Section 8

ELECTRONIC ASSEMBLY

GENERAL

The electronic assembly consists of a single chassis on which are mounted two separate amplifiers consisting of the reproduce amplifier, the record amplifier, the bias and erase oscillator and the power supply.

On the chassis are facilities available for setting RECORD LEVEL, REPRODUCE LEVEL (when meter panel 515 is not used), RECORD NOISE BALANCE, RECORD BIAS, HF EQUALIZER to adjust equalization in high and low speeds, an ERASE TRIMMER adjustment for setting high frequency current in the erase head, and a HF EQUALIZER to adjust to the reproduce equalization curve. Also located on the electronic chassis are all connecting and interconnecting provisions for line input, line output, connections to the tape transport, and head connections. One screw type filament fuse post and warning light are also provided on the chassis.

RECORD AMPLIFIER

The record section is a three stage, high gain, resistance coupled amplifier, using transformer input coupling to the first stage. Two triodes and one dual triode, V101, V102, and V103 and their related circuitry form the three stages of amplification.

The signal enters through J101S RECORD IN 10K BRIDGING connector (balanced or unbalanced) and is impressed across the primary of input transformer T101, delivered through the secondary of the same and through variable resistor R101 to the grid of tube V101 (6C5). The signal then leaves the plate of V101 and passes through capacitor C102 and resistor R105 to the grid of tube V102 (6C5) -- the second stage. Time constant of R105 and either C125 or C126, depending on the tape speed selected, provides the high frequency slope of the pre-

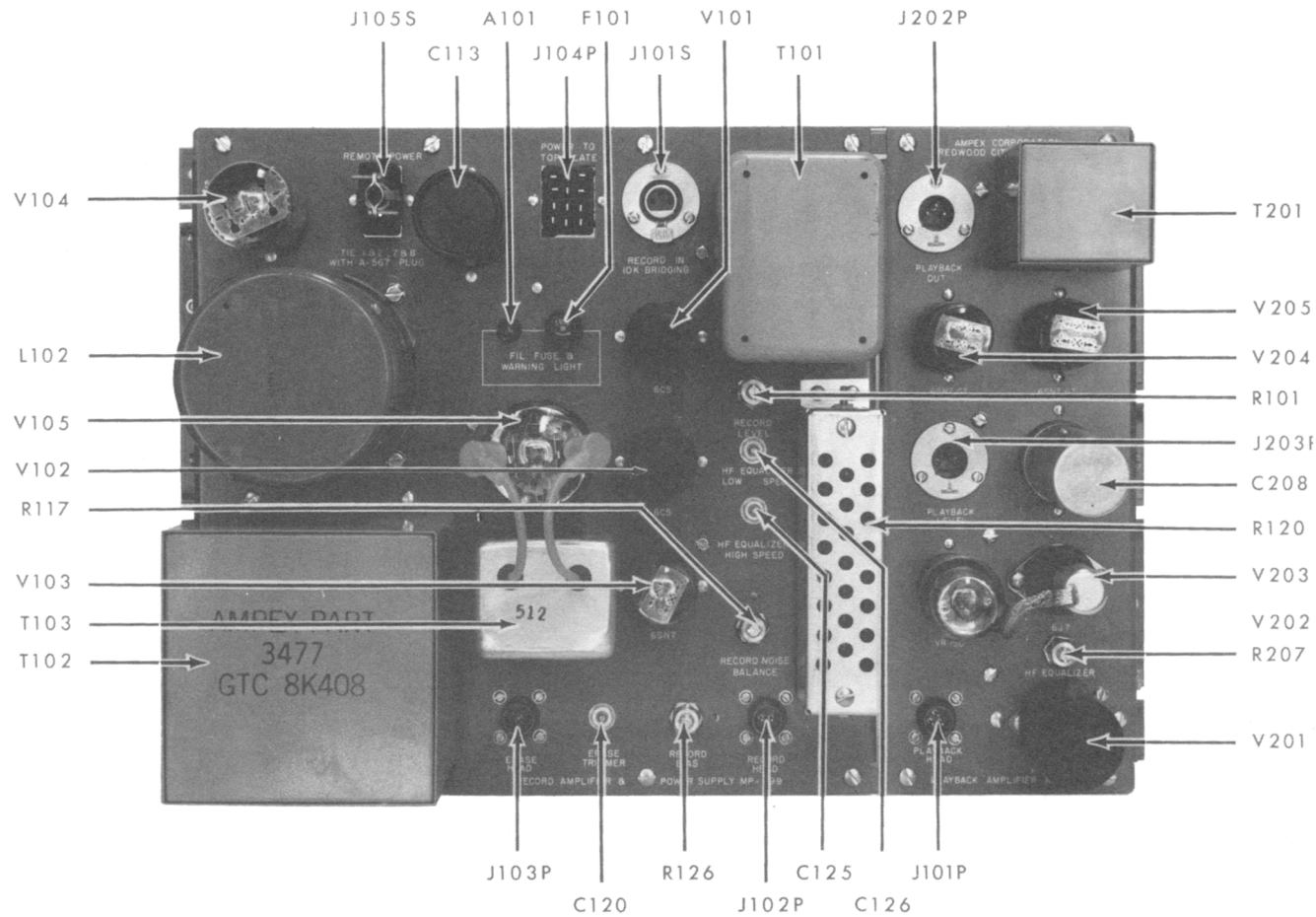


Fig. 8-1 ELECTRONIC ASSEMBLY COMPONENT CALLOUTS

emphasis curve. The low frequency portion of the pre-emphasis curve is determined by the time constant of the RC circuit formed by R107 and C105 which reduces mid frequencies and provides a slight boost at low frequencies. Leaving V102 of the second stage of amplification, the signal passes through capacitor C107 to the grid of dual triode tube V103 (6SN7).

The record head is driven by tube V103, parallel connected to achieve high current capabilities. The signal is mixed with the bias and erase oscillator and delivered to the record head. The noise balance bridge circuit, consisting of capacitor C112 and resistors R116, R117, R118 and R119 provides an approximately equal d-c voltage to each side of the record head (approximately +15 volts). When the equipment is not in the record mode, the record head is shorted out by relay contact set K101-1. See figure 8-2.

RECORD BIAS is adjusted by variable resistor R126 to the record head. ERASE TRIMMER adjustment is made by the combination of variable capacitor C120 and fixed capacitor C119 to the erase head.

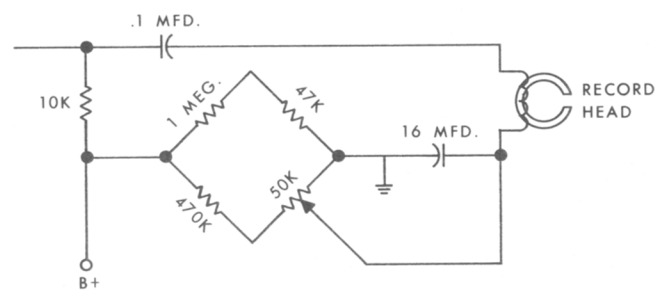
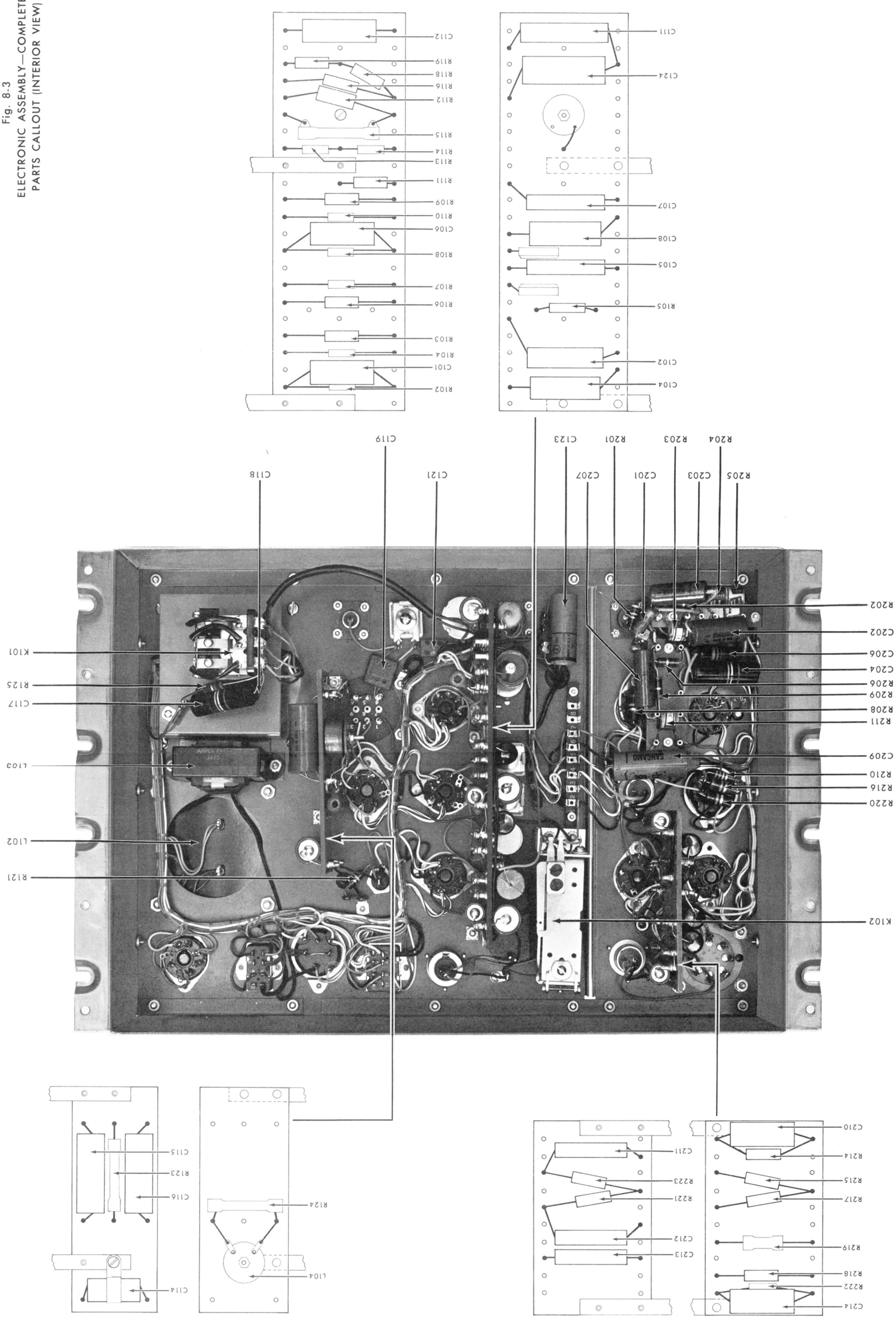


