

MONAURAL IN DESK MOUNT



STEREO IN RACK MOUNT

CRITERION 80

PRELIMINARY INSTRUCTION BOOK

CRITERION 80

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INTRODUCTION

CRITERION 80 is a fully NAB compatible tape cartridge system. The many features and options provide a model for every application.

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## SECTION 1 - INSTALLATION

### 1.1 UNPACKING AND INSPECTION

Remove all packing material and carefully lift the units from the boxes. Check the equipment against the packing slips. Install the relays according to the enclosed set-up sheet. Visually inspect the units for any apparent damage and for missing or loose components. Check for proper operation of the front panel controls. Any claims for damage should be filed promptly with the transportation agency. If such claims are to be filed, all packing material must be retained.

### 1.2 INSTALLATION PROCEDURE

#### 1.2.1 GENERAL

The location in an individual station will be determined by the arrangement of the main control room facilities. The placement of equipment and wiring should be planned carefully before any installation work is started. Care should be taken to provide for adequate ventilation.

#### 1.2.2 PLAYBACK, MONOPHONIC

Connect a two-conductor shielded cable between the desired audio console input terminals and the 600 ohm program output terminals 3 and 5 of Playback connector J2. The shield of the cable should be connected to terminal 1. See Figure 1.2.

### 1.2.3 PLAYBACK, STEREOPHONIC

Connections for the Stereo Left channel are the same as for monophonic audio channel. The Stereo Right channel is connected to terminals 4 and 6 with pin 2 for connection to the shield. Phasing should be carefully observed. Terminals 1-3-5 are identical to terminals 2-4-6 respectively. See Figure 1.2.

### 1.2.4 PLAYBACK-RECORD MONOPHONIC OR STEREO

Install the Playback-Amplifier interconnecting cable between connectors J3 of the Playback and J3 of the Recording Amplifier. Connect the audio input (monophonic or stereo Left channel) to terminals 3 and 5 of J1 with the shield connected to terminal 1. For stereophonic installations, connect the Right channel audio to terminals 4 and 6 of J1 and the shield to terminal 2. See Figure 1.1.

### 1.2.5 REMOTE CONTROL CONNECTIONS

All control functions of both the Playback and Record amplifier units may be remote controlled. See charts 1.2 and 1.1 for proper connections.

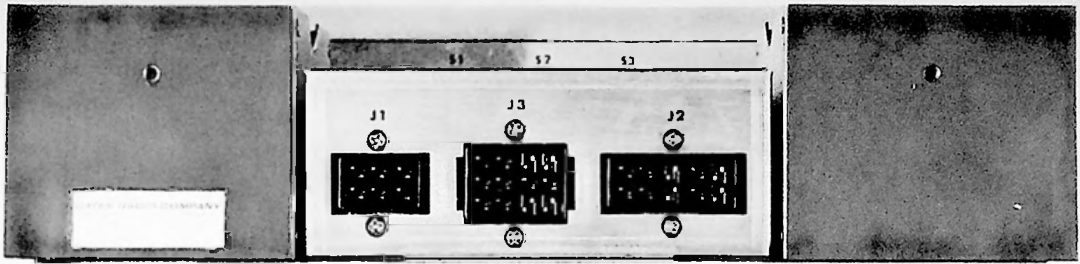


FIG. 1-1

EXTERNAL CONNECTIONS - RECORD AMPLIFIER

CONNECTOR J1

<u>TERMINAL</u>	<u>FUNCTION</u>
1	Shield Ground
3 - 5	Monophonic (or Left stereo) audio input
2	Shield Ground
4 - 6	Right stereo audio input (if used)

CONNECTOR J3

For Playback interconnecting cable.

CONNECTOR J2

1 - 2	Remote Record Set
3	Remote Set indication
5 - 8	Remote Secondary Tone keying
7 - 8	Remote Tertiary (auxiliary) Tone keying
4-6-9-10	No connection

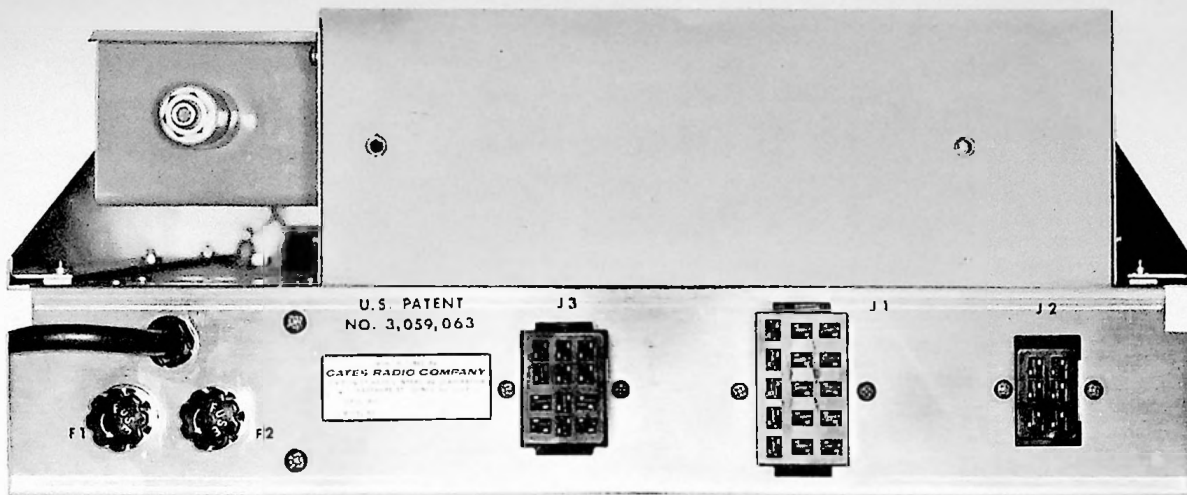


FIG. 1-2

EXTERNAL CONNECTIONS - PLAYBACK

CONNECTOR J1

<u>TERMINAL</u>	<u>FUNCTION</u>
1 - 2	Remote RUN indication
1	Ground
2 - 3	Remote Start
4 - 5	Remote Stop (see Note 1)
6 - 7	Auxiliary Start (closed momentarily as unit starts)
10 - 11	Auxiliary Switching (closed momentarily by Secondary tone)
12 - 13	Auxiliary Switching (closed momentarily by Tertiary tone)
14 - 3	Remote READY indication
15 - 1	Remote Tertiary cue indication
9 - 1	Remote Secondary cue indication

CONNECTOR J2

1	Shield Ground
3 - 5	Monophonic (or Left stereo) audio output
2	Shield Ground
4 - 6	Right stereo audio output (if used)

CONNECTOR J3

Record-Amplifier connecting cable.

NOTE 1. These terminals are strapped together (on the back of the connector) at the factory. Remove this strap if the REMOTE stop facility is used.



## SECTION 2 - OPERATION

### 2.1 RECORDING

#### 2.1.1 RECORDING AMPLIFIER CONTROL FUNCTIONS

GAIN CONTROL: The Recording Amplifier gain control AT-1 is used for adjusting the recording level as indicated by the VU meter M1. Corresponding AT2 and M2 are for the Right channel on stereo models.

RECORD SET: The Record Set pushbutton switch (SET) is used for placing the system in the recording mode.

SECONDARY CUE: The Secondary Cue pushbutton switch (SEC) is used for keying the 150 cycle tone generator.

TERTIARY (AUXILIARY) CUE: The Tertiary, or auxiliary, Cue pushbutton switch (TER) is used for keying the 8000 cycle tone generator.

