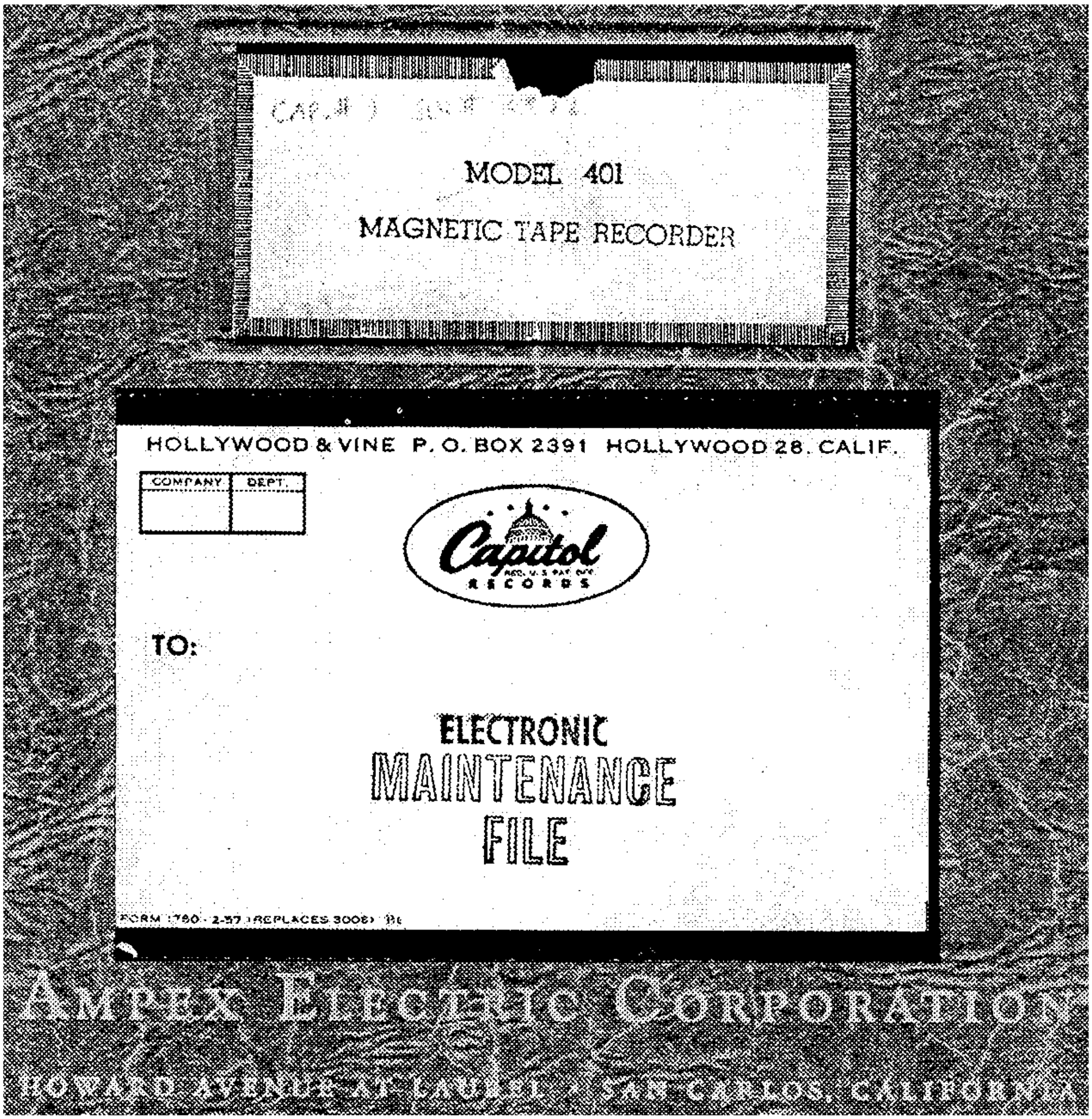
MODEL 401
MAGNETIC TAPE RECORDER
HOLLYWOOD & VINE P. O. BOX 2391 HOLLYWOOD 28, CALIF.
COMPANY
DEPT.
Capitol
RECORDS
TO:
ELECTRONIC
MAINTENANCE
FILE
AMPEX ELECTRIC CORPORATION
HOWARD AVENUE AT LAUREL • SAN CARLOS, CALIFORNIA

MODEL 401

The Model 401 is identical to the Model 400 in every respect except the head assembly. The 401 incorporates heads to erase and record over the full width of the tape. Thus tapes recorded on the 401 can be played back on the Model 300 and Model 201 without pre-erasing the unused portion of the tape and without necessitating level adjustment.

The Installation & Operation Manual of the Model 400 which follows applies in all respects other than the half track record features.

Both the 400 and 401 will play back either full or half track recordings recorded on any AMPEX recorder.

ISSUE NUMBER 3
EFFECTIVE SERIAL #2722

AMPEX MODEL 400

INSTALLATION & OPERATION MANUAL

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3-12-51

SPECIFICATIONS - MODEL 400

Tape Speed. 15 inches per second and 7.5 inches per second, with motor speed change and equalization switches conveniently located.

Frequency Response.

At 15 inches	± 2 db.	50 - 15,000 cycles
At 7 1/2 inches	± 2 db.	70 - 10,000 cycles
	± 4 db.	30 - 15,000 cycles

Signal-to-Noise Ratio. Over 55 db. at both 7 1/2 inches per second and 15 inches per second, as defined by the N.A.B. 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 30 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 the tape accelerates to full speed in less than 1/10 second because capstan motor operates whenever power is on.)

Stopping Time. When playing at 15 inches per second, the tape moves less than 2 inches after stop switch is operated.

Flutter and Wow. At 15 i.p.s. well under 2/10% r.m.s. measuring all flutter components from 0 to 300 cycles using a tone of 3,000 cycles. At 7 1/2 inches per second under 1/4%.

Playback Timing Accuracy. 2/10%.

Playing Time. 32 minutes at 15 inch speed with standard N.A.B. reel; 64 minutes at 7.5 inch speed (on each track). The standard R.M.A. reel may also be used. The Model 400 Magnetic Tape Recorder is designed to record on only one-half of the standard 1/4" wide tape in accordance with R.M.A. standards. By turning the reel over and recording on the other half, twice the amount of program can be stored on a single reel, thereby effecting a 50% saving in tape.

Rewind Time. One and a half minutes for the full N.A.B. reel.

Operation Selector. A single selector control lever is used for FAST FORWARD, PLAY, STOP, and REWIND. A separate record button energizes record relay, which drops out when machine is stopped. Shuttling back and forth of tape made possible by changing from one mode of operation to the other.

Complete Plug-In Head Housing. Erase, record, and playback heads are contained in a single plug-in head housing.

Simultaneous Monitoring. Separate record and playback amplifiers and heads allow the tape to be monitored while recording.

Input. A switch allows the recorder to accommodate either microphone level low impedance input or to bridge 600 ohms plus 4 VU line balanced or unbalanced.

Playback Amplifier. Plus 4 VU output into 600 ohms balanced or unbalanced.

Metering. A 4 inch VU meter is mounted on the front panel and provides for:

a. Direct monitor of record input signal before or during recording.

b. Monitor of recorded output signal from playback head while recording or during playback.

c. Reading bias current.

d. Reading erase current.

Phone Monitoring. A phone monitor jack is provided for direct monitor of record input signal before or during recording, and monitor of recorded output signal from playback head while recording or during playback.

An A-B switch is incorporated in order that direct comparison can be made between the original program and the recorded program while a recording is being made. The same switch transfers the VU meter for level comparison and monitoring.

Mountings. Rack or portable case.

Dimensions. Mechanical unit is mounted on 15 3/4" panel for standard rack mounting. Electronic unit is mounted on 7" panel for standard rack mounting. Power supply is on a 5 1/4" panel for rack mounting, or mounted in the portable case. Portable case holding both the mechanical unit and the electronic assembly has overall dimensions of approximately 13 3/4" high, 17 1/2" deep, and 20" wide.

W e i g h t. Approximately 75 pounds for complete unit in portable case.

INSTALLATION

IMPORTANT:

Before attempting to operate the recorder, first read the following sections on installation and operation.

The portable machine is shipped in a ready-to-operate condition.

The rack mounted machine should be mounted on a standard 19" relay rack with the mechanical unit above the main electronic panel. The electronic power supply panel should be mounted directly above the mechanical assembly, or at least 5" below the electronic assembly. Greater proximity to the electronic assembly will result in increased hum level. For further information on rack mounting, see Page 3 of this section.

All connections are readily accessible from the front panel. Release the front panel cover by unlatching and removing the top cover. The numbers set off in parentheses in the following text refer to the numbered designations in Fig. 6 and Fig. 7.

I. OUTPUT:

A. For Studio Line:

Plus 4 VU, 600 ohm line output, balanced or unbalanced, is available across terminals 2 and 3 of the LINE OUT connector, (12). Pin 1 is the chassis ground. If unbalanced output is desired, tie either side of the line to ground. It is necessary to supply 600 ohm termination to this output at all times in order to maintain correct meter calibration while recording or playing back. Therefore, if the output is not feeding a terminated line or if the output is not connected, such as on remote pickups, the LINE OUTPUT TERMINATION switch, (13), must be switched to IN.