Fig. 8-2 SIMPLIFIED SCHEMATIC, NOISE BALANCE CIRCUITRY

Fig. 8-3
ELECTRONIC ASSEMBLY—COMPLETE
PARTS CALLOUT (INTERIOR VIEW)



REPRODUCE AMPLIFIER

The reproduce section of the electronic assembly is a four stage, resistance coupled, audio amplifier. Two pentodes and two twin triodes are used to provide two stages of amplification, phase inversion, and a push-pull output.

Signals on the moving magnetic tape induce voltages in the reproduce heads. Using high impedance heads, this induced voltage appears across resistors R201 and R202 and then on to the grid of V201. Heater voltage of 12.6 volts d-c is applied to tube V201 from the power supply. Voltage regulator V202 provides constant screen and plate voltage to this first stage of amplification. The amplified output of this first stage is coupled to the second stage grid through capacitor C204. Resistor R207 adjusts the reproduce equalization curve.

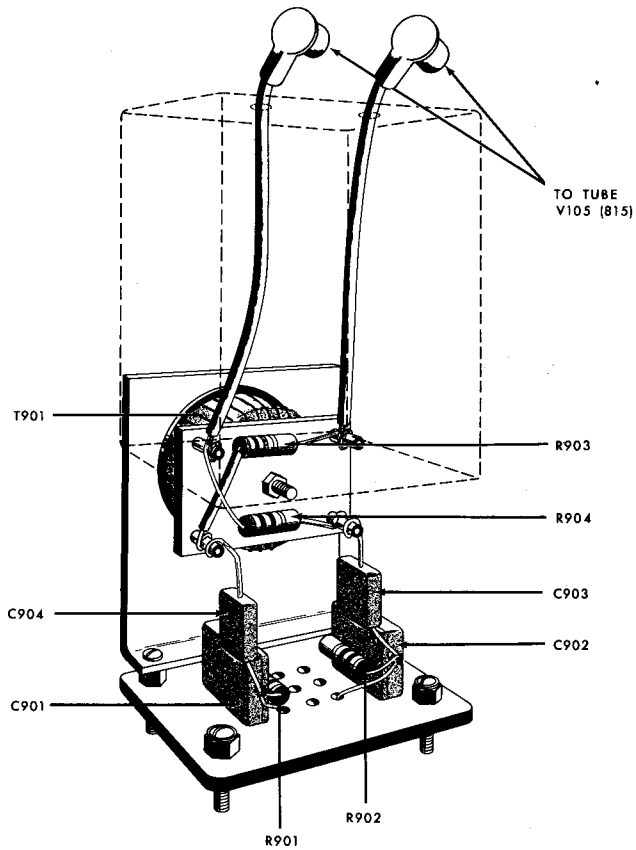
The signal now is delivered to amplifier stage V204, the tube receiving the signal through coupling capacitor C209 and PLAY-BACK LEVEL potentiometer R213.

The output of plate number one (pin 5) of V204 is coupled to the grid (pin 4) of V205. A portion of the output of plate number one (pin 5) is fed to grid two (pin 1) of V204 through the split load resistive network consisting of resistors R215 and R219 and coupling capacitor C213. The output of plate two (pin 2) of V204, which is 180° out of phase with plate one, is fed through coupling capacitor C212 to grid number two (pin 1) of V205. The output from plates of tube V205 (pins 2 and 5) provides push-pull output to the primary of transformer T201. The secondary of T201 provides balanced or unbalanced output to a 600 ohm line.

BIAS AND ERASE OSCILLATOR

The oscillator is a push-pull Colpitts type and provides both erase and bias current. Choke L104 and capacitor C116 provides a filtering circuit to keep high frequency energy from feeding back into the power supply.

Capacitors C116, C117, C118, C119; resistor R125 and to some extent choke L104 minimize transients caused by turning on the oscillator.



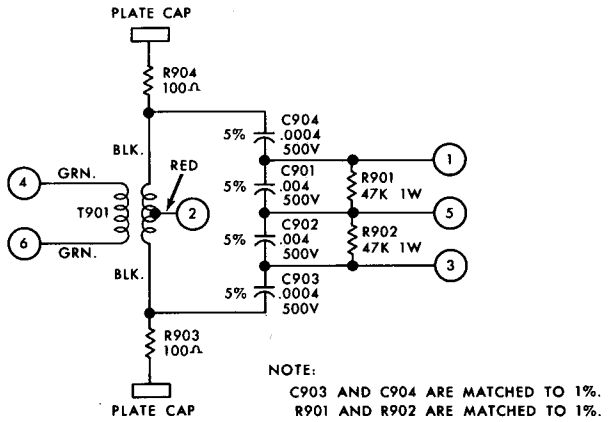


Fig. 8-4 OSCILLATOR COIL ASSEMBLY

NOTE

The oscillator is capable of delivering considerably more current than being presently utilized. Older model 300's required more current than present day machines.

Figure 8-4 illustrates the oscillator coil assembly (Catalog No. 512-00) and its functional schematic.

POWER SUPPLY

The filament of the first reproduce amplifier tube (V201) is connected from B-lead at transformer T101 to ground, thus placing it in series with the current (150 ma) drawn from the high voltage supply. This current produces the required 12.6 volts d-c drop across the filament of tube V201. Opening of this circuit will result in no high voltage load and an excessive high voltage will be placed across capacitor C113 and will possibly damage this component. A high voltage so produced will appear across resistor R121 and lamp A101, causing lamp A101 to glow, indicating that an open circuit exists in the B-lead.

CAUTION

IMMEDIATELY TURN THE RECORDER OFF AND CHECK THE FILAMENT CIRCUIT IF LAMP A101 BECOMES ILLUMINATED.

Plate voltage for oscillator tube (V105) is obtained after the first choke in the two stage LC filter. In order to maintain constant current through tube V201, resistor R120 is connected in place of the oscillator, when the reproduce mode only is used. Voltage from this same point is also used to actuate equalization relay K102. Resistor R122 acts as a current limiter when the relay is shorted out by speed switch S502 (located on the tape transport) for slow speed equalization.

ALIGNMENT AND PERFORMANCE CHECKS

EQUIPMENT REQUIRED

Ampex Standard Alignment Tape

Speed	Width	Ampex Catalog Number
7-1/2 inches per second (NAB)	1/4-inch tape	31321-01
15 inches per second (NAB)	1/4-inch tape	31311-01

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 monitoring aurally.

Nutdriver, number 8 (1/4-inch)

Reel of unrecorded tape.

Long screwdriver (approximately 7-inch bit).

Small screwdriver.

Alignment applies to the necessary adjustments required to enable the electronic assembly and heads of the tape recorder to perform properly. A machine "out of alignment" may be characterized by poor frequency response, high noise, low output, or high distortion. It should not be necessary to align the recorder when it arrives from the factory. The procedures described on the following pages have been performed at the factory prior to shipment. Further adjustments are not required except as found necessary in routine maintenance.