#### 2.1.2 RECORDING PROCEDURE

The procedure for recording one or more productions is as follows:

- a) Insert a ERASED tape cartridge into the right side of the cartridge slot in the Playback unit. Note that the STOP indicator is illuminated, indicating the cartridge is properly placed.
- b) Momentarily press the RECORD SET switch. The switch will be illuminated by the internal pilot lamp.

c) Adjust the INPUT CONTROL so the program level reads 0 (zero) on the VU meter on the most intense program peaks.

d) Press the START switch on the Playback unit and start recording immediately.

e) Upon completion of the recorded production, momentarily press the STOP switch only if more than one production is desired on the same cartridge. If only one production is to be used on the cartridge, allow the tape to continue running until it is stopped by the automatic cue tone.

f) When recording more than one production on a single tape cartridge, follow the procedure listed in Steps c thru e for each recording. Upon completion of the final recorded production, allow the tape to continue running until it is stopped by the automatic cue tone.

The 1000 Hz Primary cue tone is recorded automatically at the beginning of the recording. If the Tertiary tone is to be used, it may be applied at any time during the recording. If the Secondary (end of message) tone is used, it should be applied immediately after the end of the program material. If desired, the Secondary and Tertiary tones may be inserted after the message has been completely

recorded. This permits monitoring and accurate placement of the tones.

## 2.2 PLAYBACK

### 2.2.1 CONTROL FUNCTIONS

START-RUN: The START switch causes the control circuits and the solenoid to be energized; and the tape to be set in motion. This switch is illuminated by an internal lamp when the tape is running in either the Playback or Record mode.

STOP-READY: The STOP switch is used to manually stop tape motion. This switch is illuminated by an internal lamp when a cartridge is properly inserted and the Playback is in the READY mode.

ON-OFF: The ON-OFF switch applies power to the entire unit. A red pilot lamp is illuminated when the unit is on.

PROGRAM GAIN: The Program Gain controls are mounted on the main chassis, and are used for adjustment of program output level. The Right Gain Control is not used in monophonic units.

CUE SENSITIVITY: The Cue Sensitivity controls are mounted on the respective circuit cards.

### 2.2.2 PLAYBACK PROCEDURE

The procedure for routine on-the-air playback of program material is as follows:

- a) Insert a recorded tape cartridge into the right side of the cartridge slot.
- b) Observe that the STOP-READY switch is illuminated, indicating the cartridge has been properly inserted, and that the unit is ready for on-the-air playback.
- c) Momentarily press the START switch. Tape motion will be started and will continue until the automatic cue tone is picked up by the cue head and the unit will stop in the correct position for the next playback.

## SECTION 3 - THEORY OF OPERATION

### 3.1 GENERAL

#### 3.1.1 PLAYBACK UNIT

The basic CRITERION 80 Playback unit is a solid state single-tone cue machine available in slide-out rack panel mounting or trimline desk console in either monophonic or stereophonic versions. Second and third tone operation is optional. All versions of the CRITERION 80 equipment meet NAB specifications and offer 24 volt DC external switching for safety in remote starting applications, and adaptability to automated systems. Electronics are of plug-in design; including relays, circuit cards, front panel switch assemblies and external connections. The high quality, laminated heads are built with an all metal face providing for long wear and low oxide accumulation. Improved solenoid action and shock mounted relays contribute to the quiet operation of the unit, and the proven full-swing pressure wheel linkage makes actual studio operation easy and fool-proof.

The heart of the CRITERION 80 Playback unit is a heavy-duty tape transport with its hysteresis synchronous positive speed direct capstan drive

motor. The CRITERION 80 tape transport offers speed accuracy comparable to the finest reel-to-reel machines. Sealed precision instrument type ball bearings are used making transport flutter less than .2% rms.

Plug-in printed circuit boards offer the finest in advanced solid state design. Top quality epoxy glass board construction is used throughout for easy component access should maintenance be required. A regulated power supply is used to power all circuits assuring correct operating parameters and reliable operation at all times.

POWER CONTROL BOARD: This card contains the solenoid power supply and relay as well as a one-shot relay driver for an external "auxiliary start" output. The capstan motor may be connected to run continuously or to be switched by the deck microswitch. Suppressor network R3 and C2 may be connected across the deck microswitch or may be connected across the line.

POWER SUPPLY CARD: Diodes CR1 and CR2, together with C1, form the positive power supply which is applied to Q1 and Q2 in a compound connected series regulator. Diode CR3, with R1 and C4, form the

current limited and filtered negative supply of approximately 8 volts used for reverse bias switching in the Record unit. Resistors R4 and R5 provide forward base bias to Q1, which is regulated at 24 volts by zener diode CR4. Capacitor C2 operates as a pre-filter for Q1 and as a delaying network to prevent high surge currents through Q1 and Q2. Resistor R2 limits the emitter current of Q1 and the base drive of Q2 for high current or short circuit protection. F1 is a quick acting instrument type fuse to assure protection for the power supply in case of shorts. At this point the voltage is +23 volts and is further filtered by R3 and C3 to supply the program amplifier cards.

PROGRAM AMPLIFIER: Transistors Q1 and Q2 are connected as a boot-strap amplifier for high DC stability. C3, R2, and R9 provide equalization, fixed for low frequencies of the NAB curve and adjustable at high frequencies to compensate for head losses and allow the choice of operating curves to match 3-3/4, 7-1/2, or 15 IPS requirements. R1 and R4 provide local AC feedback for these stages to increase AC stability. Q3 is a medium impedance amplifier matching the gain control as an input load. R14 and R12 provide

feedback for AC stability. Q4 is a Class A impedance matching output amplifier working into line transformer T1. R19 is a voltage dropping resistor for the lamp element of the LDR audio switch to allow operation from the +23 volts supply. The LDR provides a slight delay in the output of the program amplifier to suppress start-up noises.

1 kHz PRIMARY CUE: Q1 and Q2 comprise a broadband amplifier to provide high input impedance and high current gain suitable for driving all the cue sensors, which are compounded as a load. AC feedback for Q2 is provided by R5. Signal is coupled to the cue gain control R7, where cue sensitivity for the 1 kHz sensor is set. C7 allows low frequency degeneration for Q3, C8 provides high frequency limiting action. Q4 is a similarly tuned stage; the result is a passive two-stage amplifier at 1 kHz, with roll-off on either side at approximately 12 dB per octave. Q5 and Q6 operate as a signal rectifier and DC amplifier, with C13 providing a delaying action. Q6 is connected to the base of Q9 through a resistance bridging network. Q9 is a relay driver and is normally in saturation through bias resistors R21 and R29 to the positive supply. When a cue signal



is detected, Q6 will remove the drive from Q9 and cause relay K1 to drop out; provided that Q7 is not conducting. The time delay/protect circuit receives run voltage from relay K1 through R33.

C14 charges through R32 to the avalanche voltage of uni-junction Q10. Q10 conducts, providing a gate signal for Q11; which fires, latches, and drops its anode voltage across R33 nearly to zero. During this timing interval Q8 is ON holding Q7 ON, which holds Q9 ON. In this way Q9 can not be turned OFF by a cue signal until after the time delay cycle. A positive input to the base of Q8, through R26 from the 150 Hz sensor card, provides safety muting during reception of 150 Hz tones. R26 may be removed if this feature is not desired.

