacement of some components requires precision work which should not be attempted in the field. If faults should become evident in such components, the entire subassembly should be returned to your Ampex dealer or to the factory for overhaul.

NOTE

Ampex can accept no responsibility for care or return of unidentified parts returned to the factory. Always write the Audio Service Department for a properly authorized return tag before shipping.

When packing motors which are to be returned, take particular care to protect the motor shafts from being bent in transit.

4.3.2 Replacing Brake Bands

The most convenient method of replacing the brake band is to remove the applicable

motor assembly from the transport, although this is not required for equipment that is rack mounted.

To remove the motor from the transport, disconnect the motor plug (P505P takeup or P506P supply) from the receptacle on the transport control box. At the back of the transport, manually support the motor and remove the four nuts and washers that secure the motor mounting plate (and the reel escutcheons) to the transport and remove the motor assembly (the turntable will still be attached to the motor and the reel escutcheons will be loose).

To replace the brake band then proceed as follows (numbers in parenthesis refer to item and figure numbers in Section 7).

Step 1: Remove the brake tension spring (10; 7-12) from the brake lever (4; 7-12).

Step 2: Remove the two screws holding the capacitor (9; 7-11). Disconnect the wires to the capacitor at the knife disconnect points, and remove the capacitor.

Step 3: Remove the three screws (22; 7-11) that secure the brake housing to the motor, disconnect the solenoid leads at the knife disconnect points, and remove the entire brake assembly from the motor.

Step 4: Remove the two socket head cap screws (26; 7-12) that secure the end of the brake band near the two "high side" brake adjustment points (farthest from the solenoid). A clamp will also come free.

Step 5: Loosen, but do not remove, the two socket head cap screws (26; 7-12) that clamp the other end of the brake band (nearest the solenoid). Using care not to lose the leaf spring, slide that end of the band from the clamp.

Step 6: Remove the brake band.

Step 7: Position the new brake band through the holes in the housing. Replace the two cap screws and clamp removed in Step 4, tightening the screws.

Step 8: Slip the slotted end of the brake band between the leaf spring (9; 7-12) and the band link (3; 7-12). Run the two cap screws in until they are snug but the band will still slip.

Step 9: Check that the solenoid stop (7; 7-12) is positioned so that the travel of the solenoid plunger is limited to 3/16 inch.

Step 10: Replace the brake assembly on the motor, manually actuating the solenoid to allow the brake band to slip over the drum.

Step 11: Replace the spring removed in Step 1.

Step 12: Manually actuate the solenoid, and slide the slotted end of the band in or out of the linkage (9 and 3; 7-12) so that the band flattens against the housing without buckling. Tighten the two cap screws. (This determines the maximum looseness of the band around the drum.)

Step 13: Release the solenoid. The brake band should limit the travel of the plunger so that there is a clearance of from 1/16 to 3/32 inch between the plunger and the solenoid stop. If not, the slotted end of the band, (refer to Step 12) must be slid further into the clamp (effectively shortening the band). The final adjustment must result in the proper clearance between the solenoid and plunger (solenoid deactuated) and free rotation of the drum with no drag when the solenoid is actuated. Also, there must be no buckling of the band (indicating the band is too long) when the solenoid is actuated.

Step 14: Check and adjust brake tensions (paragraph 4.2.3). This can be done before reinstalling the motor assembly on the transport.

Step 15: Reconnect the solenoid leads. Replace the capacitor and reconnect its leads. If the motor assembly was removed, reinstall it on the transport.

4.4 PRINCIPLES OF OPERATION

4.4.1 General

The tape transport mechanism (Fig. 4-4) provides tape motion for all modes of operation. Interaction of four basic assemblies and their associated components -- the tape supply system, the tape take-up system, the tape drive system, and the control circuit -- insures smooth positive movement of the tape across the head assembly, and proper tape tension. All tape motion controls, a reel size selector, a safety microswitch, and the head assembly are located on the tape transport.

Location of components at the back of the tape transport is shown in Fig. 4-5).

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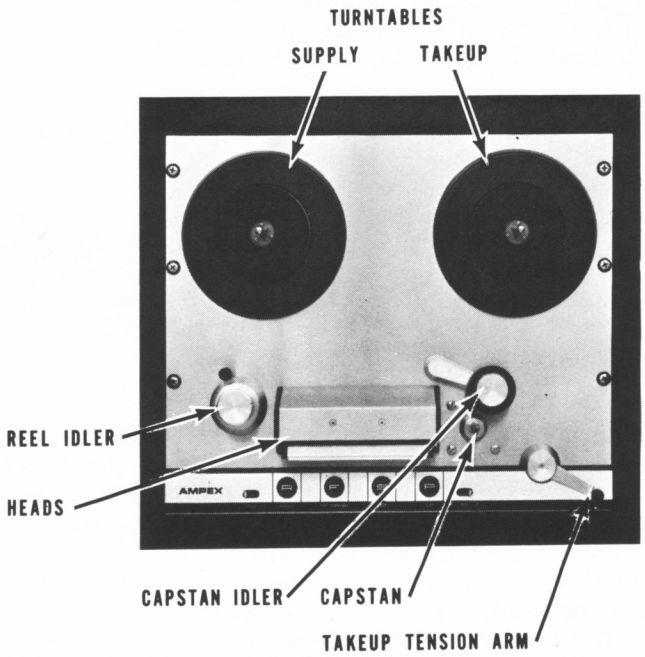

Fig. 4-4 Tape Transport, Front View

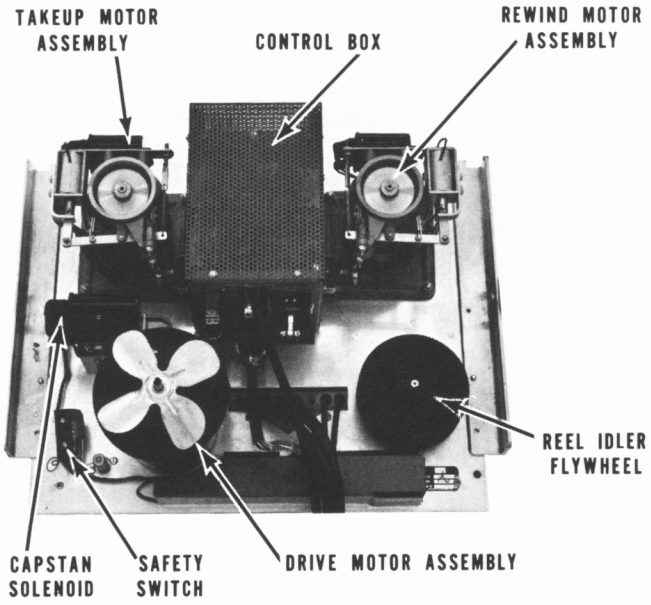

Fig. 4-5 Tape Transport,Rear View

4.4.2 Tape Supply and Take-up Systems

From the supply reel, on the left side of the tape transport as the operator faces the equipment, tape is delivered to the take-up reel when the Play or Fast Forward buttons are pressed, tape is rewound onto the supply reel when the Rewind button is pressed. Proper tape tensioning is maintained during all modes by the opposing action of two induction torque motors.

The reel idler assembly on the supply side of the tape transport is composed of a pulley, a spring-pivot-mounted arm, and a flywheel for smoothing out transient speed variations in the supply turntable assembly.

On the take-up side of the tape transport, a tension arm assembly with a spring-pivot-mounted arm performs two main functions. The first is to provide a small tape storage loop which prevents tape breakage during the starting and stopping of tape motion. Secondly, this arm is used to stop the equipment if tension is lost due to tape breakage, at the end of the tape, etc., by actuating safety switch S501.

Both the tape supply and take-up assemblies are composed of induction torque motors (B503 supply-rewind, B502 takeup), a turntable mounted directly on each motor shaft, a brake housing assembly and a flange for mounting the entire assembly. Because the brake housings are mirror images of each other, these assemblies are not interchangeable although the motors are identical. The brakes are solenoid operated, remaining in the braking position until the brake solenoids, K505 and K506, are energized -- at which time the brakes are released.

The supply and take-up motors are so connected that when power is applied with no tape threaded, the turntables, will rotate in opposite directions. The tape supply turntable will rotate clockwise and the tape take-up turntable, counterclockwise.

During all operating modes, the two torque motors act as tensioning devices. In the fast forward and rewind modes one motor operates at maximum torque, the other at reduced torque.

Motor torque in the reproduce and record modes is adjusted to equality by the tensioning adjustment resistors (R503 takeup and R505 holdback) in series with each motor. In the fast forward modes, the torque of the supply (rewind) motor is reduced by introduction of a series resistance (R504). In the rewind mode, R504 is connected in series with the take-up motor.

In the fast forward mode, the take-up motor operates at full torque, the supply motor at reduced torque, and the tape is pulled from the tape supply reel. Because the torque of the tape supply turntable motor (rewind motor) is applied in the opposite direction to the turntable rotation,

the tape is held under continuous tension as it is pulled from the reel.

In the rewind mode, the supply motor operates at full torque and the take-up motor holds the tape under continuous tension by its opposite and reduced torque.

In the reproduce or record modes, both torque motors operate at the same reduced torque. The capstan and the capstan idler, between which the tape is clamped, then determines the tape speed, and the tensioning system supplies tape or takes it up as metered by the capstan drive. From the point of view of the tape supply turntable, the capstan and idler action exerts sufficient pull on the tape to overcome the opposing torque of the supply motor, which constitutes the hold back tension. From the point of view of the tape takeup turntable, the capstan and idler action is feeding the tape to it. The tape is held under tension here because the take-up rate exceeds the feed rate (a tape loop will be thrown on the right side of the capstan whenever any malfunction causes the feed rate to exceed the take-up rate).

If a tape loop is thrown, or the tape breaks, the take-up tension arm will actuate the safety switch S501 and stop the equipment. The take-up tension arm is not a part of the tape tension system. Its function is to takeup tape slack, especially when starting, and to operate the safety switch.

The reel idler assembly smooths out transients in the supply reel system. For example, when starting the tape in the reproduce mode, the momentary strain transmitted through the tape to the tape supply turntable when the capstan idler forces the tape against the capstan is considerable. Under some circumstances, this impulse tends to stretch or break the tape. A momentary decrease in holdback tension might be sufficient to start a transient oscillation in the tape tension system which would be reflected as a periodic variation in the distance of the tape from the heads. This variation might be of sufficient magnitude to appear as an undesirable fluctuation in the signal level at the start of recording or reproduction. The reel idler arm absorbs most of the starting strain, and prevents or minimizes this type of oscillation. The reel idler pulley and flywheel provide additional stability in the tape tension system, by smoothing out such transients as motor torque fluctuations and irregularities due to faulty tape wrap on the supply reel. This is accomplished because the high inertia of the reel idler pulley and flywheel effectively isolate the reel assembly from the heads.

4.4.3 Tape Drive System

The tape drive system is composed of the drive motor, the extended shaft of which forms the capstan, the capstan idler arm and idler, and the tape guides at the tape entrance and exit within the head assembly.

The purpose of the tape drive system is to transport the tape across the heads at a uniform speed during the record and reproduce processes. By means of a hysteresis synchronous capstan drive motor (B501) and a capstan idler, the magnetic tape is driven at a constant speed after power has been applied to the equipment and the Play button pressed. The drive motor has two sets of windings to provide two tape speeds, either of which can be selected at SPEED toggle switch S503. The SPEED switch also controls the actuation of the equalization relay in the electronic assembly.

After the POWER switch at the electronic assembly has been placed in the ON position and the tape is threaded (actuating the safety switch) the drive motor operates continuously, awaiting the PLAY command (the RECORD function is selected at the amplifier). When the PLAY button is pressed, the capstan solenoid (K501) and the brake solenoids (K505 and K506 -- releasing brake pressure) are energized. The capstan solenoid pulls the rubber tired capstan idler wheel, which is mounted on a swivel type arm, against the tape, causing the tape to make firm positive contact with the capstan. The tape is then driven at a constant speed across the head assembly.

4.4.4 Brake Operation

Smooth brake operation is important in maintaining proper tape tension when stopping the tape. Because the holdback tension, supplied by the trailing turntable motor torque, is lost after the STOP button is pressed, maintenance of tape tension then becomes a function of brake operation. The braking force acting on the turntable from which the tape is being pulled (trailing turntable) in all modes of operation must exceed the braking force acting on the turntable taking up the tape (the leading turntable) to prevent tape loops forming.

The ratio of the braking force in one direction to the braking force in the other -- the brake differential -- is approximately two to one on this equipment. This differential is determined by three springs -- two of which determine the "high" braking force and one (which acts on the brake lever) the "low" braking force.

4.4.5 Control Circuit

4.4.5.1 General

Located in the control circuit box underneath the tape transport are all relays, the tension adjustment resistors, and electronic components such as capacitors and resistors (with the exception of the three motor starting capacitors, the capstan solenoid, the brake solenoids and the safety microswitch, which are mounted adjacent to the assemblies they serve).

On the outside of the control circuit box, receptacles are available for cables from the drive motor, supply motor, take-up motor and control cluster. Female receptacles and plugs (cables not supplied) are also available for interconnecting the tape transport and accessory units such as remote control panels and a precision frequency source.

NOTE

The special connector jumper plugs supplied for receptacles J503S 60 CYCLE AMPLIFIER and J502S REMOTE CONTROL must be plugged into their receptacles when these accessory units are not used. Jumpers in these plugs complete the necessary circuits in the system for proper operation.

All control of the tape transport takes place at the control circuit switch assembly comprising four pushbuttons: Rewind, Fast forward, Stop and Play. Two toggle switches REEL (size) and SPEED are mounted at either end of the control cluster. (The RECORD function is controlled at the amplifier.) The safety switch (not an operating control) is mounted under the tape transport.

Refer to Figs. 7-1 and 7-2 to follow the description of operating functions.

4.4.5.2 Play

When Play button S505 is pressed, play relay K502 is energized. Capstan solenoid K501 is energized, and a holding circuit is formed, through contact sets K502-1, K503-1, K504-3, and the normally closed Stop button S502. Power is connected to the turntable reel motors through contact K502-2. Through contact K502-3, d-c voltage is applied to brake solenoids K505 and K506. The reel motors are powered and the brakes are released simultaneously, causing the equipment to operate in the reproduce mode at the tape speed selected by SPEED switch S503.

NOTE

The record mode is not a tape motion control function, but it is interlocked and dependent on the PLAY button, which must be pressed before the record mode can be energized at the amplifier.

4.4.5.3 Rewind

When Rewind button S507 is pressed, rewind relay K504 is energized and held in this condition by relay contact sets K504-1, K503-3 and the normally closed Stop button S502. Contact set K504-2 connects the full a-c power directly to the rewind (supply) motor, and places R504 in the a-c circuit to the take-up motor. The rewind motor thus operates at full torque and the take-up motor at reduced torque, and tape is pulled at a maximum speed from the take-up to the rewind reel. Contact set K504-3 completes the d-c circuit to the brake solenoids, releasing the brakes.

4.4.5.4 Fast Forward

When Fast Forward button S506 is pressed, fast forward relay K503 is energized and held through contacts K503-1, K504-3, and the normally closed Stop button S502. Contact set K503-2 connects the full a-c power to the take-up motor, and places R504 in the circuit to the rewind motor. The take-up motor now operates at full torque and the rewind motor at reduced torque, causing the tape to be pulled at a maximum speed from the rewind to the take-up reel. Contact set K503-3 completes the d-c circuit to the brake solenoid, releasing the brakes.

4.4.5.5 Stop

When the tape is moving in any mode and the Stop button (S502) is pressed, the brake solenoids and all relays are de-energized. The brakes are applied to both turntable motors. The capstan drive motor will continue to operate so long as the tape remains properly threaded.

4.4.5.6 Safety Interlocks

When the tape is moving in either of the high speed modes (fast forward or rewind) it is impossible to switch to the play mode without first

pushing the STOP button. In fast forward, contact K503-1 interlocks the play relay and capstan solenoid. In rewind, K504-3 is the interlock.

CAUTION

IF THE STOP AND PLAY BUTTONS ARE PRESSED IN TOO RAPID A SEQUENCE WHEN THE TAPE IS IN EITHER FAST WINDING MODE, TAPE WILL ALMOST INVARIABLY BE BROKEN OR DEFORMED. ALWAYS ALLOW TIME FOR THE TAPE TO STOP COMPLETELY WHEN SWITCHING FROM EITHER OF THE FAST MODES TO PLAY.

4.4.5.7 Reel Size Switch

Selection of proper holdback tension, depending on reel hub size, is made at the two position toggle switch labeled REEL. Holdback tension is not a constant in any mode of operation, varying directly as a function of the trailing turntable motor torque, and inversely as a function of the effective trailing reel hub diameter (hub diameter includes the tape wound on the hub). For a given torque on the trailing motor, the holdback tension will increase as the effective hub diameter of the trailing reel decreases. Reducing the torque on the trailing turntable motor will decrease the holdback tension.

The holdback tension resistors for adjustment of take-up and rewind motor torques are factory-set for NAB 10-1/2 inch reels. When these reels are used, the REEL switch must be positioned to the right -- toward the large circle. If the smaller (7 or 5 inch) EIA reels are used, compensation for the overall increase in holdback tension must be made by placing the switch to the left -- toward the small circle. This places resistor R502 in series with the take-up and rewind motors, thus reducing the torque of both motors in any mode of operation when the EIA reels are used. If it is desired to accelerate faster in the rewind or fast forward modes, the switch may be placed in the large position during these modes, but be sure it is returned to the small position when fastwinding is completed. The REEL SIZE switch is a SPST switch placed across the resistor R502. It is closed in the position for 10-1/2 inch diameter NAB reels, and open (resistor R502 in the torque motor circuits) for the small reels.

NOTE

In the large reel position both the rewind and take-up reels must be NAB type and in the small reel position both reels must be EIA.

Section 5

ELECTRONIC MAINTENANCE

5.1 PREVENTIVE MAINTENANCE

Preventive maintenance of the electronic assembly consists only of keeping the assembly clean. Remove the covers at frequent intervals and remove any accumulations of dirt and dust, using a small brush or vacuum cleaner. Do not use the blower action of a vacuum cleaner (or any other compressed air device) in cleaning, because particles of dust might be blown into critical areas -- such as bearings -- on the tape transport.

5.2 CHECKOUT AND ADJUSTMENT

5.2.1 General

The checkout and adjustment procedures which follow are described for a record/reproduce equipment. There should be little difficulty in relating these instructions to the relatively simple adjustment of a reproduce-only unit.

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

Standard alignment 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 tape should be stored under the tape tension encountered in a normal play run, not after being rewound. After extended use, the response will begin to fade -- for example, the head azimuth tone on the standard tape may be down as much as 2 db.

When the standard tape is first run, it should be moved in the fast forward mode to the take-up side, then rewound to another reel (not the standard tape reel). The standard tape reel is then placed on the takeup turntable and tape threaded to it. This allows storage on the original reel without rewinding. Subsequent runs are made by putting the standard tape on the takeup turntable and rewinding to an empty reel on the supply turntable before proceeding with the reproduce alignment.

5.2.2 Test Equipment Required

D-C Voltmeter, 20,000 ohms-per-volt
A-C Vacuum Tube Voltmeter, Hewlett-Packard Model 400D or equivalent
Ampex Standard Alignment Tapes as applicable

15 ips NAB No. 01-31311-01
15 ips CCIR No. 01-31313-01
15 ips AME No. 01-31312-01
7-1/2 ips NAB No. 01-31321-01
7-1/2 ips CCIR No. 01-31323-01
3-3/4 ips (120 μsec) No. 01-31331-01
3-3/4 ips (200 μsec) No. 01-31334-01

*Current probe (for vtvm)
*Electronic Counter
Signal Generator, Hewlett-Packard Model 200C or equivalent
*Bias Filter (see Fig. 5-3)
Noise Filter (see Fig. 5-4)
*Wave Analyzer
Normal tools used by technician.

*If available.

5.2.3 Test Conditions

LINE TERMINATION switch on back of electronics in ON position to terminate equipment during all checks.

INPUT SELECTOR switch on back of electronics in UNBAL BRIDGE position during all checks.

Heads cleaned and demagnetized before starting checks.

Top and bottom covers installed on electronics during checks.

All record tests made with professional grade magnetic tape such as Ampex No. 631 or equivalent.

5.2.4 Voltage Regulator Adjustment

Proper operation of the voltage regulator can be checked at the octal socket for accessories (J7) at the back of the electronic assemblies.

Step 1: At the transport, select the low tape speed.

Step 2: Use pressure sensitive tape to hold the takeup tension arm away from its rest position, so that it does not contact the safety switch.

Step 3: Place the RECORD SELECTOR switches for all electronic assemblies in the READY position. Press the Play pushbutton on the transport and the RECORD pushbutton on the master electronic assembly. (The equipment will be in the record mode with the capstan idler against the capstan, and both reel motors operating.)

Step 4: Check the voltage from pin 7 (positive) of the octal socket to chassis ground, using the d-c voltmeter. It should be 23 volts (±1 volt).

If the need for adjustment is indicated, remove the top service cover from the electronics assembly to gain access to the printed circuit board of that assembly. Repeat Steps 1, 2, and 3 previously described, checking the voltage from terminal 48 (positive) of the printed circuit board to chassis ground. Adjust R77 (see Fig. 5-1) on the printed circuit board to achieve a 23 volt indication (±1/2 volt) on the voltmeter.

Repeat the procedure for the other electronic assembly if this is a two channel equipment.

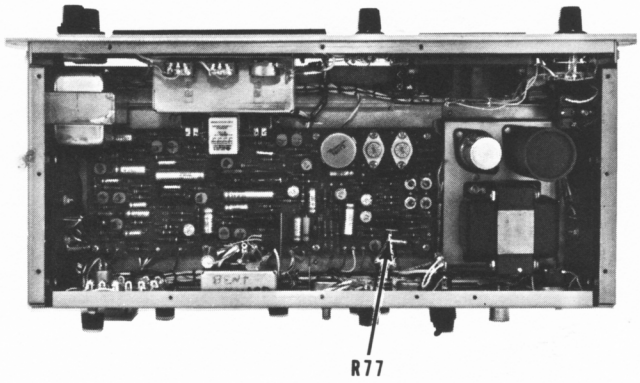

Fig. 5-1 Voltage Regulator Adjustment Point

5.2.5 Reproduce Alignment

Standard tape speeds available with this equipment are 3-3/4 - 7-1/2 ips and 7-1/2 - 15 ips. Because the 7-1/2 ips speed is common to either version, and will provide an optimum setting of controls, the reproduce alignment will be started with that speed.

Step 1: At the back of the electronic assembly, connect the vtvm to the line OUTPUT connector. Terminate the output by placing the LINE TERMINATION switch in the ON position.

Step 2: Remove the head cover by removing the two screws on the top of the cover, and carefully lifting it up and off.

Step 3: Thread the 7-1/2 ips Ampex Alignment Test Tape on the tape transport.

CAUTION

WHENEVER A STANDARD TAPE IS THREADED ON THE TRANSPORT, ALWAYS CHECK THAT THE RECORD SELECTOR SWITCHES ON ALL ELECTRONIC ASSEMBLIES ARE IN THE SAFE POSITION.

Step 4: Select the 7-1/2 ips speed at the transport and place the OUTPUT SELECTOR switch

(not provided on reproduce-only equipment) in the REPRODUCE position. Start the standard tape in motion in the reproduce mode.

Step 5: The first tone on the standard tape is at 700 cps. Adjust the REPRODUCE LEVEL control to achieve any convenient indication on the vtvm.

Step 6: The next tone is at 15,000 cps. As this signal is reproduced, adjust the reproduce head azimuth (see Fig. 5-2) to achieve a maximum indication on the vtvm. If the head azimuth is far out of adjustment, minor peaks will be observed on each side of the correct setting; the correct adjustment will be unmistakable, however, for it will result in a vtvm indication obviously higher than the minor peaks.

CAUTION

DO NOT TAMPER WITH ANY SCREW ON THE HEAD ASSEMBLY OTHER THAN THE ONE FOR AZIMUTH ADJUSTMENT.

Step 7: If this is a two-channel equipment, repeat Steps 1, 4, 5, and 6 for the second channel. If the head azimuth does not peak at exactly the same setting, a compromise adjustment between the two heads in the stack must be made.

Step 8: After completing the reproduce head azimuth adjustment, rewind the standard tape to the beginning of the first tone and replace the head cover.

Step 9: Remove the cover on the front panel of the electronic assembly by removing the two screws which secure it to the panel.

Step 10: Start the tape in motion in the reproduce mode. As the 700 cycle tone is reproduced, set the REPRODUCE LEVEL control to achieve a convenient reference indication on the vtvm (i.e, -2 or -6 dbm).

Step 11: Check response as the balance of the tones on the standard tape are reproduced. Adjust the appropriate REPRODUCE HIGH FREQUENCY equalizer as required to achieve the flattest possible response (within specifications). However, do not adjust the equalizer more than ±2 db from the theoretical curves shown on Figs. 8-7 and 8-8.

