

ALTEC SERVICE CORPORATION

MANUAL FOR SERVICING

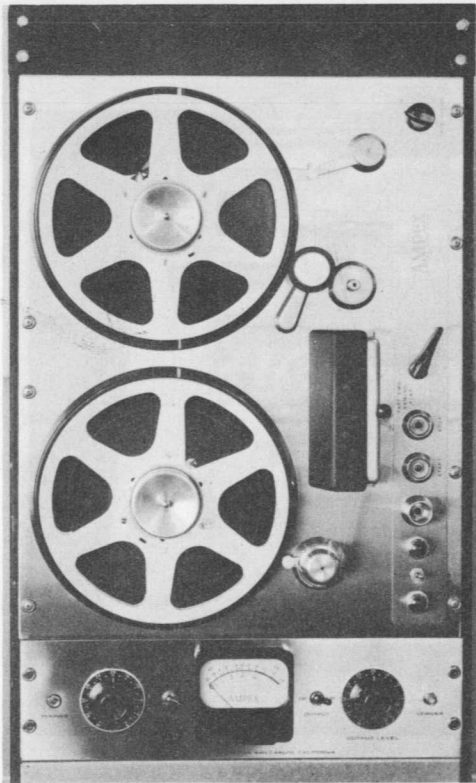
AMPEX TAPE RECORDERS

MODELS 300, 301 AND 302

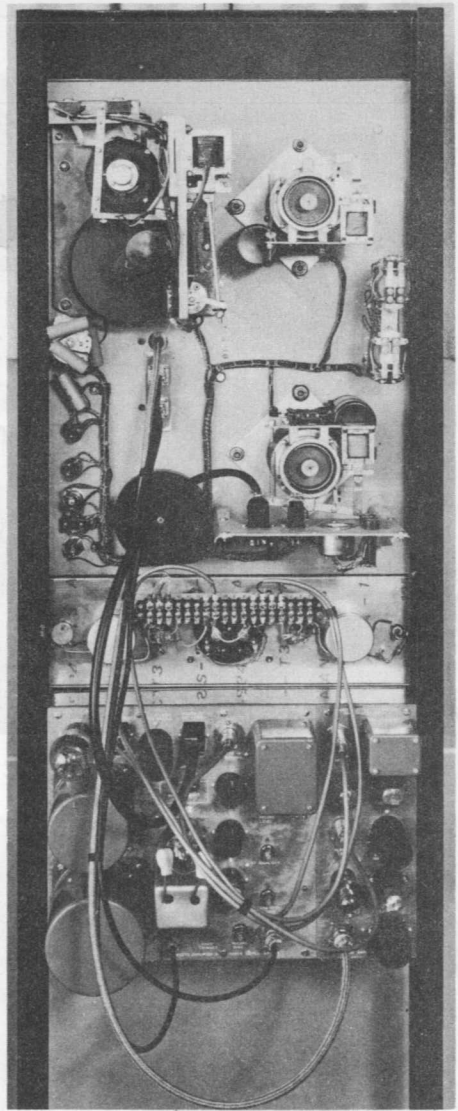
SECTION I - EQUIPMENT BULLETINS

SECTION II - GENERAL INSTRUCTIONS
AND TEST DATA

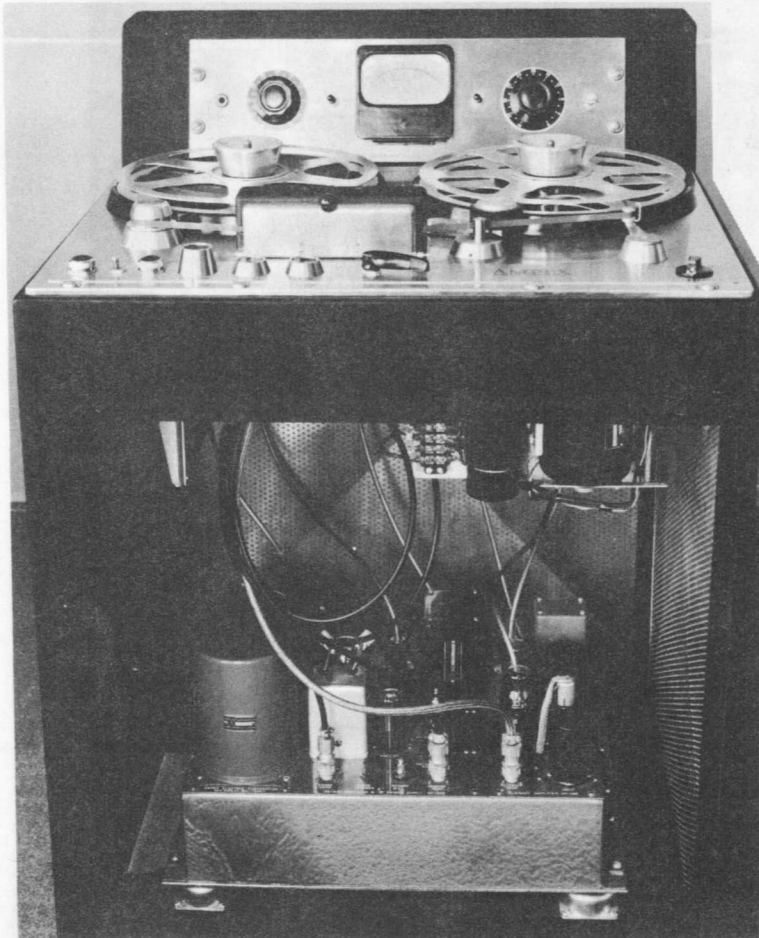
RESTRICTED TO ALTEC SERVICE PERSONNEL



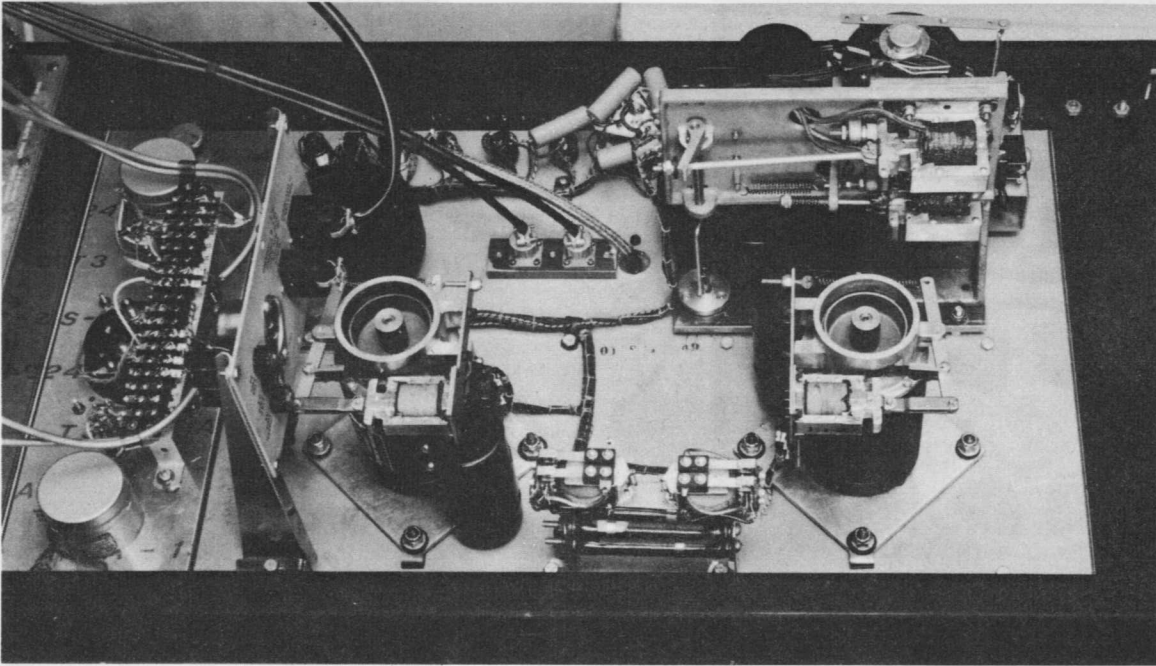
Front View - Model 300
Rack Mount With Meter Control Panel



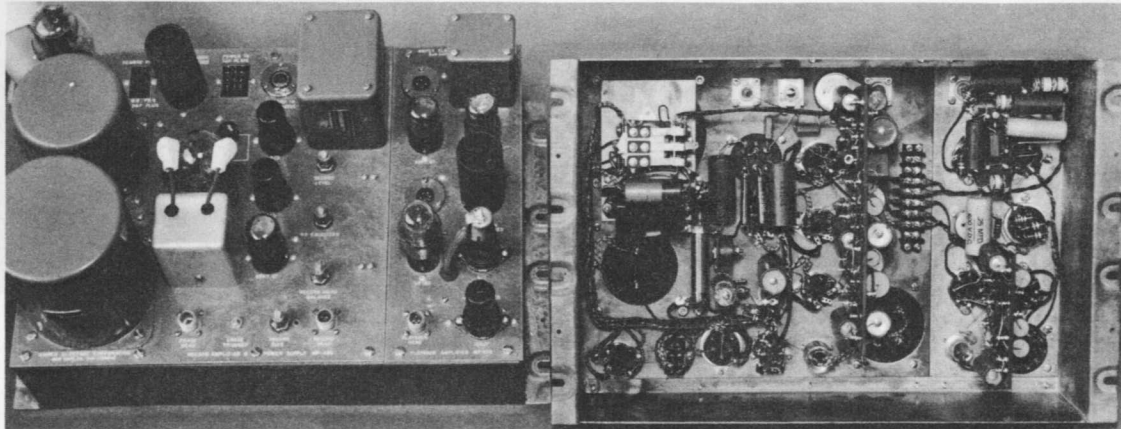
Rear View - Model 300
Rack Mount With Meter Control Panel



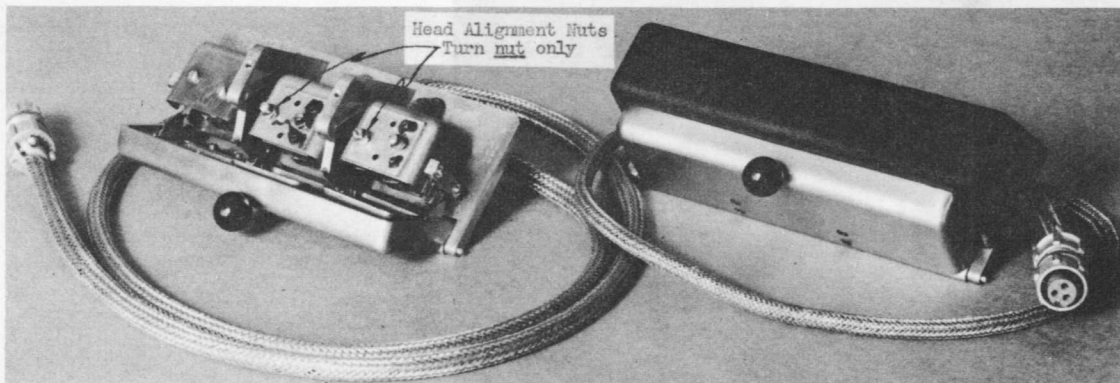
Model 300-C Console - Front Cover Removed



Model 300 - Bottom View of Top Plate



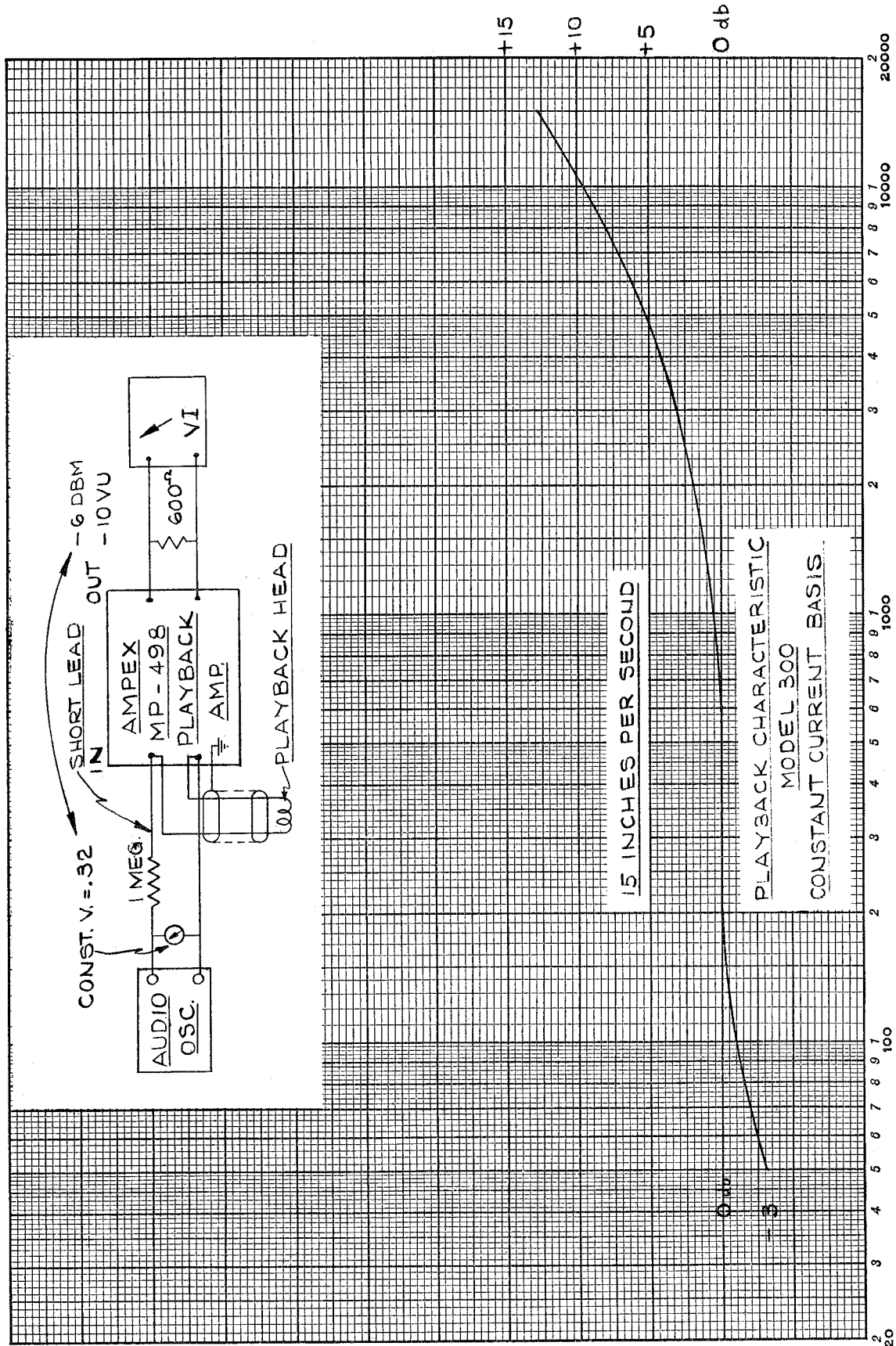
Model 300 - Electronic Assembly 55A



Model 300 - Head Assembly MP-375

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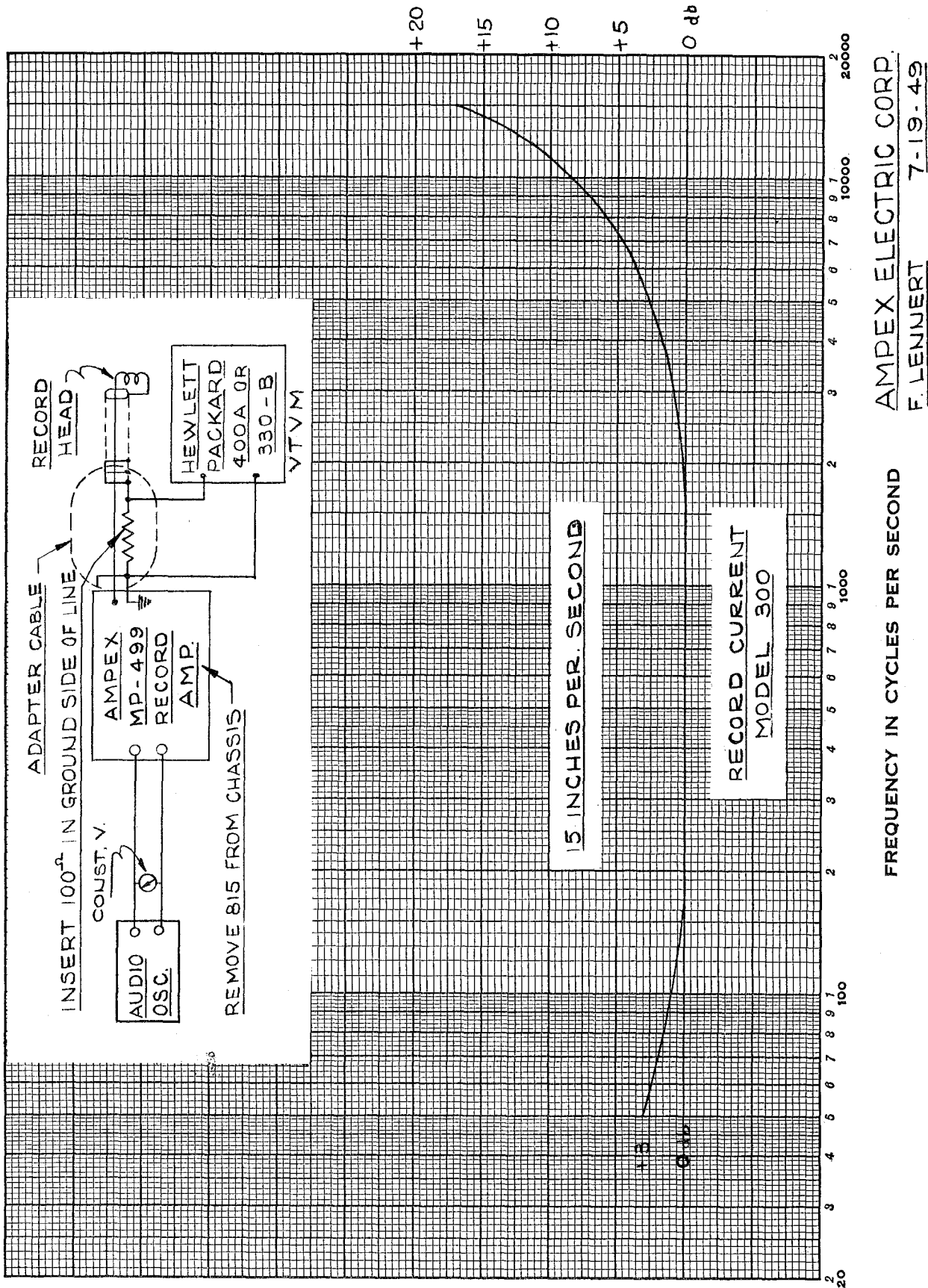
AMPEX ELECTRIC CORP.
F. LENNERT 7-19-49

FREQUENCY IN CYCLES PER SECOND

ALTEC SERVICE CORPORATION

AMPEX TAPE RECORDERS
MANUAL FOR SERVICING

Section I-1



AMPEX ELECTRIC CORP.
F. LENNERT 7-19-49

FREQUENCY IN CYCLES PER SECOND

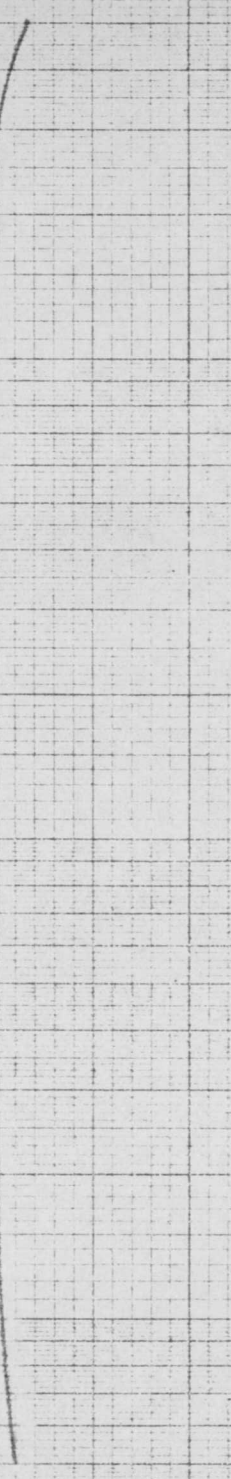
Aug. 31, 1950
 F. Lennert

Model 1302
 Record Amplifier

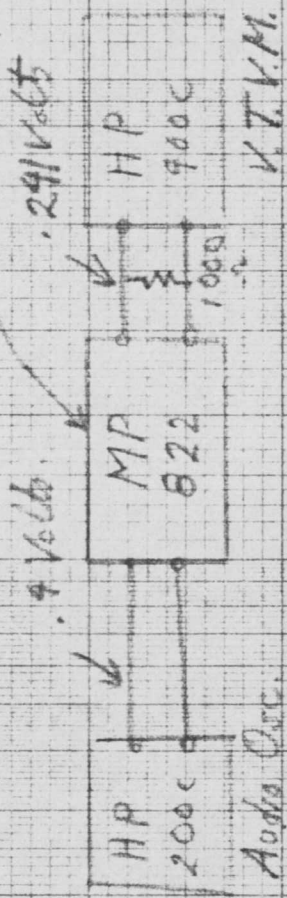
Frequency Response

+1 0 Db -1

1
9
8
7
6
5
4
3
2
1
pk
9
8
7
6
5
4
3
2
1
to
9
8
7
6
5
4
3
2
1
100
9
8
7
6
5
4
3
2
1



Oscillator Plate Caps Removed to Disable Oscillator



.291 Volts

.9 Volts

Fig. 9

INSTRUCTION BOOK

MODEL 300 MAGNETIC TAPE RECORDER

INDEX of SECTIONS, CIRCUITS and DRAWINGS

SEC. I-1

Section I

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2. Unpacking and Installing

Section II

1. Mechanical Operation
2. Electronic Operation

Section III

1. Electronics Alignment
2. Electronics Special Considerations

Section IV

1. Head Housing
2. Head Alignment
3. Head Demagnetization

Section V

Drive System

FIGURE 1—Top Plate — Bottom View

FIGURE 2—Capstan Assembly

FIGURE 3—Reel Idler Assembly

FIGURE 4—Take-up Tension Arm

FIGURE 5—Top Plate — Top View

FIGURE 6—Record Amplifier and Power Supply Schematic

FIGURE 7—Top Plate Control Circuits

FIGURE 8—Playback Amplifier Schematic

FIGURE 9—Electronics — Chassis Top View

FIGURE 10—Recommended Layouts:

(a) Bridging with Meter Control Panel

(b) Matching with Meter Control Panel

(c) Bridging or Matching without Meter Control Panel

FIGURE 11—Inter-Unit Connection Diagram

FIGURE 12—Meter Control Panel Schematic (Bridging)

FIGURE 13—Meter Control Panel Schematic (Matching)

AMPEX MODEL 301

The AMPEX Model 301 recorder is a modified version of the Model 300, converted to run at 15 and 30 inches per second. The difference in speed is accomplished by changing the diameter of the flywheel on the capstan shaft (see fig. 2) and of the motor pulley. Also, the rubber tire is placed on the motor pulley instead of the capstan flywheel. A lower mass flywheel is required on the reel idler.