Alignment procedures are as follows:

I. OVERALL PERFORMANCE CHECK

1. Frequency Response

2. Noise Measurement
3. Distortion

II. HEAD ALIGNMENT

III. PLAYBACK ALIGNMENT

IV. RECORD ALIGNMENT

1. Record-Bias and Level Adjustment
2. Record Equalization
3. Record Noise Balance

V. ERASE ADJUSTMENT

Reproduce alignment tapes 31321-01 (7-1/2 ips) and 31311-01 (15 ips) are available for alignment purposes. Several tones are recorded on these tapes for performing specific reproduce alignment procedures. They are as follows:

1. Reference tone for level adjustment,
2. High frequency tone for head azimuth check, and
3. A series of tones for a reproduce response check.

These tapes are recorded in either the 15 or 7-1/2 ips tape speed. Selection of the tape to be used is determined by the demands of the operator. The 15 ips alignment tape is recorded at normal operating level. The 7-1/2 ips alignment tape is recorded 10 db below recommended operating level.

IMPORTANT

BEFORE REPRODUCING THE STANDARD TAPE, DEMAGNETIZE THE HEADS WITH THE AMPEX HEAD DEMAGNETIZER, CATALOG NUMBER 704. MAGNETIZED HEADS WILL CAUSE A PARTIAL ERASURE OF HIGH FREQUENCIES ON THE STANDARD TAPE.

I. OVERALL PERFORMANCE CHECK

The following procedure is recommended for checking the performance of this recorder at the time of installation and as necessary thereafter.

1. Overall Frequency Response:

Thread a new reel of tape on the machine. The equalization curves for this machine have been established by use of high quality professional recording tape.

A. 7-1/2 Inch Response:

Due to the nature of the pre-emphasis in the record circuit, tape saturation will occur at the high frequencies unless the response check is made at least 20 db below normal operating level.

Therefore, check the response with a sensitive meter such as a Hewlett-Packard 400C connected to the output. In absence of a sensitive meter, a standard vu meter, preceded by a flat amplifier with at least 20 db gain can be used. Response should be within the limits indicated in Section 1, PERFORMANCE CHARACTERISTICS.

B. 15 Inch Response:

Make the response check approximately 10 db below operating level to avoid saturation effects. The response should fall within the limits indicated in Section 1, PERFORMANCE CHARACTERISTICS.

2. Overall Noise Measurement:

Overall wide band noise should be measured with a vacuum tube voltmeter,

such as a Hewlett-Packard 400C, while playing back a tape that has been previously erased on the machine. First erase a tape with the input to the record amplifier shorted. Rewind and play this tape back. This will prevent the inaudible bias frequency leakage from entering into the noise measurement, thus producing a false reading. The wide band noise should be below the figures listed in Section 1.

3. Distortion:

Overall distortion may be measured by connecting any standard distortion measurement apparatus across the output. The readings from a wave analyzer or selective frequency distortion meter will be more accurate at lower distortion levels. Distortion readings are somewhat dependent on tape. Readings of approximately 1% are normal at operating levels while readings of approximately 3% are normal at 6 db above operating level.

II. HEAD ALIGNMENT

The high frequency response of the recorder depends on the correct head alignment. If tapes are to be interchangeable from one machine to another, the heads of all machines must have the same azimuth setting. This is accomplished by using a standard tape (Catalog Number 31321-01 or 31311-01) for aligning the heads of all machines. Head alignment is independent of tape speed, so the operator must use the correct alignment tape for the tape speed being utilized with the equipment being aligned.

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

Fig. 8-5 AZIMUTH ADJUSTMENT

Looking at the head housing from the front of the three heads, from left to right are: Erase, Record, and Reproduce.

The azimuth angle of the erase head is not adjustable. The record and reproduce heads should be aligned only after reading and fully understanding the procedure under ALIGNMENT OF REPRODUCE AND RECORD CIRCUITS. The actual physical alignment of the record and reproduce heads consists of placing a 1/4-inch spintite wrench on the left hand elastic stop nut on each head and adjusting back and forth until the proper azimuth angle is reached. Adjust as follows:

Step 1. Adjust the reproduce head azimuth by playint the standard tape at the tape speed being used (7-1/2 or 15). Set the stop nut for the maximum output of the 15 kc tone.

Step 2. The record head azimuth is then aligned with the reproduce head

by recording a 15 kc signal from an audio oscillator on a blank tape and adjusting the record stop nut for maximum reproduce output.

III. ALIGNMENT OF REPRODUCE CIRCUITS

NOTE

DO NOT ATTEMPT TO ADJUST RECORD CIRCUITRY BEFORE ALIGNMENT OF REPRODUCE.

Alignment procedure for the reproduce circuitry is as follows:

Step 1. Thread an audio standard tape on the tape transport. Terminate the output with a 600 ohm external termination. Set the OUTPUT switch (R1102) on the meter panel to the LINE position. Connect an external vu meter across the output. Connect an amplifier and loudspeaker or a pair of headphones to the output of the machine or to the phone jack (J1101) on the meter panel so the voice announcements on the standard tape can be aurally monitored.

Step 2. Turn power switch (S801) to the "ON" position (indicated by power indicator lamp on the tape transport).

Step 3. Place the mode selector switch (S802) to the PLAY position and set the TAPE SPEED switch S502 to HIGH or LOW, depending on the tape speed desired. If the equipment houses a meter panel, set the meter panel OUTPUT control knob to the number 14 position. Press START button S805 to start the tape.

7.5 IPS REPRODUCE ALIGNMENT TAPES (31321-01)

A. With meter panel

The first tone on the alignment tape is a reference tone recorded at 10 db below normal operating level. All other tones on the tape are recorded at this level, except the final tone on the tape. Set the OUTPUT control at position 4 and adjust the VERNIER control (R213) so the vu meter reads "0" (+4 dbm output). The second tone is a high frequency tone. Adjust the playback head azimuth stop nut for maximum output as indicated on the vu meter. A series of tones in descending frequency follow the alignment tone. These tones provide a test of the reproduce system response. After the last response test tone (50 cps) set the OUTPUT control to position 14. The next tone will be a reference tone recorded at normal operating level. The vernier control should be readjusted so that the vu meter reads "0" (+4 dbm).

B. Without meter panel.

On the first alignment tape tone adjust the PLAYBACK LEVEL control on the electronics assembly so the output is -6 dbm (.338V rms). Adjust the head alignment on the second tone. On the final normal operating level tone readjust the level control if necessary so that the output is +4 dbm (1.23V rms)

15 IPS REPRODUCE ALIGNMENT TAPES

A. With meter panel

The first tone on the alignment tape is a reference tone recorded at normal operating level as are all tones on this tape. Set the OUTPUT control to position 14 and adjust the VERNIER control so the output indicates "0" on the vu meter. The second tone is a high frequency tone. Adjust the playback head azimuth stop nut for maximum output. The following tones in descending frequency may be used to check the reproduce system response.

B. Without meter panel

On the first alignment tape tone adjust the PLAYBACK LEVEL control on the electronics assembly so the output is +4 dbm (1.23V rms). Then follow same procedure as for machines with meter panel.

1. Reproduce Equalization:

The reproduce amplifier is factory adjusted by means of the HF EQUALIZER potentiometer (R207), in accordance with the standard voltage shown in figure 8-6. The recommended method for adjusting the reproduce amplifier response is to connect an audio oscillator and vacuum tube voltmeter to the reproduce amplifier. Adjust the HF EQUALIZER (R207) to give the frequency response of the standard 50 microsecond curve. Deviation from this curve is not recommended. Check the reproduce level set-

