

AMPEX

MODEL 450B

**OPERATION AND
MAINTENANCE MANUAL**

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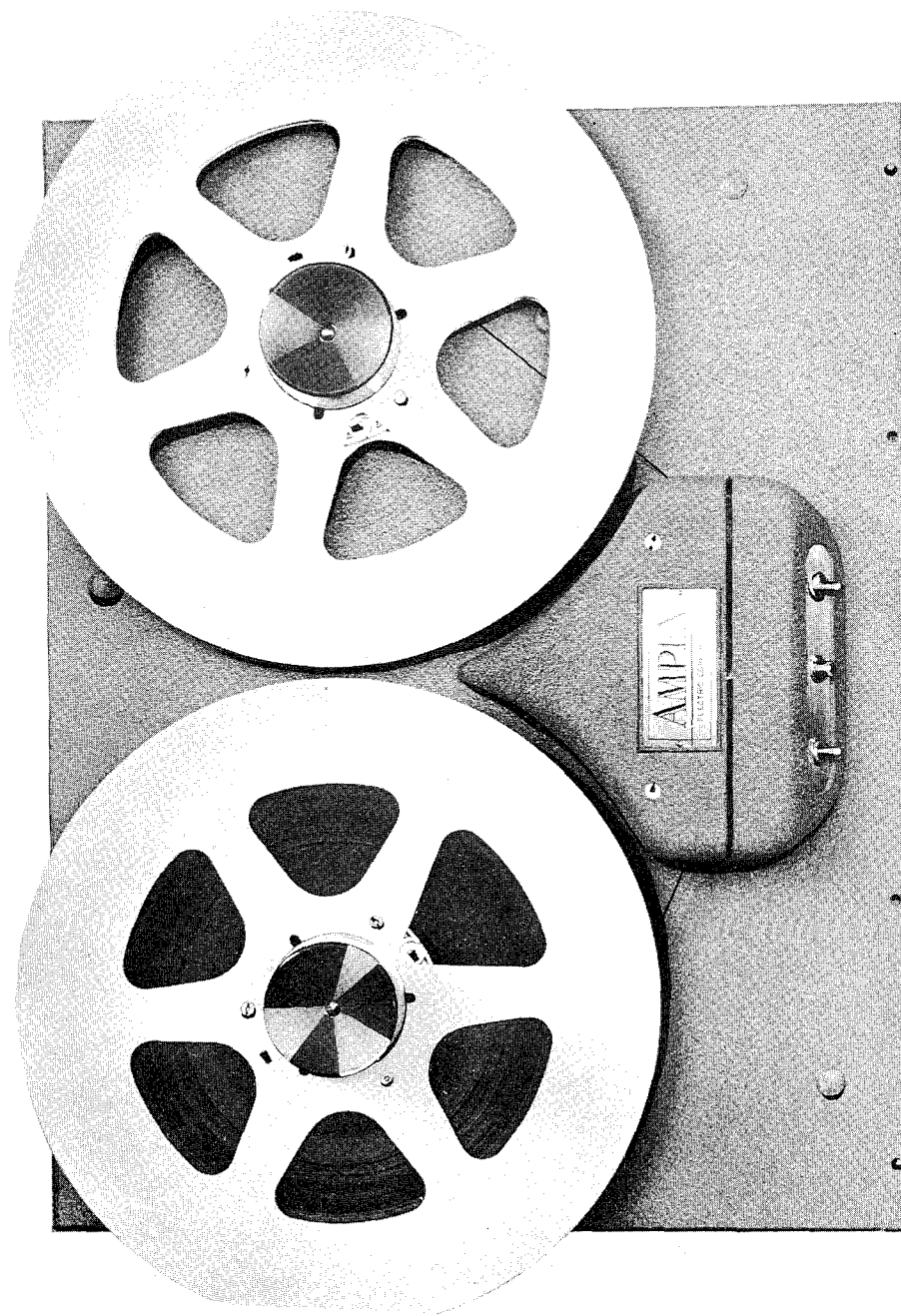
TABLE OF CONTENTS

	<u>Page</u>
I. DESCRIPTION AND SPECIFICATIONS	-
1. Description	1-1
2. Specifications	1-2
II. INSTALLATION	-
1. General	2-1
2. Power Connections	2-1
3. Output Connections	2-2
4. Required Tape Characteristics	2-2
5. Accessory Control Panel	2-2
6. Performance Checks	2-3
7. Mounting Conversion	2-4
III. OPERATION	-
1. Reel Size and Reel Knobs	3-1
2. Tape Threading	3-1
3. Power	3-2
4. Tape Motion	3-2
5. Automatic Reversal	3-2
6. External Control	3-3
IV. THEORY OF OPERATION	-
1. Tape Transport Assembly	4-1
2. Playback Amplifier Assembly	4-3
3. Automatic Control Unit	4-3
V. ROUTINE MAINTENANCE	-
1. Cleaning	5-1
2. Lubrication	5-2
3. Head Demagnetization	5-2
VI. CORRECTIVE MAINTENANCE	-
1. Mechanical Adjustments	6-1
2. Alignment of Playback Amplifier	6-3
3. Automatic Control Unit	6-5
VII. REPLACEMENT OF PARTS	-
1. Disassembly of Turntable Components	7-1
2. Removal of Drive Motor	7-1
3. Removal of Capstan and Head Assembly	7-2
VIII. PARTS LIST	

LIST OF ILLUSTRATIONS

Frontispiece

1. Tape Movement and Head Location
2. Playback Amplifier Response Curves
3. Reel Holddown Knob
4. Tape Transport, Front View
5. Tape Transport, Rear View
6. Tape-Transport Details, Rear View
7. Take-Up System
8. Turntable System, Exploded View
9. Control Circuit, Schematic Diagram
10. Tape Transport, Schematic Diagram
11. Playback Amplifier Assembly, Schematic Diagram
12. Automatic Control Unit, Schematic Diagram
13. Playback Amplifier Assembly
14. Automatic Control Unit



AMPEX MODEL 450B
CONTINUOUS TAPE REPRODUCER

SECTION I

DESCRIPTION AND SPECIFICATIONS

1. DESCRIPTION

The AMPEX Model 450B is a single-speed magnetic-tape reproducer which plays back prerecorded 1/4-inch dual-track recording tape. The tape is played back in both directions so that it is unnecessary to switch the reels in order to play back the second track on the tape. The equipment is available in two versions -- automatic tape reversal and manually-controlled tape reversal. The tape transport operates either at 3-3/4 or 7-1/2 inches per second, although the tape speed may be changed from one speed to the other by changing pulleys and belts and equalizing the amplifier.

The automatic reversal version includes three units -- a tape transport (Catalog No. 7631), a playback amplifier assembly (Catalog No. 5593 R1), and an automatic control unit (Catalog No. 7630). The automatic control unit is used with the tape transport to provide automatic reversal of tape direction when a 25-cps signal recorded at the ends of the program tape triggers the control unit. The tape direction may also be reversed at any time by actuating a direction control pushbutton on the tape transport.

The manually controlled version includes only the tape transport and the playback amplifier. Tape direction is controlled only by the pushbutton.

The Model 450B is available in three mounting styles:

1. For rack mounting.
2. In a table-top cabinet (Catalog No. 4317) (including a cover), approximately 16 inches high by 30-1/2 inches wide by 23-1/2 inches deep.
3. In a portable case (Catalog No. 3318-4), 15-1/2 inches high by 27 inches deep by 27 inches wide.

The playback amplifier and automatic control unit (if supplied) are factory assembled to the rear of the tape transport. If the equipment is to be rack mounted, it is recommended that the amplifier and control unit be removed from the tape transport and mounted directly to the rack, below the tape transport. The increased accessibility will facilitate the servicing of the equipment.

The various versions of the reproducer are cataloged as follows:

<u>Tape Speed--Supply Voltage Frequency -- Mounting</u>	<u>Automatic Reversal</u>	<u>Manually Controlled Reversal</u>
3-3/4 ips -- 60 cps -- for rack mount	7715-2	7715-1
3-3/4 ips -- 60 cps -- in cabinet	7715-10	7715-9
3-3/4 ips -- 60 cps -- portable	7715-18	7715-17
3-3/4 ips -- 50 cps -- for rack mount	7715-4	7715-3
3-3/4 ips -- 50 cps -- in cabinet	7715-12	7715-11
3-3/4 ips -- 50 cps -- portable	7715-20	7715-19
7-1/2 ips -- 60 cps -- for rack mount	7715-6	7715-5
7-1/2 ips -- 60 cps -- in cabinet	7715-14	7715-13
7-1/2 ips -- 60 cps -- portable	7715-22	7715-21
7-1/2 ips -- 50 cps -- for rack mount	7715-8	7715-7
7-1/2 ips -- 50 cps -- in cabinet	7715-16	7715-15
7-1/2 ips -- 50 cps -- portable	7715-24	7715-23

Accessory equipment available includes a console base (Catalog No. 5945) which increases the height to 40 inches and in which storage space is provided for reels of tape, and a control panel (Catalog No. 4331), for use with the playback amplifier. The control panel controls amplifier gain and meters amplifier output by a 4-inch VU meter calibrated for +4 vu (1.23 volts). The panel is attached directly to the front panel of the playback amplifier; it can be used, therefore, only when the amplifier is independently rack mounted.

2. SPECIFICATIONS

Tape Speed

Single speed -- either 3-3/4 or 7-1/2 ips.
(Tape speed may be changed in the field by changing pulleys and belts, and equalizing the playback amplifier)

Frequency Response

3-3/4 ips +2 db, 50 to 7,500 cps
7-1/2 ips +2 db, 50 to 10,000 cps
7-1/2 ips +4 db, 50 to 15,000 cps

Signal-to-Noise Ratio

For 3-3/4 or 7-1/2 ips machine, better than 50 db referred to a signal recorded at a level at which total harmonic distortion does not exceed 3% rms. (Level is determined by use of Minnesota Mining & Manufacturing Company type 111 construction 5RBA or later magnetic tape or equivalent, being recorded on a machine which introduces no additional distortion on the tape.)

Output Level

+4 vu (1.23 volts) output into 600 ohms, unbalanced or balanced from tapes recorded at AMPEX recommended operating level (point of approximately 1% rms total harmonic distortion when using tape described above). The 600-ohm output will drive a high-impedance amplifier directly.

Flutter and Wow

7-1/2 ips under 0.25% peak
3-3/4 ips under 0.4% peak
Measuring value of all components between 0 and 300 cps on an rms meter calibrated to read peak values of constant-amplitude sine-wave flutter.

Playing Time

At 3-3/4 ips:

14-inch reels 4 hours 16 minutes in each direction, providing 8 hours, 32 minutes when using automatic reversal.

10-1/2-inch reels 2 hours, 8 minutes each direction.

At 7-1/2 ips:

10-1/2-inch reels 1 hour, 4 minutes each direction.

Controls

ON--OFF and START--STOP toggle switches; DIRECTION pushbutton; located on tape transport.

Power Requirements

115 volts \pm 10%, ac, 1 ampere
Equipment available for either 50 or 60 cps operation.

Dimensions and Weight
(rack mounting)

With playback amplifier mounted on rear of tape transport, complete equipment requires 24-1/2 inches of space in commercial 19-inch rack, with a depth of 10 inches.

Playback amplifier may be rack mounted and requires 5-1/4 inches of rack space.

Automatic control unit requires 1-3/4 inches of rack space.

Total weight is 50 pounds.

SECTION II

INSTALLATION

NOTE

See Fig. 1 for an explanation of directions of tape movement, and head locations.

1. GENERAL

Equipment which is mounted within the table-top cabinet is shipped ready for operation. Removal of the panel on the rear of the cabinet permits access to the a-c power and output receptacles.

Equipment intended for rack mounting should be mounted on a commercial 19-inch relay rack. The playback amplifier and automatic control unit (if supplied) are mounted on the underside of the tape transport. If rack space is available, it is recommended that these units be removed from the tape transport and mounted on the relay rack below the tape transport, in order to increase accessibility. Both the amplifier and control unit are mounted to brackets on the tape transport (See Fig. 5). The only precautions necessary are in the placement of the head cables. They should be disconnected from the amplifier and then clamped to the tape transport. Then connect the head cable with the red band to receptacle J101P in the amplifier, and the other head cable to J102P.

CAUTION

Do NOT increase the length of the head cables under any circumstances. The capacitance will be increased and will cause undesirable resonance with the heads, resulting in poor performance.

Before making any connections or operating the machine, make certain that the forward and reverse belts have been twisted 180° so that a different belt surface engages the pulley surfaces (See Fig. 5).

2. POWER CONNECTIONS

Connect the power cable (Catalog No. 2413) between a-c power receptacle J105P on the playback amplifier and a source of 115-volt a-c power.

CAUTION

This equipment is available either for 50 or 60 cps operation. The required power-line frequency is indicated on the nameplate located either on the rear of the cabinet

or on the tape transport.

On transports designed for manually-controlled tape reversal, insert a dummy plug (Catalog No. 7684) in connector J203S on the amplifier chassis (automatic control unit receptacle) in order to supply power to the capstan solenoid and reversing relay.

3. OUTPUT CONNECTIONS

a. Studio Line -- A +4-vu, 600-ohm output, balanced or unbalanced, is available across pins 2 and 3 of output connector J103P. Pin 1 is chassis ground. If an unbalanced output is desired, connect either side of the line (pin 2 or 3) to chassis ground (pin 1). The output must be terminated at all times; therefore, if the equipment is not feeding a terminated line, connect an external 600-ohm load across the output.

b. High Impedance Input -- Connect pin 3 of output connector J103P to the high side of the amplifier input. Strap pins 1 and 2 of J103P and connect them to the ground side of the amplifier input. Connect an external 600-ohm termination from pin 3 to pin 2.

4. REQUIRED TAPE CHARACTERISTICS

The playback amplifier response for the 7-1/2-ips machine is adjusted to the standard 50-microsecond curve (See Fig. 2). The 3-3/4-ips machines are equalized to a 200-microsecond curve. The tapes used on this machine should be recorded so that a flat overall response will be produced when the playback response is adjusted to the standard curves. All AMPEX audio recorders will produce the desired characteristics. The tapes should be recorded at the AMPEX recommended operating level, which may be ascertained by playing an AMPEX Standard Alignment Tape (3-3/4 ips -- Catalog No. 6000, 7-1/2 ips -- Catalog No. 5563).