Because of the greater power required to drive at 30 inches per second, a ball bearing motor is required. The audible noise level of the drive is greater than the Model 300 for this reason, especially at the highest speed.

The electronic alterations which are made for the Model 301 consist of incorporating relays which operate from the Speed change switch. The 15 inch characteristics are identical to the Model 300. At the 30 inch speed, the relays operate to alter the equalization characteristics in accordance with the requirements of the higher speed.

The specifications for the Model 301 are identical to those of the Model 300 except for speed. The minimum performance characteristics at 30 inches are the same as specified for 15 inch operation.

AMPEX MODEL 302

The Ampex Model 302 is designed primarily to be used for recording telemetering channels up to 35 kc. However, it is well suited for the recording of all types of data covering a frequency range of 50 to 40,000 cycles.

The only mechanical difference in the Model 302 from the standard Model 300 is that the drive has been modified to run at 15" and 30" per second, instead of 7.5 - 15". The modification is identical to the Model 301, and is accomplished by using a different pulley ratio between the motor and capstan flywheel.

Electrically, the erase and record heads have been modified to operate at a frequency of over 150 k.c. The playback head has been modified to respond to 60 k.c. The electronic chassis has been modified to record with a constant current record characteristic, and the overall response is flat to 30 k.c. at 30 inches per second. At 15 inches per second, the response is flat to 20 k.c.

SPECIFICATIONS

- A. Speed: 30" per second or 15" per second.
- B. Frequency Response: At 30" per second, ± 2 db. 50 to 30,000 cycles. Down no more than 10 db. at 50 kc.
At 15" per second, ± 3 db. 100 - 20,000 cycles.
- C. Signal to noise ratio. At least 50 db. below 1% overall distortion, measured in band widths not exceeding one octave.
- D. Constant current record characteristic.
- E. Playing time: 16 minutes at 30", 32 minutes at 15".
- F. Bias frequency: Greater than 150 kc.
- G. Flutter and wow: Less than 0.1% r.m.s.

All other features identical with Model 300.

INSTALLATION

Input and output connections are made to terminal strip on the back of the Meter Control Panel (see Figure 12). The input connections are made to terminals 1, 2 and 3. If the input is unbalanced, connect the grounded side of the line to terminal No. 2.

Output connections may be made either to the Monitor terminals 8, 9 and 10 or to the Line Out terminals Nos. 13, 14 and 15. If connections are made to the Monitor terminals, the monitor may be switched from the input to the output of the machine by means of the Monitor key on the Meter Control Panel. In this case, the monitor should have a bridging input and the playback amplifier should be loaded by placing the Output key in the Cue position. If output connections are made to the Line Out terminals, the equipment being fed should provide termination to the playback amplifier with a 600 ohm load. If unbalanced connections are used, terminals 10 and 15 should be connected to ground.

The normal record level has been set at 1% overall distortion. The normal setting of the Playback Level control is 10. Thus, with the Playback Level control set at 10 and the VI meter reading 0, standard level is being recorded on the tape.

Bias is set to give maximum output when recording a constant level 1000 tone.

If the machine has been subjected to severe cold, allow the drive assembly to run for five minutes before using the machine.

SPECIFICATIONS FOR MODEL 300

All performance characteristics of the Model 300 Magnetic Tape Recorder equal or exceed the standards recommended by the NAB Subcommittee on Magnetic Recording.

Tape Speed: 15 inches per second and 7.5 inches per second, with speed change effected by a single control. The same control also provides the necessary equalization change to compensate for the change in speed.

Frequency Response: At 15 inches, ± 2 db. 50 — 15,000 cycles.
At 7.5 inches, ± 2 db. 50 — 7,500 cycles.

Signal-to-Noise Ratio: Over 60 db., as defined by the proposed NAB standards. By definition, the signal-to-noise ratio is the ratio of peak recording level to the total unweighted playback noise when erasing a signal of peak recording level and in the absence of a new signal. Thus bias and erase noise are included, as well as playback amplifier noise. All frequencies between 50 and 15,000 cycles are measured. The peak recording level is defined as that level at which the overall (input to output) total r.m.s. harmonic distortion does not exceed 3% when measured on a 400 cycle tone.

Starting Time: Instantaneous. (When starting in the Normal Play mode of operation, the tape is up to full speed in less than 1/10 second.)

Stopping Time: When playing at 15 inches per second, tape moves less than 2 inches after depressing Stop button.

Flutter and Wow: At 15 inches per second, well under 0.1% r.m.s., measuring all flutter components from 0 to 300 cycles, using a tone of 3,000 cycles. At 7.5 inches, under 0.2%.

Separate record and playback heads and amplifiers for simultaneous monitoring of the tape.

Playback Timing Accuracy: 0.2%.

Playing Time: 33 minutes at 15 inch speed on proposed standard NAB reel, 66 minutes at 7.5 inch speed. The Model 300 will also accommodate the standard RMA reel in various thicknesses.

Rewind Time: One minute for the full NAB reel.

Controls: Start, Stop and Record are push-button, relay operated and may be remote controlled. Normal Play, Fast Forward, and Rewind on a selector switch, with rapid shuttling back and forth made possible by instantly changing from one mode of operation to the other without stopping in between.

Complete Plug-in Head Housing: Double mumetal shield cans on playback head, equivalent shielding on record head, matching self-aligned covers on hinged gate. Drop-in threading.

Record Amplifier: Bridging input, normally set up for + 4 V.U. in.

Playback Amplifier: Normally + 4 V.U. output. Will deliver 20 d.b.m. without exceeding 1% total harmonic distortion at any frequency from 30-15,000 cycles.

Dimensions: Mechanical unit on 24 1/2" panel for standard rack mounting. Electronic unit on 12 1/4" panel for standard rack mounting.

Mounting: Rack, Console, or Portable Cases.

Meter Control Panel available at extra cost with features outlined below:

Bridge Input step control will adjust record level for any input greater than -20 V.U., 10,000 ohm bridging, any balanced or unbalanced line.

Output step control will adjust level up to +8 V.U. regardless of tape level — 600 ohm or 150 ohm balanced or unbalanced line.

V.U. meter will meter playback output while recording or playing back.

Output key (line or cue).

Phone Jack with input-output key (A-B Key).

UNPACKING AND INSTALLING

1. Open packing case carefully and save it. In the event of possible shipping damage the case may be needed for return shipment.
2. Examine electronics chassis and see that the rubber mountings have not been damaged. A properly mounted chassis floats freely on the rubber cushions.
3. Unpack the interconnecting cables and install. The twelve conductor cable connects the mechanical and electronic units. See Fig. 1 and Fig. 9 for location of plugs.
4. Unpack the tubes and install them in their respective sockets. **WARNING! BE VERY CAREFUL WITH THE 12SJ7 TUBE AS IT IS HAND SELECTED FOR LOW NOISE AND MAY BE DAMAGED BY CARELESS HANDLING.** See ELECTRONICS SPECIAL CONSIDERATIONS, II, before turning on power.
5. Release capstan drive motor shipping binding. This is the wire which holds the motor away from the rubber-tired flywheel. Do not make any adjustments on the drive system at this time. No adjustments need be made unless damage has occurred during shipping.
6. Connect input and output circuits to the machine. See ELECTRONICS OPERATION.
7. Connect power cord to 115 V., 60 cycles A.C. only.
8. The capstan speed should be checked with the stick-on stroboscope provided. Place stroboscope on capstan shaft with sticky side down and view rotating shaft under 60 cycle light. If the speed is not correct the spokes will appear to rotate. Slight speed changes can be realized by change in capstan drive motor pressure. This adjustment is at spring D, Fig. 1 on the motor solenoid draw bar. Increasing pressure will slow the capstan, decreasing pressure will speed the capstan. Adjust for no rotation of the stroboscope spokes.
9. Load the left hand reel holder with tape and thread as shown in Fig. 5. Be sure the tape used has the oxide-coated side toward the rear of the machine; i.e., toward the head faces.
10. A reel hold-down or editing knob should be placed on each reel spindle and pushed down firmly. To remove the hold-down, raise the tongue on the side of the knob with the finger and lift off. Do not touch the tongue when placing the hold-down on.

The machine is now ready to operate.

MECHANICAL OPERATION

When the machine is ready to operate, turn on the power switch, see Fig. 5. This turns on the amplifiers and control circuits. The capstan drive will also start if the tape has been threaded, as the takeup tension arm operates a switch which shuts the motors off when the tape runs out. Pushing the Start button will now start the tape moving according to the mode selected on the Play, Rewind, Fast Forward control. In the Play position the tape will be reproduced at the output terminals. Pushing the Record button will permit an input to the machine to be recorded on the tape with almost simultaneous playback of the new program. Pushing the Stop button will stop the machine and turn off the recording amplifier; therefore, one must always push the Start and Record buttons, in that order, to record. The mode selector switch allows transfer from Play to Rewind or Fast Forward without pushing the Start button when switching. This helps greatly in editing and segueing. However, when going from Rewind to Play, the machine shuts off and the Start button must be used to restart the tape motion.

If, when the tape is running in Play, it is desired to accelerate or slow the tape it may be done as follows:

To Slow the Tape: Hold the Start button down and push the Stop button for the length of time desired. Upon releasing the Stop button the tape is again up to speed.

To Accelerate the Tape: Move the selector to the Fast Forward position. Return to Play when desired.

These two motions are useful when cueing, segueing or synchronizing programs. This can only be accomplished by reason of the rapid start feature incorporated in this machine.

ELECTRONIC OPERATION

(WHEN SET UP AS IN ELECTRONIC ALIGNMENT)

I. Machine Without Meter Control Panel:

A. Feed machine with $+ 4$ V.U., machine output $+ 4$ V.U., see Fig. 10C.

II. Machine With Bridging Input Meter Control Panel:

A. See Fig. 10A.

B. Level is set by adjusting Playback Level step control to 14, and adjusting Record Level step control until output level meter reads $+ 4$ V.U. operating level.

C. Input level must be greater than -10 V.U.

D. On Playback, any tape from any machine can be played back at $+ 4$ V.U. by adjusting Playback step control.

III. Machine With Matching Input Meter Control Panel:

A. See Fig. 10B.

B. For inputs equal or greater than $+ 4$ V.U.:

Adjust Record Level step control for program level on meter switched to input or for program level on meter switched to output of playback with playback set as in II.

C. For inputs less than $+ 4$ V.U.:

Adjust R101 with Record step control wide open and meter on playback as in II.

ELECTRONIC ALIGNMENT

The following alignment procedure has been executed at the factory prior to shipping. No further adjustments should be necessary unless alterations occur in shipment or as required by routine maintenance.

A standard tape is available for alignment purposes and contains the following frequency run recorded at 15" per second:

	1 Kc for level adjustment (recorded 10 db. below recommended operating point).	
15 Kc	6400 cycles	
14 "	3200 "	
13 "	1600 "	
12 "	800 "	
11 "	400 "	
10 "	200 "	
9 "	100 "	
8 "	70 "	
	50 "	

I. (A) Alignment of Playback Circuits on Machines Without Meter Control Panel— Must Be Performed in Order Indicated:*

1. Thread standard tape on machine.
2. Connect 600 ohms termination on output with your program VI meter across termination.
3. Turn on A.C. power.
4. Set machine in PLAY position and 15 inch speed and push Start button.
5. Adjust output of 1 Kc. tone with Playback gain control R213 to read operating level on your meter.
6. Align playback head (see HEAD ALIGNMENT) on 15 Kc. tone for maximum output.
7. Adjust Playback HF Equalizer C205 for flat overall response (± 2 db. 50 cycles to 15,000 cycles).
8. Set playback level 10 db. lower because standard tape level is 10 db. below operating level.

(B) Playback Electronic Alignment With Bridging or Matching Meter Control Panel:

1. Thread standard tape on machine.
2. Turn on A.C. power.
3. Set Playback Level control to 4. (This allows you to make frequency runs at operating level on meter instead of -10 d.b.)
4. Start tape.
5. Adjust R213 (now on panel) so panel VI reads 0 on 1 Kc. test tone.
6. Align playback head gap on 15 Kc. tone. (See HEAD ALIGNMENT.)
7. Adjust Playback Equalizer (C205) for flat response.
8. Set Playback Level control at 14. (This drops amplifier gain 10 db. for normal operation.)

II. Alignment of Record Circuits (After Playback Alignment) — With or Without Meter Control Panel:

1. PRELIMINARY

A. Units without Meter Control Panel:

Connect monitor amplifier, 600 ohms termination, and meter on output of Playback.

B. Units with Meter Control Panel:

Connect monitor amplifier and termination to Meter Control Panel Line Out terminals, and set Line Cue switch on line.

A. & B. Place blank reel of M.M.M. 111 tape on machine and set into operation on the 15 inch per second Record position.

*NOTE: All step controls located on Meter Control Panel.

2. NOISE TEST:

Detach record cable from Record Amplifier. Place a 1 microfarad condenser across 600 ohm output termination on playback amplifier. This is to remove 70 Kc. components from noise measurements. Noise should read 40 db. below standard tape level (50 db. below operating level). If noise is too high and is crackling in nature, demagnetize heads — especially playback head (see HEAD DEMAGNETIZATION). Noise can be measured by using a Hewlett-Packard noise and distortion analyzer, VTVM type 400 A, or any approved method. (If noise with machine standing is higher than above, check input tube of Playback Amplifier.)

3. ERASE ADJUSTMENT:

It should not be necessary to make this adjustment except at rare intervals because of the high degree of stability of the oscillator circuits. Do not make this adjustment unless erase head will not erase previous program. Do not readjust erase to attempt to eliminate crackling tape noise, as the erase current does not produce crackling even if out of adjustment. If adjustment is indicated, the following procedure must be taken:

- A. Pull out Erase Cable from Record Chassis plug (J103P).
- B. Make adapter plug by inserting 10 ohm resistor in series with ground side of erase cable.
- C. Insert adapter in J103P, insert cable into adapter.
- D. Place VTVM such as Hewlett-Packard 400A across 10-ohm resistor. Set on 3 volt scale. Full scale will read 300 Ma. record current.
- E. Loosen Erase Trimmer C120 for minimum capacity and slowly increase capacity until meter indicates 250 Ma. erase current. The erase is now properly adjusted.

4. BIAS ADJUSTMENT:

- A. Plug in record head.
- B. Remove 1 microfarad condenser from output.
- C. Connect audio oscillator to input of machine. Turn oscillator on and set to 1 Kc.
- D. Set record level so that it reads approximately standard tape level.
- E. Turn Bias Control (R126) fully counter-clockwise. Then turn in a clockwise direction slowly (increasing bias), until the 1 Kc. tone is recorded at its highest level. Increase further until 1 Kc. drops 2 db. in level. This is the correct bias adjustment.

5. RECORD NOISE ADJUSTMENT (D.C. BALANCE):

- A. Replace 1 microfarad condenser across 600 ohm termination on playback output.
- B. Remove audio oscillator from input and short record input terminals.
- C. Adjust Noise Balance control (R117) until crackling disappears. If noise is not at least 40 db. below standard tape level (50 db. below operating level), demagnetize playback head and record head.

6. RECORD EQUALIZER:

- A. Remove 1 microfarad condenser from playback output.
- B. Reconnect audio oscillator to input of Record Amplifier.
- C. Adjust Record Level (R101) so that standard tape level is effected on output of playback amplifier. This is the level at which all frequency response measurements should be made in order to prevent tape saturation.
- D. Set oscillator at 15 Kc. and align record head for maximum output. (See HEAD ALIGNMENT.)
- E. In order that frequency runs not be made on the insensitive range of the VI meter, playback gain may be raised 10 db. and returned to normal after run as in I.
- F. Sweep the oscillator across audio spectrum and adjust Record H.F. Equalizer C103 on Record Chassis for flat response (± 2 db., 50 – 15,000 cycles) as read on playback output.

7. RECORD LEVEL ADJUSTMENT:

In all cases, connect audio oscillator to the input of the machine and adjust level to +4 V.U. program level at 1 Kc. On machines with a Meter Control Panel, the input of the machine is at the Line In terminals on the Meter Control Panel terminal strip.

A. *Units without Meter Control Panel:*

With machine running at 15 inch speed in Record, set Record Level control (R101) so that correct operating level is read on playback.

B. *Units with matching Meter Control Panel:*

Same as A. with Record Level step control wide open.

C. *Units with bridging Meter Control Panel:*

Same as A. with Record Level step control set at 14. When adjusted in this manner, proper record level can be obtained from a -10 V.U. line by turning the Record Level step control on the Meter Control Panel wide open.

ELECTRONICS SPECIAL CONSIDERATIONS

I. Do not remove any tube from the Record Amplifier while the machine is recording, as the record head may become magnetized. Should this occur it will be necessary to demagnetize same.

II. Warning! The input tube in the playback amplifier is D.C. heated by returning the B supply through its heater. F101 (fuse) is selected to protect the input tube against abnormal heater surges. A101 (Neon indicator) will light in the event of failure of the playback input tube heater or the 1/4 ampere protective fuse F101. **SHOULD THIS HAPPEN, THE CAN OF THE INPUT CONDENSER C113 WILL BE AT A HIGH POTENTIAL WITH RESPECT TO GROUND AND FOR THIS REASON IS PAPER COVERED. C113 SHOULD THEREFORE BE REPLACED ONLY WITH CONDENSERS HAVING INSULATED COVER.** F101 and A101 are located on top of Record Amplifier and Power Supply Chassis. **DO NOT REMOVE INPUT TUBE WITH POWER ON,** as damage to C114 may result. **DO NOT REPLACE F101 WHILE NEON BULB IS LIGHTED,** or fuse will blow.

III. Setting of Bleeder Resistor R120:

The current through the high voltage supply is 145 Ma.

During Playback, pole 3 of Record relay K101 transfers the B supply from the Erase oscillator circuit to bleeder resistor R120 (located on underside of Record Amplifier and Power Supply Chassis), which should be adjusted to maintain the same current in playback as when recording.

