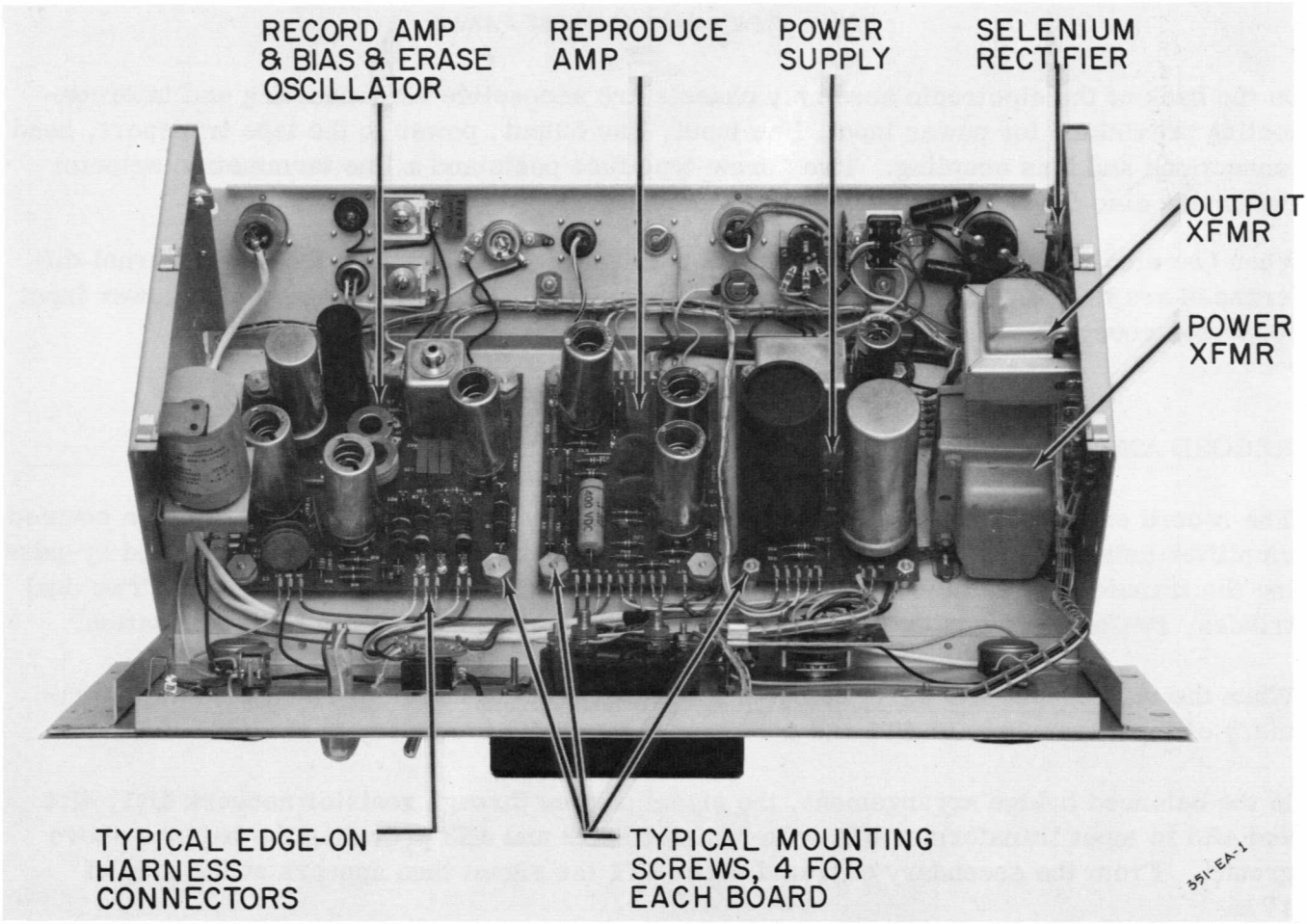
SECTION 5

ELECTRONIC ASSEMBLY

GENERAL

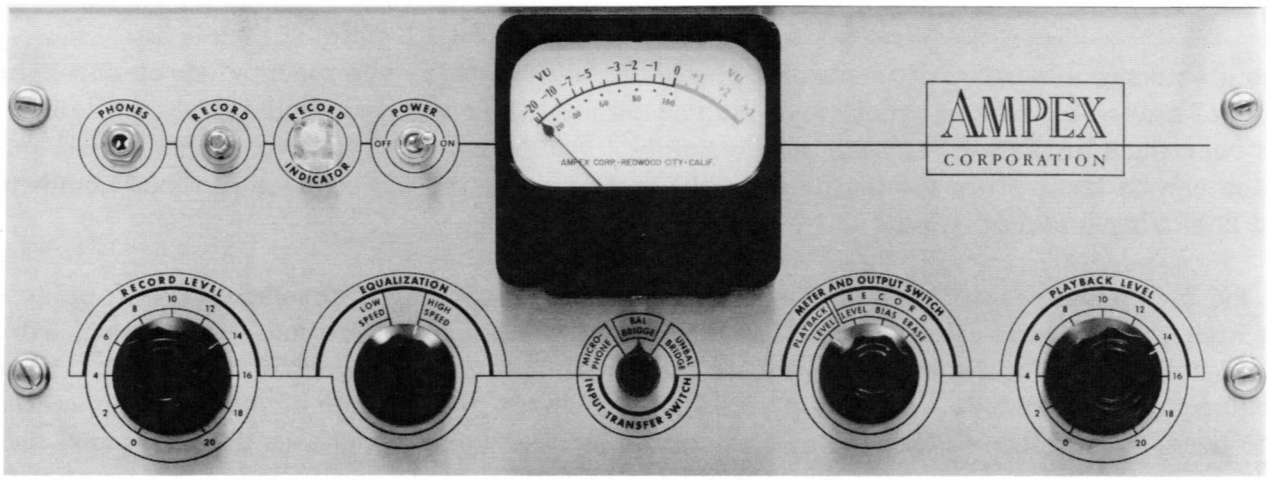
The electronic assembly consists of a single chassis on which are mounted three subassemblies of etched board construction -- the record amplifier with bias and erase oscillator, the reproduce amplifier, and the power supply. Each subassembly is an etched board entity which can be taken from the main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



LOCATION OF ELECTRONIC SUBASSEMBLIES

the assembly. A control for the record function, signified by an accompanying indicator light, completes the front panel arrangement.



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AMPLIFIER CHASSIS, FRONT PANEL

On the back of the electronic assembly chassis are accessible 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 also provided on the chassis back panel.

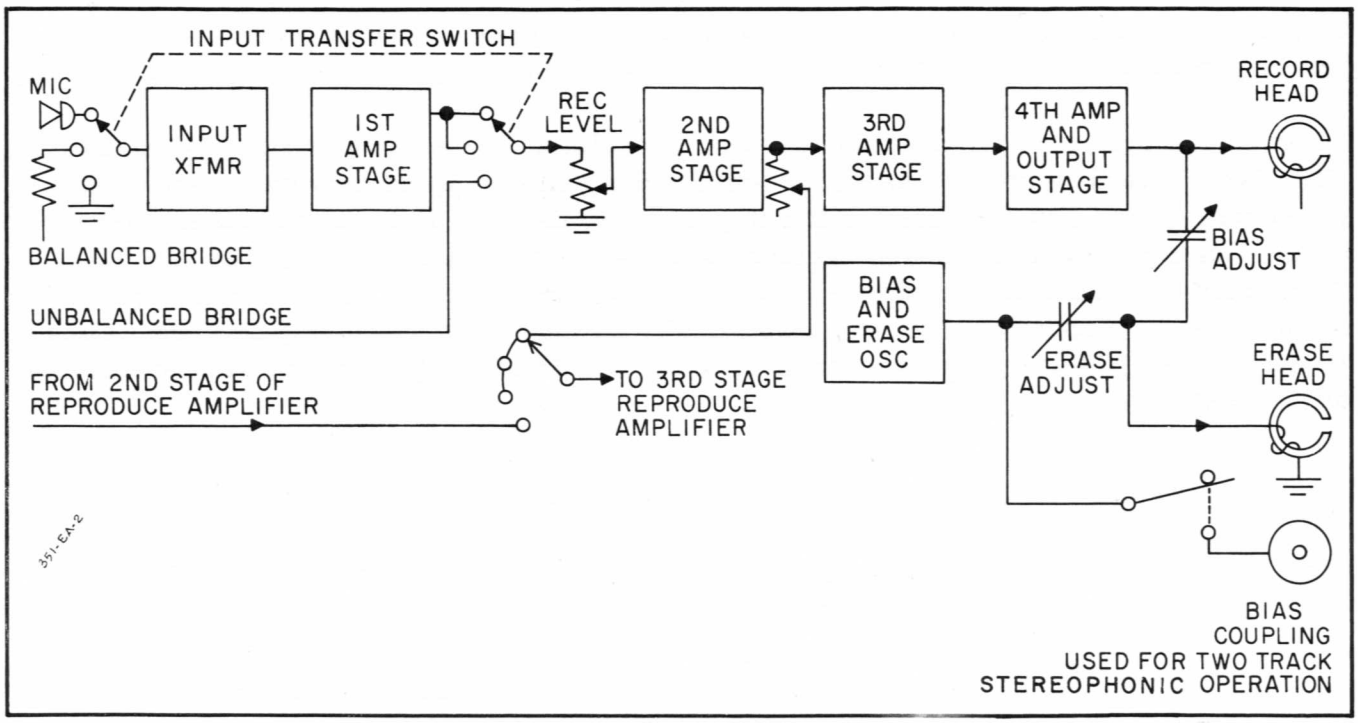
When two electronic assemblies are used for stereophonic operation, the only external differences are that the slave amplifier has one fuse post instead of two and the ac power input connector receptacle position is not furnished.

RECORD AMPLIFIER

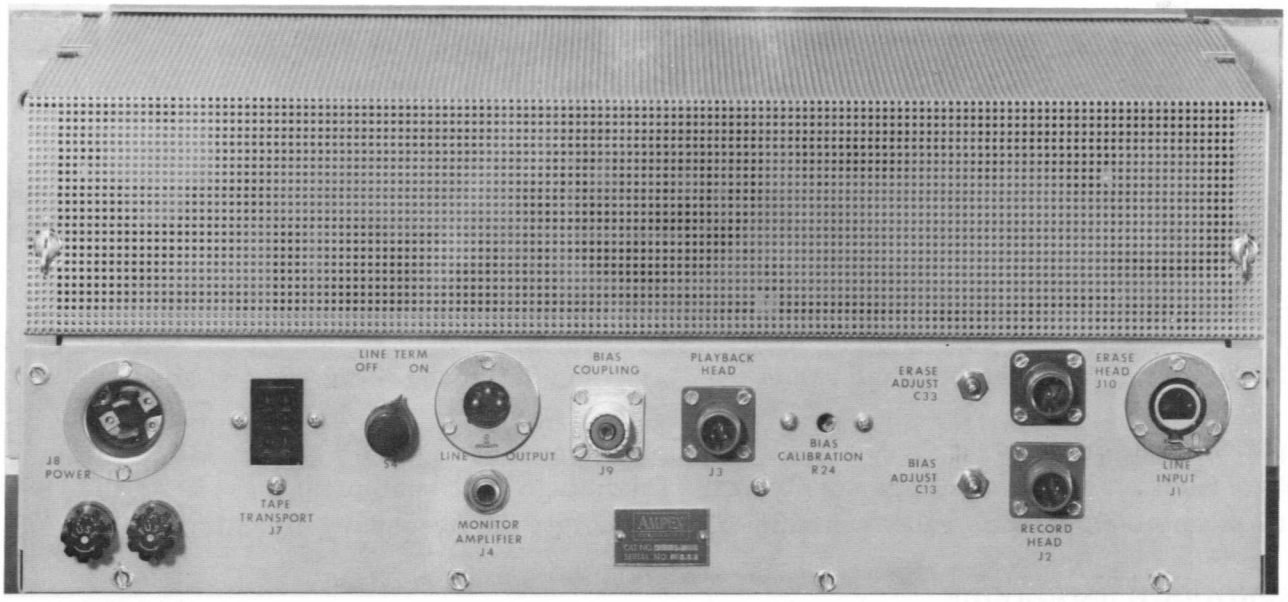
The record section of the electronic assembly is a four stage, high gain, resistance coupled amplifier using transformer coupling for microphone or balanced bridge inputs, and by-passing the transformer and the first stage when unbalanced bridge input is selected. Two dual triodes, 1V1 and 1V2 and their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



BLOCK DIAGRAM RECORD CIRCUIT



AMPLIFIER CHASSIS, REAR VIEW

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.

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 portions of each amplifier.

