ELECTRONIC ASSEMBLY

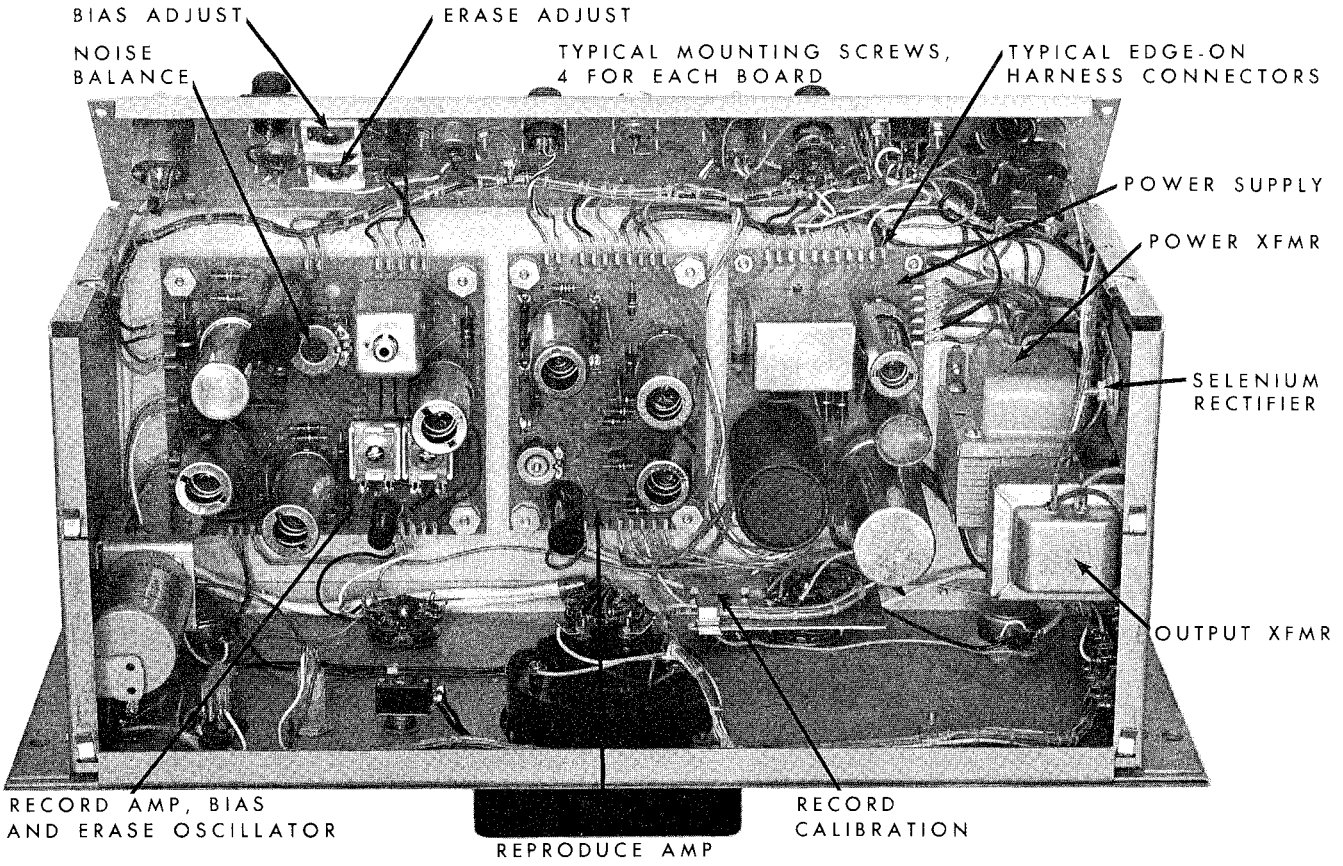
NOTE

This manual is primarily intended for recorders using Ampex Catalog Number 02-30960 electronics. In instances where there are significant differences between this electronics assembly and earlier models using Catalog Number 30750 or 30950 electronics, an appropriate notation will be found.

GENERAL

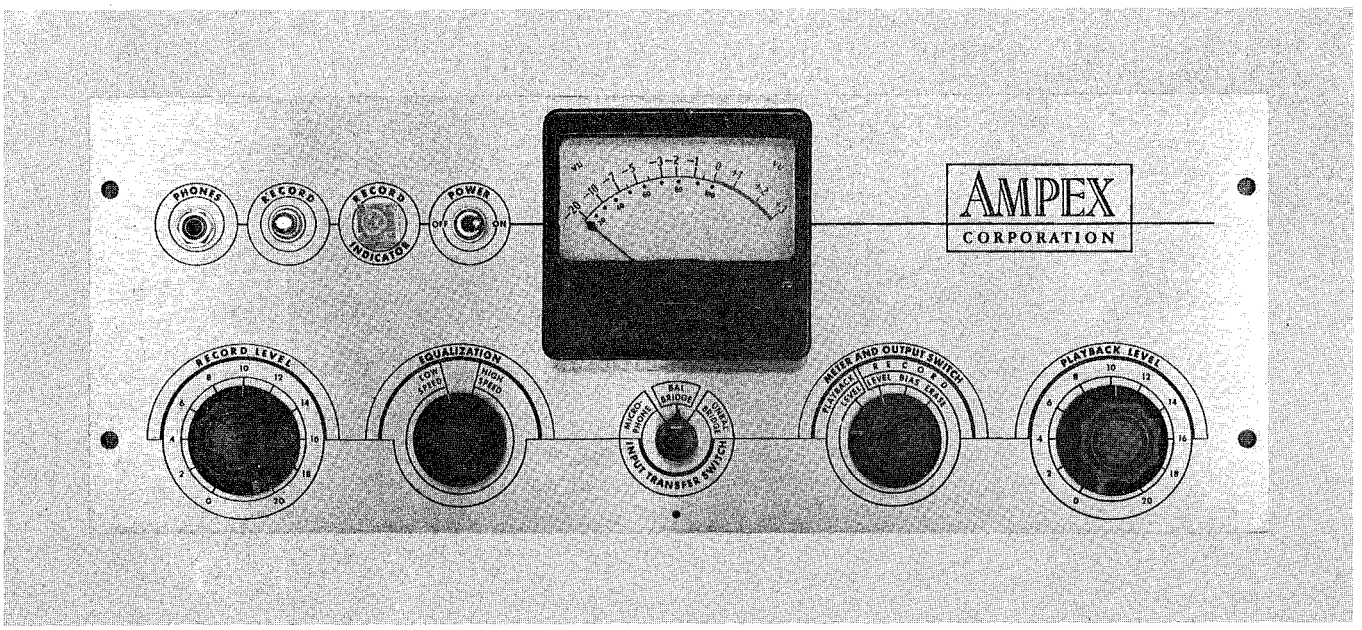
The electronic assembly consists of a single chassis on which are mounted three subassemblies of etched board construction — the record amplifier with bias and erase oscillator, the reproduce amplifier, and the power supply. Each subassembly is an etched board entity which can be taken from the main assembly by disconnecting the edge-on harness connectors and removing 4 mounting sleeve nuts.

On the face panel, facilities are available for setting record and reproduce levels, selecting high or low speed equalization circuitry, making input transfers for microphone, balanced bridge or unbalanced bridge inputs, and switching meter and output circuitry. Visual monitoring of reproduce, record, bias, and erase levels is provided by the vu meter on the face panel. Two phone jacks for aural monitoring are provided, one on the face panel and another on the back of the electronic chassis. Power on-off is controlled at the front of the assembly. A control for the record function, signified by an accompanying indicator light, completes the front panel arrangement.

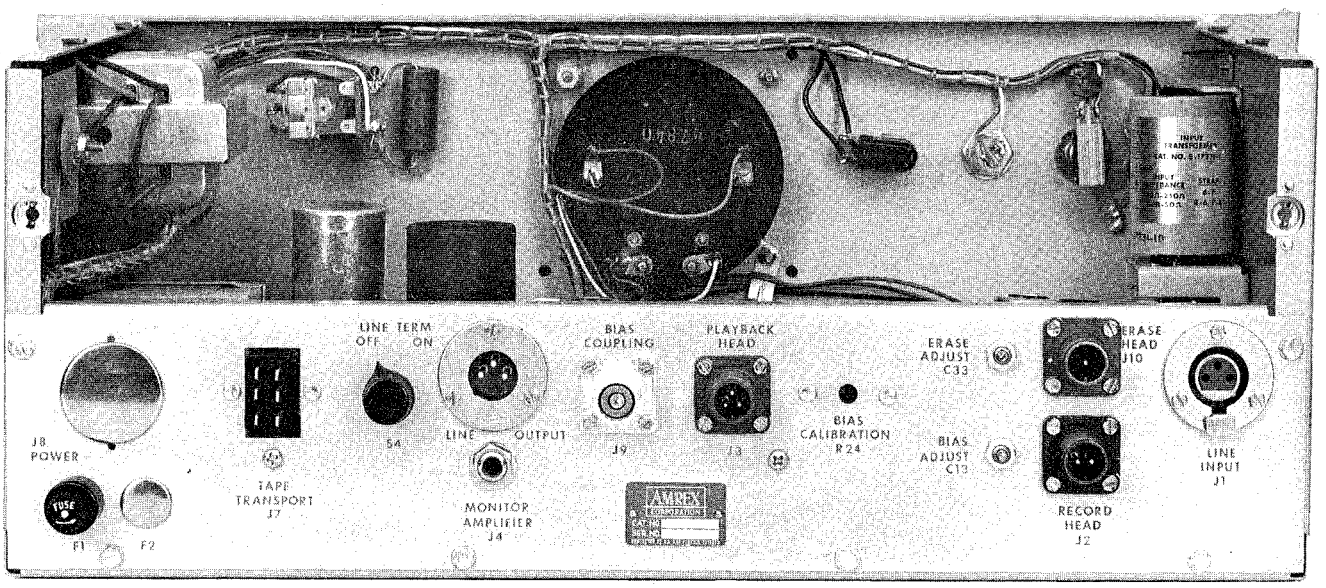


Location of electronic subassemblies

On the back of the electronic assembly chassis are all connecting and interconnecting provisions for power input, line input, line output, power to the tape transport, head connections and bias coupling. Two screw-type fuse posts and a line termination selector switch are



Amplifier chassis, front panel



Amplifier chassis, rear view

also provided on the chassis back panel.

When two electronic assemblies are used for stereophonic operation, the only external differences are that the slave amplifier has one fuse post instead of two and the ac power input receptacle (J8) is not furnished.