IV. Dummy Plugs:

There are two plugs type A567 which have pins 1 and 2 jumpered and also pins 7 and 8 jumpered. These plugs must be used in order for the machine to operate properly. The first must be plugged in the Remote Control Socket located on the Power Outlet Panel underneath the top plate (Fig. 1). The second plugs in socket J105S located on the top rear of the Record and Power Supply Chassis, which is clearly marked in Fig. 9. The latter of these plugs is to be removed only in the event of connection to this power supply of the AMPEX mixer pre-amplifier used on the portable model. The former is to be removed only in the event that a remote control cable is used, and then this in turn must be left in the socket.

V. Playback Cable:

Do not attempt to lengthen or change playback cable for any reason because cable capacity is used to resonate the playback head. Serious frequency discrimination will occur if this is disregarded.

VI. When disconnecting any solenoid or motor, observe polarity of the leads, as all leads have been arranged so as to produce the minimum hum fields.

AMPEX SERVICE TAG

1. USE

- 1.1 SERVICE TAG (AMPEX) shall be attached to each item of material returned from the field.

2. ORIGINATION

- 2.01 FROM - Print the name of the installation from which the material is being returned.
- 2.02 ADDRESS - Print the address, city, and state in which the installation is located.
- 2.03 Give the code number and the name of the equipment being returned, and the serial number of the machine on which the item was replaced.
- 2.04 REASON FOR RETURN - Explain the defect in detail. When returning a transformer state "Grounded to case", "Short circuited windings", "Open circuited", etc. Do not use explanations such as "Defective", "N.G.", etc.
- 2.05 QUANTITY - A separate tag must be issued for each item being returned.
- 2.06 DAYS-HOURS USED - For "Complaint" returns give the number of days or hours used. This is important.
- 2.07 REPLACING SSA NO. - Give the number of the SSA, Form ASC-70, on which the replacement material is being ordered.
- 2.08 DIVISION - Give the name of the division.
- 2.09 INSPECTOR - To be signed by the Inspector.
- 2.10 DATE - Show date of origination of complaint.
- 2.11 CREDIT RETURNED ARTICLE TO - Indicate whether complaint, surplus, or for repair.

3. DISTRIBUTION

- 3.1 Attach to material.
- 3.2 Return defective equipment to Division Office where Ampex invoice number will be added to tag and equipment re-shipped to Ampex Electric Corporation for credit.

HEAD HOUSING

The head housing, see Fig. 5, is a die cast assembly which contains the three heads used in the recording process. The heads are respectively erase, record and playback as viewed from left to right when facing the machine. The gate on the housing holds the playback and record shield covers and the tape-lifting fingers. The function of the tape-lifting fingers is to remove the tape from the heads when the gate is open during Rewind or Fast Forward operation. This reduces head wear considerably. The tape may leave a deposit on the heads if allowed to contact them at high speeds. Such a deposit will seriously impair the performance of the machine and should be guarded against by always opening the gate on Fast Forward and Rewind. If a deposit is left, it may be easily removed with carbon tetrachloride on a soft rag. Never use metal of any kind to touch the head surfaces.

HEAD ALIGNMENT

Remove the top cover from the head housing by removing the two screws from the top of same, and pulling cover gently back and up.

Looking at the head housing from the front, the three heads from left to right are: erase, record and playback.

The azimuth angle of the erase head requires no adjustment, and should not be touched.

The record and playback heads should be aligned only after reading and fully understanding the procedure under ELECTRONICS ALIGNMENT.

The actual physical alignment of the record and playback heads consists of placing a 1/4" spintite socket wrench on the left hand elastic stop nut in each head and adjusting back and forth until the proper azimuth angle is arrived at. This is accomplished by first playing the standard tape and adjusting the playback head until maximum response is obtained on the 15,000 cycle tone. The record head is then aligned with the playback head by recording 15,000 cycles on a blank tape, and adjusting the record head for maximum playback output.

HEAD DEMAGNETIZATION

Occasionally the heads become magnetized through some electrical fault which may occur in the amplifiers or by coming into physical contact with a magnetized object. In order to demagnetize these heads completely in such events, a demagnetizer should be used. A demagnetizer suitable for this purpose is manufactured by AMPEX as an accessory item. In the event, however, that time does not permit the owner of the machine to wait for delivery of a demagnetizer, he may make one as follows: Cut a piece of transformer lamination to a $\frac{1}{4}$ " x 2" size. Wrap the strip of metal with suitable insulating material and wind approximately 400 turns of No. 36 wire and attach a 4' length of 2 connector cord. Bend the iron strip into a "U" shape and bring the ends of the "U" to a spacing of $\frac{1}{4}$ ". Connect to a 6 volt source of A.C., open the gate on the head housing and bring the ends of the "U" in contact with the 2 poles on the magnetized head. Remove the demagnetizer very slowly, allowing the A.C. field to die off gradually. Repeat this operation on record and playback heads only, as the erase head will demagnetize itself. In the event demagnetization is not effected, repeat the process more carefully.

The capstan may become magnetized by contact with a magnetized tool. Should this occur it may be demagnetized with an A.C. solenoid placed over the shaft and slowly pulled away.

DRIVE SYSTEM

The drive system employs three motors. Two induction motors with solenoid operated brakes are used for take-up and rewind. These motors are shown in Fig. 7 and require no service attention! The torque of these two motors is adjusted at the factory by means of resistors R401, R402 and R403 and should be left alone unless shipping damage to the resistors has occurred. Both motors are adjusted for a tension of 5 to 6 ounces pull on the reel hub in Play. R402 is adjusted for the maximum hold-back tension during Fast Forward and Rewind which will still allow the tape to accelerate when starting with a full reel.

The third motor is the synchronous motor used for capstan drive. If this motor has oil cups it is a sleeve bearing type and requires S.A.E. 30 oil at three month intervals. If motor is a sealed ball bearing motor, no service is required. This motor is mounted on a spring hinge which is moved by a solenoid to engage the motor and the capstan flywheel. In the rack mounted position the additional spring "B" must be attached.

When the machine is turned on and the tape threaded into position, the solenoid "C" pulls the motor into engagement with the capstan flywheel tire and drives it. The pressure between the motor and flywheel is adjustable at spring "D" and is adjusted to give synchronous speed as described in INSTALLATION.

The capstan shaft has a permanently lubricated ball bearing at the bottom end to take the flywheel load and to maintain a minimum of friction, see Fig. 2. The upper bearing on the shaft is a precision bronze sleeve bearing which permits absolutely true running of the capstan. This bearing must be oiled with S.A.E. 30 motor oil. This should be done every six months. To oil: Loosen set screw in dust cap surrounding the capstan shaft just below the tape contact point. Push the rubber idler wheel away from the shaft just enough to allow the cap to be removed. This exposes a felt washer which covers the oil hole. Remove this washer and oil through the larger of the two holes exposed. Fill until no more oil will enter! Replace as disassembled.

The mechanism of the capstan idler is operated by solenoid "E" in Fig. 1 and is returned by spring "A." Capstan idler pressure is set so that it will just deform the tape if the tape is stopped with the hand while the machine is running. This pressure is adjusted at point "F" in Fig. 1. A drop of oil on all bearing surfaces of this mechanism at six month intervals is recommended. WARNING! Under no conditions should any oil be allowed to come in contact with the rubber surfaces of the capstan idler and flywheel.

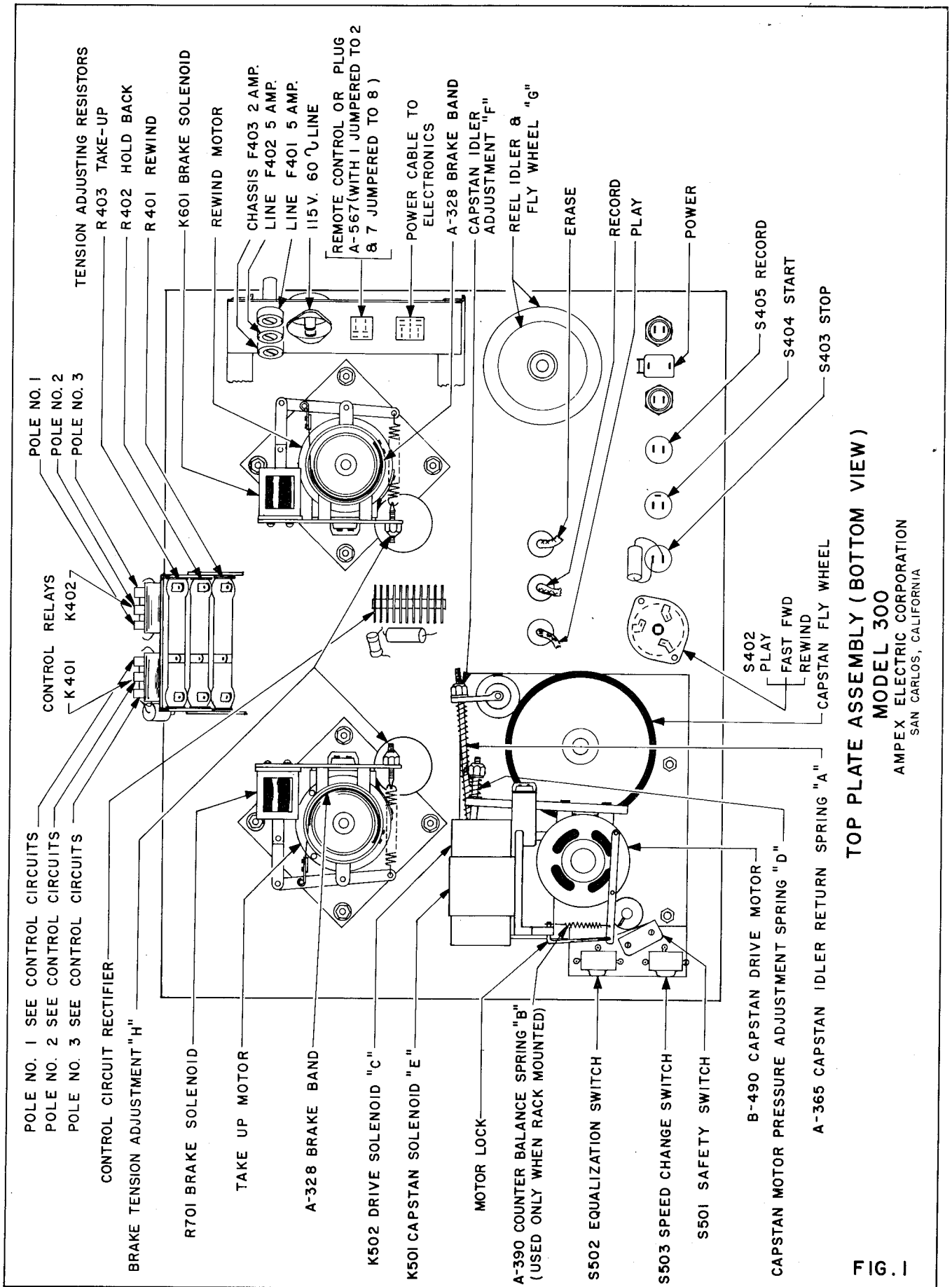
The reel idler is shown in Fig. 1 at "G." This shaft has two single shielded ball bearings. Factory lubrication is for the life of the bearings. Should these bearings require servicing or replacement the complete reel idler assembly should be exchanged for a factory reconditioned unit. The extremely low pulley run-out of this assembly is achieved by a final finish cut being taken while running on its own bearings after final assembly. Under no circumstance should the shaft be removed from the assembly, since in all probability the relationship of parts will be lost. This may result in the introduction of the reel idler period into the measurable flutter and "wow" components of the machine.

The mechanical brakes on the rewind and takeup motors ordinarily require *no* adjustments. Should trouble occur which appears to be due to faulty braking, the tension may be adjusted. The only adjustment on the brakes is performed by adjusting tension at "H" in Fig. 1. If machine throws a loop of tape on stopping, the trailing reel brake tension is too low, or if it breaks the tape the tension is too high. However, unless tampered with, the adjustment should be permanent until such time as the brake bands wear out.

Daily attention should be given to cleaning of the following:

1. Capstan shaft
2. Head faces
3. Tape guides

Clean all surfaces of the above with carbon tetrachloride applied with a soft cloth.

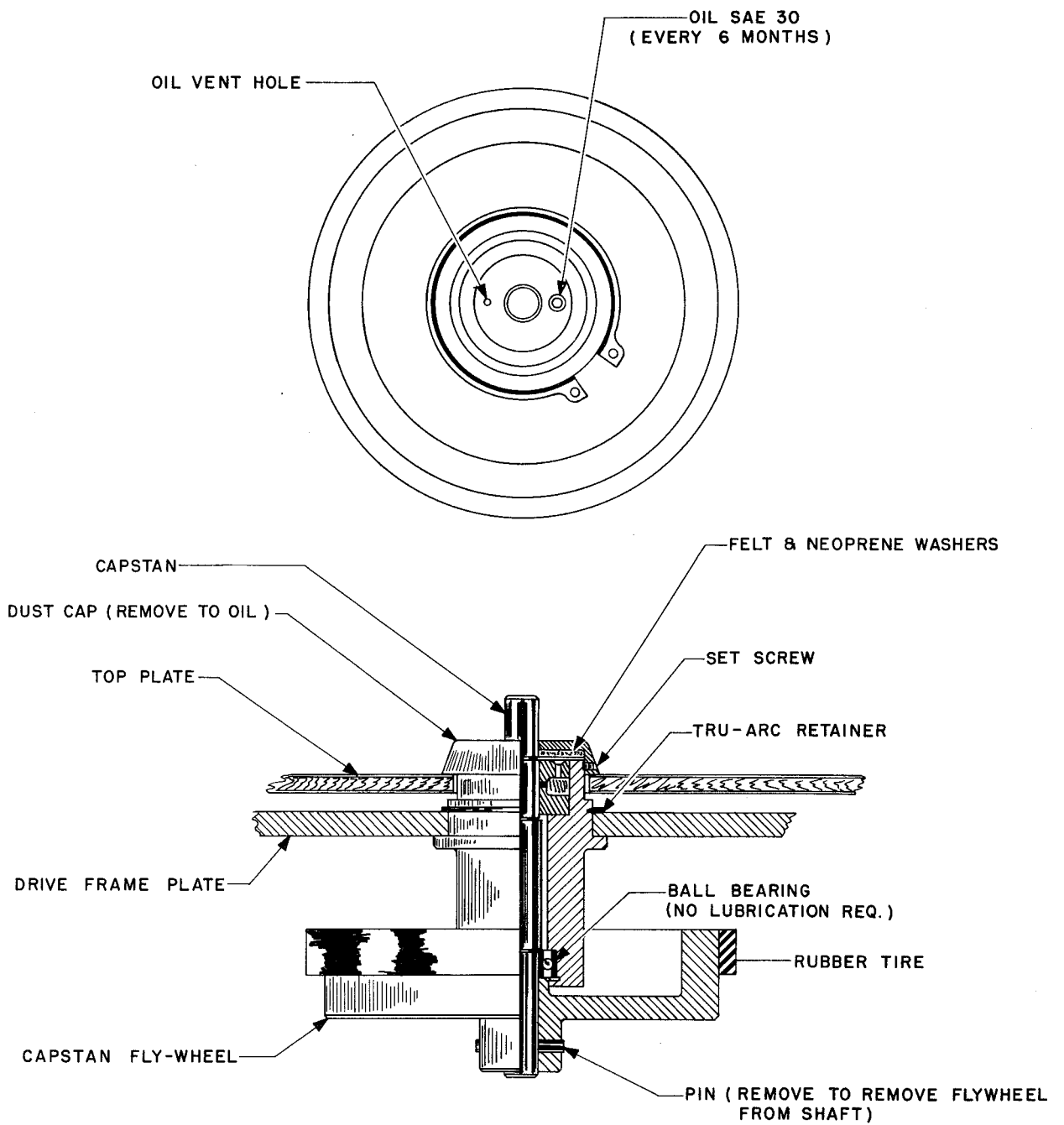


TOP PLATE ASSEMBLY (BOTTOM VIEW)

MODEL 300

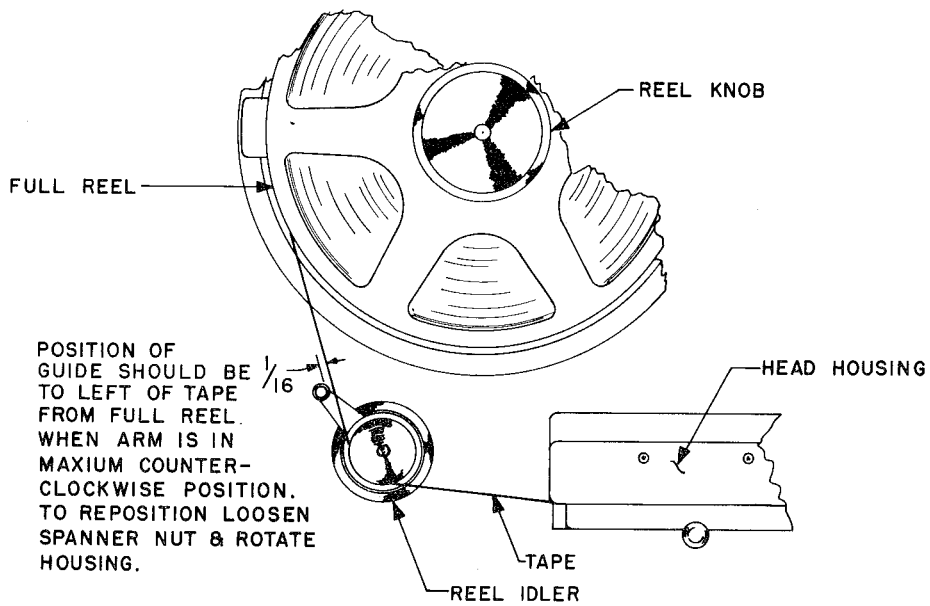
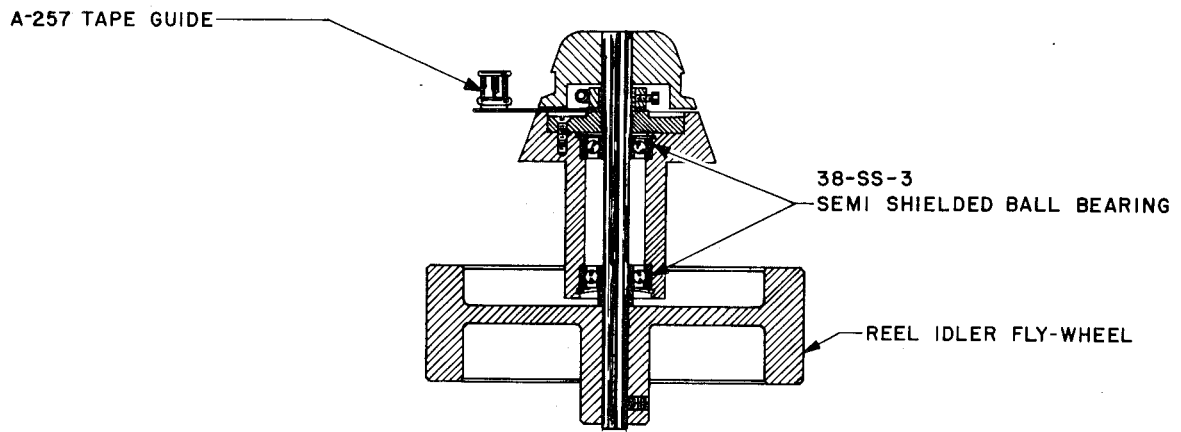
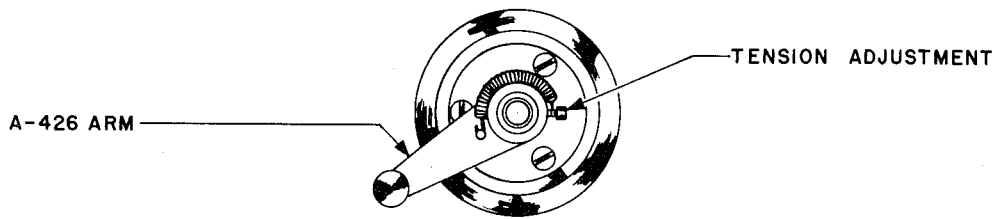
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