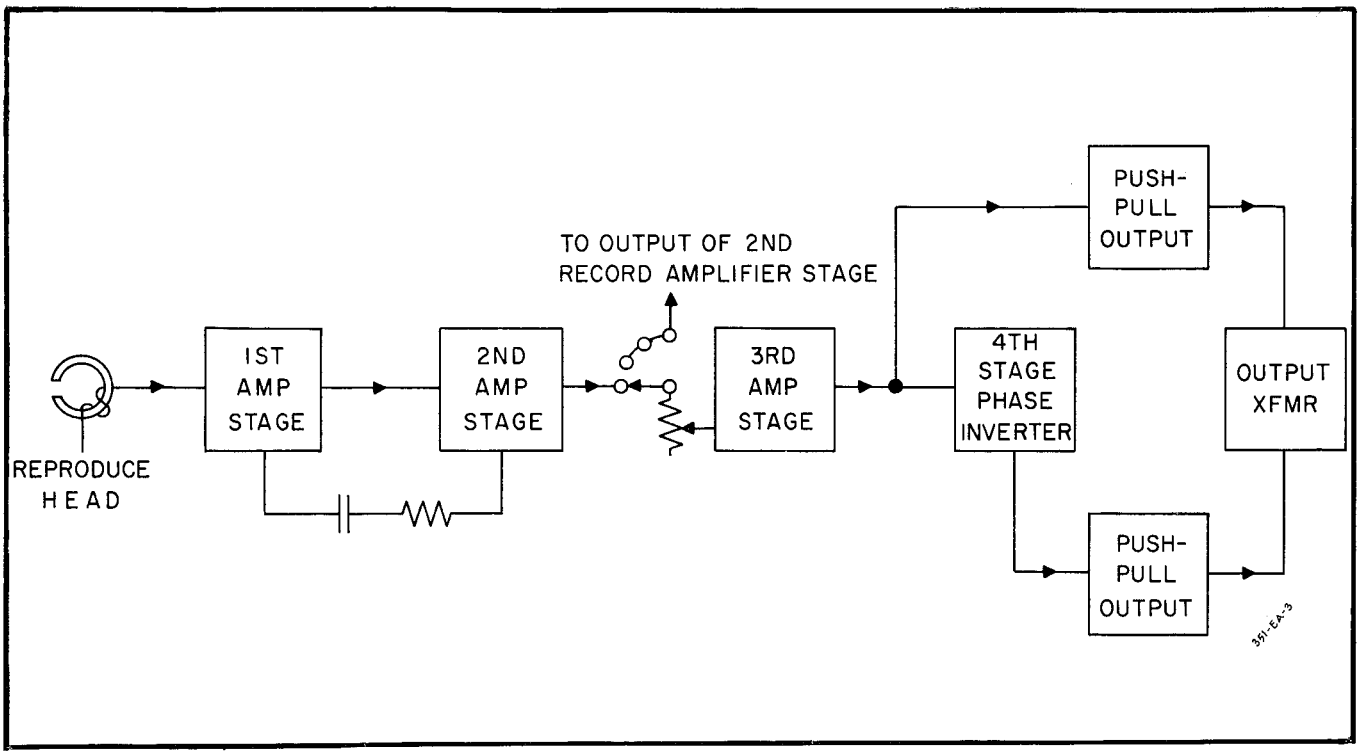
The signal now is coupled to the grid of the third stage by capacitor 1C5, bias and negative feedback is provided through unbypassed resistor 1R16. Further amplification takes place in this third stage and pre-emphasis circuitry for HIGH and LOW tape speeds is provided at capacitors 1C6, 1C7 and 1R17 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. The LC network 1C11, 1C12, 1L1 and 1R22 supplies a high frequency boost by its resonant characteristics. The fourth stage is designed to act as a constant current amplifier in order to feed 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 and 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 supply 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 five stage, resistance coupled, audio amplifier. Three dual triodes are used to provide three stages of amplification, phase inversion and a push-pull output amplifier.



BLOCK DIAGRAM REPRODUCE CIRCUIT

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. When low impedance heads are used the signal is first passed through step-up transformer 6T2. Bias on this first stage is derived from the voltage divider network consisting of resistors 2R26 and 2R28 plus tube current through resistor 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 3-3/4 and 7-1/2 ips tape speed pair, resistor 2R30 is selected when EQUALIZATION SWITCH 4S2 on the face panel of the electronic assembly is in the LOW position; RESISTOR 2R31 is selected by the HIGH position. For the 7-1/2 and 15 ips tape speed pair, resistor 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 stages when the POWER switch is in the ON position. The signal can be monitored at the plate of one half of 2V5 before it goes through the output transformer by using phone jack 5J4 MONITOR AMPLIFIER. This position can be useful for feeding such devices as low gain amplifiers, sensing strips, et cetera. After the signal

reaches the secondary of output transformer 6T3, it is delivered to the LINE TERM switch 5S4 for selection of resistor 5R48 to obtain a nominal 600 ohm line output termination.

Again the signal can be monitored at 4J6 PHONES or at the vu meter using the PLAYBACK position of the METER AND OUTPUT SWITCH.

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 high frequency bias and erase signal. Both halves of the tube are resistance coupled triode amplifiers, 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, and 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 depressed, 115 volt d-c is available at pin 3 of 5J7, and when RECORD button 4S6 is depressed, 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 depressed, the 115 volt d-c no longer reaches pin 3 of 5J7 and relay 3K1 is de-energized and drops out.

ALIGNMENT AND PERFORMANCE CHECKS

Equipment Required

Ampex Standard Alignment Tape

3-3/4 ips
7-1/2 ips
15 ips

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 Monitoring Aurally

Nutdriver number 8 (1/4 inch)

Reel of unrecorded tape

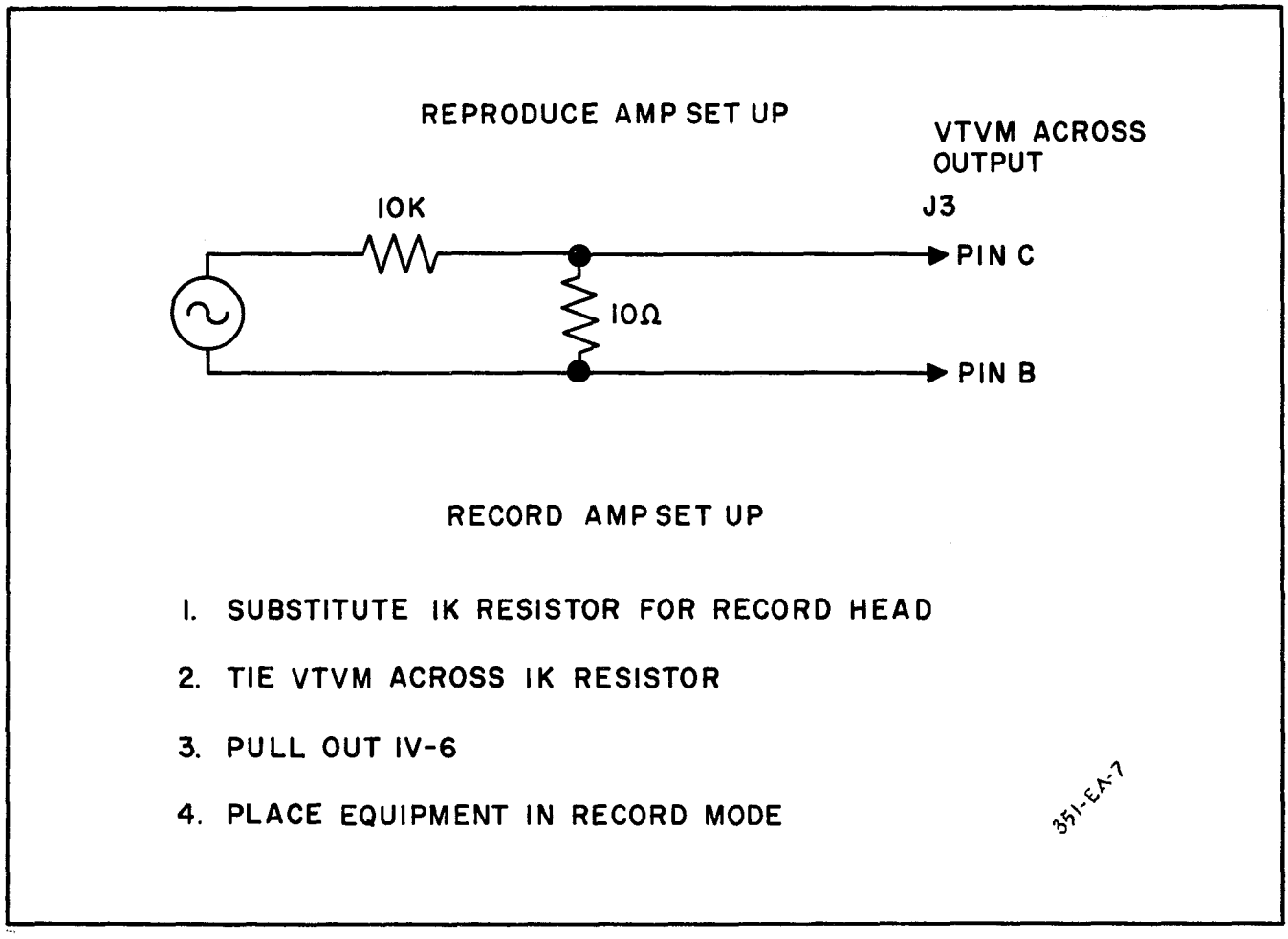
Long Screwdriver (approximately 7 inch bit)

Small Screwdriver

Reproduce Alignment Using Vtvm

Head Alignment

Step 1: 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.



FREQUENCY RESPONSE TEST SET-UP

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.

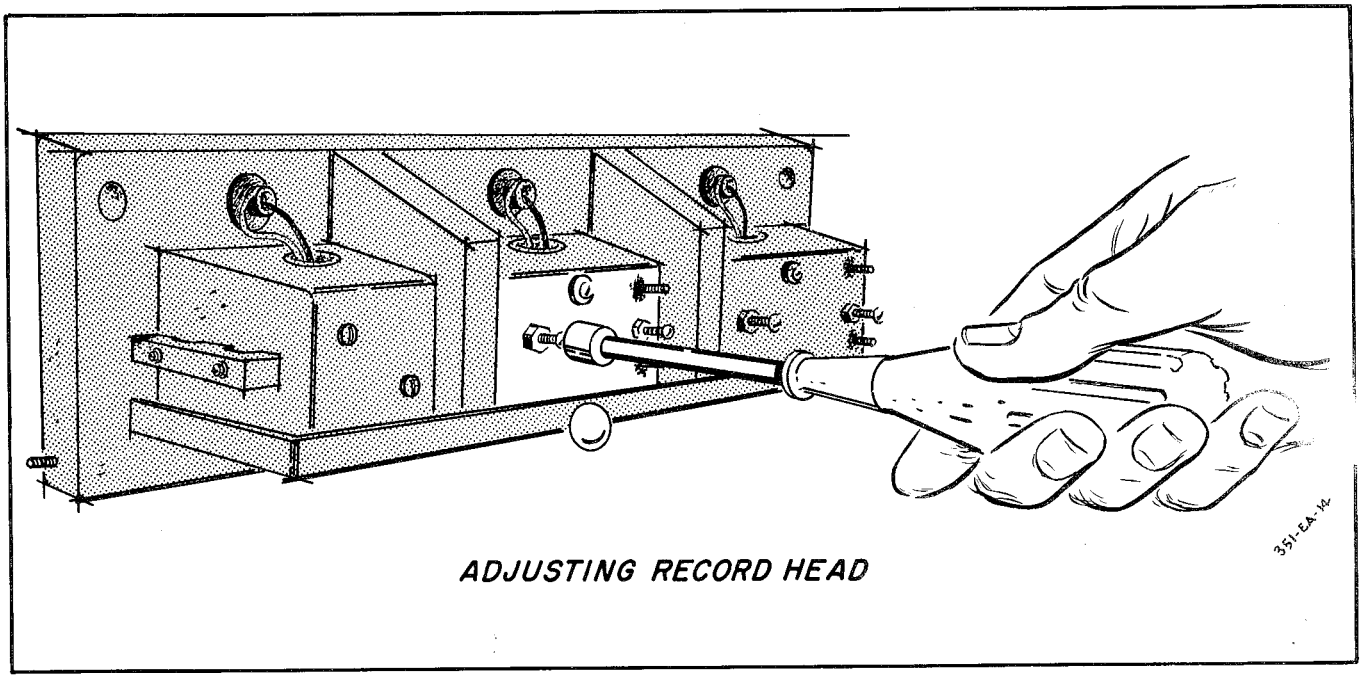
Step 2: Set the EQUALIZATION switch to the desired speed.

Step 3: Place the METER AND OUTPUT switch in the PLAYBACK position.

Step 4: Place the PLAYBACK LEVEL knob at the number 10 calibration.

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: Take the number 8 (1/4 inch) nut driver and adjust the reproduce head azimuth for a maximum reading on the vtvm as the appropriate tone on the standard tape is reproduced. The tones will be 7,500 cycles for 3-3/4 ips, 10,000 for 7-1/2 ips and 15,000 cycles for 15 ips.



ADJUSTING RECORD HEAD

HEAD AZIMUTH ADJUSTMENT

NOTE

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

Reproduce Level Control Calibration

Step 1: As the first 250 cycle tone is reproduced from the standard tape, set the PLAYBACK LEVEL control to obtain a +8 dbm (1.95v) reading on the vtvm.

Step 2: A reference level 250 cycle tone 10 db below normal operating level follows on the standard tape. If necessary, trim the PLAYBACK LEVEL knob so that the vtvm reads exactly -2 dbm (.62 v).

FROM THIS POINT ON DO NOT TOUCH ANY ADJUSTMENT CONTROL.

Step 3: Depending on tape speed, tones from 50 cycles to 15,000 cycles now will be reproduced from the standard tape. Check to see that the vtvm readings conform to PERFORMANCE CHARACTERISTICS in SECTION 1. If the performance characteristics are not met, recheck head azimuth alignment.

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 below the operating range.

Reproduce Amplifier Alignment Using V-u Meter

Step 1: With the POWER switch in the ON position, thread the Ampex standard tape along the prescribed path.

Step 2: Set the EQUALIZATION switch to the desired speed.

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

Step 4: Set the PLAYBACK LEVEL knob to the number 16 calibration.

Step 5: Reproduce the standard tape and as the 10,000 cycle tone is heard, adjust the reproduce head azimuth to obtain a maximum reading on the vu meter using the number 8 (1/4 inch) nut driver. If the PLAYBACK LEVEL control is set too high, back it off.

Step 6: Let the first 250 cycle tone at maximum operating level on the standard tape reproduce without touching the equipment, but note its location on the tape for later use.

Step 7: Wait for the 250 cycle tone 10 db below normal recording level and adjust the PLAYBACK LEVEL knob to obtain a reading of zero on the vu meter.