B. For Connection to High Impedance Amplifier Input:

Connect pin 3 of the LINE OUT connector, (12), to the high side of the amplifier input. Strap pins 1 and 2 of the connector and connect to the ground side of the amplifier input. The LINE OUTPUT TERMINATION switch, (15), must be left in the position designated IN at all times, as explained in A above.

II. INPUT:

The following inputs are provided:

A. Microphones:

Any low impedance microphone, the nominal impedance of which is in the range of 30 to 250 ohms can be plugged in directly. Connect microphone to pins 2 and 3 of the input connection, (14). Connect cable shield to pin 1. Place the INPUT TRANSFER SWITCH, (15), in the MIC position.

The microphone input transformer is strapped for the optimum step up for a 150 to 250 ohm source. Therefore, in the case of microphones having 50 ohms or less impedance, 6 db. additional gain can be obtained by strapping the input as shown in Fig. 5. This is not usually necessary, however, and should not be done unless insufficient gain is found to exist. If the input is re-strapped, serious frequency discrimination will exist should the input be fed from a source impedance greater than 50 ohms.

High impedance microphones are not recommended for use on this equipment. In general, the quality obtainable from high impedance microphones is not satisfactory for professional work.

In the event that it becomes necessary to connect a high impedance microphone, the input circuit will have to be re-wired as shown in Fig. 4.

B. Bridging a Balanced Studio Line:

Connect balanced line to pins 2 and 3 of the input connector, (14). Pin 1 is ground. Place the INPUT TRANSFER SWITCH, (15), in the BAL BRIDGE position. Input levels of minus 10 to plus 10 VU can be accommodated. The load placed on the line is approximately 100,000 ohms.

If the input transformer is restrapped for 50 ohms, the input level accommodated on the balanced bridge position is minus 16 to plus 4 VU.

For bridging higher or lower level lines, an external bridge can be wired in the line to the machine. This would consist of a resistance, the value of which should be 50,000 times the RMS program voltage, in series with each side of the line. A 50 ohm resistor should terminate the output side of the two bridging resistors. The output of the bridge must be fed to the microphone input of the recorder.

C. Bridging an Unbalanced Source:

Connect unbalanced line, radio tuner, etc., to pins 3 and 1 of the input connector (14). Pin 1 is the ground side. Place the INPUT TRANSFER SWITCH, (15), in the UNBAL. BRIDGE position. This connection provides 100,000 ohms bridging of any RMS program voltage greater than 1/2 volt.

III. PHONES:

Any sensitive high impedance head phones can be plugged in the jack (11), provided for monitoring of incoming line or playback of the recording.

IV. RECOMMENDED RACK MOUNTING OF TWO MACHINES:

If two 400s or 401s are to be mounted on a standard rack, the following placement is recommended (starting at the top of the rack):

1. Install a 1 3/4 inch spacer panel at the top of the rack.
2. Install below this panel the Mechanical Assembly for machine #1.
3. Install the Electronic Assembly for machine #1.
4. Install a 1 3/4 inch or 3 1/2 inch spacer panel.
5. Install the Mechanical Assembly #2.
6. Install the Electronic Assembly #2.
7. Install a 5 1/4 inch or 7 inch spacer panel.
8. Install both power supply panels at the bottom.

   (The cable on the power supply for the upper recorder will have to be extended in length.)

   It is important that no power supply be closer than 5 inches to an Electronic Assembly!

OPERATION - MODEL 400

I. REEL SIZE: The turntable on the left side (tape supply) is equipped to handle either the N. A. B. 10 1/2" reel of tape or the smaller R. M. A. 5 and 7 inch sizes. Handling these different type reels on this turntable can be accomplished as follows:

(1) N. A. B. - 10 1/2" Reel - Place the Reel Size Switch (6) in the Large position and place the reel on the turntable after positioning the black plastic reel centering guide that has been provided.

(2) R.M.A. - 7 & 5" Reels - Place the Reel Size Switch (6) in the Small position and place the reel on the keyed turntable directly.

The turntable on the right side (takeup reel) will handle only the N. A. B. 10 1/2" reel and the keys have not been provided on the turntable to drive the small reels. Attempting to use the small R. M. A. reels on the right hand (takeup) turntable will seriously impair the performance of the machine.

II. TAPE THREADING: Thread tape as indicated in Fig. 6. The takeup tension arm, (5), must be moved into position as shown, in order to supply power to operate the machine.

III. POWER: Power is supplied to the top plate through switch, (3), which must be turned on to energize the motors. Main power is supplied through switch, (9), which must be turned on to operate the electronics and top plate. The top plate and electronics are individually fused by (7) and (8), respectively.

IV. FUSES: Top Plate Fuse (7) 2 Amperes
Chassis Fuse (8) 1 Ampere

V. SPEED SWITCHES: There are two switches associated with operating speed. Switch (4) governs the motor, and (19) corrects equalization in the amplifiers.

VI. TAPE MOTION: The tape motion is controlled by means of a mode selector switch (1) and the PLAY button (2), directly to its left. The selector switch should be moved firmly by means of the selector knob attached. Hold the knob securely between the thumb and forefinger while changing its position. Rapid, positive motion of the selector knob is recommended in preference to slow action. This is to insure simultaneous action of all necessary functions.

- IMPORTANT -

The trip out switch will not disengage the capstan idler at the end of the reel unless the tape will freely disengage the reel hub. All new factory wound reels of tape should be unwound and inspected, as they are usually looped to the hub in a manner such that they will not come free. If the tape does not disengage the reel, the drive capstan will wear a flat in the rubber capstan idler wheel which will necessitate the wheel's replacement. Any adhesive material accumulation on the hub must be removed with solvent for the same reason.

1. Play and Record. The tape is set into play motion by first depressing the PLAY button, (2), and then moving the selector switch, (1), to the FORWARD position. It is important that the PLAY button be depressed before moving the selector switch or the tape will move at the fast forward speed instead of at the operating speed. The tape must be completely stopped before starting in this mode. The selector switch should be moved firmly and rapidly to insure proper operation.

2. Stop. To stop the tape motion, while it is moving in any mode, merely return the selector switch, (1), to the OFF position. This will occur automatically if the tape should break or run off of either reel.

CAUTION: Never stop the machine near the end of a fast wind when using the small reel, but allow the tape to run off. When the amount of tape remaining on the unwinding reel is less than 1/2", the rate of rotation of the reel becomes so great that it may not stop without throwing a slack loop.

3. Fast Forward. Move the selector switch, (1), toward the left without depressing the button. This is a fast forward speed which is used in order to rapidly arrive at a point within the reel.

4. Rewind. Move the selector switch, (1), toward the right. This is a fast reverse and is used to rewind the tape completely or to return to an earlier section. In using either the fast forward or rewind mode, it is desirable to remove the tape from direct contact with the heads by opening the gate of the head assembly. This is to prevent oxide coating from depositing on the heads and impairing the performance, and reduces wear on the heads.

In putting the recorder into play or fast forward immediately after fast rewind, slack in the tape may occur causing the recorder to trip off. In this case, return the mode selector to "off", take up the slack in the tape, and the machine will function normally. The condition is brought about by the turntable motor spinning free for a short time in the direction it was last running. The operator will find a number of ways to avoid delay due to this condition. One of the simplest is to move the mode selector a few degrees in the direction the machine was last running before proceeding in the desired mode.

VII. **PLAYBACK:** To play back a previously recorded tape, turn the **METER** and **OUTPUT** switch, (20), to the extreme left position designated **PLAYBACK.** Then start the tape in motion as indicated under Play. If the recording was made at the correct level, the VU Meter will peak on O (zero). No attempt should be made to alter the gain of the playback amplifier if the meter does not peak on O (zero). Otherwise, the calibration of this meter as a record level indicator will be destroyed. The playback gain will be close when playing any tape recorded to N. A. B. specifications at 15"/sec.

VIII. **RECORD:** To record a new program on previously recorded tape, or on blank tape, turn switch (20) to the second position from the left which is designated **RECORD-LEVEL.** Turn the Record Gain control, (16), clockwise until the level reads O (zero) on the VU meter on the most intense program peaks. The program can be audibly monitored through either the ear phones jack, (10), or the **LINE OUT** before the tape is in motion. (For correct meter calibration it is important that the **LINE OUT** be properly terminated either external to the machine or by use of the **LINE OUTPUT TERMINATION** switch, (13). (See detailed instructions under **INSTALLATION.**) This direct monitor feature allows the program to be set up through the machine without actually recording during the set up period.

When the program level is properly set, start the tape in motion as indicated under **PLAY**. Then push the **RECORD** button, (18). (Be sure there is a delay of at least 1/2 second before operating the **RECORD** button, as the surge from operating the **PLAY** control may magnetize the record head, thereby increasing the noise level on the tape.) The record indicator, (17), above the record button will now glow and the machine is recording.

It is desirable to check the record bias and erase currents occasionally. In order to do this, reposition switch, (20), to the positions designated **BIAS** and **ERASE**, respectively. The erase is not critical and should read in the upper half of the meter scale. The bias on this machine, serial #2701 and after, should read between - 1/2 and + 1/2 on the VU scale. The bias is somewhat critical and must be kept within the indicated range in order to record the higher frequencies at 7 1/2 inch tape speed.