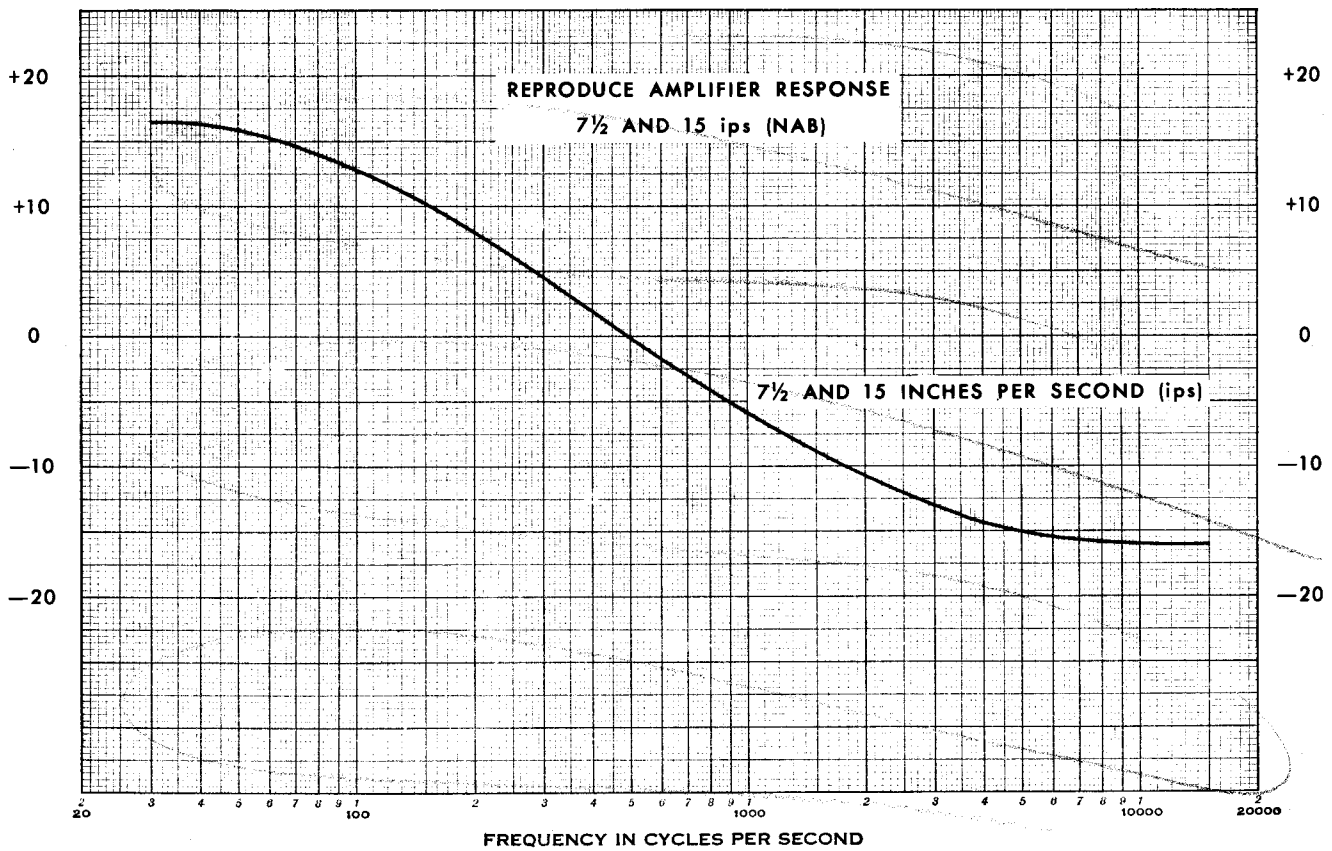


Fig. 8-6 REPRODUCE AMPLIFIER RESPONSE (7½ AND 15 IPS NAB)

ting with a standard tape if any change is made in the equalizer.

The above will properly align the reproduce circuit for operation at both the 7-1/2 and 15 ips tape speeds. The standard tape will play back within ±2 db to 15 kc when the reproduce amplifier is adjusted to the standard curve. Failure for the standard tape to play back within these tolerances after the reproduce amplifier has been aligned indicates one of the following:

A. Trouble in the head assembly, such as worn heads.

B. A faulty standard tape which has been partially erased at the high frequencies by passing over magnetized heads, etc.

An overall frequency response check will isolate the trouble. Good overall response indicates a faulty standard tape. Poor overall response indicates one of the following:

A. Faulty Heads.
B. Tape deficiency.
C. Record or reproduce amplifier improperly equalized.
D. Incorrect bias.

Alignment of the record circuits as described in the next sub-section will further aid in isolating trouble.

IV. ALIGNMENT OF RECORD CIRCUITS

Record alignment should be attempted only after the reproduce has been properly aligned. Perform the following operations in the sequence indicated:

1. Record Bias and Level Adjustment:

The record bias current is factory adjusted for optimum overall response and low frequency distortion. However, the optimum value of bias current will vary with different types of tape. The record equalization characteristics on this equipment have been determined for peak bias at 1000 cycles at 15 inch per second tape speed. Peak bias means that the bias current is adjusted so that the 1000 cycle signal is recorded at its maximum level. Adjust the bias in the following manner:

a. Thread a blank tape on the machine. Terminate the reproduce output with a 600 ohm termination. Set the OUTPUT switch on the meter panel to the LINE position. Connect an external vu meter across the output.

b. Connect an audio oscillator to the input of the record amplifier or to the meter panel if the machine is so equipped. Set the oscillator at +4 dbm (1.23V rms) and 1 kc.

c. On machines with a bridging meter panel, set the RECORD LEVEL control knob to 14. The OUTPUT LEVEL control knob should also be set at position 14.

d. Start the tape in the record mode of operation at the tape speed desired. Make a preliminary record level set by adjusting the RECORD LEVEL (R101) on the electronic chassis, so that the reproduce output reads approximately +4 dbm (1.23V rms).

e. Adjust the RECORD BIAS (R126) for maximum reproduce output of the 1 kc tone.

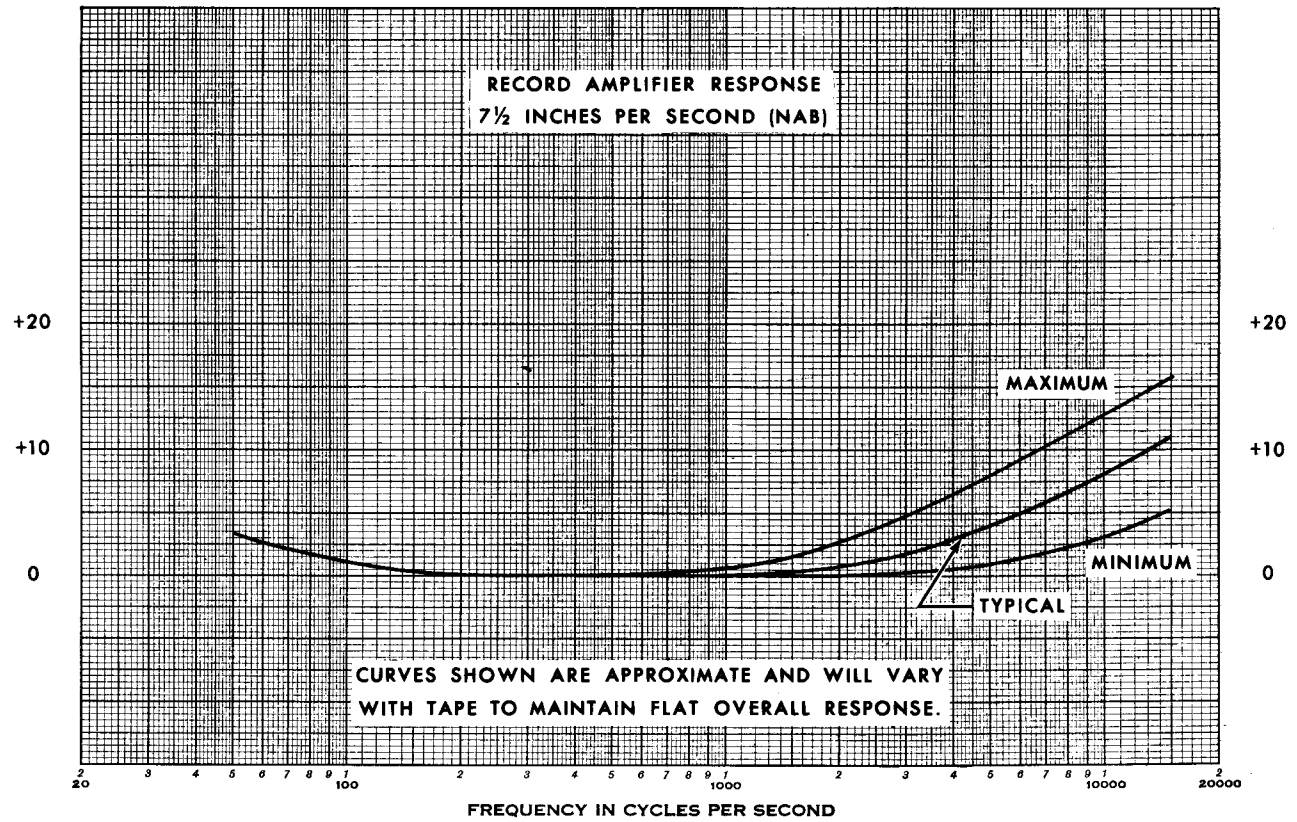


Fig. 8-7 RECORD AMPLIFIER RESPONSE (7½ IPS NAB)