NOTE

When half track or two track heads are employed, readings below 700 cps (7-1/2 and 15 ips) or 500 cps (3-3/4 ips) are invalid when reproducing a standard tape. These tapes are recorded full track, and the "fringing" effect that occurs results in high indications at lower frequencies. This effect does not occur when tapes are recorded and reproduced using heads of the same configuration.

Step 12: As the 700 cycle tone at operating level is reproduced, turn the REPRODUCE LEVEL control to the CAL mark and adjust the REP CAL control as necessary to achieve a +8 or +4 dbm indication on the vtvm (level will depend on whether the equipment is strapped for a +8 or +4 dbm operating level output). The equipment vu meter should indicate 0, ±3/4 db.

NOTE

On reproduce-only equipment there is no REP CALIB control. As the 700 cps tone is reproduced, simply adjust the REPRODUCE LEVEL control for the indicated output.

Step 13: Allow the tape to continue in motion in the reproduce mode until it is completely wound on the supply reel.

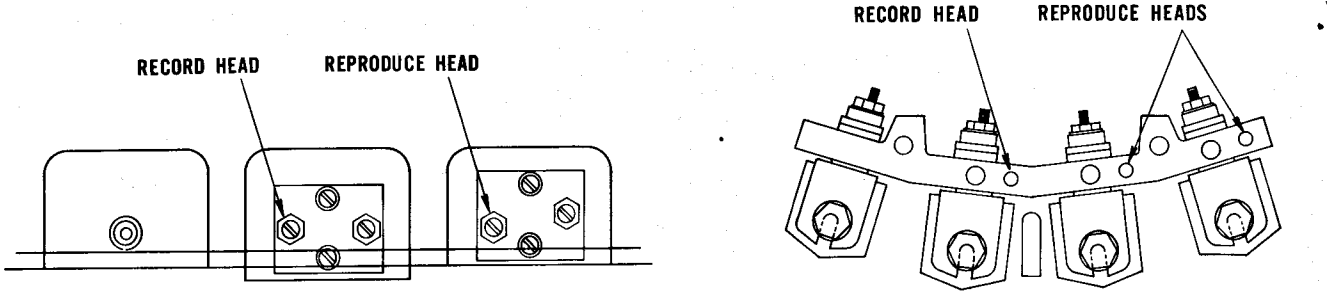

Fig. 5-2 Head Azimuth Adjustment Points

Step 14: Repeat Steps 8 and 11 for the second speed, using the appropriate standard alignment test tape.

Step 15: Repeat Steps 8, 9, 10, 11, 12, and 13 for the second electronic assembly if this is a two channel recorder.

5.2.6 Record Bias Oscillator Frequency and Erase Current Adjustment

This adjustment, which is not applicable to reproduce-only equipment, is made at the factory using a current probe, electronic counter, and vtvm, and placing one channel at a time in the record mode. If such equipment is available, check the erase current at the back of the erase head connector (with the erase head connected); it should be 60 milliamperes (±5 ma). Then check the frequency, which should be 100,000 cps (±5,000 cps). If adjustment is required, set ERASE ADJ control C36 to achieve the 60 ma erase current and BIAS FREQ control C34 so that the frequency is as close as possible to 100,000 cps. Then readjust C36 for correct erase current.

NOTE

If this is a two channel recorder, the bias oscillator frequencies in the two electronic assemblies must be identical within 1,000 cps.

If the test equipment used at the factory is not available, do not tamper with the adjustment of C34 or C36 unless erase efficiency is impaired or a beat frequency (when simultaneously recording and reproducing on both channels of a two channel equipment) becomes noticeable. In either case, adjust ERASE ADJ control C36 for a 40 volt (±1 volt) erase level, measuring with the vtvm at the back of the erase head connector (with the erase head connected). On two channel equipment, adjust BIAS FREQ control C34 to eliminate the beat frequency, then re-check the setting of C36.

5.2.7 Record Bias Adjustment

NOTE

On this and other record adjustments, blank tape is specified. Tape used can be either blank (bulk erased) or recorded with information not necessary to save (it will be erased during the record process). However, always bulk erase tape if it was recorded with a head configuration different from that on the equipment under test (the original recording might not be completely erased on the equipment).

This is a critical adjustment which must be made with the type of tape which will normally be used. It is not applicable to reproduce-only equipment.

Step 1: At the electronic assembly for the channel to be tested, place the RECORD SELECTOR switch in the READY position and the OUTPUT SELECTOR switch in the REPRODUCE position.

Step 2: Apply power to the equipment and select the 7-1/2 ips tape speed.

Step 3: Connect the signal generator to pins 1 and 3 of the line INPUT connector for the channel under test. Set it to 500 cps at a nominal 1 volt level.

Step 4: Connect the vtvm to the line OUTPUT of the channel under test.

Step 5: Thread blank tape on the equipment.

Step 6: Place the tape in motion in the record mode. Adjust the RECORD LEVEL control to achieve a convenient vtvm indication.

NOTE

Record only on the channel being tested.

Step 7: While thus simultaneously recording and reproducing, adjust the BIAS ADJ control for a peak vtvm indication.

Step 8: Turn the OUTPUT SELECTOR switch to the BIAS position. Adjust the BIAS CAL control, on the back panel of the electronic assembly, so that the vu meter indicates 0.

Leave test equipment connected for subsequent test procedures.

5.2.8 Record Level Adjustment and Calibration

The reproduce level must be adjusted (see paragraph 5.2.5) before starting this procedure, which is not applicable to reproduce-only equipment.

Step 1: Repeat Steps 1 through 5 of the record bias adjustment procedure (refer to paragraph 5.2.7). Leave the signal generator on 500 cps at a nominal 1 volt level.

Step 2: Start tape in motion in the record mode.

Step 3: While thus simultaneously recording and reproducing, turn the RECORD LEVEL control to achieve either a +8 or +4 dbm indication on the vtvm (level will depend on whether the particular equipment is strapped for a +8 or +4 dbm operating level output).

Step 4: Turn the OUTPUT SELECTOR switch to the INPUT position, and adjust the REC CAL control for a 0 indication on the vu meter.

Step 5: Repeat the procedure for the second channel if this is a two channel equipment.

Leave test equipment connected for subsequent checks.

5.2.9 Record Head Azimuth Adjustment

This adjustment is not applicable to reproduce-only equipment.

Step 1: Repeat Steps 1 through 5 of the record bias adjustment procedure (refer to paragraph 5.2.7). Set the signal generator to 15,000 cps at a nominal 1 volt level, and adjust the RECORD LEVEL control to obtain a -10 indication on the vu meter with the OUTPUT SELECTOR switch in the INPUT position.

Step 2: Remove the head cover by removing the two screws at the top of the cover and carefully lifting it off.

Step 3: Place tape in motion in the record mode. Place the OUTPUT SELECTOR switch in the REPRODUCE position.

Step 4: While thus simultaneously recording and reproducing, adjust the record head azimuth (see Fig. 5-2) to achieve a maximum vtvm indication. There may be minor peaks if the azimuth is far out of adjustment, but the correct setting will result in an output obviously higher than the minor peaks.

CAUTION

DO NOT TAMPER WITH ANY SCREW ON THE HEAD OTHER THAN THE ONE FOR AZIMUTH ADJUSTMENT.

Step 5: Repeat the procedure for the other channel if this is a two channel equipment. If the azimuth does not peak at exactly the same setting, a compromise adjustment between the two heads in the stack must be made.

Step 6: Replace the head cover.

Leave test equipment connected for subsequent checks.

5.2.10 Low Frequency Reproduce Equalization Adjustment

Step 1: Repeat Steps 1 through 5 of the record bias adjustment procedure. Set the signal generator to 500 cps at a nominal 1 volt level.

Step 2: Place tape in motion in the record mode. Simultaneously record and reproduce at normal level.

Step 3: Change the frequency of the signal generator as required and adjust the 7-1/2 ips REPRODUCE LOW FREQUENCY equalizer for the flattest possible response from 250 cps to 30 cps in accordance with specifications. This is accomplished by adjusting for equal levels of the positive head bump peaks and negative head bump dips.

Step 4: Repeat Steps 1, 2, and 3 for the second speed, adjusting the appropriate reproduce low frequency equalizer.

Step 5: Repeat the entire procedure for the other channel if this is a two channel equipment.

On reproduce-only equipment, record frequencies from 250 to 30 cps on a properly adjusted record unit which has the same head configuration as the reproducer. Adjust the low frequency equalizer while reproducing this tape. If a record unit is not available thread the appropriate standard alignment tape on the equipment and adjust the low frequency equalizer for the output indication shown on Table 5-1 when the 50 cycle tone is reproduced.

Table 5-1. Low Frequency Equalization Response Using Standard Alignment Tape

TAPE SPEED	HEAD	RESPONSE (50 cps)
15 ips	Full Track	0 db
15 ips	Half Track	+2.5 db
15 ips	Two Track	+2 db
7-1/2 ips	Full Track	0 db
7-1/2 ips	Half Track	+2 db
7-1/2 ips	Two Track	+2 db
3-3/4 ips	Full Track	0 db
3-3/4 ips	Half Track	+1 db
3-3/4 ips	Two Track	+1 db

5.2.11 Record Equalization Adjustment

This procedure, which is not applicable to reproduce-only equipment, is most easily made by using a bias filter (see Fig. 5-3). If such a filter cannot be constructed, a trial-and-error method must be employed where the tape is first recorded as in Steps 2, 3, and 4 at different settings of the record equalization, then reproduced to determine proper setting.

Step 1: Repeat Steps 1 through 5 of the record bias adjustment procedure (refer to paragraph 5.2.7) inserting the bias filter between the OUTPUT connector and the vtvm. Set the generator to 500 cps at a nominal 1 volt level.

Step 2: Place the OUTPUT SELECTOR switch in the INPUT position and adjust the RECORD LEVEL control for a -10 or a -14 dbm output as indicated on the vtvm (level will depend on whether the equipment is strapped for a +8 or +4 db operating level output). Return the OUTPUT SELECTOR switch to the REPRODUCE position.

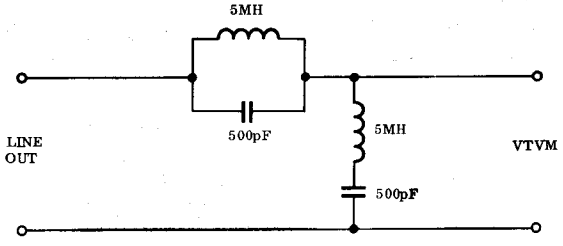

Fig. 5-3 Bias Filter

Step 3: Place the tape in motion in the record mode.

Step 4: While thus simultaneously recording and reproducing, change the frequency of the signal generator as required, and adjust the RECORD EQUALIZATION control for the flattest possible high frequency response in reference to 500 cps, in accordance with specifications.

Step 5: Repeat Steps 1 through 4 for the second speed.

Step 6: Repeat the entire procedure for the other channel if this is a two channel equipment.

5.2.12 Distortion and Noise Balance Adjustment

This adjustment, which is not applicable to reproduce-only equipment, is made at the factory using a signal generator with a second harmonic distortion less than 0.2% and a wave analyzer. Bias symmetry control R84 is adjusted for minimum second harmonic distortion of a 500 cps signal at 7-1/2 ips, placing only one channel at a time in the record mode.

If the test equipment used at the factory is unavailable, do not tamper with the adjustment of R84 unless some component in the bias and erase oscillator is changed. After completing such corrective maintenance, simultaneously record and reproduce with no input signal while monitoring the reproduce output through a high gain amplifier and loudspeaker (or head set). Adjust BIAS SYMMETRY control R84 for a minimum popping or hissing noise.

NOTE

If the symmetry control has no audible effect, simply leave it in the midposition.

5.3 OVERALL PERFORMANCE CHECKS

5.3.1 Test Equipment Required

Signal Generator, Hewlett-Packard Model 200C or equivalent
*Bias Filter (see Fig. 5-3)
A-C Vacuum Tube Voltmeter, Hewlett-Packard Model 400D or equivalent
Bandpass Filter (See Fig. 5-4)
*Wave Analyzer

*If available

5.3.2 Test Conditions

LINE TERMINATION switch on back of electronics in ON position to terminate equipment during all checks.

INPUT SELECTOR switch on back of electronics in the UNBAL BRIDGE position.

Heads cleaned and demagnetized before starting checks.

Top and bottom covers installed on electronics during checks.

All record tests made with professional grade-magnetic tape such as Ampex No. 631 or equivalent.

5.3.3 Overall Frequency Response Check

This check can be made while simultaneously recording and reproducing if the bias filter (see Fig. 5-3) is available. If this is not the case, record the tape and then rewind and make the response run.

On reproduce-only equipment the response check can be made by recording the tape on a properly adjusted recorder with the same track configuration as the reproducer. If such a recorder is unavailable, make the check with a standard tape (refer to paragraph 5.2.5) -- keeping in mind the low frequency limitations noted for such a tape.

Step 1: Connect the signal generator to pins 1 and 3 of the line INPUT connector for the channel under test. Set it to 500 cps at a nominal 1 volt level.

Step 2: Connect the bias filter to the corresponding line OUTPUT connector, and connect the vtvm to the output of the filter.

Step 3: Place the OUTPUT SELECTOR switch in the INPUT position and adjust the RECORD LEVEL control for a -10 or -14 dbm output as indicated on the vtvm (level is dependent on whether the equipment is strapped for a +8 or +4 db operating level output). Then turn the OUTPUT SELECTOR switch to the REPRODUCE position.

Step 4: Place the RECORD SELECTOR switch of the channel being tested in the READY condition.

Step 5: Thread blank tape on the equipment and select the 7-1/2 ips tape speed.

Step 6: Place the tape in motion in the record mode.

Step 7: While thus simultaneously recording and reproducing, change the signal generator frequency in discrete steps from 30 to 15,000 cps. The response, as indicated on the vtvm, should be within the tolerances quoted in specifications (refer to Section 1).

Step 8: Select the second speed and repeat Steps 6 and 7. Note that if the second speed is 3-3/4 ips, the record level as quoted in Step 3 is correct. If it is 15 ips that level may be increased to 0 or -4 dbm (depending on output strapping) as indicated on the vtvm. Make the response run from 50 to 7,500 cps for the 3-3/4 ips speed, from 30 to 18,000 cps at the 15 ips speed.

Step 9: Repeat the entire procedure for the other channel if this is a two channel equipment.

Poor frequency response can result from any of the causes listed below:

a. Heads in need of demagnetization (refer to Section 6).

b. Heads in need of cleaning (refer to Section 6).

c. Head azimuths incorrectly adjusted (refer to paragraphs 5.2.5 and 5.2.9).

d. Bias level incorrectly adjusted (refer to paragraph 5.2.7).

e. Reproduce equalization incorrectly adjusted (refer to paragraphs 5.2.5 and 5.2.10).

f. Record calibration incorrectly adjusted (refer to paragraph 5.2.8).

g. Record equalization incorrectly adjusted (refer to paragraph 5.2.11).

h. Play holdback tension incorrectly adjusted (refer to Section 4).

i. Magnetic tape not professional quality.

j. Signal generator output not flat over response spectrum.

5.3.4 Overall Signal-to-Noise Check

To make this check it is required that an output bandpass filter be employed. A

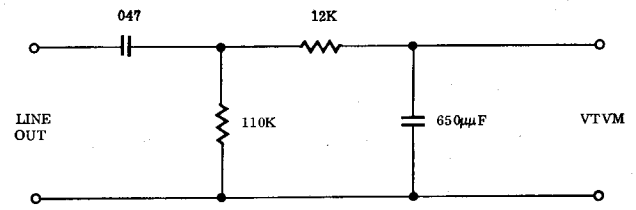

Fig. 5-4 Noise Filter

schematic diagram of the necessary filter is shown on Fig. 5-4.

Step 1: Connect the signal generator to pins 1 and 3 of the line INPUT connector for the channel under test. Set it to 500 cps at a nominal 1 volt level.

Step 2: Connect the bandpass filter to the corresponding line OUTPUT connector, and the vtvm to the output of the filter.

Step 3: Place the OUTPUT SELECTOR switch in the INPUT position and adjust the RECORD LEVEL control for a +14 or +10 dbm output (depending on whether the equipment is strapped for a +8 or +4 dbm operating level output).

Step 4: Place the RECORD SELECTOR switch in the READY position.

Step 5: Thread blank tape on the equipment and select the 7-1/2 ips tape speed. Close the head gate.

Step 6: Place tape in motion in the record mode and record a section of the tape with the 500 cps signal.

Step 7: Rewind the tape to the beginning of the recording made in Step 6. Remove the signal generator. Place the OUTPUT SELECTOR switch in the REPRODUCE position. Close the head gate.

Step 8: Start tape in motion in the record mode with no input signal. The noise level, while thus erasing the 500 cps recording, 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, add 14 db (+8 dbm output) or 10 db (+4 dbm output) to the vtvm indication in Step 8 to determine the actual signal-to-noise ratio.

Step 9: Repeat Steps 6, 7, and 8 for the second speed.

Step 10: Repeat the entire procedure for the other channel if this is a two channel equipment.

The signal-to-noise ratio should meet specifications (refer to Section 1).

An inadequate signal-to-noise can result from any of these causes:

a. Heads in need of demagnetization (refer to Section 6).

b. Heads in need of cleaning (refer to Section 6).

c. Incorrect bias symmetry adjustment (refer to paragraph 5.2.12).

d. Magnetic tape not professional quality.

e. External fields from nearby motors, generators, etc.

f. Head cables rubbing against moving parts on transport.

g. Making noise run with head gate open.

To check reproduce noise, remove the tape from the equipment. Connect the vtvm to the line output connector and hold the takeup tension arm away from its rest position (so that it does not contact the safety switch). Press the Play pushbutton and read the noise on the vtvm. Under these circumstances the signal-to-noise should be as shown in Table 5-2.

Table 5-2. Reproduce Noise

TAPE SPEED	HEAD	REPRODUCE SIGNAL/NOISE
15 ips	Full Track	63 db
15 ips	Half Track	58 db
15 ips	Two Track	58
7-1/2 ips	Full Track	63 db
7-1/2 ips	Half Track	58 db
7-1/2 ips	Two Track	58 db
3-3/4 ips	Full Track	58 db
3-3/4 ips	Half Track	53 db
3-3/4 ips	Two Track	53 db

5.3.5 Overall Distortion Check

An accurate check of distortion on this equipment 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 cps signal on blank tape at normal operating level. On playback, the second harmonic component should not exceed 0.4%, the third harmonic between 0.6% and 1.1%. The most common cause of any higher second harmonic distortion reading 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 employed, the bias setting, and the accuracy with which the "normal operating level" is adjusted. A typical roll of tape will have a 500 cps third harmonic content of 0.8% at operating level, but this might range as high as 1.1%.

5.4 PRINCIPLES OF OPERATION

5.4.1 General

This discussion can be followed most easily by referring to the block diagrams of Figs. 5-5 and 5-6, and the schematic diagrams of Figs. 7-3 through 7-7. Because there is considerable difference in the reproduce circuit between the record/reproduce and reproduce-only equipment, the two will be described separately.

On the record/reproduce assembly, numbers preceding the reference symbol refer to the physical location of the component. Symbols preceded by 1 (1Q1, 1R31, etc.) indicate the component is on the printed circuit board. A 2 indicates location on the front panel, 3 on the left panel (when facing the front), 4 on the back panel, 5 on the right panel, and 6 on the power supply.

On two channel equipment one electronics assembly will be a "master" unit, the other a "slave" unit. The only differences between the two is that power application and entrance into the record mode is controlled at the master. A-c power is connected to the master, and routed from there to the tape transport and the slave assembly.

5.4.2 Power Supply

Line power is connected to the electronic assembly at 4J10, and is then connected through POWER switch 2S4 and fuse 4F2 across the primary of power transformer 6T3. (From the switch, a-c power is also delivered to the tape transport through fuse 4F1 and connector 4J9.)

One secondary winding of transformer 6T3 is connected to the lights on the vu meter, which act as a power indicator. The other secondary winding is across a bridge rectifier, consisting of diodes 1CR3 through 1CR6. After rectification, power is routed to a voltage regulator circuit.

In the voltage regulator, the reference voltage is established by zener diode 1CR10, and the sampling voltage is taken at variable resistor 1R77 (which provides the voltage adjustment). If the output voltage tends to vary with load, the conductance of transistor 1Q22 will change. This in turn affects the conductance of transistors 1Q21 and 3Q20, connected in a Darlington circuit, so that the voltage is returned to the normal level.

Transistor 1Q19 acts as a constant current source. Diode 1CR9 and resistor 1R74 provide overload protection. If the current through 1R74, combined with that through 1R73, results in a voltage sufficient to break down 1CR9, transistor 1Q19 will be biased toward cutoff. This in turn will under bias the rest of the transistors in the regulator.

A +23 volt regulated output is delivered to the speed switch on the tape transport, and used to energize equalization relay 2K1 in the low speed position of that switch. It is also routed to all stages in the reproduce amplifier, the octal socket for accessory input units, and the first three stages in the record amplifier.

When the channel is in the record mode, one contact of record relay 3K2 connects the power to the final two stages of the record amplifier, and through series transistor 1Q23 and fuse 4F3 to the bias oscillator. Those circuits thus will opeate only when the channel is recording.

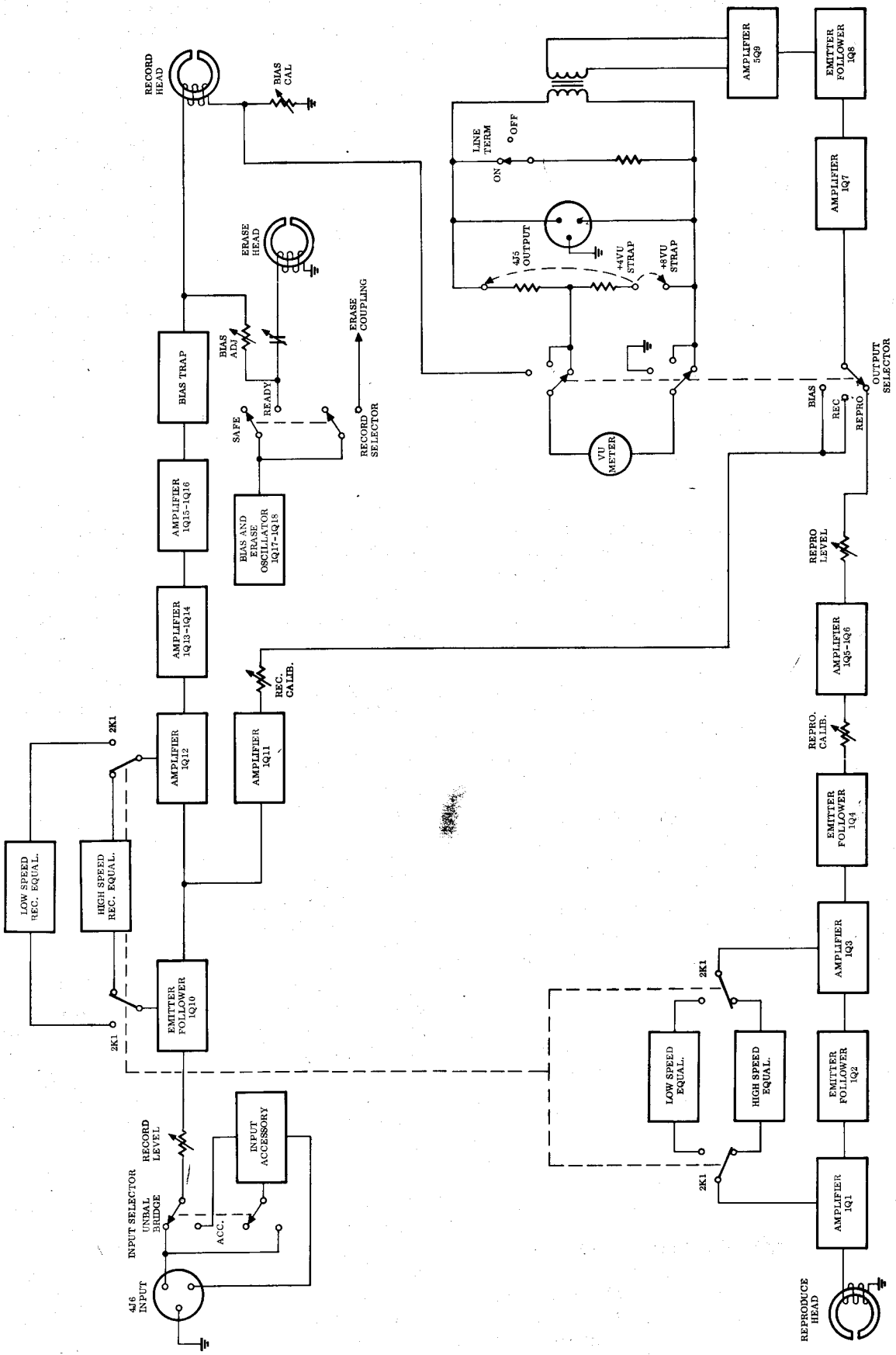

Fig. 5-5 Block Diagram, Record/Reproduce Electronic Circuit

NOTE

The power supply in a reproduce-only unit employs a very simple voltage regulator, consisting of a bridge rectififer, series power transistor, and a zener diode.