5. ACCESSORY CONTROL PANEL

The control panel (Catalog No. 4331) may be attached to the amplifier only if the amplifier is rack mounted. The procedure is as follows:

- (1) Remove the blank panel from the playback amplifier.
- (2) Attach the two meter input leads of the control panel to terminals 1 and 6 on output transformer T101 located on the amplifier.
- (3) Connect the meter lamp leads to the two terminals of the tie point shown in Fig. 13.

- (4) Remove PLAYBACK GAIN control R106 from the amplifier assembly and mount it on the control panel.

NOTE

Read Section III "Operation" before making the checks described below.

6. PERFORMANCE CHECKS

The following performance checks should be performed at the time of installation, and thereafter whenever necessary.

a. Frequency Response -- (1) Place a standard alignment tape (3-3/4 ips -- Catalog No. 6000, 7-1/2 ips -- Catalog No. 5563) on the lower turntable.

(2) Connect a 600-ohm termination, a vacuum-tube voltmeter, and a pair of headphones to the output of the machine.

(3) Check the frequency response in the forward direction (voice announcements should be understandable).

(4) Rewind the tape, turn it over, and place it on the upper turntable.

(5) Check the response in the reverse direction.

(6) The response should be within the specifications for the machine (See paragraph 2, Section I). If the response is not within the specification limits, perform the adjustments described in paragraph 2, Section VI.

NOTE

The standard tape may produce erroneous results if it is played backward so that the voice announcements cannot be understood.

b. Noise Measurements -- Wide band noise is measured with a vacuum-tube voltmeter such as the Hewlett Packard Model 400C while playing back an erased tape. Tank erase a tape and play it on the machine. The noise should be -40 dbm (0.0077 volts) or less. If the noise is not within specification, follow the procedure for level adjustment (See paragraph 2a, Section VI) and repeat the check. If it is still not within specification limits, noisy tubes or bad components can be suspected, or the heads may be magnetized.

c. Distortion -- This parameter can be measured by connecting any standard distortion measuring apparatus across the output of the machine. Readings from a wave analyzer or selective frequency distortion meter will be more accurate than those from a null type instrument at lower distortion levels. The distortion readings depend upon tape characteristics and tape recording level. The last tone heard on the standard tape (250 cps at operating level) should cause a harmonic distortion of approximately 1 per cent. If the distortion is much greater than this value, a check of tubes, resistance and voltages is indicated in the playback amplifier.

d. Flutter and Wow -- Flutter and wow are period changes in speed over a short time interval. Variations in amplitude which are indicated on level instruments do not constitute flutter and are caused entirely by variations in tape coating.

(1) Record a 3,000-cps signal at the desired speed on an AMPEX tape recorder. If the required speed is not available, record a 6,000-cps signal at twice the desired playback speed.

(2) Connect a flutter bridge (such as A. K. Tatum, Beverly Hills, California Model 2A Flutter Meter) to the output of the machine and play back this tape.

(3) The readings should be under the values indicated in the Specifications (See Paragraph 2, Section I). If not, clean and lubricate as described in paragraphs 1 and 2 of Section V. Note if the belts are excessively dirty; if so replace. Make sure that belts have been twisted 180°.

7. MOUNTING CONVERSION

The tape tension settings in horizontally mounted machines (table top cabinet or portable) differ from those in machines intended for rack mounting. If it is desired to convert from one mounting orientation to another, the tape tension adjustments must be reset. For detailed procedures, see paragraph 1b, Section VI.

NOTE

In rack mounting, the machine MUST be oriented so that the head assembly is to the right when viewing the machine from the front.

SECTION III

OPERATION

1. REEL SIZE AND REEL KNOBS

The 3-3/4-ips machines, as shipped from the factory, will accommodate NARTB 10-1/2 or 14 inch reels; the 7-1/2-ips machines, as shipped from the factory, will accept only 10-1/2-inch reels. Either machine can be readily re-adjusted in the field to accommodate RMA reels with hub diameters 2-1/4 inches or larger (See paragraph 3, Section IV).

Cabinet-mounted and portable machines are equipped with editing knobs (Catalog No. 1917) to hold the tape reels in place on the tape transport. Rack-mounted equipments require hold-down knobs on the turntable shafts to prevent the reels from slipping off the shafts. A reel hold-down knob (Catalog No. 9093) is supplied with tape transports intended for rack mounting.

The action of the reel hold-down knob is simple and positive. The knob is slipped on the turntable shaft with the concave side facing outward (See Fig. 3), and is pressed down firmly to engage the reel locating disc in the center of the reel. The turntable shaft is engaged by a spring-loaded collet within the knob. The knob is self centering; the knob base is mechanically coupled to the reel locating disc through a loading spring.

The hold-down knob must be taken off the shaft to allow removal of the reels. Pressing the release lever forward releases the collet, and the knob can then be removed from the shaft. The reel should be held in position as the knob is being removed so that it will not slip off the shaft.

2. TAPE THREADING

(1) Place a full reel of tape on either turntable so that the oxide coated side will face the rear of the head housing (shiny tape side facing the operator).

(2) Hold the tape taut with both hands and place the tape in the slot in the head housing cover.

(3) Attach the free end of the tape to the empty reel. Anchor the tape around the hub by making a small loop at the free end of the tape and placing the loop around the tape anchor on the reel.

(4) When properly threaded the equipment will appear as shown in the Frontispiece.

(5) If it should be necessary to unthread the tape in the middle of a reel, pull the tape toward the front of the head housing, and holding the tape taut with both hands, remove it from the cover. If the tape is not held tightly, it may catch on the inside of the housing and tear or break.

CAUTION

Do not use paper-base tape on this equipment.

3. POWER

Power is supplied to both the transport and amplifier and control unit (if supplied) by actuating the ON--OFF switch on the tape transport. The tape transport is protected by fuse F-101 located on the amplifier chassis; the amplifier and control unit are protected by fuse F-102 located on the amplifier chassis. Allow the amplifier to warm up for at least 30 seconds before attempting to start the tape transport.

4. TAPE MOTION

The tape is set in motion by actuating the START--STOP switch on the tape transport. The direction of tape motion is determined by the direction in which the tape was moving when power to the machine was last shut off. When the tape is travelling from the lower to the upper reel, (left to right facing front of machine), it is referred to as traveling in the "forward direction". When conditions are reversed, the tape is travelling in the "reverse direction". If the tape is not moving in the desired direction, actuate the DIRECTION pushbutton on the tape transport.

When the tape is travelling in the forward direction, the upper tape track will be reproduced at playback-amplifier output connector J103P. The output level will be +4 v_u into a 600-ohm load if the tapes have been recorded at the recommended operating level. The lower track of tape will be reproduced at J103P when the tape is traveling in the reverse direction.

5. AUTOMATIC REVERSAL

On automatic reversal machines (equipped with the automatic control unit), the direction of tape travel will be reversed whenever a 25-cps tone is reproduced from the tape. The control unit is adjusted to change tape direction whenever a tone from 24 to 26 cps, with a duration of from 2 to 4 seconds, and at the recommended level is reproduced. If the program material should contain 25-cps components approaching operating level, the machine will, of course, reverse. Therefore, tapes to be reproduced on this equipment should be recorded with a high-pass filter which will attenuate 25-cps components by at least 20 db.

The tape direction will also be changed every time the DIRECTION push-button is pressed.

6. EXTERNAL CONTROL

A receptacle (J203S) is provided on the automatic control unit for time clock control of the operation of the reproducer. Any timer which does not draw more than 100 milliamperes dc may be used. The automatic control unit is shipped with a dummy plug (Catalog No. 7633) inserted in the receptacle; the dummy plug should be left in place unless the external timer is used. If an external timer is used, remove the jumpers from the dummy plug and wire the timer to the plug.

SECTION IV

THEORY OF OPERATION

1. TAPE TRANSPORT ASSEMBLY

The tape transport is essentially a tape drive system, a reproducing head for each direction of tape travel, and a friction take-up system for each direction of tape travel. Figures 4, 5, and 6 show front and rear views of the tape transport. References in the following paragraphs refer to reference numbers shown next to each part designation.

a. Tape Drive System -- The tape drive system consists of a capstan drive motor assembly (5), and capstan and head assembly (2). The capstan drive motor is a single-speed synchronous motor which is connected to the capstan flywheel (3) by a drive belt (16). The motor is pivot mounted so that it is free to move in order to compensate for any changes in belt length. The motor is counterbalanced by a weight (11) and is spring loaded to maintain correct belt tension. The capstan flywheel is attached to the capstan shaft which is mounted in precision sleeve bearings in the capstan and head assembly. The tape is driven at a constant speed by the capstan (B) when the tape is pressed against the capstan shaft by a capstan idler (C). The capstan idler pressure is determined by a spring (32) in the eyebolt (35) which connects the idler to the capstan solenoid. The spring pressure is adjusted by a locknut (A) on the end of the eyebolt.

b. Playback Heads -- The capstan shaft is located between the two playback heads. The left head (viewed from the front of the head assembly) covers the upper track on the tape and is connected by a relay to the playback amplifier when the tape is pulled in the forward direction (left to right or upward). When the tape is pulled in the reverse direction (right to left or downward), the right-hand or reverse head covers the lower track on the tape, and the relay switches it into the amplifier. Two rollers (D) in the capstan and head assembly guide the tape across the heads.

c. Take-Up System -- Separate friction take-up systems are used for each direction of tape travel. In the forward direction, the following parts provide the necessary take-up:

- Forward clutch pulley (21)
- Forward ratchet (26)
- Forward pawl (27)
- Forward turntable belt (30), (nearest topplate)
- Forward tension idler (40)
- Forward fixed pulley (24)

The reverse turntable belt and associated parts perform no useful function in the forward direction. Referring to Fig. 8, the clutch pulleys (21) are journaled to the turntable shaft (17) with ball bearings, and the pulley is free to rotate on the shaft.

Referring to Fig. 7, the pawl attached to the clutch pulley will lock this pulley to the shaft in one direction of rotation, thus producing unidirectional torque. Thus, assuming that the pulley is rotating in a counterclockwise direction, the spring clip on the pawl will cause the pawl to engage the teeth of the ratchet, locking the clutch pulley to the ratchet and turntable shaft. When the turntable rotates in the opposite (clockwise) direction, the pawl will be forced out of engagement with the ratchet, and the clutch pulley will rotate independently.

Operation of the take-up system in the forward direction is as follows:

The capstan pulls the tape from the lower turntable, turning the turntable shaft and ratchet in a counterclockwise direction.

The pawl engages the ratchet, driving the forward clutch pulley.

The forward clutch pulley, in turn, drives the forward fixed pulley, and thus, the upper turntable through the forward turntable belt.

The drive ratio between the large clutch pulley and the small fixed pulley is substantially greater than that required to turn the turntable at the necessary speed. Therefore, the clutch pulley will slip because the surface of the fixed pulley provides a high coefficient of friction.

Because of this continued slippage, the speed of rotation of the upper reel of tape automatically compensates for the change in effective diameters of the tape on the reels, and maintains tension to prevent any slack in the tape.

The reverse turntable belt will have no effect on tape tension because the reverse pawl will not engage the reverse ratchet when the upper reel is rotating in a clockwise direction. The reverse pulley shaft will rotate independently of the upper turntable shaft. When tape direction is reversed, the functions of the forward and reverse belts are changed so that the reverse turntable belt produces the torque and the forward belt idles.

The tension idlers (40) hold the belts under constant tension. The idlers are journaled to the idler arms which, in turn, are free to pivot on the supporting stud (39). The tension idler springs hold the idlers against their respective belts. In normal operation of the equipment, the idlers are de-energizing or self relieving in order to maintain a constant torque independent of the change in slipping friction between the belt and clutch pulley. Thus, if the coefficient of friction between the belt and pulley should rise, the pulley is free to move against the spring tension to compensate for the increase in friction. The tension springs, therefore, determine both the take-up torque and the tape tension to be maintained. Nine holes (E) are provided in the tension arms for adjusting the spring tension to maintain proper tape tension.

d. Control Circuit -- The control circuit for the tape transport is shown in Fig. 9. When ON--OFF switch S301 is actuated, a-c power is supplied to selenium rectifier SR301 which provides d-c to operate relay K201 and capstan solenoid K301. The circuit between pins J203S-12 and J203S-11 is closed either through the automatic control unit circuitry or by the insertion of a dummy plug in the automatic control unit receptacle J302S on the tape transport. Therefore closing START--STOP switch S302 will energize capstan solenoid K301. Motor switch S304 will be mechanically closed by the capstan solenoid, and power will be applied to the capstan drive motor. The direction in which the tape will move is determined by the position of the impulse (ratchet) relay K302. This relay has two states -- forward and reverse. The relay can be actuated only by pressing the DIRECTION pushbutton S303 or by a signal from the automatic control unit. Upon starting the machine, even after it has been shut down, the relay will remain in the position in which it was prior to shutdown, and the machine will operate in the same direction as before.

When the DIRECTION pushbutton has been actuated, relay K302 switches to its other state, and reverses the application of power to the drive motor which reverses its direction of rotation. Relay K302 also transfers B+ power from dummy load R305 to the head switching relay K101 in the playback amplifier when the machine switches from the reverse to forward mode. When the automatic control unit is plugged into J302S in place of the dummy plug, motor reversing is controlled either by a 25-cps tone on the tape or by the DIRECTION pushbutton.

2. PLAYBACK AMPLIFIER ASSEMBLY

The playback amplifier consists of an audio amplifier, a self-contained power supply, and head switching facilities.

Figure 11 is a schematic diagram of the unit. The playback amplifier is a three-stage amplifier which provides +4 vu, 600-ohm output at output connector J103P. The required equalization is provided in the plate circuit of V101 by C104 and EQUALIZATION CONTROL R107. This control is adjusted so that the amplifier response conforms with the standard curve shown in Fig. 2. Playback gain is adjusted by PLAYBACK GAIN control R106 in the grid circuit of V102. The power supply provides 6.3-volt a-c heater power for V103, 12.6-volt d-c heater power for V101 and V102 through full-wave selenium rectifier SR101, and the plate supply through full-wave rectifier V105 (5Y3G).

Head switching relay K101, actuated by B+ power through the contacts of motor reversing relay K302, transfers the input of the playback amplifier between the two head connectors.