150 HZ SECONDARY CUE: The amplified cue signal is received from the 1 kHz card. R1, C1 and sensitivity control R2 form a low-pass network into the base of Q1. C14 provides low frequency degeneration and C3 provides high frequency attenuation for Q1. Q2 is in a similar circuit, resulting in a passive amplifier with slopes either side of center frequency of approximately 12 dB per octave. Q3 and Q4 operate as a signal rectifier and DC amplifier for the relay, with C9 providing a delaying action.

An output is taken from the collector of Q4 back to Q8 on the 1 kHz card for safety muting during the 150 Hz operation. The relay is normally returned to the anode of Q11 on the 1 kHz card to allow 150 cycle sensor operation only after the protect timer interval has passed.

8 KHZ TERTIARY CUE: The amplified cue signal is received from the 1 kHz cue card. C1, C10 and sensitivity control R2 form a high pass network feeding Q1 in this circuit. The safety and inhibit functions utilized in the 150 Hz card are not utilized in this circuit, which otherwise functions the same as the 150 Hz cue circuit.

### 3.1.2 RECORD AMPLIFIER

The basic CRITERION 80 Recording Amplifier is a solid state, single-tone cue device for use in association with any monophonic model CRITERION 80 Playback. The Recording Amplifier is also available in slide-out rack panel mounting or trim-line desk console in either monophonic or stereophonic versions. Second and third tone operation is optional. Operation on regulated DC power from the associated Playback unit assures correct operating parameters at all times. The printed circuit board mounting of all components in the CRITERION 80 Recording Amplifier provides for easy

and efficient maintenance. Pre-wired PC plugs permit easy field modification of any single-tone amplifier to three-tone operation.

RECORD AMP/METER AMP: Transistor Q1 is a common emitter amplifier with R2 providing local AC feedback. C2 slightly boosts high frequency gain to compensate for reactive losses in the input network. The output of Q1 feeds both the meter gain control (R13) and the pre-emphasis network consisting of C5, R6, C6 and R9. The input to the base of Q2 is fed from this network, and additionally shaped by C8, C9 and L1 to drive the recording head. L2 and C10 form a bias trap to limit bias on the collector of Q2. Transistors Q3 and Q4 make up a boot-strap amplifier, providing high input and low output impedance to drive the meter and its bridge rectifier.

BIAS OSCILLATOR: Transistors Q1 and Q2 operate as a Class AB push-pull oscillator, with transformer T1 and C4 as a tuned load. AC positive feedback is provided through C2 and C3. Negative feedback, for stability, is developed across R2 and R5. Output is taken from three taps on the transformer through resistors R8, R9 and R10, which provide resistive loads and current limiting while the switching transistors are AC grounded. Q3, Q4 and Q5 are saturated gates to allow selective

application of bias to any of the three outputs. Trimmer C5, C6 and C7 provide independent bias adjustments for each head section. Diodes CR1 and CR2 turn on the bias oscillator by voltage from the SET button or the two-tone oscillator card, when keyed. DC reverse drive, to open the clamping gates, is derived from these same voltage sources. Resistor R1 and capacitor C1 filter the DC power applied to the oscillator circuit, to prevent false triggering.

1 KHZ PRIMARY CUE OSCILLATOR: This card includes the 1 kHz oscillator and a timer circuit, which automatically applies a 1 kHz signal at the start of each recording operation. Transistor Q1 and associated components form a tunable shunt-fed Hartley oscillator. Potentiometer R5 is the primary cue level control, and serves as the oscillator load. The 1 kHz tone is coupled into amplifier Q2; the 150 Hz tone and the 8 kHz tone are also fed into the card through terminal 2 into Q2. Thus, Q2 acts as a common amplifier for all three tones, which are then coupled through the bias trap to the cue record head. The timer section of the card gets its power through terminal 12, which starts charging C10

through R14. When the charge on C10 reaches the avalanche point of Q3, the uni-junction will fire; applying a positive pulse to the base of Q4, which latches and remains on until power is interrupted again. During this timing period, transistor Q5 and Q6 are in the ON state, providing DC to power the 1 kHz tone oscillator. After the timing period, the power is dropped by Q4 through R19 to remove power from the oscillator.

2-TONE OSCILLATOR CARD: Both the 150 Hz and the 8 kHz oscillators are contained in this card. The circuits are similar to the 1 kHz card; being shunt fed Hartley oscillators, pushbutton controlled by application of DC power. The 150 Hz oscillator is turned ON by application of +23 volts through terminal 3, to the collector of Q1. The same voltage will pass through CR1 and out terminal 5 to trigger the bias oscillator, which will be gated to the cue head, along with the 150 Hz. The oscillator frequency is tuned by L1 and the level is controlled by potentiometer R7. The 8 kHz oscillator is identical in circuit configuration and operation, with the exception of a change in component values to change the frequency. Power is fed back through CR2 to turn on the bias whenever the 8 kHz cue tone is used.

SIGNAL INPUT CARD: This card contains the line transformer and impedance matching resistors. Options are provided for 600 ohm matching (with or without 30 dB attenuation) and 20k ohm bridging inputs, by arranging the resistors on the card.

CONTROL CIRCUITS: The Record unit is interlocked so that it can not be put into the Record mode while the Playback unit is running. This prevents accidental recording during Playback operations. Input plug J3, terminal 2 is supplied with +23 volts in the Ready condition, which drops to zero during the Run condition. Action of the SET switch will apply power and energize relay K1. One set of contacts will supply power to pin C on the Record/Lock control card which will hold K1 in the Record mode after the Playback has started.

Pin D on the Record/Lock control card is supplied power from terminal 3 of J3, which remains positive until the Playback unit is stopped. This removes power from the emitter of Q1 and causes K1 to drop out. The unit can not be set after the Playback is started, because the voltage on terminal 2 drops to zero when the Playback is in the Run condition. J3, terminal 4 carries positive voltage when the Playback is in the Run condition, which is applied to the 2-tone pushbuttons so that secondary and

and tertiary cue tones may be recorded at any time during Playback operations.

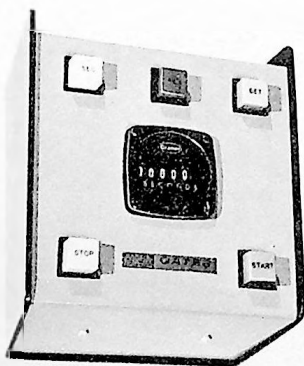
### 3.1.3 REMOTE CONTROLS

Three remote controls are offered to aid in the convenience and flexibility of CRITERION 80 operation. The RC-T provides all the controls and indicators of a Playback/Record installation as well as a timer to measure elapsed time in seconds.

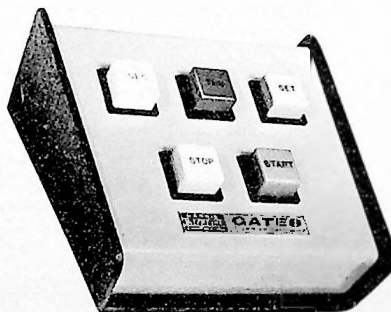
This is an invaluable aid in production of cartridges. A connector is provided for the logging encoder, to put digital logging information on the cartridges.

The RC-RA provides all the features of the RC-T except the timer.

The RC-P-4 provides a START control with RUN and READY indicators for four Playback units.