FIG. 1



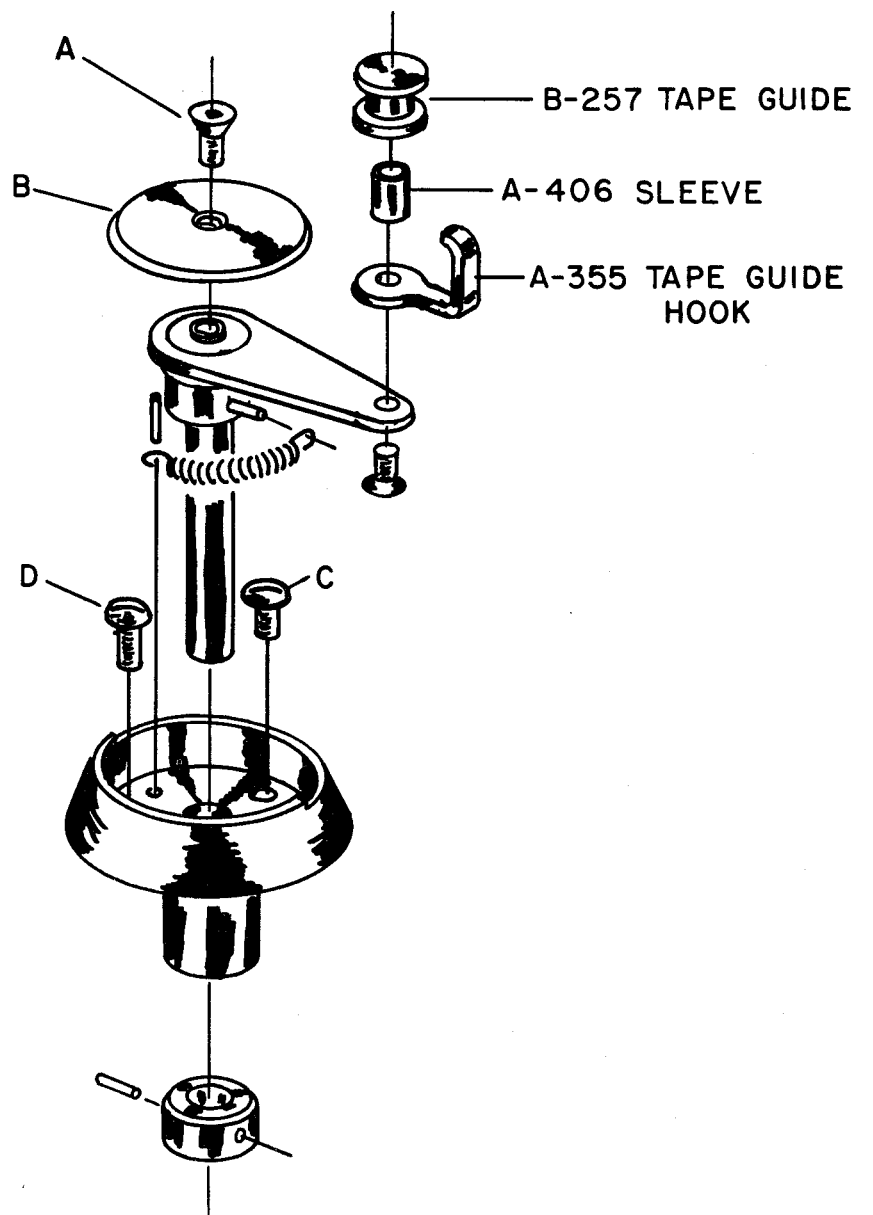
C-366
CAPSTAN ASSEMBLY
MODEL 300
 AMPEX ELECTRIC CORPORATION
 SAN CARLOS, CALIFORNIA

FIG. 2



MP-354
 REEL IDLER ASSEMBLY
 MODEL 300
 AMPEX ELECTRIC CORPORATION
 SAN CARLOS, CALIFORNIA

FIG. 3

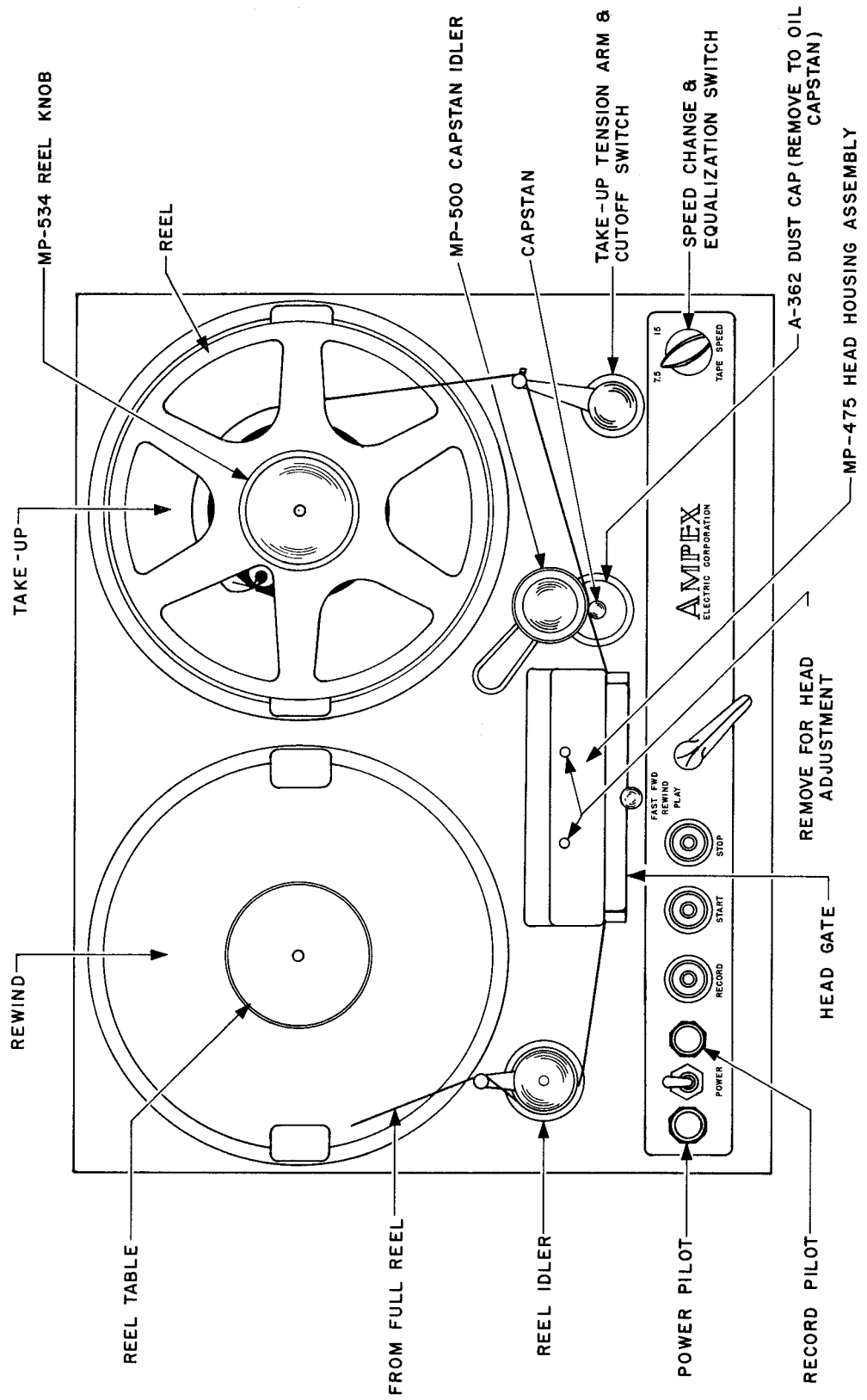


TO REMOVE ASSEMBLY FROM TOP PLATE REMOVE
SCREW A, DISC B & SCREWS C & D. LIFT OUT.

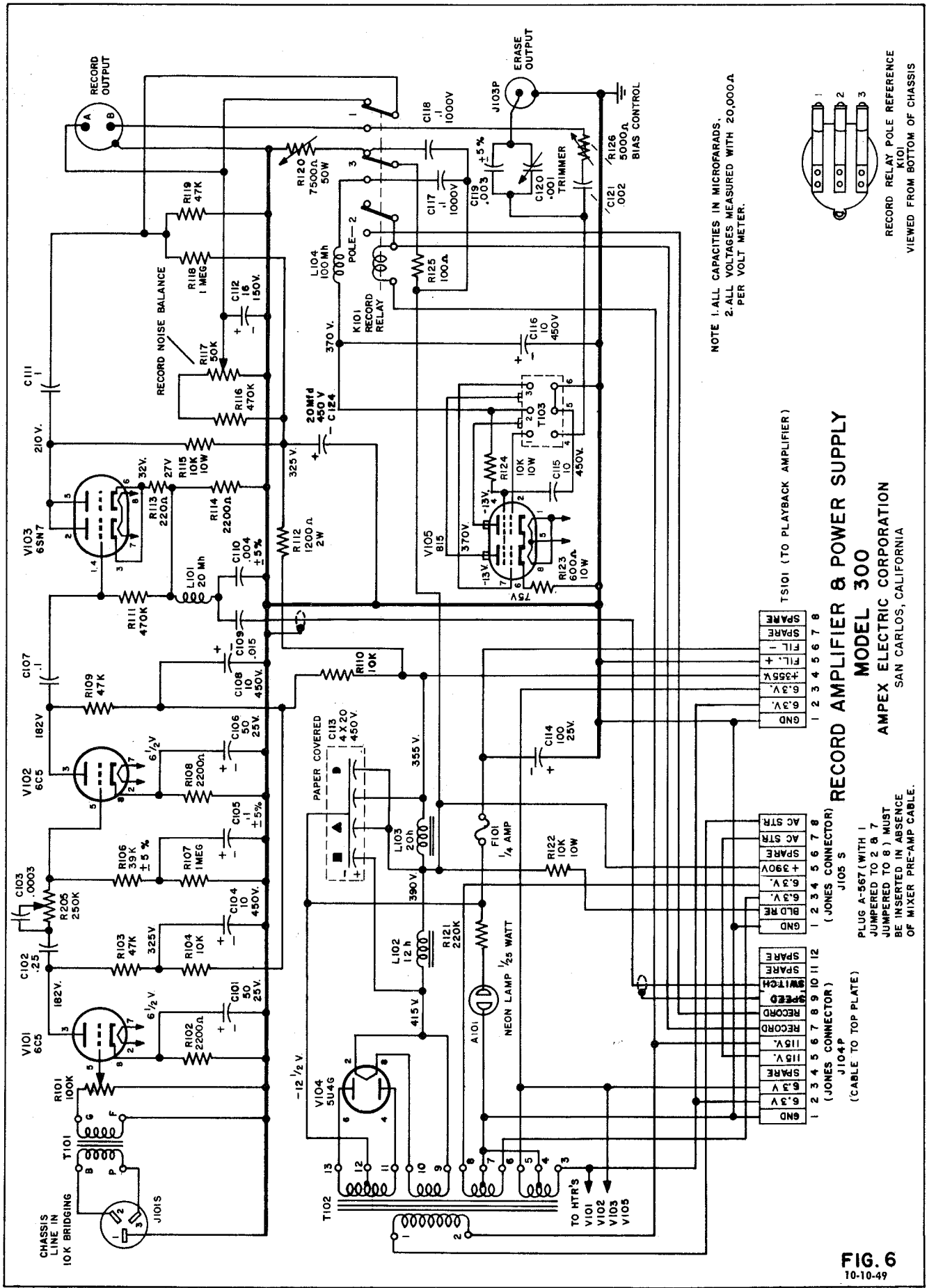
DO NOT OIL ASSEMBLY

MP-425
TAKE-UP TENSION ARM ASSEMBLY
MODEL 300
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

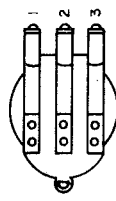
FIG. 4



MP-511
TOP PLATE ASSEMBLY (TOP VIEW)
MODEL 300
 AMPEX ELECTRIC CORPORATION
 SAN CARLOS, CALIFORNIA



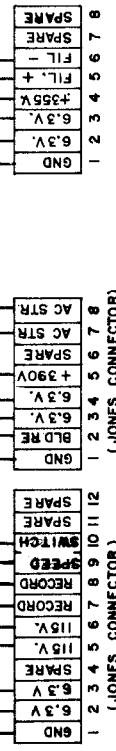
NOTE 1. ALL CAPACITIES IN MICROFARADS.
 2. ALL VOLTAGES MEASURED WITH 20,000A PER VOLT METER.



RECORD RELAY POLE REFERENCE
 K101
 VIEWED FROM BOTTOM OF CHASSIS

**RECORD AMPLIFIER & POWER SUPPLY
 MODEL 300**

AMPEX ELECTRIC CORPORATION
 SAN CARLOS, CALIFORNIA

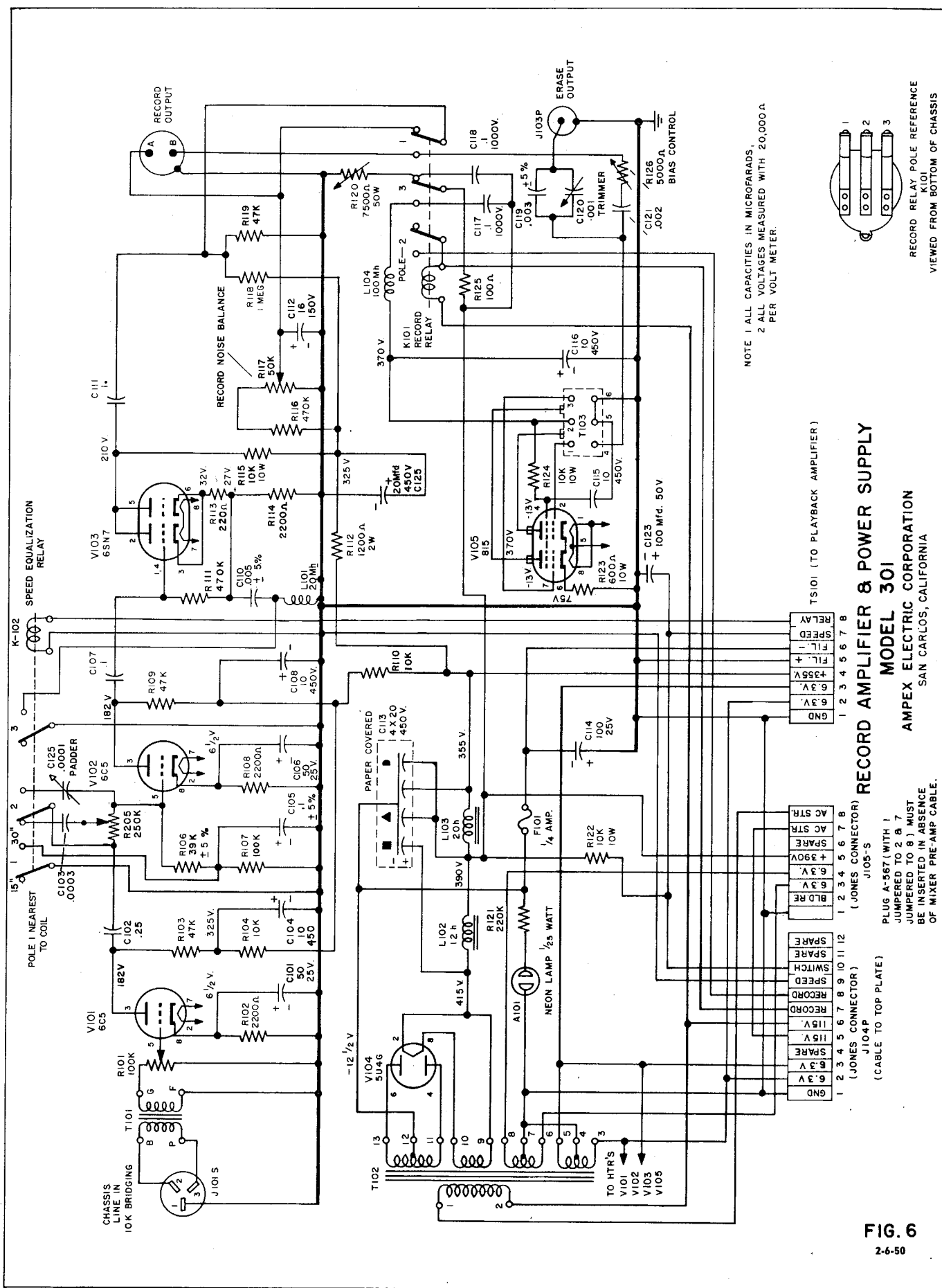


(CABLE TO TOP PLATE)
 (JONES CONNECTOR)
 J104P

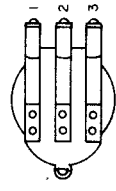
(JONES CONNECTOR)
 J105S

PLUG A-567 (WITH 1
 JUMPERED TO 2, 6, 7
 JUMPERED TO 8) MUST
 BE INSERTED IN ABSENCE
 OF MIXER PRE-AMP CABLE.

FIG. 6
 10-10-49



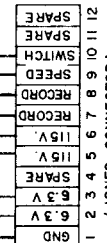
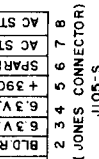
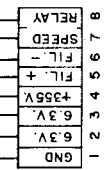
NOTE 1 ALL CAPACITIES IN MICROFARADS,
2 ALL VOLTAGES MEASURED WITH 20,000 Ω
PER VOLT METER.



RECORD RELAY POLE REFERENCE
K101
VIEWED FROM BOTTOM OF CHASSIS

RECORD AMPLIFIER & POWER SUPPLY MODEL 301

AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA



PLUG A-567 (WITH 1
JUMPER TO 2, 8, 7
JUMPER TO 8) MUST
BE INSERTED IN ABSENCE
OF MIXER PRE-AMP CABLE.

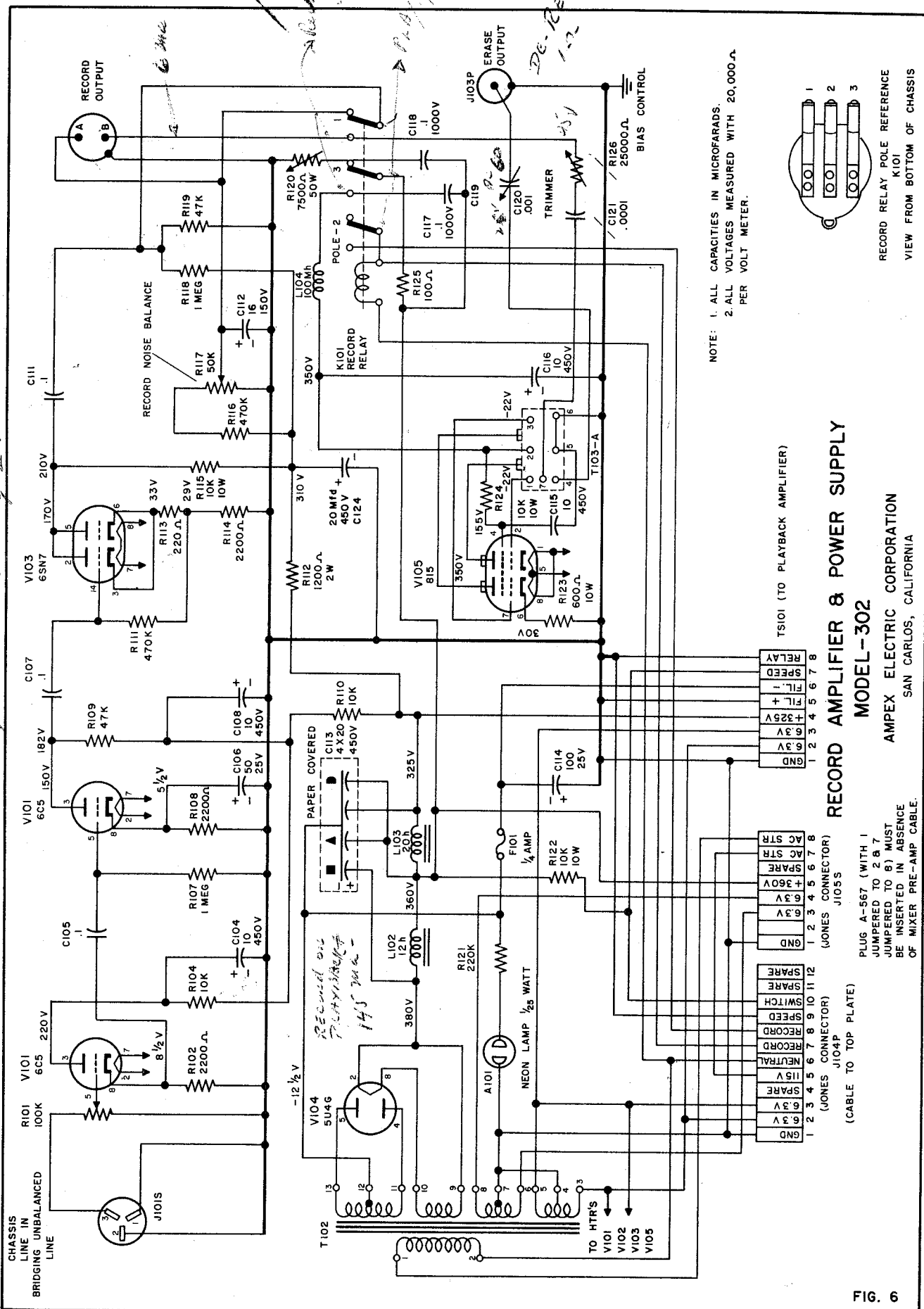
(CABLE TO TOP PLATE)

FIG. 6
2-6-50

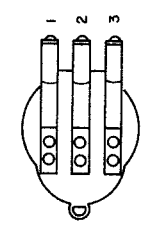
*Record Mtd
DC-R = 8.5 A*

*Oscillator Readings
350 Hz 40 dB - 6.5 59.7
180 Hz*

*It = 160 MA. Record on Playback
E = 400. 504-Field L102*



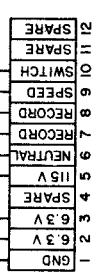
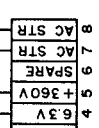
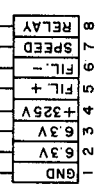
NOTE: 1. ALL CAPACITIES IN MICROFARADS.
2. ALL VOLTAGES MEASURED WITH 20,000 Ω PER VOLT METER.