3. AUTOMATIC CONTROL UNIT (IF SUPPLIED)

The automatic control unit reverses the direction of tape travel when a 25-cps tone of the proper duration and level is reproduced from the tape. The unit consists of a selective frequency amplifier and a relay to control motor reversing relay K302 (See Fig. 12). External control of the automatic control unit is facilitated by wiring internal connections to receptacle J203S, a time clock receptacle, which permits an

external timer to control the entire machine. If the timer is not used, a dummy plug is inserted in J203S.

The 25-cps reversing signal recorded on the tape enters the control unit at pin 7 of J201P which is connected to the amplifier. It is impressed on the grid of voltage amplifier V201. LEVEL CONTROL R201 is used to adjust the level of the tone so that it is 0.77 volts measured at playback output receptacle J103P on the amplifier. Signals of this level will cause automatic reversal to occur. Voltage amplifier V201 incorporates a parallel T feedback network which will feed back all frequencies except 25 cps. Therefore, V201 will amplify only 25-cps signals. The amplified 25-cps signal is fed to the grid of V202 which is normally biased to cutoff by -12 volts on the grid. The 25-cps signal forces V202 into conduction, and a positive d-c voltage is produced at the cathode. This voltage is impressed on the grid of thyatron V203. The plate of V203 is fed from a high-voltage a-c source through dropping resistor R214 and the winding of relay K201. When the grid voltage is zero, the thyatron will not conduct because the screen is biased negative and the cathode is returned to a 3.2-volt a-c source (measured with respect to ground) which is in phase with the a-c voltage on the plate. When the grid is driven positive, the thyatron will conduct on the positive alternating cycles only, and relay K201 will be energized.

When K201 is energized, motor-reversing relay K302 which is an impulse or latching type relay is also energized. Whenever K302 is energized by a momentary pulse, it changes from the position in which it was prior to receipt of the pulse to its alternate condition. The next momentary pulse will cause the relay to revert to its initial condition. Therefore, regardless of the direction in which the tape is traveling, the machine will reverse tape direction whenever the 25-cps tone is reproduced.

In certain types of operations, it is necessary for the automatic control unit to be desensitized for several seconds after it has been energized. This is accomplished by shorting the screen of V201 to ground through contact set A of relay K201, disabling V201 for several seconds after K201 energizes and until capacitor C207 can recharge.

SECTION V

ROUTINE MAINTENANCE

The equipment will operate over long periods of time with a minimum of attention. Trouble-free operation will be ensured if the following routine maintenance operations are performed.

1. CLEANING

The tape transport must be kept dry at all times. If at all possible, avoid operating the equipment in dusty or greasy atmospheres.

The heads on the equipment will not require cleaning under normal operation. However, if foreign material such as adhesive from splicing tape should adhere to the heads, they may be cleaned with a soft, lintless cloth moistened with undenatured ethyl alcohol.

CAUTIONS

1. Do NOT use carbon tetrachloride or trichloroethylene to clean the heads. These solvents may remove the laminating adhesive from the heads.
2. Do NOT bend the head shields to obtain access to the heads. Bending the mu-metal will destroy the annealing and may increase the noise level as much as 10 db.

The tire on the capstan idler wheel will gradually pick up the lubricant with which most tape manufacturers impregnate the tapes; this condition is unavoidable. The lubricant is important for reducing flutter, head wear, and tape squeak. It also permits more uniform contact with the heads, and reduces high frequency amplitude variation. Clean the idler wheel tire monthly by wiping with a lintless cloth moistened with ethyl alcohol. Insofar as is possible, do not touch the tire with the fingers. If the tire is not cleaned periodically, there will be a loss of positive drive at the capstan -- particularly toward the end of a reel, when holdback tension is highest.

The contacts of head switching relay K301 on the amplifier chassis and motor-reversing relay K201 on the automatic control unit must be kept clean at all times. With no power on at the machine, place a piece of high-quality unsized bond paper between the normally closed contacts of the relays and burnish the contacts. Then, operate the relay armature by hand, and burnish the normal open contacts.

2. LUBRICATION

The tape transport should operate properly for approximately two years -- before requiring lubrication. At that time, the capstan bearings may require lubrication with SAE 20 motor oil. All other points in the equipment are permanently lubricated. To lubricate the capstan, remove the head housing cover and then loosen the oil cap. This will expose two oil holes which contain felt held in contact with the springs. Saturate the felts with oil.

CAUTION

Do NOT overlubricate. Three drops should be sufficient in each hole.

3. HEAD DEMAGNETIZATION

The playback heads in this machine will not become magnetized under normal operating conditions. Occasionally, however, some phenomena may tend to send an unbalanced pulse through the heads and magnetize them. A magnetized head may be recognized by an increase in noise level and partial erasure of the high frequencies on the tape being played back. If the following precautions are observed, no difficulty should be experienced:

1. Do not test the continuity of the heads with an ohmmeter.
2. Do not play a tape on the machine that contains signals which will saturate the tape (20 db above operating level).

If the heads should become magnetized, they may be demagnetized as follows:

WARNING

Removal of the head housing cover with power on will expose dangerous high voltages.

- (1) Remove the two screws holding the head housing cover in order to obtain access to the heads.
- (2) Remove the mounting screws holding the shields in front of each head.
- (3) Bring the tips of an AMPLEX head demagnetizer (Catalog No. 704) in contact with the pole pieces.
- (4) Slide the demagnetizer up and down several times along the core stack at the gap.
- (5) Slowly withdraw the demagnetizer so that the influence of its field will die gradually.

- (6) In reassembly, the front shields must be so positioned that minimum hum will occur. The outer mounting holes in each shield are slotted so that the shield may be pivoted on the center screw. Replace the screws loosely.
- (7) Connect an output meter or oscilloscope to the amplifier output.
- (8) Start the machine (without tape) and with the DIRECTION switch in the appropriate position for each head, adjust each shield position for minimum hum, before tightening the mounting screws.
- (9) Replace the head housing cover.

SECTION VI

CORRECTIVE MAINTENANCE

1. MECHANICAL ADJUSTMENTS

The mechanical adjustments described below have been made at the factory before shipment. Additional adjustments are unnecessary unless indicated by poor or degraded performance of the equipment. **THE ADJUSTMENTS MUST BE PERFORMED BY QUALIFIED PERSONNEL ONLY.**

a. Capstan Idler Pressure -- The capstan idler is forced against the capstan by the action of capstan solenoid K301. Idler pressure is supplied by the capstan idler pressure spring and is adjusted by a locknut on the capstan solenoid eyebolt (See A, Fig. 5). Tightening this nut increases the spring pressure until a point is reached where the pressure will decrease and the capstan solenoid will not bottom. Insufficient idler pressure may be detected by the presence of tape slippage.

The recommended procedure is as follows:

- (1) Operate the CN--OFF and START--STOP switches and check that the capstan idler just touches the capstan when the solenoid is bottomed the point at which one finger held lightly on the capstan idler hub will keep it from turning.
- (2) If not, turn power off at the machine and turn the locknut slightly.
- (3) Repeat steps (1) and (2) until the capstan idler just touches the capstan when the solenoid is bottomed.
- (4) Then turn the locknut an additional 2-1/4 turns to increase spring pressure.
- (5) Repeat step (1) and check that the solenoid will bottom after the adjustment. When adjusted as above the tape pull will be between 40 and 50 ounces.

b. Tape Tension Adjustment -- Tape tension is adjusted by changing the pressure applied to the forward and and reverse turntable belts by the **tension** idlers. The pressure, in turn, regulates the belt slippage at the clutch pulley and thus determines the take-up torque. The adjustment is made by changing the position of the tension idler spring to any of the nine holes in the tension idler arm (Point E, Fig. 5).

NOTE

If the equipment is rack mounted, the weight of the reverse tension idler tends to decrease the pressure on the reverse turntable belt. The effects of these weights are compensated by increasing tension on the reverse tension idler spring, and decreasing tension on the forward tension idler spring. If the equipment is mounted horizontally, the pressure on both belts is independent of the weight of the idlers. Therefore, if the original mounting position of the equipment is changed, the spring tensions must be readjusted appropriately.

Separate adjustments of spring tensions must be made for each direction of tape travel. The take-up system which is not being adjusted must be disabled because the method of measurement causes both pawls to engage, and false readings will be produced unless the opposite system is disabled. The following procedure is applicable whenever tape tension must be readjusted -- after converting from one mounting position to another, adapting the machine for 7-inch RMA reels, or correcting tape tension after replacement of parts.

- (1) Attach one end of a 30-inch long piece of string to the hub of either an NARTB or RMA reel and the other end to a spring scale (0 to 16 ounces preferred).

NOTE

Most scales, when operated in the horizontal plane, will show a zero setting different from normal scale zero. Correct the scale readings in the following steps accordingly.

- (2) For measuring tension in the forward direction of tape travel, remove the reverse turntable belt (farthest from the topplate) and place the reel on the lower turntable.
- (3) Hold the upper reel stationary, wind the string around the hub, and then pull the scale in the direction in which the tape would be pulled.
- (4) Holding the upper reel stationary, read the scale only when the turntable is in steady motion; the force required to overcome static friction will produce an excessively high initial reading. The corrected scale reading should be 7 ± 1 ounces.

- (5) If not, tension may be adjusted by hooking the lower tension idler spring in a different hole in the idler arm. Moving the spring closer to the pivot point will increase tension, and vice versa. Repeat the above steps until the tension is at the proper value.
- (6) Repeat the above steps for the reverse direction of tape travel. Remove the forward turntable belt and restore the reverse turntable belt. Attach the string and scale to the upper turntable and hold the lower turntable stationary during the test. If necessary, adjust the reverse idler spring for a tension of 7 \pm 1 ounces.

c. Pawl Leaf Setting -- The leaves of the pawls must grip the ratchet snugly for proper operation of the take-up system. If the leaves should become bent accidentally, replace them with new parts. If new parts are not available, carefully bend the leaves back into shape so that the tips are 0.001 to 0.005 inches apart. This adjustment is very important; if the tips are touching one another, there is no way of determining the drag they produce on the ratchet, and take-up tension may be lessened.

d. Motor Counterbalance Adjustment -- The counterbalance weight (Item 11, Fig. 5) should be positioned on the shaft so that the motor will be balanced with the motor spring (12) removed.

2. ALIGNMENT OF PLAYBACK AMPLIFIER

Alignment includes all adjustments necessary for proper performance of the playback amplifier. Equipment "out of alignment" may be characterized by poor frequency response, high noise level, or low output. It is NOT necessary to align the equipment when it is received from the factory because the procedures described in this paragraph have been performed prior to shipment. Further adjustments are unnecessary unless necessitated by degraded performance of the equipment. **QUALIFIED PERSONNEL ONLY SHOULD PERFORM THE PROCEDURES DESCRIBED BELOW.**

Alignment consists of the following steps:

1. Playback equalization.
2. Head azimuth adjustment.
3. Response check and level adjustment.

The following equipment is required for complete alignment:

1. Audio oscillator with a range from 20 to 20,000 cps (Hewlett-Packard 200 C or equivalent).
2. A-c vacuum tube voltmeter (Hewlett-Packard 400C or equivalent). A standard v-u meter preceded by a flat amplifier can be used in place of the VTVM.

3. Standard alignment tape for 3-3/4-ips (Catalog No. 6000). The tape includes the following tones:

A 7,500 cps tone recorded 10 db below operating level, for head azimuth check.

A series of tones recorded 10 db below operating level, for playback response check.

A 250-cps tone recorded at operating level (point of approximately 1% rms tape distortion), for adjusting gain.

4. Standard alignment tape for 7-1/2-ips (Catalog No. 5563). This tape is similar to the above except for playback speed. The frequency of the tone for head azimuth check is 10 kc.

a. Playback Equalization -- The playback amplifier is factory equalized in accordance with the standard voltage curve shown in Fig. 2. If equalization is necessary, remove the head cables and connect the audio oscillator and VTVM to the playback amplifier as shown in Fig. 2. Adjust PLAYBACK EQUALIZER R107 on the amplifier chassis so that the frequency response at both speeds agrees with that shown in Fig. 2.

b. Head alignment -- The high frequency response of the equipment depends upon correct head azimuth adjustment. A standard alignment tape is used for setting the head azimuths.

- (1) Remove the two screws from the top of the head housing cover and lift the cover upward.
- (2) The forward head (See Fig. 1) is used when tape is moving from the upper to the lower reel; the reverse head is used when tape is moving in the opposite tape direction. The heads are aligned by adjusting the lower elastic stop nut on each head with a 1/4-inch Spintite wrench.

CAUTION

Do not touch any of the other adjustment points on the top of the head cans. These points are jig set at the factory; if disturbed, it may be necessary to return the equipment to the factory for re-adjustment.

- (3) Place a standard alignment tape on the lower turntable.

- (4) Connect a 600-ohm termination, a VTVM, and a pair of headphones to the output of the machine, and start the tape in the forward direction.
- (5) Adjust the azimuth of the lower head for maximum output of the first tone to be heard on the tape as read on the VTVM.
- (6) Rewind the standard tape and place it on the upper turntable. Start the transport in the opposite direction and adjust the reverse head azimuth for maximum level of the first tone on the tape.

NOTE

Erroneous settings may result if the standard tape is played backward because the voice announcements cannot be understood.

c. Response Check and Level Adjustment -- The tones following the head alignment tone on the standard tape are used for checking the response of the equipment. The final tone on the standard tape is 250 cps at operating level (point of approximately 1% distortion) for adjusting the gain of the playback amplifier. Failure of the equipment to play back within the specifications (See paragraph 2, Section I) after equalization and head alignment have been checked indicates one or both of the following:

1. Trouble in head assembly (Faulty heads)
2. Faulty standard tape which has been partially erased at the high frequencies by passing over magnetized heads.

Adjust PLAYBACK GAIN control R106 so that the output is +4 dbm (1.23 volts rms) when the last tone on the standard tape is played back. Some difference in output between the two heads may be observed. In such instances, the proper gain setting is a compromise between that for each head.

3. AUTOMATIC CONTROL UNIT

The gain of the automatic control unit is factory adjusted to reverse the tape transport on 24 to 26 cps signals which produce an output level of 0.77 volts rms measured at the playback output receptacle J103P of the amplifier. This level is based upon the playback gain as set at the factory, and which will reproduce the recommended record level at 1.23 volts rms measured across J103P. The following procedure is recommended for setting the 25-cps gain:

- (1) Place the tape transport in the forward mode of operation.
- (2) Disconnect the head cable with the red band from the head assembly.