RECORD AMPLIFIER

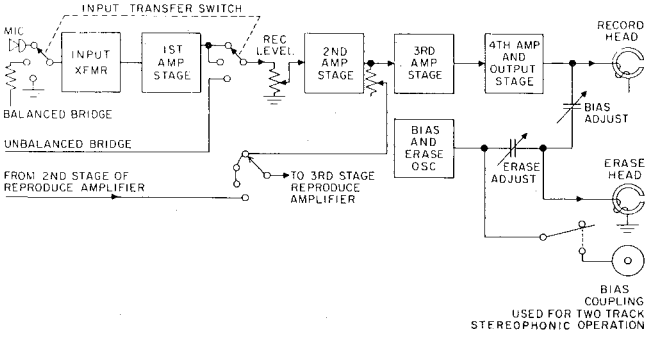
The record section of the electronic assembly is a four stage, high gain, resistance coupled amplifier using transformer coupling for microphone or balanced bridge inputs, and by-passing the transformer and the first stage when unbalanced bridge input is selected. Two dual triodes, 1V1 and 1V2 and their related circuitry, form the four stages of amplification.

When the microphone INPUT is selected the signal from 5J1 is impressed across the primary of input transformer 6T1 and delivered through the secondary to the grid of 1V1.

In the balanced bridge arrangement, the signal passes through resistor network 4R1, 4R4 and 4R5 to input transformer 6T1 with resistors 4R2 and 4R3 providing the balance above ground. From the secondary of transformer 6T1 the signal then appears at the grid of 1V1.

Using the unbalanced bridge arrangement, transformer 6T1 and the first stage of 1V1 are by-passed, the signal appearing at the grid of the second stage through resistor 4R5 and across potentiometer 4R9 with resistor 4R3 and 4R4 completing the circuit to ground.

At the first stage, bias and negative feedback is achieved by means of unbypassed resistor 1R7. When this first stage is used, the amplified signal is coupled through capacitor 1C1 and potentiometer 4R9 and resistor 1R8 (in parallel) to the grid of the second stage, where further amplification takes place. Potentiometer 4R9 provides a means for setting RECORD LEVEL. Bias and negative feedback in the second stage are attained by unbypassed resistor 1R11. Capacitor 1C2A and resistor 1R13 form a plate decoupling network. Capacitors 1C3 and 1C4 and potentiometer 4R12 (RECORD CALIBRATE) provide record calibration circuitry.



Block diagram, record circuit

NOTE

When reading meter indications with the METER AND OUTPUT SWITCH in the record position, only the first two stages of the record amplifier and the last three stages of the reproduce amplifier are connected in the circuit, omitting record pre-emphasis and reproduce equalization circuitry so that meter indications will reflect only the flat action of each amplifier.

The signal now is coupled to the grid of the third stage by capacitor 1C5, bias and negative feedback is provided through unbypassed resistor 1R16. Further amplification takes place in this third stage and pre-emphasis circuitry for HIGH and LOW tape speeds is provided at capacitors 1C46, 1C7 and 1R17 which provide the necessary high frequency rise. At the low end of the frequency spectrum, an effective 3 db gain is furnished by the resistor/capacitor combination 1R18 and 1C8.

In the fourth stage, coupled to the third stage by capacitor 1C9, the signal is applied to the grid of 1V2. Bias and negative feedback is supplied by unbypassed resistor 1R21 and 1R22.

NOTE

Catalog Number 30750 and 30950 electronics used an LC network (1L1 and 1C11 or 1C12) which supplied a high frequency boost by its resonant characteristics.

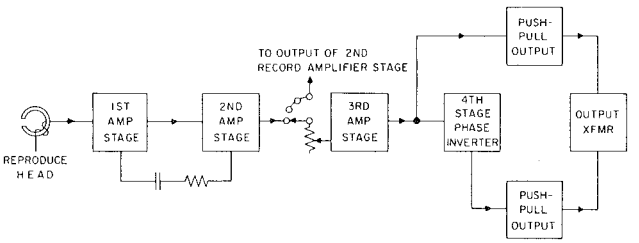
The fourth stage is a constant current circuit which minimizes level variations which would normally occur between different frequencies as they were fed to the reactive load presented by the record head. The output of this fourth stage is mixed with the signal from the bias and erase oscillator before being delivered to the record head.

Plate voltage for the first three stages is supplied whenever POWER switch 4S5 is in the ON position. For plate voltage to be applied to the final stage, the equipment must be in the record mode, at which time relay contacts 3K1C complete the necessary circuitry.

REPRODUCE AMPLIFIER

The reproduce section of the electronic assembly is a resistance coupled audio amplifier. Three dual triodes are used to provide three stages of amplification, phase inversion and a push-pull output amplifier.

Signals on the moving magnetic tape induce voltages in the reproduce head. When high impedance heads are used, this induced voltage appears across resistor 2R25 and then on the grid of 2V3. Bias on this first stage is derived from the voltage divider network consisting of resistors 2R26 and 2R28. Capacitor 3C16a and resistor 3R32 form a plate decoupling network. The amplifier output of this first stage is coupled to the second stage grid through capacitor 2C14. Capacitor 3C16b and resistor 3R35 form a plate decoupling network. Reproduce equalization is achieved by means of capacitor 2C15 and resistors 2R29, 2R30 and 2R31. For the 3¾ and 7½ ips tape speed pair, potentiom-



Block diagram, reproduce circuit

eter 2R30 is selected when EQUALIZATION SWITCH 4S2 on the face panel of the electronic assembly is in the LOW position; POTENTIOMETER 2R31 is selected by the HIGH position. For the 7½ and 15 ips tape speed pair, potentiometer 2R31 serves both speeds.

The signal now is delivered to amplifier stage 2V4, the tube receiving the signal through coupling capacitor 2C17, PLAYBACK LEVEL potentiometer 4R36 and switch 4S3a. The output of 2V4a is coupled through 2C19 to one grid of the push-pull output stage, and a portion of this output is coupled through capacitor 2C18 to phase inverter 2V4b. Both signals, now 180 degrees out of phase with each other, are fed through coupling capacitors to the respective grids of push-pull amplifier 2V5 and then to the primary of center tapped output transformer 6T3.

Plate voltage is supplied to all reproduce stages when the POWER switch is in the ON position. The signal can be monitored from the output of the feedback winding by using phone jack 5J4 MONITOR AMPLIFIER. This same output winding provides negative feedback to the cathode of 2V4A. This position can be useful for feeding such devices as low gain amplifiers, sensing strips, et cetera.

NOTE

Catalog number 30750 and 30950 electronics provide the signal to MONITOR JACK 5J4 from the plate of 2V5.

One secondary of output transformer 6T3 delivers signal to 5J5 output jack, and to LINE TERM switch 5S4 for selecting resistor 5R48 to obtain a nominal 600 ohm termination when necessary. The output signal is also delivered to VU meter 4M1 through resistor network 6R51, 6R53, and 6R52 which determines the amount of signal required to obtain a reading of 0 on the meter. The output signal also appears across 4J6 PHONES jack for aural monitoring.

Transformer strapping and cabling connections for various outputs are discussed in SECTION 2 INSTALLATION.

BIAS AND ERASE OSCILLATOR

A dual triode tube 1V6, connected as a push-pull oscillator, provides a high frequency bias and erase signal. Both halves of the tube are resistance coupled triode amplifiers, with the output of each plate coupled to the grid of the other triode section. Any signal on the grid of either tube will be amplified in the plate circuit and coupled to the grid of the other tube. The signal then will appear at the plate of the second tube and be coupled back to the grid of the first tube in phase with the original signal. Frequency of oscillation is approximately 100 kc.

The oscillator output is fed through variable capacitor 5C33 ERASE ADJUST where erase current adjustments are made. From 5C33 it follows another path through variable capacitor 5C13 BIAS ADJUST where bias current adjustments take place. The bias signal is then mixed with the record signal and delivered to the record head.

NOISE BALANCE control, potentiometer 1R63, in the oscillator grid circuits is adjusted to correct for any asymmetry in wave form, which would cause random noise during reproduction and distortion while recording.

Plate voltage is supplied through relay contact K1C only when the equipment is in the record mode.

POWER SUPPLY

Vacuum tube 3V7, connected as a conventional full wave rectifier, supplies plate power for all tubes in the electronic assembly, and it also supplies the record indicator light. Selenium rectifier CR1, connected as a conventional full wave rectifier provides d-c filament voltage for 1V1, 1V2 and 2V3.

The center tap of the 2V3 tube filament provides a ground for the d-c filaments. *This tube must be in its socket for proper operation.* A-c power input is connected at 5J8 POWER receptacle and is controlled by switch 4S5 POWER.

The power is fed through fuse 5F1 and impressed across the primary of power transformer 6T4 and also through fuse 5F2 to the tape transport.

There are four secondary windings on the power transformer—three for filament supply and one for high voltage. One filament winding serves rectifier tube 3V7, one center-tapped winding provides 12.6 volt d-c filament voltage after rectification, one winding supplies 12.6 and 6.3 volt a-c voltage, and the other center-tapped winding furnishes high voltage. An rc network consisting of the four section capacitor 3C16 and resistors 3R54, 3R55 and 3R56 provides filtering action. Relay contact 3K1B shorts resistor 3R54 in the record mode to provide a nearly constant B+ supply in any mode of operation.

Through record relay 3K1C, B+ is applied to the bias oscillator and the last stage of the record amplifier. Whenever the PLAY button on the tape transport is pressed, 115 volt d-c is available at pin 3 of 5J7, and when RECORD button 4S6 is pressed, the 115 volt d-c is applied to the record relay coil. As long as 115 volt d-c is available at pin 3 of 5J7, contact 3K1A holds

the relay energized. When the STOP button on the tape transport is pressed, the 115 volt d-c no longer reaches pin 3 of 5J7 and relay 3K1 is de-energized and drops out. Slave electronics relay 4K3 provides a coupling contact, 4K3A, when both electronics are in the record mode (concurrent recording). This relay remains energized for a short time after the second relay 3K1 is de-energized to maintain oscillator coupling during the decay period of the oscillators.

NOTE

In catalog numbers 30950 and 30960 slave electronics, relay 4K3A contacts serve as interconnection between the master and slave oscillators. Catalog number 30750 slave electronics did not have relay 4K3.

CAUTION

Before performing alignment and performance checks on stereophonic equipment see special notes on aligning stereophonic equipment.