5.4.3 Record Circuit

The signal to be recorded is connected to the equipment at INPUT connector 4J6. From there it is connected to the INPUT SELECTOR switch 4S3. If the recording is from an unbalanced line this switch is placed in the UNBAL BRIDGE position, if it is from a balanced line or microphone, the switch is placed in the ACCESSORY position and the proper accessory plug-in unit (transformer or microphone preamplifier, see Section 1) is inserted in octal socket 4J7.

From the selector switch or accessory unit, the signal is routed through RECORD LEVEL control 2R38 to the base of emitter-follower stage 1Q10. From the emitter of 1Q10 the signal path splits. One path leads through the record calibrating amplifier 1Q11, whose gain is adjusted by RECORD CALIBRATE control 2R45, and through contacts of the OUTPUT SELECTOR switch 2S1 to the line amplifier -- through which it proceeds to the monitor jack, vu meter, and OUTPUT connector for monitoring purposes.

The second signal path from 1Q10 is through resistor 1R42 to the base of amplifier stage 1Q12. Note that record equalization consists of a variable capacitor (on the plug-in equalizers) selected by contacts of equalization relay 2K1; this capacitor is connected in parallel with 1R42 to provide the necessary high frequency pre-emphasis.

After amplification in 1Q12 the signal is connected to 1Q13 and 1Q14, which form a Darlington amplifier circuit. In such a circuit, the first transistor in the circuit (1Q13) provides a low impedance source for the second (1Q14). The resultant amplifier is characterized by very low noise. From this amplifier the signal proceeds to a constant current amplifier stage formed by 1Q15 and 1Q16.

In this constant current state, transistor 1Q15 acts as an active load resistance for the collector of 1Q16, providing a relatively low d-c resistance and a relatively high a-c resistance. In the audio frequency range, therefore, the collector of 1Q16 works into an impedance which is sufficiently high to provide a constant current source for the record head, yet allows full utilization of the d-c operating voltage available.

From this stage the signal is routed through a bias trap, consisting of choke 1L1 and capacitor 1C27, to the record head. Operating voltage is delivered to 1Q13, 1Q14, 1Q15, and 1Q16 only when the channel is in the record mode, so those stages are inactive in any other mode.

The bias/erase oscillator, consisting of transistors 1Q17 and 1Q18, is a push-pull circuit connected as tuned flip-flop. Operating voltage is delivered only when the channel is in the record mode. Symmetry of the output waveform is adjusted at 4R84, and the frequency is adjusted at variable capacitor 4C34. The transformer-coupled output is delivered to the RECORD SELECTOR switch 2S5. When this switch is in the READY position, the oscillator output is routed through BIAS ADJUST resistor 2R68 to the record head, where it is mixed with the signal. It is also connected through ERASE ADJUST capacitor 4C36 to the erase head, and to the erase coupler jack (4J12). On two channel equipment the erase coupling jacks are employed to connect the two oscillators and thus lock their frequencies together; this prevents any beat frequency from being generated. When the RECORD SELECTOR switch is in the SAFE position the oscillator transformer, record head and erase head, and the coupling circuit, are disconnected from each other.

5.4.4 Reproduce Circuit (Record/Reproduce Equipment)

The signal from the reproduce head enters the electronic assembly at 4J1 and is amplified by transistor stage 1Q1. It is then routed through emitter follower 1Q2 to another amplifier (1Q3). The high speed or low speed equalization circuit, as selected by contacts of equalization relay 2K1, is connected from the collector of 1Q3 back to the emitter of 1Q1, and d-c feedback is provided through 1R4 between these two stages.

Transistor 1Q4 is another emitter follower, followed by REProduce CALIBration control 2R15. The signal then proceeds to a Darlington amplifier, formed by transistors 1Q5 and 1Q6. In this circuit 1Q5 acts as a low impedance source for 1Q6 to produce amplification of the signal and low noise.

After amplification in 1Q5/1Q6, the amplitude is adjusted by REPRODUCE LEVEL control 2R21 and the signal then proceeds through contacts of the OUTPUT SELECTOR switch to amplifier stage 1Q7. The signal is next routed through emitter follower 1Q8 to the output amplifier stage 5Q9.

A monitor jack is connected in the collector circuit of 5Q9. Note that there is a small amount of d-c (approximately 1 volt) present at this jack. Headsets with impedances of 300 ohms or more may be used to monitor the signal.

The output signal is coupled through transformer 5T1 to the line OUTPUT connector 4J5. LINE TERMINATION switch 4S2 connects resistor 4R36 across the transformer secondary during test and adjustment procedures, or removes it during normal operation. If the equipment is operated into a high impedance load (2,000 ohms or more) switch 4S2 should be left in the ON position.

Visual monitoring of the signal is provided at the vu meter. Note that, depending on the position of the OUTPUT SELECTOR switch, the meter will indicate REPRODUCE level, record (INPUT) level, or BIAS level. (This switch also determines whether the reproduce or record signal is present at the monitor jack and the output connector.) The placement of straps in the meter circuit determines whether the meter indicates 0 at a +8 db level or a +4 db level. With the +8 db strapping, resistors 4R33 and 4R34 are connected as a voltage divider across the secondary of transformer 5T1, with the meter connection taken at the junction of the two resistors. For a +4 db output, the strapping connects 4R33 and 4R34 in parallel on one side of the line, and the meter is connected in series with this circuit.

In the BIAS position of the OUTPUT SELECTOR switch, resistor 2R37 is connected to the vu meter (it is shorted in any other switch position). This is simply to provide proper working impedance for the meter, when it is connected to the bias circuit.

5.4.5 Reproduce Circuit (Reproduce-only Equipment)

The signal reproduced from the tape enters the assembly at 2J1, and is amplified in stage 2Q1. It then proceeds through emitter follower stage 2Q2 to another amplifier, 2Q3. High speed or low speed equalization, selected by contacts of equalization relay 2K1, is connected from the collector of 2Q3 back to the emitter of 2Q1. D-C feedback is also provided between these two stages through resistor 2R9.

Amplitude of the signal is adjusted by REPRODUCE LEVEL control 2R14, followed by amplifier stage 2Q4. Emitter follower 2Q5 and output amplifier 2Q6 complete the circuit.

The output signal is coupled through transformer 2T1 to the line OUTPUT connector 2J2. The vu meter on this assembly is an optional accessory; if employed, meter strapping is the same as that explained in paragraph 5.4.4.

5.4.6 Record Control Circuit

The RECORD pushbutton is located on the master electronic assembly. To enter the record mode, RECORD SELECTOR switch 2S5 must be in the READY position (on two channel equipment either or both channels may be placed in the ready condition). After tape is started in motion in the play mode at the tape transport, pressing the RECORD pushbutton will place any channel which is in the ready condition into the record mode.

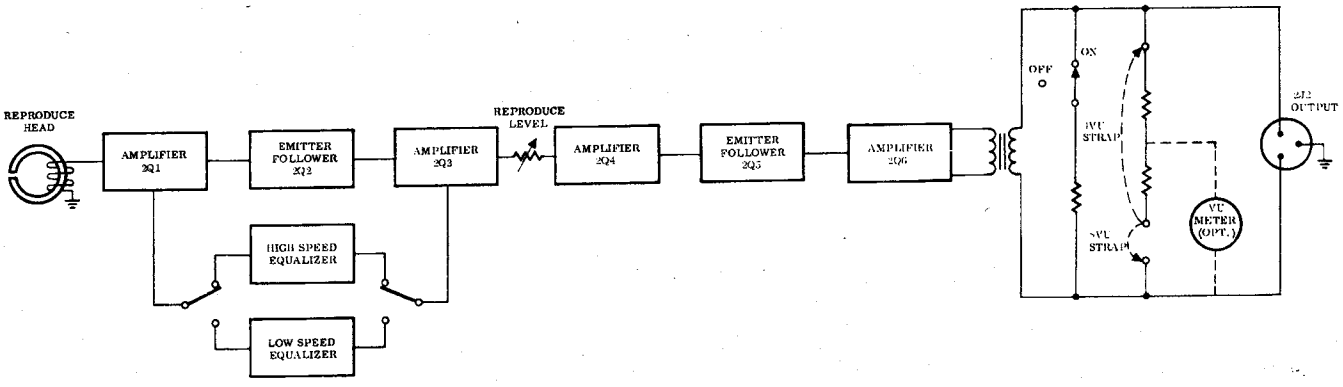

Fig. 5-6 Block Diagram, Reproduce-only Electronic Circuit

When the pushbutton is pressed, record relay 3K2 is energized. One of its contact sets forms a holding circuit and another contact set switches power to the record and bias oscillator circuits. The equipment will thus be placed in the record mode, on the channels which were placed in the ready condition (any channel, including the master, which is left in the "safe" condition will not be recording).

Indicator lights 2I2 and 2I1 show when a channel is in the ready condition or in the record mode respectively.

Section 6

HEAD ASSEMBLY

6.1 GENERAL

Standard head assemblies contain three head stacks -- erase, record, and reproduce in that order from left to right as viewed from the front. Each stack can contain one head (full track or half track) or two heads (two tracks).

Also, a special head assembly is available containing an additional reproduce head for playing back four track tapes. On this assembly the stacks are placed 2 track erase, 2 track record, 4 track reproduce, and 2 track reproduce in that order. A switch, located between the record and 4 track head stacks, selects either the 4 track or 2 track reproduce head. Two channel reproduce-only equipment is furnished with a two track and four track reproduce head; the single channel can have a half track or full track reproduce head.

The head gate, on the front of the assembly, contains the playback and record shield covers, and controls the tape lifters. The tape lifter removes the tape from contact with the heads when the gate is opened; it is intended for use when tape is being transported in either fastwinding mode.

6.2 MAINTENANCE

6.2.1 Cleaning

Oxide from the magnetic tape will be deposited on the head assembly, and must be removed if the equipment is to operate to high standards. Heads, tape guides, and other components in the tape threading path, should be cleaned after each eight hour operating period, or more often if visual inspection so indicates.

CAUTION

USE ONLY THE RECOMMENDED SOLVENT TO CLEAN THE HEADS, AS SOME SOLVENTS WILL DAMAGE THESE PRECISE ASSEMBLIES. 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 MIGHT SCRATCH THE HEAD ASSEMBLY.

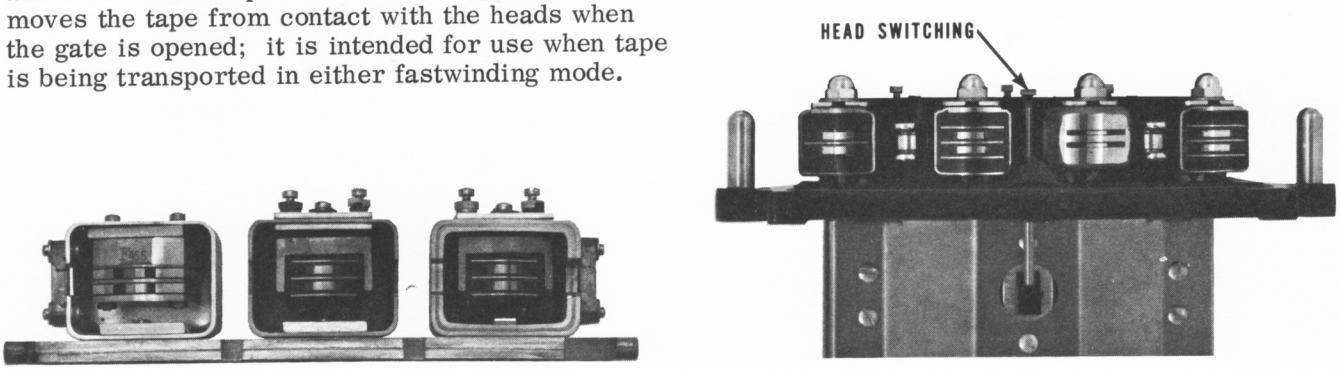

Fig. 6-1 Typical Head Assemblies

Step 1: Fully open the head gate.

Step 2: Moisten a cotton swab on a small stick (Q-tip) with Ampex Head Cleaner, Catalog No. 01-0823 or 087-004, which consists of Xylene and 0.1% Aerosol. Clean each head.

Step 3: Clean the tape guiding elements, the capstan, and the capstan idler with denatured alcohol.

NOTE

The head cleaning solution can be used to clean all metallic components (not the capstan idler) if excessive oxide deposits are encountered.

6.2.2 Demagnetizing

Heads occasionally acquire a degree of permanent magnetization which can result in increased noise and distortion and the partial erasure of high frequency signals on recorded tapes. Demagnetize the heads after each eight hour operating period, or more often if there is any suspicion that the procedure is required. Demagnetization is easily accomplished using an Ampex Head Demagnetizer, Catalog No. 01-0820.

Step 1: Turn power off 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 pressure sensitive 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 gap 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 head stacks, and at the tape guides.

Step 6: Withdraw the demagnetizer at least three feet from the recorder before unplugging it from the power source.

-01	-02	-07	-08	-13	-14	-19	-20		Ampex Part No.
x								Recorder/Reproducer, 7-1/2 - 15 ips, Full Track, 60 cycle	4010035-01
	x							Recorder/Reproducer, 7-1/2 - 15 ips, Full Track, 50 cycle	4010035-02
		x						Recorder/Reproducer, 7-1/2 - 15 ips, Half Track, 60 cycle	4010035-07
			x					Recorder/Reproducer, 7-1/2 - 15 ips, Half Track, 50 cycle	4010035-08
				x				Recorder/Reproducer, 3-3/4 - 7-1/2 ips, Full Track, 60 cycle	4010035-13
					x			Recorder/Reproducer, 3-3/4 - 7-1/2 ips, Full Track, 50 cycle	4010035-14
						x		Recorder/Reproducer, 3-3/4 - 7-1/2 ips, Half Track, 60 cycle	4010035-19
							x	Recorder/Reproducer, 3-3/4 - 7-1/2 ips, Half Track, 50 cycle	4010035-20
1	1	1	1	1	1	1	1	Electronics Assembly	4020251-01
1	1	1	1					Equalizer, Assembly, 15 ips NAB	4020252-01
1	1	1	1	1	1	1	1	Equalizer Assembly, 7-1/2 ips, NAB	4020252-02
				1	1	1	1	Equalizer Assembly, 3-3/4 ips	4020252-03
1		1						Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
	1		1					Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
				1		1		Transport Assembly, 3-3/4 - 7-1/2 ips, 60 cycle	4020254-03
					1		1	Transport Assembly, 3-3/4 - 7-1/2 ips, 50 cycle	4020254-04
		1	1			1	1	Head Assembly, Single Channel, Half Track	4020261-01
1	1			1	1			Head Assembly, Single Channel, Full Track	4020261-02
2	2	2	2	2	2	2	2	Reel Knob Assembly	4040492-10
1	1	1	1	1	1	1	1	Cable Assembly, Power	4050156-01
2	2	2	2	2	2	2	2	Reel Hold Down Knob	4100137-10
1	1	1	1	1	1	1	1	Reel Assembly, 10-1/2-inch	4690003-10
1	1	1	1	1	1	1	1	Connector, Plug, 3 pin, female	144-003
1	1	1	1	1	1	1	1	Connector, Plug, 3 pin, male	145-009
1		1		1		1		Instruction Manual Package	4090014-01
	1		1		1		1	Instruction Manual Package	4090014-02

SINGLE CHANNEL RECORDER/REPRODUCER

CONSOLE MOUNTED

-03	-04	-09	-10	-15	-16	-21	-22		Ampex Part No.
x								Recorder/Reproducer, 7 1/2 - 15 ips, Full Track, 60 cycle	4010035-03
	x							Recorder/Reproducer, 7 1/2 - 15 ips, Full Track, 50 cycle	4010035-04
		x						Recorder/Reproducer, 7 1/2 - 15 ips, Half Track, 60 cycle	4010035-09
			x					Recorder/Reproducer, 7 1/2 - 15 ips, Half Track, 50 cycle	4010035-10
				x				Recorder/Reproducer, 3 3/4 - 7 1/2 ips, Full Track, 60 cycle	4010035-15
					x			Recorder/Reproducer, 3 3/4 - 7 1/2 ips, Full Track, 50 cycle	4010035-16
						x		Recorder/Reproducer, 3 3/4 - 7 1/2 ips, Half Track, 60 cycle	4010035-21
							x	Recorder/Reproducer, 3 3/4 - 7 1/2 ips, Half Track, 50 cycle	4010035-22
1	1	1	1	1	1	1	1	Electronics Assembly	4020251-01
1	1	1	1					Equalizer Assembly, 15 ips, NAB	4020252-01
1	1	1	1	1	1	1	1	Equalizer Assembly, 7 1/2 ips, NAB	4020252-02
				1	1	1	1	Equalizer Assembly, 3 3/4 ips	4020252-03
1		1						Transport Assembly, 7 1/2 - 15 ips, 60 cycle	4020254-01
	1		1					Transport Assembly, 7 1/2 - 15 ips, 50 cycle	4020254-02
				1		1		Transport Assembly, 3 3/4 - 7 1/2 ips, 60 cycle	4020254-03
					1		1	Transport Assembly, 3 3/4 - 7 1/2 ips, 50 cycle	4020254-04
		1	1			1	1	Head Assembly, Single Channel, Half Track	4020261-01
1	1			1	1			Head Assembly, Single Channel, Full Track	4020261-02
2	2	2	2	2	2	2	2	Knob Assembly, Editing	4030145-10
1	1	1	1	1	1	1	1	Console Assembly	4030246-01
1	1	1	1	1	1	1	1	Panel, blank	4040857-01
1	1	1	1	1	1	1	1	Cable Assembly, power	4050156-01
1	1	1	1	1	1	1	1	Panel, Front Facing	4290563-01
1	1	1	1	1	1	1	1	Reel Assembly, 10 1/2-inch	4690003-10
1	1	1	1	1	1	1	1	Connector, Plug, 3 pin, female	144-003
1	1	1	1	1	1	1	1	Connector, Plug, 3 pin, male	145-009
1		1		1		1		Instruction Manual Package	4090014-01
	1		1		1		1	Instruction Manual Package	4090014-02

SINGLE CHANNEL RECORDER/REPRODUCER

PORTABLE

-05	-06	-11	-12	-17	-18	-23	-24		Ampex Part No.
x								Recorder/Reproducer, 7 1/2 - 15 ips, Full Track, 60 cycle	4010035-05
	x							Recorder/Reproducer, 7 1/2 - 15 ips, Full Track, 50 cycle	4010035-06
		x						Recorder/Reproducer, 7 1/2 - 15 ips, Half Track, 60 cycle	4010035-11
			x					Recorder/Reproducer, 7 1/2 - 15 ips, Half Track, 50 cycle	4010035-12
				x				Recorder/Reproducer, 3 3/4 - 7 1/2 ips, Full Track, 60 cycle	4010035-17
					x			Recorder/Reproducer, 3 3/4 - 7 1/2 ips, Full Track, 50 cycle	4010035-18
						x		Recorder/Reproducer, 3 3/4 - 7 1/2 ips, Half Track, 60 cycle	4010035-23
							x	Recorder/Reproducer, 3 3/4 - 7 1/2 ips, Half Track, 50 cycle	4010035-24
1	1	1	1	1	1	1	1	Electronics Assembly	4020251-01
1	1	1	1					Equalizer Assembly, 15 ips, NAB	4020252-01
1	1	1	1	1	1	1	1	Equalizer Assembly, 7 1/2 ips, NAB	4020252-02
				1	1	1	1	Equalizer Assembly, 3 3/4 ips	4020252-03
1		1						Transport Assembly, 7 1/2 - 15 ips, 60 cycle	4020254-01
	1		1					Transport Assembly, 7 1/2 - 15 ips, 50 cycle	4020254-02
				1		1		Transport Assembly, 3 3/4 - 7 1/2 ips, 60 cycle	4020254-03
					1		1	Transport Assembly, 3 3/4 - 7 1/2 ips, 50 cycle	4020254-04
		1	1			1	1	Head Assembly, Single Channel, Half Track	4020261-01
1	1			1	1			Head Assembly, Single Channel, Full Track	4020261-02
1	1	1	1	1	1	1	1	Case Assembly, Transport	4030154-01
1	1	1	1	1	1	1	1	Case Assembly, Electronics	4150296-01
2	2	2	2	2	2	2	2	Reel Knob Assembly	404092-10
1	1	1	1	1	1	1	1	Cable Assembly, power	4050156-01
1	1	1	1	1	1	1	1	Cable, Transport, Power Extension	4050382-01
2	2	2	2	2	2	2	2	Reel Hold Down Knob	4100137-10
1	1	1	1	1	1	1	1	Reel Assembly	4690003-10
1	1	1	1	1	1	1	1	Connector, plug, 3 pin, female	144-003
1	1	1	1	1	1	1	1	Connector, plug, 3 pin, male	145-009
1		1		1		1		Instruction Manual Package	4090014-01
	1		1		1		1	Instruction Manual Package	4090014-02

TWO CHANNEL RECORDER/REPRODUCER

UNMOUNTED

-01	-02	-07	-08	-13	-14	-19	-20		Ampex Part No.
x								Recorder/Reproducer, 7 1/2 - 15 ips, 60 cycle, STD. head	4010036-01
	x							Recorder/Reproducer, 7 1/2 - 15 ips, 50 cycle, STD. head	4010036-02
		x						Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 60 cycle, STD. head	4010036-07
			x					Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 50 cycle, STD. head	4010036-08
				x				Recorder/Reproducer, 7 1/2 - 15 ips, 60 cycle, 4 pos. head	4010036-13
					x			Recorder/Reproducer, 7 1/2 - 15 ips, 50 cycle, 4 pos. head	4010036-14
						x		Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 60 cycle, 4 pos. head	4010036-19
							x	Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 50 cycle, 4 pos. head	4010036-20
1	1	1	1	1	1	1	1	Electronics Assembly, Master	4020251-01
1	1	1	1	1	1	1	1	Electronics Assembly, Slave	4020251-02
2	2			2	2			Equalizer Assembly, 15 ips, NAB	4020252-01
2	2	2	2	2	2	2	2	Equalizer Assembly, 7-1/2 ips, NAB	4020252-02
		2	2			2	2	Equalizer Assembly, 3-3/4 ips	4020252-03
1				1				Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
	1				1			Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
		1				1		Transport Assembly, 3-3/4 - 7-1/2 ips, 60 cycle	4020254-03
			1				1	Transport Assembly, 3-3/4 - 7-1/2 ips, 50 cycle	4020254-04
1	1	1	1					Head Assembly, 2 channel, standard	4020262-01
				1	1	1	1	Head Assembly, 4 position	02-96620-05
2	2	2	2	2	2	2	2	Reel Knob Assembly	4040492-10
1	1	1	1	1	1	1	1	Cable Assembly, Power	4050156-01
1	1	1	1	1	1	1	1	Cable Assembly, Bias Coupling	4050160-02
1	1	1	1	1	1	1	1	Cable Assembly, Power Interconnecting	4050381-01
2	2	2	2	2	2	2	2	Reel Hold Down Knob	4100137-10
1	1	1	1	1	1	1	1	Reel Assembly, 10-1/2 -inch	4690003-10
2	2	2	2	2	2	2	2	Connector, Plug, 3 pin, female	144-003
2	2	2	2	2	2	2	2	Connector, plug, 3 pin, male	145-009
1		1		1		1		Instruction Manual Package	4090114-01
	1		1		1		1	Instruction Manual Package	4090114-02

TWO CHANNEL RECORDER/REPRODUCER

CONSOLE MOUNTED

-03	-04	-09	-10	-15	-16	-21	-22		Ampex Part No.
x								Recorder/Reproducer, 7 1/2 - 15 ips, 60 cycle, STD. head	4010036-03
	x							Recorder/Reproducer, 7 1/2 - 15 ips, 50 cycle, STD. head	4010036-04
		x						Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 60 cycle, STD. head	4010036-09
			x					Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 50 cycle, STD. head	4010036-10
				x				Recorder/Reproducer, 7 1/2 - 15 ips, 60 cycle, 4 position head	4010036-15
					x			Recorder/Reproducer, 7 1/2 - 15 ips, 50 cycle, 4 position head	4010036-16
						x		Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 60 cycle, 4 position head	4010036-21
							x	Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 50 cycle, 4 position head	4010036-22
1	1	1	1	1	1	1	1	Electronics Assembly, master	4020251-01
1	1	1	1	1	1	1	1	Electronics Assembly, slave	4020251-02
2	2			2	2			Equalizer Assembly, 15 ips, NAB	4020252-01
2	2	2	2	2	2	2	2	Equalizer Assembly, 7 1/2 ips, NAB	4020252-02
		2	2			2	2	Equalizer Assembly, 3 3/4 ips	4020252-03
1				1				Transport Assembly, 7 1/2 - 15 ips, 60 cycle	4020254-01
	1				1			Transport Assembly, 7 1/2 - 15 ips, 50 cycle	4020254-02
		1				1		Transport Assembly, 3 3/4 - 7 1/2 ips, 60 cycle	4020254-03
			1				1	Transport Assembly, 3 3/4 - 7 1/2 ips, 50 cycle	4020254-04
1	1	1	1					Head Assembly, 2 channel, Standard	4020262-01
				1	1	1	1	Head Assembly, 4 position	02-96620-05
2	2	2	2	2	2	2	2	Knob Assembly, Editing	4030145-10
1	1	1	1	1	1	1	1	Console Assembly	4030246-01
1	1	1	1	1	1	1	1	Cable Assembly, power	4050156-01
1	1	1	1	1	1	1	1	Cable Assembly, bias coupling	4050160-02
1	1	1	1	1	1	1	1	Cable Assembly, power interconnecting	4050381-02
1	1	1	1	1	1	1	1	Reel Assembly, 10 1/2 inch	4690003-10
2	2	2	2	2	2	2	2	Connector, plug, 3 pin, female	144-003
2	2	2	2	2	2	2	2	Connector, plug, 3 pin, male	145-009
1		1		1		1		Instruction Manual Package	4090014-01
	1		1		1		1	Instruction Manual Package	4090014-02