The bias is adjusted by means of the locked control, (11). The meter calibration for bias measurement can be checked as indicated in electronic alignment.

An actual comparison of the recording with the direct program can be made both audibly and on the VU meter by moving the selector switch, (20), to the extreme left position for playback monitor, and then to the second from the left position for monitor of the unrecorded program. The levels as read on the meter and the quality as heard will be the same within the tolerances of the machine. It should be noted that some change in level as read on the VU meter while switching from A to B will be experienced if a tape of different manufacture than the one used to set up the machine is used.

When the program being recorded is finished, return switch, (1), to the central OFF position. The tape transport will stop and the record relay will drop out, making the record circuits inactive. The record circuits will remain inactive until the record button is again depressed while the tape is moving in the play mode.

NOTE:

Because of the extremely wide frequency range of the VU meter, some pickup of the erase and bias frequency will be experienced while monitoring the record or playback level while recording. The pickup of this oscillator frequency (approximately 90 Kc.) can be read on the VU meter approximately 15 Db. below the program level, but does not interfere in any way with the performance of the machine.

HEAD HOUSING

The head housing, see Fig. 6, 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 position. 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, 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 ELECTRONIC 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 on 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 high frequency adjustment tone provided at the beginning of the standard tape. 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. The demagnetizer is used by opening the gate of the head housing and allowing the demagnetizer to come into contact with each head. The tip is split at the end. This split section should be placed across the gap in the center of each head. Move the tip up and down across the head surface slowly. Remove the demagnetizer very slowly, allowing the A.C. field to die off gradually. Repeat this operation on all three heads. In the event demagnetization is not effected, repeat the process.

The capstan (or tape guides) may become magnetized by contact with a magnetized tool. Should this occur, the magnetized part may be demagnetized with an A.C. solenoid placed over the part and slowly pulled away.

ELECTRONIC ALIGNMENT

The amplifiers are set on standardized voltage curves at the factory and thoroughly pre-checked.

The following alignment procedure is recommended for checking electronics alignment in the field. No further adjustments should be necessary, however, unless alterations occur in shipment, or as required in routine maintenance.

A standard tape is available for alignment purposes and contains the following frequency run recorded at 15 inches per second, 10 db. below 15 inch operating level.

1 Kc.	for level adjustment
15 Kc.	for playback azimuth alignment
50	Cycles
100	"
200	"
400	"
800	"
1600	"
3200	"
6400	"
8000	"
9000	"
10000	"
11000	"
12000	"
14000	"
15000	"

I. ALIGNMENT OF PLAYBACK CIRCUIT:

A. Slide out the electronic assembly from the cabinet far enough so that adjustments can be made on the controls located on the chassis.

B. Set the TAPE SPEED and EQUALIZATION SPEED switch to 15 inches per second.

C. Put the METER & OUTPUT switch, (20), to the PLAYBACK-LEVEL position.

D. Terminate the line output either by means of the LINE OUT TERMINATION switch, (11), or by external termination of 600 ohms.

E. Connect amplifier and loudspeaker to the output or plug in a pair of high impedance head phones so that voice announcements can be heard on the standard tape.

F. Thread the standard tape on the machine and set the tape in motion in the PLAY position.

G. Adjust the 15 inch playback level control, R-139, Fig. 8, for a reading of - 10 on the VU meter on the 1000 cycle tone.

H. Adjust the playback head azimuth as discussed in Section V. if necessary.

I. Adjust the high frequency playback equalizer, R-132, Fig. 8, for flat response, $\pm$ 2 db. to 8000 cycles on the standard tape. The response beyond 8000 cycles should slowly rise to approximately plus 3 db. at 15,000 cycles.

J. Turn the front panel EQUALIZATION SPEED switch, (19), to the 7.5 position.

K. Re-run the beginning of the standard tape and by means of the 1000 cycle test tone, adjust the 7 1/2 inch playback level control, R-140, Fig. 8, for - 10 on the VU meter. (The tape should be running at 15 inches per second.)

The above will satisfactorily align the playback circuit for operation at both speeds.

II. ALIGNMENT OF THE RECORD CIRCUITS: The 7 1/2" and 15" per second record alignment should not be attempted until the playback is properly aligned.

Perform the following in the order indicated:

A. <u>Bias Adjustment:</u>

1. Output of playback amplifier must be properly terminated as in playback alignment.

2. Set the speed switches, (4) & (19), to 7 1/2 inches per second.

3. Thread blank tape on the machine and set the tape into motion in the PLAY position.

4. Connect an audio oscillator to the input connector, (14), set (15) for unbalanced input, and adjust the frequency to 2000 cycles.

5. Push the record button, (18).

(control on PB level)

6. Adjust bias control on front panel for maximum playback level of 2000 cycle tone while recording and playing back. If the output reads within 2 db. of the maximum, the distortion characteristic will not be altered. It is desirable to be within 1/2 db. of this maximum in order to achieve wide frequency range recording at 7 1/2" per second.

B. Noise Balance:

A noise balance control is provided to eliminate excessive low frequency noise and null second harmonic distortion. The noise balance should not be touched unless all heads have been thoroughly demagnetized with an AMPEX Head Demagnetizer or equivalent. (See Section IV.) If noise of a crackling nature is still found to exist in the output of the machine, connect a 1 mfd. condenser across the output of the machine and adjust the noise balance control, R-123, for minimum record noise as read on a sensitive meter or heard in a loudspeaker.

C. 7 1/2 inch Record Equalization Adjustment:

1. Reset oscillator to 400 cycles.

2. Set record gain, (16), so that VU meter connected on playback reads - 10.

3. Adjust record head azimuth as discussed in Section IV., if necessary.

4. Reset oscillator to 8000 cycles.

5. Adjust 7 1/2 inch record equalizer, C-107, Fig. 8, for -10 on playback VU meter.

6. Frequency response should be ± 2 db. from 70 to 8000 cycles. Due to tape saturation, frequency checks cannot be made at 7 1/2 inch tape speed, at this level, beyond 8000 cycles. In order to run response checks beyond 8000 cycles, a more sensitive meter such as the Hewlett Packard Model 400 Vacuum Tube Voltmeter, must be connected to the machine output. The response run should then be run at least 20 db. below operating level or - 15 dbm. as read at the output terminals. A flat amplifier preceding a standard VU meter might be used to supply the necessary sensitivity in absence of a more sensitive meter.

D. 15 inch Record Equalizer:

1. Set speed switches (4) and (19) to the 15" positions.

2. Reset oscillator to 400 cycles.

3. Set record gain so that VU meter on playback reads -10.

4. Reset oscillator to 8000 cycles.

5. Adjust 15 inch record equalizer, C-108, for -10 on playback VU meter.

6. Frequency response should be ± 2 db. from 50 to 15,000 cycles.

E. Erase Adjustment:

Erase is factory adjusted. No readjustment is necessary.

F. Record Level Meter Calibration:

The control (see Fig. 8) is adjusted such that the program level as read on the VU meter is the same as monitored from the playback head or the incoming line. This is accomplished by recording a 400 cycle tone (or program in the absence of an audio oscillator) at 0 (zero) on the VU meter with the METER & OUTPUT switch in the PLAYBACK-LEVEL position. Then switch the METER & OUTPUT switch to the RECORD-LEVEL position and adjust the RECORD LEVEL METER CALIBRATION control (Fig. 8) for 0 (zero) on the VU meter.

G. Bias Meter Calibration:

The bias meter calibration is adjusted as follows: After the bias is adjusted in A above, meter the bias in the normal fashion and adjust the meter shunt, R-150, for 0 (zero) reading on the VU scale of the meter. R-150 is located in back of the METER & OUTPUT switch.

MODEL 400 - MAINTENANCE

I. Lubrication. The drive system employs two motors. One is an induction motor for rewind and takeup. This motor has sleeve bearings for quiet operation which should be oiled once a year for average use or every six months when usage is extremely heavy. Oil through holes in the side of the motor, using 10 drops of SAE 20 motor oil.

The second motor is synchronous. The upper sleeve bearing requires the same oiling schedule described above.

The ball bearings in the idlers and turntables are factory packed and will not require attention.

The mechanical linkage should have occasional lubrication with light machine oil at only three points. See Fig. 9.

Follow the same lubrication schedule with this linkage as with the motor.

II. Brakes. Brake and holdback linings are high grade felt. After long service, however, the linings may have to be replaced. Periodic inspection of the linings is desirable as operation of the recorder with linings worn through may damage the surface of the brake drum.

The linings are supplied by the factory, cut to size. To apply:

1. Do not remove brakes but merely hold about 1/4" away from brake drum.

2. Remove old lining and scrape shoe clean.

3. Spread a liberal amount of Du Pont Household Cement or equivalent on the brake shoe.

4. Place felt carefully in position and release the brake against the drum.

5. Allow cement to set 30 minutes before using the recorder.

In an emergency any good quality felt may be cut to size and used, but should be replaced as soon as possible by factory linings.

CAUTION: Be sure that no glue gets on the working surfaces.

III. Takeup Tension Arm: The recorder may be used in either the horizontal position or rack mounted. The only adjustment affected by these conditions is the takeup tension arm, (Fig. 6). For rack mount additional tension is supplied by loosening nut (N) and tightening spring (S), (Fig. 9). Excessive tension will cause the machine to shut off during fast forward or rewind and will cause starting difficulties.