- (3) Connect the audio oscillator through the dropping resistors to playback amplifier input receptacle J101P as shown in Fig. 2.
- (4) Connect a voltmeter to playback amplifier output connector J103P.
- (5) Remove the dummy plug from time clock receptacle J203S on the control unit so that the tape transport will not be reversed in direction when thyatron V203 is fired.
- (6) Turn LEVEL CONTROL R201 (on the control unit) counterclockwise.
- (7) Adjust the oscillator frequency to 26 cps and the oscillator output level to produce a playback output 4 db below program level, or 0 db (0.77 volts).
- (8) Turn R201 clockwise until relay K201 just energizes.
- (9) Change the oscillator frequency to 24 cps; K201 should remain energized. If K201 drops out at 24 cps, turn R201 clockwise until the relay energizes.
- (10) Replace the dummy plug after making the adjustment.

SECTION VII

REPLACEMENT OF PARTS

The disassembly procedures described below are required only when parts require replacement. QUALIFIED PERSONNEL ONLY SHOULD ATTEMPT REPLACEMENT OF PARTS.

1. DISASSEMBLY OF TURNTABLE COMPONENTS (See Fig. 5)

- (1) Turn the tape transport upside down. Loosen the set screws holding the fixed pulley and ratchet assembly (23) to the shaft (17). Loosen the setscrew in the pulley retaining collar (28) on the upper turntable. Remove the cotter pin from the pawl (27).
- (2) Carefully remove the fixed pulley and clutch pulley (21) from the shaft, holding the two together as a unit.
- (3) Disengage the ratchet from the pawl. Be careful not to distort the leaves of the pawl.

NOTE

The fixed pulley and ratchet must be removed from the turntable as described above in order to replace a pawl.

- (4) The turntable and turntable shaft (17) will slide from housing (19) and the bearings (20) can be lifted from the housing.
- (5) Reassembly is the exact opposite of disassembly. Be certain that the spacer (29) is in place between the turntable bearing (20) and the clutch pulley (21) on the lower turntable. The upper turntable does not require a spacer. Be sure the turntable is seated in the housing when the set screws are tightened. When properly assembled, the turntable should be free from drag and should have no perceptible end play.

2. REMOVAL OF DRIVE MOTOR (See Fig. 5)

- (1) Remove pivot screw (F) and then remove the drive motor, pulley (14) and end plates (7 and 8) as a unit.
- (2) When installing the new motor, the end plates, spacers, and screws should be removed from the old motor and installed in the new motor.

- (3) Adjust the pivot screw (F) and lock it so that there is no drag on the motor.
- (4) When completely assembled, check that the drive belt (16) rides in the center of the capstan flywheel (3) and the motor pulley (14). Move the pulley on the motor shaft to center the belt.

An alternative method is the removal of the four lower end-bell screws and spacers to remove the motor. When these screws are removed, the end bell should be held in place to prevent it from falling off the motor.

3. REMOVAL OF CAPSTAN AND HEAD ASSEMBLY (See Fig. 4)

The capstan and head assembly should not be serviced in the field. If trouble is traced to this unit, the complete assembly should be returned to the factory.

- (1) Loosen the cable clamps and remove the head housing cover (4).
- (2) Remove the capstan flywheel (3).
- (3) Remove the cotter pin (38) and clevis pin (37) holding the capstan solenoid eyebolt (35) to the solenoid plunger. Unscrew the eyebolt nut and remove the eyebolt.
- (4) Remove the three mounting screws and lift the capstan and head assembly from the transport.

The assembly procedure is the reverse of removal. After assembling the capstan flywheel to the capstan shaft, approximately 0.005 inch end play should be present to prevent drag in the capstan. After the unit has been assembled to the transport, the capstan idler pressure should be adjusted as described in subparagraph 1a, Section VI and the head azimuth should be adjusted as described in subparagraph 2b, Section VI.

SECTION VIII

PARTS LIST

The purpose of this parts list is to aid the owners of the Ampex reproducer in the ordering of spare parts. If it is used by you to order parts, the Ampex Corporation can provide you with fast and efficient service. The parts list contains all normally replaceable parts in the equipment, identified by schematic or drawing reference symbol, part description, and Ampex stock number.

Some replacement parts shipped to you will not be exact duplicates of those used on original equipment, but will, however, be directly interchangeable with the original.

The description of each part is brief -- NOT enough for ordering the part unless the Ampex stock number is also included. The Ampex stock number is the exact designation of all parts used in Ampex equipment. For example, a 0.1 MF, 600-volt, tubular capacitor of certain physical dimensions will always bear the Ampex stock number CO-33. THIS IS THE NUMBER YOU SHOULD ALWAYS USE WHEN ORDERING REPLACEMENT PARTS. Do NOT use the schematic reference symbol; it varies with different equipments.

The following information should be included when ordering parts:

- Machine Type
- Machine Serial Number
- Ampex Stock Number
- Description of Part

Thus: 4 - CC-53 Capacitors for Model 450 #180

ALWAYS INCLUDE THE AMPEX STOCK NUMBER

2/15/55

Schematic Reference Number	Description	Amplex Catalog Number
<u>I. TAPE TRANSPORT CATALOG NO. 7631</u>		
1	Top Plate	4200
2	Capstan and Head Assembly	4314
3	Capstan Flywheel	4194
4	Head Housing Cover	4293
5	Capstan Drive Motor Assembly - 3-3/4" 60 Cycle	4209
	Capstan Drive Motor Assembly - 3-3/4" 50 Cycle	4209-1
	Capstan Drive Motor Assembly - 7-1/2" 60 Cycle	4209-2
	Capstan Drive Motor Assembly - 7-1/2" 50 Cycle	4209-3
6	Motor Bracket	4106
7	Upper Mounting Plate	4203
8	Lower Mounting Plate and Arm	4208
9	Upper Spacer	2680
10	Lower Spacer	2680-2
11	Counter Balance Weight	4205
12	Drive Motor Spring	322
13	Clevis Pin	CC-1/8-9C
14	Drive Motor Pulley-3-3/4" 60 Cycle	4284
	Drive Motor Pulley-3-3/4" 50 Cycle	4284-1
	Drive Motor Pulley-7-1/2" 60 Cycle	9723
	Drive Motor Pulley-7-1/2" 50 Cycle	9723-1
15	Drive Motor Rubber Spacer	GR-29
16	Drive Motor Belt for 3-3/4"	2871-1
	Drive Motor Belt for 7-1/2"	2871-2
17	Turntable	4159
18	Turntable Pad	958
19	Turntable Housing	4157
20	Turntable Bearings	BC-16
21	Clutch Pulley Assembly	4168
22	Bearings	BC-16
23	Fixed Pulley & Ratchet Assembly	4228
24	Fixed Pulley	4160
25	Tire	4296
26	Ratchet	4166
27	Pawl	4167
28	Pulley Retaining Collar	4161
29	Power Turntable Spacer	4268
30	Turntable Belt	4299
31	Capstan Idler Return Spring	4313
32	Capstan Idler Pressure Spring	676

NOTE: ORDER PARTS BY AMPEX CATALOG NUMBER!

Schematic Reference Number	Description	Ampex Catalog Number
B301	Synchronous a-c motor	MC-13-1
C301	2.5 MF, 330V AC Paper Capacitor	CC-408
C302	4 MF, 150V Tubular Capacitor	CC-53
C303	.5 MF, 400V Met. Paper Capacitor	CC-46
C304	.1 MF, 400V Met. Paper Capacitor	CO-44
C305	80 MF, 150V Tubular Capacitor	CC-105
C306, C307, C308, C309, C310	.02 MF, 400V Tubular Capacitor	CC-250
C311	.1 MF, 600V Tubular Capacitor	CC-33
C312	.03 MF, 400V Tubular Capacitor	CO-149
C313	.5 MF, 400V Tubular Capacitor	CC-330
J301P	Jones P-308 -- CCT Connector	PL-24P
J302S	Jones S-310-AB Connector	PL-207S
J303P	Dummy Plug-Jones P310 CCT	7634
K301	115 V DC Solenoid	670
K302	Impulse Relay 4 PDT, 115V AC	RL-64
R301	500 Ohm, 5W, WireWound Resistor	RE-623
R302	30,000 Ohm, 10W, Wire Wound Resistor	RE-97
R303	50 Ohm, 5 W, Wire Wound Resistor	RE-573
R304	22 Ohm, 1 W, Composition Resistor	RE-576
R305	10,000 Ohm, 5 W, Composition Resistor	RE-262
S301, S302	SPST Toggle Switch	SW-9
S303	Pushbutton Switch, SP Normally open	SW-34
S304	Microswitch, Normally Open	SW-3
SR301	Half-Wave Selenium Rectifier	SR-4
TS301	Terminal Strip, 4 Terminals	TS-2-4
	Terminal Strip, 8 Terminals	TS-2-8
	Terminal Strip, 9 Terminals	TS-2-9

Schematic Reference Number	Description	Ampex Catalog Number
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II. PLAYBACK AMPLIFIER, CATALOG NO. 5593 R1

C101	.1 MF, 200V Paper Capacitor	CO-97
C102	.25 MF, 25V Electrolytic Capacitor	CO-59
C103	4 MF, 150V Electrolytic Capacitor	CO-53
C104	.015 MF, 200V Mica Capacitor 5%	CO-230
C105	.01 MF, 400V Paper Capacitor	CO-42
C106	4 MF, 450 V Electrolytic Capacitor	CO-54
C107	25 MF, 25V Electrolytic Capacitor	CO-59
C108	.02 MF, 600V Paper Capacitor 5%	CO-96
C109	.1 MF, 400V Paper Capacitor	CO-44
C110	25 MF, 25V Electrolytic Capacitor	CC-59
C111	2000 MF, 15V Electrolytic Capacitor	CC-244
C112	20-30-30 MF, 475V Electrolytic Capacitor	CC-244
F101	1 Ampere 125V Slo-Blo Type 3AG Fuse	FU-7
F102	1 Ampere 125V Slo-Blo Type 3AG Fuse	FU-7
J101P	AN-3102-10S-3P Connector	PL-59P
J102P	AN-3102-10S-3P Connector	PL-59P
J103P	Cannon XL-3-14 Connector	PL-4P
J104S	Jones S-308-AB Connector	PL-54S
J105P	Hubbel No. 7466 Connector	PL-104P
J106S	Jones S-308-AB Connector	PL-54S
J107S	Convenience Outlet	PL-419
K101	3PDT 115 Volt DC Relay	5760
M101	VU Meter	ME-2
R101	1 Megohm, 1 W, 1% Film Resistor	RE-211
R102	330,000 Ohm, 1 W, 1% Film Resistor	RE-209
R103	2,200 Ohm, 1 W, Composition Resistor	RE-7
R104	1 Megohm, 1 W, 1% Film Resistor	RE-211
R105	10,000 Ohm, 2 W Composition Resistor	RE-168
R106	1 Megohm Potentiometer - Audio Taper	RE-232
R107	50,000 Ohm Potentiometer - Audio Taper	RE-225
R108	1 Megohm, 1 W Composition Resistor	RE-32
R109	330,000 Ohm, 1 W Composition Resistor	RE-30
R110	2700 Ohm, 1 W Composition Resistor	RE-8
R111	470 Ohm, 1 W 5% Composition Resistor	RE-365
R112	680,000 Ohm, 1 W Composition Resistor	RE-480
R113	1 Megohm, 1 W Composition Resistor	RE-32
R114	2,200 Ohm, 1 W Composition Resistor	RE-7

NOTE: ORDER PARTS BY AMPEX CATALOG NUMBER!

Schematic Reference Number	Description	Ampex Catalog Number
R115	470,000 Ohm, 1 W Composition Resistor	RE-31
R116	2.7 Ohm 1 W Composition Resistor	RE-574
R117	2,200 Ohm, 2 W Composition Resistor	RE-160
R118	2,200 Ohm, 2 W Composition Resistor	RE-160
R119	8,200 Ohm, 1 W Composition Resistor	RE-14
R120	10,000 Ohm, 2 W Composition Resistor	RE-168
R121	3,600 Ohm, 1 W 1% Film Resistor	RE-258
R122	8,200 Ohm, 1 W 1% Film Resistor	RE-193
R123	1,200 Ohm, 5 W Wirewound Resistor	RE-583
SR101	Full Wave Selenium Rectifier	SR-3
T101	Output Transformer	1154
T102	Power Transformer	3953
V101	12SJ7 Vacuum Tube (Selected)	TU-12
V102	12SJ7 Vacuum Tube	TU-11
V103	6C5 Vacuum Tube	TU-3
V104	VR150/OD3 Vacuum Tube	TU-2
V105	5Y3G Vacuum Tube	TU-14
XC112	Capacitor Socket	SO-9
XV104	Octal Socket	2317
XV105	Octal Socket	2317
	Power Cable	2413
	Shock Mounts	SH-9

NOTE: ORDER PARTS BY AMPEX CATALOG NUMBER!