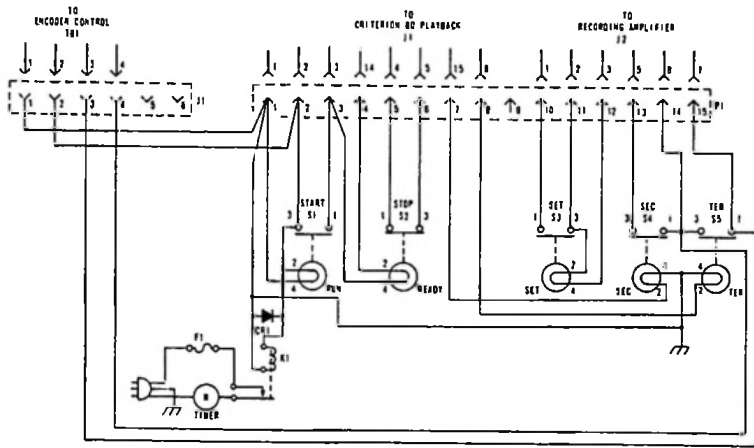
RC-T



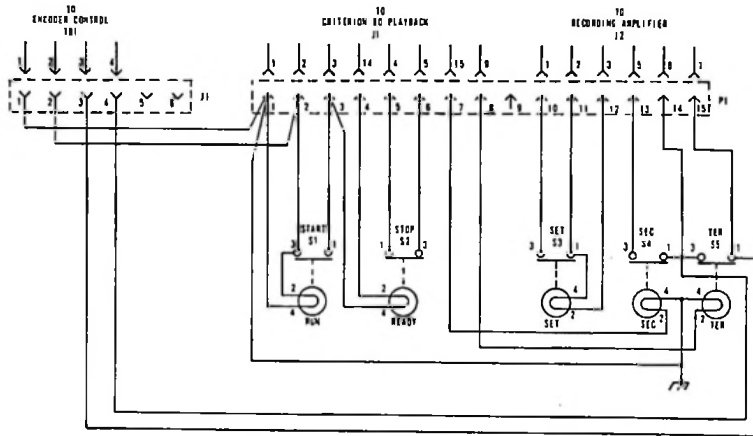
RC-RA



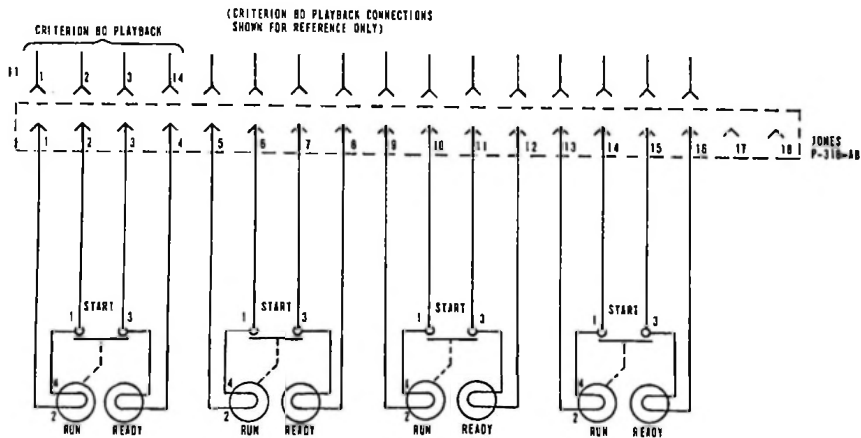
RC-P-4



SCHMATIC RC - T REMOTE CONTROL TIMER



SCHMATIC RC - RA REMOTE CONTROL



SCHMATIC RC - P - 4 REMOTE CONTROL



## SECTION 4 - TECHNICAL DATA

### 4.1 SPECIFICATIONS

#### 4.1.1 PLAYBACK UNIT

POWER SOURCE: 117 volts, 60 Hz, 50 Hz on special order.

POWER REQUIREMENTS: 65 watts maximum.

FREQUENCY RESPONSE: The overall Record/Playback response of the CRITERION 80 system is  $\pm 2$  dB from 50 to 15,000 Hz.

NOISE: 55 dB (Mono), 52 dB (Stereo) below 3% THD at 400 Hz.

DISTORTION: Record to Playback, 3% maximum level at 6 dB above NAB Standard Reference level at 400 Hz.

EQUALIZATION: In accordance with NAB Cartridge Recording and Reproducing Standards. The recording amplifiers are equalized to maintain the required Playback characteristics.

AMBIENT TEMPERATURE: 55<sup>0</sup> C, maximum.

OUTPUT PLAYBACK: +12 dBm clipping point, normally 0 dBm with standard NAB level recording. 600 ohms balanced with 150 ohms as optional connection.

CUE SIGNALS: 1000 Hz Primary Cue, 150 Hz  
Secondary and 8000 Hz Tertiary  
Cue Sensors are available as  
optional equipment.

REMOTE CONTROL: All control functions.

TAPE SPEED: 7-1/2 inches per second, 3-3/4 and  
15 on special order.

TAPE DRIVE SYSTEM: Direct capstan drive, sealed  
ball bearings. Tape START and  
STOP time: 0.1 second.

WOW AND FLUTTER: .2% or less.

TIMING ACCURACY: .1% or better.

DIMENSIONS: Rack mount, 7" high, 19" panel width,  
13-1/2" deep.

Desk-Top Cabinet, 6-3/4" high, 13-1/2"  
wide, 14-1/2" deep.

WEIGHT: 24 pounds, 35 pounds in rack mounting  
enclosure.

HEADS: In accordance with NAB Standards. Permits  
monitoring while recording.

#### 4.1.2 RECORD AMPLIFIER

POWER SOURCE: From regulated supply of Playback  
unit.

AUDIO INPUT: -20 dBm min, +18 dBm max, 600 ohms  
balanced with 150 ohms as alternate  
connection.

BIAS OSCILLATOR: Push-pull bias oscillator with  
isolated outputs, solid state  
switching to eliminate transients.

TONE GENERATORS: Individual tone oscillators with  
adjustable frequency and output  
level.

AMBIENT TEMPERATURE: 55<sup>o</sup> C, max.

REMOTE CONTROL: All control functions.

DIMENSIONS: Rack Mount, 5-1/4" high, 19" panel,  
7-3/4" deep.

Desk-Top Cabinet, 4-7/8" high,  
13-3/8" wide, 7-3/8" deep.

WEIGHT: 15 pounds

## SECTION 5 - MAINTENANCE & ADJUSTMENT

### 5.1 ADJUSTMENTS

#### 5.1.1 RECORDING AMPLIFIER

BIAS LEVEL: When purchasing a new record amplifier or replacing record heads, it will be necessary to check the bias adjustment on the record amplifier. Since the inductance of the record heads may vary from head to head, bias voltage should be readjusted each time the record amplifier is used with a new replacement head (or a different Playback unit) in order to maintain proper recorded frequency response and output. The bias adjustment should be made using the type of tape which will normally be used. The following procedure should be used when bias adjustments are required:

SET-UP -- The output of the Playback unit should be connected to a console or any convenient VU meter. Connect an audio oscillator to the Record amplifier input. For location of adjustment controls see Record Amplifier Chassis Layout.

Steps to follow in adjustment -

- 1) Set the oscillator frequency at 1000 Hz.
- 2) Insert an erased 3-1/2 or 5-1/2 minute cartridge in the Playback unit.

3) On the Recording Amplifier - press the Record SET switch and adjust the Record level to -5 VU.

4) While recording, monitor the Playback output and adjust trimmer C-6; the middle trimmer on the bias card, with a non-magnetic screwdriver for maximum Playback level. For stereo recorders, repeat the adjustments on the right channel using C7, the bottom trimmer.

NOTE: Erase cartridge if unit cues.