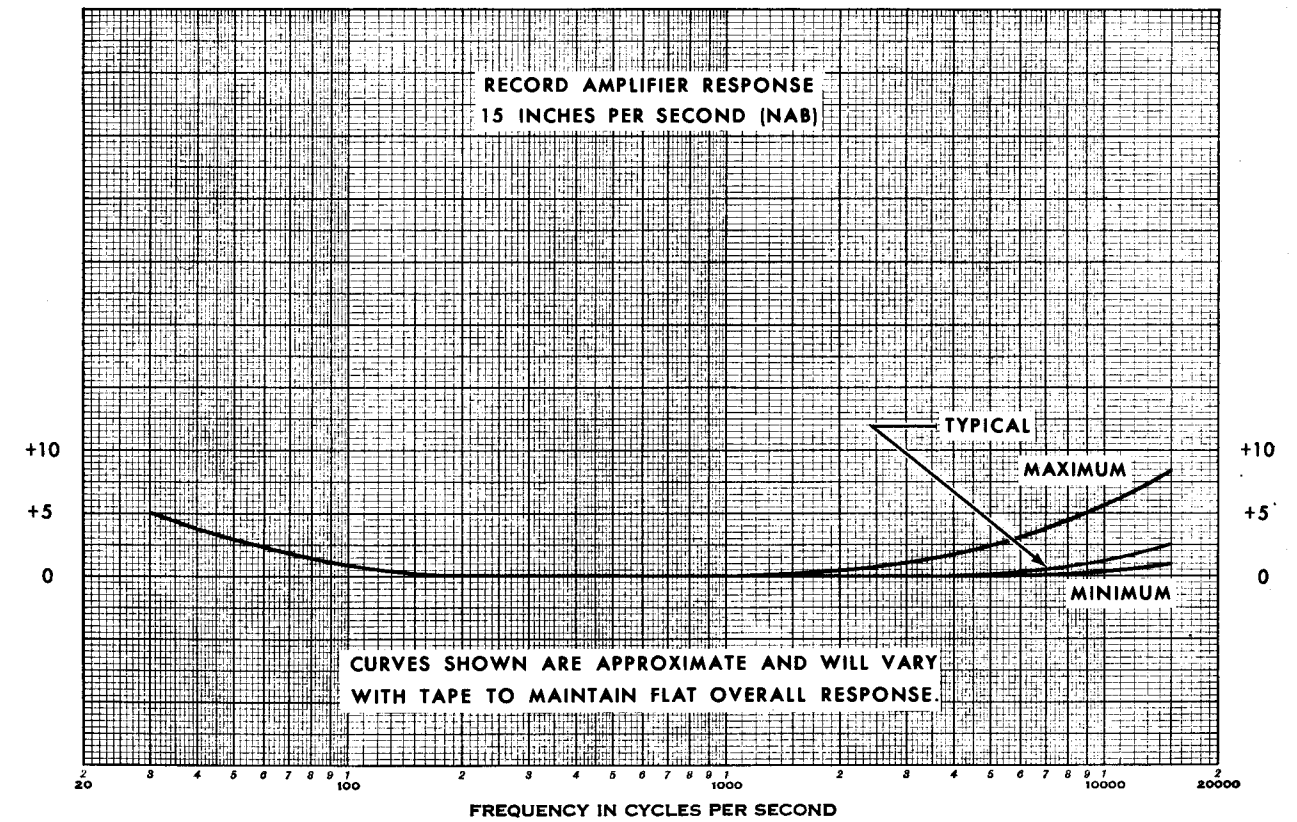


Fig. 8-8 RECORD AMPLIFIER RESPONSE (15 IPS NAB)

f. Reset the audio oscillator to 250 cycles +4 dbm. Re-adjust the RECORD LEVEL control on the electronic chassis so that the reproduce output is +4 dbm.

2. Record Equalization:

The record equalization circuits have been factory adjusted to the curves shown in figure 8-7 and 8-8. These curves have been found to produce flat overall response, when recording on high quality recording tapes. Badly worn tapes may produce loss in high frequency response and should not be used. The adjustment procedure for flat overall response on any tape is as follows:

a. Set up the machine as described under Record Bias and Level Adjustment in the record mode of operation, at 15 ips, by setting the TAPE SPEED switch on the tape transport to the HIGH position.

b. Reset the audio oscillator to 15 kc and adjust the record head azimuth as described under Head Alignment.

NOTE

ALL FREQUENCY CHECKS AT 15 IPS TAPE SPEED SHOULD BE MADE 10 DB BELOW OPERATING LEVEL TO AVOID SATURATION EFFECTS CAUSED BY HIGH FREQUENCY PRE-EMPHASIS. ON MACHINES EQUIPPED WITH METER PANELS, OUTPUT LEVEL CONTROL SHOULD BE SET AT POSITION 4 AND RECORD LEVEL AT POSITION 24 DURING RESPONSE CHECKS TO PERMIT RUNS TO BE MADE ON THE SENSITIVE RANGE OF THE VU METER.

c. Sweep the oscillator across the frequency range and adjust the record HF EQUALIZER HIGH (15 ips) for flat response within the specifications of the equipment.

d. Change the TAPE SPEED switch on the tape transport to the LOW position for 7-1/2 ips. Response check at this speed should be made 20 db below operating level to avoid tape saturation effects. Therefore, a sensitive meter or flat amplifier and vu meter should be used as described under OVERALL PERFORMANCE CHECK. Sweep the oscillator across the frequency range and adjust the record HF EQUALIZER LOW (7-1/2 ips) for flat response within the specifications of the equipment.

3. Record Noise Balance:

A noise balance control is provided to eliminate excessive low frequency noise and null second harmonic distortion. The noise balance should not be touched unless all heads have been thoroughly demagnetized with an Ampex head demagnetizer or equivalent. If noise of a crackling nature is still found to exist in the output of the machine, connect a 1 mfd capacitor across the output, then adjust the RECORD NOISE BALANCE potentiometer (R117), for minimum record noise, as read on a sensitive meter or heard in a loudspeaker connected to the recorder output through a power amplifier.

V. ERASE ADJUSTMENT

It should not be necessary to make this adjustment, except at rare intervals, be-

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

Step 1. Disconnect the erase cable from the record chassis connector (J103P).

Step 2. Make an adapter plug by inserting a 10 ohm resistor in series with the ground side of the erase cable.

Step 3. Insert adapter into connector J103P, and connect the erase cable into the adapter.

Step 4. Place a vacuum tube voltmeter across the 10 ohm resistor. Set vtvm on the 3 volt scale. Full scale deflection will read .3 milliamps of erase current.

Step 5. Turn the ERASE TRIMMER control (C120) for minimum capacity and slowly increase the capacity (counterclockwise rotation from top of chassis) until the meter reads 150-180 ma. Higher currents will produce unnecessary heating of the head.

NOTE

ALIGN THE RECORD CIRCUIT AS DESCRIBED UNDER "ALIGNMENT OF RECORD CIRCUITS" AFTER MAKING THIS ADJUSTMENT, SINCE A CHANGE IN ERASE CURRENT WILL PRODUCE A CHANGE IN BIAS CURRENT.

1. 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 +4 dbm output, add 6 db to obtain the output value from the 3% distortion level, arriving at a total of 10 db. 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 10 dbm computed to arrive at the 3% distortion level. Therefore, the vtvm reading must be converted to the signal-to-noise ratio.

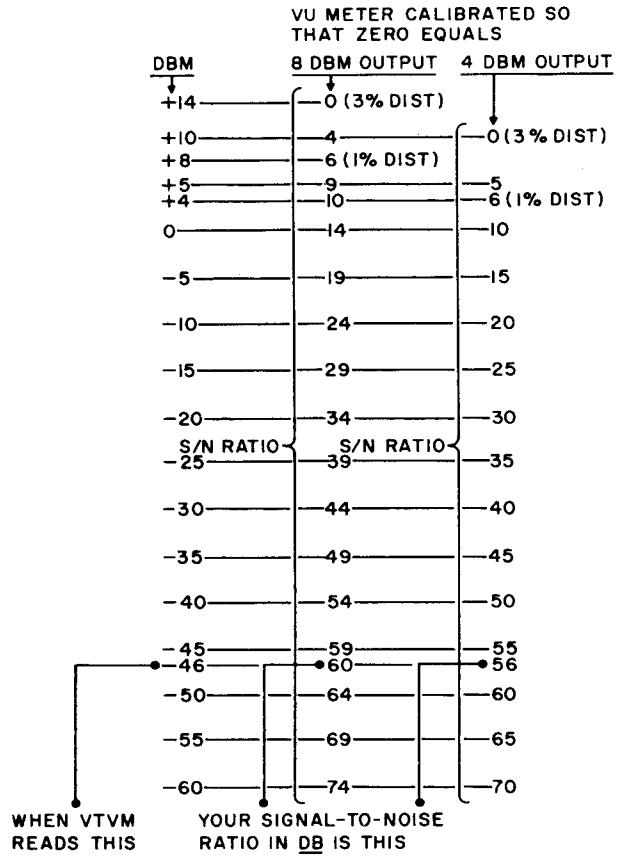


Fig. 8-9
SIGNAL-TO-NOISE RATIO COMPUTATIONS

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 vu meter is so calibrated that zero vu 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.

MAINTENANCE AND TROUBLESHOOTING

General Maintenance Information

Faithful adherence to the recommended ROUTINE MAINTENANCE found in Section 5, 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.