Schematic Reference Number	Description	Ampex Catalog Number
<u>III. AUTOMATIC CONTROL UNIT, CATALOG NO. 7630</u>		
C201, C202	.01 MF, 400V Met. Paper Capacitor	CO-42
C203, C204	.005 MF, 500 V Silver Mica Capacitor	CO-298
C205	.01 MF, 500 V Silver Mica Capacitor	CO-299
C206	50 MF, 25 V Tubular Capacitor	CO-60
C207	20 MF, 150 V Tubular Capacitor	CO-300
C208	.1 MF, 400 V Met. Paper Capacitor	CO-44
C209	4 MF, 150 V Tubular Capacitor	CC-53
C210, C213	8 MF, 350 V Tubular Capacitor	CO-215
J201P	Jones P-308-CCT Connector	PL24P
J202P	Jones P-310-CCT Connector	PL308P
J203S	Jones S-312AB Connector	PL68S
J204P	Jones P-312-CCT Connector	7633
K201	3 PDT Relay	B-5760
R201	1 Megohm Potentiometer, Audio Taper	RE-232
R202	1 Megohm, 1/2 W, 10% Composition Resistor	RE-290
R203, R204	1.3 Megohm, 1 W, 1% Film Resistor	RE-564
R205	1200 Ohm, 1/2 W, 10% Composition Resistor	RE-335
R206	620,000 Ohm, 1 W, 1% Film Resistor	RE-563
R207	1.5 Megohm, 1/2 W, 10% Composition Resistor	RE-340
R208	330,000 Ohm, 1/2 W, 10% Composition Resistor	RE-427
R209	1 Megohm, 1/2 W, 10% Composition Resistor	RE-290
R210	47,000 Ohm, 1/2 W, 10% Composition Resistor	RE-299
R211	56,000 Ohm, 1 W, 10% Composition Resistor	RE-23
R212	1 Megohm, 1/2 W, 10% Composition Resistor	RE-290
R213	47,000 Ohm, 1 W, 10% Composition Resistor	RE-22
R214	7000 Ohm, 5 W, Wirewound Resistor	RE-575
V201	6SJ7 Vacuum Tube	TU-10
V202	6J5-Vacuum Tube	TU-23
V203	GL-5663 Thyatron Tube	TU-58
	Tube Shield	SD-11

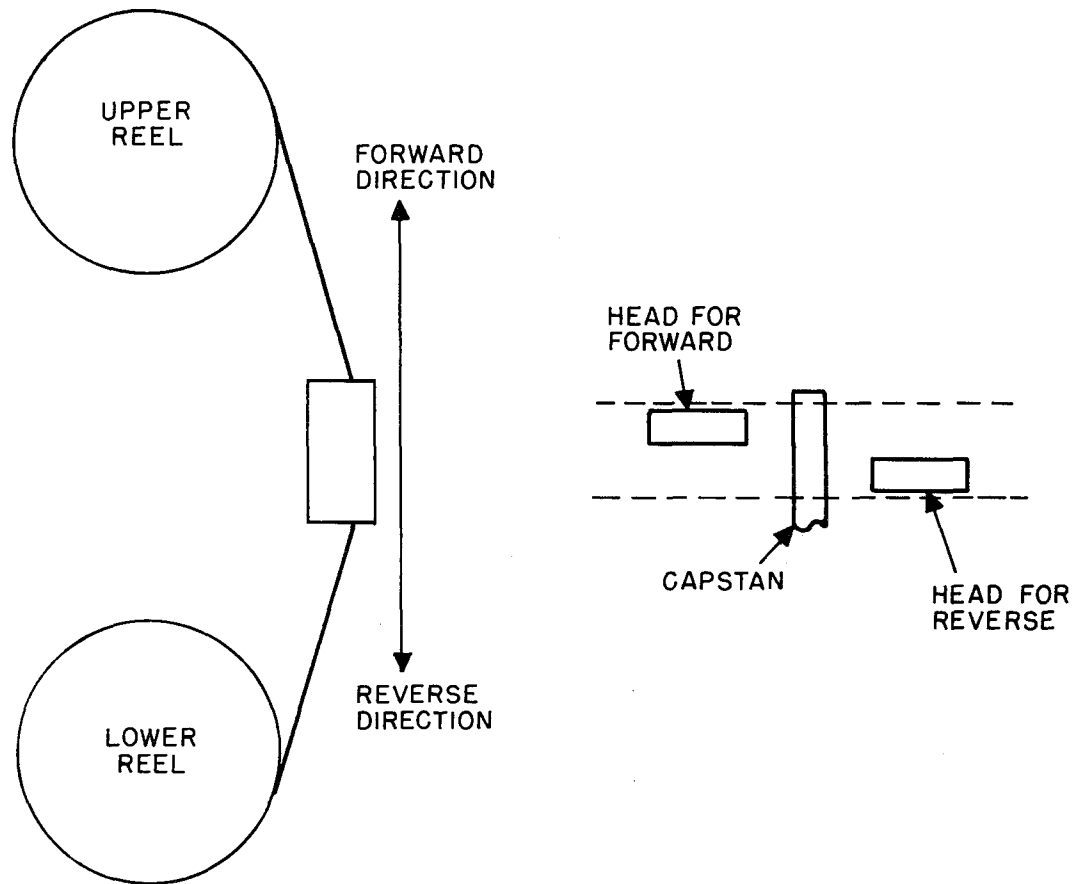


FIG. I. TAPE MOVEMENT AND HEAD LOCATION

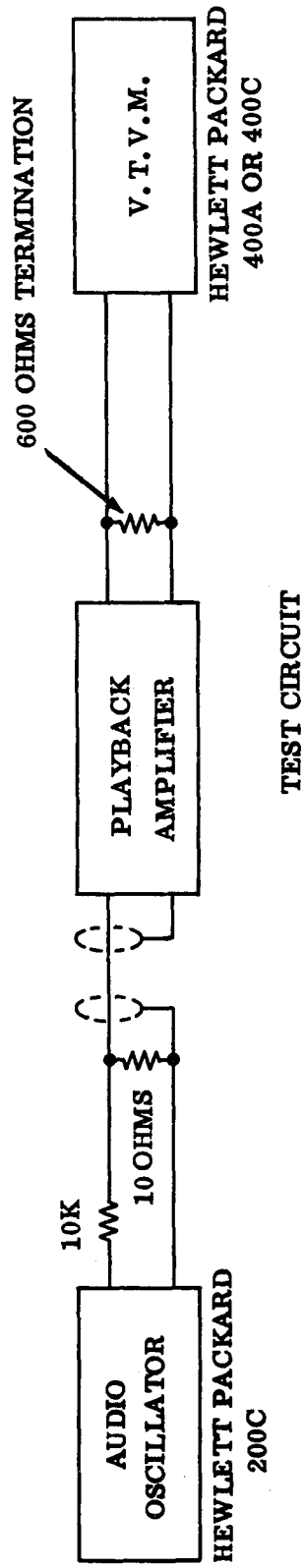
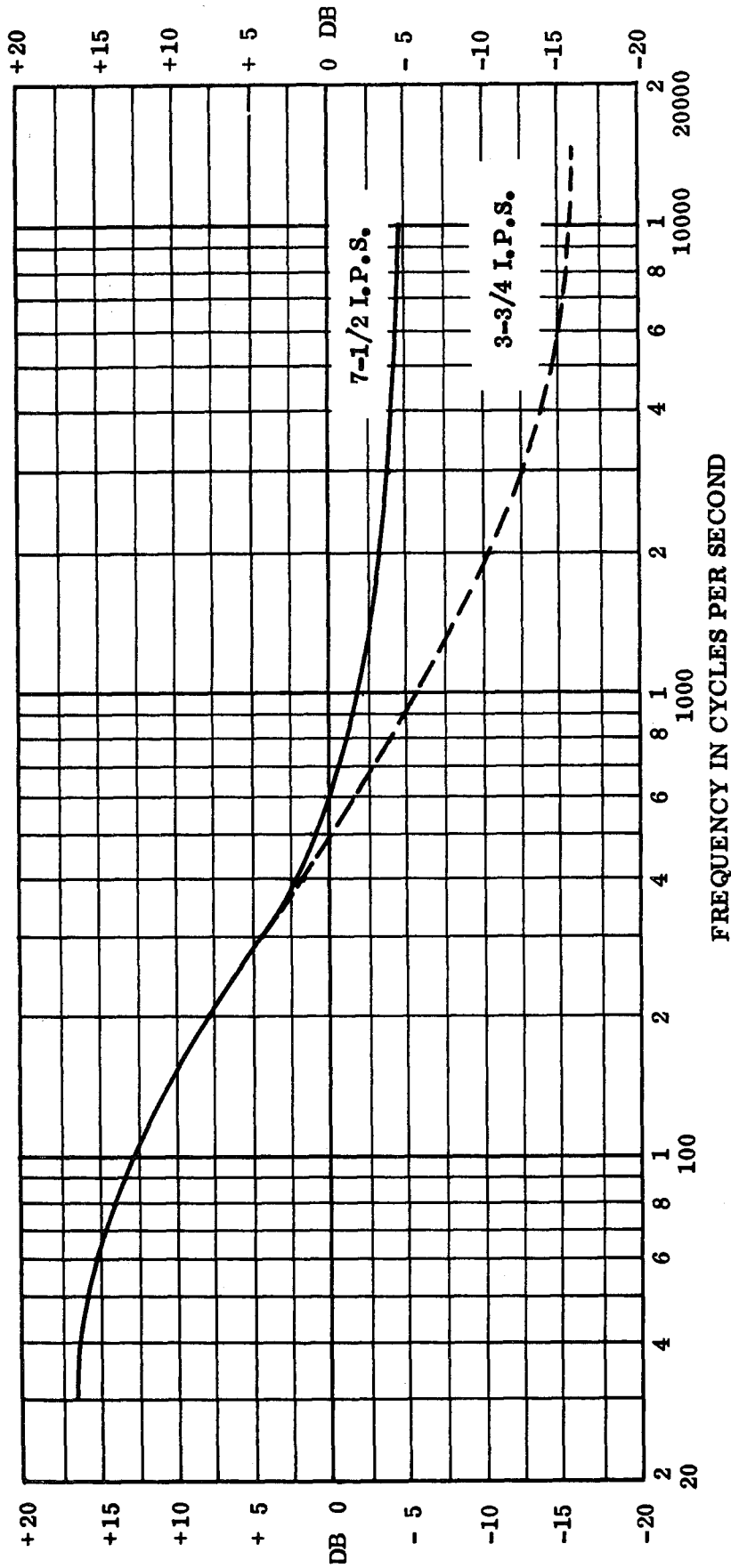


FIG. 2. PLAYBACK AMPLIFIER RESPONSE CURVES

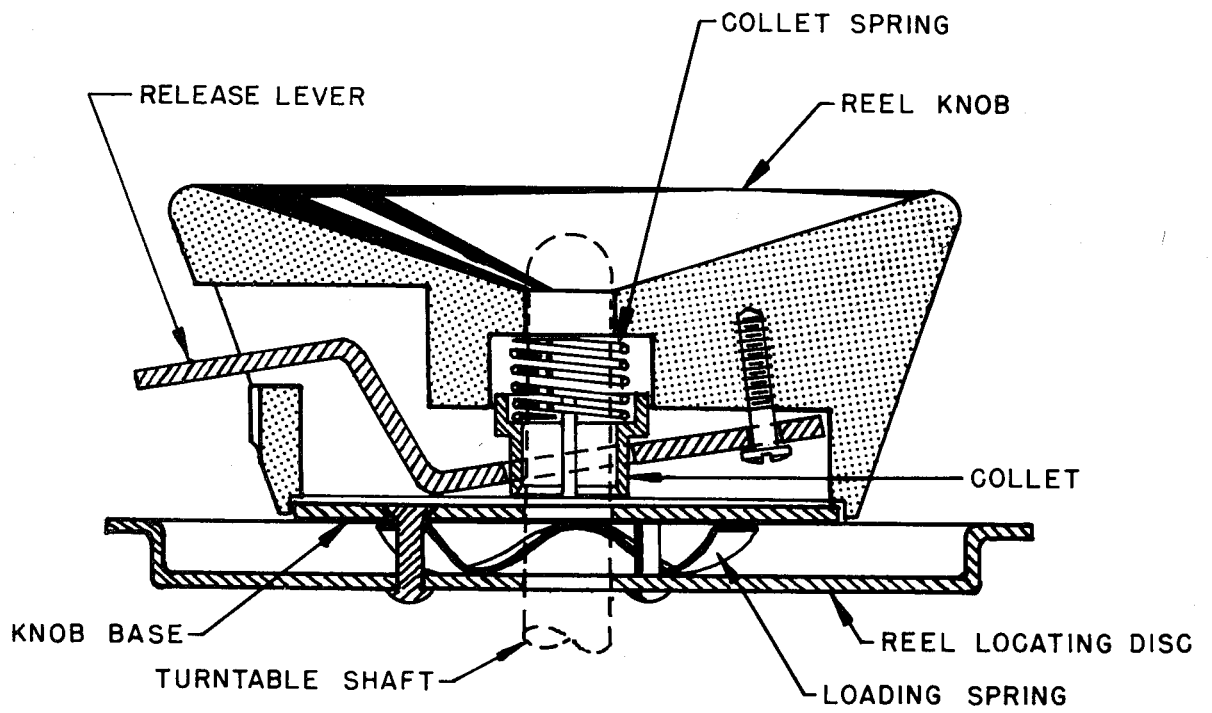
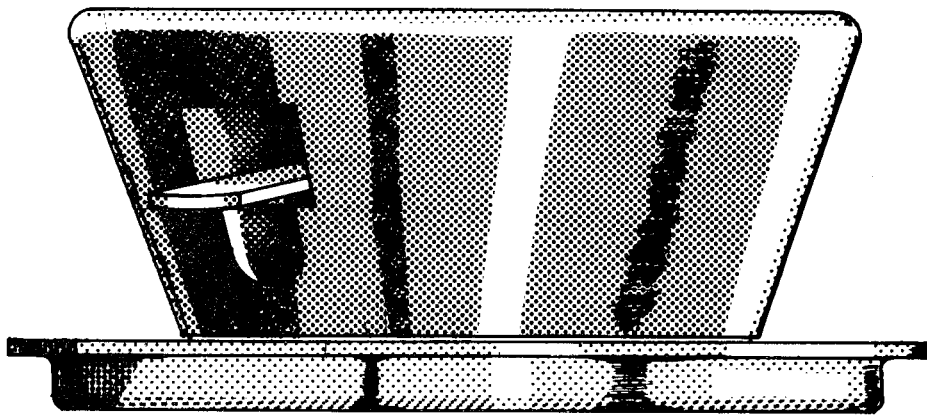