RECORD RELAY POLE REFERENCE
K101
VIEW FROM BOTTOM OF CHASSIS

**RECORD AMPLIFIER & POWER SUPPLY
MODEL-302**

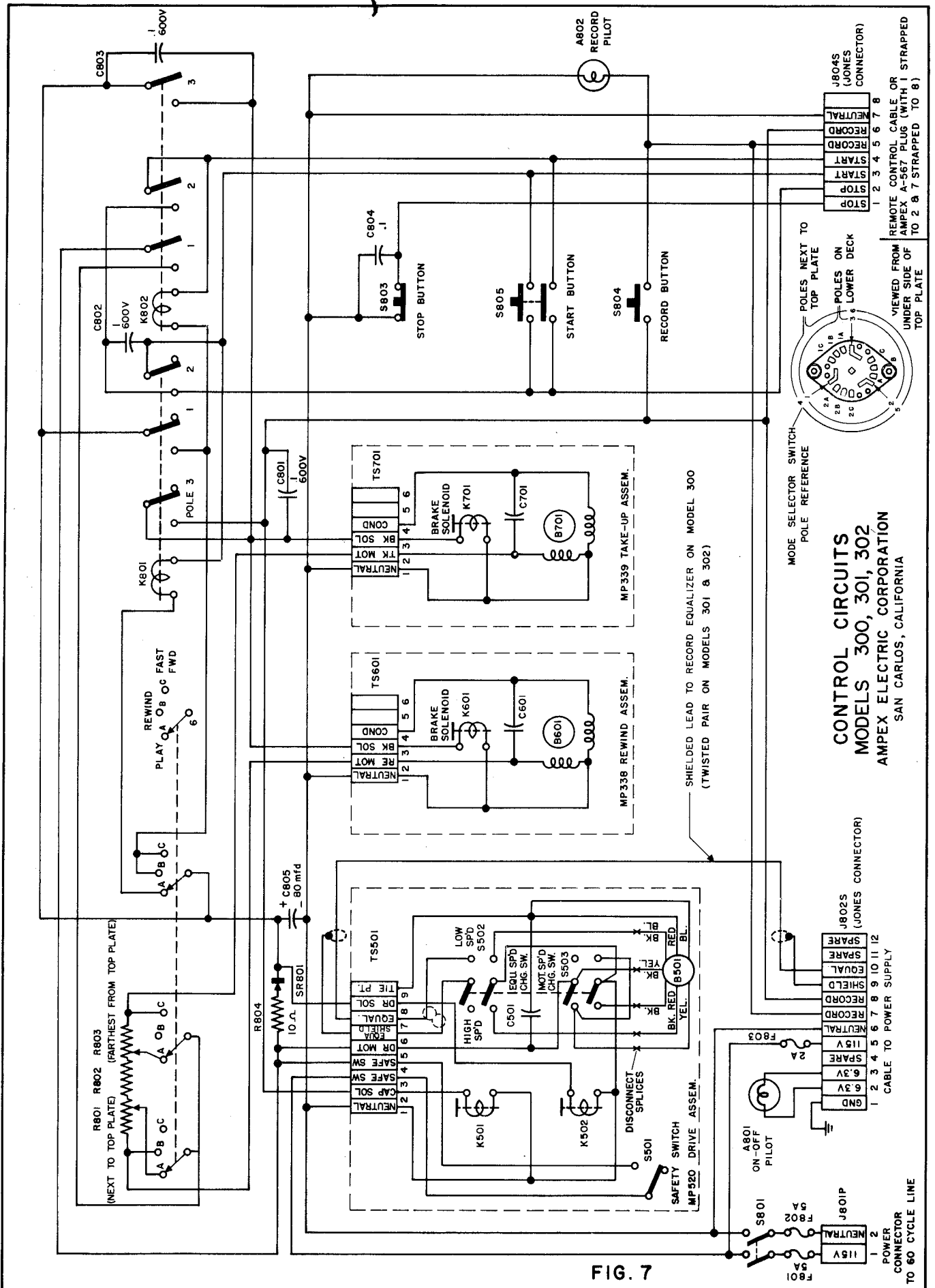
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

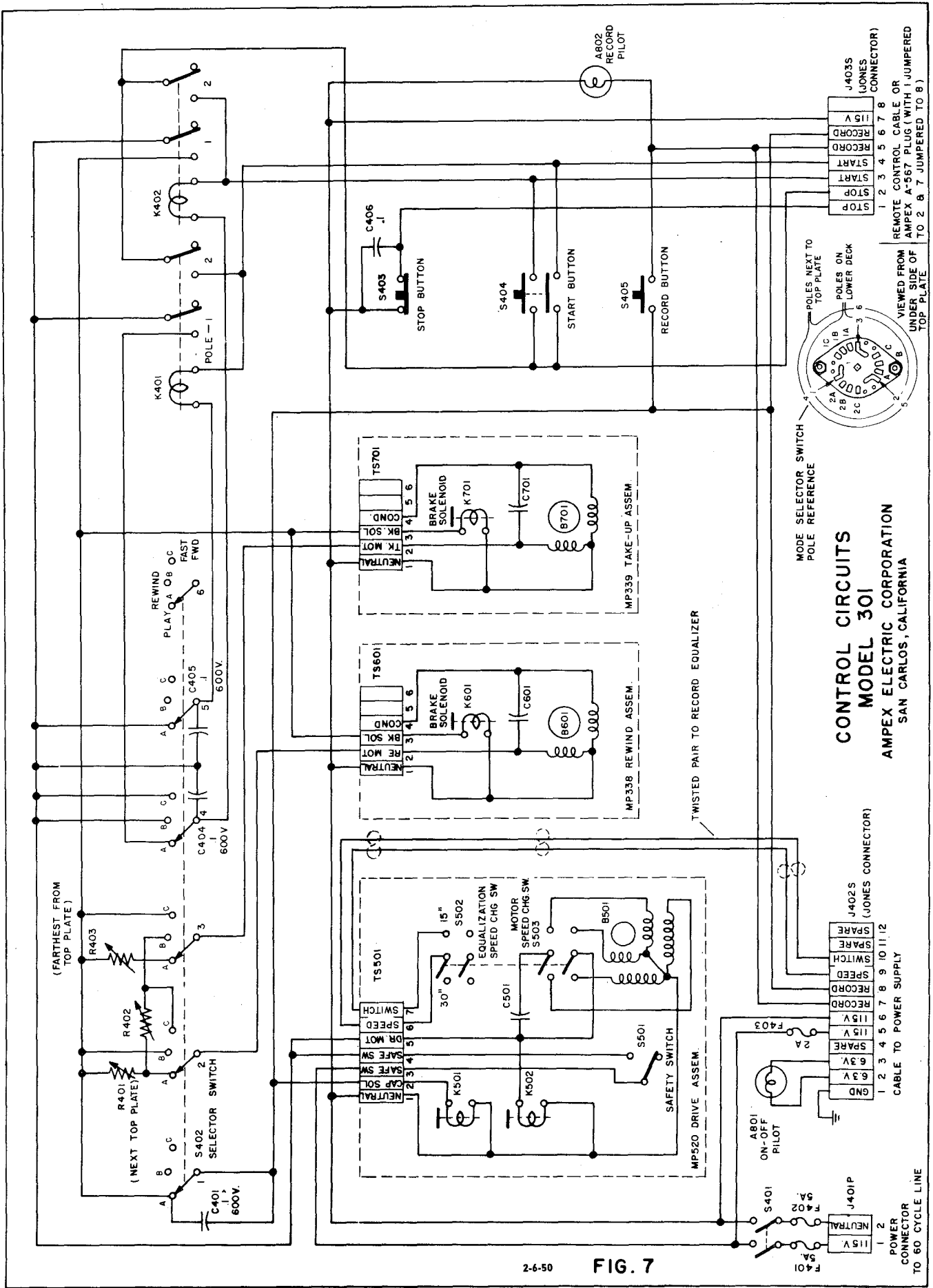


PLUG A-567 (WITH 1
JUMPERED TO 2 & 7
JUMPERED TO 6) MUST
BE INSERTED IN ABSENCE
OF MIXER PRE-AMP CABLE.

(CABLE TO TOP PLATE)

FIG. 6





2-6-50 FIG. 7

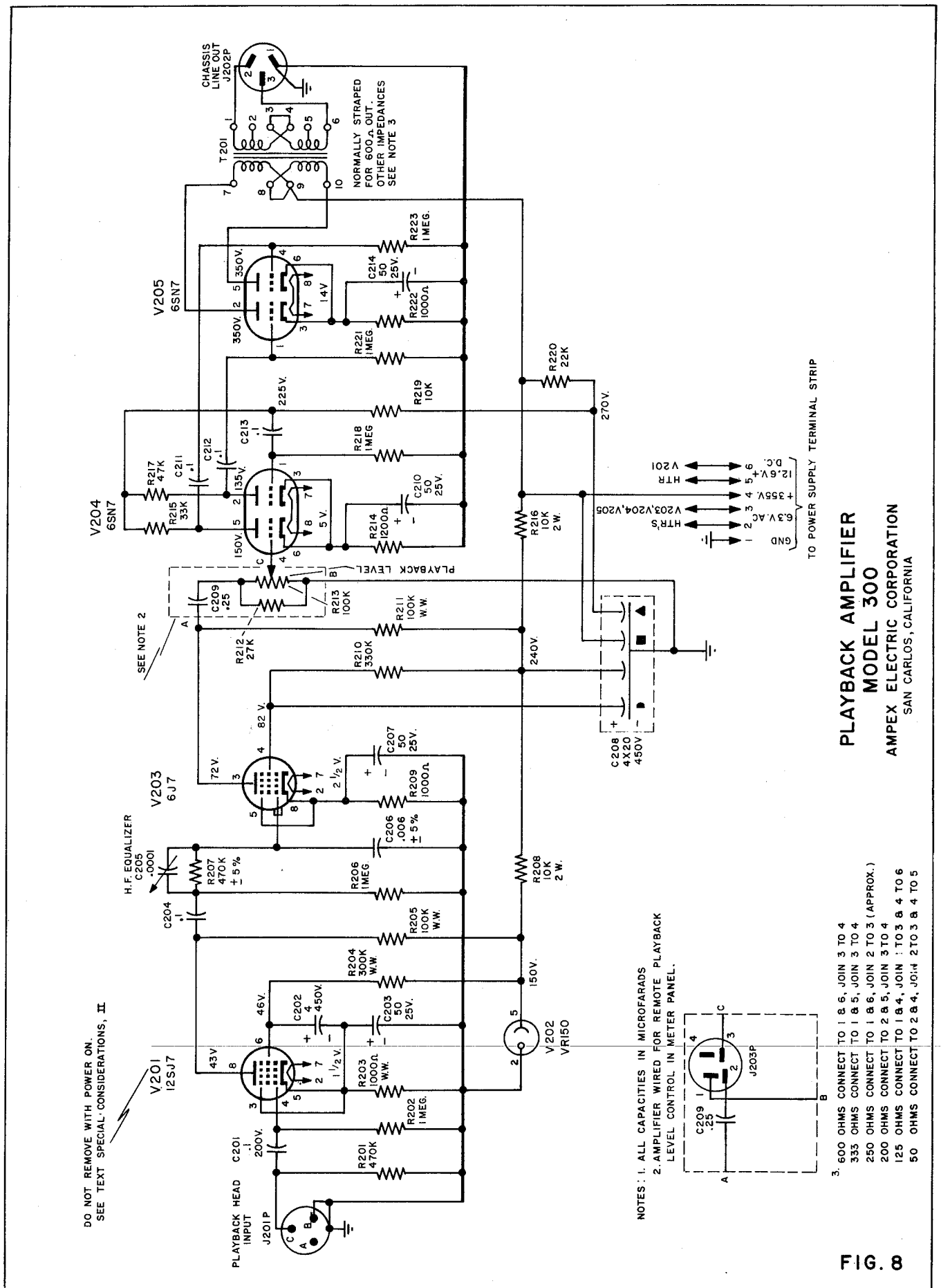
**CONTROL CIRCUITS
MODEL 301**
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

POWER CONNECTOR TO 60 CYCLE LINE

CABLE TO POWER SUPPLY

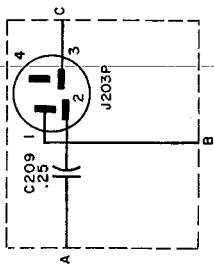
VIEWED FROM UNDER SIDE OF TOP PLATE

REMOTE CONTROL CABLE OR AMPEX A-567 PLUG (WITH 1 JUMPED TO 2 & 7 JUMPED TO 8)



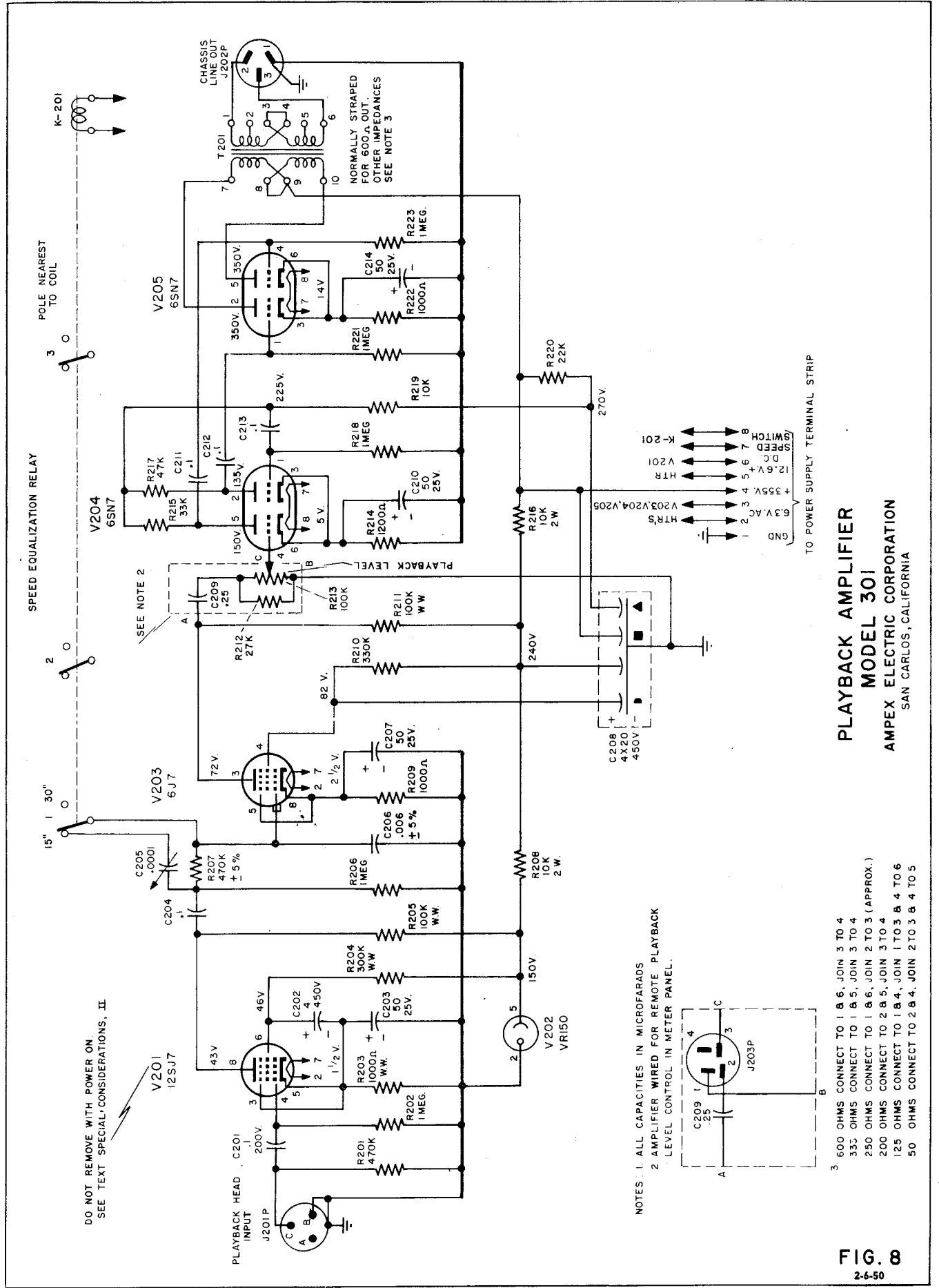
**PLAYBACK AMPLIFIER
MODEL 300**
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

- NOTES: 1. ALL CAPACITIES IN MICROFARADS
2. AMPLIFIER WIRED FOR REMOTE PLAYBACK LEVEL CONTROL IN METER PANEL.

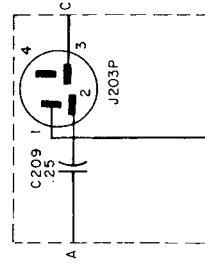


3. 600 OHMS CONNECT TO 1 & 6, JOIN 3 TO 4
333 OHMS CONNECT TO 1 & 5, JOIN 3 TO 4
250 OHMS CONNECT TO 1 & 6, JOIN 2 TO 3 (APPROX.)
200 OHMS CONNECT TO 2 & 5, JOIN 3 TO 4
125 OHMS CONNECT TO 1 & 4, JOIN 1 TO 3 & 4 TO 6
50 OHMS CONNECT TO 2 & 4, JOIN 2 TO 3 & 4 TO 5

FIG. 8



NOTES: 1. ALL CAPACITIES IN MICROFARADS
2. AMPLIFIER WIRED FOR REMOTE PLAYBACK LEVEL CONTROL IN METER PANEL.