MODELS 400 and 401

IMPORTANT NOTICE -

At the time the Model 400 was first introduced, it was not anticipated that there would be such a heavy demand for 7" RMA reels. As originally designed, accommodations were provided for the 7" reels to allow the transfer of tape from small to large reels and to record and reproduce programs without stringent quality requirements. It was realized that the performance with the small reels would not come up to that when using the large reels, and the published specifications on the Model 400 only apply when using the NAB reels.

Because of the general demand for the 7" reels, we have modified the Model 400 so that the performance when using the 7" diameter will be virtually the same as when the NAB reels are employed, except for the last few feet of tape at the hub of the small reel. This has been accomplished by using the large reel on the takeup side at all times, for in doing so, the critical adjustments necessary to maintain the performance are properly taken care of, and the flutter which was induced by the smaller reel in this position is eliminated. To accomplish this, the following modifications have been made:

1. The pins previously used for centering the small RMS reels have been removed from the right hand turntable.

2. The centering guide for the NAB reel has been permanently mounted so that it cannot be removed in the field.

These changes have made it possible to employ lighter tape tensions when using the smaller reels. It has also made the recorder much simpler to adjust, and with these changes, it is most unlikely that the machine should get out of adjustment, and the performance has undoubtedly been improved over our earlier models.

Because of the adjustments mentioned above, it must be clearly understood that the small reel is not to be used on the takeup side, SO ALL OPERATORS SHOULD BE SO INFORMED NOT TO ATTEMPT TO USE THE SEVEN-INCH RMS REELS ON THE TAKEUP TURNTABLE AT ANY TIME.

AMPEX ELECTRIC CORPORATION

4-1-51

REPLACEMENT PARTS LIST

Schematic Ref. No.	Description	Ampex Stock Number
C-101	.25 MFD, 400 V. METALIZED PAPER CONDENSER	CO-45
C-102	4 MFD, 150 V. ELECTROLYTIC CONDENSER	CO-53
C-103	25 MFD, 25 V. ELECTROLYTIC CONDENSER	CO-59
C-104	25 MFD, 25 V. ELECTROLYTIC CONDENSER	CO-59
C-105	.25 MFD, 400 V. METALIZED PAPER	CO-45
C-106	.0005 MFD, 500 V. MICA CONDENSER ± 5%	CO-2
C-107	.0001 MFD, PADDER CONDENSER	CO-92
C-108	.0001 MFD, PADDER CONDENSER	CO-92
C-109	.1 MFD, 400 V. METALIZED PAPER CONDENSER ± 5%	CO-101
C-110	25 MFD, 25 V. ELECTROLYTIC CONDENSER	CO-59
C-111	.05 MFD, 400 V. METALIZED PAPER CONDENSER	CO-43
C-112	10 MFD, 450 V. ELECTROLYTIC CONDENSER	CO-55
C-113	.005 MFD, 500 V. MICA CONDENSER ± 5%	CO-12
C-114	1 MFD 400 V. METALIZED PAPER CONDENSER	CO-47
C-115	16 MFD, 150 V. ELECTROLYTIC CONDENSER	CO-56
C-116	.1 MFD, 400 V. METALIZED PAPER CONDENSER	CO-44
C-117	.1 MFD, 400 V. METALIZED PAPER CONDENSER	CO-44
C-118	.1 MFD, 200 V. METALIZED PAPER CONDENSER	CO-97
C-119	4 MFD 150 V. ELECTROLYTIC CONDENSER	CO-53
C-120	25 MFD, 25 V. ELECTROLYTIC CONDENSER	CO-59
C-121	.01 MFD 300 V. SILVER MICA ± 5%	CO-14
C-122	.01 MFD 400 V. METALIZED PAPER	CO-42
C-123	4 MFD, 450 V. ELECTROLYTIC CONDENSER	CO-54
C-124	25 MFD, 25 V. ELECTROLYTIC CONDENSER	CO-59
C-125	.1 MFD, 400 V. METALIZED PAPER CONDENSER	CO-44
C-126	.5 MFD, 400 V. METALIZED PAPER CONDENSER	CO-46
C-127	25 MFD, 25 V. ELECTROLYTIC CONDENSER	CO-59
C-128	2000 MFD, 15 V. CAN ELECTROLYTIC CONDENSER	CO-66
C-129	20 MFD, 450 V. TUBULAR ELECTROLYTIC CONDENSER	CO-57
C-130	.1 MFD, 400 V. METALIZED PAPER CONDENSER	CO-44
C-131	.0004 MFD, SILVER MICA CONDENSER ± 5%	CO-89
C-132	.002 MFD, SILVER MICA CONDENSER ± 5%	CO-7
C-133	.0004 MFD, SILVER MICA CONDENSER ± 5%	CO-89
C-134	.1 MFD, 400 V. METALIZED PAPER CONDENSER	CO-44
C-135	.0005 MFD, 500 V. SILVER MICA CONDENSER ±	CO-5
C-136	.001 MFD PADDER CONDENSER	CO-91
C-137	.0002 MFD, 500 V. MICA CONDENSER	CO-90
C-138	.0025 MFD SILVER MICA CONDENSER ± 5%	CO-8
C-201	20 MFD, 450 V. TUBULAR CONDENSER	CO-57

Note: ORDER PARTS BY AMPEX STOCK NUMBER ONLY!

Schematic Ref. No.	Description	Ampex Stock Number
C-202	20 MFD, 450 V. TUBULAR CONDENSER	CO-57
C-301	DRIVE MOTOR CONDENSER, 6 MFD, FOR EASTERN AIR DEVICES MOTOR	CO-109
C-302	TURNTABLE MOTOR CONDENSER, 5 MFD, FOR EASTERN AIR DEVICES MOTOR	CO-110
C-303	.1 MFD, 600 V. TUBULAR CONDENSER	CO-33
J-101S	CANNON XL-3-13 CONNECTOR, LOCKING	RF-8
J-102S	RECEPTACLE - 2 CONTACT, WITH GROUNDING SPRING	RF-10
J-103S	OPEN CIRCUIT JACK	JA-3
J-104P	CANNON XL-3-14 CONNECTOR	PL-4
J-105S	8 CONTACT CONNECTOR, CHASSIS MOUNT	RF-17
J-106S	6 CONTACT CONNECTOR, CHASSIS MOUNT	RF-16
J-107S	4 CONTACT CONNECTOR, CHASSIS MOUNT	RF-15
J-201P	8 CONTACT CINCH PLUG	PL-21
J-301P	TURNTABLE MOTOR PLUG WITH SHELL	PL-19
J-302S	TURNTABLE MOTOR SOCKET WITH SHELL	RF-13
J-303P	DRIVE MOTOR PLUG WITH SHELL	PL-16
J-304S	DRIVE MOTOR SOCKET WITH SHELL	RF-14
J-305P	TOP PLATE HARNESS PLUGS WITH SHELL	PL-18
K-101	3 PDT RELAY	RL-6
L-101	20 MH CHOKE	CH-8
L-201	FILTER CHOKE	A-1155
L-202	FILTER CHOKE	A-1155
R-101	56,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-23
R-102	47 OHM 1 WATT, COMPOSITION RESISTOR	RE-263
R-103	56,000 OHM 1 WATT, COMPOSITION RESISTOR	RE-23
R-104	100,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-26
R-105	1,200 OHM, 1 WATT, COMPOSITION RESISTOR	RE-30
R-107	100,000 OHM 1 WATT, WELWYN RESISTOR	RE-205
R-108	100,000 OHM WIREWOUND POTENTIOMETER	RE-227
R-109	2,200 OHM COMPOSITION RESISTOR	RE-7
R-110	47,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-22
R-111	1,000,000 OHM 1 WATT, COMPOSITION RESISTOR ± 5%	RE-48
R-112	100,000 OHM, POTENTIOMETER, SLOTTED SHAFT	RE-227
R-113	39,000 OHM, 1 WATT, COMPOSITION RESISTOR ± 5%	RE-44
R-114	100,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-26
R-115	2,200 OHM, 1 WATT, COMPOSITION RESISTOR	RE-7
R-116	47,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-22
R-117	470,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-31
R-118	2,200 OHM, 1 WATT, COMPOSITION RESISTOR	RE-7
R-119	470 OHM, 1 WATT, COMPOSITION RESISTOR	RE-2
R-120	22,000 OHM, 2 WATT, COMPOSITION RESISTOR	RE-171
R-121	47,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-22

Note: ORDER PARTS BY AMPEX STOCK NUMBER ONLY!