FIG. 3. REEL HOLD-DOWN KNOB

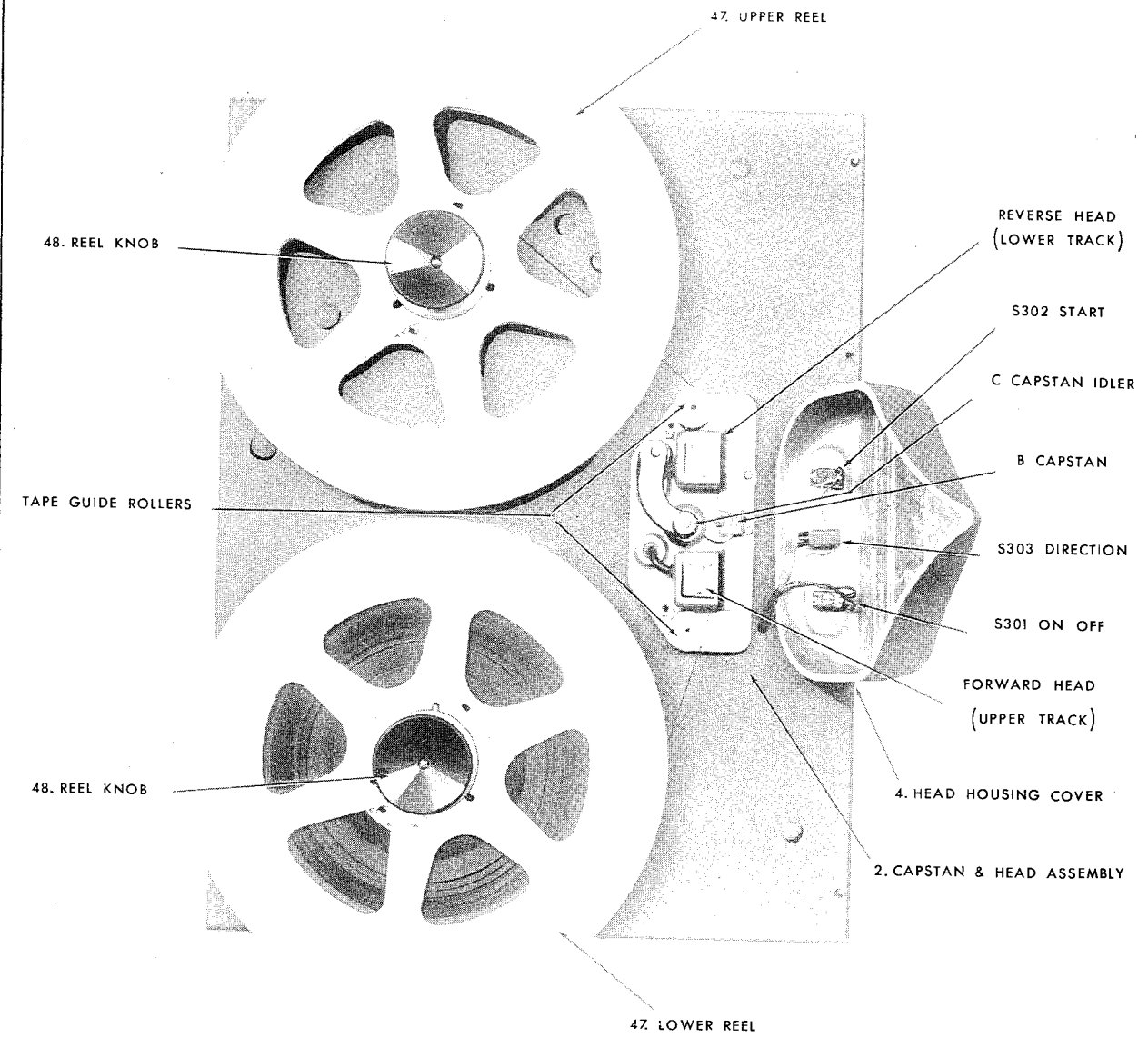


FIG. 4. TAPE TRANSPORT FRONT VIEW

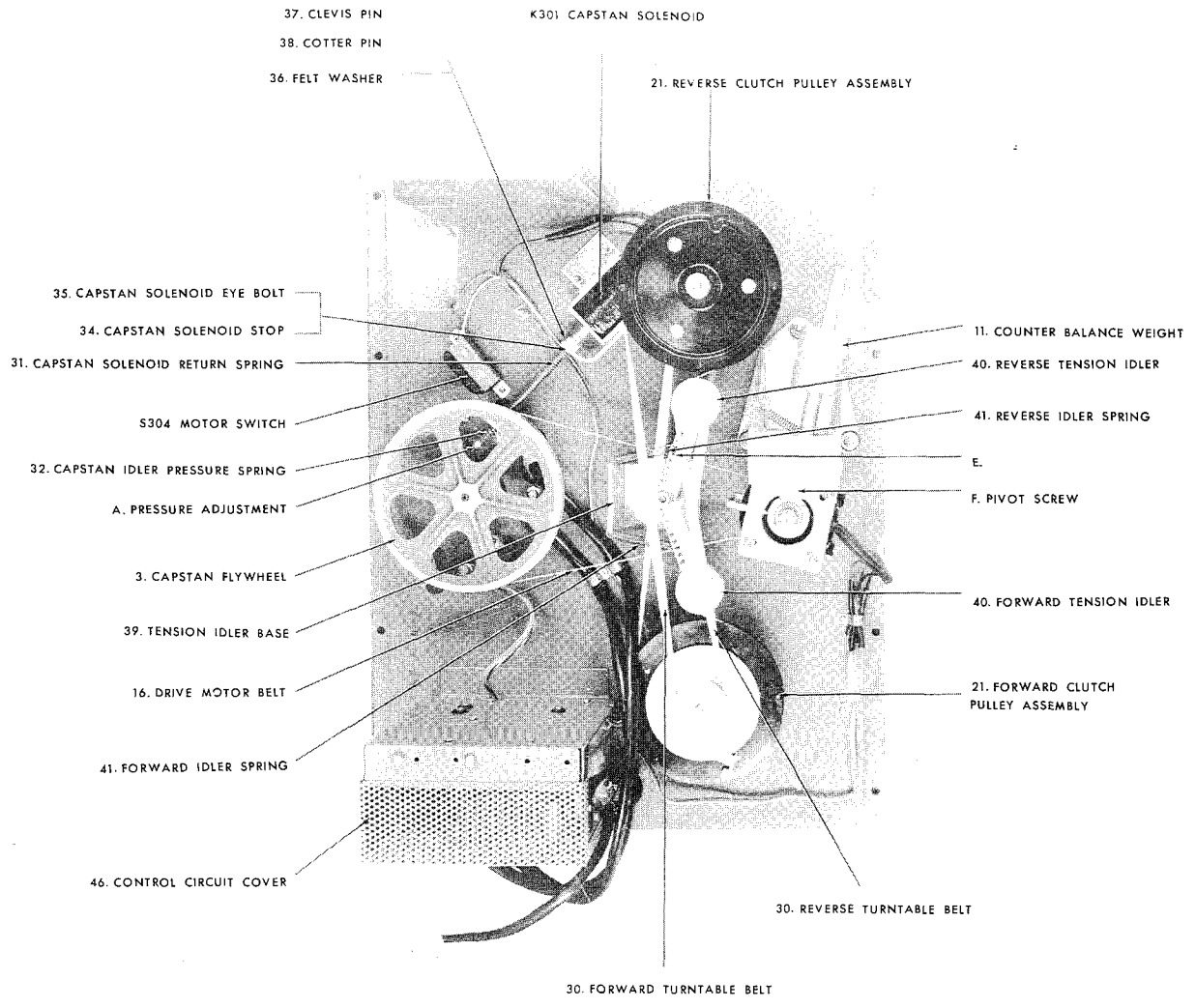


FIG. 5. TAPE TRANSPORT
 REAR VIEW

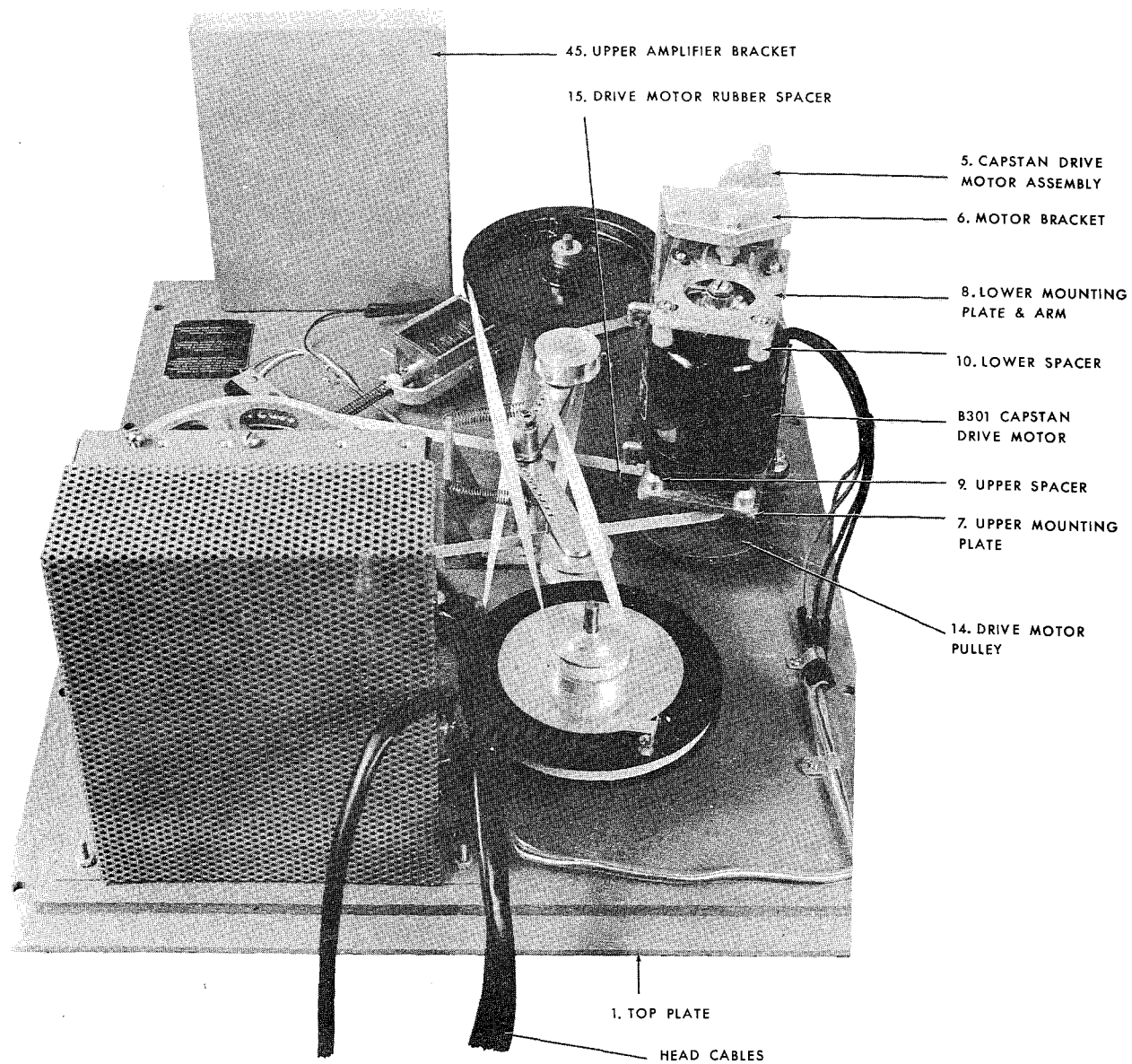
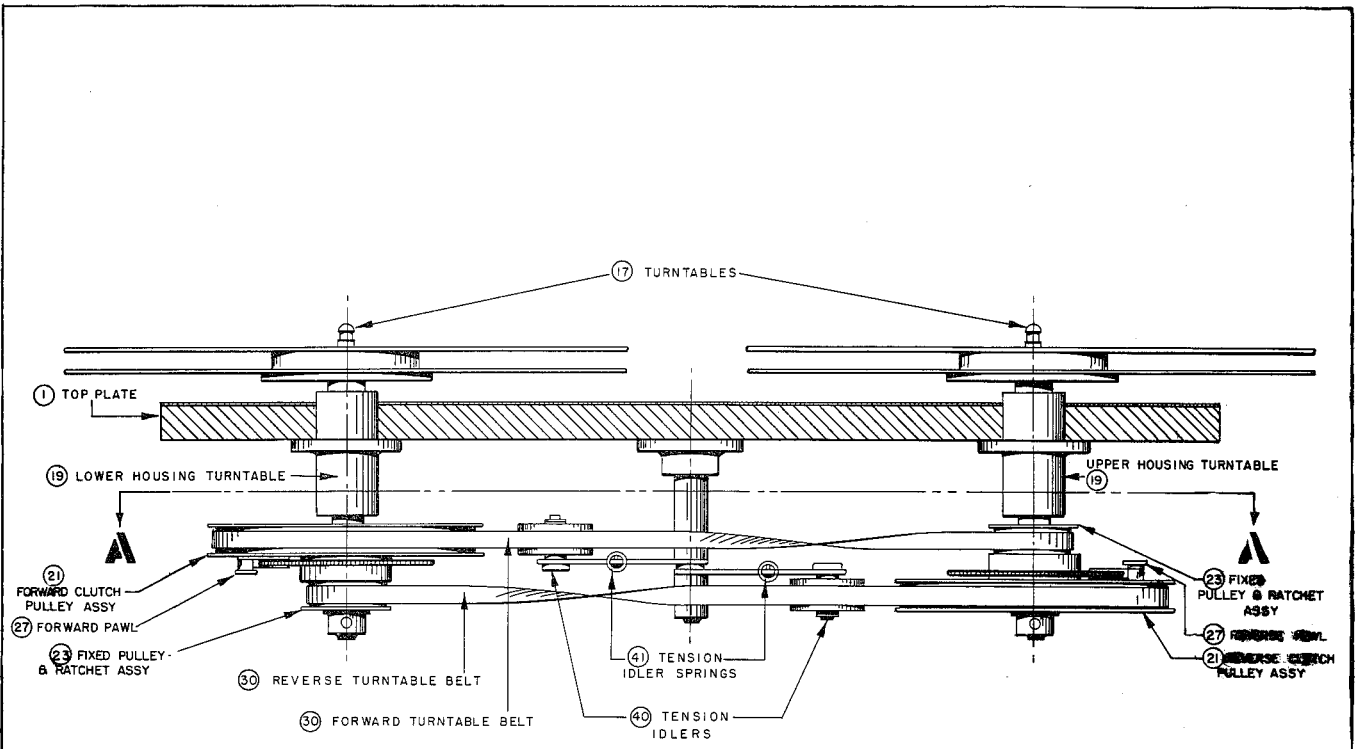


FIG. 6. TAPE TRANSPORT DETAILS
REAR VIEW



SECTION **AA**
(SIMPLIFIED)