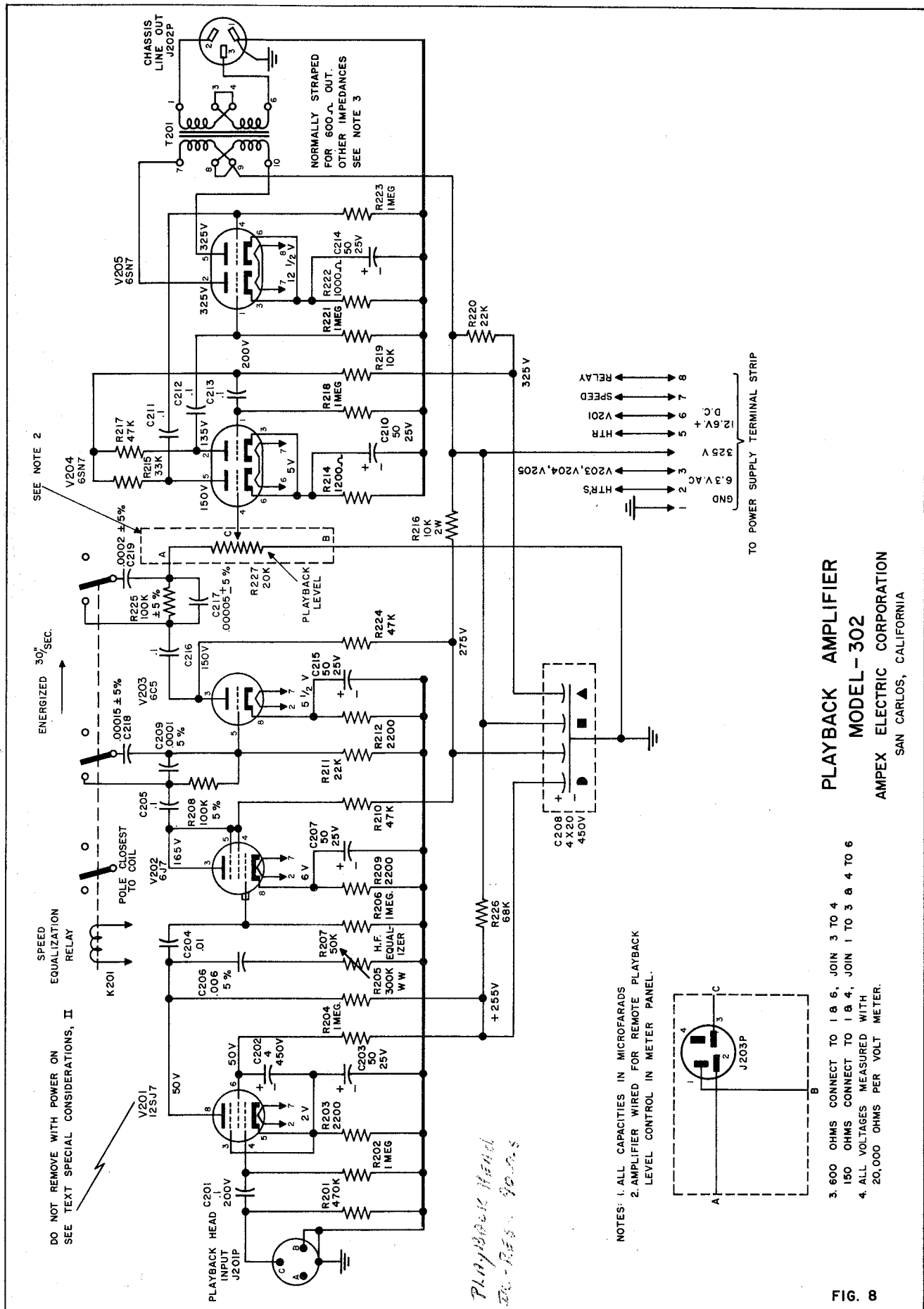


- 3. 600 OHMS CONNECT TO 1 & 6, JOIN 3 TO 4
- 333 OHMS CONNECT TO 1 & 5, JOIN 3 TO 4
- 250 OHMS CONNECT TO 1 & 6, JOIN 2 TO 3 (APPROX.)
- 200 OHMS CONNECT TO 2 & 5, JOIN 3 TO 4
- 125 OHMS CONNECT TO 1 & 4, JOIN 1 TO 3 & 4 TO 6
- 50 OHMS CONNECT TO 2 & 4, JOIN 2 TO 3 & 4 TO 5

PLAYBACK AMPLIFIER MODEL 301

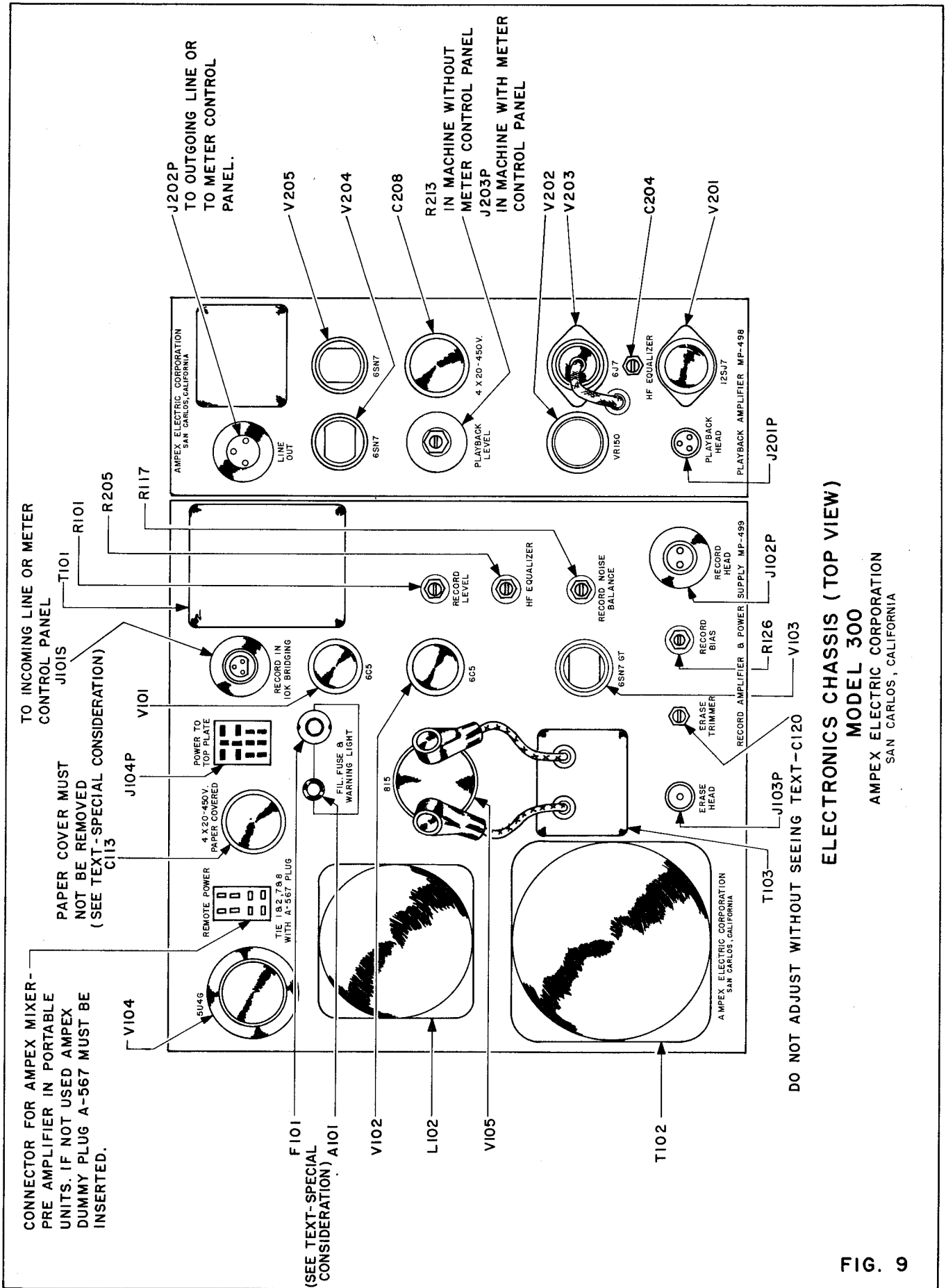
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

FIG. 8
2-4-50

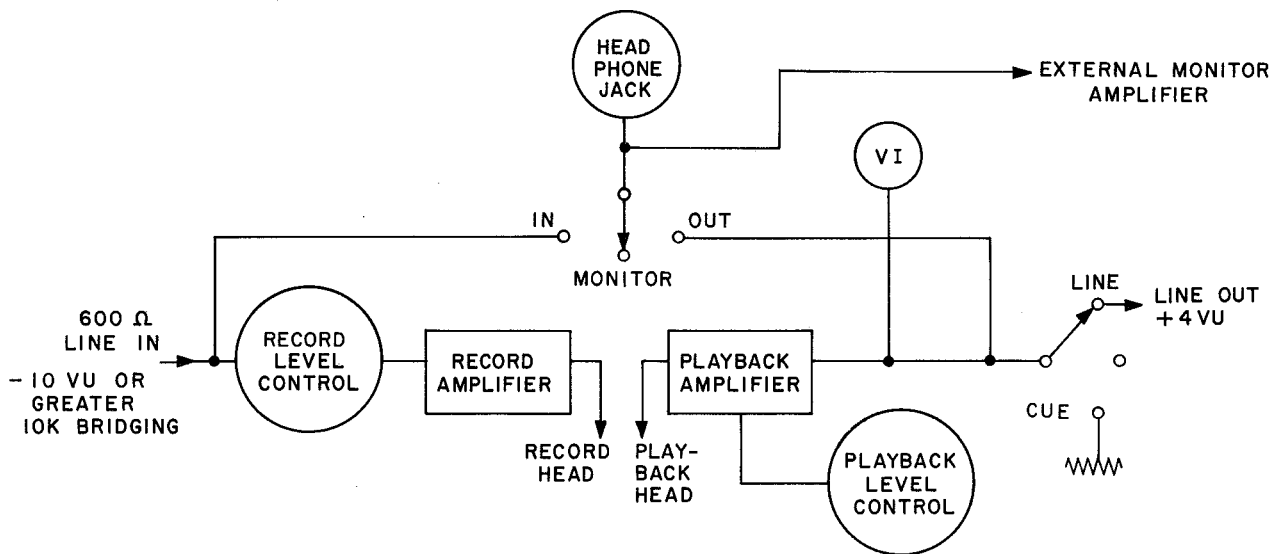


**PLAYBACK AMPLIFIER
MODEL-302**
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

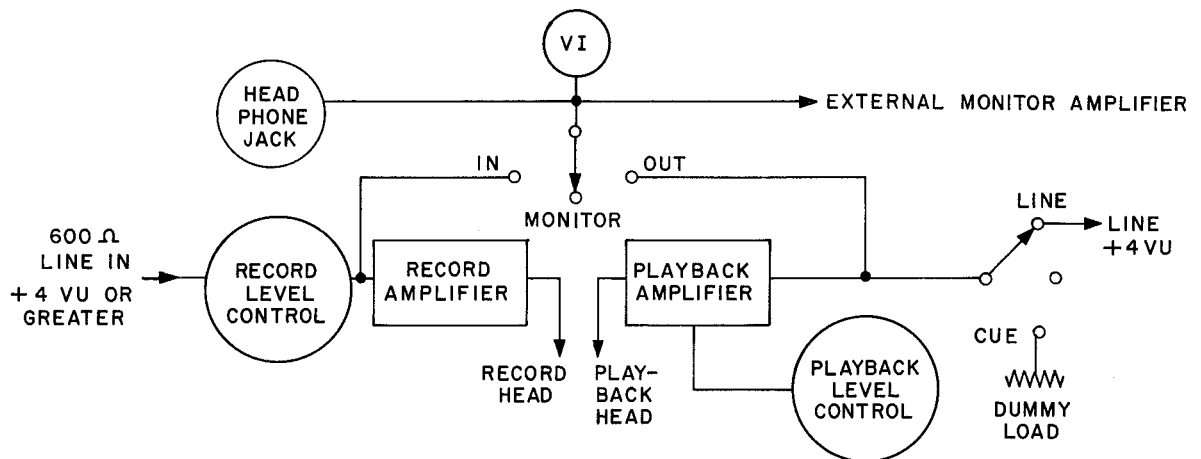
FIG. 8



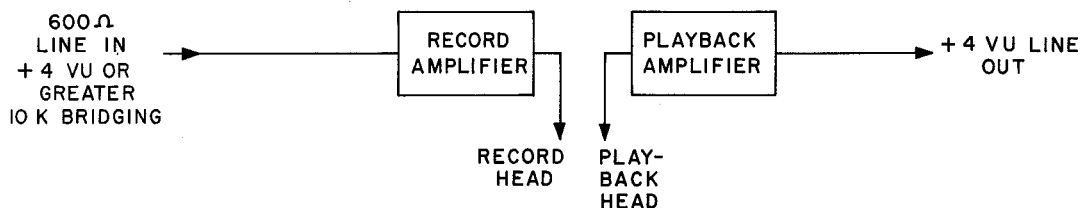
ELECTRONICS CHASSIS (TOP VIEW)
MODEL 300
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA



(A) LAYOUT FOR BRIDGING METER CONTROL PANEL



(B) LAYOUT FOR MATCHING METER CONTROL PANEL



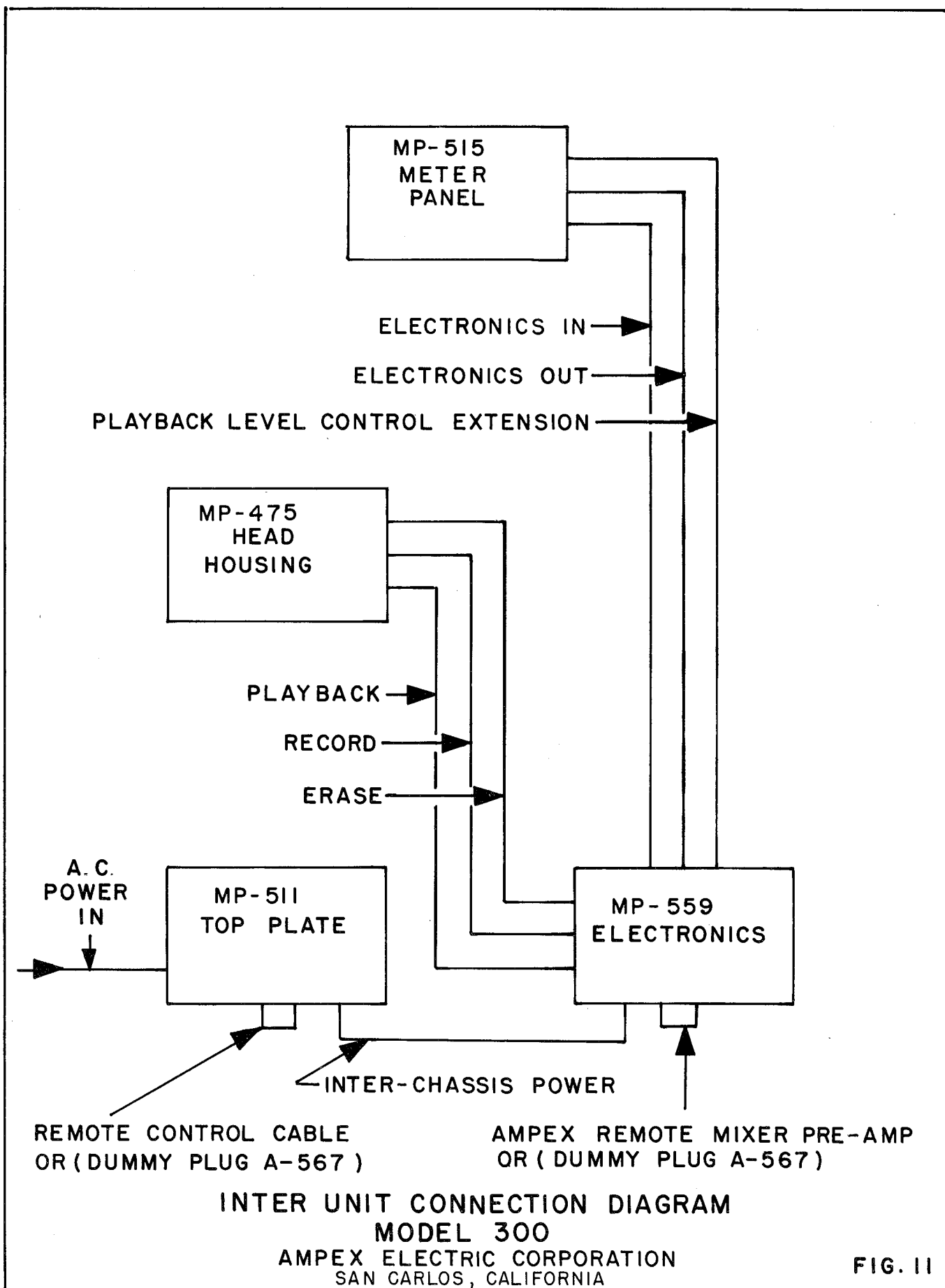
(C) LAYOUT OF ELECTRONICS WITHOUT METER CONTROL PANEL

NOTE: 1. SCREW DRIVER GAIN SETS ON RECORD & PLAYBACK AMPLIFIER CHASSIS WILL ADJUST FOR INPUT LEVELS OF -20 VU TO +8VU & OUTPUT LEVELS FROM 0 TO +8VU.
 2. ALL ABOVE UNITS MOUNTED ON METER CONTROL PANEL ARE ENCLOSED IN CIRCLE.