Step 8: Check the frequency response to see that PERFORMANCE CHARACTERISTICS are met.

Step 9: Rewind the standard tape and then reproduce the first 250 cycle tone.

Step 10: Set the PLAYBACK LEVEL knob so that the vu meter reads zero. DO NOT CHANGE THIS SETTING.

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.

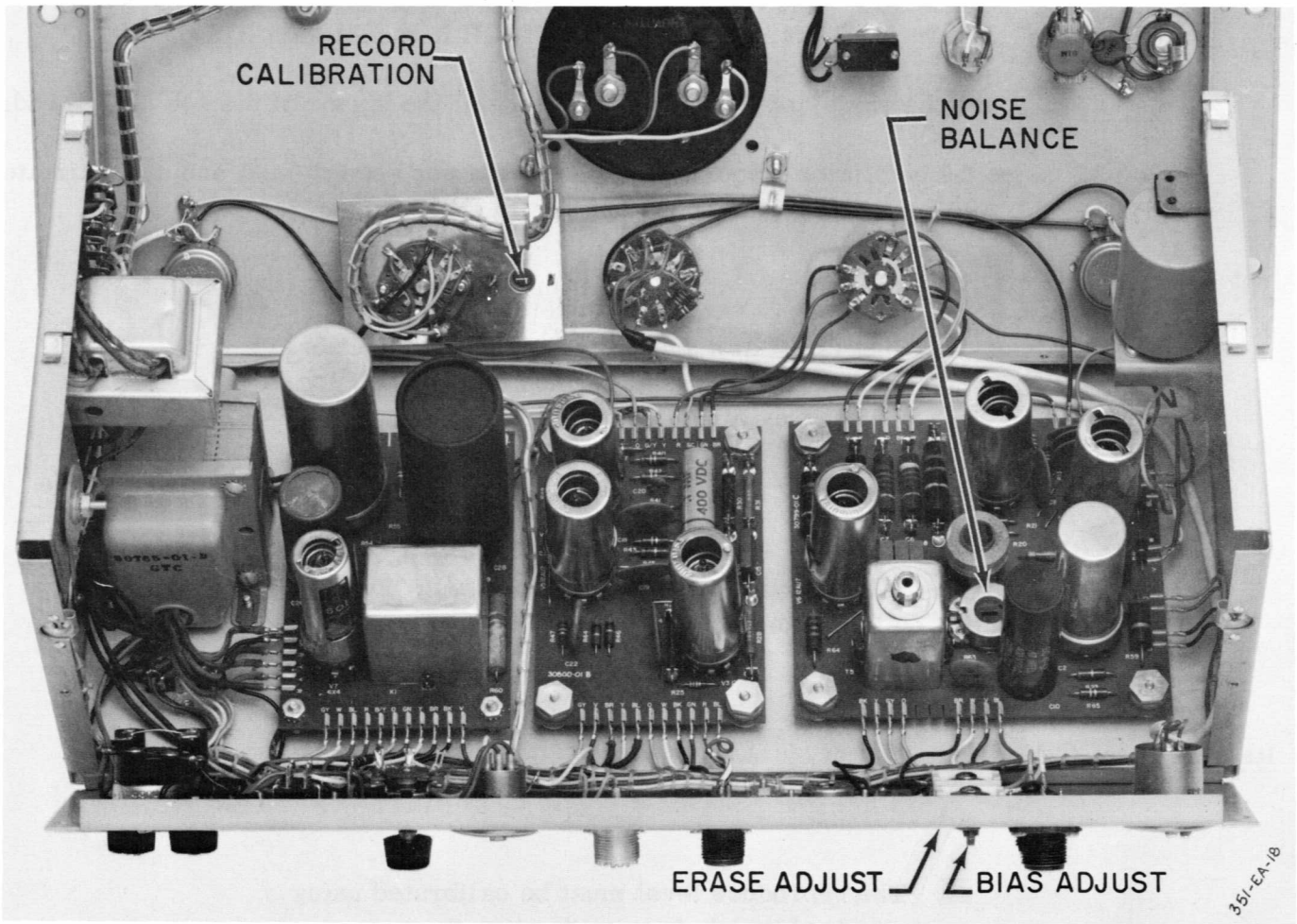
Step 2: Place the INPUT TRANSFER SWITCH in the UNBAL BRIDGE position.

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.

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



ADJUSTMENT POINTS FOR RECORD CALIBRATION, NOISE BALANCE, ERASE AND BIAS

Full (Single) Track Equipment	Half Track and Stereophonic Equipment
+1	-1/2

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 line 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 the higher of the two tape speeds.

Step 3: Set the oscillator frequency at 500 cycles per second (cps) and approximately 1 volt for 7-1/2 ips and 1000 cps for 15 ips.

NOTE

Bias is set at a specific wave length. If it is desired to set bias at 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 meter reading.

Step 5: With a small screwdriver set the BIAS ADJUST trimmer for a maximum reading on the vu meter.

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.

Record Azimuth Adjustment

Step 1: Set the oscillator to 7,500, 10,000 or 15,000 cycles depending on tape speed.

Step 2: Place the 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: 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 will 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 saturation, frequency response at 15 ips tape speed should be made at least 10 db below operating level (-2 dbm); at 3-3/4 and 7-1/2 ips at least 20 db below operating level (-12 dbm).

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

Step 2: Set the oscillator at 250 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 response check by sweeping the oscillator through all frequencies from 50 to 15,000 cycles (for 3-3/4 ips up to 7,500 cycles), noting that the response remains within the tolerances specified in SECTION 1 -- PERFORMANCE CHARACTERISTICS.

Because there are variations among tapes of different manufacturers, the high frequency end (10kc) vtvm readings may not conform to tolerances, in which case, proceed as follows:

Step 1: Set the tape in motion using the tape speed at which flattest response is desired.

Step 2: Set the audio oscillator at the frequency used for biasing 250 cps 3-3/4 ips, 500 cps 7-1/2 ips, 1000 cps 15 ips. Note the vtvm reading for later reference.

Step 3: Switch the oscillator to the high end frequency -- 5 kc for 3-3/4 ips, 10 kc for 7-1/2 and 15 ips, and readjust the bias control to bring the equipment within specifications.

Step 4: Recheck frequency response at the biasing frequency. It should not be more than 1/2 db down from the peak reading noted in Step 2. If it is down more than 1/2 db, over-compensation has been made in Step 3. Repeat the procedure from the beginning.

Step 5: Check frequency response of the other tape speed.

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

Overall Frequency Response Using the V-u 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 250 cps.

Step 4: Set the record level to approximately -20 reading on the vu meter for 3-3/4 and 7-1/2 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: Rotate the PLAYBACK LEVEL knob to the full clockwise position.

Step 7: Sweep the oscillator through the frequency band from 50 to 15,000 cycles (7,500 cycles at 3-3/4 ips), checking response by reading the vu meter.

Record Noise Balance Adjustment

Step 1: Re-establish the reproduce (PLAYBACK LEVEL) volume control setting as described earlier in this section under Reproduce Level Control Calibration.

Step 2: Position the RECORD LEVEL knob at the zero calibration point.

Step 3: Disconnect any input.

Step 4: Plug a set of earphones into the monitor jack and listen for the minimum noise location 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 output and 6 db up to 3% distortion level)
-46	(dbm, vtvm reading)
60	db signal-to-noise ratio (although the signs are different, the values are added to get a ratio)

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

When the v-u meter is so calibrated that zero v-u corresponds to +4 dbm output add 6 db to obtain the output value from 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 1000 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 1000 cycle tone the level of which produces 1% total rms distortion, due to the approach of tape saturation.

A recorded 1000 cycle tone at the 3% distortion level will be 6 db higher in level than a recorded 1000 cycle tape at the 1% level.

Measurement of signal-to-noise ratio must take into account the 6 db difference between the 1% normal calibration level and 3% maximum level. This measurement also must take into account the actual recorder output at an indicated zero on its vu meter scale. Indicated zero can be either +4 dbm (related to 1 mw into 600 ohms) or +8 dbm, at the option of the user. The signal-to-noise ratio will equal the difference between the real level of the 3% distortion 1000-cycle tone, and the real level of noise. A sensitive vtvm, calibrated in dbm relative to 1 mw at 600 ohms, can be used to measure total rms noise. A typical result might be -46 dbm. To compute s/n ratio, this must be compared with the real level of 3% distorted 1000 cycle tone. This would be +4 dbm (if the recorder is so strapped) or +8 dbm plus 6 db (the difference between 1% and 3% level). Thus, if the noise output is -46 dbm, and the machine is calibrated for +8 dbm output at zero indication, the s/n ratio is the difference between +8 dbm +6, or +14 dbm, and -46 dbm, or 60 db s/n ratio.

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.

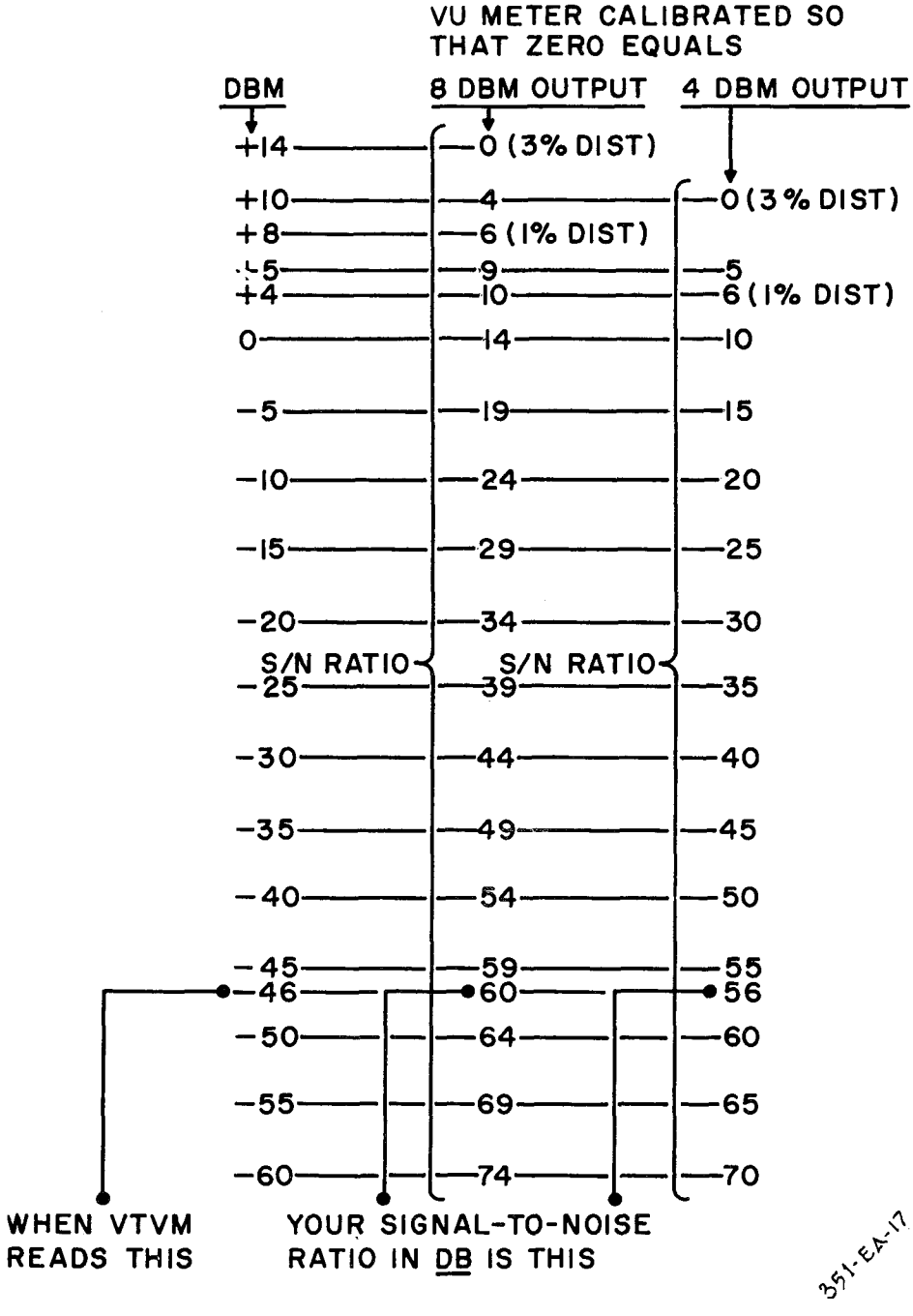
Step 6: Set the RECORD LEVEL control to zero.

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.

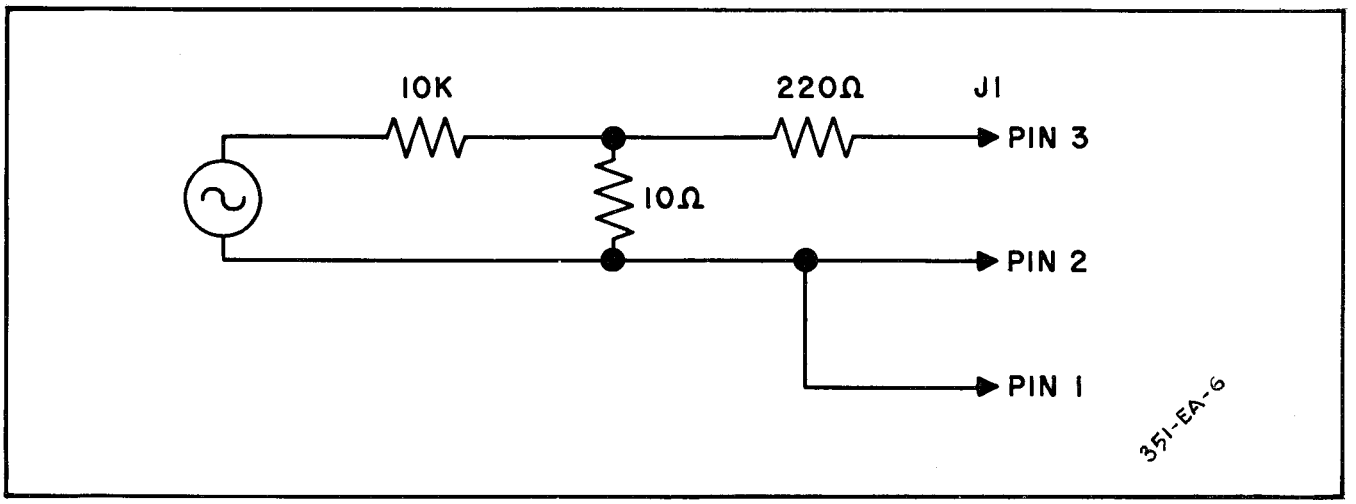
Step 10: Read the vtvm and check the reading against the table.