Schematic Ref. No.	Description	Ampex Stock Number
R-122	1,000,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-32
R-123	50,000 POTENTIOMETER, SLOTTED SHAFT	RE-266
R-124	470,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-31
R-125	15,000 OHM, 10 WATT, RESISTOR	RE-92
R-126	100,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-26
R-128	1,000,000 OHM, 1 WATT, WELWYN RESISTOR	RE-211
R-129	330,000 OHM, 1 WATT, WELWYN RESISTOR	RE-209
R-130	2,200 OHM, 1 WATT, COMPOSITION RESISTOR	RE-7
R-131	1,000,000 OHM, 1 WATT, WELWYN RESISTOR	RE-211
R-132	20,000 OHM, POTENTIOMETER, SLOTTED SHAFT	RE-240
R-133	22,000 OHM, 2 WATT, COMPOSITION RESISTOR	RE-171
R-134	1,000,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-32
R-135	330,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-30
R-136	2,700 OHM, 1 WATT, COMPOSITION RESISTOR	RE-8
R-137	560 OHM, 1 WATT, COMPOSITION RESISTOR	RE-3
R-138	1,000,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-32
R-139	1,000,000 OHM, POTENTIOMETER, SLOTTED SHAFT	RE-232
R-140	1,000,000 OHM, POTENTIOMETER, SLOTTED SHAFT	RE-232
R-141	100,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-26
R-142	10,000 OHM, 2 WATT, COMPOSITION RESISTOR	RE-168
R-143	1,000,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-32
R-144	2,200 OHM, 1 WATT, COMPOSITION RESISTOR	RE-7
R-145	560 OHM, 1 WATT, COMPOSITION RESISTOR	RE-3
R-146	100 OHM, 1 WATT, COMPOSITION RESISTOR ± 5%	RE-38
R-147	47,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-22
R-148	47,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-22
R-149	40,000 OHM, WIREWOUND POTENTIOMETER	RE-278
R-150	500 OHM, 10 WATT, WIREWOUND RESISTOR - ADJUSTABLE	RE-277
R-151	7 OHM, 1 WATT, WELWYN RESISTOR (2- 14 OHM WELWYN IN PARALLEL)	RE-257
R-152	3600 OHM, 1 WATT, WELWYN RESISTOR ± 1%	RE-258
R-153	560 OHM, 1 WATT, COMPOSITION RESISTOR	RE-3
R-154	47,000 OHM, 1 WATT, COMPOSITION RESISTOR	RE-22
R-301	150 OHM, 50 WATT, ADJUSTABLE RESISTOR	RE-259
SR-201	SELENIUM RECTIFIER - FULL WAVE	SR-3
S-101	3P3T SELECTOR SWITCH	SW-7
S-102	3P2T SELECTOR SWITCH	SW-8
S-103	PUSHBUTTON - NORMALLY OPEN	SW-11
S-104	SPST TOGGLE SWITCH - BAT HANDLE	SW-9
S-105	3P4T SELECTOR SWITCH	SW-13
S-106	SPST TOGGLE SWITCH - BAT HANDLE	SW-9
S-301	SPST TOGGLE TOP PLATE POWER	SW-9
S-302	DPDT TOGGLE SPEED CHANGE SWITCH	SW-5

Note: ORDER PARTS BY AMPEX STOCK NUMBER ONLY!

Schematic Ref. No.	Description	Ampex Stock Number
S-303	SPST MICROSWITCH - TURNTABLE POWER SWITCH	SW-2
S-304	SPDT MICROSWITCH - POWER BOOST SWITCH	SW-17
S-305	SPDT SPECIAL WAFER - REEL SIZE SWITCH	A-982
S-306	DPDT WAFER - RECORD INTERLOCK	SW-15
S-307	DPDT WAFER - TURNTABLE MOTOR REVERSING SWITCH	SW-16
T-101	MICROPHONE INPUT TRANSFORMER	B-1153
T-102	OUTPUT TRANSFORMER	B-1154
T-103	ERASE TRANSFORMER	A-1011
T-201	POWER TRANSFORMER	B-883
V-101	12SJ7 VACUUM TUBE	TU-11
V-102	12SJ7 VACUUM TUBE	TU-11
V-103	12SJ7 VACUUM TUBE	TU-11
V-104	6C5 VACUUM TUBE OR 6J5	TU-3
V-105	VR 150/OD3 VACUUM TUBE	TU-2
V-106	12SJ7 VACUUM TUBE (SELECTED)	TU-12
V-107	12SJ7 VACUUM TUBE	TU-11
V-108	6C5 VACUUM TUBE OR 6J5	TU-3
V-109	6SN7-GT VACUUM TUBE	TU-13
V-201	5Y3-G VACUUM TUBE	TU-14

MISCELLANEOUS PARTS

CAPSTAN IDLER ASSEMBLY	A-995
HEAD ASSEMBLY - (1/2 TRACK) MODEL 400	MP-475-6
HEAD ASSEMBLY - (FULL TRACK) MODEL 401	MP-475-7
LINING - BRAKE SHOE	A-962
METER 4" VU - SPECIAL	ME-2
MOTOR - DRIVE	B-793
MOTOR - REWIND - TAKEUP	B-953
RECORD INDICATOR (NEON POST LIGHT)	DL-4
REEL ADAPTER - TURNTABLE	A-976
TAPE - GUIDE	A-257
TAPE GUIDE - SPACER	A-922
TAPE GUIDE - SHIM	A-923
TURNTABLE PAD	A-958
TURRET SOCKETS (MODIFIED MOUNTING)	A-1208
INPUT CONNECTOR CANNON XL-3-12 OR XL-3-12SC	PL-33
OUTPUT CONNECTOR CANNON XL-3-11 OR XL-3-11SC	RF-38

Note: ORDER PARTS BY AMPEX STOCK NUMBER ONLY!

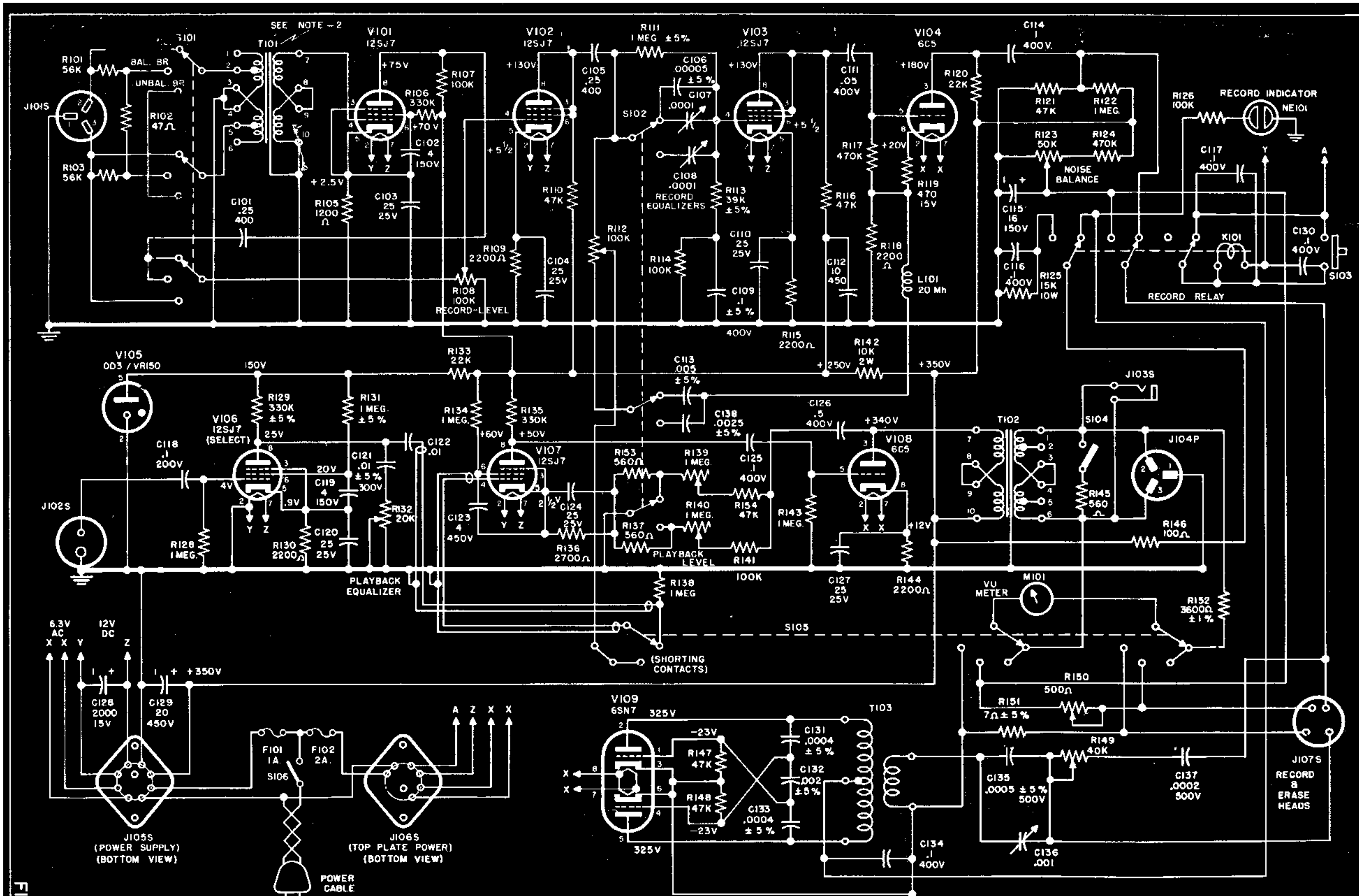


FIG. I

NOTES:

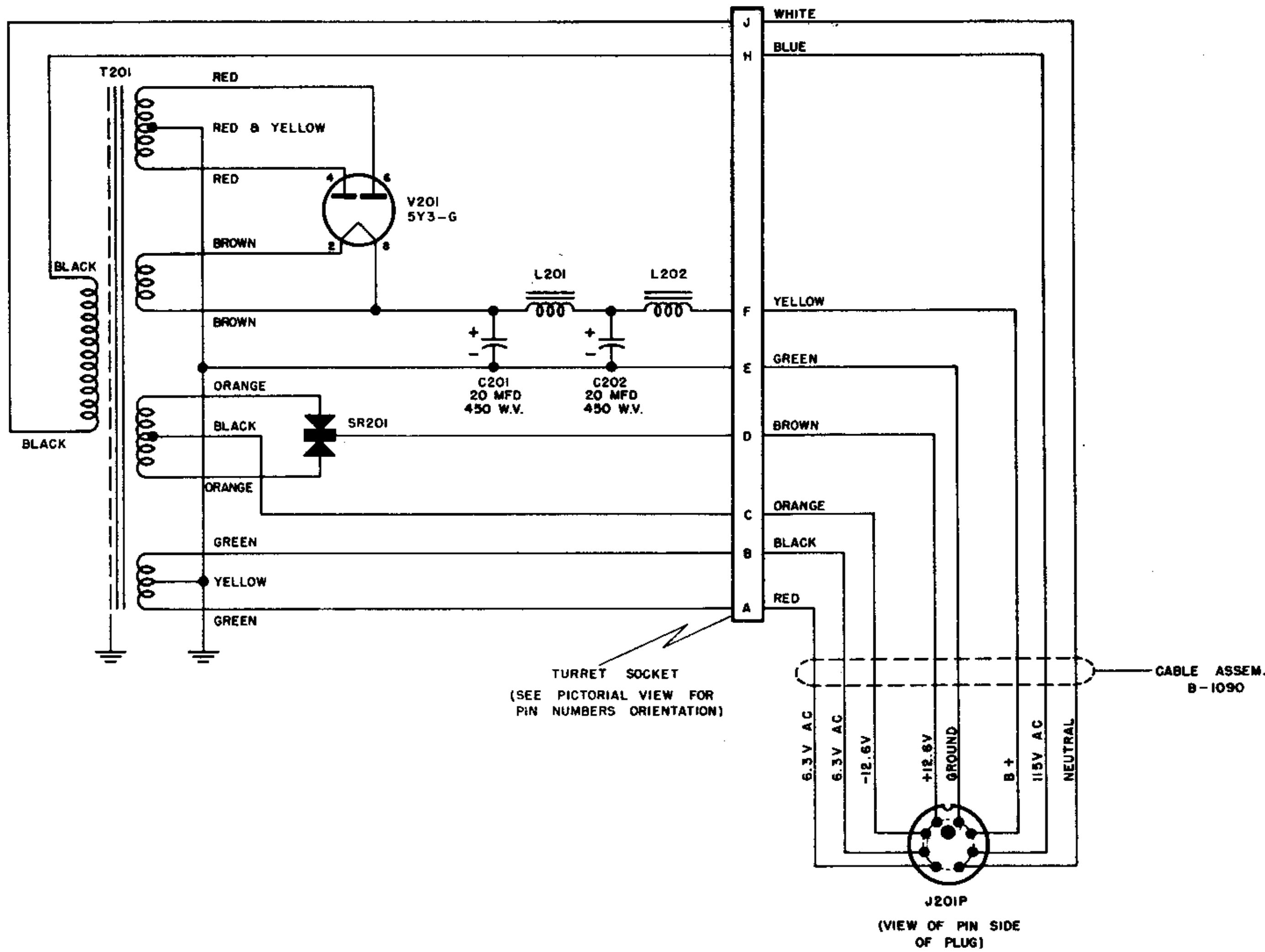
1-ALL CAPACITIES IN MICROFARADS

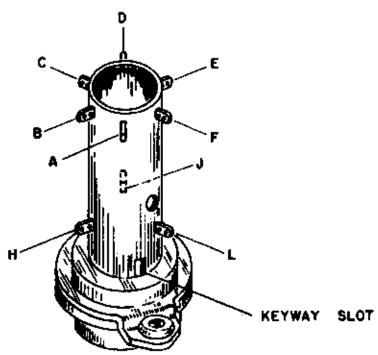
2-FOR 30 & 50 OHMS MICROPHONE SEE INSTALLATION

ELECTRONICS
MODEL-400
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

T102 TRANSFORMER IMPEDANCE CONNECTIONS—
R145 MUST BE ADJUSTED FOR OUTPUT IMPEDANCE—

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





TURRET SOCKET

FIG.2

POWER SUPPLY
MODEL-400
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

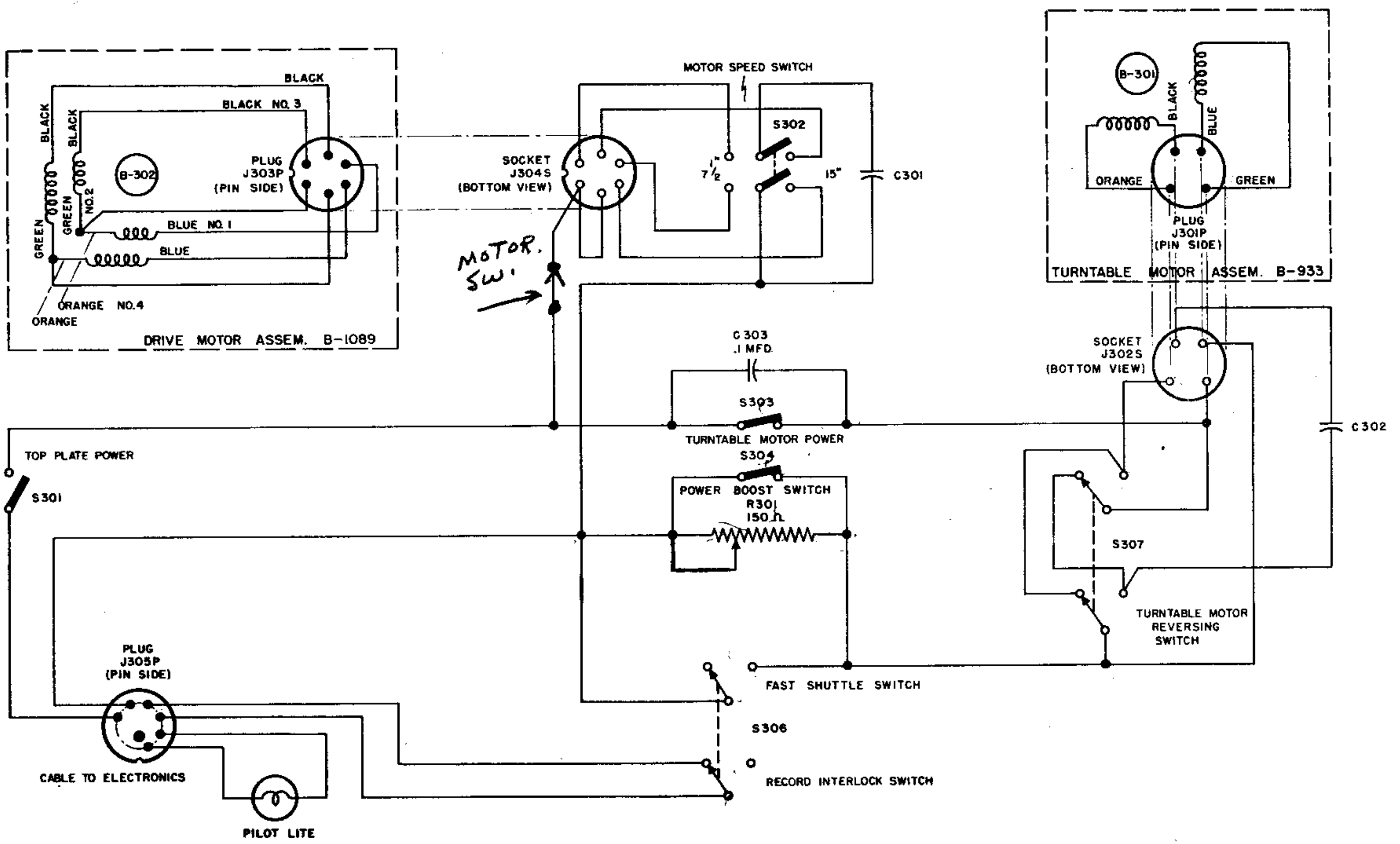


FIG. 3
3-12-51

CONTROL CIRCUITS
MODEL-400
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

FIG.4

INPUT FOR HIGH IMPEDANCE MICROPHONE
(SEE INSTALLATION)