RECOMMENDED LAYOUTS

MODEL 300

AMPEX ELECTRIC CORPORATION
 SAN CARLOS, CALIFORNIA



INTER UNIT CONNECTION DIAGRAM
MODEL 300

AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

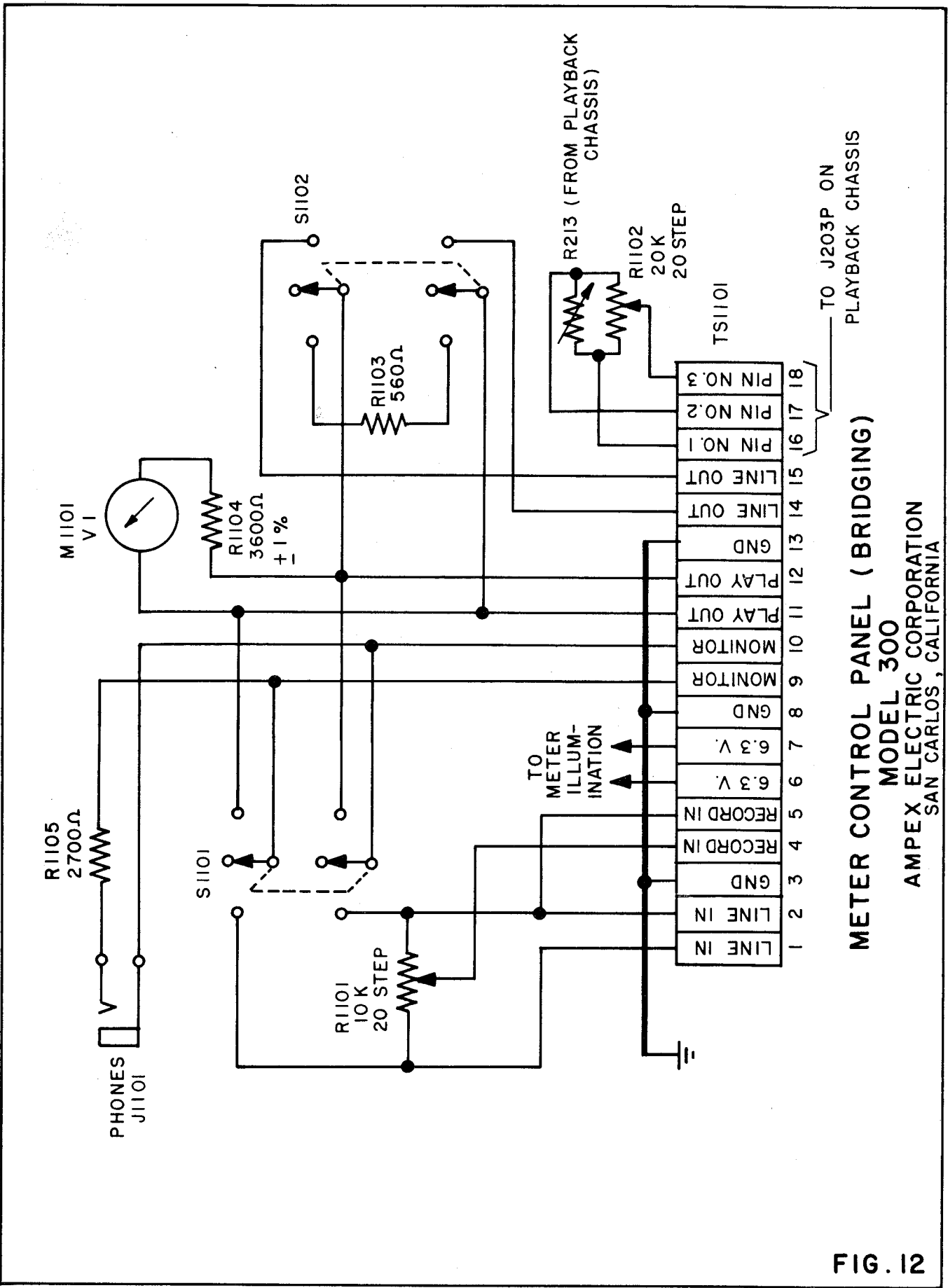


FIG. 12

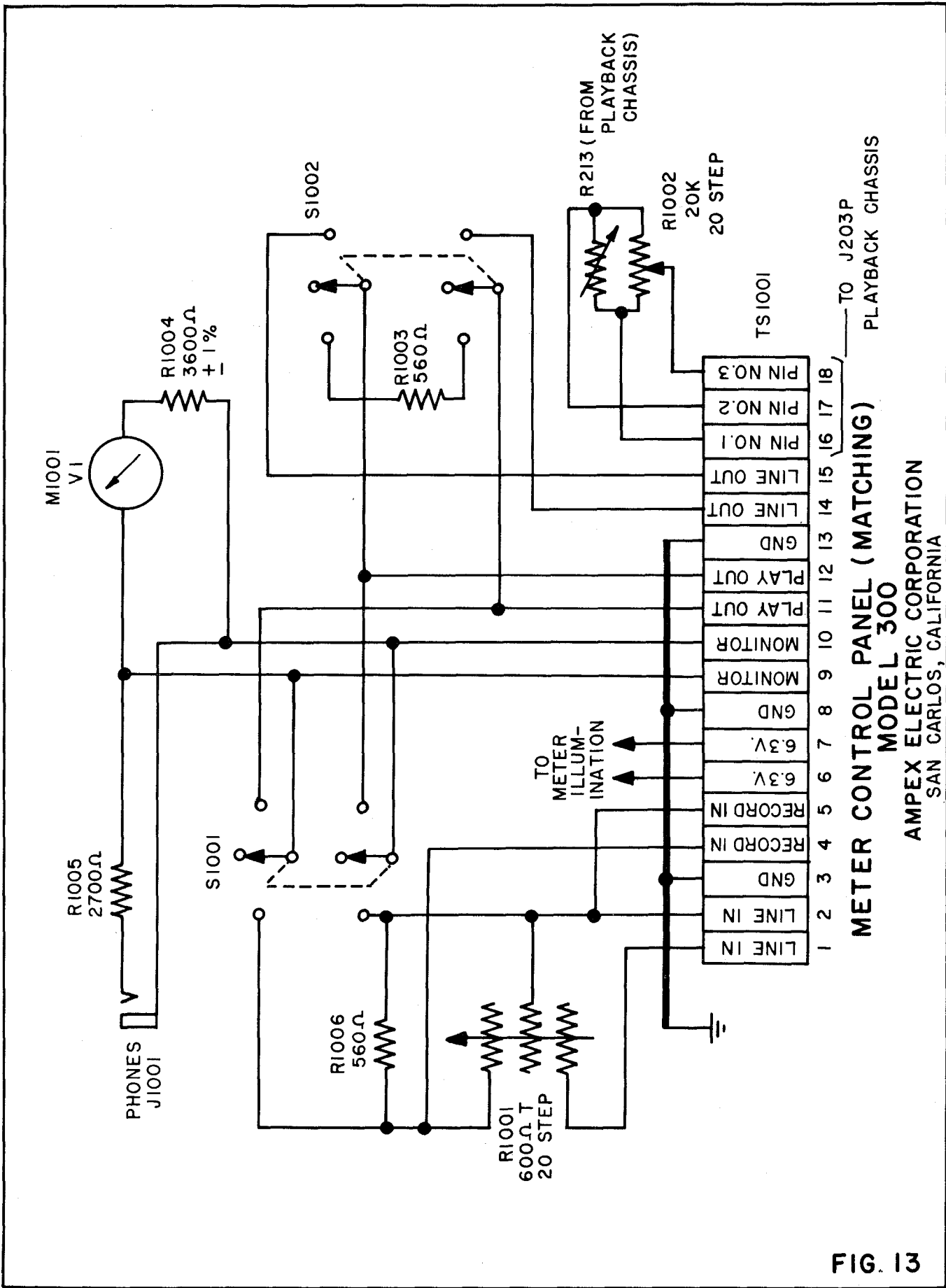
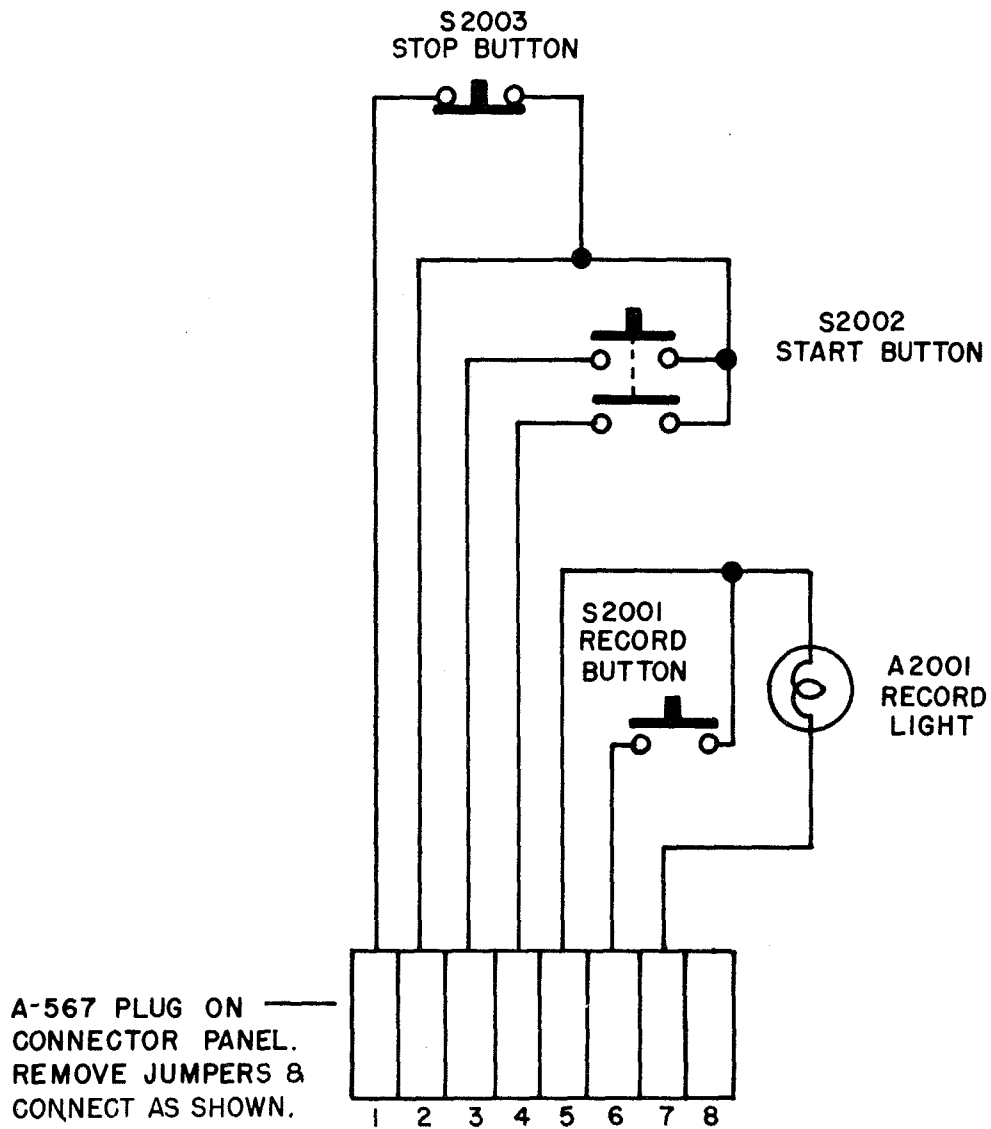


FIG. 13

**METER CONTROL PANEL (MATCHING)
MODEL 300**

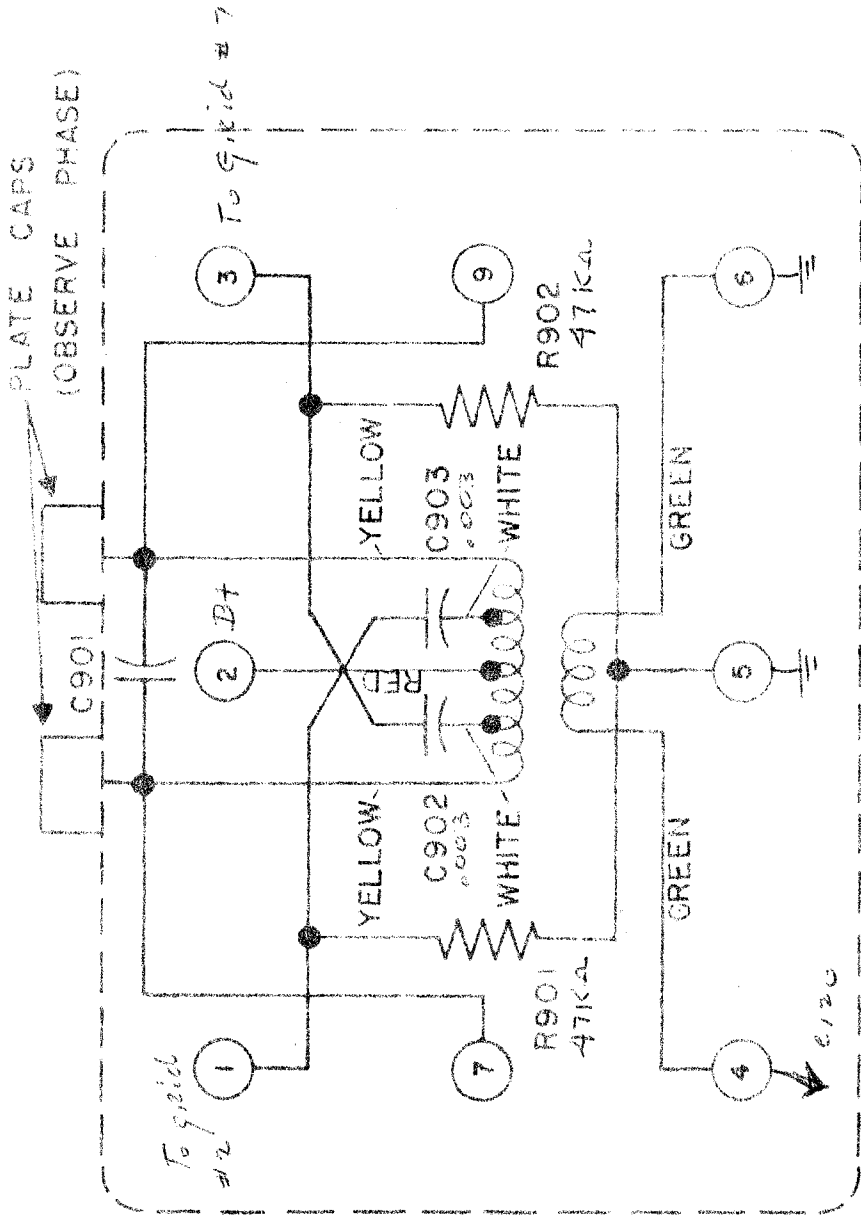
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA



- A2001 120 VOLT, 6 WATT LAMP
- S2001 SNAP ACTION PUSH BUTTON SWITCH, NORMALLY OPEN. 1 AMP. 115 V.
- S2002 DOUBLE MAKE SNAP ACTION PUSH BUTTON SWITCH, NORMALLY OPEN. 1 AMP. 115 V.
- S2003 SNAP ACTION PUSH BUTTON SWITCH, NORMALLY CLOSED. 1 AMP. 115 V.

**REMOTE CONTROL CIRCUIT
MODEL 300
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA**

FIG. 14



NAME OR MATERIAL

*SCHMATIC DIAGRAM
OSCILLATOR COIL ASSEM*

TOLERANCE UNLESS OTHERWISE NOTED
DECIMAL
ANGULAR
FRACTIONAL
ECCENTRICITY



ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

FIG. ASSEMBLY NO.

W. ALKANI

8-26-50

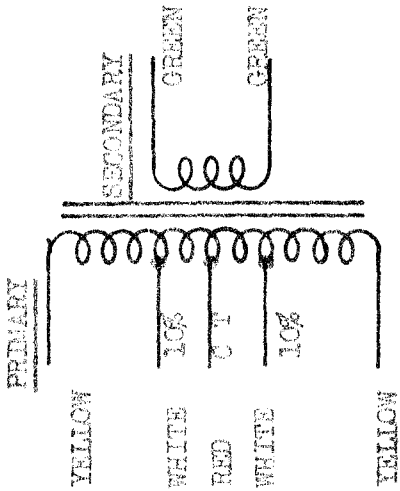
DATE

EA-134

NOTE:
C901 MOUNTED EXTERNAL TO CAN
ACROSS TERMINALS 7 & 9

SPECIFICATIONS

TOROIDAL TRANSFORMER



PRIMARY INDUCTANCE 5 M. $\pm 3\%$
 PRIMARY CENTER-TAPPED AND TAPPED AT 10% (TURNS) EACH SIDE
 OF CENTER TAP. SIDE TO SIDE BALANCE $\pm 2\%$.
 SECONDARY 10% OF TOTAL PRIMARY TURNS $\pm 2\%$.
 1500 VOLT INSULATION BETWEEN WINDINGS AND CORE
 (ABOVE APPLIED IN FORM OF R.M.S. VOLTAGE FOR 1 MINUTE TEST)

LEADS CODED AS ABOVE

BY _____ DATE _____ ISSUE _____

NAME OR MATERIAL

TOROIDAL TRANSFORMER SPEC.
 TUNING UNIT - (OSCILLATOR)

TOLERANCE UNLESS
 OTHERWISE NOTED:

- DECIMAL
- ANGULAR
- FRACTIONAL
- ECCENTRICITY



ELECTRIC CORPORATION
 SAN CARLOS, CALIFORNIA

FOR ASSEMBLY NO.

EA1134

4 NELSON

DESIGNED BY

8-26-50

DATE

DWG NO.

APPROVED

302

SCALE

ALTEC SERVICE CORPORATION
AMPEX TAPE RECORDERS
MANUAL FOR SERVICING

Section I-1
Addendum #1

0. REASON FOR REISSUE

0.1 To make revisions in accordance with suggestions from Ampex Electric Corp.

1. PURPOSE

1.1 To outline several changes of procedure in setting up Model 300 Tape Recorder which are not covered in the regular instruction book.

2. PROCEDURE

2.1 Unpack the equipment, and examine carefully for any possible damage in shipping.

2.2 Follow the procedure in the instruction book under UNPACKING AND INSTALLING. Note particularly the fact that the drive motor is blocked for shipment, and must be freed before the power is turned on.

2.3 Check head alignment with standard tape. There has been some indication that the alignment may shift in shipment. Call reports should indicate where such adjustments are needed to correct this condition.

3. GENERAL - SERVICING NOTES

3.1 One case of trouble which was reported was caused by the pickup of the magnetic coating of the tape guide of the shutoff lever. This phenomenon occurred at fast rewind speeds and apparently was due to the fact that the demonstration program material was recorded on unlubricated tape. No pickup occurred at normal playback speeds. The manufacturer has advised that the newer tapes would not lose their coatings even at rewind speed. Any cases of such trouble should be reported so that this information can be passed on to the manufacturer.

ALTEC SERVICE CORPORATION
AMPEX TAPE RECORDERS
MANUAL FOR SERVICING

Section I-1
Addendum #1

0. PURPOSE

- 0.1 To outline several changes of procedure in setting up Model 300 Tape Recorder which are not covered in the regular instruction book.

1. PROCEDURE

- 1.1 Unpack the equipment, and examine carefully for any possible damage in shipping.
- 1.2 Follow the procedure in the instruction book under UNPACKING AND INSTALLING, Note particularly the fact that the drive motor is blocked for shipment, and must be freed before the power is turned on. On the first two machines, considerable adjustment was necessary to obtain the proper speed, as we discovered that the first springs we were using on the drive motor adjustment would suffer some cold flow without recovering. This has been corrected with a better spring.
- 1.3 Replace reel idler flywheels which are packed separately. In the production machines, it was found necessary to double the inertia of the reel idler flywheel. Therefore, until a new flywheel is available, we are putting two of the regular flywheels on the reel idler. Because of the large weight, the reel idler shaft is easily bent if the unit is mis-handled in shipment, and therefore it was found necessary to pack the flywheels separately. A new flywheel has been designed which will take the place of the two present ones. The center of gravity is such that it will not require removal in shipment.
- 1.4 Check head alignment with standard tape. There has been some indication that the alignment may shift in shipment. Call reports should indicate where such adjustments are needed to correct this condition.

2. GENERAL - SERVICING NOTES

- 2.1 Any strong transient pulse which occurs while the machine is recording will magnetize the record head. Therefore users should be warned to be very careful to observe the following:
- (a) Do not pull out any tubes in the record amplifier while recording.
 - (b) Do not disconnect or connect the record head cable while recording.
 - (c) Do not depress the Record button until after depressing the Start button.
 - (d) Do not switch speeds while recording. Always press the Stop button, change speeds, and then start up again. (The magnetization caused by changing speeds during recording is slight, increasing the noise only a db or so). No harm is done by changing speeds during playback. If all of the above rules are followed, there should be no trouble with ever having magnetized heads. If the heads do become magnetized, they are very simply demagnetized with a unit as described in the instruction book.
- 2.2 Erase current is set at 220 ma instead of 250 ma, as stated in the instruction book. Actually, 190 ma will erase a 400 cycle tone at peak record level (3% harmonic distortion) within specifications.

ALTEC SERVICE CORPORATION
AMPEX TAPE RECORDERS
MANUAL FOR SERVICING

Section I-1
Addendum #1

- 2.3 As the felt on the brake linings of the Rewind and Takeup assemblies packs, the brakes have a tendency to tighten up a little over a period of time. The proper setting for the brakes is 12 oz. pull in the energizing (or tape unwinding) direction, measured by threading a piece of string on an empty reel hub and pulling tangentially with a spring scale.
- 2.4 One case of trouble which was reported was caused by the pickup of the magnetic coating of the tape guide of the shutoff lever. This phenomenon occurred at fast rewind speeds and apparently was due to the fact that the demonstration program material was recorded on unlubricated tape. No pickup occurred at normal playback speeds. The manufacturer has advised that the newer tapes would not lose their coatings even at rewind speed. Any cases of such trouble should be reported so that this information can be passed on to the manufacturer.

AMPEX SERVICE BULLETIN, NO. 1, MODEL 300

1. Head Magnetization. In order to realize the full dynamic range of type 111 tape, it is extremely important that the heads be free of magnetization. 111 tape is very sensitive to the slightest amount of magnetization on the record head, so that unless care is exercised it is very easy to raise the noise level 5 to 10 db. The Model 300 has been designed so that with normal and proper usage, the heads will not become magnetized. However, it must be remembered that any phenomena which tends to put an unbalanced pulse through the record head will magnetize it. Such pulses can be caused by appearing in the form of signal or by causing a pulse in the power supply voltage. If the following precautions are taken, no difficulty should be experienced with record head magnetization.

a. DO NOT DEPRESS THE RECORD BUTTON UNTIL AFTER DEPRESSING THE START BUTTON.

In other words, allow the transient caused by switching the motors and solenoids to die out before the record head is connected. A one-half second pause is sufficient.

b. Do not pull any tubes in the record amplifier, or connect head leads or input leads, while the machine is in the Record position. In some cases it has been found wise not to start or stop recording while there is a saturating signal fed into the record amplifier.

c. Do not switch speeds while recording. (No harm is done by changing speeds while playing back).

In the event that the head does become magnetized, follow the procedure outlined in the Instruction Book under HEAD DEMAGNETIZATION. If a head is powerfully magnetized, as when tested with an ohmmeter, the demagnetizing process may have to be repeated several times. AMPEX will soon have available a simple demagnetizer that connects to any 115 V. A.C. line.

2. Erase. In all production machines, C119 has been changed to .003 mfd. for proper erase current. The erase current is adjusted to 200 to 210 m.a. instead of the 250 m.a. originally stated in the Instruction Book. Actually, 180 m.a. will erase peak recording level within specifications. In checking erase, always check with both record and erase heads connected, as the bias on the record head provides part of the erase.

3. Reels. It has been found in some isolated cases that when the tape is allowed to run all the way out at the end of a fast wind, a section over a foot long will be broken off the end. Upon investigation, this was found to be due to the sharp edges on the slot opening of the reel hub through which the tape is threaded. The sharp edges apparently provided high friction and did not allow the end of the tape to run out freely. When these sharp edges were filed off, the breakage no longer occurred. This information is being forwarded to the N A B Sub-Committee for the standardization of reels.

Difficulty has also been experienced with the reels not being properly centered. When inserting the hold-down knob, the knob should be pushed down with one hand, and the reel held with the other hand. As the hold-down comes into contact with the reel, agitate the reel slightly with the other hand to make sure that the hold-down

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moves into the exact center of the opening, then push the knob down firmly. The hold-down knob is being re-designed so as to prevent the possibility of locking the reel off-center.

4. Threading. In threading the tape, be sure to remove any adhesive that may have been used to seal the end. If this adhesive is not removed, the first layer may stick and cause the end to break off at the end of Rewind.

SERVICE BULLETIN NO. 1A, MODEL 300

1. Solenoids. Some difficulty has been experienced with the humming or buzzing of the solenoid which operates the capstan idler, K501. Investigation of the cause of this noise has disclosed that if the linkage has not been adjusted properly, the force required of the solenoid will be greatly increased and therefore cause it to hum.