SIGNAL-TO-NOISE RATIO COMPUTATIONS

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.



MICROPHONE RESPONSE SET-UP

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 as in single track operation.

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.

The vu meter method is handy if two vtvms are not available.

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.

Frequency Response

Frequency response checks can be made on both systems simultaneously, using either the vtvm or the vu meter method, or the tracks can be checked individually.

Noise Balance Adjustment

Step 1: Re-establish the reproduce (PLAYBACK LEVEL) volume control setting of amplifier number one as described under Reproduce Level Control Calibration.

Step 2: Position the number one amplifier RECORD LEVEL knob at the zero calibration point.

Step 3: Disconnect any input.

Step 4: Place amplifier number one ONLY in the record mode.

Step 5: Plug a set of earphones into the monitor jack and listen for the minimum noise location while adjusting the noise balance control.

Step 6: Perform steps 1, 2 and 3 on amplifier number two.

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

Step 8: Listen for minimum noise location while adjusting the noise balance control.

Step 9: Place both amplifiers in the record mode and trim amplifier number one noise balance for minimum noise on amplifier number two.

Step 10: Now, with both amplifiers still in the record mode, trim amplifier number two noise balance for minimum noise on amplifier number one.

Step 11: Recheck each amplifier for minimum noise while the other amplifier is not recording. 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 SECTION 4 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.

Rewinding or moving the tape in the fast forward mode with the head assembly gate closed eventually will wear grooves in the heads, causing a similar result.

Improper head azimuth adjustment will also affect high frequency response.

When the user suspects amplifier 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

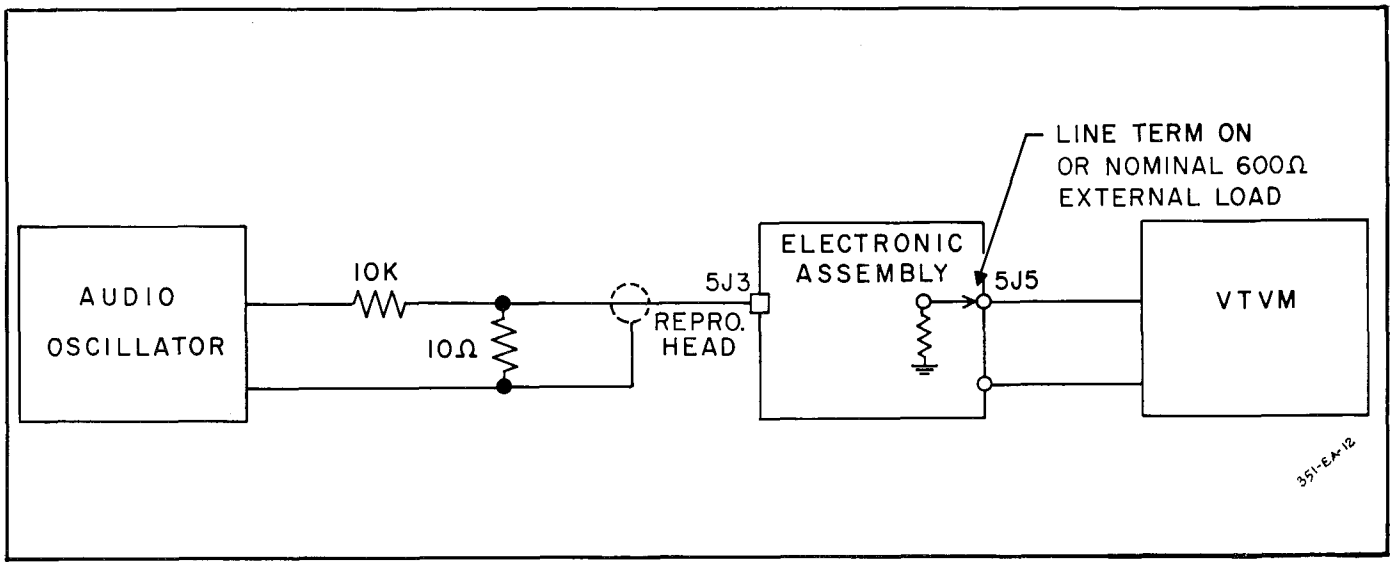
Depending on equipment, check B+ voltage at junction of 3R55 and 3R58 and make a check of tube emission. Make sure tubes are returned to same socket. Check DC filament voltage to note aging of 6CR1. 3R60 may be reduced in value or shorted out as rectifier ages. Clean the relay contacts by inserting a 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 LOCATION POWER SUPPLY AND REPRODUCE AMPLIFIER, and foldout SCHEMATIC DIAGRAM -- ELECTRONIC ASSEMBLIES).



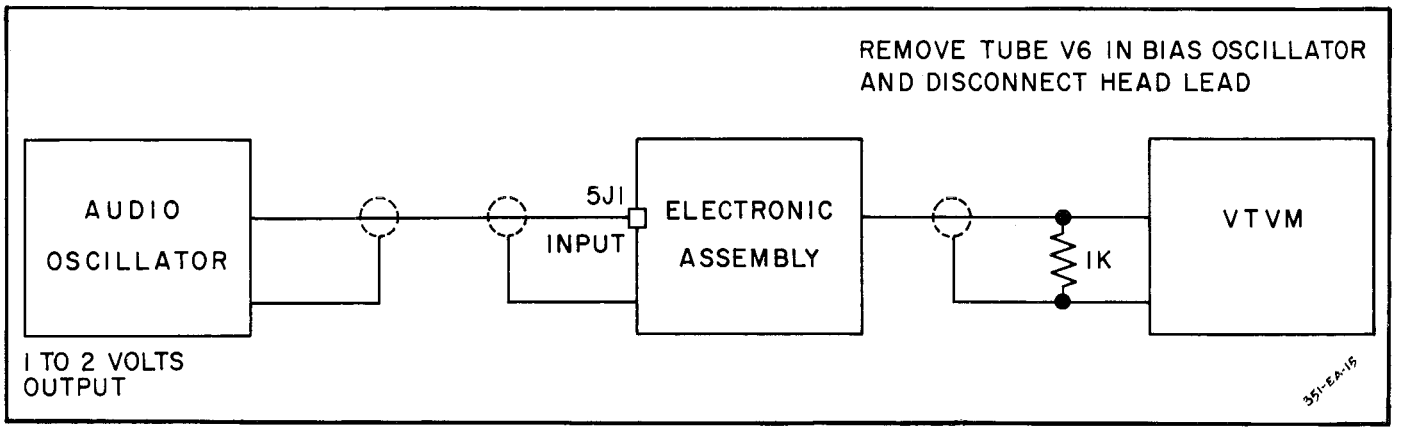
TROUBLESHOOTING THE REPRODUCE AMPLIFIER

Disconnect the head cable at 5J3 when using this circuit. Advance an audio oscillator probe progressively through each stage (checking at the grid and plate of each stage) until the point at which a signal is available at the output. The trouble then could be in the stage immediately preceding that point. When the faulty stage is located, the individual components can be isolated by a check of resistances and voltages. Typical voltage values are shown on the foldout schematic diagram. After the completion of any troubleshooting procedures, using the circuit shown above, check the reproduce amplifier response against the appropriate curve to insure that the equipment conforms to performance characteristics.

Troubleshooting the Record Amplifier

The circuit for troubleshooting the record amplifier is shown below (see also PARTS LOCATION RECORD AMPLIFIER, BIAS AND ERASE OSCILLATOR 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.



TROUBLESHOOTING THE RECORD AMPLIFIER

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
1/4-inch nut driver
Solder pick
Small wire brush
Pencil soldering iron
60/40 resin core solder

Precautions

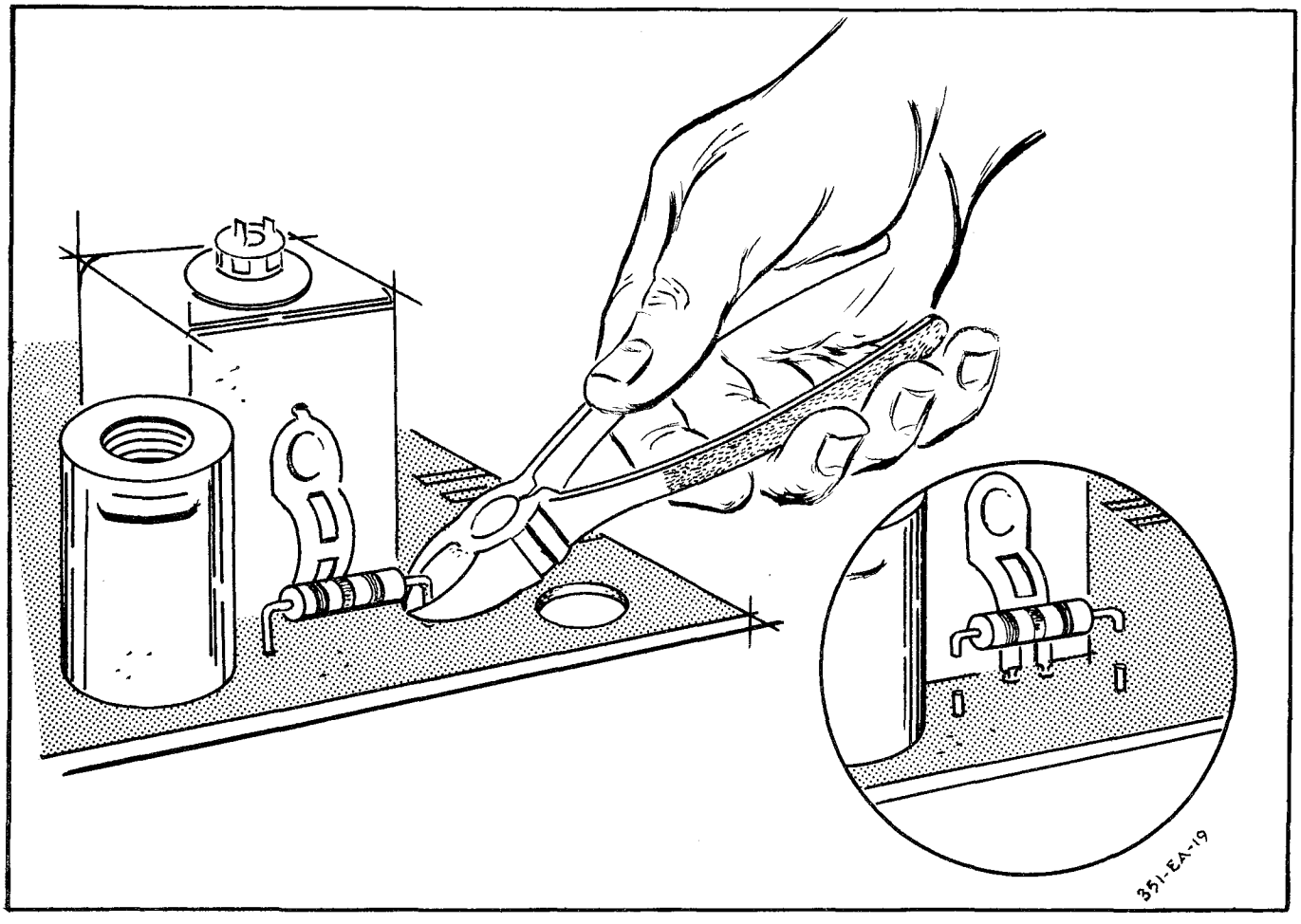
Be careful when removing components from the board to avoid damaging the components themselves or the copper foil wiring. If damage occurs, small breaks can be joined with solder, new foil can be cut to simulate the damaged sections, and large breaks can be repaired with hook-up wire. When applying new 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.