ALIGNMENT AND PERFORMANCE CHECKS

Equipment Required:

Ampex Standard Alignment Tapes for ¼ Inch Tape.

Speed	*Number Ampex Catalog*
3¾ inches per second (ips)	31331-01
7½ inches per second (ips)	31321-01
15 inches per second (NAB)	31311-01
15 inches per second (AME)	31312-01

A-c Vacuum Tube Voltmeter capable of indicating rms voltages of .004 or less.

Audio Oscillator with stable output from 50 cps to 15 kc.

Earphones or Speaker for Aural Monitoring.

Nutdriver, number 8 (¼ inch).

Reel of unrecorded tape.

Long Screwdriver (approximately 7 inch bit).

Small Screwdriver.

Reproduce Alignment:

Step 1: Remove the head cover.

Step 2: With the equipment connected as shown and all power switches in the ON position, thread an Ampex standard tape for the appropriate speed along the prescribed path.

CAUTION

The standard alignment tape used in the following procedures may be partially erased if the record and reproduce heads are permanently magnetized. Demagnetize the heads before proceeding. Do not replace the head cover on the head assembly.

Step 3: Set the EQUALIZATION switch to the desired speed.

Step 4: Place the METER AND OUTPUT switch in the PLAYBACK position.

Step 5: Terminate the output in a nominal 600 ohms (LINE TERM switch in the ON position or use a 600 ohm external load).

Step 6: Start the standard tape. The first tone on all standard tapes is a reference level, 700 cycles for 7½ and 15 inches per second, and 500 cycles for 3¾ inches per second. For 15 inches per second, adjust the playback level control so the VU meter reads zero or a VTVM across the output reads +8 dbm. For 3¾ or 7½ inches per second adjust the playback level control to a convenient meter reading for checking alignment and response.

Step 7: The next tone will be 15,000 cycles at 7½ and 15 inches per second, and 7500 cycles at 3¾ inches per second for adjusting reproduce head alignment. Take the number 8 nut driver

and adjust the left hand stop nut on the reproduce head for maximum output on VU meter or VTVM. If the peak is broad adjust for minimum output variation.

NOTE

If the head azimuth is far out of alignment (possible if inexperienced personnel without proper equipment have attempted alignment procedures) minor peaks may be observed on both sides of the maximum. The proper setting is 15 to 20 db higher than these peaks.

Step 8: Depending on tape speed, tones from 15,000 cycles to 30 cycles now will be reproduced from the standard tape. Adjust the appropriate variable equalizer (2R31 for 7½ and 15 ips, and 2R30 for 3¾) to give the flattest possible high frequency response.

CAUTION

The equalizers should not be used to compensate for system deficiencies (dirty leads, bad alignment, etc.). In general the playback equalizer should not be moved more than 2 db from the standard curve.

NOTE

Catalog #30750 and 30950 electronics used fixed equalization.

NOTE

When reproducing Ampex standard alignment tapes on multi-track equipment, the bass end of the frequency spectrum will rise in response. The actual amount of rise will vary with the width and location of the track. This phenomena is present because the reproduce head "sees" additional flux on each side of the head at long wavelengths since the standard tapes are recorded across the complete width of the tape. This fringing effect is not present when recording a track the same width as the reproduce head. The electronics should not be readjusted to compensate for this rise.

Step 9: Reproduce level control calibration—The next tone to be heard on the 3¾ and 7½ inch per second standard tapes is a reference tone at operating level. Adjust the playback level control to obtain a zero reading on the VU meter or a +8 dbm (1.95V) output on a VTVM. On the 15 inch per second standard tape, all tones are at operating level, so this calibration was made in Step 6.

NOTE

Do not change this playback level setting for the remainder of the adjustments.

Reproduce Amplifier Noise Measurement

Step 1: After performing the previous alignment checks, stop the tape motion.

Step 2: Read the stopped tape noise measurement on the VTVM. Noise should be below the level specified in performance characteristics. Inaudible low frequency bounce can cause the meter to read higher than performance characteristics tolerances. Disregard these momentary readings because they are frequencies far below the operating range.

Record Amplifier Erase Current Adjustment

Step 1: After the equipment has been properly installed and connected, and all POWER switches are in the ON position, thread blank tape along the prescribed path.

Step 2: Place the INPUT TRANSFER SWITCH in the UNBAL BRIDGE position.

Step 3: Set the METER AND OUTPUT SWITCH to the ERASE function.

Step 4: Center the noise balance potentiometer. When the user faces the front panel, the slot should parallel the face plate.

Step 5: Place the equipment in the record mode.

NOTE

Erase adjustment on stereophonic recorders must be made with only one amplifier in the record mode at a time as false readings may be obtained if both amplifiers are in the record mode.

Step 6: Using a small screwdriver, set the ERASE ADJUST trimmer on the back of the electronic chassis to obtain vu meter readings at 117 volt ac line voltage as follows:

Full (Single) Track Equipment:	Half Track and Stereophonic Equipment:
+1	−½

NOTE

Erase current will be directly proportional to line voltage and the vu meter readings will reflect any changes from the 117 volt a-c voltage.

Record Amplifier Bias Adjustment

NOTE

This adjustment should be made using the brand of tape that normally will be used on the equipment.

Step 1: Place the METER AND OUTPUT SWITCH in the PLAYBACK position.

Step 2: Place the equipment in the record mode at 7½ ips tape speed.

Step 3: Set the oscillator frequency at 500 cycles per second (cps) with an output of approximately 1 volt.

NOTE

Bias is set at a specific wavelength. It it is desired to set bias as 15 inch tape speed, use a frequency of 1000 cps.

Step 4: Place the RECORD LEVEL knob at a position that will obtain an on-scale VU meter reading.

Step 5: With a small screwdriver set the BIAS ADJUST trimmer for a maximum reading on the VU meter. Then adjust the bias control clockwise until the signal drops ½ db. Place the METER AND OUTPUT SWITCH in the BIAS position and note the reading on the VU meter. With the METER AND OUTPUT SWITCH again in the PLAYBACK position, turn the bias control counterclockwise until the signal again drops ½ db. Note the reading on the VU meter with the METER AND OUTPUT SWITCH in the BIAS position. Set the bias at the median of these two readings.

Step 6: With the METER AND OUTPUT SWITCH in the BIAS position, adjust BIAS CALIBRATION control 5R24 for a reading of zero VU on the VU meter.

NOTE

Provided that the brand and type of tape used is not changed, the BIAS ADJUST capacitor 5C13 may be used to reset the bias to a zero VU reading on the VU meter with the METER AND OUTPUT SWITCH in the BIAS position whenever the unit is recalibrated.

Record Level Calibration

NOTE

The reproduce level must be calibrated using standard tape before

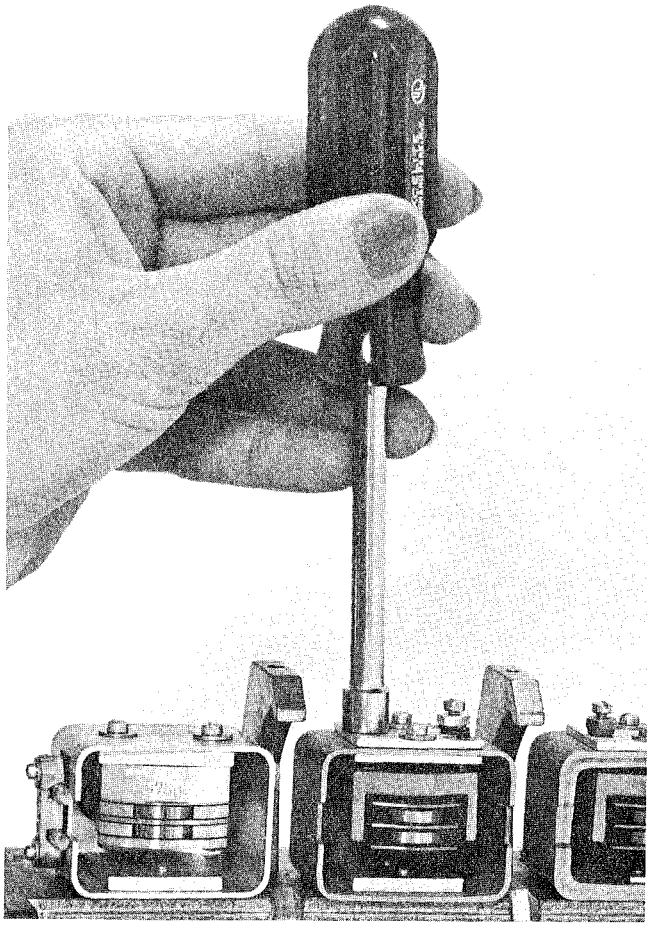
calibrating the record level (see Reproduce Level Control Calibration).

Step 1: Set the audio oscillator to 500 cps. Leave the METER AND OUTPUT SWITCH in the PLAYBACK position.

Step 2: Set the RECORD LEVEL knob to a position that will obtain a zero reading on the VU meter.

Step 3: Place the METER AND OUTPUT SWITCH in the RECORD LEVEL position.

Step 4: Using a long shank screwdriver (to avoid burns from the hot electron tubes), adjust the record level potentiometer for a zero VU reading.



Head azimuth adjustment

Record Azimuth Adjustment

Step 1: Set the oscillator at 500 cps.

Step 2: Place METER and OUTPUT SWITCH in the RECORD LEVEL position.

Step 3: Set the RECORD LEVEL knob to obtain a VU meter reading of approximately —20 (—12 on VTVM).

Step 4: Place the METER and OUTPUT SWITCH in the PLAYBACK position.

Step 5: Set the audio oscillator to 7500 cps for 3¾ ips, 15 kc for 7½ and 15 ips.

Step 6: With the nut driver, rotate the adjustment nut on the left side of the record head (as the user faces the front of the equipment) to obtain a maximum VTVM reading. Several peaks may appear, but the maximum peak is obvious because it is much greater than the minor peaks.

CAUTION

The right hand nuts are factory set. DO NOT ADJUST THEM.

NOTE

If it is desired to make this azimuth adjustment using the VU meter instead of the VTVM, place the PLAYBACK LEVEL control in the full clockwise position and adjust the azimuth nut to obtain a maximum VU meter reading.

Overall Frequency Response

To avoid tape compression, frequency response at 15 ips tape speed should be made at least 10 db below operating level (—2 dbm), at 3¾ and 7½ ips at least 20 db below operating level (—12 dbm). The standard alignment tapes are recorded at a higher level to facilitate measurements on the VU meter.