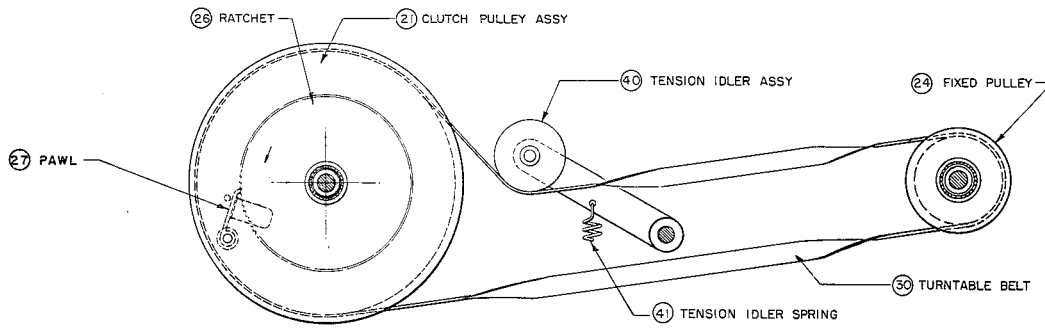
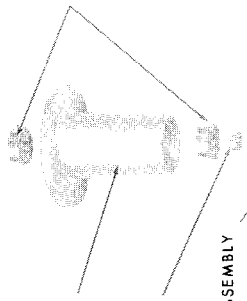


FIG. 7. TAKE-UP SYSTEM

LOWER TURNTABLE ASSEMBLY



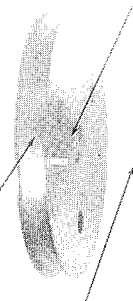
17. LOWER TURNTABLE & SHAFT



19. LOWER TURNTABLE HOUSING

29. LOWER TURNTABLE SPACER

21. FORWARD CLUTCH PULLEY ASSEMBLY



27. FORWARD PAWL

26. FORWARD RATCHET

25. TIRE

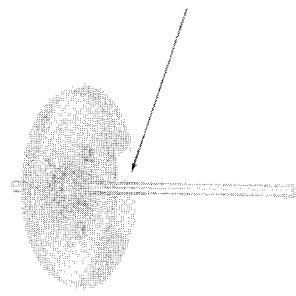
24. REVERSE FIXED PULLEY

23. FIXED PULLEY & RATCHET ASSEMBLY

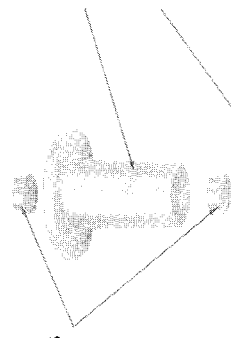
22. BEARINGS

20. BEARINGS

UPPER TURNTABLE ASSEMBLY



17. UPPER TURNTABLE & SHAFT



20. BEARINGS

19. UPPER TURNTABLE HOUSING

24. FORWARD FIXED PULLEY

25. TIRE

27. REVERSE PAWL

23. FIXED PULLEY & RATCHET ASSEMBLY

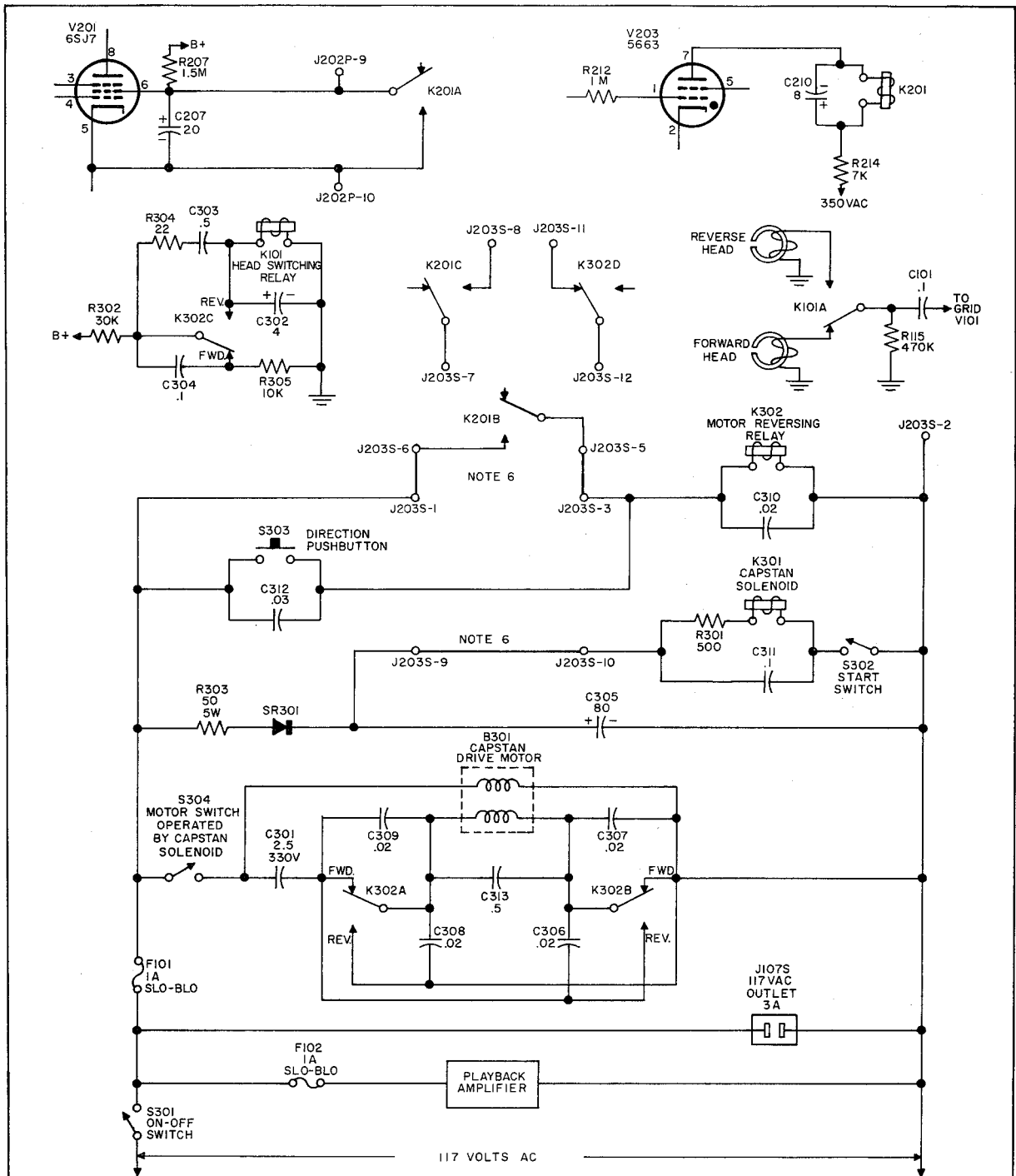
26. REVERSE RATCHET

21. CLUTCH PULLEY ASSEMBLY

22. BEARINGS

28. PULLEY RETAINING COLLAR

FIG. 8. TURNTABLE SYSTEM
EXPLODED VIEW



NOTES:

1. ALL RELAYS SHOWN DE-ENERGIZED.
2. ALL RESISTORS IN OHMS.
3. ALL CAPACITORS IN MICROFARADS.
4. SCHEMATIC NUMBER INDICATES LOCATION OF COMPONENTS:
 100 - PLAYBACK AMPLIFIER.
 200 - AUTOMATIC CONTROL UNIT
 300 - TAPE TRANSPORT.
5. J203S- CONNECTOR FOR EXTERNAL TIME CLOCK CONTROL SYSTEM.
6. HEAVY LINES INDICATE JUMPER WIRES ON DUMMY PLUG 7633 FOR NORMAL OPERATION.