5) On the Playback Unit Head Assembly: Unplug the green (Cue Play) head lead and insert the red (Program Play) head lead in its place. This permits monitoring of the cue track from the left Playback output while Cue Bias adjustments are made.

6) Extend the 1 kHz Cue Osc. card using a 915-0675-001 extender card. (Connector on extender card must face same direction as components on circuit card.) Jumper B and D on extender card (9 and 11 on circuit card) to cause the 1 kHz to operate continuously.

7) While recording adjust C5, top trimmer on the bias card, for maximum output on the program channel.

8) Return the head leads to their proper plugs. (see Head Bracket assembly Figure 5-1).

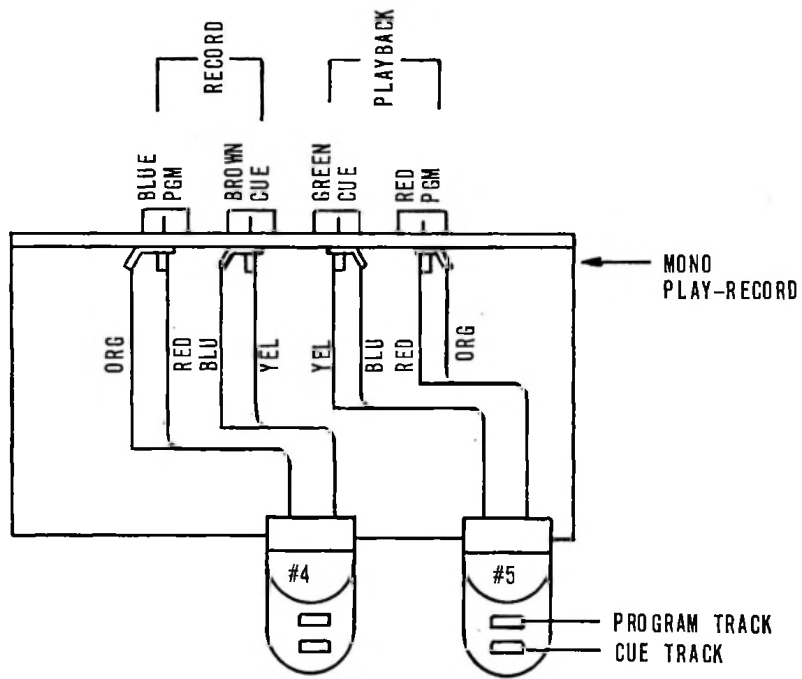
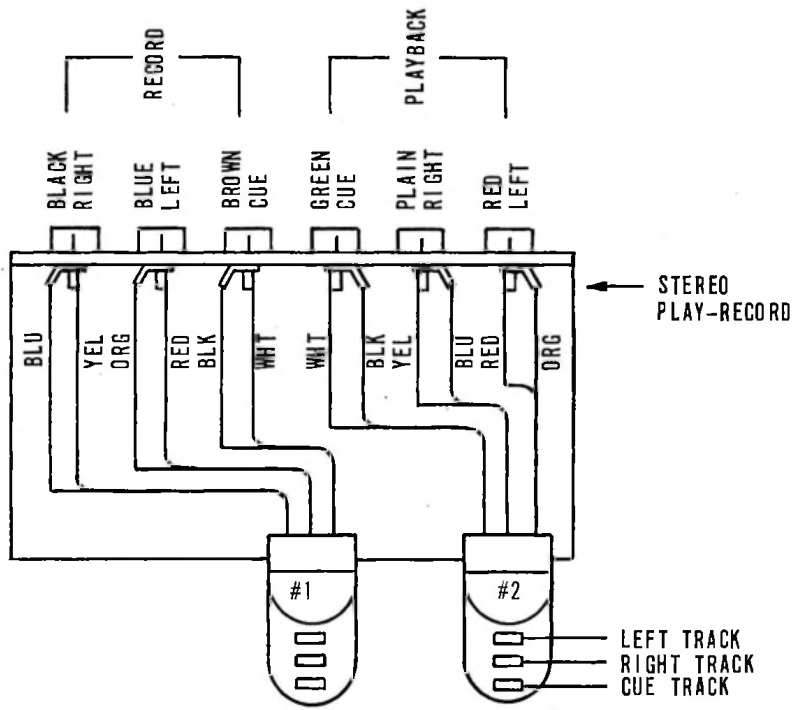


FIG. 5-1

CUE RECORD LEVELS: The Cue Record Levels are adjustable by potentiometers mounted on the oscillator cards. So long as replacement heads are of the same type as the original, no change in Cue Recording Levels should be necessary. Proper adjustment of the level controls (after Cue Bias adjustment has been performed in accordance with 4.1.1) should provide recovery levels from the Playback output as follows:

NAB Reference 400 Hz	.....	0 dBm (Ref)
Primary (1 kHz)	.....	+0.4 dBm
Secondary (150 Hz)	.....	+6.1 dBm
Tertiary (8 kHz)	.....	-9.4 dBm

CUE FREQUENCY: The Cue Frequencies are adjustable by means of the slug tuned coils on the cue oscillator cards. Adjustments of these coils are performed at the factory and should be attempted in the field only when proper equipment is available for accurately checking the oscillator frequencies.

#### 5.1.2 PLAYBACK

See Playback Chassis Layout for location of adjustment controls, Fig. 5-2.

CUE SENSITIVITY: The Cue Sensitivity is adjustable on each cue sensor card in the Playback unit.