-05	-06	-11	-12	-17	-18	-23	-24		Ampex Part No.
x								Recorder/Reproducer, 7 1/2 - 15 ips, 60 cycle, STD. head	4010036-05
	x							Recorder/Reproducer, 7 1/2 - 15 ips, 50 cycle, STD. head	4010036-06
		x						Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 60 cycle, STD. head	4010036-11
			x					Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 50 cycle, STD. head	4010036-12
				x				Recorder/Reproducer, 7 1/2 - 15 ips, 60 cycle, 4 pos. head	4010036-17
					x			Recorder/Reproducer, 7 1/2 - 15 ips, 50 cycle, 4 pos. head	4010036-18
						x		Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 60 cycle, 4 pos. head	4010036-23
							x	Recorder/Reproducer, 3 3/4 - 7 1/2 ips, 50 cycle, 4 pos. head	4010036-24
1	1	1	1	1	1	1	1	Electronics Assembly, master	4020251-01
1	1	1	1	1	1	1	1	Electronics Assembly, slave	4020251-02
2	2			2	2			Equalizer Assembly, 15 ips, NAB	4020252-01
2	2	2	2	2	2	2	2	Equalizer Assembly, 7 1/2 ips, NAB	4020252-02
		2	2			2	2	Equalizer Assembly, 3 3/4 ips	4020252-03
1				1				Transport Assembly, 7 1/2 - 15 ips, 60 cycle	4020254-01
	1				1			Transport Assembly, 7 1/2 - 15 ips, 50 cycle	4020254-02
		1				1		Transport Assembly, 3 3/4 - 7 1/2 ips, 60 cycle	4020254-03
			1				1	Transport Assembly, 3 3/4 - 7 1/2 ips, 50 cycle	4020254-04
1	1	1	1					Head Assembly, 2 channel, Standard	4020262-01
				1	1	1	1	Head Assembly, 4 position	02-96620-05
1	1	1	1	1	1	1	1	Case Assembly, Transport	403154-01
1	1	1	1	1	1	1	1	Case Assembly, Electronics	4150297-01
2	2	2	2	2	2	2	2	Reel Knob Assembly	4040492-10
1	1	1	1	1	1	1	1	Cable Assembly, power	4050156-01
1	1	1	1	1	1	1	1	Cable Assembly, bias coupling	4050160-02
1	1	1	1	1	1	1	1	Cable Assembly, power interconnecting	4050381-02
2	2	2	2	2	2	2	2	Reel Hold Down Knob	4100137-10
1	1	1	1	1	1	1	1	Reel Assembly, 10 1/2 inch	4690003-10
2	2	2	2	2	2	2	2	Connector, plug, 3 pin, female	144-003
2	2	2	2	2	2	2	2	Connector, plug, 3 pin, male	145-009
1		1		1		1		Instruction Manual Package	4090014-01
	1		1		1		1	Instruction Manual Package	4090014-02

-01	-02	-07	-08	-13	-14	-19	-20		Ampex Part No.
x								Reproducer, 7-1/2 - 15 ips, Full Track, 60 cycle	4010037-01
	x							Reproducer, 7-1/2 - 15 ips, Full Track, 50 cycle	4010037-02
		x						Reproducer, 7-1/2 - 15 ips, Half Track, 60 cycle	4010037-07
			x					Reproducer, 7-1/2 - 15 ips, Half Track, 50 cycle	4010037-08
				x				Reproducer, 3-3/4 - 7-1/2 ips, Full Track, 60 cycle	4010037-13
					x			Reproducer, 3-3/4 - 7-1/2 ips, Full Track, 50 cycle	4010037-14
						x		Reproducer, 3-3/4 - 7-1/2 ips, Half Track, 60 cycle	4010037-19
							x	Reproducer, 3-3/4 - 7-1/2 ips, Half Track, 50 cycle	4010037-20
1	1	1	1	1	1	1	1	Electronics Assembly	4020265-01
1		1						Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
	1		1					Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
				1		1		Transport Assembly, 3-3/4 - 7-1/2, 60 cycle	4020254-03
					1		1	Transport Assembly, 3-3/4 - 7-1/2, 50 cycle	4020254-04
		1	1			1	1	Head Assembly, Single Channel, Half Track	4020261-03
1	1			1	1			Head Assembly, Single Channel, Full Track	4020261-04
2	2	2	2	2	2	2	2	Reel Knob Assembly	4040492-10
1	1	1	1	1	1	1	1	Cable Assembly, Power	4050156-01
2	2	2	2	2	2	2	2	Reel Hold Down Knob	4100137-10
1	1	1	1	1	1	1	1	Reel Assembly	4690003-10
1	1	1	1	1	1	1	1	Connector, Plug, 3 pin, female	144-003
1		1		1		1		Instruction Manual Package	4090019-01
	1		1		1		1	Instruction Manual Package	4090019-02

SINGLE CHANNEL REPRODUCER CONSOLE MOUNTED

-03	-04	-09	-10	-15	-16	-21	-22		Ampex Part No.
x								Reproducer, 7-1/2 - 15 ips, Full Track, 60 cycle	4010037-03
	x							Reproducer, 7-1/2 - 15 ips, Full Track, 50 cycle	4010037-04
		x						Reproducer, 7-1/2 - 15 ips, Half Track, 60 cycle	4010037-09
			x					Reproducer, 7-1/2 - 15 ips, Half Track, 50 cycle	4010037-10
				x				Reproducer, 3-3/4 - 7-1/2 ips, Full Track, 60 cycle	4010037-15
					x			Reproducer, 3-3/4 - 7-1/2 ips, Full Track, 50 cycle	4010037-16
						x		Reproducer, 3-3/4 - 7-1/2 ips, Half Track, 60 cycle	4010037-21
							x	Reproducer, 3-3/4 - 7-1/2 ips, Half Track, 50 cycle	4010037-22
1	1	1	1	1	1	1	1	Electronics Assembly	4020265-01
1		1						Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
	1		1					Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
				1		1		Transport Assembly, 3-3/4 - 7-1/2 ips, 60 cycle	4020254-03
					1		1	Transport Assembly, 3-3/4 - 7-1/2 ips, 50 cycle	4020254-04
		1	1			1	1	Head Assembly, Single Channel, Half Track	4020261-03
1	1			1	1			Head Assembly, Single Channel, Full Track	4020261-04
2	2	2	2	2	2	2	2	Knob Assembly, Editing	4030145-10
1	1	1	1	1	1	1	1	Console Assembly	4030246-01
1	1	1	1	1	1	1	1	Panel Assembly, Blank	4040857-01
1	1	1	1	1	1	1	1	Cable Assembly, Power	4050156-01
1	1	1	1	1	1	1	1	Reel Assembly	4690003-10
1	1	1	1	1	1	1	1	Connector, Plug, 3 pin, female	144-003
1	1	1	1	1	1	1	1	Panel, Front Facing	4290563-01
1		1		1		1		Instruction Manual Package	4090019-01
	1		1		1		1	Instruction Manual Package	4090019-02

-05	-06	-11	-12	-17	-18	-23	-24		Ampex Part No.
x								Reproducer, 7-1/2 - 15 ips, Full Track, 60 cycle	4010037-05
	x							Reproducer, 7-1/2 - 15 ips, Full Track, 50 cycle	4010037-06
		x						Reproducer, 7-1/2 - 15 ips, Half Track, 60 cycle	4010037-11
			x					Reproducer, 7-1/2 - 15 ips, Half Track, 50 cycle	4010037-12
				x				Reproducer, 3-3/4 - 7-1/2 ips, Full Track, 60 cycle	4010037-17
					x			Reproducer, 3-3/4 - 7-1/2 ips, Full Track, 50 cycle	4010037-18
						x		Reproducer, 3-3/4 - 7-1/2 ips, Half Track, 60 cycle	4010037-23
							x	Reproducer, 3-3/4 - 7-1/2 ips, Half Track, 50 cycle	4010037-24
1	1	1	1	1	1	1	1	Electronics Assembly	4020265-01
1		1						Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
	1		1					Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
				1		1		Transport Assembly, 3-3/4 - 7-1/2 ips, 60 cycle	4020254-03
					1		1	Transport Assembly, 3-3/4 - 7-1/2 ips, 50 cycle	4020254-04
		1	1			1	1	Head Assembly, Single Channel, Half Track	4020261-03
1	1			1	1			Head Assembly, Single Channel, Full Track	4020261-04
1	1	1	1	1	1	1	1	Case Assembly, Transport	4030154-01
1	1	1	1	1	1	1	1	Case Assembly, Electronics	4150296-01
2	2	2	2	2	2	2	2	Reel Knob Assembly	4040492-10
1	1	1	1	1	1	1	1	Cable Assembly, Power	4050156-01
1	1	1	1	1	1	1	1	Cable Assembly, Transport Power	4050382-01
2	2	2	2	2	2	2	2	Reel Hold Down Knob	4100137-10
1	1	1	1	1	1	1	1	Reel Assembly	4690003-10
1	1	1	1	1	1	1	1	Connector, Plug, 3 pin, female	144-003
1		1		1		1		Instruction Manual Package	4090019-01
	1		1		1		1	Instruction Manual Package	4090019-02

TWO CHANNEL REPRODUCER
UNMOUNTED

-01	-02	-07	-08		Ampex Part No.
x				Reproducer, 7-1/2 - 15 ips, 60 cycle	4010038-01
	x			Reproducer, 7-1/2 - 15 ips, 50 cycle	4010038-02
		x		Reproducer, 3-3/4 - 7-1/2 ips, 60 cycle	4010038-07
			x	Reproducer, 3-3/4 - 7-1/2 ips, 50 cycle	4010038-08
1	1	1	1	Electronics Assembly, 2 channel	4020265-02
1				Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
	1			Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
		1		Transport Assembly, 3-3/4 - 7-1/2 ips, 60 cycle	4020254-03
			1	Transport Assembly, 3-3/4 - 7-1/2 ips, 50 cycle	4020254-04
1	1	1	1	Head Assembly, 2 channel, (2 track + 1/4 track)	4020266-01
2	2	2	2	Reel Knob Assembly	4040492-10
1	1	1	1	Cable Assembly, Power	4050156-01
2	2	2	2	Reel Hold Down Knob	4100137-10
1	1	1	1	Reel Assembly	4690003-10
2	2	2	2	Connector, Plug, 3 pin, female	144-003
1		1		Instruction Manual Package	4090019-01
	1		1	Instruction Manual Package	4090019-02

TWO CHANNEL REPRODUCER
CONSOLE MOUNTED

	-03	-04	-09	-10		Ampex Part No.
	x				Reproducer, 7-1/2 - 15 ips, 60 cycle	4010038-03
		x			Reproducer, 7-1/2 - 15 ips, 50 cycle	4010038-04
			x		Reproducer, 3-3/4 - 7-1/2 ips, 60 cycle	4010038-09
				x	Reproducer, 3-3/4 - 7-1/2 ips, 50 cycle	4010038-10
	1	1	1	1	Electronic Assembly, 2 channel	4020265-02
	1				Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
		1			Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
			1		Transport Assembly, 3-3/4 - 7-1/2 ips, 60 cycle	4020254-03
				1	Transport Assembly, 3-3/4 - 7-1/2 ips, 50 cycle	4020254-04
	1	1	1	1	Head Assembly, 2 channel (2 track + 1/4 track)	4020266-01
	2	2	2	2	Knob Assembly, Editing	4030145-10
	1	1	1	1	Console Assembly	4030246-01
	1	1	1	1	Panel Assembly, Blank	4040857-01
	1	1	1	1	Cable Assembly, Power	4050156-01
	1	1	1	1	Panel, Front Facing	4290563-01
	1	1	1	1	Reel Assembly	4690003-10
	2	2	2	2	Connector Plug, 3 pin, female	144-003
	1		1		Instruction Manual Package	4090019-01
		1		1	Instruction Manual Package	4090019-02

-05	-06	-11	-12		Ampex Part No.
x				Reproducer, 7-1/2 - 15 ips, 60 cycle	4010038-05
	x			Reproducer, 7-1/2 - 15 ips, 50 cycle	4010038-06
		x		Reproducer, 3-3/4 - 7-1/2 ips, 60 cycle	4010038-11
			x	Reproducer, 3-3/4 - 7-1/2 ips, 50 cycle	4010038-12
1	1	1	1	Electronic Assembly, 2 channel	4020265-02
1				Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
	1			Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
		1		Transport Assembly, 3-3/4 - 7-1/2 ips, 60 cycle	4020254-03
			1	Transport Assembly, 3-3/4 - 7-1/2 ips, 50 cycle	4020254-04
1	1	1	1	Head Assembly, 2 Channel (2 track + 1/4 track)	4020266-01
1	1	1	1	Case Assembly, Transport	4030154-01
1	1	1	1	Case Assembly, Electronics	4150296-01
2	2	2	2	Reel Knob Assembly	4040492-10
1	1	1	1	Cable Assembly, Power	4050156-01
1	1	1	1	Cable Assembly, Transport Power	4050382-01
2	2	2	2	Reel Hold Down Knob	4100137-10
1	1	1	1	Reel Assembly	4690003-10
2	2	2	2	Connector, Plug, 3 pin, female	144-003
1		1		Instruction Manual Package	4090019-01
	1		1	Instruction Manual Package	4090019-02

Item	Fig. No.	-01	-02	-03	-04		Ampex Part No.
	7-9	x				Tape Transport Assembly, 7-1/2 - 15 ips, 60 cycle	4020254-01
	7-9		x			Tape Transport Assembly, 7-1/2 - 15 ips, 50 cycle	4020254-02
	7-9			x		Tape Transport Assembly, 3-3/4 - 7-1/2 ips, 60 cycle	4020254-03
	7-9				x	Tape Transport Assembly, 3-3/4 - 7-1/2 ips, 50 cycle	4020254-04
2	7-9	1	1	1	1	Transport Control Box Assembly, (see separate Parts List)	4020204-40
3	7-9	1	1	1	1	Solenoid Assembly, Capstan Idler	4030112-10
		1	1	1	1	Stop, Solenoid	4220139-20
		1	1	1	1	Spring, Solenoid Return	4270161-10
		1	1	1	1	Spring, Idler Adjusting	4270162-10
		1	1	1	1	Bolt, Eye	4400496-30
		1	1	1	1	Solenoid	4590063-10
		2	2	2	2	Connector, Solderless	171-008
		1	1	1	1	Clevis Pin, 1/8 dia. x 17/32	400-009
		1	1	1	1	Cotter Pin, 1/16 dia. x 1/2	401-005
4	7-9	1	1			Capstan Idler Assembly	4030203-10
5	7-9			1	1	Capstan Idler Assembly	4030203-40
		1	1			Wheel Assembly	4040404-10
				1	1	Wheel Assembly	4040404-50
		1	1	1	1	Cap, Capstan Idler	4100166-10
		1	1	1	1	Shaft	4210189-10
		1	1	1	1	Lock Ring	4320112-10
		1	1	1	1	Washer, Thrust	4440027-10
		1	1	1	1	Washer, Felt	4440239-10
6	7-9	1	1	1	1	Takeup Tension Arm Assembly	4030242-01
1	7-10	1	1	1	1	Arm Assembly	4040405-40
3	7-10	1	1	1	1	Guide Tape	4210183-20
5	7-10	1	1	1	1	Shaft, Takeup Tension Arm	4210185-10
6	7-10	1	1	1	1	Collar, Shaft	4220138-10
7	7-10	1	1	1	1	Hook, Tape Guide	4230158-10
8	7-10	1	1	1	1	Cap, Takeup Tension Arm	4250193-01
9	7-10	1	1	1	1	Spring, Arm Return	4270158-10
11	7-10	1	1	1	1	Base, Takeup Tension Arm	4330104-10
12	7-10	A/R	A/R	A/R	A/R	Shim, brass, .005	4440235-10
13	7-10	A/R	A/R	A/R	A/R	Shim, brass, .003	4440024-60
16	7-10	1	1	1	1	Pin, .0625 dia. x 7/8	403-001
17	7-10	2	2	2	2	Pin, .094 dia. x 3/8	406-013
18	7-10	2	2	2	2	Screw, 4-40 x 1/4	471-598
7	7-9	1	1	1	1	Rewind Assembly	4030247-01
		1		1		Rewind Assembly (Alternate)	4030247-02
			1		1	Rewind Assembly (Alternate)	4030247-03
1	7-11	1	1	1	1	Brake Assembly, Rewind	4030114-20
1	7-12	1	1	1	1	Band Assembly	4040414-10
2	7-12	2	2	2	2	Spacer	4220141-10
3	7-12	2	2	2	2	Link, Brake Band	4230161-10
4	7-12	1	1	1	1	Lever, Brake	4230162-10
5	7-12	2	2	2	2	Link, Solenoid	4230163-10
6	7-12	1	1	1	1	Bracket, Solenoid	4260183-10
7	7-12	1	1	1	1	Stop, Solenoid	4260184-10
8	7-12	2	2	2	2	Spring, Compression	4270163-10
9	7-12	1	1	1	1	Spring, Leaf	4270164-10
10	7-12	1	1	1	1	Spring, Brake	4270178-10
11	7-12	1	1	1	1	Cross Head, Brake	4330109-10
12	7-12	1	1	1	1	Anchor Brake	4330110-10
13	7-12	1	1	1	1	Housing, Brake	4330112-10
14	7-12	2	2	2	2	Clamp, Band Link	4330113-10
15	7-12	1	1	1	1	Bolt, Spade	4440496-60
16	7-12	1	1	1	1	Solenoid	4590067-10
20	7-12	2	2	2	2	Connector, Solderless	171-008
21	7-12	1	1	1	1	Clevis Pin, 1/8 dia. x 9/32	400-002
22	7-12	1	1	1	1	Clevis Pin, 1/8 dia. x 15/32	400-007
23	7-12	2	2	2	2	Cotter Pin, 1/16 dia. x 1/2	401-005
24	7-12	2	2	2	2	Drive Lock Pin, 1/8 dia. x 1/2	403-008
25	7-12	1	1	1	1	Roll Pin, 1/8 dia. x 7/8	406-042
3	7-11	1	1	1	1	Motor Assembly, Torque, (G.E.)	4040804-50
3	7-11	1	1	1	1	Motor Assembly, Torque (Bodine -- Alternate)	4040804-60
1	7-13	1	1	1	1	Drum, Brake	4250112-10
2	7-13	1	1	1	1	Flange Motor	4330115-10
4	7-13	1	1	1	1	Motor, Torque, Bodine (Alternate)	4590064-10
8	7-13	1	1	1	1	Motor, Torque, G.E.	4590107-10
11	7-13	2	2	2	2	Roll Pin, 3/32 dia. x 3/4	406-006
15	7-13	1	1	1	1	Turntable	4250189-01
7	7-11	1		1		Capacitor, 3.75 mfd (Bodine Motor)	4050336-30
8	7-11		1		1	Capacitor, 4 mfd (Bodine Motor, 50 cycle)	4050336-40
9	7-11	1	1	1	1	Capacitor, 10 mfd (G.E. motor)	4050361-10
10	7-11	1	1	1	1	Pad, Turntable	4130163-01
11	7-11	1	1	1	1	Spacer, Motor Flange (Bodine Motor)	4220140-10
12	7-11	1	1	1	1	Drive Plate, Reel	4320128-10

Item	Fig. No.	-01	-02	-03	-04		Ampex Part No.
17	7-11	1	1	1	1	Connector, 8 pin, Jones)-308-CCT-L	145-013
18	7-11	4	4	4	4	Connector, Solderless	171-008
8	7-9	1	1	1	1	Takeup Assembly	4030248-01
8	7-9	1	1	1	1	Takeup Assembly (Alternate)	4030248-02
						Brake Assembly	4030114-10
						(Parts same as Rewind Assembly)	
						Motor Assembly, Torque (G. E.)	4040804-50
						Motor Assembly, Torque (Bodine -- Alternate)	4040804-60
						(Parts same as Rewind Assembly)	
						(All other parts same as Rewind Assembly)	
9	7-9			1	1	Dust Cap Assembly, Capstan	4040406-10
10	7-9	1	1			Dust Cap Assembly, Capstan	4040406-20
		1	1			Dust Cap, Capstan	4100127-10
				1	1	Escutcheon Cap, Capstan	4100128-10
		1	1	1	1	Washer, Felt	4440237-20
		1	1	1	1	O Ring	432-007
11	7-9			1	1	Reel Idler Subassembly	4040407-16
12	7-9	1	1			Reel Idler Subassembly	4040407-17
				1	1	Pulley Assembly	4040408-60
		1	1			Pulley Assembly	4040408-70
		1	1	1	1	Bushing	4200121-10
		1	1	1	1	Tape Guide	4210188-20
		1	1	1	1	Arm	4230159-10
		1	1	1	1	Spring	4270160-10
		1	1	1	1	Housing	4290272-10
		1	1	1	1	Mount	4290273-10
14	7-9	1				Motor, Drive, Assembly	4040416-15
15	7-9			1		Motor, Drive, Assembly	4040416-16
16	7-9		1			Motor, Drive, Assembly	4040416-17
17	7-9				1	Motor, Drive, Assembly	4040416-18
		1	1	1	1	Flywheel, Drive Motor	4250113-10
		1				Motor, Ashland, 7-1/2 - 15 ips, 60 cycle	4590068-10
				1		Motor, Ashland, 3-3/4 - 7-1/2 ips, 60 cycle	4590068-20
			1			Motor, Ashland, 7-1/2 - 15 ips, 50 cycle	4590093-30
					1	Motor, Ashland, 3-3/4 - 7-1/2 ips, 50 cycle	4590093-40
		1	1	1	1	Plug, 6 contact, Jones	145-012
18	7-9	1	1	1	1	Capacitor Assembly	4040591-02
		1	1	1	1	Capacitor, 3.75 mfd	4540292-30
		1	1	1	1	Safety Boot	032-082
		2	2	2	2	Connector, Solderless	171-008
19	7-9	1	1	1	1	Pushbutton Assembly (S)	4040884-01
20	7-9	1	1	1	1	Pushbutton Assembly (P)	4040884-02
21	7-9	1	1	1	1	Pushbutton Assembly (F)	4040884-03
22	7-9	1	1	1	1	Pushbutton Assembly (R)	4040884-04
		1	1	1	1	Pushbutton, Control (S)	4100160-10
		1	1	1	1	Pushbutton, Control (P)	4100160-20
		1	1	1	1	Pushbutton, Control (F)	4100160-30
		1	1	1	1	Pushbutton, Control (R)	4100160-60
		1	1	1	1	Plate, Button Keeper	4330233-01
23	7-9	1	1	1	1	Harness Assembly, Switch	4050378-01
24	7-9	2	2	2	2	Guard, Reel	4110172-20
26	7-9	1	1	1	1	Escutcheon, Left	4110253-01
27	7-9	1	1	1	1	Escutcheon, Right	4110254-01
28	7-9	1	1	1	1	Shield, Microswitch	4170184-01
30	7-9	1	1	1	1	Bushing, Capstan Idler	4200122-10
31	7-9	1	1	1	1	Spacer, Microswitch	4220229-01
32	7-9	1	1	1	1	Arm, Solenoid, capstan idler	4230160-10
33	7-9	1	1	1	1	Flywheel, Reel Idler	4250115-10
34	7-9	1	1	1	1	Bracket, Solenoid, Capstan Idler	4260181-01
35	7-9	4	4	4	4	Spring, Pushbutton	4270241-01
36	7-9	1	1	1	1	Cover, Relay Chassis	4290279-10
38	7-9	1	1	1	1	Cover Assembly, Switch	4040886-01
39	7-9	1	1	1	1	Arm, Capstan Idler	4330106-10
40	7-9	A/R	A/R	A/R	A/R	Washer, Shim, 0.315 id. x .005 thick	4440113-10
41	7-9	A/R	A/R	A/R	A/R	Washer, Shim, 0.315 id. x .010 thick	4440113-20
42	7-9	A/R	A/R	A/R	A/R	Washer, Shim, 0.315 id. x .003 thick	4440113-30
43	7-9	A/R	A/R	A/R	A/R	Washer, Shim, Tape Guide, .005 stainless steel	4440236-20
44	7-9	A/R	A/R	A/R	A/R	Washer, Shim, Tape Guide, .010 stainless steel	4440236-30
50	7-9	1	1	1	1	Clamp, Cable, 1/4 dia.	302-007
51	7-9	2	2	2	2	Clamp, Cable, 5/16 id., plastic	302-196
52	7-9	1	1	1	1	Roll Pin, 1/8 dia. x 3/4	406-005
74	7-9	1	1	1	1	Fan, Drive Motor	591-001