REMOVING RESISTOR

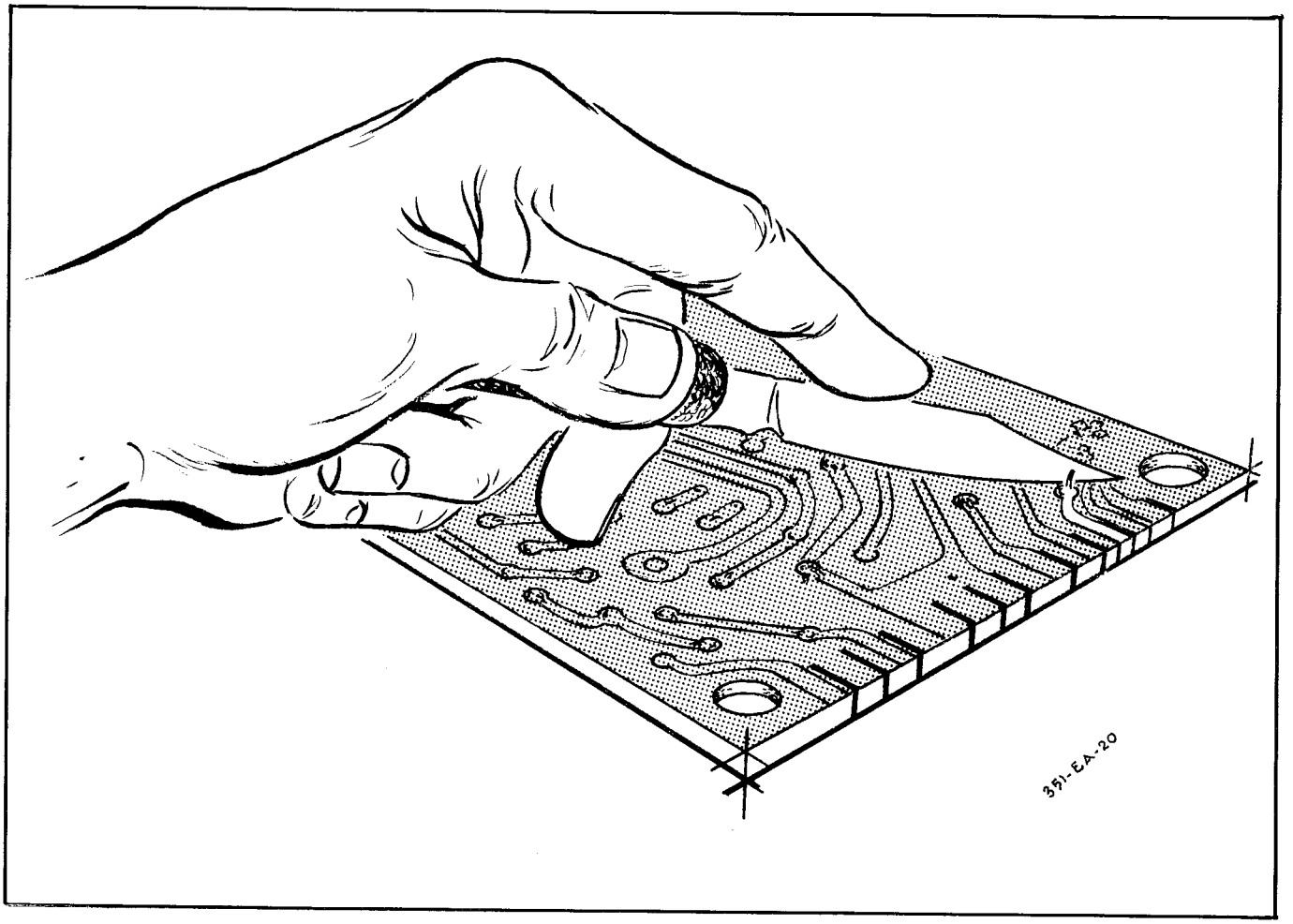
Replacing the Resistor

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.



RELIEVING MECHANICAL JOINT OF COMPONENT

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

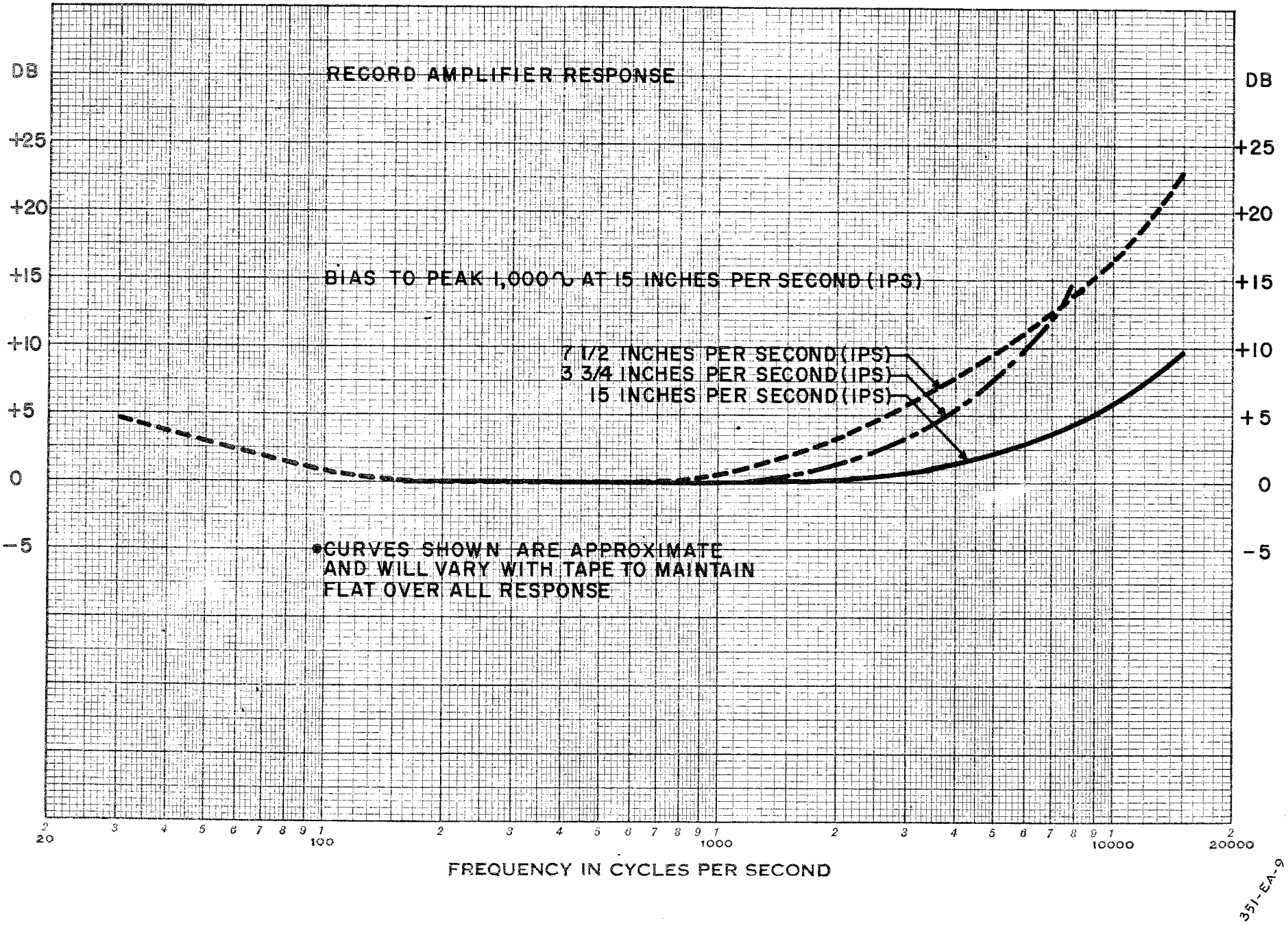
Step 2: With a pen knife inserted between the socket lug and wiring foil, bend each lug upward - except the grounding lug.

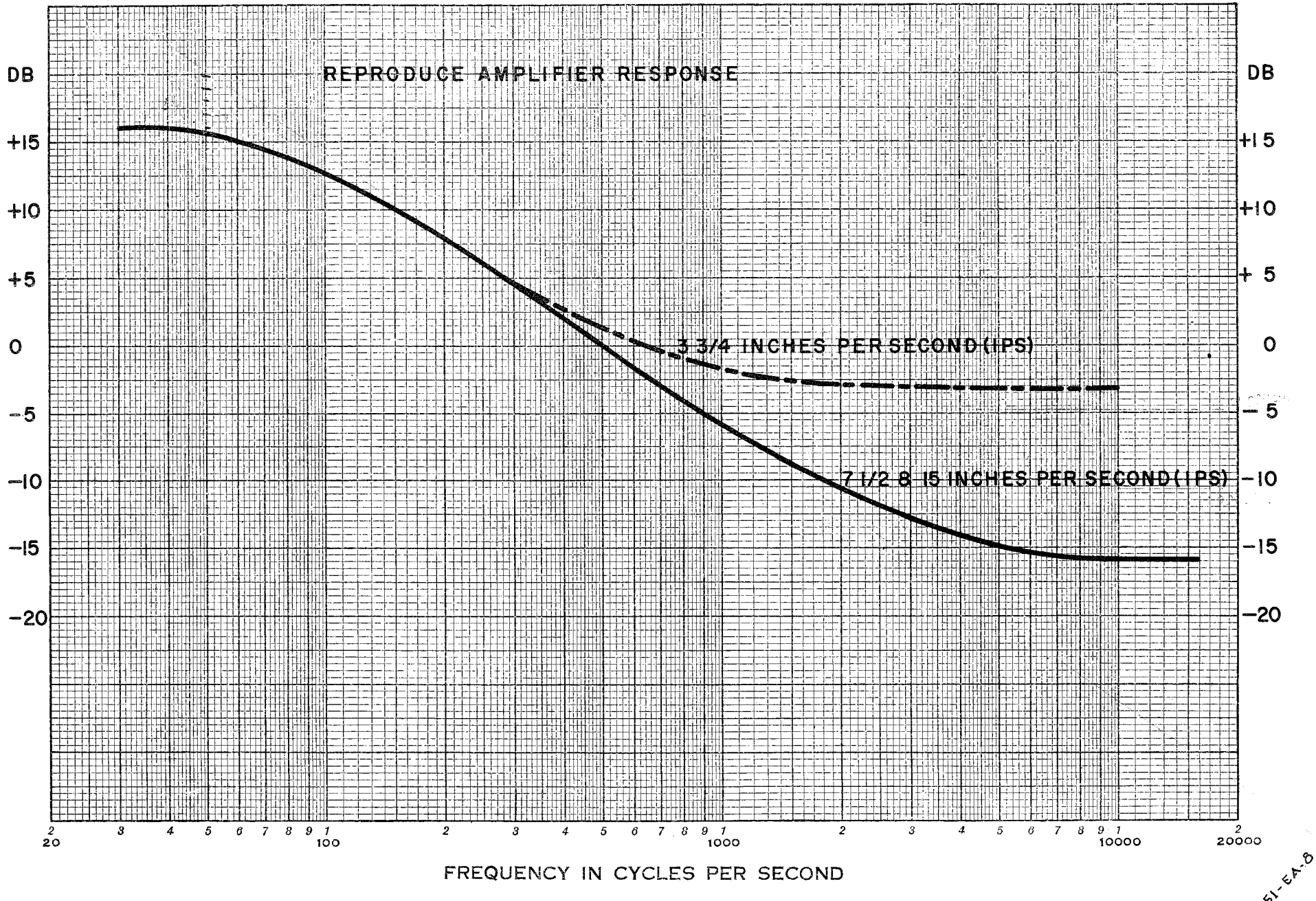
Step 3: When all socket lugs have been freed from the wiring foil, heat the grounding lug until the solder melts and slowly pull the socket away from the board.

ORDERING PARTS

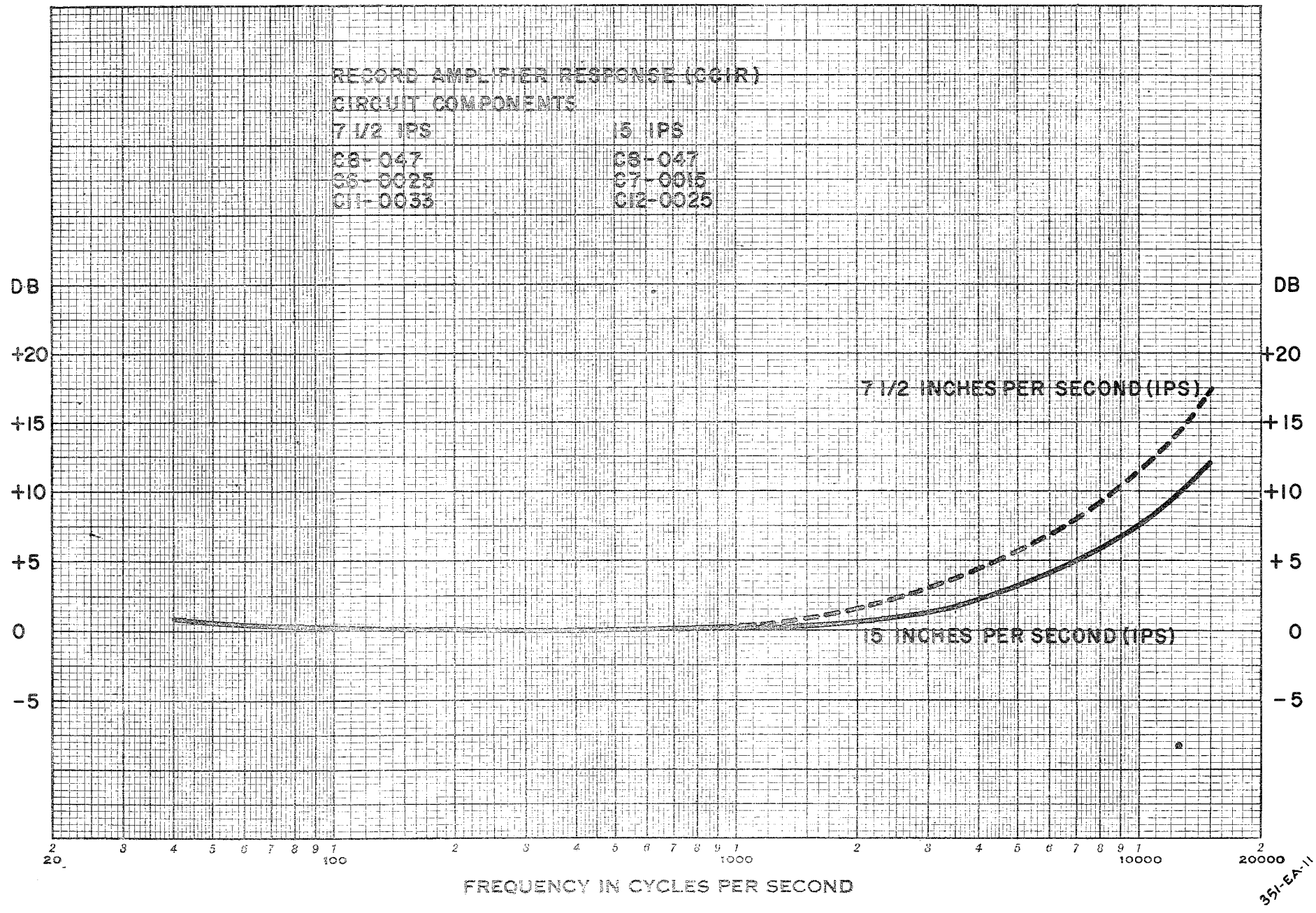
The purpose of the parts list is to aid you in ordering replacement parts. Ampex can offer fast and efficient service in providing normally replaceable parts of the components in the system when proper information is furnished. Parts are listed according to the schematic reference symbol, a description 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.