Step 1: Place the METER and OUTPUT SWITCH in the RECORD LEVEL position.

Step 2: Set the oscillator at 500 cycles and adjust the RECORD LEVEL control to obtain a VTVM reading of approximately −12 dbm (.195v).

Step 3: Now place the METER and OUTPUT SWITCH in the PLAYBACK LEVEL position.

Step 4: Make a frequency response check by sweeping the oscillator through all frequencies from 50 to 15,000 cycles.

NOTE

Models using 30750 or 30950 electronic assemblies utilize fixed equalization.

The high frequency response may vary with tapes of different manufacturers. This machine has been adjusted to give optimum performance within specification with an average tape. The high frequency record equalizers 1C46 or 1C7 (depending on tape speed) may be adjusted to give the flattest possible response with the tape you intend to use. Do not use the playback equalizers 2R30 or 2R31 to compensate for tape variations. The bias setting will also change the high frequency response, especially at the lower tape speeds (3¾ and 7½ ips). Before adjusting the record equalizers make sure the bias has been correctly adjusted as previously described.

CAUTION

Changing bias may change the RECORD LEVEL CALIBRATION and may require re-adjustment as described earlier in this section on "RECORD LEVEL CALIBRATION."

If tolerances are not met, trouble-shooting is indicated or the tape can be faulty.

Overall Frequency Response Using the VU-Meter

Step 1: Thread blank tape along the prescribed path.

Step 2: Place the METER and OUTPUT SWITCH in the RECORD LEVEL position.

Step 3: Set the audio oscillator to 500 cps.

Step 4: Set the record level to approximately −20 reading on the VU meter for 3¾ and 7½ ips tape speed, −10 for 15 ips tape speed.

Step 5: Now place the METER and OUTPUT SWITCH in the PLAYBACK LEVEL position.

Step 6: Note the position of the PLAYBACK LEVEL knob for future reference.

Step 7: Rotate the PLAYBACK LEVEL until the 500 cycle plays back at a convenient reference on the VU meter. Sweep oscillator through the frequency band checking response on the VU meter.

Step 8: Re-establish the PLAYBACK LEVEL CONTROL setting by placing this knob in its original position (see Step 6).

Record Noise Balance Adjustment

CAUTION

For stereophonic equipment see NOTES ON ALIGNING STEREOPHONIC EQUIPMENT.

Step 1: Position the RECORD LEVEL knob fully counterclockwise.

Step 2: Disconnect any input.

Step 3: Plug a set of earphones into the monitor jack and listen for the point of minimum noise while adjusting the noise balance control.

NOTE

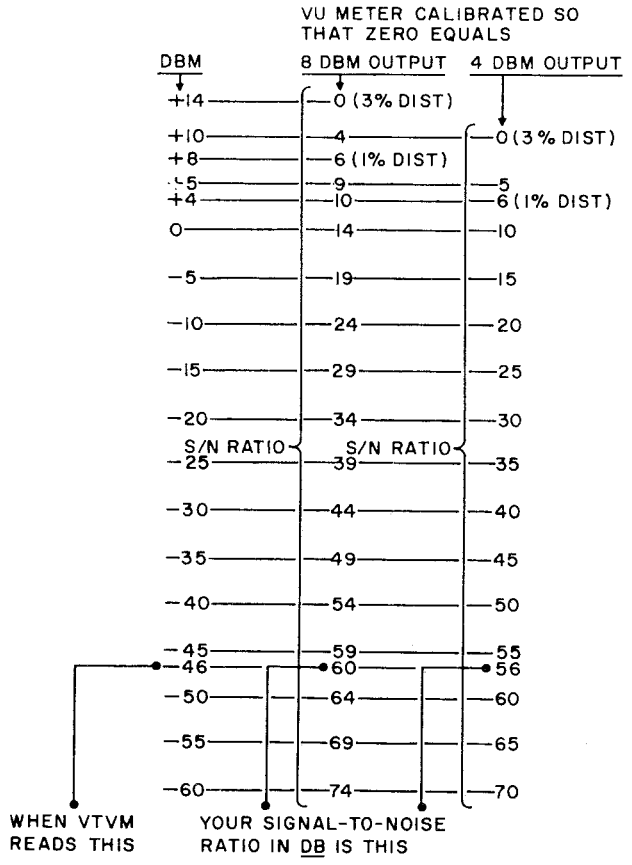
If the slot of the noise balance adjustment is more than 45 degrees from a line parallel to the plane of the face plate, troubleshooting is indicated. If the noise tends to null at either adjustment extreme, it indicates excessive leakage in capacitor 1C10, trouble in the oscillator circuitry or magnetized heads.

Record Noise Measurement

To translate vtvm readings into specific signal-to-noise ratios when the vu meter is so calibrated that zero vu corresponds to +8 dbm output, add 6 db to obtain the output value from the 3% distortion level, arriving at a total of 14 dbm. Having made this computation, bear in mind that, although the noise reading taken on the vtvm is dbm, the measurement is a *ratio* which must include the 14 dbm computed to arrive at the 3% distortion level. Therefore, the vtvm reading must be converted to the signal-to-noise *ratio*.

Example: 14 (dbm, includes +8 dbm normal level and +6 dbm to 3% distortion level)
−46 (dbm, vtvm reading)
60 db signal-to-noise ratio

Any reading below −46 dbm meets performance characteristics specifications of 60 db signal-to-noise and satisfies the signal-to-noise ratio definition.



Signal-to-noise ratio computations

When the VU meter is so calibrated that zero VU corresponds to +4 dbm output add 6 db to obtain the output value to the 3% distortion level arriving at a total of 10 dbm.

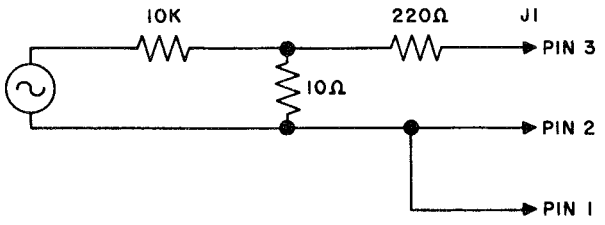
Example: 10 (dbm, 4 +6)
−46 (dbm vtvm reading)
56 (db, signal-to-noise ratio)

Ampex signal-to-noise ratio specifications on audio instruments define in decibels the ratio existing between the level of a steady 400 cycle tone, recorded at a level at which distortion produced by the approach of tape saturation equals 3% total rms, and that level of total rms noise, in the band from 30 to 15,000 cycles, which exists in reproduction under the same gain conditions.

Ampex audio instruments normally are calibrated so that the VU meter reads zero level when reproducing a steady 400 cycle tone the level of which produces 1% total rms distortion due to the approach of tape saturation.

A recorded 400 cycle tone at the 3% distortion level will be 6 db higher in level than the same tone recorded at the 1% level.

Step 1: Place the METER AND OUTPUT SWITCH in the RECORD LEVEL position.
Step 2: Set the oscillator to 400 cps.
Step 3: Adjust the RECORD LEVEL control to obtain a vtvm reading 6 db above operating level (+14 dbm for equipment with 8 dbm output).
Step 4: Record the 400 cps on a section of tape, noting where the recording begins for later reference.
Step 5: Disconnect the oscillator.
Step 6: Set the RECORD LEVEL control to zero. (Fully counterclockwise).
Step 7: Rewind to the beginning of the 400 cps recording.
Step 8: Erase the tape by recording with zero signal.
Step 9: Rewind again to the beginning of the recording.
Step 10: Read the vtvm and check the reading against the table.



Microphone response set-up

Microphone Response

Connect an audio oscillator as shown in the illustration and make the response check by sweeping the oscillator through the frequency range to be checked.

NOTES ON ALIGNING STEREOPHONIC EQUIPMENT

Stereophonic equipment, consisting of two electronic assemblies—a master and a slave, and two track head assemblies, is aligned in an almost identical fashion to the monaural system by considering and aligning each amplifier separately.

Certain simple differences are outlined for the user's guidance. Before attempting alignment of the two track stereophonic equipment, note the instructions for each category.

Head Azimuth Adjustment

Because there are two heads in each record and reproduce stack, make the azimuth adjustment for an average maximum meter indication, adjusting first one head and then the other, and finally adjusting for the average maximum meter indication.

This compromise azimuth adjustment applies to reproduce and record heads alike. When aligning the record heads, energize the record relays by depressing the record buttons on each electronic assembly.

Record Alignment of Stereophonic Equipment

Treat each amplifier as though aligning for single track operation, and following the instructions in this section, proceed in this sequence:

1. Center the noise balance (slot parallel to plane of the chassis face panel if it is not within 45° of center position).

2. Set the ERASE ADJUST trimmer for proper indication.

NOTE

When the METER and OUTPUT SWITCH is in the ERASE position, meter readings must be made with only one amplifier in the record mode because, if both amplifiers are recording, false readings will be taken.

3. Set the BIAS ADJUST trimmer for proper indication.

4. Set the record calibration for proper reading. Repeat on second channel.

Frequency Response

Frequency response checks can be made on both systems simultaneously, or the tracks can be checked individually.

Noise Balance Adjustment

Step 1: Position the number one amplifier RECORD LEVEL knob fully counterclockwise.

Step 2: Disconnect any input.

Step 3: Place amplifier number one ONLY in the record mode.

Step 4: Plug a set of earphones into the monitor jack and listen for the minimum noise location while adjusting the noise balance control.

Step 5: Stop the recorder.

Step 6: Perform steps 1 and 2 on amplifier number two.

Step 7: Place amplifier number two ONLY in the record mode.

Step 8: Listen for the point of minimum noise while adjusting the noise balance control. Noise balance control slots should be within 45 degrees of a line paralleling the face panel of the chassis.

MAINTENANCE AND TROUBLESHOOTING

General Maintenance Information

Faithful adherence to the recommended ROUTINE MAINTENANCE found in SEC-

TION 6 TAPE TRANSPORT MECHANISM and careful performance checks will insure excellent equipment operation. When the cleaning, lubricating and demagnetizing procedures are followed as prescribed and the system is set up according to the instructions in this manual, equipment performance should meet the high Ampex standards.

Neglect of maintenance procedures, such as failure to clean the capstan, the head faces and the tape guides daily can cause deficiencies that are reflected in the amplifiers. For instance, poor tape-to-head contact, due to tape oxide accumulations, will diminish high end frequency response.

Improper head azimuth adjustment will also affect high frequency response.

When the user suspects faults, the above information should be considered, and, if satisfied that the cause is in the amplifier, he then can begin troubleshooting.