Ref. No.	Qty.		Ampex Part No.
C502	1	Capacitor, electrolytic, 150 mfd, -10 +100%, 180 vdcw	031-624
C504	2	Capacitor, mylar, 0.25 mfd, ±10%, 100 vdcw	033-151
C505	5	Capacitor, paper, .047 mfd, ±20%, 400 vdcw	035-059
C506	x	Same as C505	035-059
C507	2	Capacitor, mylar, .01 mfd, 600 vdcw	055-039
C508	x	Same as C507	055-039
C509	x	Same as C504	033-151
C510	x	Same as C505	035-059
C511	x	Same as C505	035-059
C515	x	Same as C505	035-059
CR501	1	Rectifier, half wave, 130 vac	582-016
CR502	1	Diode, 1N2863	580-027
J501	1	Connector, receptacle, 21 contacts, female	146-057
J502	1	Connector, receptacle, 10 contacts, female	146-018
J503	3	Connector, receptacle, 8 contacts, female	146-003
J504	1	Connector, receptacle, 6 contacts, female	146-004
J505	x	Same as J503	146-003
J506	x	Same as J503	146-003
K502	3	Relay, 3 PDT, 115 vdc	020-006
K503	x	Same as K502	020-006
K504	x	Same as K502	020-006
R501	1	Resistor, fixed, wirewound, 10 ohms, ±10%, 5W	043-156
R502	1	Resistor, fixed, wirewound, 75 ohms, ±5%, 50W	043-002
R503	2	Resistor, variable, wirewound, 150 ohms, ±5%, 50W	040-011
R504	1	Resistor, variable, wirewound, 750 ohms, ±5%, 50W	040-007
R505	x	Same as R503	040-011
R506	1	Resistor, fixed, composition, 22 ohms, ±10%, 1W	041-132
R507	4	Resistor, fixed, composition, 100 ohms, ±10%, 1/2W	041-038
R508	x	Same as R507	041-038
R509	x	Same as R507	041-038
R510	x	Same as R507	041-038
	1	Dummy Plug, remote connector	4050101-10
	1	Dummy Plug, 60 cycle connector	4050138-10
P507	1	Connector, plug, 8 contacts, male	145-013

Ref. No.	Loc.*	-01	-02		Ampex Part No.
		x		Master Electronic Assembly	4020251-01
			x	Slave Electronic Assembly	4020251-02
C1	1	2	2	Capacitor, electrolytic, tubular, 4 mfd, -10 +75%, 15 vdcw	031-424
C2	1	1	1	Capacitor, electrolytic; 25 mfd, -10 +75%, 3 vdcw	031-620
C3	1	1	1	Capacitor, mylar; .002 mfd, ±10%, 600 vdcw	055-024
C4	1	2	2	Capacitor, electrolytic, tubular; 50 mfd, -10 +75%, 3 vdcw	031-244
C5	1	2	2	Capacitor, electrolytic, tubular; 100 mfd, -10 +75%, 6 vdcw	031-166
C6	1	2	2	Capacitor, electrolytic, tubular; 50 mfd, -10 +100%, 25 vdcw	031-190
C7	1	4	4	Capacitor, electrolytic, tubular; 2 mfd, -10 +75%, 25 vdcw	031-646
C8	1	3	3	Capacitor, mylar; 0.22 mfd, ±10%, 100 vdcw	035-819
C9	1	5	5	Capacitor, mylar; 0.1 mfd, ±10%, 100 vdcw	035-831
C10	1	2	2	Capacitor, electrolytic, tubular; 100 mfd, -10 +75%, 25 vdcw	031-186
C11	1	x	x	Same as C7	031-646
C12	1	x	x	Same as C7	031-646
C13	1	x	x	Same as C8	035-819
C14	1	x	x	Same as C5	031-166
C15	2	6	5	Capacitor, ceramic, tubular; .01 mfd, 500 vdcw	030-002
C16	1	x	x	Same as C9	035-831
C17	1	x	x	Same as C9	035-831
C18	1	3	3	Capacitor, electrolytic, tubular; 10 mfd, -10 +75%, 25 vdcw	031-148
C19	1	x	x	Same as C8	035-819
C20	1	x	x	Same as C10	031-186
C21	1	1	1	Capacitor, plastic; 0.47 mfd, ±5%, 100 vdcw	055-035
C22					
C23	1	x	x	Same as C7	031-646
C24	1	x	x	Same as C9	035-831
C25	1	x	x	Same as C4	031-244
C26	1	x	x	Same as C18	031-148
C27	1	1	1	Capacitor, mica; 500 pfd, ±5%, 300 vdcw	034-933
C28	1	6	6	Capacitor, mylar; .01 mfd, ±5%, 100 vdcw	035-574
C29	1	x	x	Same as C28	035-574
C30	1	x	x	Same as C28	035-574
C31	1	x	x	Same as C28	035-574
C32	1	x	x	Same as C28	035-574
C33	1	1	1	Capacitor, mylar; .018 mfd, ±5%, 100 vdcw	055-028
C34	4	2	2	Capacitor, variable, mica; 1400-3055 pfd, 175 vdcw	038-011
C35	1	x	x	Same as C18	031-148
C36	4	x	x	Same as C34	038-011
C37	4	1	1	Capacitor, mica; .001 mfd, ±5%, 500 vdcw	034-707
C38	4	2	2	Capacitor, paper, tubular; .0047 mfd, ±20%, 600 vdcw	035-028
C39	4	x	x	Same as C38	035-028
C40	6	1	1	Capacitor, electrolytic; 1000 mfd, -10 +150%, 50 vdcw	031-705
C41	1	x	x	Same as C9	035-831
C42	1	x	x	Same as C1	031-424
C43	6	1	1	Capacitor, electrolytic; 500-500-100 mfd, 25 vdcw	031-707
C44	1	x	x	Same as C6	031-190
C45	1	x	x	Same as C28	035-574
C46	4	1	1	Capacitor, electrolytic; 100 mfd, -10 +75%, 25 vdcw	031-186
C47	4	x	x	Same as C15	030-002
C48	4	x	x	Same as C15	030-002
C49	4	x	x	Same as C15	030-002
C50	2	x	0	Same as C15	030-002
C51	2	x	x	Same as C15	030-002
CR1	2	5	5	Diode, 1N2860	580-042
CR2	3	1	1	Diode, 1N2863	580-027
CR3	1	x	x	Same as CR1	580-042
CR4	1	x	x	Same as CR1	580-042
CR5	1	x	x	Same as CR1	580-042
CR6	1	x	x	Same as CR1	580-042
CR7	1	2	2	Diode, SG-22	013-041
CR8	1	x	x	Same as CR7	013-041
CR9	1	3	3	Diode, 1N67A	013-011
CR10	1	1	1	Diode, zener, LMZ-11-20	013-668
CR11	1	x	x	Same as CR9	013-011
CR12	1	x	x	Same as CR9	013-011
F1	4	1	0	Fuse, fast blow; 3 ampere, 250 volt	070-001
F2	4	1	1	Fuse, slow blow; 0.5 ampere, 125 volt	070-026
F3	4	1	1	Fuse, fast blow; 0.25 ampere, 250 volt	070-006
I1	2	1	1	Lamp, neon, Record indicator	060-999
I2	2	1	1	Lamp, neon, Ready indicator	060-996
I3	2	-	-	ON VU meter	-
I4	2	-	-	ON VU meter	-
J1	4	1	1	Connector, receptacle, 3 contact, male	143-008

*Location Guide
1. Printed Circuit Board
2. Front Panel
3. Left Panel (from front)
4. Back Panel
5. Right Panel
6. Power Supply

Ref. No.	Loc.*	-01	-02		Ampex Part No.
J2	2	3	2	Connector, receptacle, 8 contact, female	146-003
J3	2	x	x	Same as J2	146-003
J4	2	1	1	Connector, jack, phone	148-015
J5	4	1	1	Connector, receptacle, 3 contact, male	147-004
J6	4	1	1	Connector, receptacle, 3 contact, female	146-007
J7	4	1	1	Connector, socket, octal	150-023
J8	4	1	1	Connector, receptacle, 2 contact, male	143-009
J9	4	x	0	Same as J2	146-003
J9		0	1	Connector, receptacle, 8 contact, male	147-013
J10	4	1	0	Connector, receptacle, 2 contact, male	147-013
J11	4	1	1	Connector, receptacle, 1 contact, male	143-010
J12	4	1	1	Connector, receptacle, 1 contact, female	146-067
K1	2	1	1	Relay, 4 PDT, 24 volt dc; 2 amps resistive load, gold contacts	020-244
K2	3	1	1	Relay, 2 PDT, (special)	4590050-10
L1	1	1	1	Inductor, coil; 5 mH, ±5%	051-342
L2	4	1	1	Inductor, choke; 1.2 mH	051-336
M1	2	1	1	Meter, VU	4140016-10
Q1	1	13	13	Transistor, silicon, TI415, 2N3707	014-560
Q2	1	x	x	Same as Q1	014-560
Q3	1	x	x	Same as Q1	014-560
Q4	1	x	x	Same as Q1	014-560
Q5	1	x	x	Same as Q1	014-560
Q6	1	x	x	Same as Q1	014-560
Q7	1	x	x	Same as Q1	014-560
Q8	1	2	2	Transistor, germanium 2N414	014-029
Q9	5	1	1	Transistor, germanium, 2N1168	014-591
Q10	1	x	x	Same as Q1	014-560
Q11	1	x	x	Same as Q1	014-560
Q12	1	x	x	Same as Q1	014-560
Q13	1	x	x	Same as Q1	014-560
Q14	1	x	x	Same as Q1	014-560
Q15	1	4	4	Transistor, silicon, 2N697	014-090
Q16	1	x	x	Same as Q15	014-090
Q17	1	3	3	Transistor, silicon, 40250	014-587
Q18	1	x	x	Same as Q17	014-587
Q19	1	x	x	Same as Q8	014-029
Q20	3	x	x	Same as Q17	014-587
Q21	1	x	x	Same as Q15	014-090
Q22	1	x	x	Same as Q1	014-560
Q23	1	x	x	Same as Q15	014-090
R1	1	2	2	Resistor, fixed, composition, 330,000 ohms, ±10%, 1/2W	041-078
R2	1	1	1	Resistor, fixed, composition, 75,000 ohms, ±5%, 1/2W	041-253
R3	1	3	3	Resistor, fixed, composition, 68,000 ohms, ±10%, 1/2W	041-070
R4	1	2	2	Resistor, fixed, composition, 110,000 ohms, ±5%, 1/2W	041-024
R5	1	1	1	Resistor, fixed, composition, 100,000 ohms, ±10%, 1/2W	041-072
R6	1	1	1	Resistor, fixed, metal film, 1,000 ohms, ±1%, 1/4W	048-259
R7	1	2	2	Resistor, fixed, composition, 47,000 ohms, ±10%, 1/2W	041-068
R8	1	1	1	Resistor, fixed, composition, 240,000 ohms, ±5%, 1/2W	041-374
R9	1	1	1	Resistor, fixed, composition, 620,000 ohms, ±5%, 1/2W	041-900
R10	1	6	6	Resistor, fixed, composition, 2,200 ohms, ±10%, 1/2W	041-052
R11	1	1	1	Resistor, fixed, composition, 24,000 ohms, ±5%, 1/2W	041-498
R12	1	2	2	Resistor, fixed, composition, 220 ohms, ±10%, 1/2W	041-040
R13	1	1	1	Resistor, fixed, composition, 5,100 ohms, ±5%, 1/2W	041-001
R14	1	2	2	Resistor, fixed, composition, 22,000 ohms, ±10%, 1/2W	041-064
R15	2	1	1	Resistor, variable, 100,000 ohms, high torque	4520145-50
R16	1	2	2	Resistor, fixed, composition, 2 megohms, ±5%, 1/2W	041-382
R17	1	3	3	Resistor, fixed, composition, 360,000 ohms, ±5%, 1/2W	041-590
R18	1	4	4	Resistor, fixed, composition, 1,000 ohms, ±10%, 1/2W	041-048
R19	1	3	3	Resistor, fixed, composition, 4,700 ohms, ±10%, 1/2W	041-056
R20	1	1	1	Resistor, fixed, composition, 910 ohms, ±5%, 1/2W	041-522
R21	2	1	1	Resistor, variable, composition, 10,000 ohms, ±20%, 2W	044-233
R22	1	1	1	Resistor, fixed, composition, 1.1 megohm, ±5%, 1/2W	041-898
R23	1	x	x	Same as R17	041-590
R24	1	x	x	Same as R17	041-590
R25	1	x	x	Same as R10	041-052
R26	1	1	1	Resistor, fixed, composition, 180 ohms, ±10%, 1/2W	041-257
R27	1	1	1	Resistor, fixed, composition, 390 ohms, ±10%, 1/2W	041-043
R28	1	1	1	Resistor, fixed, composition, 680 ohms, ±10%, 1W	041-143
R29	1	x	x	Same as R10	041-052
R30	1	1	1	Resistor, fixed, composition, 470 ohms, ±10%, 1/2W	041-044
R31	1	x	x	Same as R12	041-040
R32	4	1	1	Resistor, fixed, composition, 10 ohms, ±5%, 1W	041-095

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6. Power Supply

Ref. No.	Loc.*	-01	-02		Ampex Part No.
R33	4	1	1	Resistor, fixed, composition, 4,300 ohms, ±5%, 1/2W	041-012
R34	4	1	1	Resistor, fixed, composition, 9,100 ohms, ±5%, 1/2W	041-373
R35	4	1	1	Resistor, fixed, composition, 2,400 ohms, ±5%, 1/2W	041-316
R36	4	1	1	Resistor, fixed, composition, 680 ohms, ±10%, 1/2W	041-046
R37	2	1	1	Resistor, fixed, composition, 6,200 ohms, ±5%, 1/2W	041-455
R38	2	1	1	Resistor, variable, composition, 100,000 ohms, ±10%, 2W	044-015
R39	1	1	1	Resistor, fixed, composition, 1 megohm, ±5%, 1/2W	041-286
R40	1	x	x	Same as R16	041-382
R41	1	x	x	Same as R14	041-064
R42	1	x	x	Same as R4	041-024
R43	1	x	x	Same as R19	041-056
R44	1	x	x	Same as R10	041-052
R45	2	2	2	Resistor, variable, 25,000 ohms, high torque	4250145-20
R46	1	1	1	Resistor, fixed, composition, 10,000 ohms, ±10%, 1/2W	041-060
R47	1	1	1	Resistor, fixed, composition, 390,000 ohms, ±10%, 1/2W	041-079
R48	1	2	2	Resistor, fixed, composition, 3,300 ohms, ±10%, 1/2W	041-054
R49	1	1	1	Resistor, fixed, composition, 33,000 ohms, ±10%, 1/2W	041-066
R50	1	1	1	Resistor, fixed, metal film, 1.21 megohms, ±1%, 1/2W	048-965
R51	1	x	x	Same as R3	041-070
R52	1	1	1	Resistor, fixed, composition, 7,500 ohms, ±5%, 1/2W	041-361
R53	1	1	1	Resistor, fixed, composition, 39,000 ohms, ±5%, 1/2W	041-018
R54	1	1	1	Resistor, fixed, composition, 4,300 ohms, ±5%, 1/2W	041-012
R55	1	1	1	Resistor, fixed, composition, 2.2 megohms, ±10%, 1/2W	041-086
R56	1	1	1	Resistor, fixed, composition, 470,000 ohms, ±10%, 1/2W	041-080
R57	1	x	x	Same as R7	041-068
R58	1	x	x	Same as R3	041-070
R59	1	x	x	Same as R48	041-054
R60	1	x	x	Same as R1	041-078
R61	1	1	1	Resistor, fixed, composition, 100 ohms, ±10%, 1/2W	041-038
R62	1	1	1	Resistor, fixed, composition, 150 ohms, ±10%, 1/2W	041-241
R63	4	1	1	Resistor, variable, 500 ohms, high torque	4520145-10
R64	1	2	2	Resistor, fixed, composition, 8,200 ohms, ±10%, 1/2W	041-059
R65	1	x	x	Same as R64	041-059
R66	1	1	1	Resistor, fixed, composition, 10 ohms, ±10%, 1/2W	041-032
R67	2	1	1	Resistor, fixed, composition, 2,700 ohms, ±10%, 1/2W	041-278
R68	2	x	x	Same as R45	4520145-20
R69	2	1	1	Resistor, fixed, composition, 220 ohms, ±10%, 1/2W	041-040
R70	2	2	2	Resistor, fixed, composition, 100,000 ohms, ±10%, 1/2W	041-072
R71	2	x	x	Same as R70	041-072
R72	1	x	x	Same as R19	041-056
R73	1	x	x	Same as R18	041-048
R74	1	1	1	Resistor, fixed, wirewound, 1.8 ohms, ±5%, 2W	047-828
R75	1	x	x	Same as R18	041-048
R76	1	x	x	Same as R10	041-052
R77	1	1	1	Resistor, variable, composition, 1,000 ohms, ±30%, 1/10W	044-370
R78	1	x	x	Same as R10	041-048
R79	1	1	1	Resistor, fixed, composition, 82 ohms, ±10%, 1/2W	041-037
R80	1	3	3	Resistor, fixed, composition, 68 ohms, ±10%, 1/2W	041-036
R81	1	x	x	Same as R18	041-048
R82	1	x	x	Same as R80	041-036
R83	1	x	x	Same as R80	041-036
R84	4	1	1	Resistor, variable, wirewound, 25 ohms	4520149-10
R85	4	1	1	Resistor, fixed, composition, 220 ohms, ±10%, 1/2W	041-040
S1	2	1	1	Switch, Output Selector	4620191-01
S2	4	1	1	Switch, Line Termination	122-016
S3	4	1	1	Switch, Input Selector	4620190-01
S4	2	1	0	Switch, toggle, SPST, power	120-005
S5	2	1	1	Switch, Record Selector	4620192-01
S6	2	1	0	Switch, Record	120-472
T1	5	1	1	Transformer, output	4580192-01
T2	1	1	1	Transformer, bias and erase oscillator	560-090
T3	6	1	1	Transformer, power	4580191-01
TP1	4	1	1	Test Point, banana jack, black	146-385
TP1	4	1	1	Test Point, banana jack, red	146-385
	4	3	2	Fuse Post	
	4	2	2	Knob, black, with pointer	230-008
	2	1	1	Knob, black, plain	4100105-02
	2	1	1	Knob, black, skirt	4100105-06
	2	1	1	Knob, red top, plain	4100105-32
	2	1	1	Knob, red top, skirt	4100105-36
	2	2	2	Knob, Lock	230-071
	2	1	0	Pushbutton, Record	4100175-01
	1	19	19	Socket, transistor, insulated	150-103

*Location Guide
1. Printed Circuit Board
2. Front Panel
3. Left Panel (from front)
4. Back Panel
5. Right Panel
6. Power Supply

PLUG-IN EQUALIZER ASSEMBLY
(RECORD/REPRODUCE EQUIPMENT)

Ref. No.	-01	-02	-03	-04	-05		Ampex Part No.
	x					Equalizer, 15 ips, NAB	4020252-01
		x				Equalizer, 7-1/2 ips, NAB	4020252-02
			x			Equalizer, 3-3/4 ips, 120 or 200 microsecond	4020252-03
				x		Equalizer, 15 ips, CCIR	4020252-04
					x	Equalizer, 7-1/2 ips, CCIR	4020252-05
		1	1			Capacitor, variable, mica, 350-1180 pfd, 250 vdcw	038-028
	1			1		Capacitor, variable, mica, 65-340 pfd, 250 vdcw	038-005
					1	Capacitor, variable, mica, 100-550 pfd, 250 vdcw	038-009
	1	1	1	1	1	Capacitor, 3,600 pfd, ±5%, 600 vdcw	055-025
		1			1	Capacitor, ceramic disc, 33 pfd, ±5%, 500 vdcw	030-305
				1		Capacitor, ceramic disc, 56 pfd, ±5%, 500 vdcw	030-306
				1	1	Capacitor, electrolytic, 25 mfd, 3 vdcw	031-620
	1	1	1	1	1	Connector, 8 pins, male	147-006
	1	1	1		1	Resistor, variable, miniature, 100,000 ohms	4520146-10
				1		Resistor, variable, miniature, 25,000 ohms	4520146-30
	1	1	1	1	1	Resistor, variable, miniature, 5 megohms	4520146-40
	1	1	1	1	1	Housing, equalizer	4040914-01

Ref. No.	Loc.*	-01	-02		Ampex Part No.
		x		Single Channel Electronic Assembly	4020265-01
			x	Two Channel Electronic Assembly	4020265-02
		1	1	Power Supply Module	4050389-01
C1	1	2	2	Capacitor, paper, .0047 mfd, ±20%, 600 vdcw	035-028
C2	1	x	x	Same as C1	035-028
C3	1	1	1	Capacitor, electrolytic, 2,000 mfd, +150 -10%, 50 vdcw	031-705
C4	1	1	1	Capacitor, electrolytic, 500 - 500 mfd, 50 vdcw	031-710
C5	1	2	2	Capacitor, ceramic disc, .01 mfd, 500 vdcw	030-002
C6	1	x	x	Same as C5	030-002
CR1	1	4	4	Diode, 1N2860	580-042
CR2	1	x	x	Same as CR1	580-042
CR3	1	x	x	Same as CR1	580-042
CR4	1	x	x	Same as CR1	580-042
CR5	1	1	1	Diode, zener, 24 volts, LMZ24A	013-676
DS1	1	1	1	Lamp, incandescent, pilot, #51	060-028
F1	1	1	1	Fuse, fast blow, 3 ampere, 250 volt	070-001
F2	1	2	2	Fuse, slow blow, 0.5 ampere, 125 volt	070-026
F3	1	x	x	Same as F2	070-026
J1	1	1	1	Connector, receptacle, 2 contacts, male	147-013
J2	1	1	1	Connector, receptacle, 8 contacts, female	146-003
J3	1	2	2	Connector, receptacle, 6 contacts, female	146-004
J4	1	x	x	Same as J3	146-004
Q1	1	1	1	Transistor, silicon, 40250	014-587
R1	1	1	1	Resistor, fixed, composition, 270 ohms, ±10%, 1/2W	041-041
R2	1	1	1	Resistor, fixed, composition, 330 ohms, ±10%, 1/2W	041-042
S1	1	1	1	Switch, toggle, SPST, power	120-005
T1	1	1	1	Transformer, power	4580191-01
	1	3	3	Fuse Post	085-001
	1	1	1	Holder, pilot lamp, DS-1	130-062
		1	2	Audio Module (quantities listed for each module)	4050390-01
C1	2	1	1	Capacitor, electrolytic, 25 mfd, -10 +75%, 3 vdcw	031-620
C2	2	1	1	Capacitor, paper, .002 mfd, 600 vdcw	055-024
C3	2	1	1	Capacitor, electrolytic, 50 mfd, -10 +75%, 3 vdcw	031-244
C4	2	1	1	Capacitor, electrolytic, 4 mfd, -10 +75%, 15 vdcw	031-424
C5	2	2	2	Capacitor, Electrolytic, 2 mfd, -10 +75%, 25 vdcw	031-646
C6	2	2	2	Capacitor, electrolytic, 100 mfd, -10 +75%, 6 vdcw	031-166
C7	2	1	1	Capacitor, electrolytic, 50 mfd, -10 +100%, 25 vdcw	031-190
C8	2	1	1	Capacitor, mylar, 0.22 mfd, ±10%, 100 vdcw	035-819
C9	2	x	x	Same as C5	031-646
C10	2	x	x	Same as C6	031-166
C11	2	1	1	Capacitor, mylar, .022 mfd, ±10%, 100 vdcw	035-777
C12	2	2	2	Capacitor, mylar, .0036 mfd, ±5%, 600 vdcw	055-025
C13	2	x	x	Same as C12	055-025
CR1	2	1	1	Diode, 1N2860	580-042
J1	2	1	1	Connector, receptacle, 3 contact, male	143-008
J2	2	1	1	Connector, receptacle, 3 contact, male	147-004
K1	2	1	1	Relay, 4PDT, 24 vdc	020-244
Q1	2	4	4	Transistor, silicon, T.I. 415, 2N3707	014-560
Q2	2	x	x	Same as Q1	014-560
Q3	2	x	x	Same as Q1	014-560
Q4	2	x	x	Same as Q1	014-560
Q5	2	1	1	Transistor, germanium, 2N414	014-029
Q6	2	1	1	Transistor, germanium, 2N1168	014-591
R1	2	3	3	Resistor, fixed, composition, 330,000 ohms, ±10%, 1/2W	041-078
R2	2	1	1	Resistor, fixed, composition, 68,000 ohms, ±10%, 1/2W	041-070
R3	2	1	1	Resistor, fixed, composition, 75,000 ohms, ±5%, 1/2W	041-253
R4	2	1	1	Resistor, fixed, composition, 100,000 ohms, ±10%, 1/2W	041-072
R5	2	1	1	Resistor, fixed, metal film, 1,000 ohms, ±1%, 1/4W	048-259
R6	2	1	1	Resistor, fixed, composition, 47,000 ohms, ±10%, 1/2W	041-068
R7	2	1	1	Resistor, fixed, composition, 620,000 ohms, ±5%, 1/2W	041-900
R8	2	1	1	Resistor, fixed, composition, 240,000 ohms, ±5%, 1/2W	041-374
R9	2	1	1	Resistor, fixed, composition, 110,000 ohms, ±5%, 1/2W	041-024
R10	2	3	3	Resistor, fixed, composition, 2,200 ohms, ±10%, 1/2W	041-052