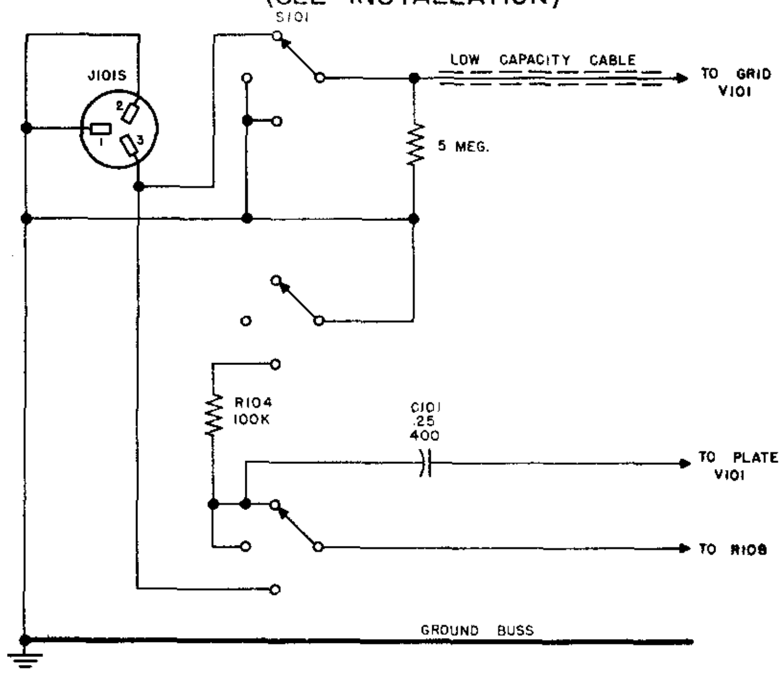
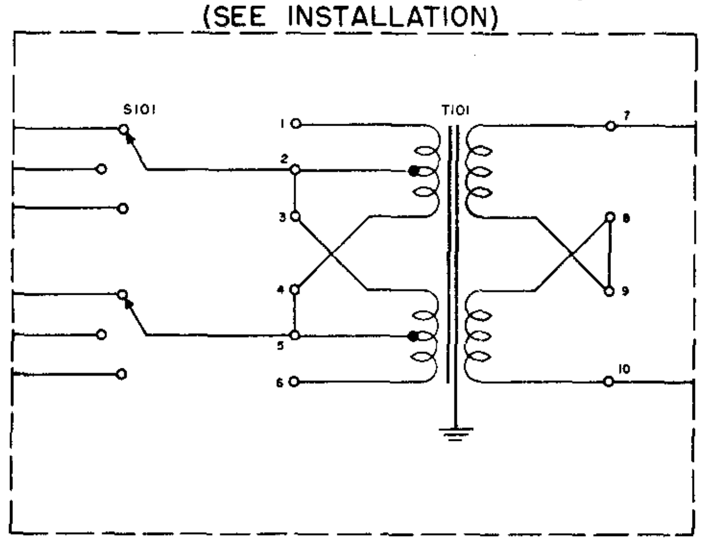


FIG. 5

INPUT TRANSFORMER CONNECTION FOR
30 & 50 OHMS MICROPHONES
(SEE INSTALLATION)