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

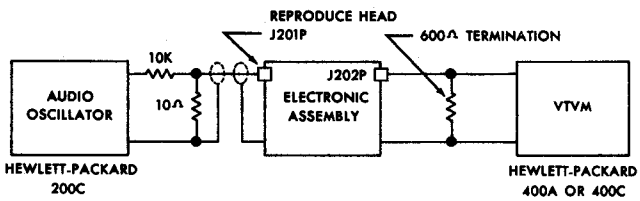


Fig. 8-10 TROUBLESHOOTING THE REPRODUCE AMPLIFIER

SCHEMATIC DIAGRAM -- ELECTRONIC ASSEMBLIES).

Disconnect the head cable at J201P 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 procedure, using the circuit shown above, check the reproduce amplifier response against the appropriate curve to insure that the equipment conforms to performance characteristics.

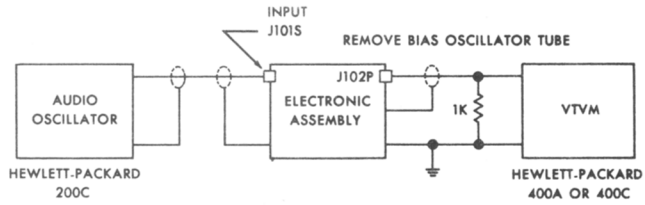


Fig. 8-11 TROUBLESHOOTING THE RECORD AMPLIFIER

Troubleshooting the Record Amplifier

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. Disconnect the record head lead before checking amplifier response.

The circuit for troubleshooting the record amplifier is shown above (see also -- PARTS LOCATION RECORD AMPLIFIER, BIAS AND ERASE OSCILLATOR and foldout SCHEMATIC DIAGRAM -- ELECTRONIC ASSEMBLIES).

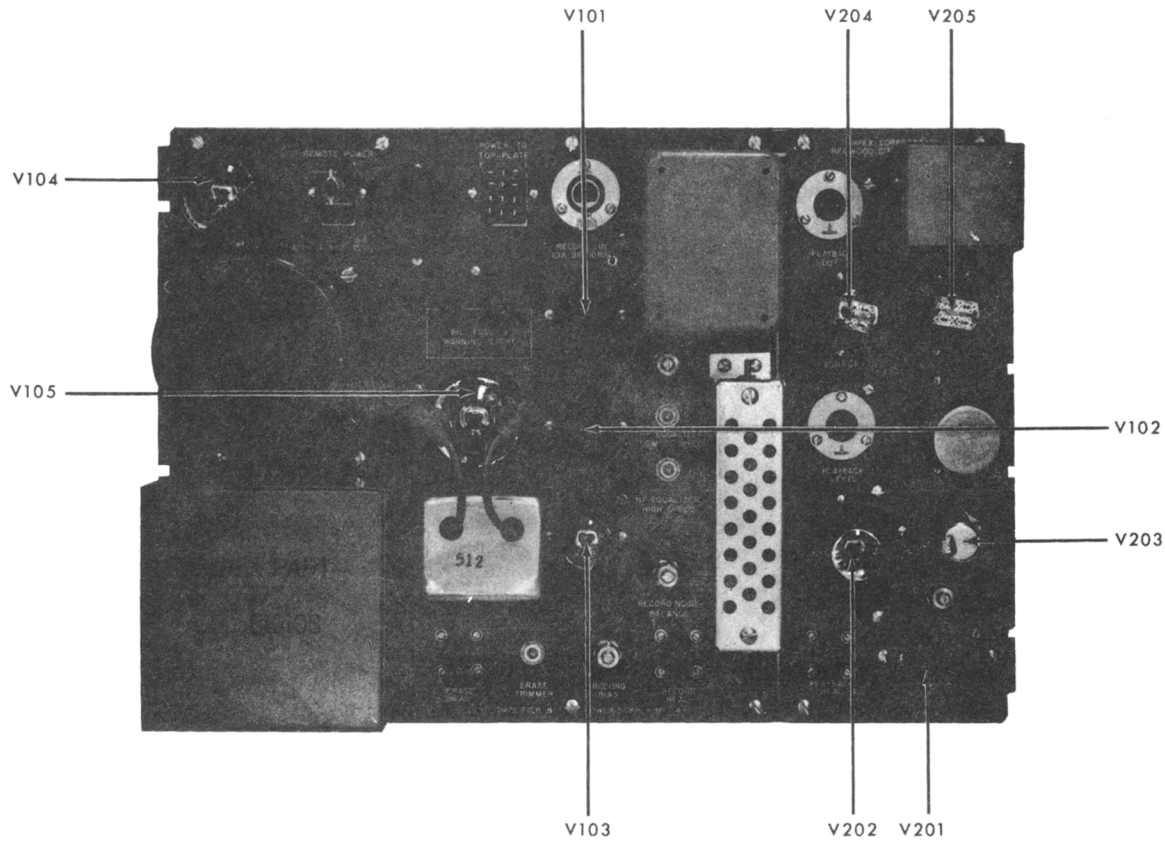


Fig. 8-12 ELECTRONIC CHASSIS TUBE LAYOUT

ELECTRONIC ASSEMBLY
PARTS LIST
CATALOG NUMBER 559-00

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
A101	LAMP, miniature: 6.3V, .15A.: General Electric Part No. 47	060-001
C101	CAPACITOR, electrolytic: tubular, 50 mfd, 25 vdcw, -10+250%: Cornell Dubilier Part No.	031-030
C102	CAPACITOR, paper: tubular, .25 mfd., 600 vdcw, -10+20%: Sprague Part No. 109P	035-097
C104	CAPACITOR, electrolytic: tubular, 10 mfd, 450 vdcw, -10+150%: Cornell Dubilier Part No. BRM-1045	031-007
C105	CAPACITOR, paper: tubular, .1 mfd., 600 vdcw, 5%: Sprague Part No. 109P	035-073
C106	Same as C101	031-030
C107	CAPACITOR, paper: tubular, .1 mfd, 600 vdcw, -10%+20%: Sprague Part No. 109P10496	035-074
C108	Same as C104	031-007
C109	CAPACITOR, mica: axial, .0035 mfd, 500 vdcw, 5%: Elmenco Part No. Type CM30	034-079
C110	CAPACITOR, mica: axial, .002 mfd, 500 vdcw, 5%: MIL-C-5A: CM30E202J	034-022
C111	CAPACITOR, metallized: axial, 1 mfd, 400 vdcw, 20%: Astron Part No. ML-4-1M	033-010
C112	CAPACITOR, electrolytic: tubular, 16 mfd, 150 vdcw, -10+150%: Cornell Dubilier Part No. BRM-1615	031-018
C113	CAPACITOR, electrolytic: twist-tab, 30-30-20 mfd, 475 vdcw, -10+150%: Sprague Part No. type DFP	031-082
C114	CAPACITOR, electrolytic: tubular, 100 mfd, 25 vdcw, -10+250%: Cornell Dubilier Part No. BRHM-251	031-029

REF NO.	PART DESCRIPTION	AMPEX PART NO.
C115	Same as C104	031-007
C116	Same as C104	031-007
C117	Same as C107	035-074
C118	Same as C107	035-074
C119	CAPACITOR, mica: axial, .0015 mfd, 500 vdcw, 5%: MIL-C-5A: CM30C152J	034-021
C120	CAPACITOR, variable: 275-970 mfd, 175 vdcw: Elmenco Part No. 306	038-003
C121	CAPACITOR, mica: axial, .0005 mfd., 500 vdcw, 5%: Elmenco Part No. CM20C501J	034-063
C123	CAPACITOR, electrolytic: tubular, 100 mfd., 50 vdcw, -10+150%: Cornell Dubilier Part No. BRHM-501	031-022
C124	CAPACITOR, electrolytic: tubular, 20 mfd, 450 vdcw, -10+50%: Cornell Dubilier Part No. BRM-2045	031-006
C125	CAPACITOR, variable: 15-130 mfd, 175 vdcw: Elmenco Part No. 302 type 30	038-002
C126	Same as C125	038-002
C201	CAPACITOR, metallized: axial, .1 mfd, 200 vdcw, 20%: Astron Part No. ML-2-1	033-003
C202	CAPACITOR, electrolytic: tubular, 4 mfd, 450 vdcw, -10+150%: Cornell Dubilier Part No.	031-009
C203	Same as C101	031-030
C204	Same as C107	035-074
C206	CAPACITOR, paper: tubular, .036 mfd, 200 vdcw, 5%: Sprague Part No. 109P	035-100
C207	Same as C101	031-030
C208	CAPACITOR, electrolytic: twist-tap, 20-20-20-20 mfd, 450 vdcw, -10+50%: Cornell Dubilier Part No. UPT222245	031-073