*Location Guide
1. Power Supply Module
2. Audio Module

Ref. No.	Loc.*	-01	-02		Ampex Part No.
R11	2	1	1	Resistor, fixed, composition, 24,000 ohms, ±5%, 1/2W	041-498
R12	2	2	2	Resistor, fixed, composition, 220 ohms, ±10%, 1/2W	041-040
R13	2	1	1	Resistor, fixed, composition, 5,100 ohms, ±5%, 1/2W	041-001
R14	2	3	3	Resistor, variable, high torque, 100,000 ohms	4520145-50
R15	2	1	1	Resistor, fixed, composition, 1.1 megohm, ±5%, 1/2W	041-898
R16	2	2	2	Resistor, fixed, composition, 360,000 ohms, ±5%, 1/2W	041-590
R17	2	x	x	Same as R16	041-590
R18	2	x	x	Same as R10	041-052
R19	2	1	1	Resistor, fixed, composition, 180 ohms, ±10%, 1/2W	041-257
R20	2	1	1	Resistor, fixed, composition, 390 ohms, ±10%, 1/2W	041-043
R21	2	1	1	Resistor, fixed, composition, 680 ohms, ±10%, 1W	041-143
R22	2	x	x	Same as R10	041-052
R23	2	1	1	Resistor, fixed, composition, 470 ohms, ±10%, 1/2W	041-044
R24	2	x	x	Same as R12	041-040
R25	2	1	1	Resistor, fixed, composition, 10 ohms, ±5%, 1W	041-095
R26	2	1	1	Resistor, fixed, composition, 680 ohms, ±10%, 1/2W	041-046
R27	2	1	1	Resistor, fixed, composition, 4,300 ohms, ±5%, 1/2W	041-012
R28	2	1	1	Resistor, fixed, composition, 9,100 ohms, ±5%, 1/2W	041-373
R29	2	1	1	Resistor, fixed, composition, 2,400 ohms, ±5%, 1/2W	041-316
R30	2	2	2	Resistor, variable, high torque, 5 megohms	4520145-60
R31	2	x	x	Same as R1	041-078
R32	2	x	x	Same as R14	4520145-50
R33	2	x	x	Same as R30	4520145-60
R34	2	x	x	Same as R1	041-078
R35	2	x	x	Same as R14	4520145-50
S1	2	1	1	Switch, rotary, SPDT	122-016
T1	2	1	1	Transformer, output	4580192-01
		1	1	Cover, chassis, audio	4290595-01
		5	5	Socket, transistor	150-103

*Location Guide
1. Power Supply Module
2. Audio Module

HEAD ASSEMBLY
Single Track

Ref. No.	-01	-02	-03	-04		Ampex Part No.
	x				Head Assembly, half track, record/reproduce	4020261-01
		x			Head Assembly, full track, record/reproduce	4020261-02
			x		Head Assembly, half track, reproduce-only	4020261-03
				x	Head Assembly, full track, reproduce-only	4020261-04
	1	1	0	0	Gate Assembly	4030243-01
	0	0	1	1	Gate Assembly	4030243-02
	1	1	1	1	Cover Assembly, reproduce head	4040531-01
	1	1	0	0	Cover Assembly, record head	4040532-01
	1	1	1	1	Head Gate	4040887-01
	2	2	2	2	Tape Lifter Assembly	4040888-01
	2	2	1	1	Plate, head cover spring	4270155-10
	1	1	0	0	Base Plate Subassembly	4030244-01
	0	0	1	1	Base Plate Subassembly	4030244-02
	1	1	0	0	Can Assembly, record head	4040403-02
	1	1	0	0	Can Assembly, erase head	4040422-02
	1	1	1	1	Can Assembly, reproduce head	4040425-04
	2	2	2	2	Post, gate stop	4220228-01
	2	2	0	0	Plate, head clamping (record, erase)	4330120-10
	1	1	1	1	Base Plate	4330122-02
	1	1	1	1	Plate, head clamping (reproduce)	4330123-01
	0	0	1	1	Tape Guide	4210193-10
	1	0	1	0	Head Stack, reproduce, half track	4040438-51
	0	1	0	1	Head Stack, reproduce, full track	4040438-52
	1	0	0	0	Head Stack, record, half track	4040438-66
	0	1	0	0	Head Stack, record, full track	4040438-67
	0	1	0	0	Head Stack, erase, full track	4040829-01
	1	0	0	0	Head Stack, erase, half track	4040831-01
	1	1	1	1	Housing Assembly	4040885-01
	4	4	2	2	Spring, head adjusting	4270167-10
	1	1	1	1	Spring, head gate detent	4270242-01
	2	2	2	2	Drive Pin, head gate	403-006

HEAD ASSEMBLY
Two Track, Record/Reproduce

Ref. No.	-01		Ampex Part No.
	x	Head Assembly, record/reproduce	4020262-01
	1	Gate Assembly	4030243-01
	1	Cover Assembly, reproduce head	4040531-01
	1	Cover Assembly, record head	4040532-01
	1	Head Gate	4040887-01
	2	Tape Lifter Assembly	4040888-01
	2	Plate, head cover spring	4270155-10
	1	Base Plate Subassembly	4030245-01
	1	Can Assembly, record head	4040403-02
	1	Can Assembly, erase head	4040422-02
	1	Can Assembly, reproduce head	4040425-04
	2	Post, gate stop	4220228-01
	2	Plate, head clamping (record, erase)	4330120-10
	1	Base Plate	4330122-02
	1	Plate, head clamping (reproduce)	4330123-01
	1	Head Stack, reproduce	4040437-01
	1	Head Stack, record	4040437-05
	1	Head Stack, erase	4040831-01
	1	Housing Assembly	4040885-01
	4	Spring, head adjusting	4270167-10
	1	Spring, head gate detent	4270242-01
	2	Drive Pin, head gate	403-006

HEAD ASSEMBLY
Two Track, Reproduce-Only

Ref. No.	-01		Ampex Part No.
	x	Head Assembly, two track, reproduce-only	4020266-01
	1	Gate Assembly	4030243-03
	1	Cover Assembly, head, right position	4040531-01
	1	Cover Assembly, head, left position	4040532-01
	1	Gate Subassembly	4040887-01
	2	Tape Lifter Assembly	4040888-01
	2	Plate, head cover spring	4270155-10
	1	Base Plate Subassembly	1231758-01
	1	Can Assembly, head, left position	1231754-01
	1	Can Assembly, head, right position	4040425-04
	1	Tape Guide	4210193-10
	2	Post, gate stop	4220228-02
	1	Plate, head clamping, left position	4330120-10
	1	Plate, head clamping, right position	4330123-01
	1	Base Plate	4330122-03
	1	Bracket Assembly, switch mounting	1231755-01
	1	Bracket	1231752-01
	1	Switch, slide	4620124-10
	1	Head Stack, reproduce, 1/4 track	1231757-01
	1	Head Stack, reproduce, 2 track	4040437-01
	1	Housing Assembly	4040885-01
	3	Spring, head adjusting	4270167-10
	1	Spring, head gate detent	4270242-02
	2	Drive Pin, head gate	403-006

HEAD ASSEMBLY
Special Four-Stack Record/Reproduce
Two Track

Ref. No.	-05		Ampex Part No.
	x	Head Assembly, Two Track and 1/4 Track	02-06620-05
	1	Head Stack, two track, reproduce	02-96170-04
	1	Head Stack, 1/4 track, reproduce	02-96640-02
	1	Head Stack, two track, record	02-96170-11
	1	Head Stack, two track, erase	1815071-01
	1	Base Assembly	4030105-20
	2	Tape Guide	4210170-10
	1	Handle, tape lifter	4120051-10
	1	Base	4330132-10
	4	Plate, spring retaining	4330133-10
	4	Mounting, head	4040692-10
	2	Spring, tape guide return	4270169-10
	2	Spring, tape guide detent	4270170-10
	8	Spring, head mounting	4270171-10
	1	Pin Knuckle, spring guide	4040449-10
	1	Guide Rod	4210195-10
	2	Tape Guide	4210196-10
	1	Shaft, switch	4210197-10
	1	Cam, tape lifter retract	4230165-10
	1	Spring, head cover	4270200-10
	1	Shield, head cover	4290235-20
	1	Shield, head base	4290296-10
	1	Wire, retaining	4320115-10
	1	Stanchion, over center	4330134-10
	1	Base Plate	4330135-10
	2	Hinge	4330136-10
	1	Head Cover	4330137-10
	1	Head Connecting Chassis Assembly	4030124-50
	1	Panel, rear	4290245-10
	1	Chassis	4290299-10
	1	Base	4330102-10
	1	Switch, slide, DPDT	4620124-10

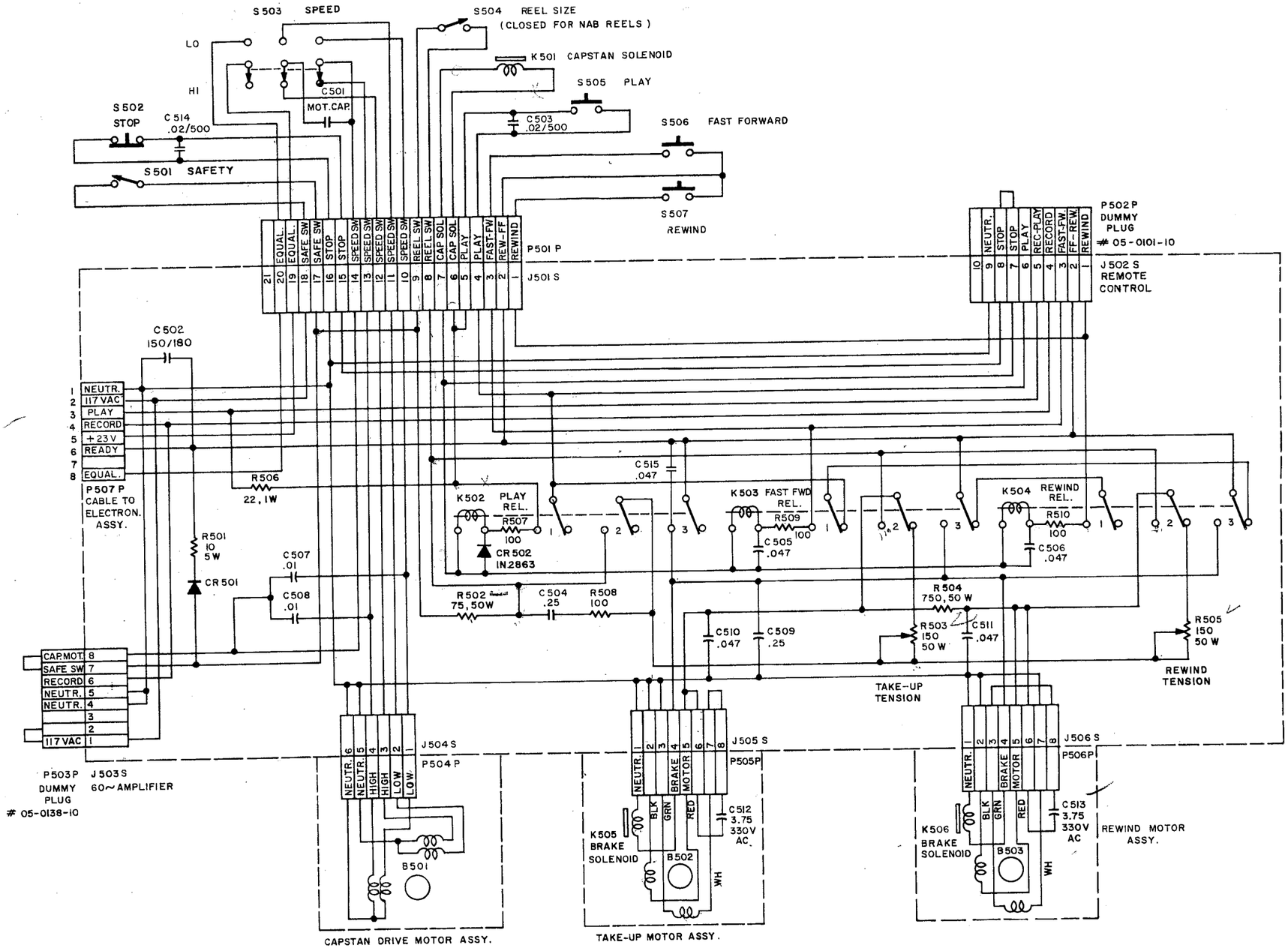
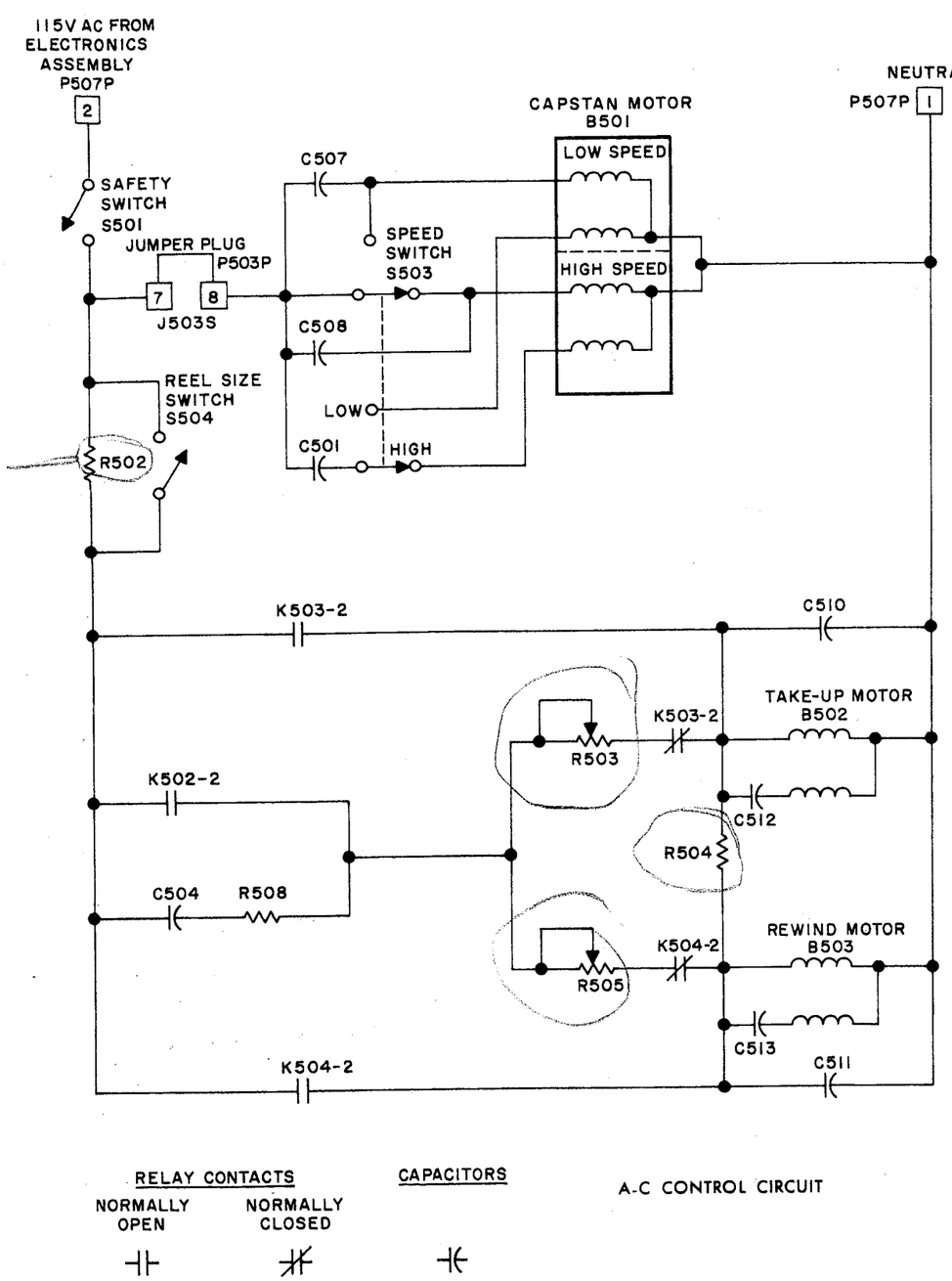


Fig. 7-1 Schematic Diagram, Tape Transport



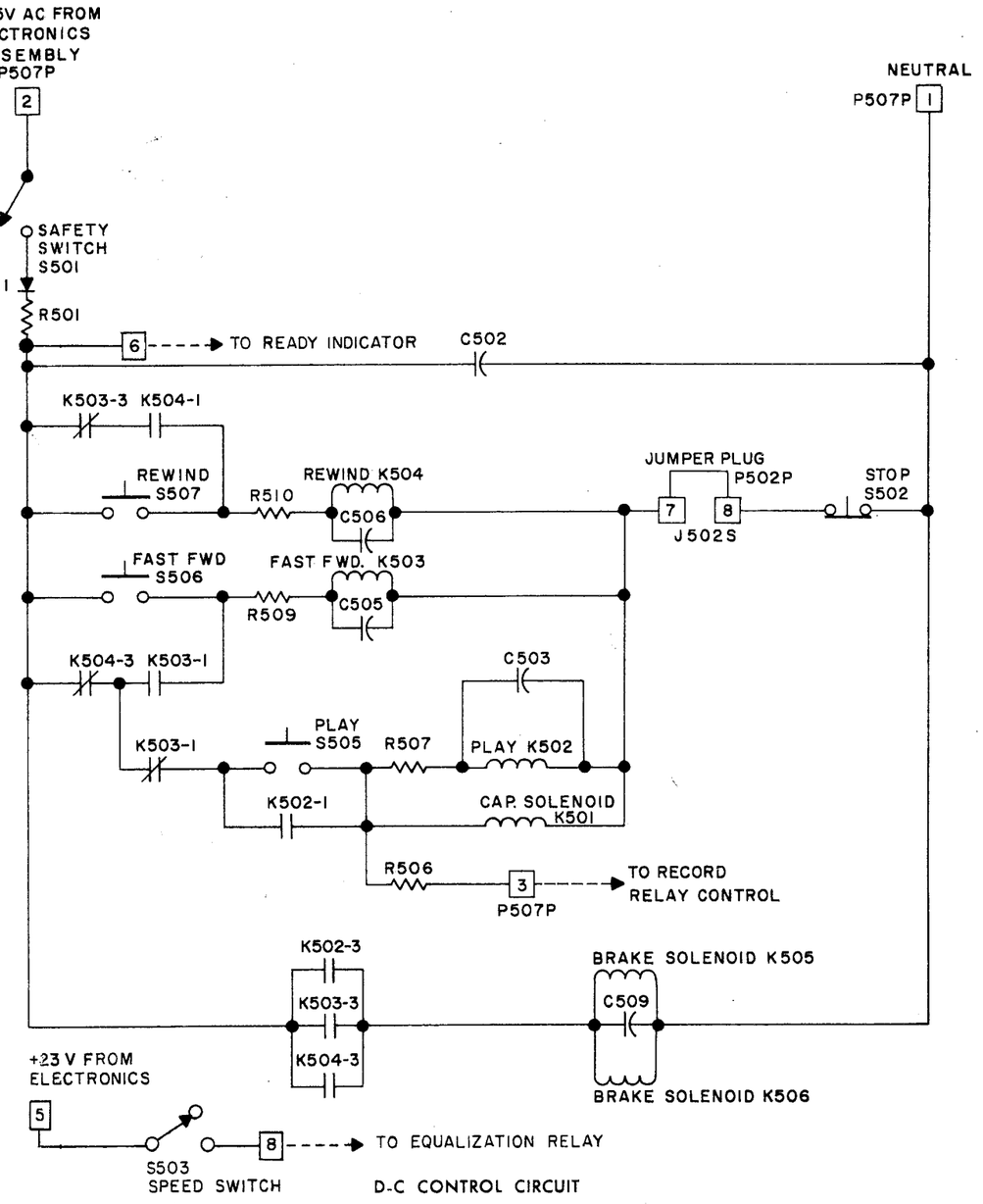


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Fig. 7-2 Simplified Diagram, Tape Transport Controls

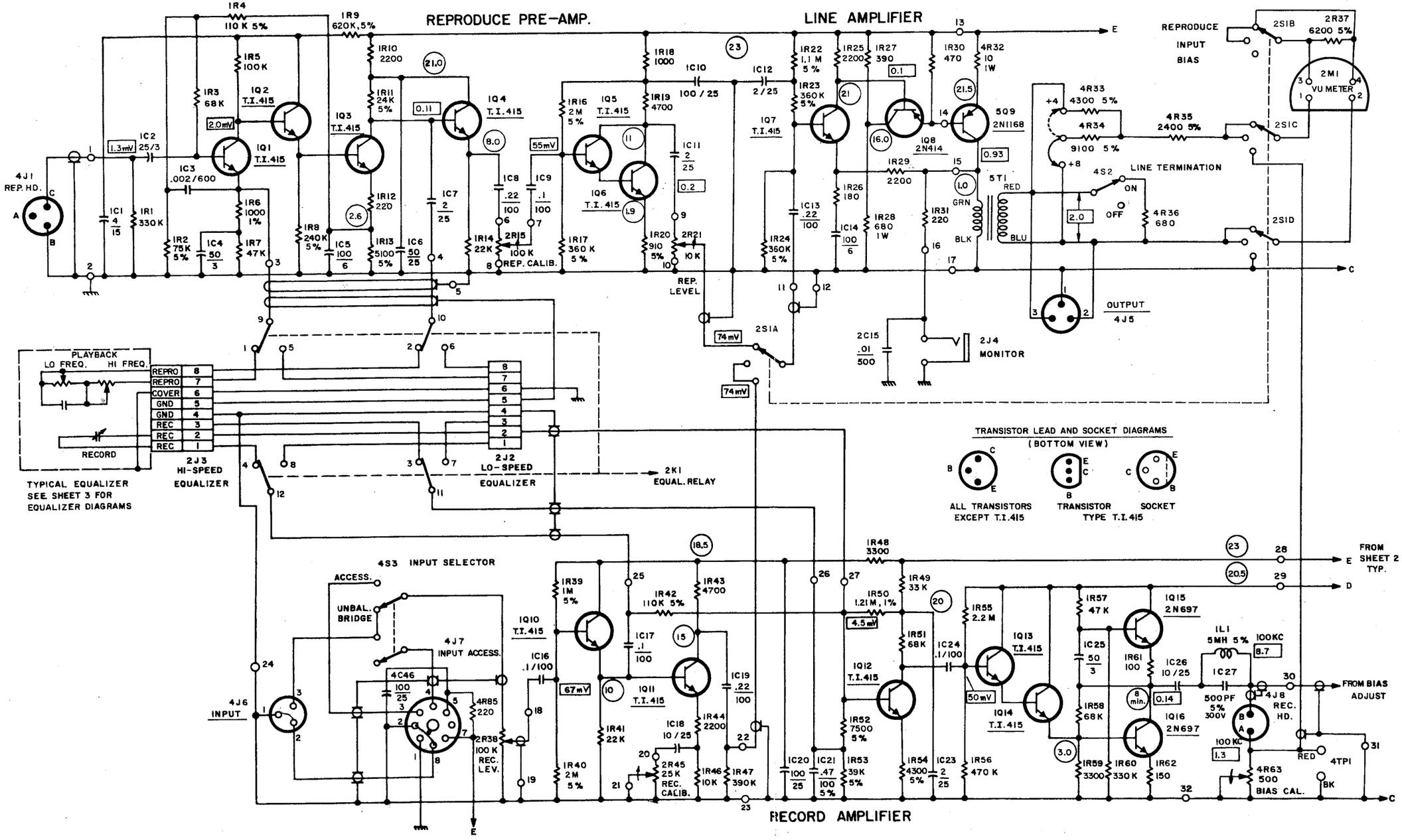
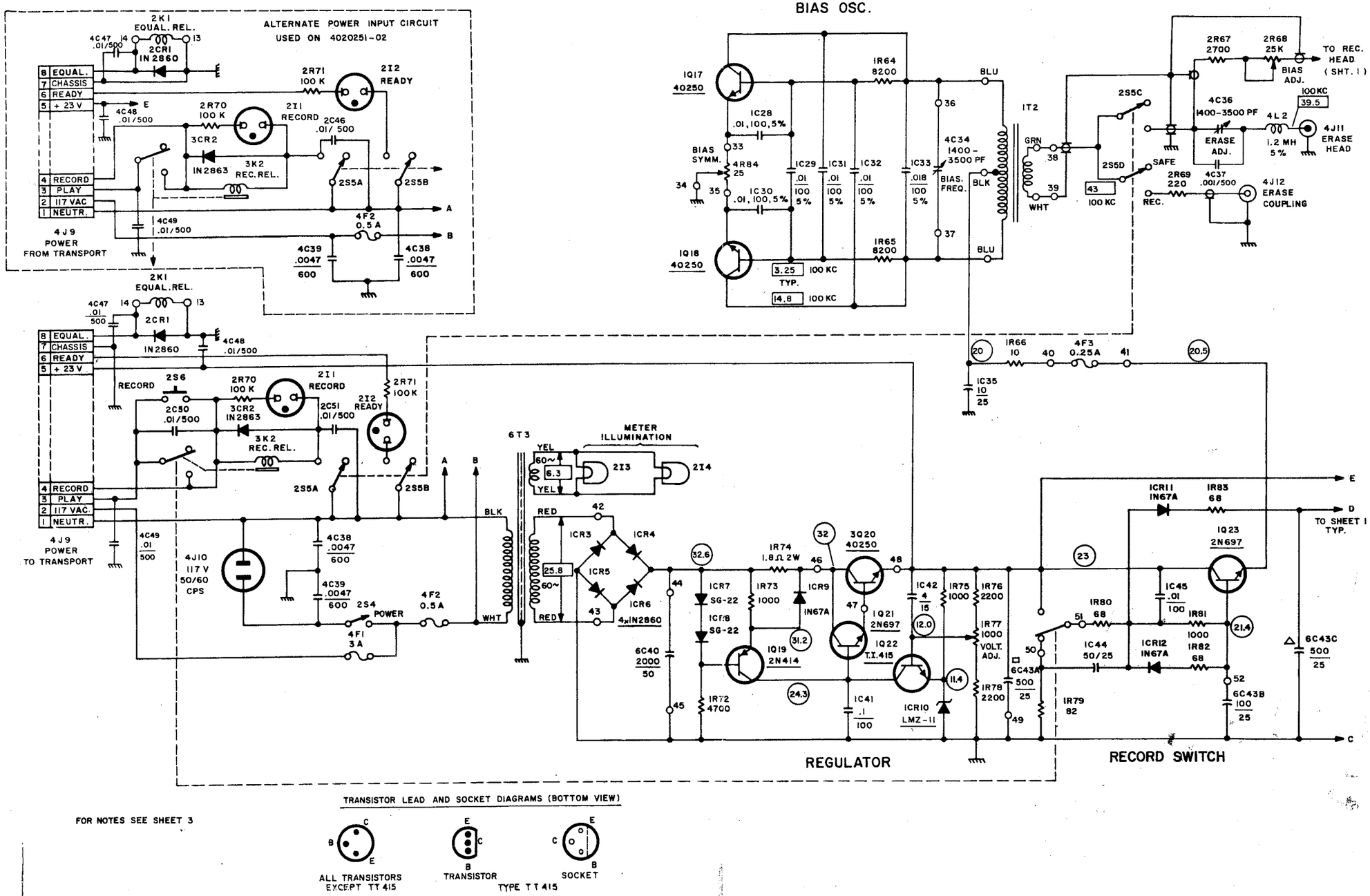