Progressive Maintenance of the Amplifiers

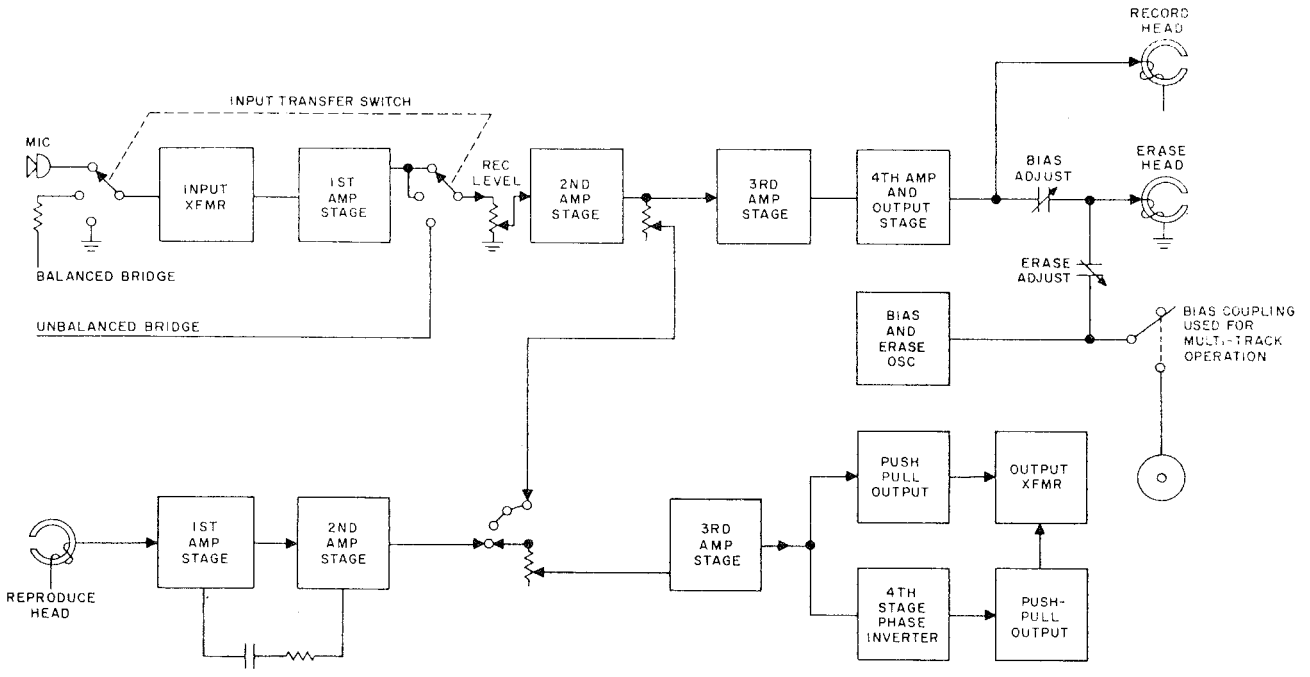
Depending on equipment, check B+ voltage at junction of 3R55 and 3R58 and make a check of tube emission. Make sure tubes are returned to same socket. Check DC filament voltage to note aging of 6CR1. 3R60 may be reduced in value or shorted out as rectifier ages. Clean the relay contacts by inserting a piece of high quality bond paper between contacts and pulling it back and forth several times.

Corrective Maintenance

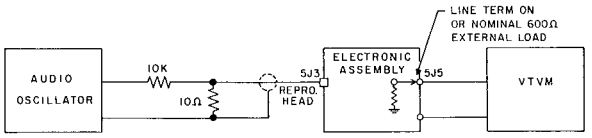
The first step in any corrective maintenance procedure is localizing the faulty circuit. If a tape recorded on the equipment itself does not reproduce correctly, the trouble can be in either the record or the reproduce circuit. In this case, the faulty circuit can be identified by reproducing a standard alignment tape or a commercially recorded tape; if, while reproducing the standard tape, trouble still exists the fault is in the reproduce circuit, if the reproduce function is normal, the fault is in the record circuit. A run through of the alignment and performance checks for the offending circuit will further isolate the trouble or may rectify it, and the faulty component or mechanical device then should be identified easily.

Troubleshooting the Reproduce Amplifier

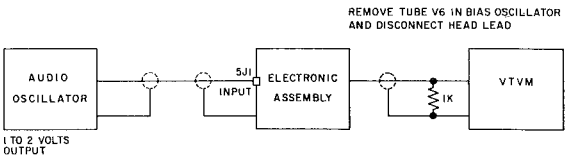
A circuit for troubleshooting the reproduce amplifier is shown below (see also — PARTS



System block diagram



Trouble shooting the reproduce amplifier



Trouble shooting the record amplifier

LOCATION POWER SUPPLY AND REPRODUCE AMPLIFIER, and foldout SCHEMATIC DIAGRAM — ELECTRONIC ASSEMBLIES).

Proceed as in troubleshooting the reproduce amplifier. Typical voltage readings are shown on the foldout schematic diagram. Using the circuit below, check the record amplifier against the appropriate response curve. *Remove tube 1V6, and disconnect the record head lead before checking amplifier response.*

Servicing and Repairing Printed Circuits

Because of the uniform wiring layout and translucent boards, printed circuits can be traced more easily than conventional circuits, troubleshooting is less difficult, and any qualified person will be able to service and repair the equipment including replacement of components by following the instructions, suggestions and procedures in this section. The translucency of the board makes locating connections and test points easier if a light bulb is placed underneath the circuit to be traced. Continuity checks and measurement of resistors, coils and some types of capacitors can be made at the component side of the etched board. Very small breaks in wiring can be located by means of a magnifying glass. The parts location illustrations and the schematic diagram in this section can be used to advantage when tracing circuitry, especially where tube sockets are concerned. Pin numbers are plainly marked.

Equipment and Tools Required

Diagonal cutters
Long-nosed pliers
Pocket knife
¼-inch nut driver
Solder pick
Small wire brush
Pencil soldering iron
60/40 resin core solder

Precautions

Be careful when removing components from the board to avoid damaging the components themselves or the copper foil wiring. If damage occurs, small breaks can be joined with solder, new foil can be cut to simulate the damaged sections, and large breaks can be repaired with hook-up wire. When applying new foil, first remove all coatings such as flux, grease and wax from the damaged portion and place the adhesive side of the foil toward the board. With the tip of the smooth wedge-shaped soldering iron heat the new foil, sliding the tip slowly along the copper surface for about a minute to cure the bond.

Excessive pressure can crack the boards. Access to certain components may not be possible when the boards are in the chassis. To remove the board from the chassis, remove the four mounting nuts carefully. When disconnecting the edge-on harness connectors, make certain that the diagonal pliers grasping the individual connector will not strike and break an adjacent component. To prevent this type of damage, insert a screw driver or similar protective device between the diagonal pliers and the vulnerable component. A vise with protected jaws can be used to hold the boards while servicing. Avoid excessive pressure against the boards when using the vise.

Another source of damage can come from overheating during the soldering process. Excessive heat can cause breaks in the bond between the board and foil, necessitating costly repair of the foil connections. Use 60/40 resin core solder, the melting point of which is 375 degrees F. Some soldering irons are available with tip temperature of 650 degrees F., but the more skilled repair man can speed up the soldering process by using an iron with a tip temperature in the neighborhood of 750 degrees F.

Removing a Resistor

A convenient method of removing resistors is to clip the leads with cutters, leaving sufficient wire at each point so that wiring terminals remain. New components can be soldered to these remnant leads.

Replacing the Resistor

Make mechanical joints by wrapping a turn of each new resistor wire around the remnant wires left from the old component. Perform the soldering quickly and efficiently.

Solder Method of Removing and Replacing Components

On the wiring side of the board at the component to be replaced, heat the connections with an iron until the solder melts. Quickly remove the iron and brush away the solder using the wire brush. Two or more heating passes may be required; but take special care to avoid excessive heat.

Now the mechanical joint will be revealed. Insert a knife blade between the board and the exposed wire, and carefully raise the wire until it is perpendicular to the board and will come free in the next step. Again apply the soldering iron to the connection point while simultaneously moving the lead back and forth until it breaks free of the molten solder.

Take the replacement component, cut the leads to the desired length, insert them into the holes, bending the leads against the board to make mechanical connections, and solder the connections.

Replacing Electrolytic Capacitors, Relays and Coils

The replacement of these types of components can be accomplished as follows:

Step 1: With the soldering iron, heat each connection and brush away melted solder. Some parts may require prying the mounting lugs perpendicular to the board in order to brush away the melted solder.

Step 2: Trim the lugs as close as possible to the board.

Step 3: Again apply the soldering iron to the connections, brush away the melted solder.

Step 4: Insert replacement component and solder the connections.

Replacing of Tube Sockets

Step 1: With soldering iron, heat each contion and brush away melted solder. If the connections do not come free on the first pass, repeat the heating process until connections are broken.

Step 2: With a pen knife inserted between the socket lug and wiring foil, bend each lug upward — except the grounding lug.

Step 3: When all socket lugs have been freed from the wiring foil, heat the grounding lug until the solder melts and slowly pull the socket away from the board.

ORDERING PARTS

The purpose of the parts list is to aid you in ordering replacement parts. Ampex can offer fast and efficient service in providing normally replaceable parts of the components in the system when proper information is furnished. Parts listed according to the schematic reference symbol, a description of the part and the Ampex part number. The Ampex Corporation offers some replacement parts that are not necessarily exact replicas of those used on the original version of the equipment; but these parts are interchangeable with the original parts. The description column names the part, its composition, electrical value and manufacturer's number (or military specification when available)—and the AMPEX PART NUMBER.

Ampex part numbers are the exact designation for all parts used in Ampex equipment. For example, CAPACITOR, fixed: ceramic, .02 uf + 80%-20%, 500 vdcw; Sprague Part No. 36C205 will always bear the Ampex catalog number 54-0265. THIS IS THE NUMBER YOU SHOULD USE WHEN ORDERING REPLACEMENT PARTS. The schematic reference number should NOT be used for ordering purposes as it will vary with different equipment types. Include the following information when ordering parts: Equipment Type, Equipment Serial Number, Ampex Part Number, Description of Part. Example: 4 ea 54-0265 capacitors for Series 351.