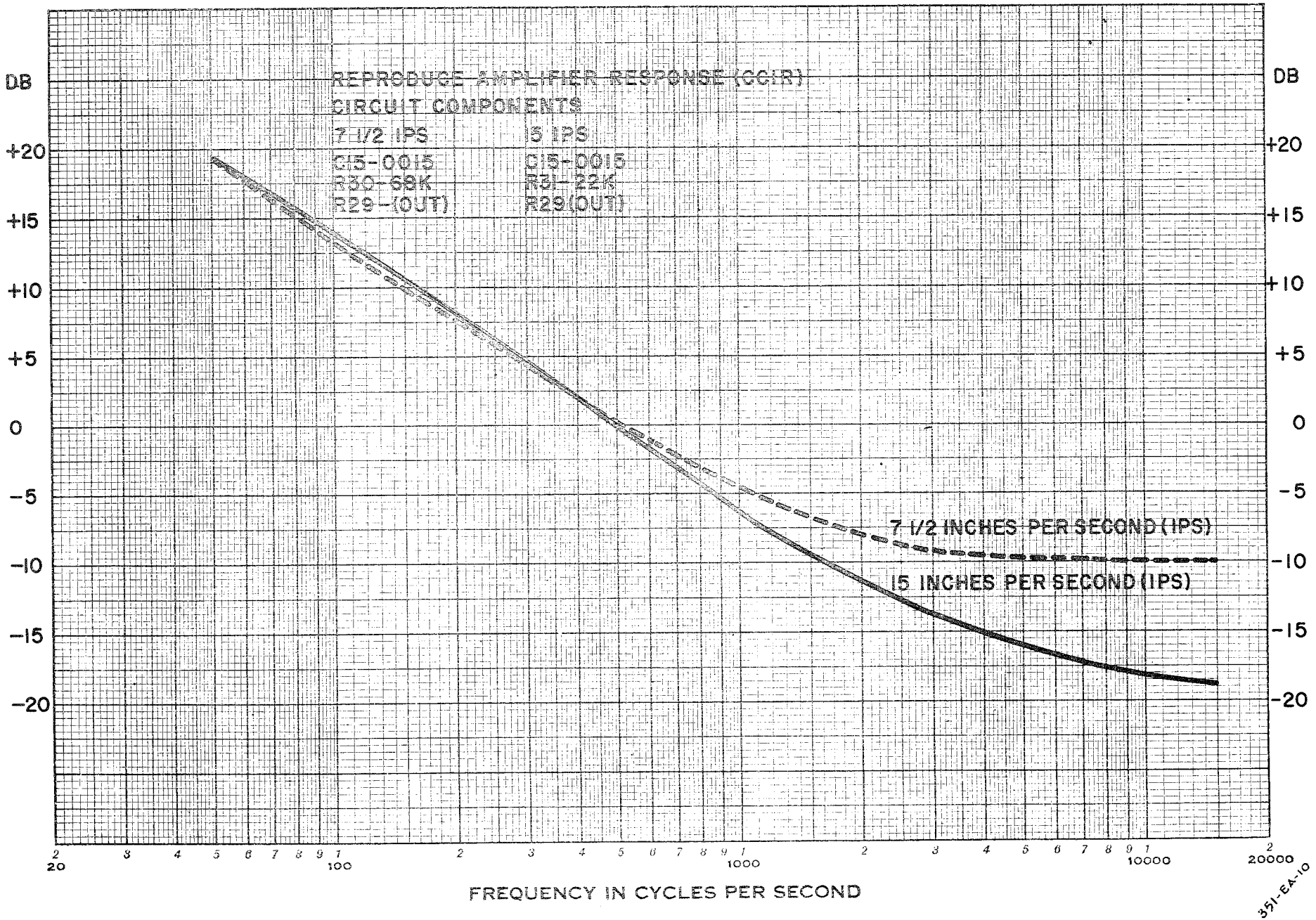
Ampex part numbers are the exact designation for all parts used in Ampex equipment. For example, CAPACITOR, fixed: ceramic, .02 uf + 80% - 20%, 500 vdcw; Sprague Part No. 36C205 will always bear the Ampex catalog number 030-059. THIS IS THE NUMBER YOU SHOULD USE WHEN ORDERING REPLACEMENT PARTS. The schematic 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: 4-030-059 capacitors for Series 351.


RECORD AMPLIFIER RESPONSE
DB
+25
+20
+15
+10
+5
0
-5
BIAS TO PEAK 1,000∿ AT 15 INCHES PER SECOND (IPS)
7 1/2 INCHES PER SECOND (IPS)
3 3/4 INCHES PER SECOND (IPS)
15 INCHES PER SECOND (IPS)
•CURVES SHOWN ARE APPROXIMATE
AND WILL VARY WITH TAPE TO MAINTAIN
FLAT OVER ALL RESPONSE
20
100
1000
10000
20000
FREQUENCY IN CYCLES PER SECOND
351-EA-9


REPRODUCE AMPLIFIER RESPONSE
DB
+15
+10
+5
0
-5
-10
-15
-20
3 3/4 INCHES PER SECOND (IPS)
7 1/2 & 15 INCHES PER SECOND (IPS)
20
100
1000
10000
20000
FREQUENCY IN CYCLES PER SECOND

351-EA-8


RECORD AMPLIFIER RESPONSE (CCIR)
CIRCUIT COMPONENTS
7 1/2 IPS
C8-047
C5-0025
C11-0033
15 IPS
C8-047
C7-0015
C12-0025
DB
+20
+15
+10
+5
0
-5
7 1/2 INCHES PER SECOND (IPS)
15 INCHES PER SECOND (IPS)
20
100
1000
10000
20000
FREQUENCY IN CYCLES PER SECOND
351-EA-11

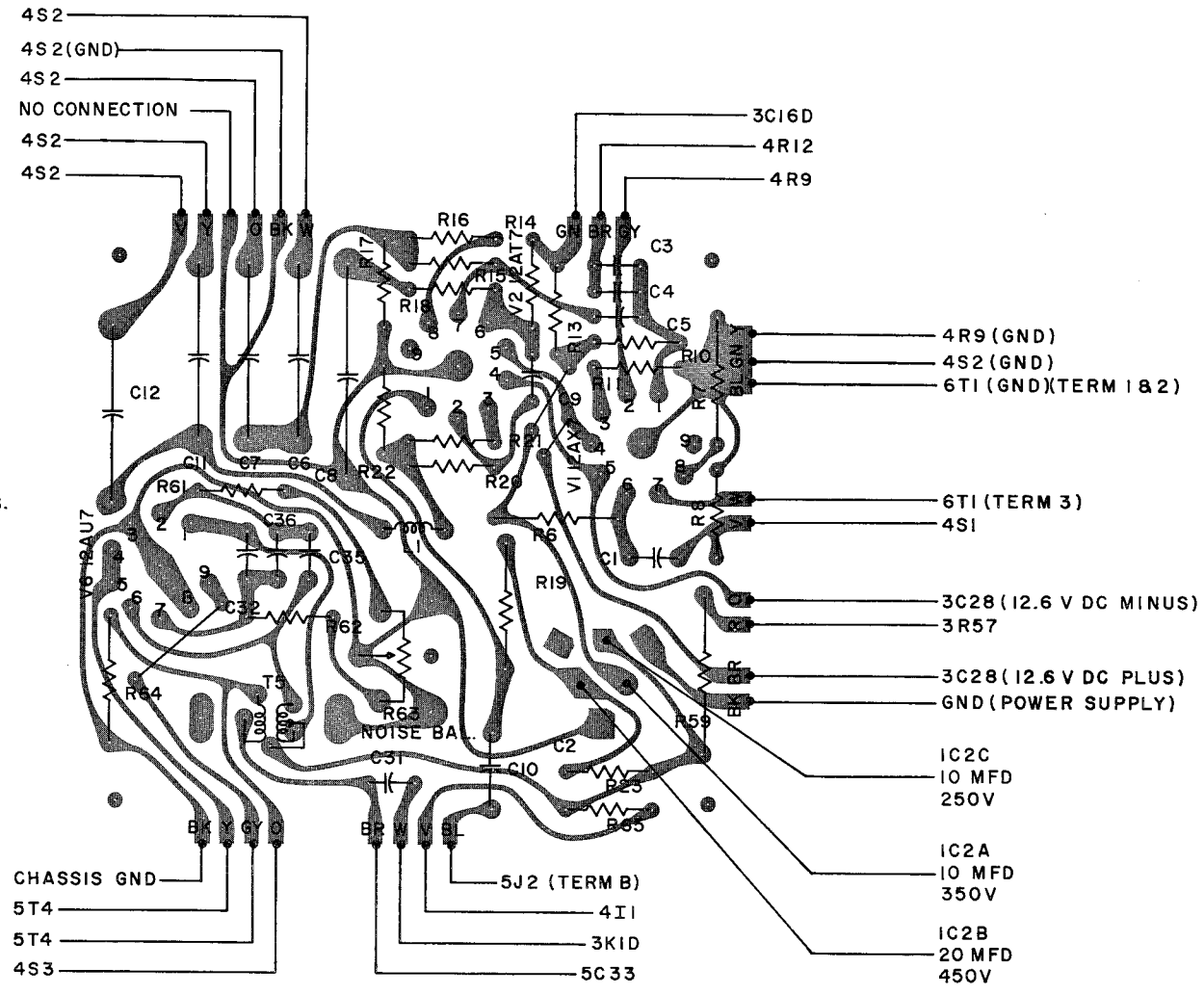

REPRODUCE AMPLIFIER RESPONSE (CCIR)
CIRCUIT COMPONENTS
7 1/2 IPS
C15-0015
R30-68K
R29-(OUT)
15 IPS
C15-0015
R31-22K
R29(OUT)
7 1/2 INCHES PER SECOND (IPS)
15 INCHES PER SECOND (IPS)
DB
+20
+15
+10
+5
0
-5
-10
-15
-20
20
100
1000
10000
20000
FREQUENCY IN CYCLES PER SECOND

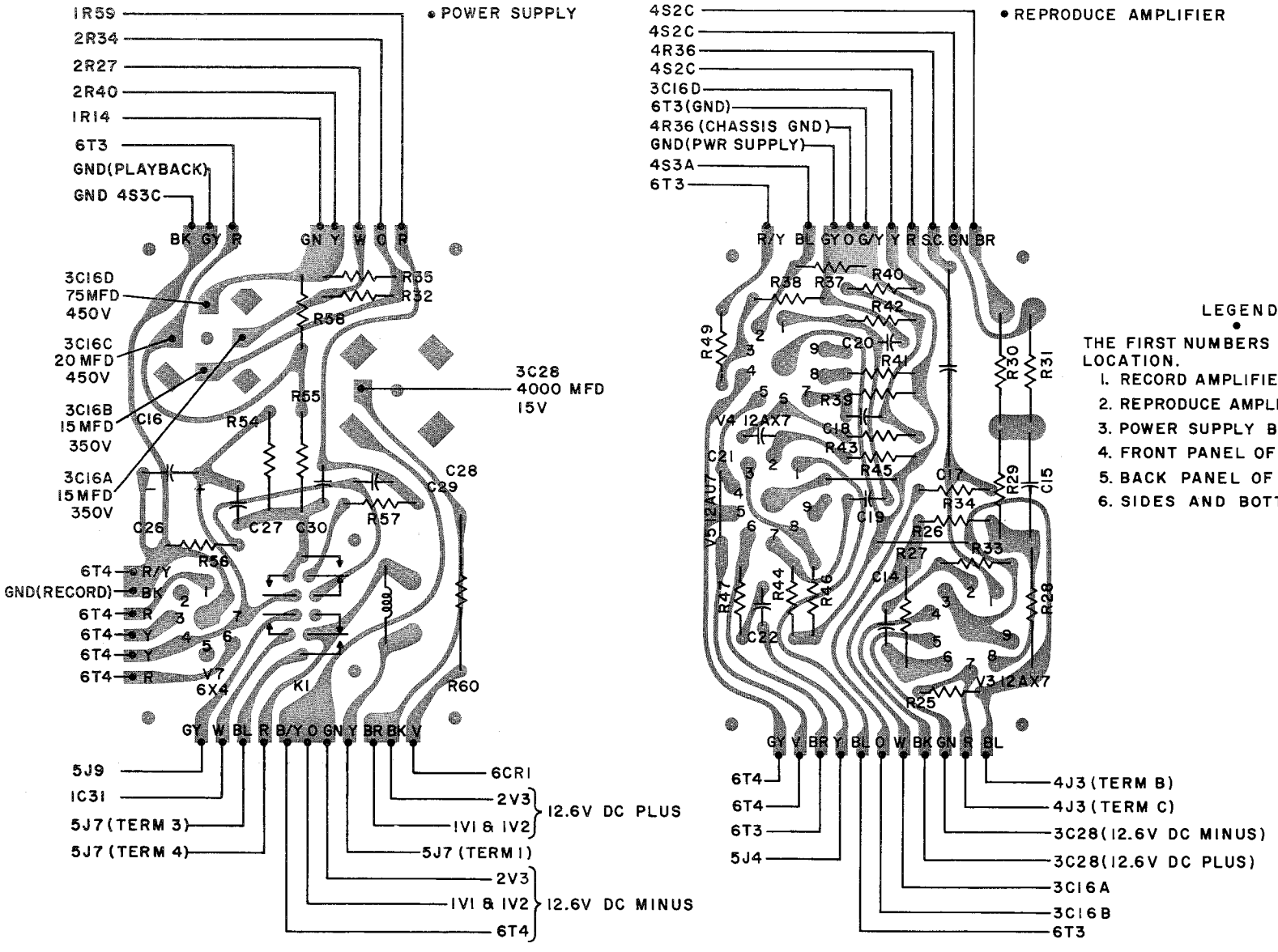
351-EA-10

LEGEND

THE FIRST NUMBERS SIGNIFY THE LOCATION.