MODEL-400

AMPEX ELECTRIC CORPORATION

SAN CARLOS, CALIFORNIA

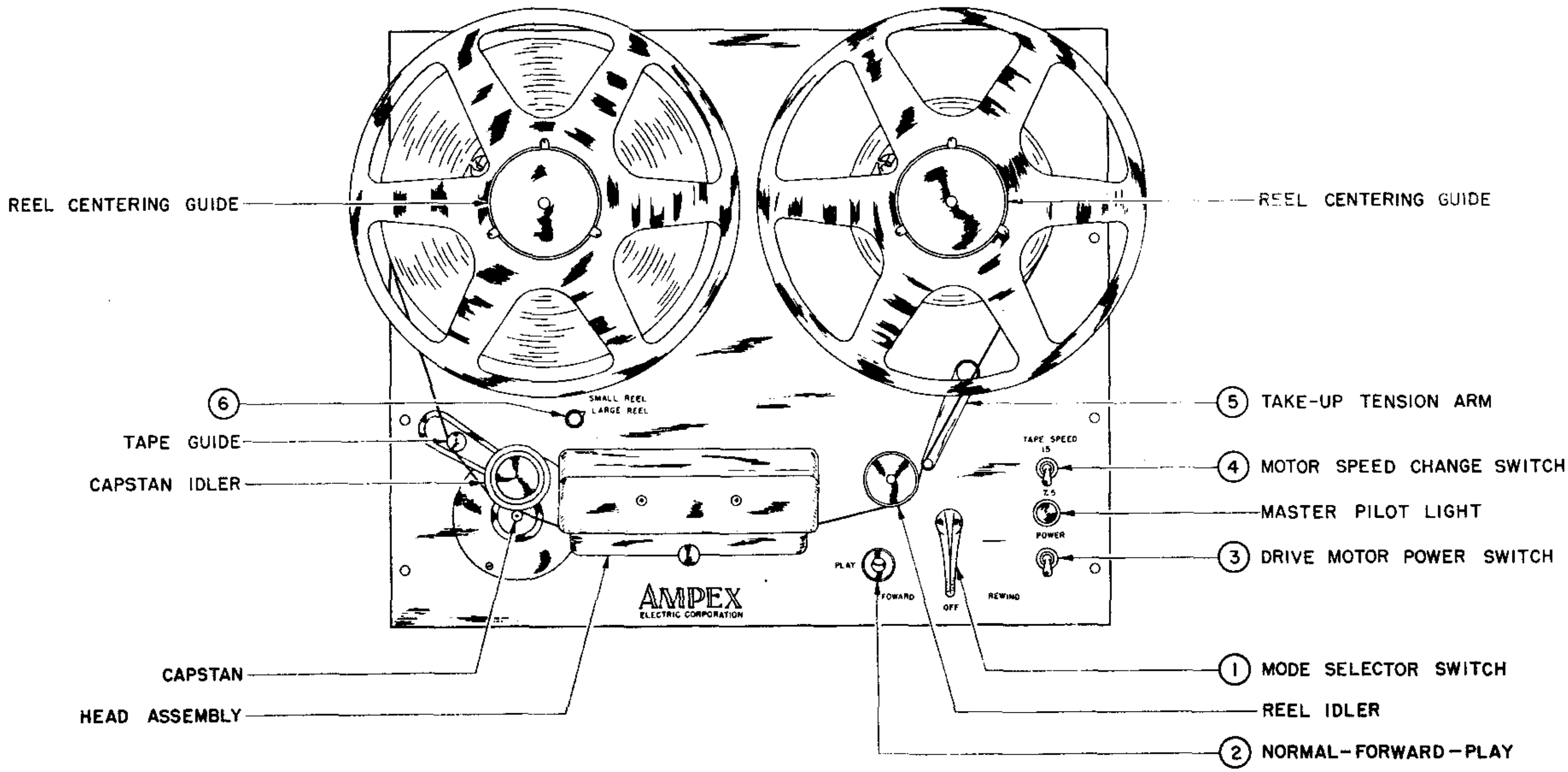


FIG. 6

TOP PLATE
MODEL-400
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

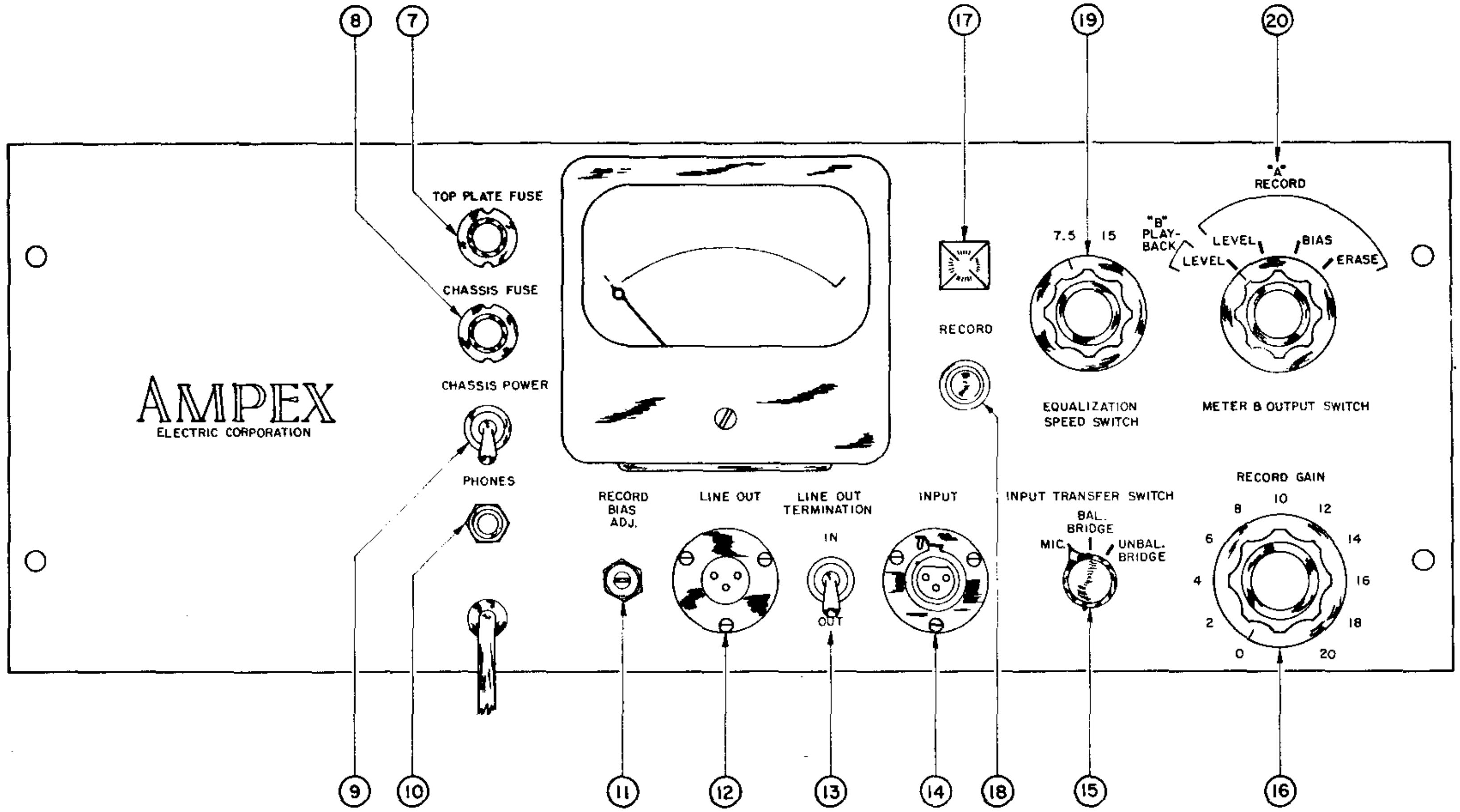
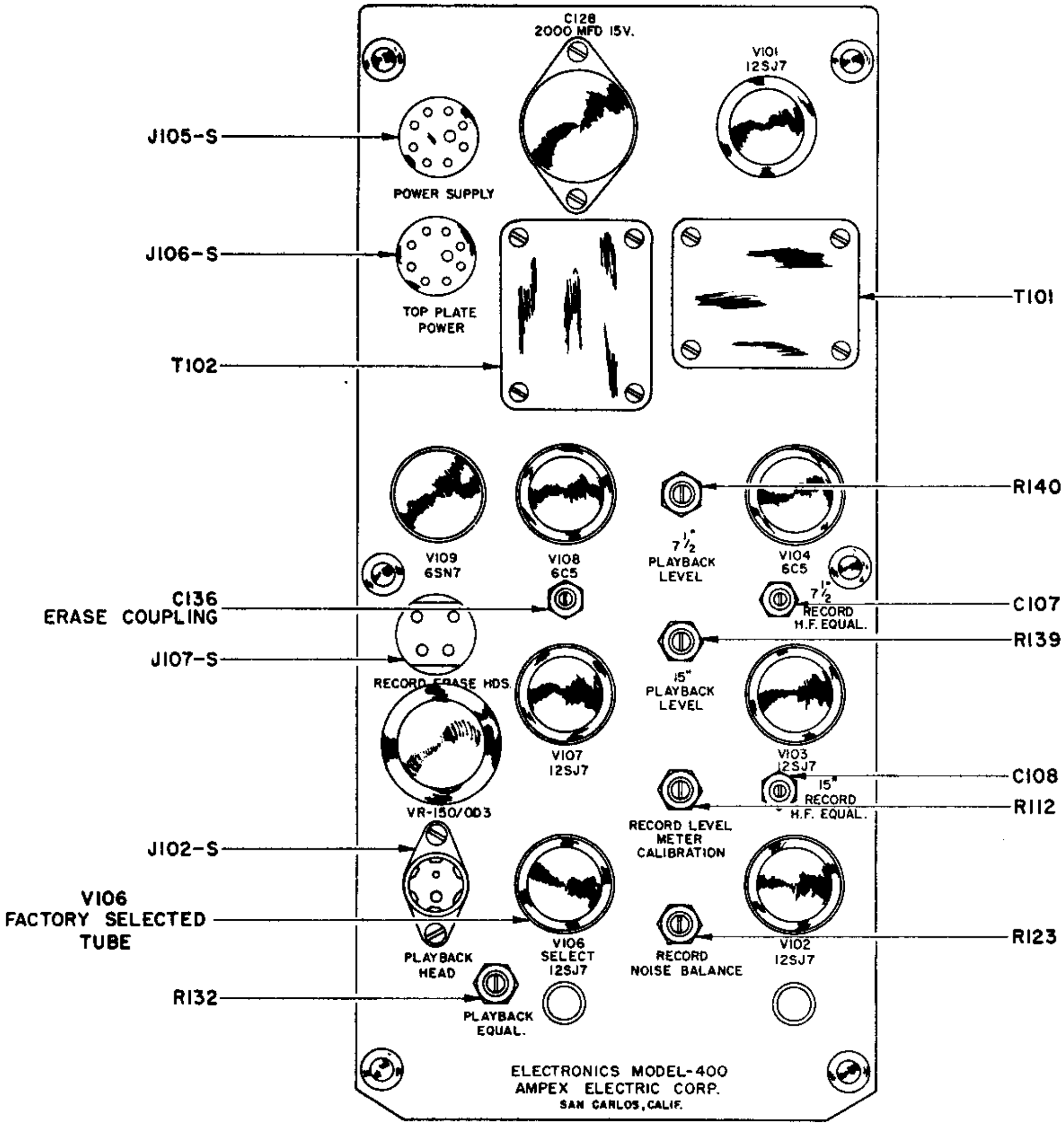


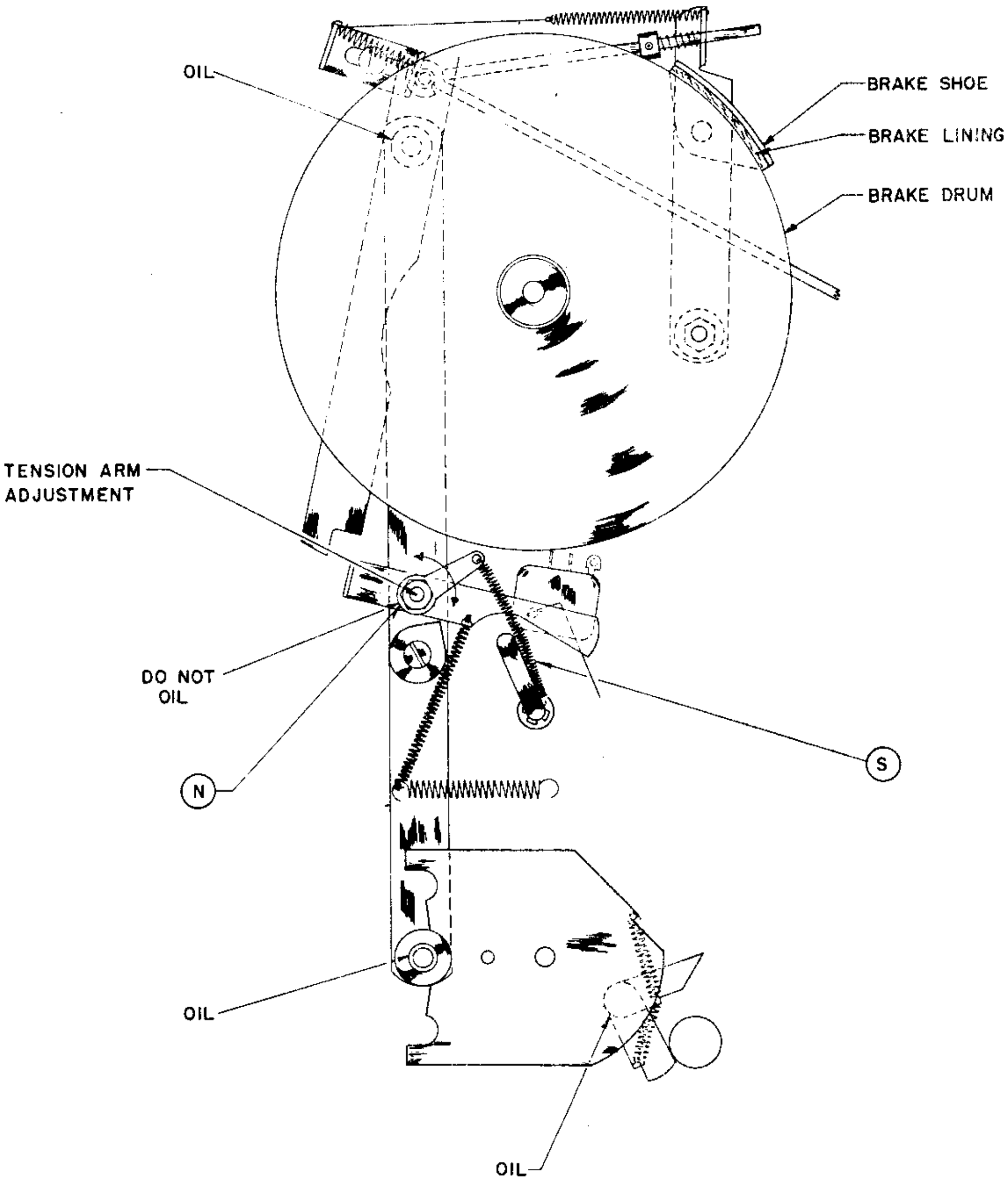
FIG. 7

ELECTRONICS-FRONT PANEL
MODEL-400
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA



ELECTRONICS-TOP PLATE
MODEL-400
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

FIG. 8



MECHANICAL LINKAGE
MODEL - 400
AMPEX ELECTRIC CORPORATION
SAN CARLOS, CALIFORNIA

FIG. 9