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
	ELECTRONIC ASSEMBLY, Master: 7-1/2 - 15 ips NAB; Catalog No. 02-30960-01	
	ELECTRONIC ASSEMBLY, Master: 3-3/4 - 7-1/2 ips NAB; Catalog No. 02-30960-02	
	ELECTRONIC ASSEMBLY, Slave: 7-1/2 - 15 ips NAB; Catalog No. 02-30960-03	
	ELECTRONIC ASSEMBLY, Slave: 3-3/4 - 7-1/2 ips NAB; Catalog No. 02-30960-04	
1C1	CAPACITOR, Fixed: paper; 0.15 mfd; ±20%; 400 vdcw; Sprague Part No. 89D15404	035-205
1C2	CAPACITOR, Fixed: electrolytic; 10 mfd; 450 vdcw; 20 mfd; 450 vedw; 10 mfd; 350 vdcw	30770-01
1C3	CAPACITOR, Fixed: ceramic; 0.02 mfd; +80 -20%; 500 vdcw; Sprague Part No. 36C205	030-059
1C4	(Same as 1C3)	030-059
1C5	(Same as 1C3)	030-059
C6	Not Used	---
1C7	CAPACITOR, Variable: ceramic; 100-550 pfd; 500 vdcw; MIL-C-81A:CV11D4-50 (Used on 02-30960-01 & -03 only)	038-009
1C7	CAPACITOR, Variable: mica; 550-1600 pfd; 250 vdcw; El Menco Type 309 (Used on 02-30960-02 & -04 only)	038-015
1C8	CAPACITOR, Fixed: paper; 0.02 mfd; ±5%; 400 vdcw; Sprague Part No. 89P20354	035-267
1C9	(Same as 1C3)	030-059
1C10	CAPACITOR, Fixed: paper; 0.47 mfd; ±20%; 400 vdcw; Cornell Dubilier Part No. BC4P47	035-206
C11	Not Used	---
C12	Not Used	---
5C13	CAPACITOR, Variable: mica; 15-130 pfd; 175 vdcw; El Menco Type 302	038-002
2C14	(Same as 1C3)	030-059
2C15	CAPACITOR, Fixed: mica; 750 pfd; ±5%; 500 vdcw; El Menco Part No. CM20C751J	034-144
3C16	CAPACITOR, Fixed: electrolytic; 15 mfd; 350 vdcw; 15 mfd; 350 vdcw; 75 mfd; 450 vdcw; 20 mfd; 450 vdcw	30769-02
2C17	(Same as 1C1)	035-205
2C18	(Same as 1C3)	030-059
2C19	(Same as 1C3)	030-059
2C20	CAPACITOR, Fixed: ceramic; 150 pfd; ±20%; 500 vdcw; Sprague Part No. 40C218	030-046
2C21	(Same as 1C3)	030-059
2C22	CAPACITOR, Fixed: ceramic; 0.1 mfd; +80 -20%; 50 vdcw; Sprague Part No. 33C41	030-063
4C23	CAPACITOR, Fixed: ceramic; 2 x 0.001 mfd; 500 vdcw; Erie Part No. 812-.001	030-004
5C24	CAPACITOR, Fixed: ceramic; 0.0047 mfd; ±20%; 500 vdcw; MIL-C-20A:CC36CH470G	035-028
5C25	(Same as 5C24)	035-028
3C26	CAPACITOR, Fixed: electrolytic; 20 mfd; 450 vdcw; Cornell Dubilier Part No. BR10422	031-144
3C27	(Same as 1C3)	030-059
3C28	CAPACITOR, Fixed: electrolytic; 4000 mfd; 15 vdcw	30769-01
3C29	CAPACITOR, Fixed: ceramic; 0.01 mfd; ±20%; 1000 vdcw; Sprague Part No. 33C35A	030-045
3C30	(Same as 3C29)	030-045

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
C31	Not Used	---
1C32	CAPACITOR, Fixed: mica; 350 pfd; ±1%; 500 vdcw; Cornell Dubilier Part No. 5A5T35	034-169
5C33	CAPACITOR, Variable: mica; 100-550 pfd; 175 vdcw; El Menco Type 304	038-009
5C34	CAPACITOR, Fixed: mica; 910 pfd; ±5%; 500 vdcw; Cornell Dubilier Part No. 5A5T91	034-145
1C35	(Same as 1C32)	034-169
1C36	CAPACITOR, Fixed: mica; 0.001 mfd; ±5%; 500 vdcw; Cornell Dubilier Part No. 5A5D1	034-147
4C37	CAPACITOR, Fixed: ceramic; 0.01 mfd; 500 vdcw; Erie Part No. 811-.01	030-002
C38	Not Used	---
5C39	CAPACITOR, Fixed: mica; 33 pfd; ±5%; 500 vdcw; Cornell Dubilier Part No. 22A5233	034-168
C40 thru C42	Not Used	---
4C43	CAPACITOR, Fixed: electrolytic; 10 mfd; 150 vdcw; Cornell Dubilier Part No. BBR-10-150 (Used on 02-30960-03 & -04 only)	031-157
C44	Not Used	---
C45	Not Used	---
1C46	CAPACITOR, Variable: mica; 550-1600 pfd; 250 vdcw; El Menco Type 309 (Used on 02-30960-01 & -03 only)	038-015
1C46	CAPACITOR, Variable: mica; 780-2110 pfd; 250 vdcw; El Menco Type 311 (Used on 02-30960-02 & -04 only)	038-026
6CR1	RECTIFIER, Selenium: single phase; full wave; General Electric Part No. 6RS5WH5	581-001
4CR2	RECTIFIER, Selenium: single phase; half wave; General Electric Part No. 6RS20PH4RAD1 (Used on 02-30960-03 & -04 only)	581-031
5F1	FUSE, Cartridge: 0.5 amp; 250 v; slow blow; Littelfuse Part No. 313.500	070-026
5F2	FUSE, Cartridge: 3 amp; 250 v; fast blow; Littelfuse Part No. 312003 (Used on 02-30960-01 & -02 only)	070-001
4I1	LAMP, Indicator: neon; Drake Mfg. Part No. 105	132-003
5J1	CONNECTOR; Receptacle: female; 3 contact; Cannon Part No. XL-3-13	146-007
5J2	CONNECTOR, Receptacle: male; 2 contact; AN3102A-10SL-4P	143-009
5J3	CONNECTOR, Receptacle: male; 3 contact; AN3102A-10S-3P	143-008
5J4	JACK, Phone: open circuit; Switchcraft Part No. 11	148-015
5J5	CONNECTOR, Receptacle: male; 3 contact; Cannon Part No. XL-3-14	147-004
4J6	(Same as 5J4)	148-015
5J7	CONNECTOR, Receptacle: female; 6 contact; Jones Part No. S-306-AB (Used on 02-30960-01 & -02 only)	146-004
5J7	CONNECTOR, Receptacle: male; 6 contact; Jones Part No. P-306-AB (Used on 02-30960-03 & -04 only)	147-011
5J8	CONNECTOR, Receptacle: male; 2 contact; Hubbel Part No. 7466 (Used on 02-30960-01 & -02 only)	147-013

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
5J9	CONNECTOR, Receptacle: female; 1 contact; Amphenol Part No. 83-1R	146-067
5J10	CONNECTOR; Receptacle: male; 1 contact; AN3102A-10S-2P	143-010
3K1	RELAY, Record: 115 vdc	30763-01
K2	Not Used	---
4K3	RELAY, Bias coupling: 115 vdc dpst; Comar Part No. C6605 (Used on 02-30960-03 & -04 only)	020-066
4M1	METER, vu	30667-01
4R1	RESISTOR, Fixed: composition; 100K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF104K	041-072
4R2	RESISTOR, Fixed: composition; 100 ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF101K	041-038
4R3	(Same as 4R2)	041-038
4R4	RESISTOR, Fixed: composition; 20K ohm; ±5%; 1/2 watt; MIL-R-11A:RC20GF203J	041-356
4R5	RESISTOR, Fixed: composition; 82K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF823K	041-071
1R6	RESISTOR, Fixed: film; 100K ohm; ±1%; 1/2 watt; Electra Type DC-1/2	042-092
1R7	RESISTOR, Fixed: film; 2.7K ohm; ±1%; 1/2 watt; MIL-R-10509A:RN15R2701F	042-123
1R8	RESISTOR, Fixed: composition; 1 megohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF105K	041-031
4R9	RESISTOR, Variable: composition; 100K ohm; 2 watt; Allen Bradley Part No. JA1041	044-015
1R10	(Same as 4R1)	041-072
1R11	RESISTOR, Fixed: composition; 3.3K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF332K	041-054
4R12	RESISTOR, Variable: composition; 250K ohm; 1/4 watt; Chicago Telephone Supply Type PM-45	044-179
1R13	RESISTOR, Fixed: composition; 27K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF273K	041-065
1R14	RESISTOR, Fixed: composition; 330K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF334K	041-078
1R15	(Same as 1R8)	041-031
1R16	RESISTOR, Fixed: composition; 1.5K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF152K	041-050
1R17	RESISTOR, Fixed: composition; 47K ohm; ±5%; 1/2 watt; MIL-R-11A:RC20GF473J	041-020
1R18	RESISTOR, Fixed: film; 150K ohm; ±1%; 1/2 watt; Electra Type DC-1/2	042-137
1R19	RESISTOR, Fixed: composition; 22K ohm; ±10%; 1 watt; MIL-R-11A:RC32GF223K	041-162
1R20	(Same as 1R8)	041-031
1R21	RESISTOR, Fixed: composition; 220 ohm; ±5%; 1/2 watt; MIL-R-11A:RC20GF221J	041-004
1R22	RESISTOR, Fixed: composition; 2.2K ohm; ±5%; 1/2 watt; MIL-R-11A:RC20GF222J	041-239
1R23	RESISTOR, Fixed: composition; 8.2K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF822K	041-059
5R24	RESISTOR, Variable: wirewound; 1K ohm; ±20%; 2 watt; Clarostat Part No. 39-1000	044-255
2R25	(Same as 1R14)	041-078
2R26	RESISTOR, Fixed: composition; 470K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF474K	041-080
2R27	RESISTOR, Fixed: wirewound; 330K ohm; ±2%; 1/2 watt; Cinema Type CE-516E	043-995