FIG. 9. CONTROL CIRCUIT, SCHEMATIC DIAGRAM

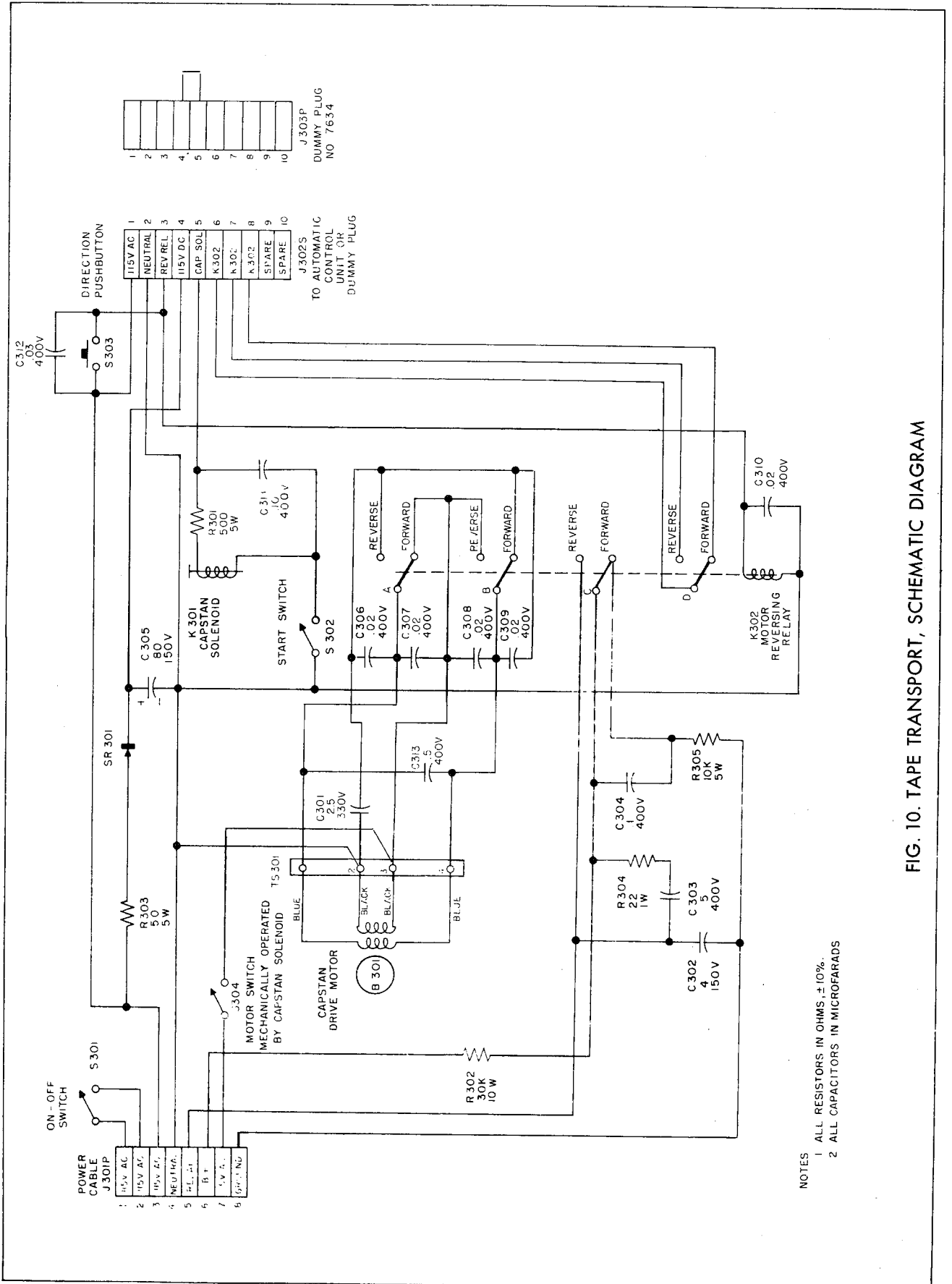


FIG. 10. TAPE TRANSPORT, SCHEMATIC DIAGRAM

- NOTES
- 1 ALL RESISTORS IN OHMS, ±10%.
 - 2 ALL CAPACITORS IN MICROFARADS

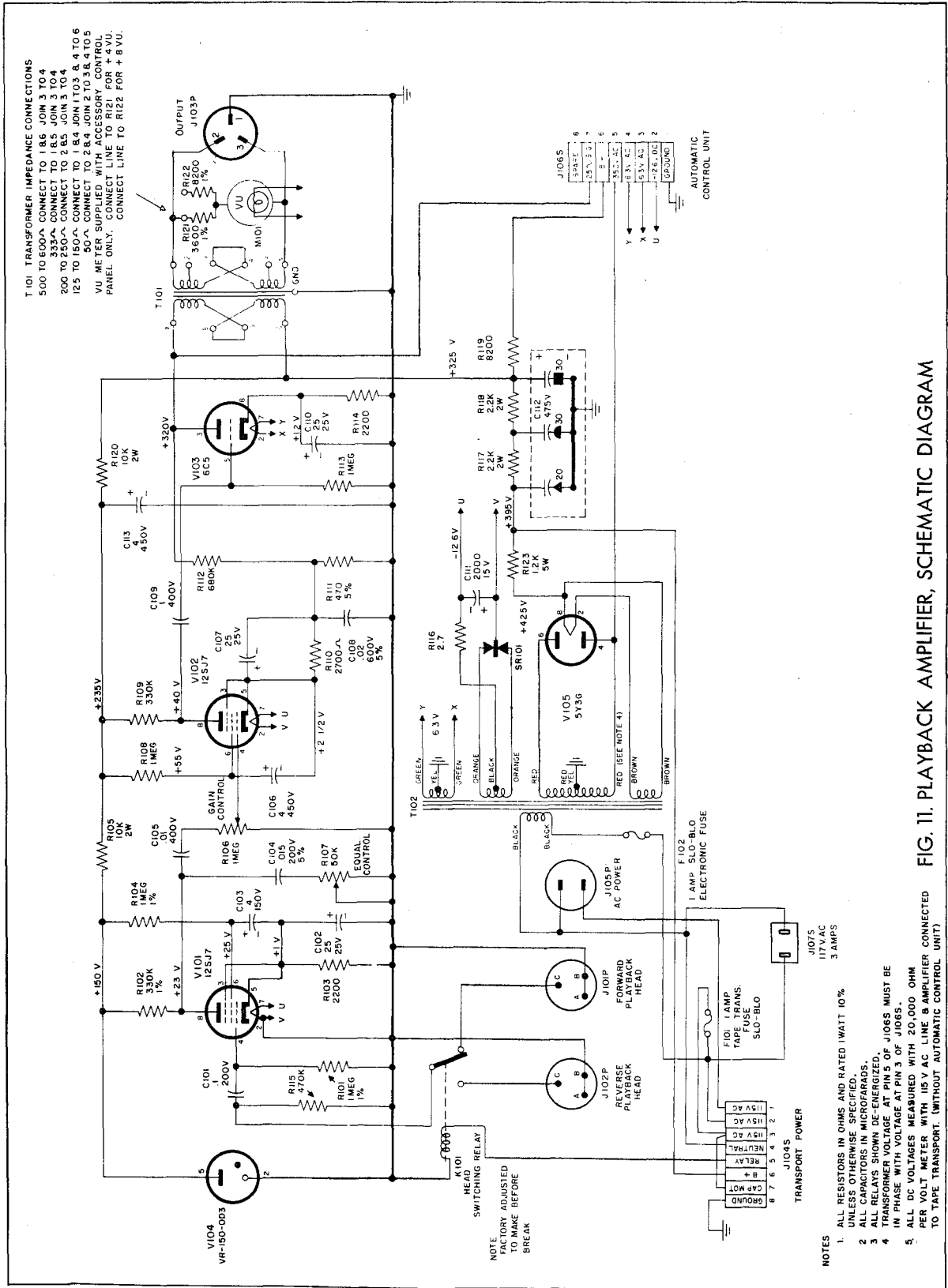
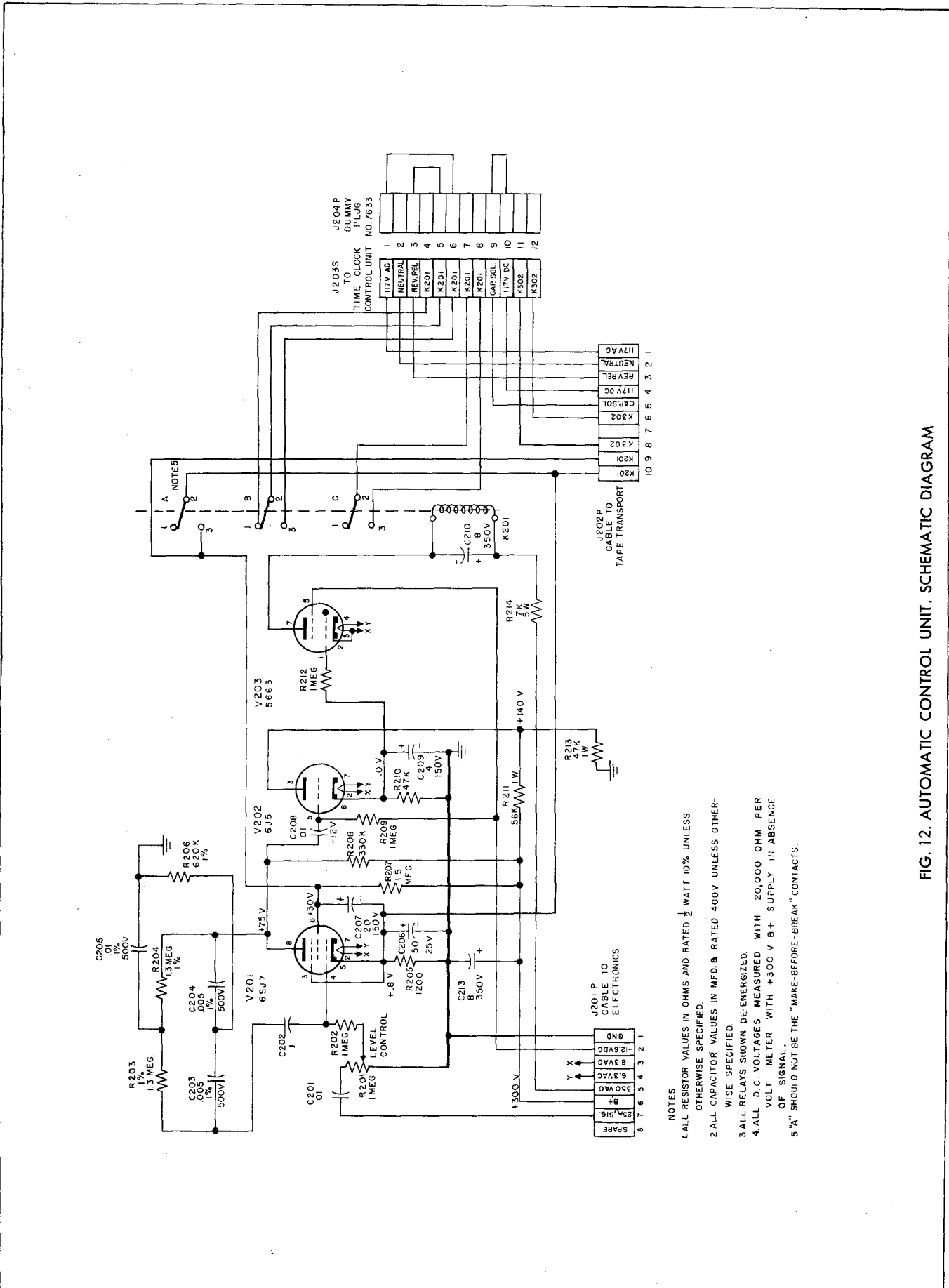


FIG. 11. PLAYBACK AMPLIFIER, SCHEMATIC DIAGRAM



- NOTES
1. ALL RESISTOR VALUES IN OHMS AND RATED $\frac{1}{2}$ WATT 10% UNLESS OTHERWISE SPECIFIED.
 2. ALL CAPACITOR VALUES IN MFD. & RATED 400V UNLESS OTHERWISE SPECIFIED.
 3. ALL RELAYS SHOWN DE-ENERGIZED.
 4. ALL D.C. VOLTAGES MEASURED WITH 20,000 OHM PER VOLT METER WITH +300 V B+ SUPPLY IN ABSENCE OF SIGNAL.
 5. "A" SHOULD NOT BE THE "MAKE-BEFORE-BREAK" CONTACTS.

FIG. 12. AUTOMATIC CONTROL UNIT. SCHEMATIC DIAGRAM

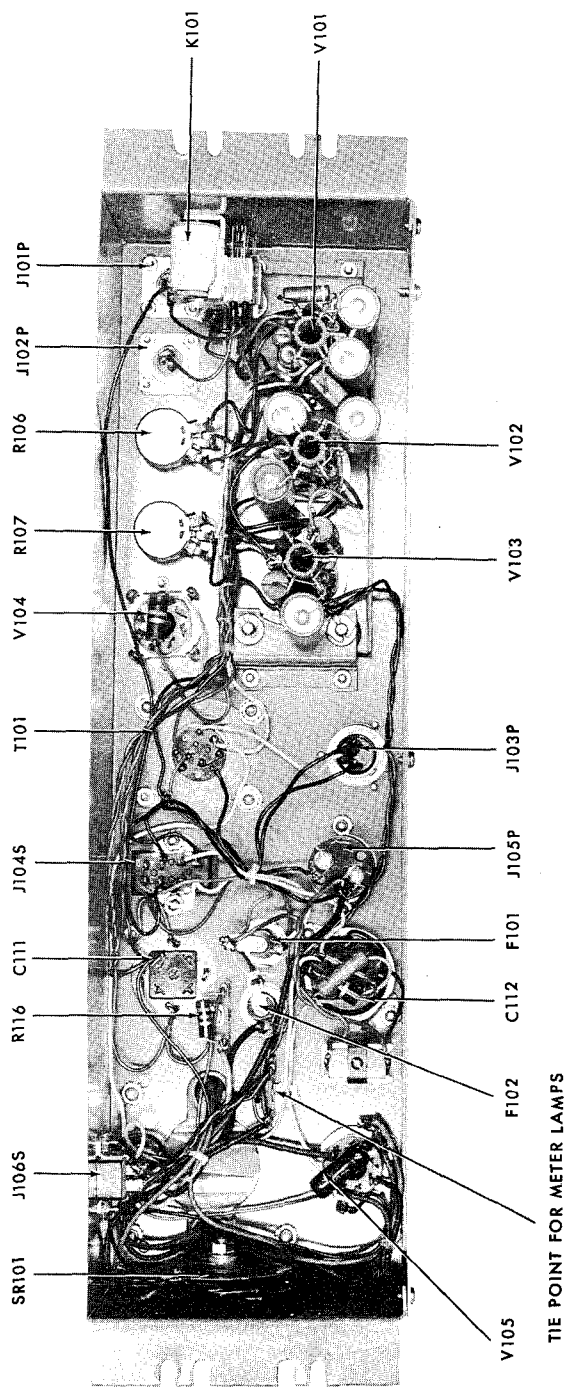
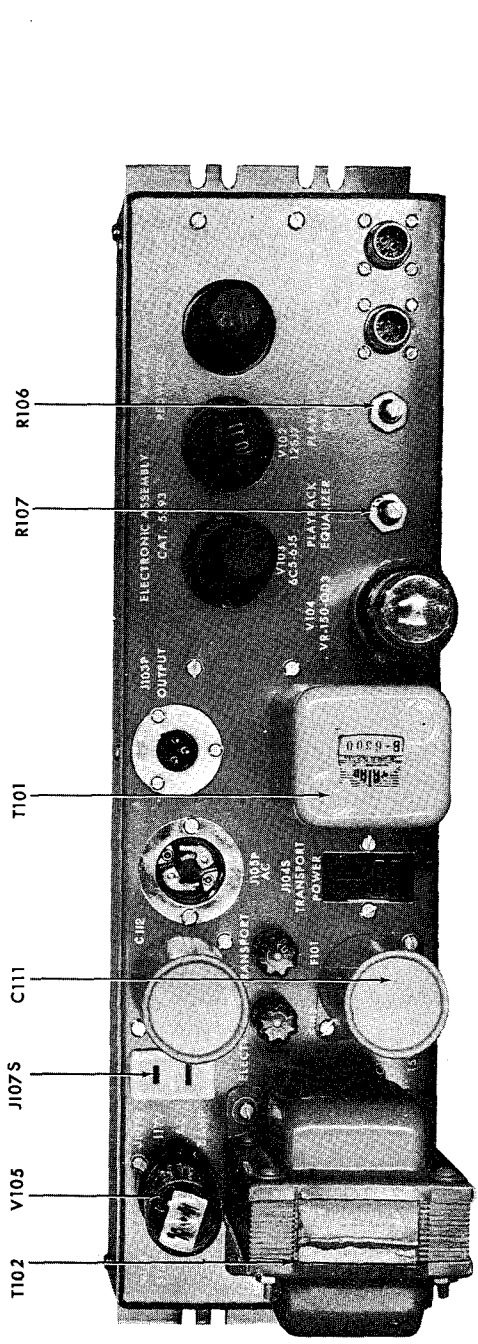


FIG. 13. PLAYBACK AMPLIFIER

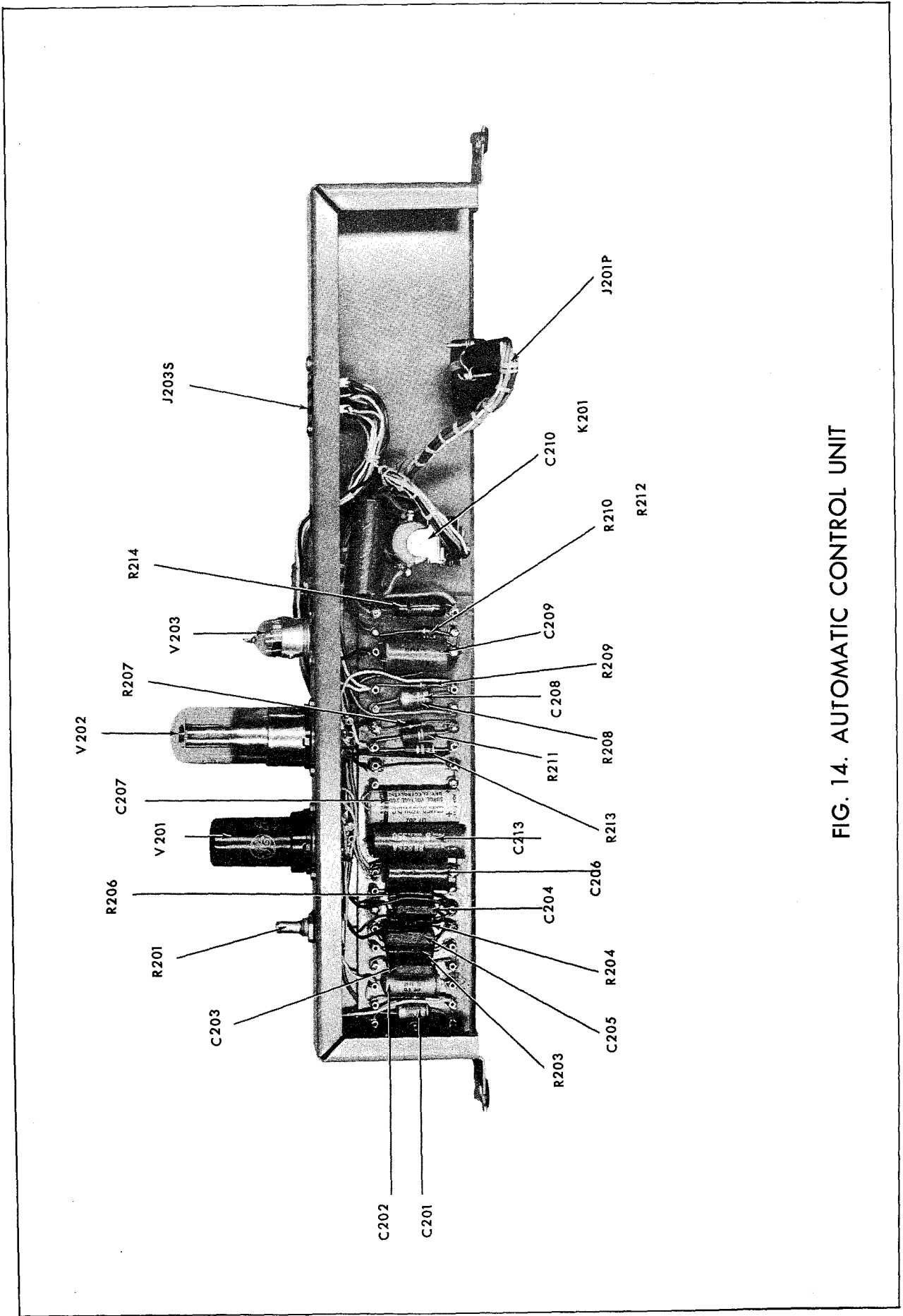


FIG. 14. AUTOMATIC CONTROL UNIT