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




• POWER SUPPLY
1R59
2R34
2R27
2R40
1R14
6T3
GND(PLAYBACK)
GND 4S3C
BK GY R
GN Y W O R
3C16D 75MFD 450V
3C16C 20 MFD 450V
3C16B 15 MFD 350V
3C16A 15MFD 350V
C16
R35
R32
R58
R55
R54
3C28 4000 MFD 15V
C28
C29
R57
C26
R56
C27
C30
6T4 R/Y
GND(RECORD) BK
6T4 R
6T4 Y
6T4 Y
6T4 R
V7 6X4
K1
R60
GY W BL R B/Y O GN Y BR BK V
5J9
1C31
5J7(TERM 3)
5J7(TERM 4)
6CR1
2V3
1V1 & 1V2
12.6V DC PLUS
5J7(TERM 1)
2V3
1V1 & 1V2
6T4
12.6V DC MINUS
• REPRODUCE AMPLIFIER
4S2C
4S2C
4R36
4S2C
3C16D
6T3(GND)
4R36(CHASSIS GND)
GND(PWR SUPPLY)
4S3A
6T3
R/Y BL GY O G/Y Y R S.C. GN BR
R38 R37 R40
R42
R49
C20
R41
R30
R31
R39
V4 12AX7
C18
R43
C21
R45
C17
R29
C15
V5 12AU7
R34
C19
R26
R27
R33
R47
R44
R46
C14
R28
C22
V3 12AX7
R25
GY Y BR Y BL O W BK GN R BL
6T4
6T4
6T3
5J4
4J3(TERM B)
4J3(TERM C)
3C28(12.6V DC MINUS)
3C28(12.6V DC PLUS)
3C16A
3C16B
6T3
LEGEND
• THE FIRST NUMBERS SIGNIFY THE LOCATION.
1. RECORD AMPLIFIER BOARD
2. REPRODUCE AMPLIFIER BOARD
3. POWER SUPPLY BOARD
4. FRONT PANEL OF AMP. CHASSIS
5. BACK PANEL OF AMP. CHASSIS
6. SIDES AND BOTTOM

NOTES

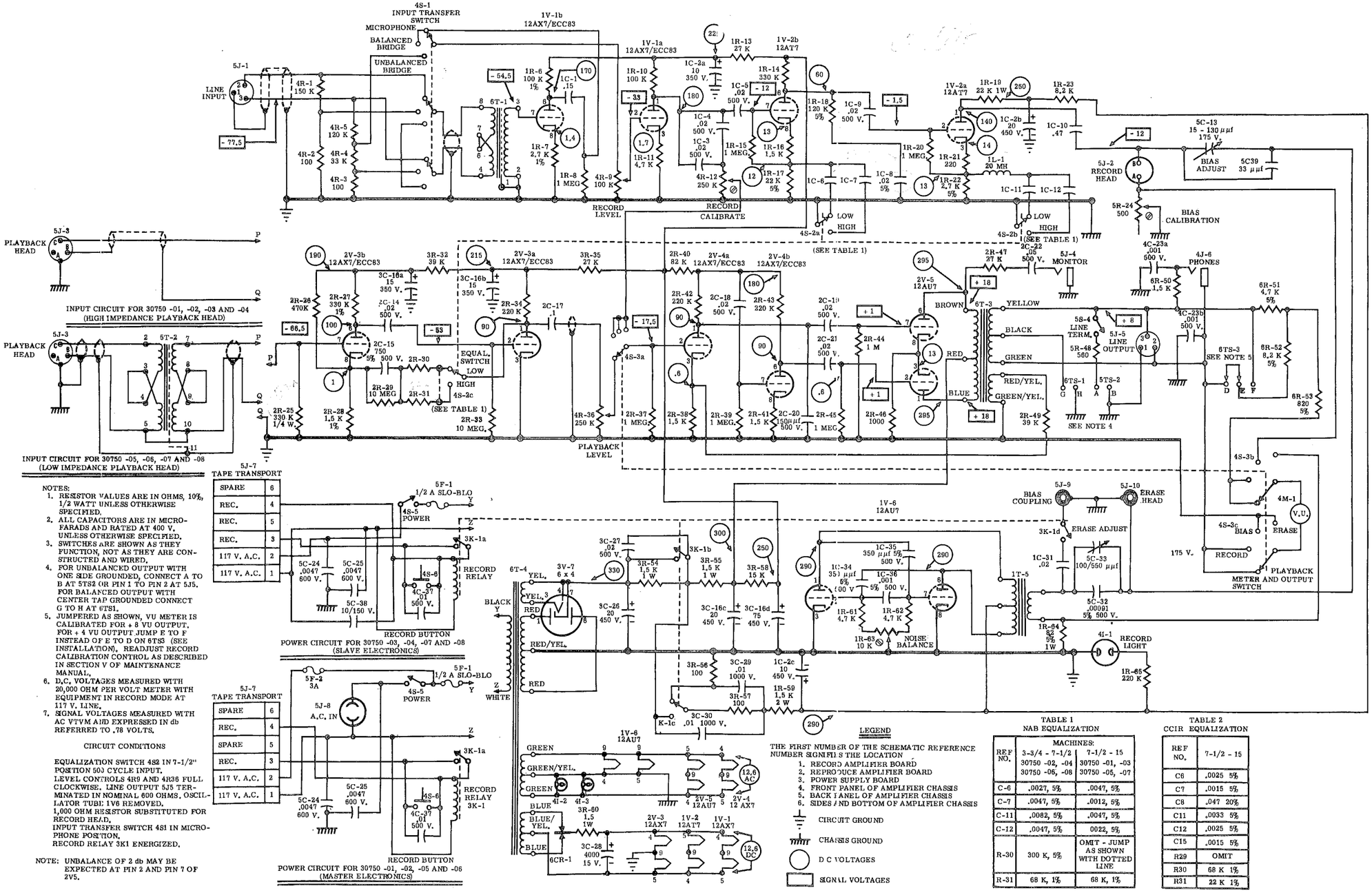
REF. NO.	PART DESCRIPTION	AMPEX PART NO.
	351 SERIES COMPLETE EQUIPMENT	
	Rack Mount, 7-1/2 - 15 ips, Full Track, 60 Cycle Power	30700-01
	Rack Mount, 7-1/2 - 15 ips, Full Track, 50 Cycle Power	30700-02
	Rack Mount, 7-1/2 - 15 ips, Half Track, 60 Cycle Power	30700-07
	Rack Mount, 7-1/2 - 15 ips, Half Track, 50 Cycle Power	30700-08
	Rack Mount, 3-3/4 - 7-1/2 ips, Full Track, 60 Cycle Power	30700-13
	Rack Mount, 3-3/4 - 7-1/2 ips, Full Track, 50 Cycle Power	30700-14
	Rack Mount, 3-3/4 - 7-1/2 ips, Half Track, 60 Cycle Power	30700-19
	Rack Mount, 3-3/4 - 7-1/2 ips, Half Track, 50 Cycle Power	30700-20
	Console, 7-1/2 - 15 ips, Full Track, 60 Cycle Power	30700-03
	Console, 7-1/2 - 15 ips, Full Track, 50 Cycle Power	30700-04
	Console, 7-1/2 - 15 ips, Half Track, 60 Cycle Power	30700-09
	Console, 7-1/2 - 15 ips, Half Track, 50 Cycle Power	30700-10
	Console, 3-3/4 - 7-1/2 ips, Full Track, 60 Cycle Power	30700-15
	Console, 3-3/4 - 7-1/2 ips, Full Track, 50 Cycle Power	30700-16
	Console, 3-3/4 - 7-1/2 ips, Half Track, 60 Cycle Power	30700-21
	Console, 3-3/4 - 7-1/2 ips, Half Track, 50 Cycle Power	30700-22
	2 Case Portable, 7-1/2 - 15 ips, Full Track, 60 Cycle Power	30700-05
	2 Case Portable, 7-1/2 - 15 ips, Full Track, 50 Cycle Power	30700-06
	2 Case Portable, 7-1/2 - 15 ips, Half Track, 60 Cycle Power	30700-11
	2 Case Portable, 7-1/2 - 15 ips, Half Track, 50 Cycle Power	30700-12
	2 Case Portable, 3-3/4 - 7-1/2 ips, Full Track, 60 Cycle Power	30700-17
	2 Case Portable, 3-3/4 - 7-1/2 ips, Full Track, 50 Cycle Power	30700-18
	2 Case Portable, 3-3/4 - 7-1/2 ips, Half Track, 60 Cycle Power	30700-23
	2 Case Portable, 3-3/4 - 7-1/2 ips, Half Track, 50 Cycle Power	30700-24
	351-2 EQUIPMENT	
	Rack Mount, 7-1/2 - 15 ips, 60 Cycle Power	30810-01
	Rack Mount, 7-1/2 - 15 ips, 50 Cycle Power	30810-02
	Rack Mount, 3-3/4 - 7-1/2 ips, 60 Cycle Power	30810-05
	Rack Mount, 3-3/4 - 7-1/2 ips, 50 Cycle Power	30810-06
	2 Case Portable, 7-1/2 - 15 ips, 60 Cycle Power	30810-03
	2 Case Portable, 7-1/2 - 15 ips, 50 Cycle Power	30810-04
	2 Case Portable, 3-3/4 - 7-1/2 ips, 60 Cycle Power	30810-07
	2 Case Portable, 3-3/4 - 7-1/2 ips, 50 Cycle Power	30810-08
	The prefix number of the following component reference symbols designates physical location (see LEGEND on the schematic diagram).	
1C1	CAPACITOR, fixed: paper, .15 uf ± 20%, 400 vdcw; C.D. Part No. BC4P15±20%	035-205
1C2	CAPACITOR: electrolytic -- 10 uf, 450 volt; 20 uf, 450 volt; 10 uf, 350 volt --	30770-01
1C3	CAPACITOR, fixed: ceramic, .02 uf +80% -20%, 500 vdcw; Sprague Part No. 36C205	030-059
1C4	Same as C3	
1C5	Same as C3	
1C6	CAPACITOR, fixed: paper, .0047 uf ± 5%, 400 vdcw; C.D. Part No. ST4D47 Used in 7-1/2 - 15 ips Equipment	035-026
1C6	CAPACITOR, fixed: paper, .0027 uf ± 5%, 400 vdcw; Sprague Part No. 109P27254 Used in 3-3/4 - 7-1/2 ips Equipment	035-238
1C7	CAPACITOR, fixed: paper, .0012 uf ± 5%, 400 vdcw; Sprague Part No. 109P12254 Used in 7-1/2 - 15 ips Equipment	035-203
1C7	Same as C6 (.0047) Used in 3-3/4 - 7-1/2 ips Equipment	
1C8	CAPACITOR, fixed: paper, .02 uf ± 5%, 400 vdcw; C.D. Part No. Type PJ	035-020
1C9	Same as C3	
1C10	CAPACITOR, fixed: paper, .47 uf ± 20%, 400 vdcw; C.D. Part No. BC4P47±20%	035-206
1C11	Same as C6 (.0047) Used in 7-1/2 - 15 ips Equipment	
1C11	CAPACITOR, fixed: paper, .0082 uf ± 5%, 200 vdcw; C.D. Part No. 109P Used in 3-3/4 - 7-1/2 ips Equipment	035-030
1C12	CAPACITOR, fixed: paper, .0022 uf ± 5%, 400 vdcw; Sprague Part No. 109P22254 Used in 7-1/2 - 15 ips Equipment	035-204
1C12	Same as C6 (.0047) Used in 3-3/4 - 7-1/2 ips Equipment	
5C13	CAPACITOR, variable: mica, 15-130 uuf, 175 vdcw; El Menco Part No. 302 (type 30)	038-002
2C14	Same as C3	