These controls are preset to barely trigger at 10 dB

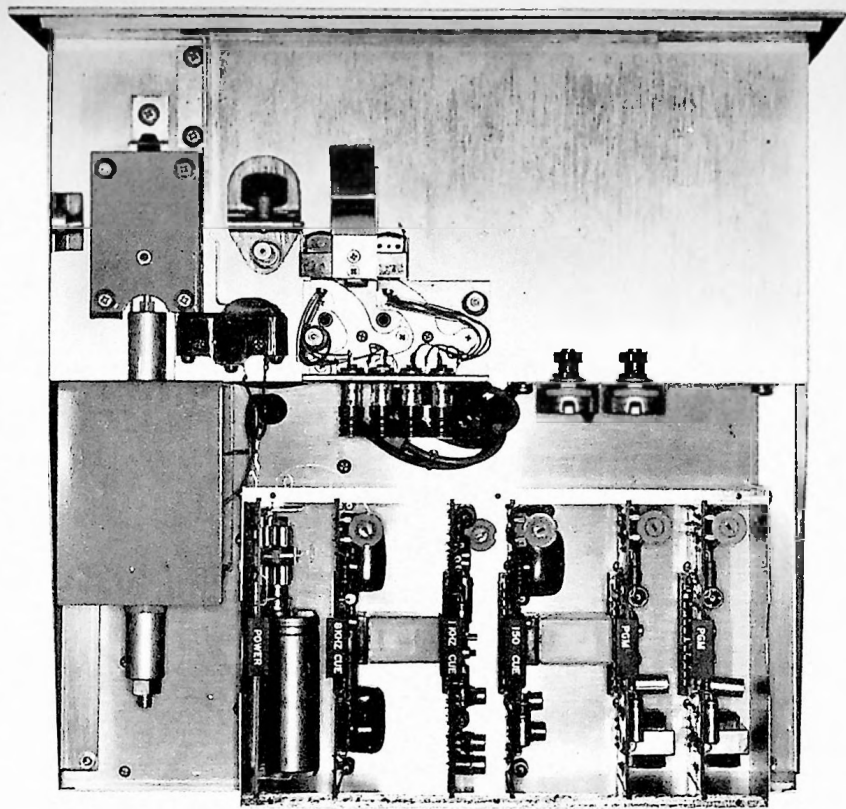


FIG. 5-2

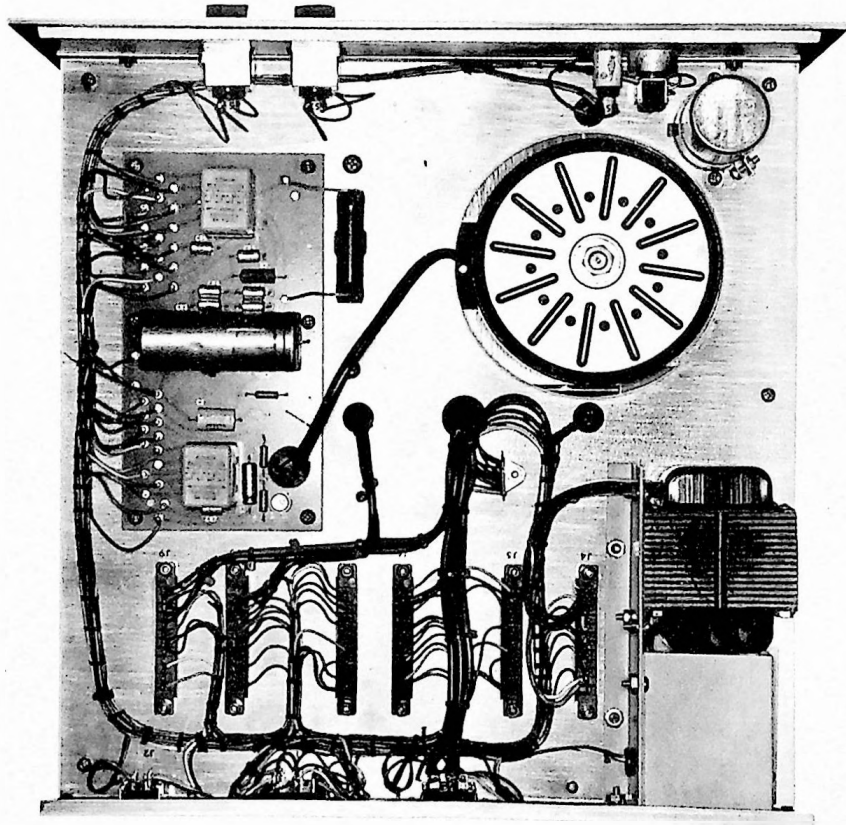


FIG. 5-3



below the NAB standard levels at the factory and should require no further adjustment.

PROGRAM GAIN: The Program Gain controls are mounted on the main chassis of the Playback. The Right Gain Control is not used in monophonic units. The Program Gain is preset at the factory to produce 0 dBm output from a tape recorded at NAB standard reference level.

HEAD ALIGNMENT: Head Alignment should be checked in routine preventative maintenance, this topic is covered in Section 5 of this manual.

## 5.2 MAINTENANCE

### 5.2.1 RECORDING AMPLIFIER

Under normal operating conditions the Recording Amplifier requires no routine maintenance.

### 5.2.2 PLAYBACK UNIT

The CRITERION 80 Playback unit is factory adjusted to provide peak performance and under normal operating conditions should require no routine electrical maintenance.

HEADS: As with any quality tape equipment frequent checks of head alignment, condition and cleanliness are imperative for maximum performance and trouble-free operation. Proper head care is especially important on the production equipment.

Dirty, misaligned or worn heads are frequently at fault when problems are encountered in the areas of low program output, poor frequency response and false or missing cues. Cueing problems are easily detectable, therefore, and serve as good indicators for the need of head maintenance.

CAUTION - In the majority of cases cueing problems are only compounded by readjustment of either Cue Record Level or Cue Sensitivity to settings other than those outlined in 5.1.1 and 5.1.2.

A. To facilitate easy head alignment checks, standard tapes should be recorded immediately upon receipt of the equipment. Tapes should be recorded as follows:

- 1) Record one cartridge with 15 kHz at a Record Level of -15 VU. Play the cartridge back, note and keep a log of the output level.
- 2) Record one cartridge while operating the 1 kHz Cue Osc., with pins 9 and 11 shorted on an extender card, in the Record Amplifier (no program input on this tape). This action records a continuous 1 kHz tone on the Cue track.

Remove Cue Play head cable to prevent the Cue Sensor from stopping machine.

3) Reverse the Cue Play and Program Play head cables. Play back the tape, and note and log the output level.

4) While manually depressing the Secondary Cue (150 Hz) button on the Record Amplifier repeat Step 3) for one cartridge.

5) While manually depressing the Tertiary Cue (8 kHz) button on the Record Amplifier repeat Step 3) for one cartridge.

6) Using a clean 3-1/2 minute cartridge, record a single 1000 Hz cue tone (do not record program material on this tape). The tone is recorded automatically at the beginning of the recording process. Allow the machine to run until the tape cues. Rerun the tape, and log the exact time required for playback. This tape should be kept on hand as a timing standard.

B. Of the various causes of cueing difficulties, that of head misalignment is most frequently encountered. The following discussion describes mounting and alignment of heads on the CRITERION 80 equipment.

#### Installation of Heads:

- a) Install the thin lock nut on the head mounting stud.
- b) Carefully thread the head leads through the head mounting hole. Use tubing over leads as protection against cutting wire insulation while threading in the head. Screw the head into the mounting hole until the apex of the head face is  $27/32$ " plus or minus  $1/32$ " from the front edge of the support member.

#### NOTES:

- 1) Do not twist or apply tension to the head leads.
- 2) When tightening the head, apply pressure only to the boss located on the back of the head cup - not directly to the head.
- 3) Solder the head leads only after completion of the installation. Ref. Fig. 5-1.
- 4) Replace tape guide and cartridge hold-down spring. The bottom of all three fingers of the tape guide should rest on the deck surface.

#### Height Adjustment:

Fig. 5-4 illustrates the location of adjustment points, mounting screws and output connectors. The following steps outline proper adjustment procedures:

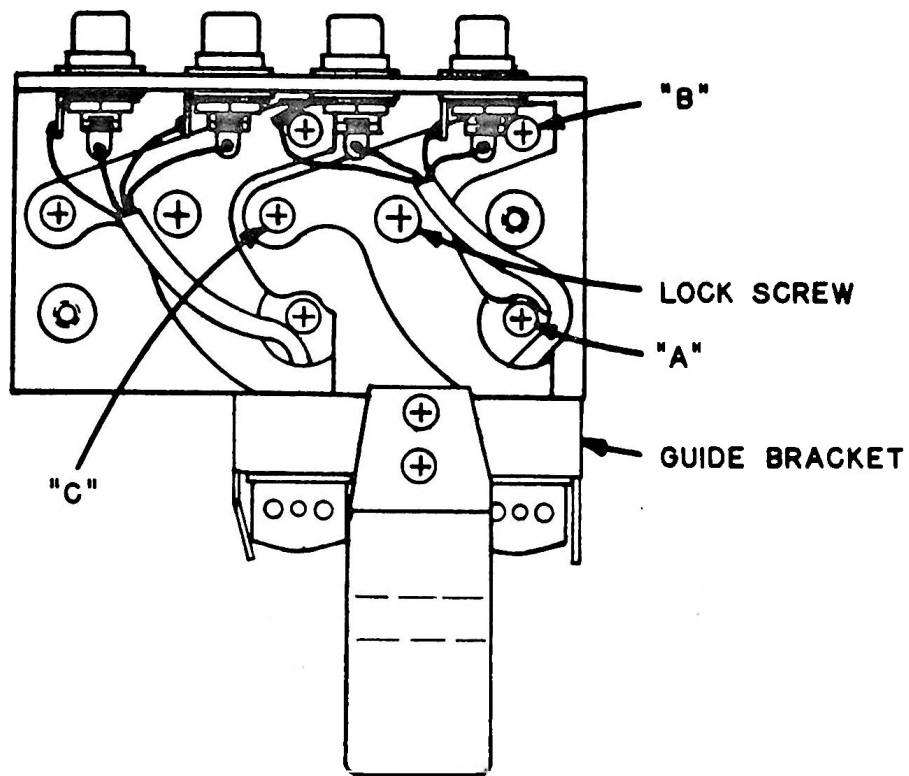


FIG. 5-4

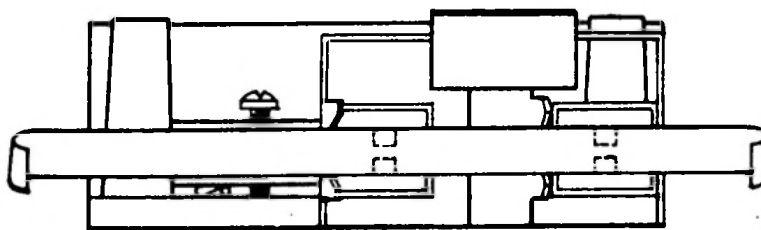


FIG. 5-5

- a) Turn the lock screw counterclockwise until the screw is well above the lock (maximum down) position.
- b) Adjust screw A for 9/16" height of the top of the upper track above the deck surface. Gates gauge (Fig.5-9) can be used to make this setting. It can also be used to check the guide post height of cartridges.
- c) Adjust screw B for exact perpendicularity between the deck surface and pole faces. This may be done using a metal gauge (Fig. 5-6 or good quality machinist rule 3/4 or 1 inch wide) which is known to be square. Resting one edge of the gauge on the deck surface, move the gauge against the face of the head. At the point of perpendicularity, no space should be visible between the head and gauge as the gauge is resting flat on the deck.
- d) To facilitate fine adjustment of height, a strip of clear mylar may be prepared by removing the lubricant and oxide from a short length of 1/4" tape. Flux remover or shellac thinner\* will suffice to loosen the oxide so it may be wiped off the transparent mylar base.
- e) Refer to Fig.5-5 and position the mylar across the head faces and properly engaged in the tape
- \*use in well ventilated area to prevent fire hazard.

CAPSTAN ADJUSTMENT GAGE  
815 1447

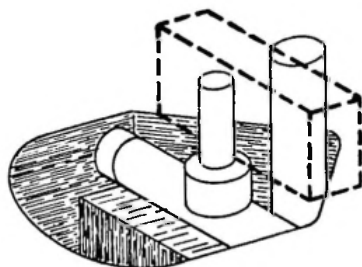
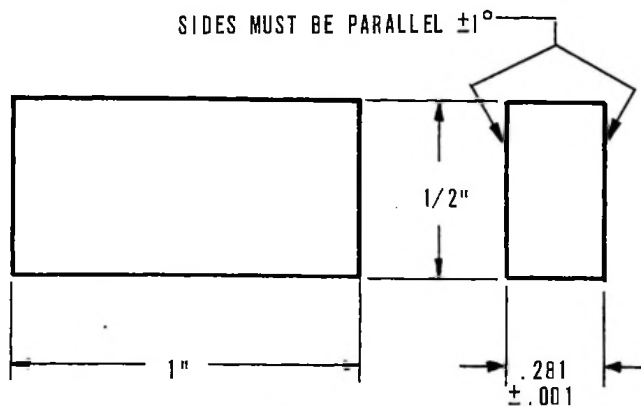
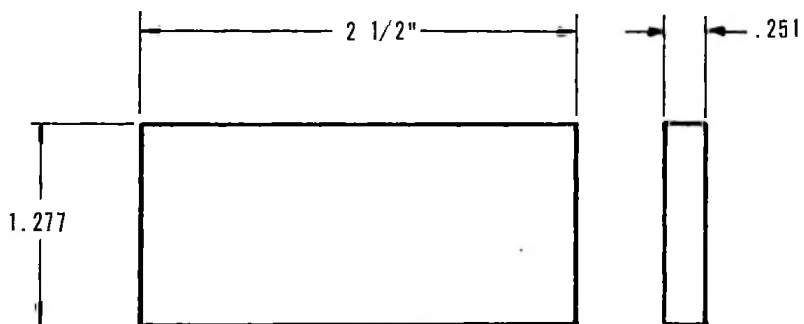


FIG. 5-6

HEAD ADJUSTMENT GAGE  
815 0841



NOTE: ALL CORNERS  $90 \pm 0.1^\circ$

FIG. 5-7

PINCH ROLLER - GO/NO GO  
ADJUSTMENT GAGE  
815 0844

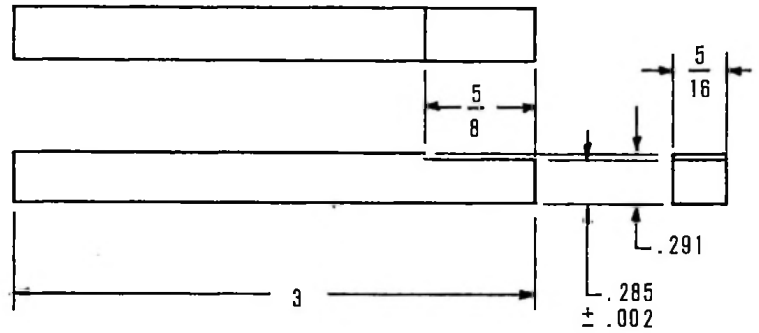
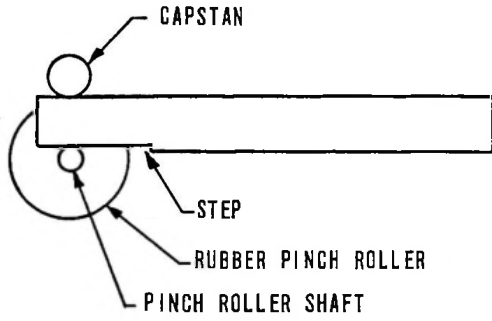