REF NO.	PART DESCRIPTION	AMPEX PART NO.
C209	CAPACITOR, paper: tubular, .25 mfd, 600 vdcw, -10+20%: Sprague Part No. 109P	035-097
C210	Same as C101	031-030
C211	Same as C107	035-074
C212	Same as C107	035-074
C213	Same as C107	035-074
C214	Same as C101	031-030
F101	FUSE, cartridge: glass case, 1/4 amp, 250V, fast blow: Littlefuse Part No. 312-250	070-006
J101S	CONNECTOR, receptacle: female, 3 contact: Cannon Part No. XL-3-13	146-007
J102P	CONNECTOR receptacle: male, 2 contacts: MS102A10SL-4P	143-009
J103P	CONNECTOR, receptacle: male, 1 contact: MS102A10S-2P	143-010
J104P	CONNECTOR, receptacle: male, 12 contacts; 730V rms, 10 amps: Jones Part No. P-312-AB	147-008
J105S	CONNECTOR, receptacle: female, 8 contacts, 730V rms, 10 amp: Jones Part No. S-308-AB	146-003
J201P	CONNECTOR, receptacle: male, 3 contacts: MS3102A-10S-3P	143-008
J202P	CONNECTOR, receptacle: male, 3 contacts: Cannon Part No. XL-3-14	147-004
J203P	CONNECTOR, receptacle: male, 4 contacts: Cannon Part No. XL-4-14	147-009

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
K101	RELAY: 115V dc coil, 10 amp, 3 PDT: Philtron Part No. 33QA	020-006
K102	RELAY: Telephone relay, 450 ohm coil, 3PDT: Philtron Part No. 2QA19A	020-001
L101	COIL, rf choke: 20 mh	051-018
L102	CHOKE: 12 henries	3479-00
L103	CHOKE: 20 henries	3480-00
L104	COIL: rf choke, 100 MA, 100 MH	051-020
R101	RESISTOR, variable: .1 megohm, 1/4 watt, 20%: Centralab Part No. Model 2 (TPR-C2)	044-038
R102	RESISTOR, fixed: axial, composition, 2.2K ohms, 1 watt, 10%: MIL-R: 11A: RC32GF222K	041-150
R103	RESISTOR, fixed: axial, composition, 47K ohms, 1 watt, 10%: MIL-R-11A: RC32GF473K	041-166
R104	RESISTOR, fixed: axial, composition, 10K ohms, 1 watt, 10%: MIL-R-11A: RC32GF103K	041-158
R105	RESISTOR, fixed: axial, composition, .47 megohm, 1 watt, 10%: MIL-R-11A: RC32GF474J	041-124
R106	RESISTOR, fixed: axial, composition, 33K ohms, 1 watt, 5%: MIL-R-11A: RC32GF333J	041-113
R107	RESISTOR, fixed: axial, composition, .1 megohm, 1 watt, 10%: MIL-R-11A: RC32GF104K	041-170
R108	Same as R102	041-150
R109	Same as R103	041-166
R110	Same as R104	041-158

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
R111	RESISTOR, fixed: axial, composition, .47 megohm, 1 watt, 10%: MIL-R-11A: RC32GF474K	041-178
R112	RESISTOR, fixed: axial, composition, 1.2 K ohms, 2 watts, 10%: MIL-R-11A: RC42GF122K	041-203
R113	RESISTOR, fixed: axial, composition, 220 ohms 1 watt, 10%: MIL-R-11A: RC32GF221K	041-130
R114	Same as R102	041-150
R115	RESISTOR, fixed: wirewound, 10K ohms, 10 watts, 5%: Tru-ohm Part No. type FRL-10	043-128
R116	Same as R111	041-178
R117	RESISTOR, variable: 50K ohms, 1/4 watt, 20%: Centralab Part No. Model 2 (TRC-C1)	044-051
R118	RESISTOR, fixed: axial, composition, 1 megohm, 1 watt, 10%: MIL-R-11A: RC32GF105K	041-182
R119	Same as R103	041-166
R120	RESISTOR, fixed: wirewound, 6 K ohms, 50 watts, 5%: Tru-ohm Part No. type FR-50	043-017
R121	RESISTOR, fixed: axial, composition, .22 megohm, 1 watt, 10%: MIL-R-11A: RC32GF224K	041-174
R122	RESISTOR, fixed: wirewound, 10 K ohms, 25 watts, 5%: Tru-ohm Part No. type FR-25	043-074
R123	RESISTOR, fixed: wirewound, 600 ohms, 10 watts, 5%: Tru-ohm Part No. type FRL-10	043-108
R124	Same as R115	043-128
R125	RESISTOR, fixed: axial, composition, 10 ohms, 1 watt, 10%: MIL-R-11A: RC32GF101K	041-137
R126	RESISTOR, variable: 10K ohms, 5 watts, 20%: Centralab Part No. model V (TRC-C1)	044-024

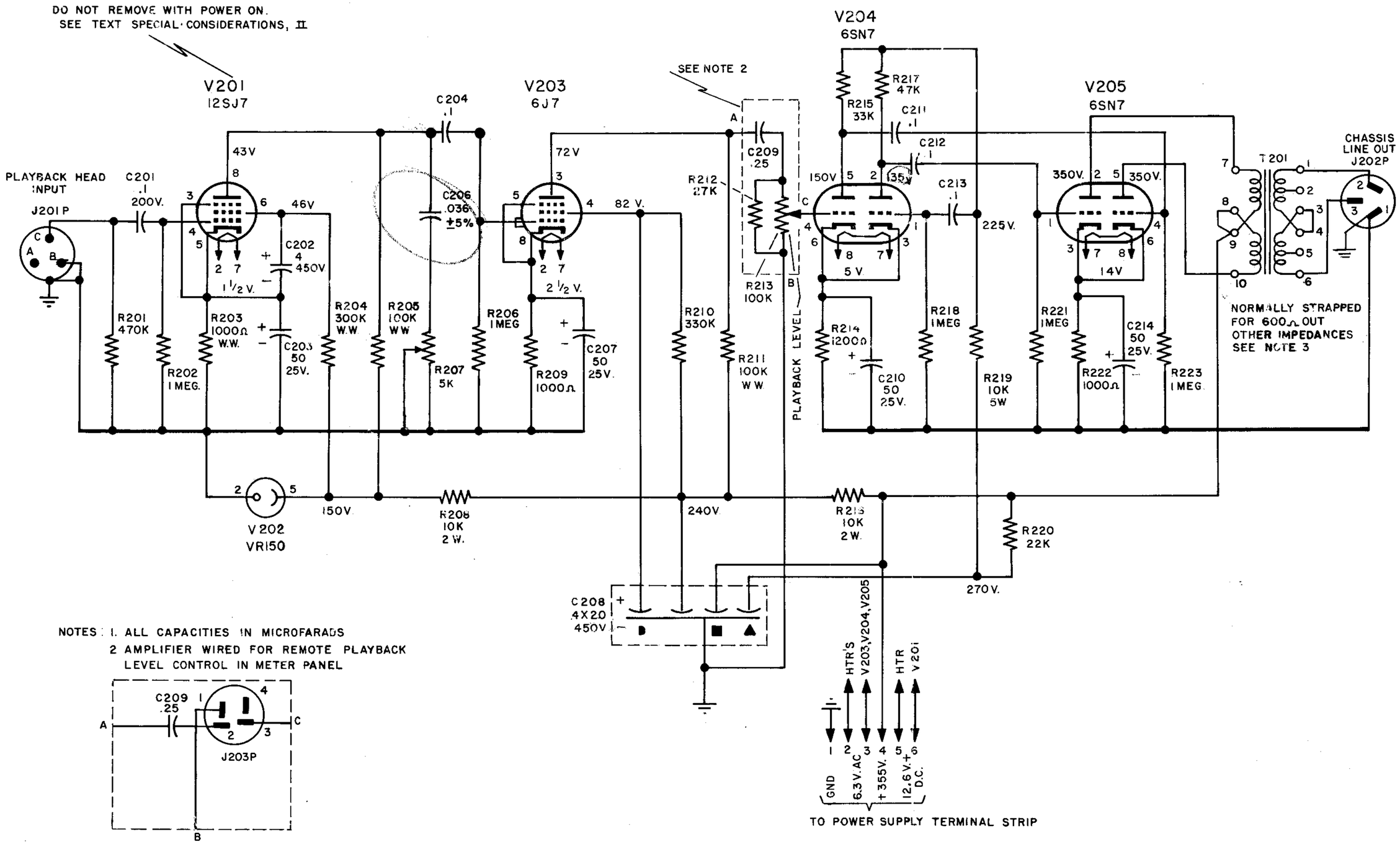
REF. NO.	PART DESCRIPTION	AMPEX PART NO.
R201	Same as R111	041-178
R202	Same as R118	041-182
R203	RESISTOR, fixed: wirewound, 1 K ohms, 1/2 watt, 1%: Ohmite Part No. type 832-S	043-193
R204	RESISTOR, fixed: wirewound, .3 megohm, 1/2 watt, 1%: Ohmite Part No. type 832-S	043-192
R205	RESISTOR, fixed: wirewound, .1 megohm, 1/2 watt, 1%: Ohmite Part No. type 832-S	043-190
R206	Same as R118	041-182
R207	RESISTOR, variable: 5K ohms, 1/4 watt, 20%: Centralab Part No. model 2 (TPR-C4)	044-046
R208	RESISTOR, fixed: axial, composition, 10 K ohms, 2 watts, 10%: MIL-R-11A: RC42GF103K	041-213
R209	RESISTOR, fixed: axial composition, 1 K ohms, 1 watt, 10%: MIL-R-11A: RC32GF102K	041-146
R210	RESISTOR, fixed: axial, composition, .33 megohm, 1 watt, 10%: MIL-R-11A: RC32GF334K	041-176
R211	RESISTOR, fixed: wirewound, .1 megohm, 1/2 watt, 1%: Ohmite Part No. type 832-S	043-190
R212	RESISTOR, fixed: axial, composition, 27K ohms, 1 watt, 10%: MIL-R-11A: RC32GF273K	041-163
R213	RESISTOR, variable: .1 megohm, 1/4 watt, 20%: Centralab Part No. model 2 (TPR-C1)	044-038
R214	RESISTOR, fixed: axial, composition, 1.2 K ohms, 1 watt, 10%: MIL-R-11A: RC32GF122K	041-147
R215	RESISTOR, fixed: axial, composition, 33 K ohms, 1 watt, 10%: MIL-R-11A: RC32GF333K	041-164
R216	Same as R208	041-213