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
2C15	CAPACITOR, fixed: mica, 750 uuf ± 5%, 500 vdcw; El Menco Part No. CM20C751J	034-144
3C16	CAPACITOR: electrolytic -- 15 uf, 350 volt; 15 uf, 350 volt; 75 uf, 450 volt; 20 uf, 450 volt --	30769-02
2C17	CAPACITOR, fixed: paper, .1 uf ± 20 %, 400 vdcw; CDST4P1(20%)	035-069
2C18	Same as C3	
2C19	Same as C3	
2C20	CAPACITOR, fixed: ceramic, 150 uuf, ± 20%, 500 vdcw; Sprague Part No. 40C218	030-046
2C21	Same as C3	
2C22	CAPACITOR, fixed: ceramic, .05 uf +80% -20%, 500 vdcw; Sprague Part No. 5HK-S5	030-031
4C23	CAPACITOR, fixed: ceramic, 2 x .001 uf, 500 vdcw; Erie Part No. 812-.001	030-004
5C24	CAPACITOR, fixed: ceramic, .0047 uf, ± 2%, 500 vdcw; JAN-C-20A: CC36CH470G	035-028
5C25	Same as C24	
3C26	CAPACITOR, fixed: electrolytic, 20 uf, 450 vdcw; C.D. Part No. BR10422	031-144
3C27	Same as C3	
3C28	CAPACITOR: electrolytic, 4000 uf, 15 volt	30769-01
3C29	CAPACITOR, fixed: ceramic, .01 uf, ± 20%, 1000 vdcw; Sprague Part No. 33C35A	030-045
3C30	Same as C29	
1C31	Same as C3	
5C32	CAPACITOR, fixed: mica, 910 uuf, ± 5%, 500 vdcw; C.D. Part No. 5A5T91	034-145
5C33	CAPACITOR, variable: mica, 100-550 uuf, 175 vdcw; El Menco Part No. 304 Type 30	038-009
1C34	CAPACITOR, fixed: mica, 350 uuf, ± 5%, 500 vdcw; C.D. Part No. 5A5T35	034-146
1C35	Same as C34	
1C36	CAPACITOR, fixed: mica, .001 uf ± 5%, 500 vdcw; C.D. Part No. 5AT535	034-147
4C37	CAPACITOR, fixed: ceramic, .01 uf, 500 vdcw; Erie Part No. 811-.01	030-002
5C38	CAPACITOR, electrolytic: 10 uf, 150 vdcw; C.D. Part No. BBR-10-150	031-157
5C39	CAPACITOR, fixed: mica, 33 uuf, 500 vdcw; 5%; C.D. Part No. 22A5233	034-168
6CR1	RECTIFIER, selenium: single phase, center tap, 26 volt ac rms max. in -- 1.26 amp dc max. out; G.E. Part No. 6RS5WH5	581-001
5F1	FUSE: 1/2 amp, 250 volt, slow blow; Littlefuse Part No. 313.500	070-026
5F2	FUSE: 3 amp, 250 volt, fast blow; Littlefuse Part No. 312003 Master only	070-001
4I1	POST LIGHT: 1/4 watt neon without internal resistor; 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	PHONE JACK, open circuit type, 2 conductor; Switchcraft Part No. 11	148-015
5J5	CONNECTOR, receptacle: male, 3 contact; Cannon Part No. XL-3-14	147-004
4J6	Same as J4	
5J7	CONNECTOR, receptacle: female, 6 contact; Jones Part No. S-306-AB Master only	146-004
5J7	CONNECTOR, receptacle: male, 6 contact; Jones Part No. P-306-AB Slave only	147-011
5J8	CONNECTOR, receptacle: male, 2 contact; Hubbel Part No. 7466 Master only	147-013
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: 115v dc	30763-01
1L1	CHOKE, rf: 20 mh, 125 ma	30767-01

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
4M1	METER, vu: frosted lamps 6.3 volt, .3 amp	30667-01
4R1	RESISTOR, fixed: composition, .15 meg, 1/2 watt; MIL-R-11A, RC20GF154K	041-074
4R2	RESISTOR, fixed: carbon, 100 ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF101K	041-038
4R3	Same as R2	
4R4	RESISTOR, fixed: carbon, 33K ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF333K	041-066
4R5	RESISTOR, fixed: carbon, .12 meg, 1/2 watt, 10%; MIL-R-11A, RC20GF124K	041-073
1R6	RESISTOR, fixed: film, .1 meg ± 1%, 1/2 watt; Electra Part No. Type DC-1/2	042-092
1R7	RESISTOR, fixed: film, 2700 ohm, 1/2 watt, 10%; MIL-R-10509A, RN15R2701F	042-123
1R8	RESISTOR, fixed: composition, 1 meg, 1/2 watt; MIL-R-11A, RC20GF105K	041-031
4R9	RESISTOR, variable: composition, .1 meg, 2 watts; AB Part No. JA1041	044-015
1R10	RESISTOR, fixed: composition, .1 meg, 1/2 watt; MIL-R-11A, RC20GF104K	041-072
1R11	RESISTOR, fixed: carbon, 4700 ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF472K	041-056
4R12	RESISTOR, variable: carbon, .25 meg, 1/4 watt, 20%; CTC Part No. type PM-45	044-179
1R13	RESISTOR, fixed: carbon, 27K ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF273K	041-065
1R14	RESISTOR, fixed: composition, .33 meg, 1/2 watt; MIL-R-11A, RC20GF334K	041-078
1R15	Same as R8	
1R16	RESISTOR, fixed: composition, 1500 ohm, 1/2 watt; MIL-R-11A, RC20GF152K	041-050
1R17	RESISTOR, fixed: carbon, 22K ohm, 1/2 watt, 5%; MIL-R-11A, RC20GF223J	041-016
1R18	RESISTOR, fixed: carbon, .12 meg, 1/2 watt, 5%; MIL-R-11A, RC20GF124J	041-318
1R19	RESISTOR, fixed: carbon, 22K ohm, 1 watt, 10%; MIL-R-11A, RC32GF223K124J	041-162
1R20	Same as R8	
1R21	RESISTOR, fixed: carbon, 220 ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF221K	041-040
1R22	RESISTOR, fixed: carbon, 2700 ohm, 1/2 watt, 5%; MIL-R-11A, RC20GF272J	041-278
1R23	RESISTOR, fixed: carbon, 8200 ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF822K	041-059
5R24	RESISTOR, variable: wirewound, 500 ohm, 2 watts, 20%; Claro Part No. 39-500	044-178
2R25	RESISTOR, fixed: carbon, .33 meg, 1/4 watt, 10%; Allen Bradley Part No. Type CB	041-325
2R26	RESISTOR, fixed: carbon, .47 meg, 1/2 watt, 10%; MIL-R-11A, RC20GF474K	041-080
2R27	RESISTOR, fixed: film, .33 meg ± 1%, 1/2 watt; Electra Part No. Type DC-1/2	042-100
2R28	RESISTOR, fixed: film: 1500 ohm, 1/2 watt, 1%; Electra Part No. DC-1/2	042-076
2R29	RESISTOR, fixed: film, 10 meg, 1/2 watt, 10%; MIL-R-11 RC20GF106K	041-090
2R30	RESISTOR, fixed: carbon, .30 meg, 1/2 watt, 5%; MIL-R-11A, RC20GF304J 3-3/4 - 7-1/2 ips Equipment	041-326
2R31	RESISTOR, fixed: film, 68K ohm, 1/2 watt, 1%; Electra Part No. Type DC-1/2	042-088
3R32	RESISTOR, fixed: carbon, 39K ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF393K	041-067
2R33	Same as R29	
2R34	RESISTOR, fixed: carbon, .22 meg, 1/2 watt, 10%; MIL-R-11A, RC20GF224K	041-076
3R35	Same as R13	
4R36	RESISTOR, variable: carbon, .25 meg, 2 watts, 10%; AB Part No. CA2541, SD3056	044-128
2R37	Same as R8	
2R38	Same as R16	
2R39	Same as R8	
2R40	RESISTOR, fixed: carbon, 82K ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF823K	041-071
2R41	Same as R16	
2R42	Same as R34	
2R43	Same as R34	
2R44	Same as R8	
2R45	Same as R8	
2R46	RESISTOR, fixed: carbon, 1K ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF102K	041-048
2R47	Same as R13	
5R48	RESISTOR, fixed: carbon, 560 ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF561K	041-045
2R49	Same as R32	
6R50	RESISTOR, fixed: carbon, 1.5K ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF152K	041-050
6R51	RESISTOR, fixed: carbon, 4.7K ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF472J	041-013
6R52	RESISTOR, fixed: carbon, 8.2K ohm, 1/2 watt, 5%; MIL-R-11A, RC20GF822J	041-309
6R53	RESISTOR, fixed: carbon, 820 ohm, 1/2 watt, 5%; MIL-R-11A, RC20GF821J	041-317
3R54	RESISTOR, fixed: carbon, 1.5K ohm, 1 watt, 10%; MIL-R-11A, RC32GF152K	041-148
3R55	Same as R54	
3R56	Same as R2	041-055
3R57	Same as R2	
3R58	RESISTOR, fixed: carbon, 15K ohm, 1/2 watt, 10%; MIL-R-11A, RC20GF153K	041-062
1R59	RESISTOR, fixed: carbon, 1.5K ohm, 2 watts, 10%; MIL-R-11A, RC42GF152K	041-204
3R60	RESISTOR, fixed: wirewound, 1.5 ohm, 1 watt, 10% IRC Type BW-1	043-286
1R61	Same as R11	
1R62	Same as R11	
1R63	RESISTOR, variable: carbon, 10K ohm, 044-171, 1/4 watt, 30%; CTS Part No. UPM-45 SPEC3471	044-171
1R64	RESISTOR, fixed: carbon, 8.2 ohm, 1 watt, 5%; MIL-R-11A, RC32GF825J	041-319
1R65	Same as R34	041-076
4S1	SWITCH, rotary: INPUT TRANSFER, 3 position	30760-01
4S2	SWITCH, rotary: EQUALIZATION, 2 position	30761-01
4S3	SWITCH, rotary: METER AND OUTPUT, 4 position	30762-01
5S4	SWITCH, rotary: LINE TERM, 3P4T; Oak Part No. 59016-23	122-016
4S5	SWITCH, toggle: POWER, SPST; Carling Part No. 110-B-73	120-005
4S6	SWITCH, rotary: RECORD, pushbutton SPST, normally open; A H and H Part No. 3391BSA	120-013
6T1	TRANSFORMER, microphone input	17331-01
5T2	TRANSFORMER, input Low Impedance Heads Only	6299
6T3	TRANSFORMER, output	30633-01
6T4	TRANSFORMER, power	30634-01
1T5	TRANSFORMER, oscillator	30766-01
1V1	TUBE, electron: 12AX7	012-105
1V2	TUBE, electron: 12AT7	012-034
2V3	Same as V1	
2V4	Same as V1	
2V5	TUBE, electron: 12AU7	012-107
1V6	Same as V5	
3V7	TUBE, electron: 6X4	012-050
	*BOARD ASSEMBLY, power supply	30754-01
	*BOARD ASSEMBLY, record: 3-3/4 - 7-1/2 ips	30755-02
	*BOARD ASSEMBLY, record: 7-1/2 - 15 ips	30755-01
	*BOARD ASSEMBLY, reproduce: 3-3/4 - 7-1/2 ips	30756-02
	*BOARD ASSEMBLY, reproduce: 7-1/2 - 15 ips	30756-01
	FACING PANEL	5711-2
	HARNESS ASSEMBLY, master	30819-01
	HARNESS ASSEMBLY, slave	30819-02
	KNOB, large, skirted: Reproduce and Record Level Control	230-004
	KNOB, small, skirted: Equalization and Output	230-003
	KNOB, small with pointer: Input and Line Termination	230-008
	POST, fuse; F1 and F2	085-001
	SHIELD, tube, for all except V7	160-012
	SHIELD, tube; V7	160-043
	SHOCKMOUNT	350-015
	SOCKET, tube: 7 pin	150-067
	SOCKET, tube: 9 pin	30818-01

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

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
	ACCESSORIES	
	CABINET, console	5797
	CABLE ASSEMBLY, power interconnecting for rack mounted equipment	30812-01
	CABLE ASSEMBLY, power interconnecting for portable equipment	30812-02
	CABLE, bias interconnecting for dual track equipment	14943-02
	CABLE, extension	5795
	CABLE, power	2413
	CASE, portable, Electronic Assembly, single unit	4100
	CASE, portable, Electronic Assembly, dual track unit	3935
	CASE, tape transport	5727
	REEL ADAPTOR	976
	EDITING KNOB, console and portable	1917
	HOLD-DOWN KNOB, reel, for rack	9093
	REMOTE CONTROL UNIT, single track, complete with 30 foot cable	5763-0
	Remote Control Unit Parts	
J701P	CONNECTOR, receptacle: male, 10 contact; Jones Part No. P-310-AB	132-007
A702	LAMP, REMOTE TAPE MOTION: Same as A701	
	LAMP BASE, green	132-007
	LAMP BASE, red	132-006
A701	LAMP, REMOTE RECORD: 120 volts, 6 watts	060-006
S701	PUSHBUTTON, fast forward	120-013
S702	Same as S701, rewind	
S703	PUSHBUTTON, STOP	120-014
S704	Same as S701, START	
S705	Same as S701, RECORD	
	REMOTE CONTROL UNIT, dual track, complete with 30 foot cable	5763-2
	REMOTE CONTROL PANEL, single track, unwired, less cable and box	5763-1
	REMOTE CONTROL PANEL, dual track, unwired, less cable and box	5763-3
	WOODBOX, grey	3661-0



NOTES:

1. RESISTOR VALUES ARE IN OHMS, 10%, 1/2 WATT UNLESS OTHERWISE SPECIFIED.
2. ALL CAPACITORS ARE IN MICROFARADS AND RATED AT 400 V, 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. D.C. VOLTAGES MEASURED WITH 20,000 OHM PER VOLT METER WITH EQUIPMENT IN RECORD MODE AT 117 V. LINE.
7. SIGNAL VOLTAGES MEASURED WITH AC VTVM AND EXPRESSED IN db REFERRED TO .78 VOLTS.

CIRCUIT CONDITIONS

EQUALIZATION SWITCH 4S2 IN 7-1/2" 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 2 db MAY BE EXPECTED AT PIN 2 AND PIN 7 OF 2V5.

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
D C VOLTAGES
SIGNAL VOLTAGES

TABLE 1
NAB EQUALIZATION

REF NO.	MACHINES: 3-3/4 - 7-1/2 30750 -02, -04 30750 -06, -08	7-1/2 - 15 30750 -01, -03 30750 -05, -07
C-6	.0027, 5%	.0047, 5%
C-7	.0047, 5%	.0012, 5%
C-11	.0082, 5%	.0047, 5%
C-12	.0047, 5%	.0022, 5%
R-30	300 K, 5%	OMIT - JUMP AS SHOWN WITH DOTTED LINE
R-31	68 K, 1%	68 K, 1%

TABLE 2
CCIR EQUALIZATION

REF NO.	7-1/2 - 15
C6	.0025 5%
C7	.0015 5%
C8	.047 20%
C11	.0033 5%
C12	.0025 5%
C15	.0015 5%
R29	OMIT
R30	68 K 1%
R31	22 K 1%