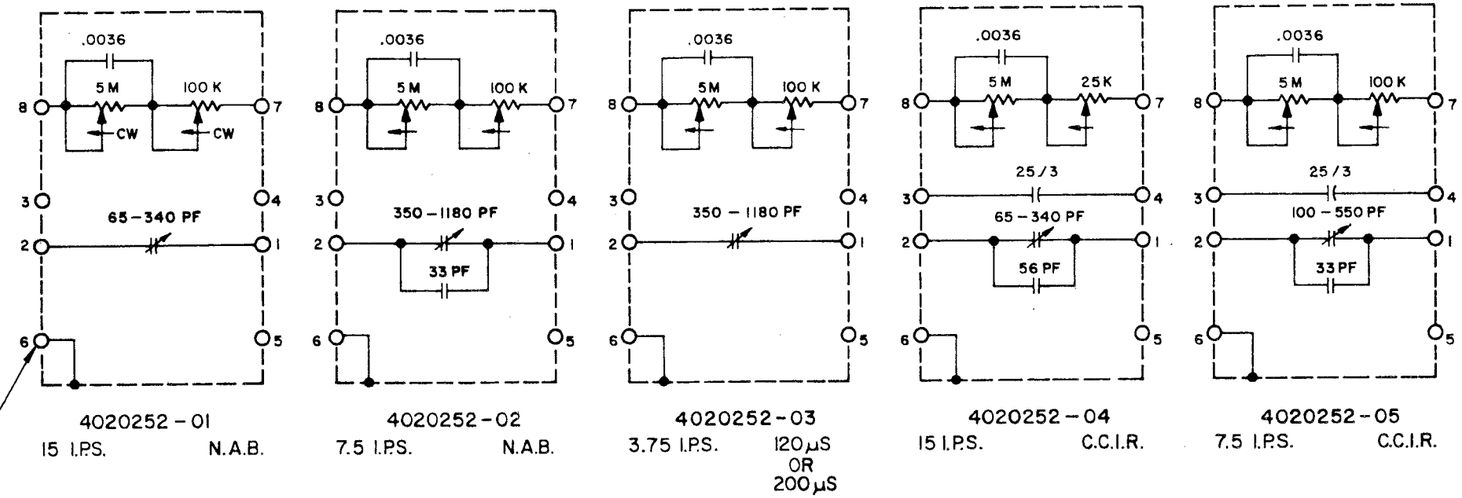
Fig. 7-3 Schematic Diagram, Record/Reproduce Electronics, Sheet 1 of 3



FOR NOTES SEE SHEET 3

TRANSISTOR LEAD AND SOCKET DIAGRAMS (BOTTOM VIEW)

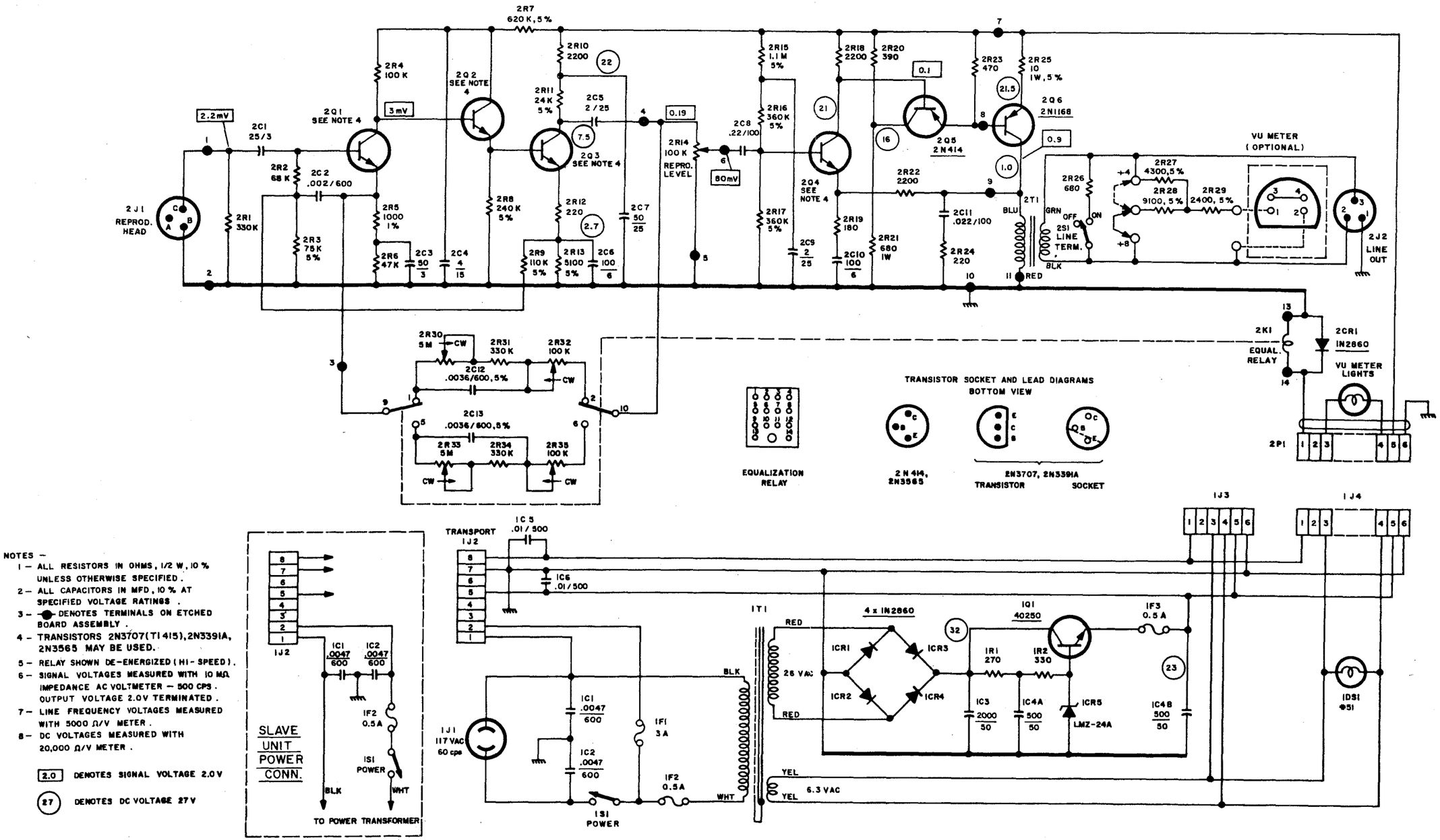
Fig. 7-4 Schematic Diagram, Record/Reproduce Electronics, Sheet 2 of 3



NOTES –

1. ALL RESISTORS IN OHMS, 1/2 W, 10%, UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS IN MFD, UNLESS OTHERWISE SPECIFIED.
3. COMPONENT LOCATION IS INDICATED BY FIRST DIGIT OF SCHEMATIC REFERENCE NUMBER:
   - 1 — PRINTED CIRCUIT BOARD
   - 2 — FRONT PANEL
   - 3 — LEFT PANEL (WHEN FACING FRONT)
   - 4 — BACK PANEL
   - 5 — RIGHT PANEL
   - 6 — POWER SUPPLY
4. (15) — INDICATES TERMINAL ON P.C. BOARD.
5. (23) — INDICATES D.C. VOLTAGE TO GROUND, MEASURED WITH A 20,000 Ω / V METER.
6. [7.5] — INDICATES SIGNAL VOLTAGE TO GROUND OR OTHER LINE AS INDICATED AT 500 CPS WITH 7.5 I.P.S. N.A.B. EQUALIZER IN USE. MEASURED WITH A 10 MΩ INPUT VTVM. 60 CPS VOLTAGES MEASURED WITH A 5000 Ω / V METER.

Fig. 7-5 Schematic Diagram, Record/Reproduce Electronics, Sheet 3 of 3



NOTES —

1 — ALL RESISTORS IN OHMS, 1/2 W, 10 % UNLESS OTHERWISE SPECIFIED.
2 — ALL CAPACITORS IN MFD, 10 % AT SPECIFIED VOLTAGE RATINGS.
3 — ● DENOTES TERMINALS ON ETCHED BOARD ASSEMBLY.
4 — TRANSISTORS 2N3707(TI 415), 2N3391A, 2N3565 MAY BE USED.
5 — RELAY SHOWN DE-ENERGIZED (HI-SPEED).
6 — SIGNAL VOLTAGES MEASURED WITH 10 MΩ IMPEDANCE AC VOLTMETER — 500 CPS. OUTPUT VOLTAGE 2.0V TERMINATED.
7 — LINE FREQUENCY VOLTAGES MEASURED WITH 5000 Ω/V METER.
8 — DC VOLTAGES MEASURED WITH 20,000 Ω/V METER.

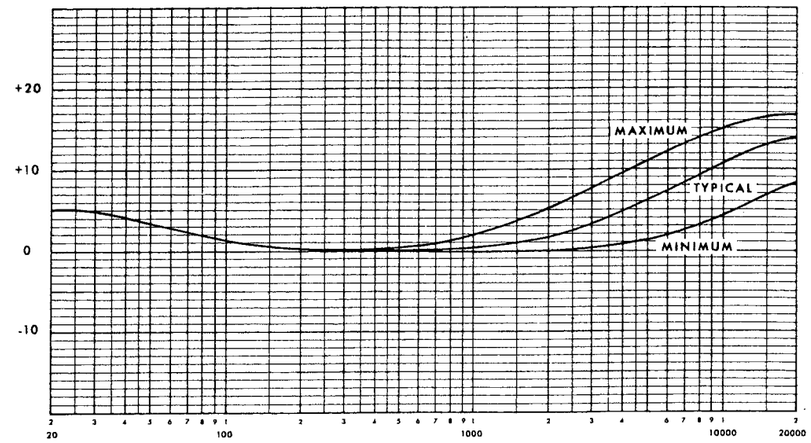
[2.0] DENOTES SIGNAL VOLTAGE 2.0 V

(27) DENOTES DC VOLTAGE 27 V

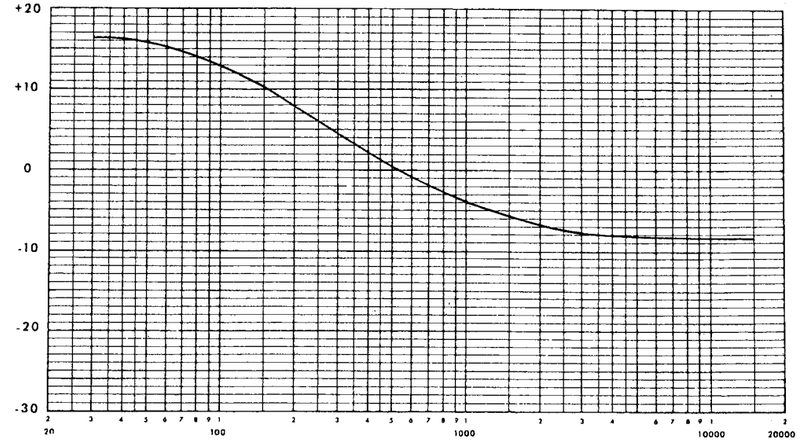
Fig. 7-6 Schematic Diagram, Reproduce-only Electronics

3¾ ips (120 usec)