Looking at the drive assembly from the bottom, the linkage of the capstan idler solenoid can be seen. The link rod (A) passes through a hole in the arm (B) that it operates, and there is a rubber washer (C) and adjusting nut (D) on the end. When the solenoid is operated, the rod pulls the rubber washer against the arm to operate it. When the solenoid is seated, the angle (E) between the rod and the arm should be less than 90°. If this is so, the effective contact point of the washer is on the outside. If the angle between the rod and the arm is greater than 90° when the solenoid is seated, the contact point of the washer on the arm is on the inside, effectively reducing the moment arm by a considerable amount, and therefore requiring much greater force to be exerted by the solenoid.

The importance of maintaining the above angle (E) below 90° was only recently discovered, and it is possible that some machines have been shipped in which this angle might be too great. While no machines have been shipped with noisy solenoids, it is possible that if the above adjustment is not proper the solenoids may become noisy in use. Should this be the case, the adjustment can be corrected as follows:

It will be noted that the capstan idler arm shaft (F) is connected to the operating shaft (G) below through a U-shaped torque link (H). If the bottom (or shorter) arm of this link (H) is bent in a clockwise direction (when looking at the link from the bottom or short arm end), this will effectively reduce the angle (E). In order to bend this arm, it is necessary to remove link (H) and hold it in a vice. The link can be removed by forcing off the spring-lock washers which position the lower arm (I and J) and which attach the return spring at the top (K). The proper value for the angle (E) is approximately 85°, or when the arm (B) is perpendicular to the plane of the solenoid base plate.

If the angle (E) is changed, it will be necessary to re-set the capstan idler adjustment (D). This adjustment is set so that when the capstan idler just touches the capstan, the solenoid is 1/8 inch shy of seating. A simple way of making this setting is to place a piece of material 1/8 inch thick between the solenoid armature and body and clamp the armature down on it. Then tighten the nut (D) until the capstan idler just touches the capstan.

It may also be necessary to reset the capstan idler solenoid Stop L. This stop should be set so that at no time during fast winding does the tape touch the capstan idler.

2. Playback Amplifier. It has been found that some of the early machines were shipped with ground wires connected to pin number 1 of the input stage and the following stage that were of insufficient strength and length to allow the tube socket to flex without breaking. Unfortunately, several of these wires have opened up in the field. The result is an excessive amount of hum pickup in the first stage of the amplifier.

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To replace this broken connection, unscrew the Playback Amplifier from the chassis frame. When the Playback Amplifier is lifted up, the ground connections are readily accessible.

3. Brakes. The brakes have been adjusted to work properly with the standard NAB double flanged reel. If small RMA reels or hubs only are used, the brakes will not necessarily stop without slack forming when fast winding onto the small reel or hub. This is because with normal brake settings, the inertia of the reel that is taking up the tape serves to tension the tape, and if the brakes are set tight enough to stop a small reel without slack, the tension on the tape will be excessive when using the regular reel.

4. Cabinet. The four feet of the console cabinet are adjustable, so that the cabinet may be leveled on any floor by merely screwing the feet to the proper position.

SERVICE BULLETIN NO. 300-1B, MODEL 300

Below is quoted contents of a letter from an Ampex customer concerning the use of unlubricated tape:

"With regard to your problem of tape breakage, it is very true that nicks on the tape will greatly weaken it, and therefore make it subject to breakage. We are in the process of re-designing the tape guides on the ends of the tension arms, and should have some available in about two weeks. We will send you a new set at No Charge, and would like for you to return your old ones. We are anxious to examine them as no one else has reported this difficulty.

"If you are going to continually use small reels, I would highly recommend that you increase the resistance of R401 and R403 to the maximum values. Even changing to higher resistors may be advisable, as one pound pull on the tape is quite a bit. The voltage on the motors should be reduced until the take-up and hold-back is the same as using the large reel, or in other words, about six ounces pull at the hub. It would be very simple to wire up a double pole switch to short out the extra sections of the added resistance when it is desired to use the large reels.

"With regard to the chattering that you mentioned, this was a problem that we had on our large Model 200 when we first changed to 15", and we found it necessary to re-design to reduce friction of the tape on some of the stationary guides. I am very surprised to hear of it happening on the 300 as the friction throughout on the 300 is greatly reduced from the 200, and we have never heard of this squeaking occurring on the 300. I would venture to guess that it occurs when using the small reels and therefore when the hold-back is excessive. This is another reason why the motor torque should be reduced for the small reels if you are going to use them continuously. Such chattering or squeaking would not occur with Minnesota lubricated tape, and that is why we recommend the use of this tape. In fact, it was to solve this problem that Minnesota Mining first inaugurated the use of lubricated tape. We have found that weather conditions greatly influence the tendency to squeak, as it is a function of the friction between the tape and the stationary guides, and this friction varies with the state of the acetate backing."

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SERVICE BULLETIN, NO. 2, MODEL 300

1. Drive Motor Lubrication. The first Model 300 machines were equipped with ball bearing drive motors, which require no attention. Since that time, sleeve bearing drive motors have become available, and have been used on all subsequent production. If your machine has a sleeve bearing drive motor, be sure to add the lubrication of this motor to the maintenance schedule.

The drive motor should be lubricated every six months or 1500 hours, whichever occurs first, with Type DTE heavy or medium oil.

The motor should be lubricated with a pump-type oil can. To reach the upper bearing in the console model, the spout should have a bend in it less than three inches from the end. In the portable model, the upper bearing is most conveniently reached by unbolting and lifting the top-plate. The top-plate should be tipped up by raising the right-hand end, as viewed when facing the front of the machine. Use the hold-down knob on the takeup motor as a handle for lifting. The plate need only be lifted a few inches to expose the bearing to be lubricated.

2. Capstan Oil Leakage. There is a tendency for oil to climb out of the capstan bearing housing during the first few weeks of operation. The capstan bearing has been thoroughly impregnated with oil so as to drive out any air inclusions, as the presence of air would tend to force oil out of the bearing housing when it becomes warm. The excess oil present climbs up the capstan when the machine is operated. Ordinarily, this oil is caught by the felt washer on top of the bearing housing. (The neoprene washer shown in Fig. 2 of the instruction book was eliminated in production because it produced flutter). If this washer becomes saturated with oil, which usually happens, then it will no longer behave as an effective seal. Therefore after the first week or so of operation, when most of the excess oil has had a chance to work out, the felt washer should be removed and washed out in carbon tetrachloride. Simply remove the capstan dust cap (see Fig. 2, instruction book) to remove the felt washer. If this washer is kept reasonably dry, then no trouble should be experienced with oil creeping up the capstan.

3. Head Magnetization. The magnetization of the record head which occurs when the Speed Change Switch is operated while recording can be eliminated by placing a 100,000 ohm resistor across terminals 9 and 10 on the back of connector J104P in the Record amplifier. (See Fig. 6 of the instruction book).

Magnetization of the record head can also occur when a sufficiently high signal is present to saturate the record amplifier. Magnetization is even worse if the recorder is started or stopped under this condition. Such a signal is 10 db greater than that necessary to saturate the tape, and 30 db above the normal operating point. Care should be taken to avoid such intense signals. Note that this applies only for levels that are far in excess of the normal operating levels.

4. Reels. In order for the brakes to work properly, the same size reel must always be placed on both turntables. In using the small RMA 7 inch reels, abnormal holdback tensions will occur at the end of the reel due to the small hub diameter. This may cause trouble due to slippage at the capstan idler (see Item No. 8 below). If the small type reels are to be used exclusively, resistors R401 and R403, in series with the Rewind and Takeup motors respectively, should be

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increased to the maximum setting. It is recommended that the smaller 5" reels not be used for recording or playback. (To play the 5" reels, external resistors would have to be added to R401 and R403 for proper tensions).

5. Erase Trimmer Adjustment. The Erase Trimmer Adjustment, C120, is set and sealed at the factory and should never be disturbed, except when a new erase head is replaced. If the adjustment is tightened too much, the oscillator shifts into a different mode of oscillation at a higher frequency. At the high frequency, it is impossible to get sufficient bias into the record head for proper operation. This shows up immediately by a large rise in high frequency response at the high end, since the bias is effective in erasing high frequencies. To eliminate the possibility of this occurring, the erase current is always set at least 30 m.a. below the point at which the oscillator shifts over into the wrong mode. This is usually around 200 m.a., although proper erasure is obtained as low as 190 m.a.

6. Brakes. In order to avoid the rightening action which occurs when brake bands become glazed, the brake bands have been treated with graphite. With the graphited brake bands, the proper tension as measured on the NAB reel hub in the unwinding or energizing direction is 14 oz. Should the brakes exhibit a tendency to tighten up or grab, they should be re-treated with graphite. (Some of the earlier machines had brake bands which were not graphited). A mixture in the proportions of one level tablespoon of graphite to one 8 oz. cup of carbon tetrachloride can be applied to the felt of the brakebands with an oil can. After graphiting, the motors should be run 10 min. with the brakes on to wear in the graphite.

7. Meter Control Panel. The Meter Control Panel was designed for balanced input and output. If it is desired to operate unbalanced, the following terminals on the Meter Control Panel should be used as the grounded side of the line:

- No. 2 on the Line In connections.
- No. 10 on the Monitor connections.
- No. 15 on the Line Out connections.

8. Tape Slippage. Various users have reported that the tape slows down near the end of the program. This occurs if the capstan idler pressure is not great enough, and of course becomes worse at the end of the reel where the holdback tension is highest. The condition is further exaggerated if a small RMA type reel is used in which case the holdback tension is even higher.

Effective capstan idler driving force is reduced as the capstan idler gradually picks up the lubrication with which Minnesota Mining and Manufacturing Company type 111 tape is treated. (This lubrication is quite important, as it reduces flutter and head wear, permits more uniform head contact and therefore less high frequency amplitude variation, and any tendency for the tape to "squeak". This "squeaking" sometimes occurs at the 7.5" speed when using the small reels and is very objectionable). For this reason, the capstan idler should be cleaned with ethyl alcohol at least once each week. Also, great care must be taken to see that oil from the capstan does not reach the capstan idler. Not only will this contribute to slippage, but oil will ruin the capstan idler tire. Follow the instructions in Paragraph 2 above to prevent oil leakage.

To test for proper capstan idler pressure, hold the tape while the machine is running in the Play position. The idler pressure should be sufficient to just deform the tape. The pressure can be increased as described in the instruction

book. Care must be taken to avoid overloading the capstan idler solenoid if audible hum is to be avoided. Such hum has no effect on the performance of the recorder.

9. Bias Adjustment. As stated in the instruction book, Paragraph 4, Page 2, Section III, the bias is set at a current at which the overall output at 1000 cycles is 2 db below the maximum. The bias current is very uncritical as far as affecting distortion, once a certain minimum is exceeded. Above this minimum point, the output remains constant for the same distortion over a very wide range. The only effect of excessive bias current is to erase high frequencies. Actually, the optimum current for the bias setting is that which produces maximum sensitivity at 1000 cycles. The bias setting is specified to be much higher than this to insure that the current will always be well beyond the region of distortion. This setting is overly conservative, and if it is found that difficulty is ever encountered in obtaining sufficiently high record level at the high frequencies, greater high frequency output can be obtained by slightly reducing the bias current. Following the procedure outlined in the instruction book, any setting just beyond the peak to 2 db down is satisfactory.

10. Speed. If the machine has been subjected to severe cold, the drive should be allowed to warm up for 5 minutes to reach speed stability. This is especially true at the 30 inch speed on the Model 301.

TUNEUP AND TRANSMISSION TEST ON AMPEX MODELS 300 & 301
(Submitted by Eastern Division - Altec Service Corporation)

After many lengthy tests, the material presented herewith is considered a concise treatise on the subject equipment. It was found that some installations had complex external bridging arrangements (some were rather unorthodox) that took time to figure out. Since it is Altec's job to get the best possible results from the Ampex machine, it was felt that by making all tests directly at the input and output plugs of the record and playback amplifiers, it would be possible to evaluate the performance of the machine without getting tangled up with the customer's own pet idea as to what constitutes ideal matching conditions.

The following procedure was evolved in order to standardize tuning and transmission testing of Ampex machines regardless of the way they may be matched or bridged into associated circuits. Because some machines come without meter panels, it is especially important that correct operating levels are established in order to prevent distortion and to preserve the high signal to noise ratio these machines are capable of achieving.

It is proposed that all tests be made with a setup as indicated on the accompanying sketch. Because the entire procedure has been set up in logical sequence, it will be found that after two or three times all operations can be memorized and should not be any more of a problem than making a transmission test on film reproducing equipment.

The recommended operating level is +4 dbm in and +4 dbm out. Since the standard test tape level is 10 db lower than the normal operating level, and also to prevent tape and head saturation, make all your tests with a -6 dbm signal and expect to get a -6 dbm reading across the output. Then after all adjustments are completed, feed program in at +4 dbm and get output at +4 dbm.

1. With machine turned off, demagnetize record and playback heads.
2. Set up equipment according to sketch and thread up standard tape. Set machine speed to 15"/sec.
3. Play 1000 cycle section of standard tape and adjust playback amplifier gain control R 213 until AS-1800 Meter, connected across the 560 ohm load resistor, reads -6 dbm on AC scale.
4. Play 1500 cps section and make azimuth adjustment of playback head with 1/4" spintite wrench to get maximum response.
5. Run balance of standard tape and flatten out response by adjustment of high frequency trimmer C 205 if this should be required.
6. Remove standard test tape and thread up a reel of 111A tape. Set AS-1600 Oscillator to -6 dbm, 500 ohms out, at 1000 cps. Start tape and press record button. Turn record amplifier gain control R 101 until meter, which is still connected to playback output reads -6 dbm.

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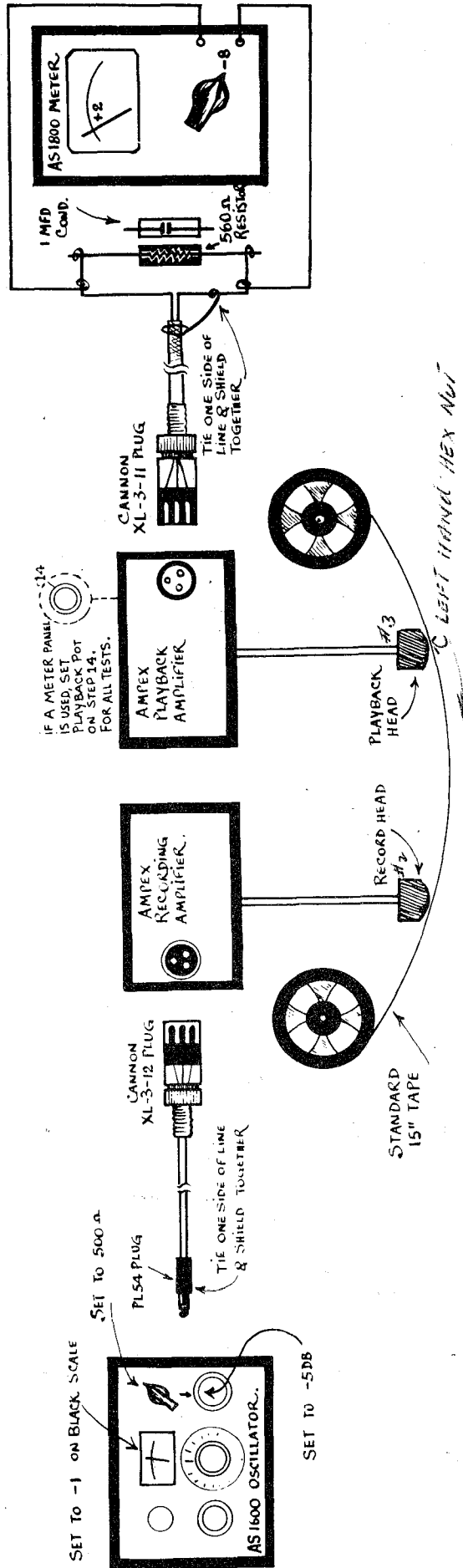
7. At this point it is proper to check the record bias adjustment. Record 1000 cps tone with AS-1600 Oscillator still set to -6 dbm, and turn record bias control R 126 fully counterclockwise. Reset R 126 in a clockwise direction until maximum output is read on AS-1800 Meter. Keep turning R 126 until the peak is passed and a 2 db drop shows on meter. This is the optimum bias adjustment. Now the reading on the AS-1800 Meter may no longer be -6 dbm. If it is not, adjust record amplifier gain control R 101 again to obtain -6 dbm on meter.
8. Make azimuth adjustment of recording head while recording 15 Kcps, with AS-1600 Oscillator still feeding -6 dbm. Adjust for maximum reading on the AS-1800 Service Meter.
9. Now record frequencies from 50 cps through 15 Kcps, keeping the oscillator output constant at -6 dbm. The AS-1800 Service Meter should read -6 dbm plus or minus 2 db, 50 to 15 Kcps or better. If necessary, adjust high frequency control R 205 in record amplifier to flatten out response.
10. Noise level is checked by shorting input to recording amplifier and placing a 1 mfd condenser across the 560 ohm load resistor at the output of the playback amplifier. Press record button. The AS-1800 Meter should read -52 dbm or better on the low VTVM scale.

One note of CAUTION: Do not use earphones across the output to listen to the frequency announcements on the test tape, if you expect to stay within the proper response limits. There is a loading effect which increases appreciably as you go below 1000 cps. If you must hear the announcements, use a bridging monitor or the AA-1000 Amplifier.

The machine is now ready to be placed into service.

If no meter panel is used, the customer should provide program material at +4 dbm and he will get a fully modulated tape signal at +4 dbm out of the playback amplifier into a 500/600 ohm load, with a distortion content of 1.1% and the maximum attainable signal to noise ratio. When a meter panel is used it is customary to set the playback level control on step 14 and to adjust the record level control until meter reads 0 VU. This will also give a +4 dbm output signal into a 500/600 ohm load, but shows 0 on the meter due to the 3600 ohm resistor in series with the meter.

It is suggested that a final check be made of the meter panel to locate any possible defects or loose connections. With an oscillator signal no higher than +4 dbm going into the input to the panel, press record button and work the record and playback level controls back and forth and note if the panel meter registers a corresponding change in the output.



SCHEMATIC FOR TEST SETUP FOR
 MODELS 300 AND 301 AMPEX TAPE RECORDER

Prepared By:
 F. Bosch } Eastern Division
 E. J. Townsend } Altec Service Corporation
 F. Hall }
 L. J. } September 1, 1950

DC CAPSTAN SOLENOID ADJUSTMENT

The Ampex Electric Corporation has recently advised us in response to an inquiry, that the way to obtain the proper adjustment for the D.C. Capstan solenoid is to reduce the solenoid input voltage to 105 volts by inserting a variac or other suitable equipment in the main A.C. supply and loosen the tension adjustment until the solenoid will just properly seat. This will automatically arrive at the proper capstan idler pressure and no further adjustment is necessary.

After this adjustment is made the variac or equivalent equipment should be removed from the circuit and the machine left operating on the standard normal A.C. line voltage.

AMPEX TAPE RECORDERS
WARRANTY TAGS

All Ampex Tape Recorders are now being shipped with Warranty Tags attached. These tags must indicate the effective date the unit was placed in operation, and coincide with the date submitted to Ampex by the customer. No warranty will be granted if this tag is missing or removed from the recorder during the 90 day period involved, and the serial numbers must agree.

When a recorder is in condition for operation, see that the tag is attached with the proper date indicated and that the customer returns the stub direct to Ampex. No warranty will be effective unless this is done, and all replacements will be billable. Please be governed accordingly, and inform the customer to comply.

The initial call reports must indicate that the warranty conditions have been complied with and the tag attached.

Also, please note that vacuum tubes are no longer included in this 90 day warranty.

For your further information, the Model 400 is serviced only on a billable basis.

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Section III

MODIFICATION PARTS LIST

PARTS REQUIRED FOR CONVERSION OF AMPEX RECORDERS,
MODELS 300, 301 AND 302 TO BODINE DRIVE MOTOR

<u>MODEL</u>	<u>SERIAL NUMBER</u>	<u>QUANTITY</u>	<u>DESCRIPTION</u>	<u>PART NO.</u>
300	113 to 500	1	Bodine Drive Motor Assembly	B1030
		1	Bracket, Hinge	B1511
		1	*Capacitor	C080
	501 to 600	1	Bodine Drive Motor Assembly	B1030
		1	Bracket, Hinge	B1072
301 and 302	113 to 500	1	Bodine Drive Motor Assembly	B1075
		1	Bracket, Hinge	B1981
		1	Capacitor	C080
		1	Capstan Assembly	C366
	501 to 600	1	Bodine Drive Motor Assembly	B1075
		1	Bracket, Hinge	B518-3
		1	Capacitor	C080
		1	Capstan Assembly	C366

Prices on request to Headquarters.

*Only required when original motor was manufactured
by Electric Indicator, Cyclohm and Bodine Drive
motors use same capacitor.