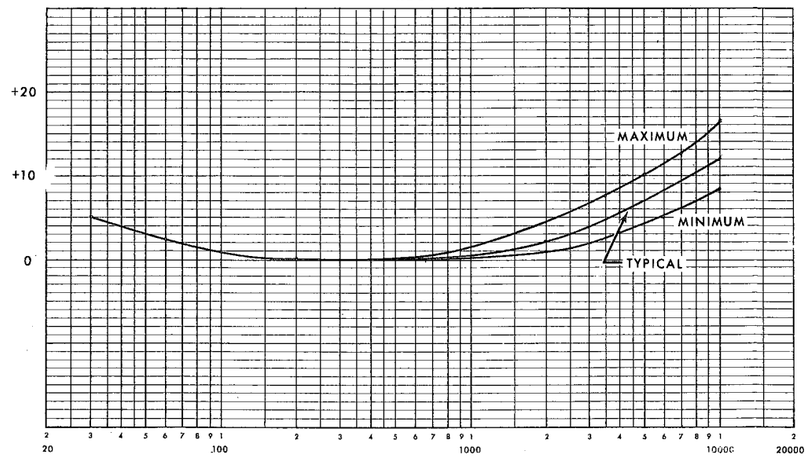
REF. NO.	PART DESCRIPTION	AMPEX PART NO.
2R28	RESISTOR, Fixed: wirewound; 1.5K ohm; ±1%; 1/2 watt; Cinema Type CE-516E	043-992
2R29	RESISTOR, Fixed: composition; 8.2 megohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF825K (Used on 02-30960-01 & -03 only)	041-381
2R29	RESISTOR, Fixed: composition; 10 megohm; ±5%; 1/2 watt; MIL-R-11A:RC20GF106J (Used on 02-30960-02 & -04 only)	041-090
2R30	RESISTOR, Variable: composition; 500K ohm; ±30%; 1/4 watt; Chicago Telephone Supply Type UPE-70, Spec. 31184 (Used on 02-30960-02 & -04 only)	044-207
2R31	RESISTOR, Variable: composition; 100K ohm; ±20%; 1/4 watt; Chicago Telephone Supply Type UPE-70, Spec. 31186	044-204
3R32	RESISTOR, Fixed: composition; 39K; ±10%; 1/2 watt; MIL-R-11A:RC20GF393K	041-067
2R33	(Same as 2R29) (10 megohm)	041-090
2R34	RESISTOR, Fixed: composition; 220K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF224K	041-076
3R35	(Same as 1R13)	041-065
4R36	RESISTOR, Variable: composition; 250K ohm; ±10%; 2 watt; Allen Bradley Part No. CA2541SD3056	044-128
2R37	(Same as 1R8)	041-031
2R38	(Same as 1R16)	041-050
2R39	(Same as 1R8)	041-031
2R40	(Same as 4R5)	041-071
2R41	(Same as 1R16)	041-050
2R42	(Same as 2R34)	041-076
2R43	(Same as 2R34)	041-076
2R44	(Same as 1R8)	041-031
2R45	(Same as 1R8)	041-031
2R46	RESISTOR, Fixed: composition; 1K ohm; ±10%; 1/2 watt; MIL-R-11A: RC20GF102K	041-048
2R47	RESISTOR, Fixed: composition; 15K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF153K	041-062
5R48	RESISTOR, Fixed: composition; 560 ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF561K	041-045
2R49	(Same as 3R32)	041-067
6R50	(Same as 1R16)	041-050
6R51	RESISTOR, Fixed: composition; 4.7K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF472K	041-013
6R52	RESISTOR, Fixed: composition; 8.2K ohm; ±5%; 1/2 watt; MIL-R-11A:RC20GF822J	041-309
6R53	RESISTOR, Fixed: composition; 820 ohm; ±5%; 1/2 watt; MIL-R-11A:RC20GF821J	041-317
3R54	RESISTOR, Fixed: composition; 1.5K ohm; ±10%; 1 watt; MIL-R-11A:RC32GF152K	041-148
3R55	(Same as 3R54)	041-148
3R56	(Same as 4R2)	041-038
3R57	(Same as 4R2)	041-038
3R58	(Same as 2R47)	041-062
1R59	RESISTOR, Fixed: composition; 1.5K ohm; ±10%; 2 watt; MIL-R-11A:RC42GF152K	041-204
3R60	RESISTOR, Fixed: wirewound; 1/5 ohm; ±10%; 1 watt; International Resistance Corp Type BW-1	043-286
1R61	RESISTOR, Fixed: composition; 4.7K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF472K	041-056

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
1R62	(Same as 1R61)	041-056
1R63	RESISTOR, Variable: composition; 10K ohm; ±30%; 1/4 watt; Chicago Telephone Supply Type UPM-45, Spec. 3471	044-171
1R64	RESISTOR, Fixed: composition; 8.2 ohm; ±5%; 1 watt; MIL-R-11A:RC32GF8R2J	041-319
1R65	(Same as 2R34)	041-076
4R70	RESISTOR, Fixed: composition; 330 ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF331K (Used on 02-30960-03 & -04 only)	041-042
2R75	RESISTOR, Fixed: composition; 680K ohm; ±10%; 1/2 watt; MIL-R-11A:RC20GF684K	041-082
4S1	SWITCH, Rotary: input transfer	30760-01
4S2	SWITCH, Rotary: equalization	30761-01
4S3	SWITCH, Rotary: meter and output	30762-01
5S4	SWITCH, Rotary: line termination	122-016
4S5	SWITCH, Toggle: power;spst; Circle "F" Part No. 1887-L2P	62-0142
4S6	SWITCH, Pushbutton: record; spst; normally open; Arrow H & H Part No. 3391BSA	120-013
6T1	TRANSFORMER, Microphone input	17331-01
T2	Not Used	---
6T3	TRANSFORMER, Output	30764-01
6T4	TRANSFORMER, Power	30765-01
1T5	TRANSFORMER, Bias	30766-01
1V1	TUBE, Electron: Type 12AX7	012-024
1V2	TUBE, Electron: Type 6201	012-993
2V3	(Same as 1V1)	012-024
2V4	(Same as 1V1)	012-024
2V5	TUBE, Electron: Type 12AU7	012-107
1V6	(Same as 1V5)	012-107
3V7	TUBE, Electron: Type 6X4	012-050
	*BOARD ASSEMBLY, Power supply	30754-01
	*BOARD ASSEMBLY, Reproduce: 7-1/2 - 15 ips	30962-01
	*BOARD ASSEMBLY, Reproduce: 3-3/4 - 7-1/2 ips	30962-02
	*BOARD ASSEMBLY, Record: 7-1/2 - 15 ips	30963-01
	*BOARD ASSEMBLY, Record: 3-3/4 - 7-1/2 ips	30963-02
	FACING PANEL	5711-02
	HARNESS ASSEMBLY, Master	30966-01
	HARNESS ASSEMBLY, Slave	30966-02
	KNOB, Hold-down: EIA reels	30971-01
	KNOB, Large: skirted	230-004
	KNOB, Small: skirted	230-003
	KNOB, Small: with pointers	230-008
	POST, Fuse	085-001
	SHIELD, Tube (for all except V7)	160-012
	SHIELD, Tube (for V7)	160-043
	SHOCKMOUNT, Printed board	350-015
	NUT, Sleeve	21078-01
	SOCKET, Tube: 7 pin	150-067
	SOCKET, Tube: 9 pin	30818-01

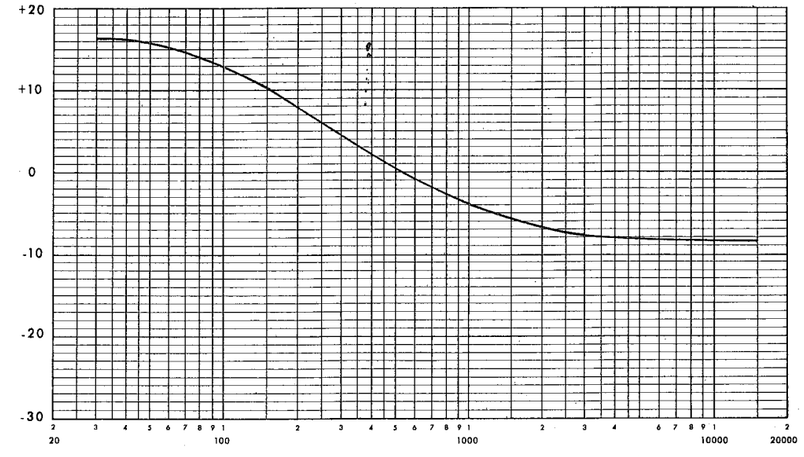
*Etched board assemblies are complete with all mounted components including tubes.

3¾ips (120 μ sec)