RECORD

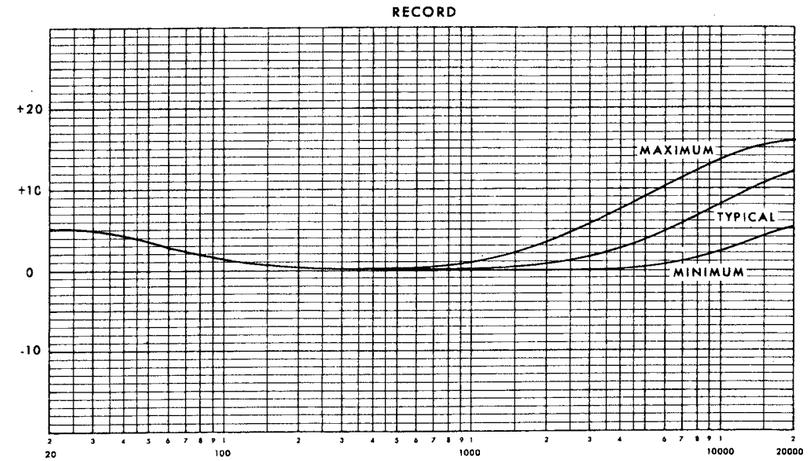


REPRODUCE

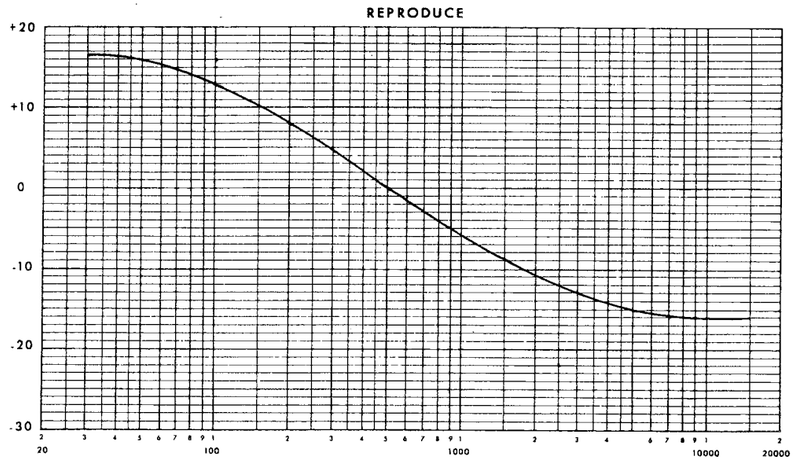


7½ ips NAB

RECORD

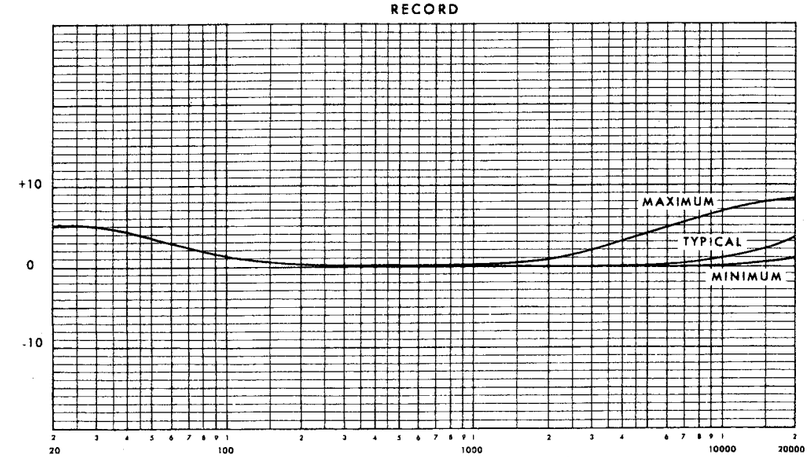


REPRODUCE

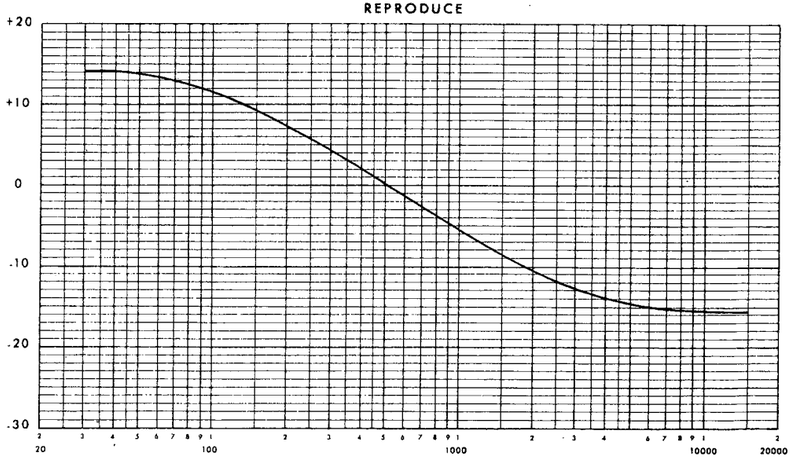


15 ips NAB

RECORD

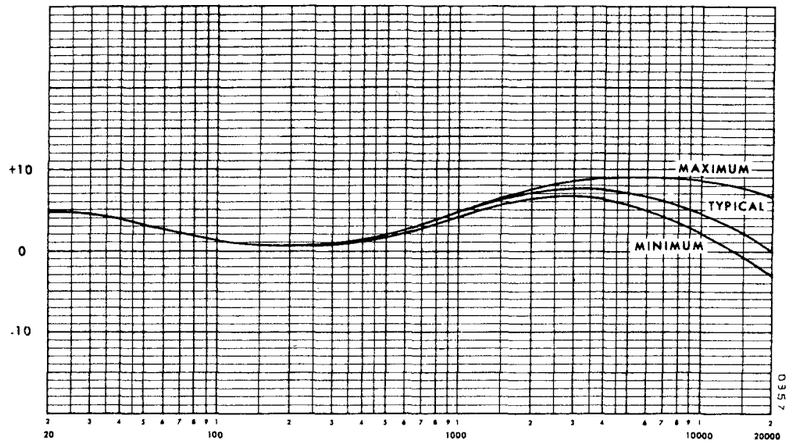


REPRODUCE



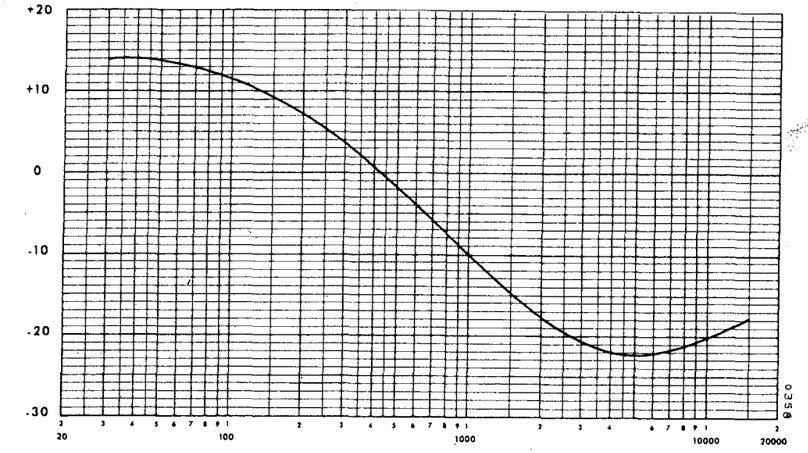
400978

Fig. 7-7 Response Curves, Sheet 1 of 2

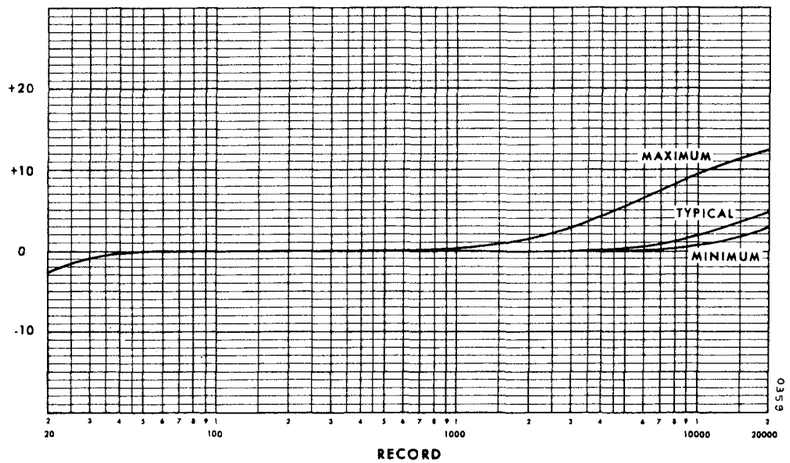


RECORD

15 ips AME

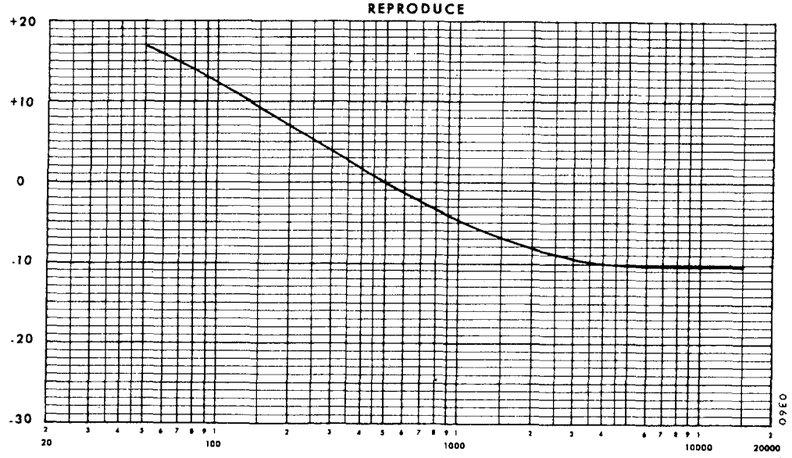


REPRODUCE

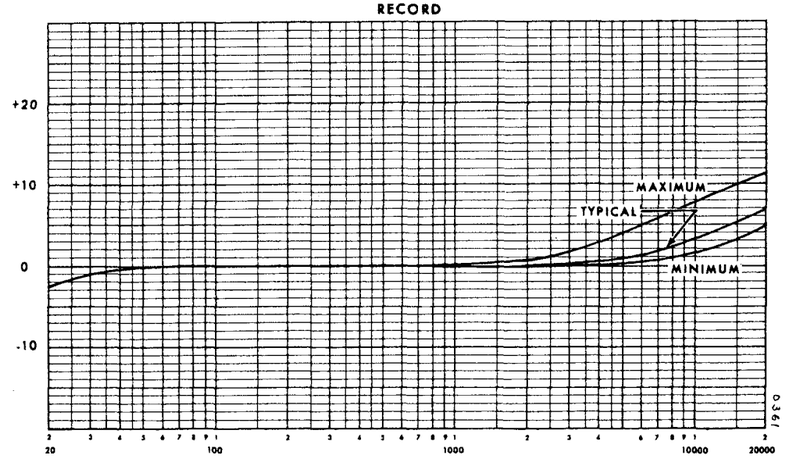


RECORD

7½ ips CCIR

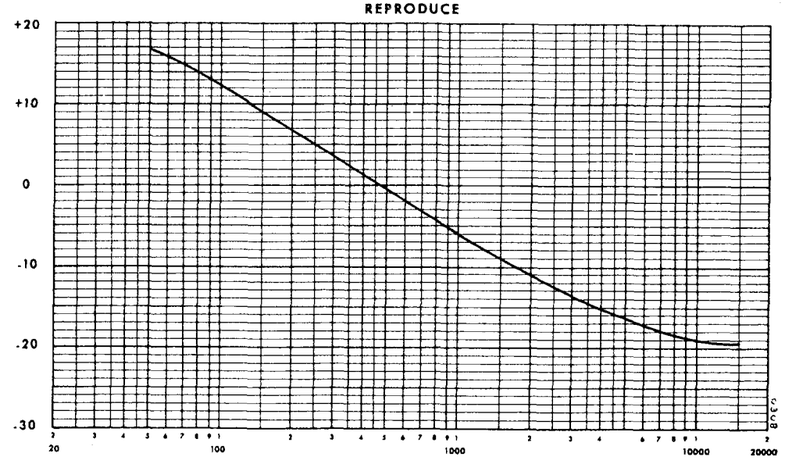


REPRODUCE



RECORD

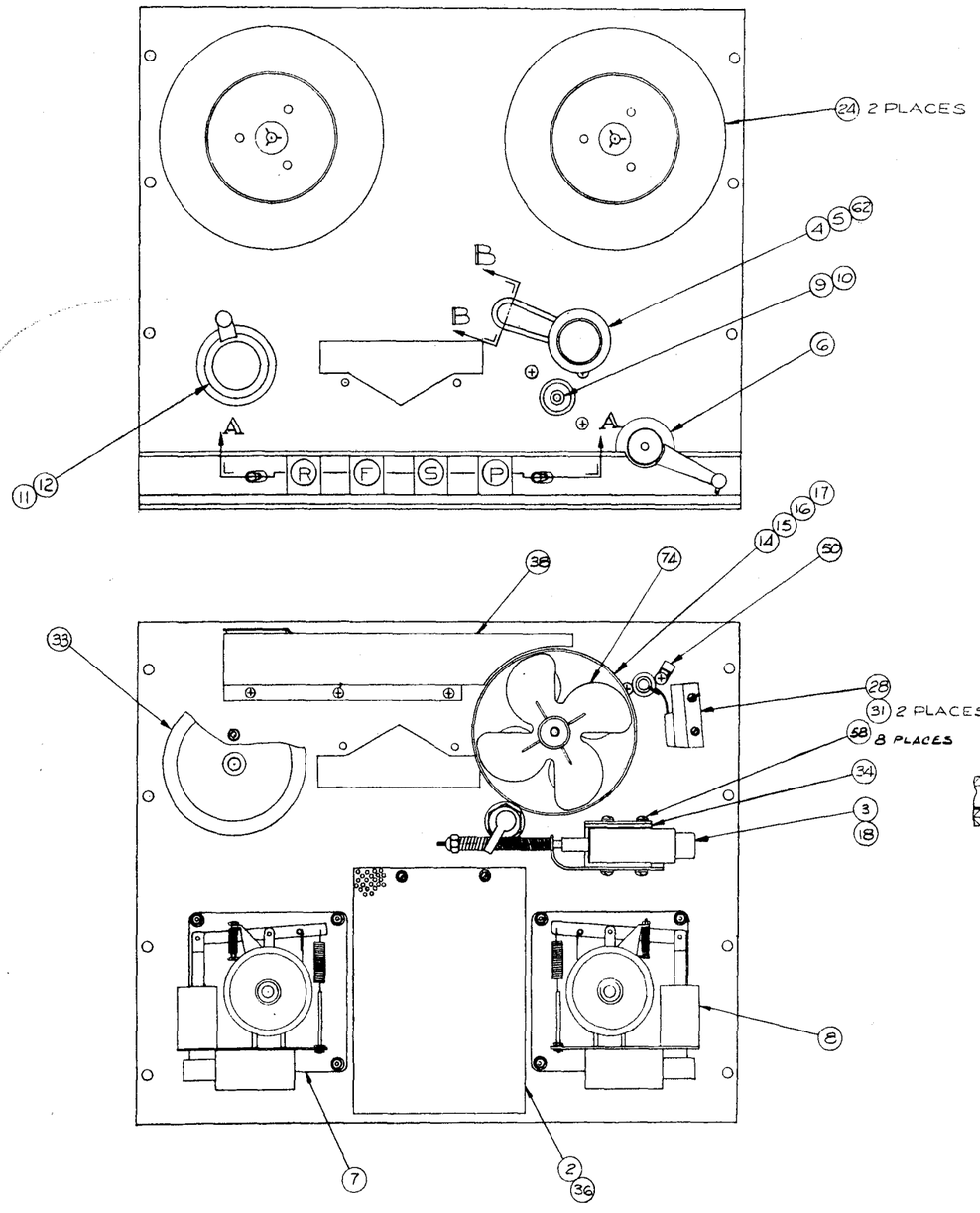
15 ips CCIR

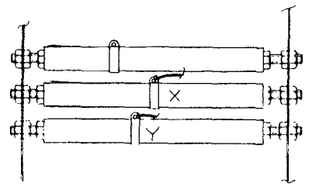


REPRODUCE

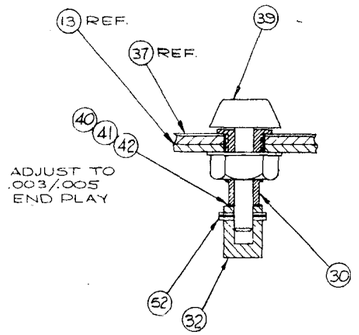
400979

Fig. 7-8 Response Curves, Sheet 2 of 2

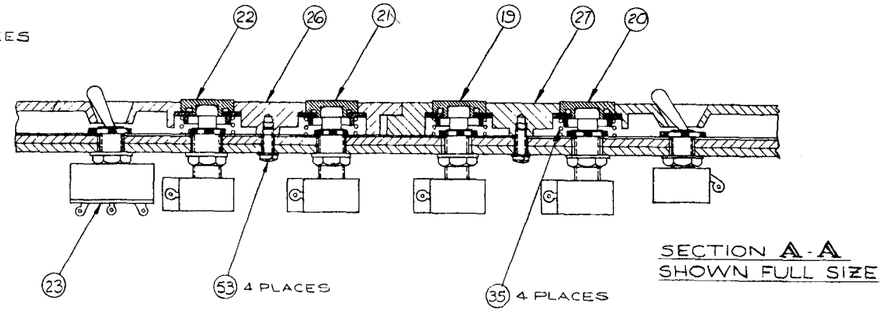




REAR VIEW OF ITEM "2"
(NOT TO SCALE)



SECTION B-B
SHOWN FULL SIZE



SECTION A-A
SHOWN FULL SIZE

Fig. 7-9 Tape Transport Assembly

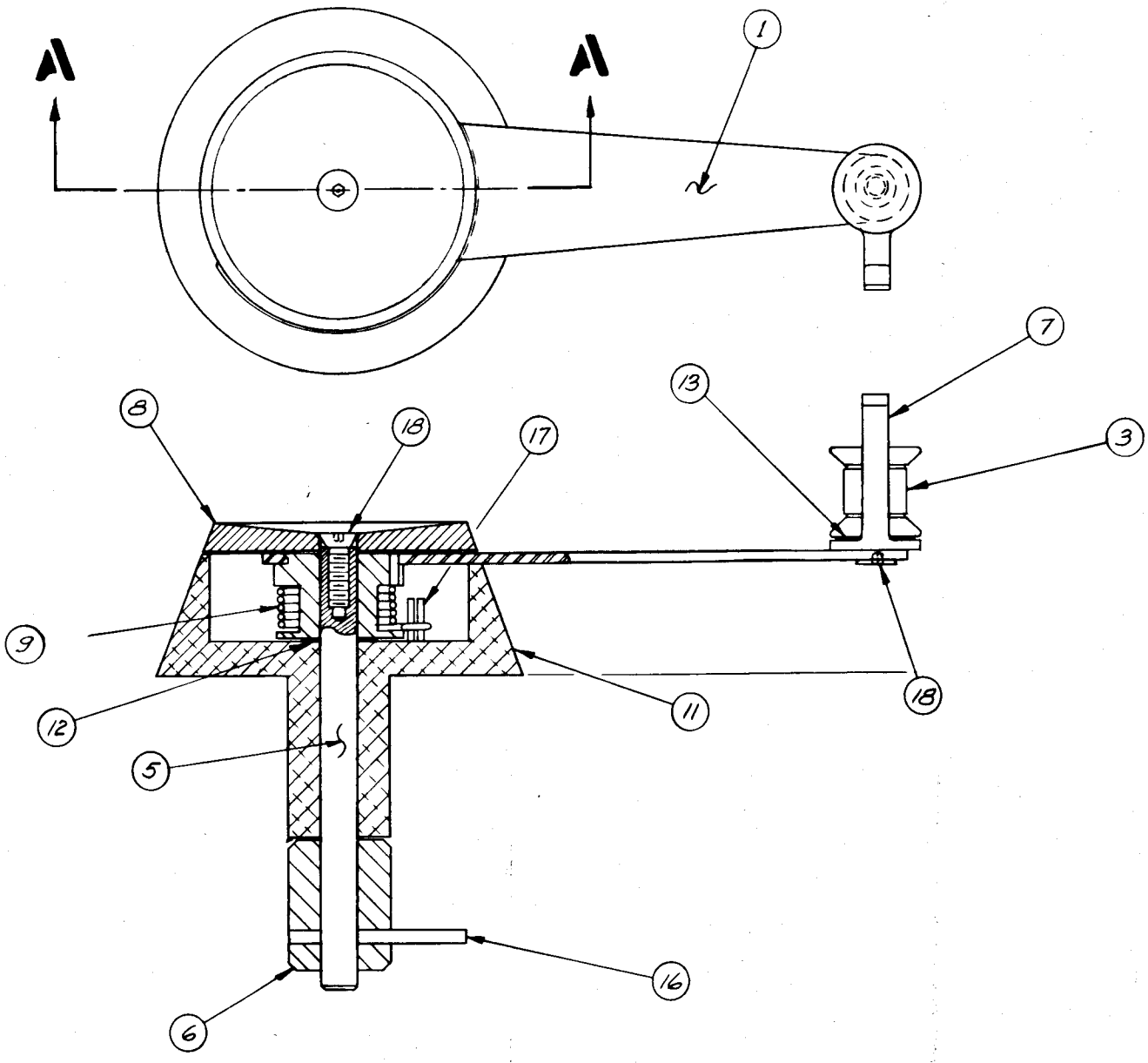
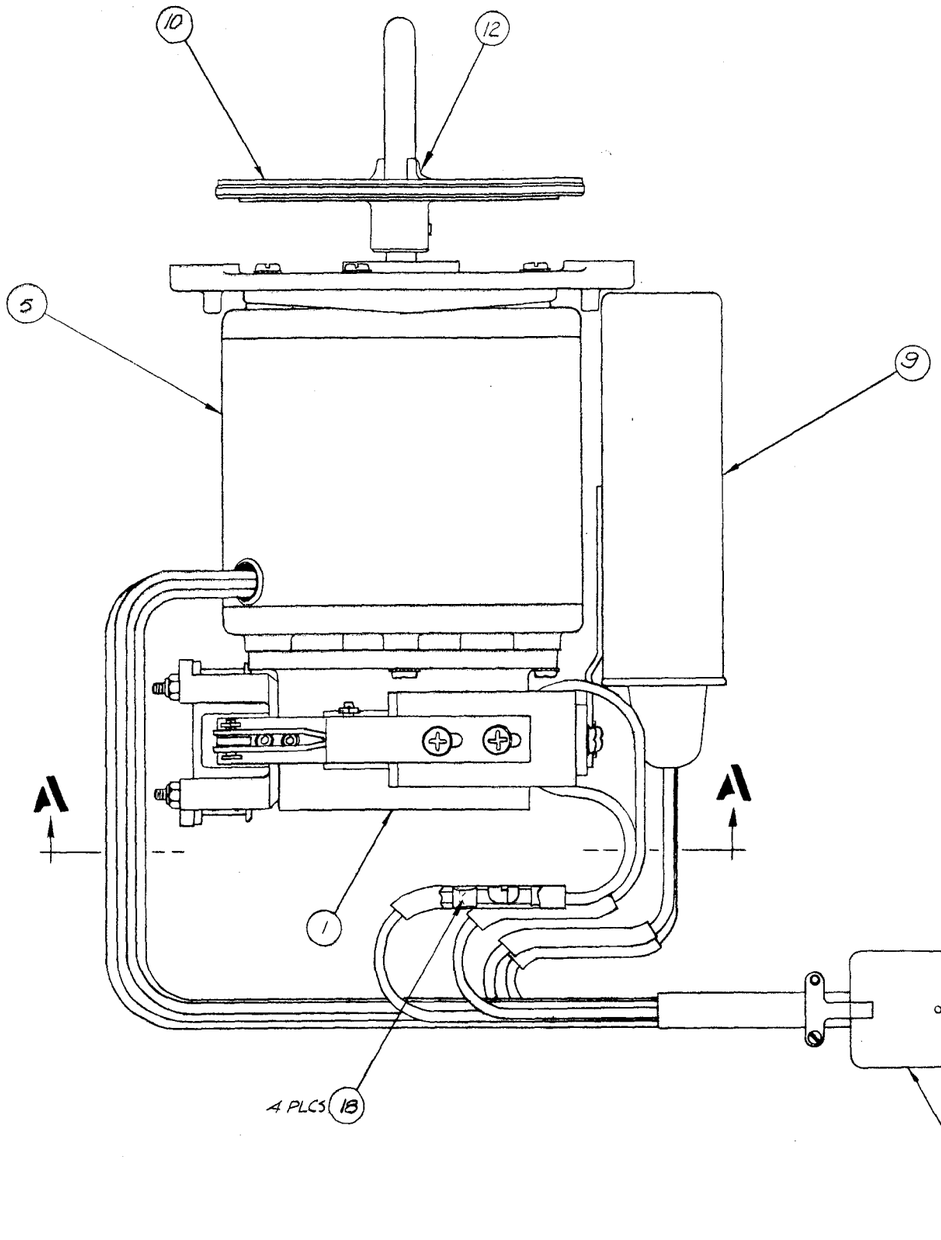
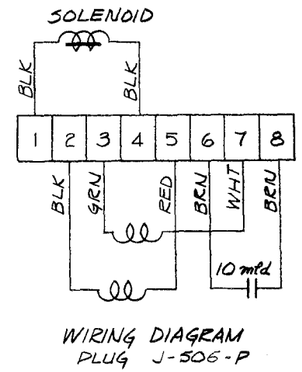


Fig. 7-10 Takeup Tension Arm Assembly





WIRING DIAGRAM
PLUG J-506-P

Fig. 7-11 Typical Reel Drive Assembly (Rewind)

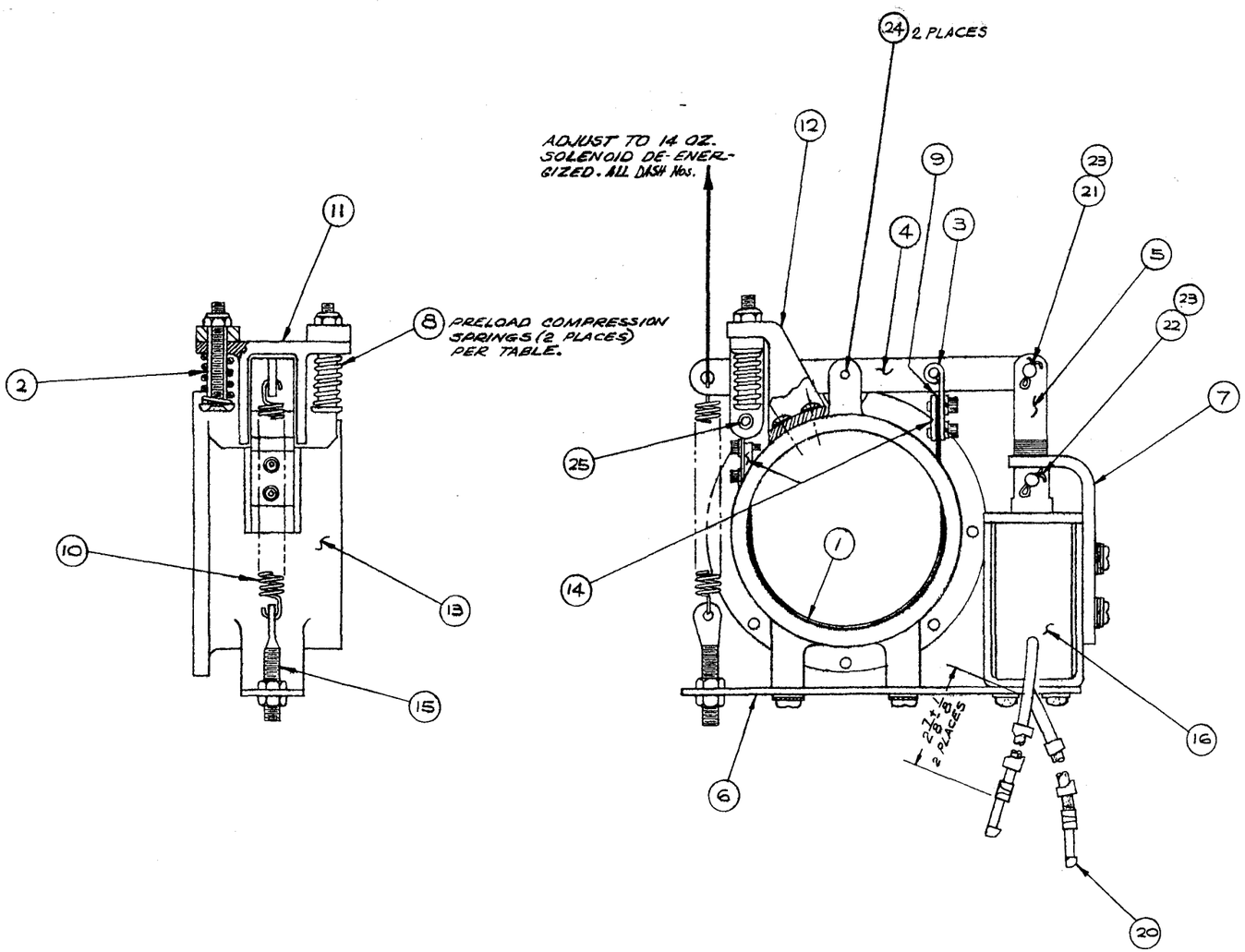


Fig. 7-12 Brake Assembly

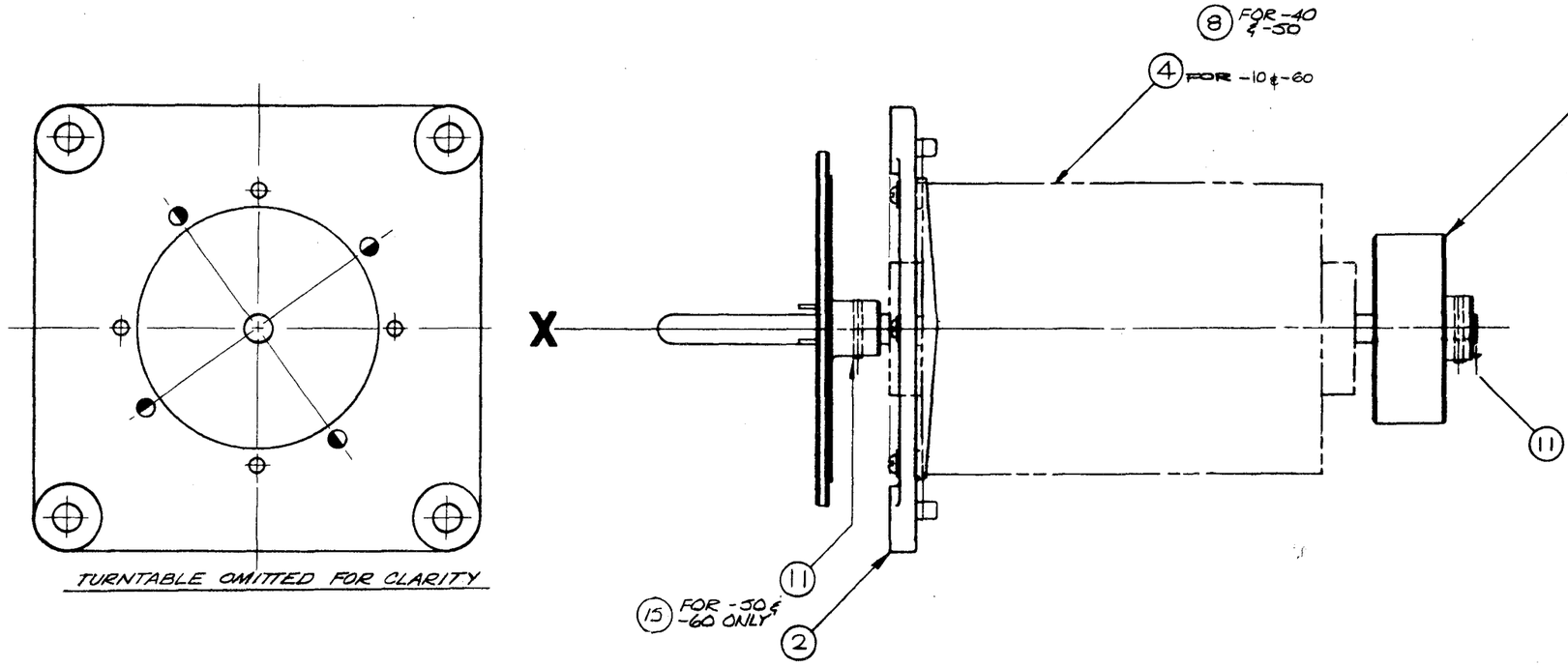
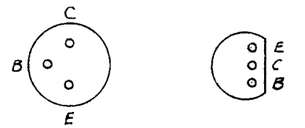


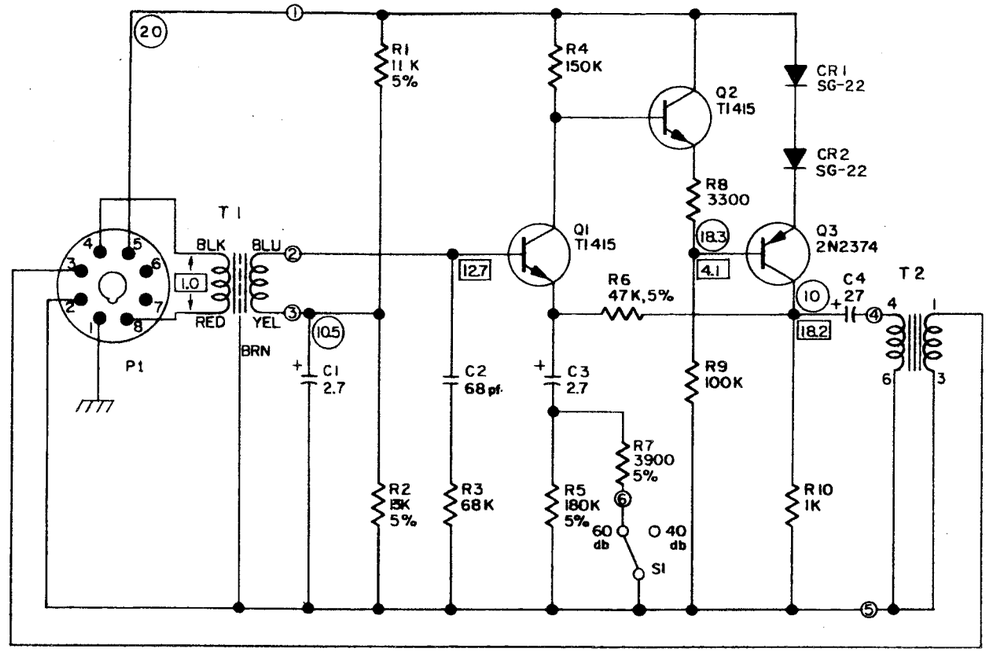
Fig. 7-13 Torque Motor Assembly

TRANSISTOR BASE DIAGRAM



ZN 2374 — BOTTOM VIEW

T1 415 (ALT. ZN3391A)



NOTES:

1. ⏚ DENOTES SHIELD CAN.
2. ALL RESISTORS ARE IN OHMS, ±10%, 1/4 WATT, UNLESS OTHERWISE SPECIFIED.
3. ALL CAPACITORS ARE IN MICROFARADS, 15 VOLT, UNLESS OTHERWISE SPECIFIED.
4. (20) INDICATES D.C. VOLTAGE TO GROUND, MEASURED WITH A 20,000 Ω/V METER
5. [10] INDICATES RMS MILLIVOLTS TO GROUND AT 500 CPS WITH 'S1' IN 60 DB POSITION AND LOADED WITH 100K RESISTOR.
6. TRANSISTORS Q1 & Q2-T1415 IS INTERCHANGEABLE WITH ZN 3391 A.

Fig. 7-14 Schematic Diagram, Microphone Preamplifier