REF. NO.		PART DESCRIPTION	AMPEX PART NO.
R217		Same as R103	041-166
R218		Same as R118	041-182
R219		RESISTOR, fixed: wirewound, 10 K ohms, 5 watts, 5%: Tru-ohm Part No. type FRL-5	043-158
R220		RESISTOR, fixed: axial, composition, 22 K ohms, 2 watts, 10%: MIL-R-11A: RC42GF223K	041-216
R221		Same as R118	041-182
R222		Same as R209	041-146
R223		Same as R118	041-182
T101		TRANSFORMER: Input	3478-00
T102		TRANSFORMER: Power	3477-00
T103		OSCILLATOR COIL ASSEMBLY	512-00
	C901	CAPACITOR, mica: axial, .004 mfd, 500 vdcw, 5%: Elmenco Part No. type CM30	034-081
	C902	Same as C901	034-081
	C903	CAPACITOR, mica: axial, .0004 mfd, 500 vdcw, Elmenco Part No. type CM20	034-058
	C904	Same as C903	034-058
	R901	Same as R103	041-166
	R902	Same as R103	041-166
	R903	Same as R125	041-137
	R904	Same as R125	041-137
	T901	COIL: Torroidal	1011-00

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
T201	OUTPUT TRANSFORMER	6300-01
TS101	TERMINAL STRIP: 8 terminal (double): Cinch Part No. 8-170	180-016
V101	TUBE, electron: octal, 6C5: R.C.A. Part No.	012-002
V102	Same as V101	012-002
V103	TUBE, electron: octal, 6SN7GTB: R.C.A. Part No.	012-061
V104	TUBE, electron: octal, .5U4G: R.C.A. Part No.	012-001
V105	TUBE, electron: octal, 815: R.C.A. Part No.	012-015
V201	TUBE, electron: octal, 12SJ7:	012-087
V202	TUBE, voltage regulator: octal, OD3, 150 vdc: R.C.A. Part No.	011-001
V203	TUBE, electron: octal, 6J7: R.C.A. Part No.	012-014
V204	Same as V103	012-061
V205	Same as V103	012-061
	DUMMY PLUG (power)	567-01
	SHAFT LOCK, nut: 1/4 inch shaft: Millen Part No. 10061	498-014
	SHIELD, tube (V101)	644-04
	SOCKET, capacitor, for twist-prong electrolytics: Cinch Part No. 54A11899 or 2CT	150-006
	SOCKET, octal (MIP): Amphenol Part No. 77-MIPS	150-001

REF. NO.	PART DESCRIPTION	AMPEX PART NO.
	SOCKET, octal: shock mounted (V201 and V202)	150-008
	CONNECTOR, plug: female, 3 contacts: Cannon Part No. XL-3-11	144-003
	CONNECTOR, plug: male, 3 contacts: Cannon Part No. XL-3-12	145-009
	CABLE, power: ac	084-005
	CABLE, interconnecting: power (rack and portable)	563-01
	CABLE, interconnecting: power (console)	563-02
	12 BAR-STROBOSTICKER	575-00

SCHEMATIC DIAGRAM
ELECTRONIC ASSEMBLY
REPRODUCE AMPLIFIER AND
BIAS AND ERASE OSCILLATOR
ED 498-00

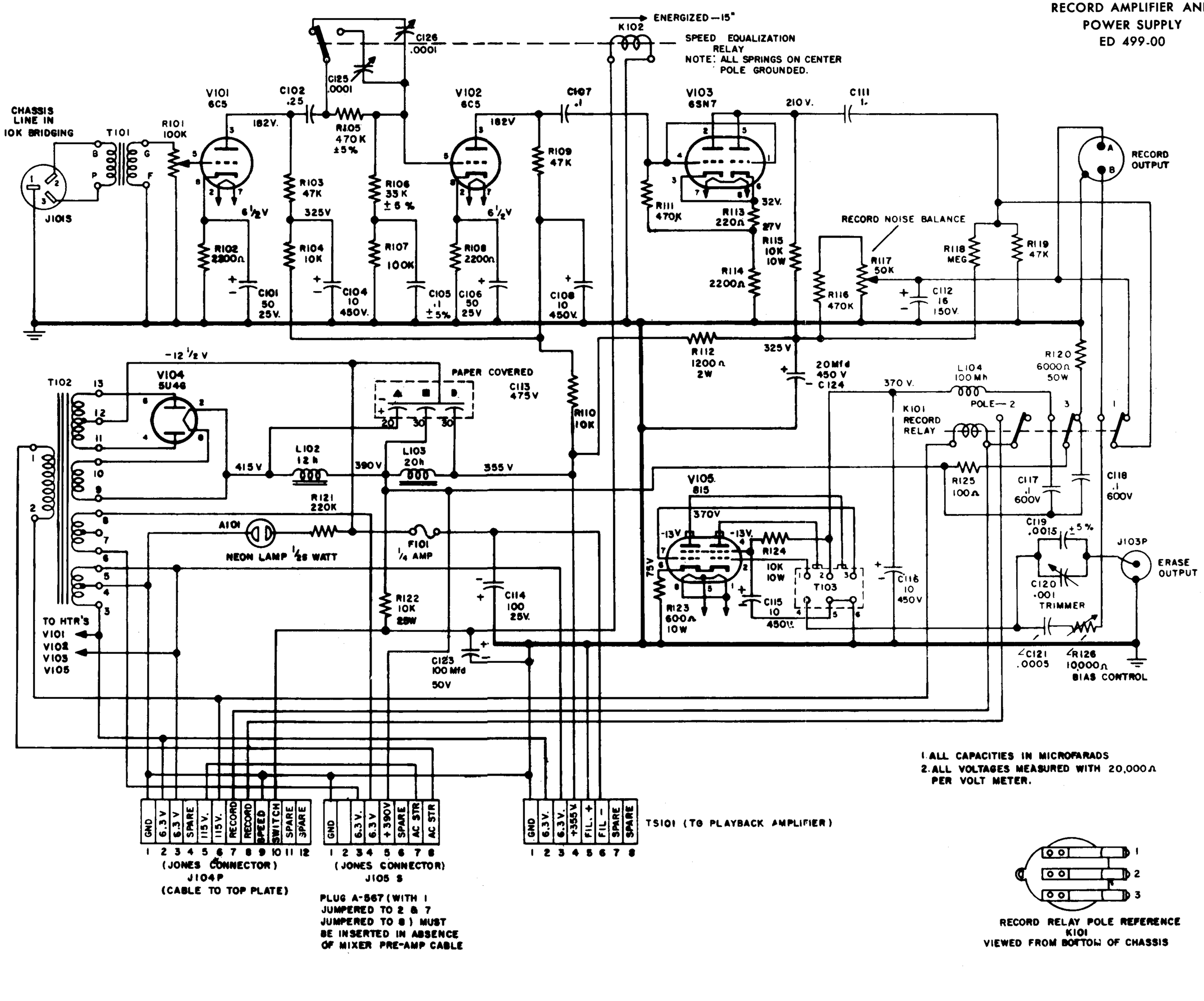


NOTES: 1. ALL CAPACITIES IN MICROFARADS

2 AMPLIFIER WIRED FOR REMOTE PLAYBACK LEVEL CONTROL IN METER PANEL

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

SCHEMATIC DIAGRAM ELECTRONIC ASSEMBLY RECORD AMPLIFIER AND POWER SUPPLY ED 499-00



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

RECORD RELAY POLE REFERENCE K101
VIEWED FROM BOTTOM OF CHASSIS