RECORD

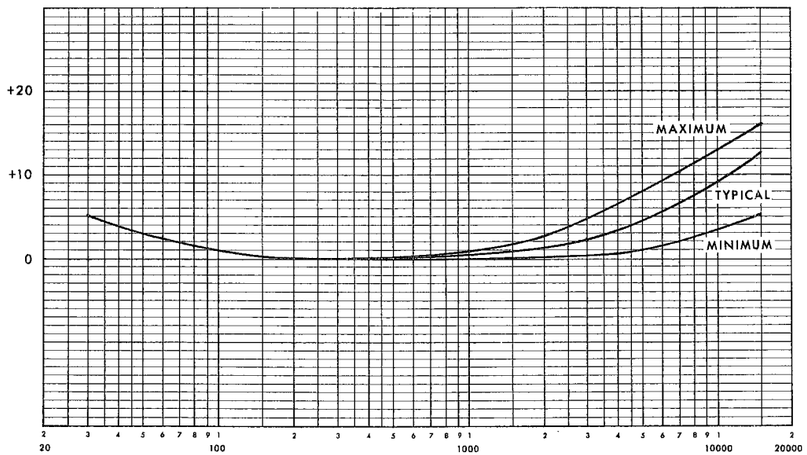


REPRODUCE

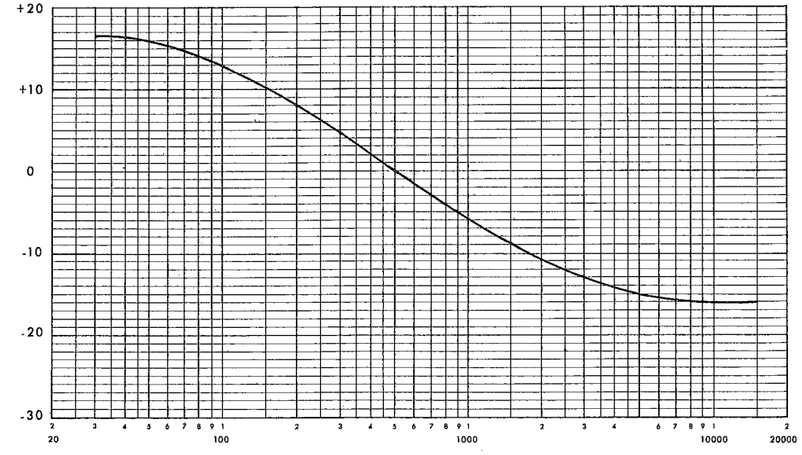


7½ips NAB

RECORD

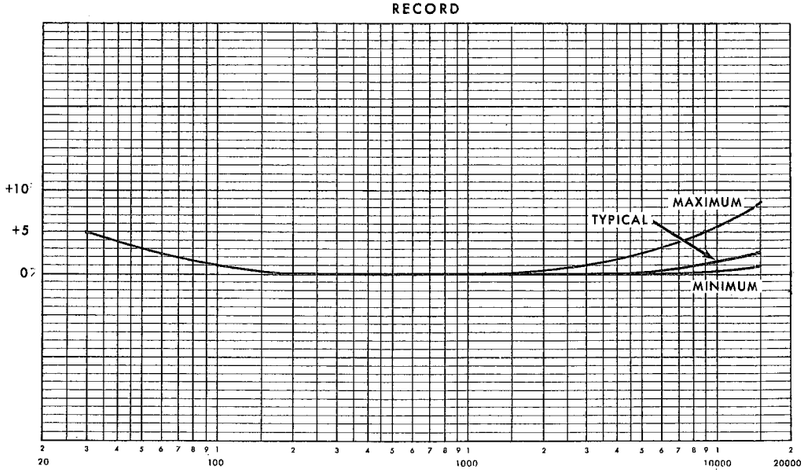


REPRODUCE

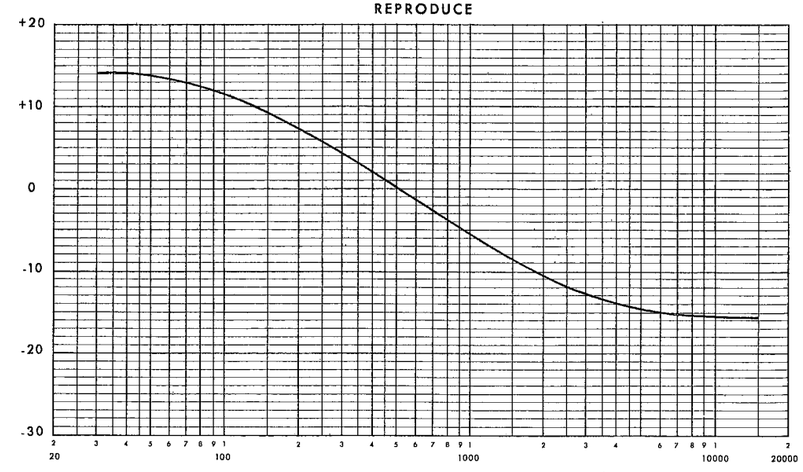


15ips NAB

RECORD



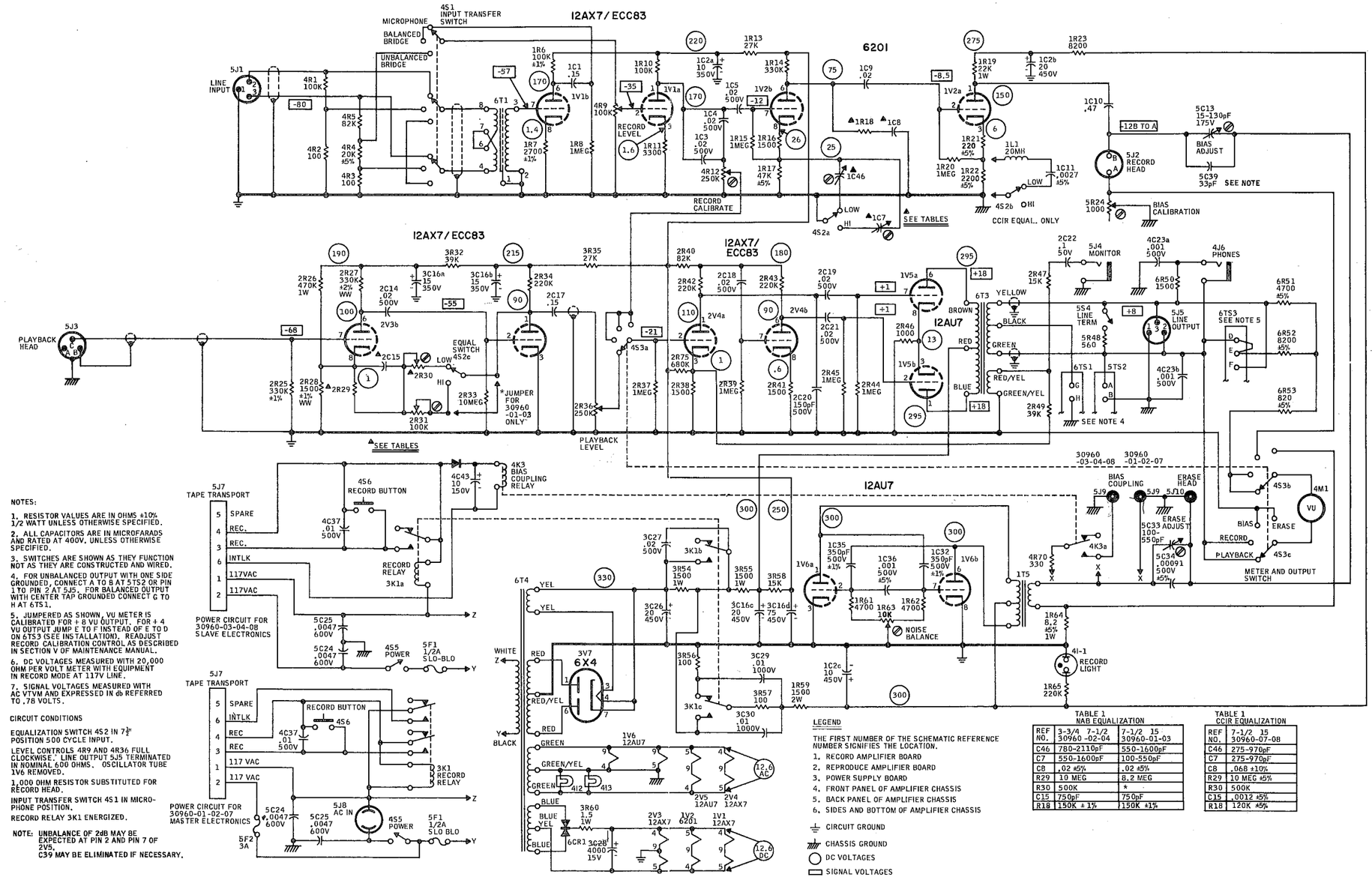
REPRODUCE



NOTE 1
RECORD CURVES SHOWN ARE APPROXIMATE AND WILL VARY WITH TAPE TO MAINTAIN FLAT OVERALL RESPONSE.

APPLICABLE RESPONSE CURVES

ELECTRONIC ASSEMBLY
SCHEMATIC DIAGRAM



NOTES:

1. RESISTOR VALUES ARE IN OHMS ±10% 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS AND RATED AT 400V, UNLESS OTHERWISE SPECIFIED.
3. SWITCHES ARE SHOWN AS THEY FUNCTION NOT AS THEY ARE CONSTRUCTED AND WIRED.
4. FOR UNBALANCED OUTPUT WITH ONE SIDE GROUNDED, CONNECT A TO B AT 5TS2 OR PIN 1 TO PIN 2 AT 5J5. FOR BALANCED OUTPUT WITH CENTER TAP GROUNDED CONNECT G TO H AT 6TS1.
5. JUMPERED AS SHOWN, VU METER IS CALIBRATED FOR +8 VU OUTPUT. FOR +4 VU OUTPUT JUMP E TO F INSTEAD OF E TO D ON 6TS3 (SEE INSTALLATION). READJUST RECORD CALIBRATION CONTROL AS DESCRIBED IN SECTION V OF MAINTENANCE MANUAL.
6. DC VOLTAGES MEASURED WITH 20,000 OHM PER VOLT METER WITH EQUIPMENT IN RECORD MODE AT 117V LINE.
7. SIGNAL VOLTAGES MEASURED WITH AC VTVM AND EXPRESSED IN db REFERRED TO .78 VOLTS.

CIRCUIT CONDITIONS

EQUALIZATION SWITCH 4S2 IN 7½" POSITION 500 CYCLE INPUT.

LEVEL CONTROLS 4R9 AND 4R36 FULL CLOCKWISE. LINE OUTPUT 5J5 TERMINATED IN NOMINAL 600 OHMS. OSCILLATOR TUBE 1V6 REMOVED.

1,000 OHM RESISTOR SUBSTITUTED FOR RECORD HEAD.

INPUT TRANSFER SWITCH 4S1 IN MICROPHONE POSITION.

RECORD RELAY 3K1 ENERGIZED.

NOTE: UNBALANCE OF 2dB MAY BE EXPECTED AT PIN 2 AND PIN 7 OF 2V5. C39 MAY BE ELIMINATED IF NECESSARY.

LEGEND

THE FIRST NUMBER OF THE SCHEMATIC REFERENCE NUMBER SIGNIFIES THE LOCATION.

1. RECORD AMPLIFIER BOARD
2. REPRODUCE AMPLIFIER BOARD
3. POWER SUPPLY BOARD
4. FRONT PANEL OF AMPLIFIER CHASSIS
5. BACK PANEL OF AMPLIFIER CHASSIS
6. SIDES AND BOTTOM OF AMPLIFIER CHASSIS

⏚ CIRCUIT GROUND
⏚ CHASSIS GROUND
○ DC VOLTAGES
▭ SIGNAL VOLTAGES

TABLE 1
NAB EQUALIZATION

REF NO.	3-3/4 7-1/2 30960-02-04	7-1/2 15 30960-01-03
C46	780-2110pF	550-1600pF
C7	550-1600pF	100-550pF
C8	.02 ±5%	.02 ±5%
R29	10 MEG	8.2 MEG
R30	500K	*
C15	750pF	750pF
R18	150K ± 1%	150K ±1%

TABLE 1
CCIR EQUALIZATION

REF NO.	7-1/2 15 30960-07-08
C46	275-970pF
C7	275-970pF
C8	.068 ±10%
R29	10 MEG ±5%
R30	500K
C15	.0012 ±5%
R18	120K ±5%