FIG. 5-8

HEAD/GUIDE HEIGHT GAGE  
815 0842

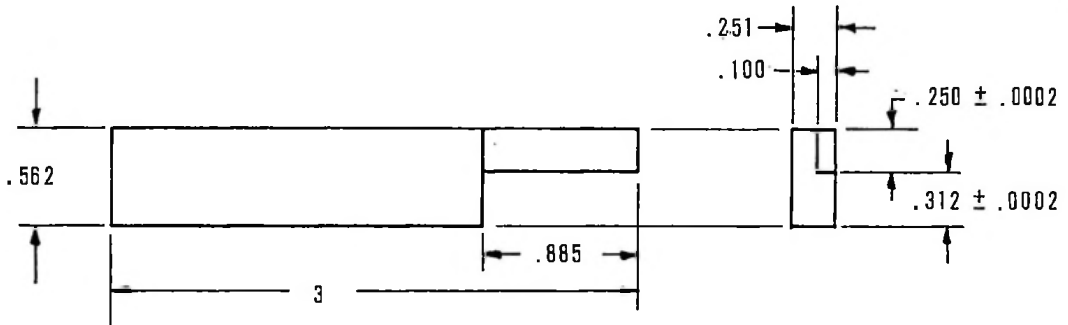


FIG. 5-9

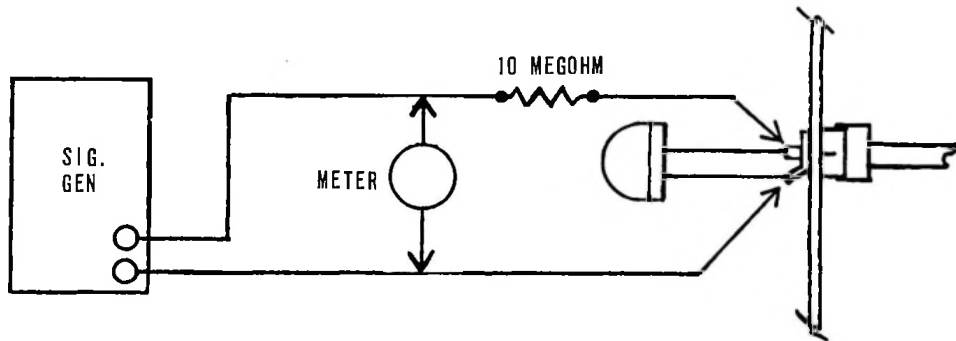
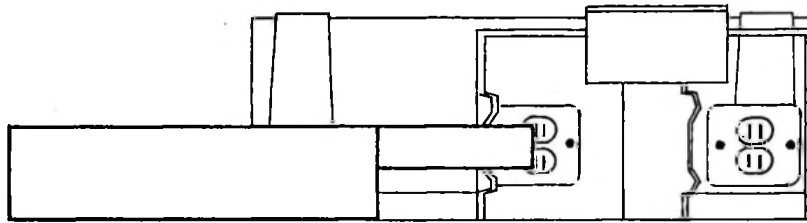


FIG. 5-10



guides. This is the position of the tape when a cartridge is being played on the machine. To free one hand for adjustments, fasten the mylar to the opposite side of the guide bracket from the head which is being adjusted. Proper tape position in the tape guide is at the point where minimum distortion of the tape is observed. This distortion is due to the tape contacting the guide and is visible as a slight crinkle at either the top or bottom of the tape. With one hand, hold the mylar in a position contacting the heads as shown.

f) While holding the mylar in this position, alternately adjust screws A and B to position the tracks with respect to the tape. Screw A should be adjusted a small amount then B should be adjusted an equal amount in the same direction. This procedure is repeated until the correct height is obtained. Proper height is that height at which the top of the upper pole piece is at the same level as the top of the tape and the bottom of the lower pole piece is at the same level as the bottom of the tape.

g) Recheck perpendicularity (Step c).

This completes the height and perpendicularity adjustments. The procedure should be repeated

for the record head (if used). After adjustments are complete, the heads should be degaussed.

Azimuth Adjustment:

- a) Remove the mylar and insert the tape which was recorded with the 15 kHz tone.
- b) While monitoring the output of the Playback unit, adjust screw C of the Playback head for maximum output level.
- c) Tighten the lock screw for this head.
- d) To facilitate monitoring Playback from the Record head, the Program play (red) head lead and the Program record (blue head lead should be reversed.
- e) Align the Record head in the same manner as described in paragraphs b and c above. Output from the Record head will be slightly less than from the Playback head.
- f) Return the head leads to their proper jacks and install the head cover.

NOTES:

As a check of azimuth on the production Playback, the following should be performed:

- 1) While recording a constant level of 15 kHz, monitor the output from the Playback head. Level should be about -15 dB.

2) Carefully adjust the azimuth screw of the Record head for maximum output.

Heads may be cleaned with a cotton swab and isopropyl alcohol. Care should be exercised to prevent misalignment of heads by excessive pressure.

PRESSURE ROLLER AND CAPSTAN SHAFT: Cotton swabs and isopropyl alcohol may also be used to remove deposits which accumulate on the pressure roller and capstan shaft. Care must be used to prevent liquid running down the capstan shaft into the motor bearings.

CUE SENSITIVITY LEVELS: When cue problems develop, a step-by-step analysis is helpful to rapidly ascertain the cause of difficulty. When such problems arise, the following procedure is recommended as a sample analysis:

As an example, consider a Playback unit which fails to respond to the 8 kHz cue tone:

1) Insert the 8 kHz standard cue tape recorded in 5.2 into the machine. Determine if the machine is cueing with the standard tape. If the unit does not cue, check head alignment with the standard 15 kHz tape.

2) Again insert the 8 kHz standard cue tape, and determine if the machine cues properly. Unless the heads are worn or the cue sensitivity level is low, the Playback should now cue properly.

3) If in Step 2, the unit did not cue properly, advance the cue sensitivity slightly and again determine if the Playback unit cues properly.

NOTE: The cue sensitivity should be advanced ONLY following the performance of Steps 1 and 2 of this discussion.

### 5.3 EMERGENCY ADJUSTMENT

In cases where the equipment has been misadjusted, repaired, or a minimum of test equipment is available, the following procedure will suffice using a Simpson Model 260 Multimeter, Audio Signal Generator and a 10 megohm resistor. All voltage readings are RMS values.

#### 5.3.1 PLAYBACK

1) Program Gain - Connect equipment as shown in Fig. 5-10 across left head cable (leave head connected). Set signal generator at 400 Hz and 7.4 V. as read on meter. Adjust Program Gain-L to read "0" dB or 0.78 V. on left PGM output. Be sure it is loaded with 600 ohms.

Meter may be moved from input to output.

Repeat for right channel on stereo models.

2) Primary Cue - Connect equipment as shown in Fig. 5-10 across cue head cable. Set signal generator to 1 kHz and 3.20 V. read on meter. Adjust R-7 (PRI CUE) on the 1 kHz Primary Cue board to barely trip and "cue-out" at this input level.

3) Secondary Cue - Change signal generator to 150 Hz and 2.60 V. Adjust R2 (SEC CUE) on the 150 Hz secondary cue board so that the relay barely trips.

4) Tertiary Cue - Change signal generator to 8 kHz and 0.22 V. Adjust R2 (TER CUE) on the 8 kHz tertiary cue board so that relay barely trips.

The Program Amplifier is now set for a standard gain and can be used to set up the level of the cue oscillators. The cue sensors are set so that the sensitivity threshold is approximately 10 dB below NAB standard cue levels, the tapes made in Section 5.2.2 can now be used to check cue functions.

### 5.3.2 RECORDER

1) Connect the red L. Play cable to the Cue Play head. Connect Simpson meter across audio output 600 ohm load.

2) SET and START Recorder, observe meter swing to about 0.75 V. for a short pulse of 0.5 to 1 second. This is the automatic 1 kHz cue tone which is being recorded on the cue track and being played back through the Left Program Amplifier. If it is necessary to adjust the level of the 1 kHz Cue Oscillator, jumper Pin 9 to Pin 11 on the base of the 1 kHz cue card to cause the tone to operate continuously. SET and START the Recorder and adjust the Recorder Cue Tone Level to 0.75 V. on the Simpson meter. Remove the jumper from 1 kHz cue card.

3) Depress SEC button and adjust SEC Cue Level for 1.5 V. on Simpson meter.

4) Depress TER button and adjust TER Cue Level for 0.37 V. on the Simpson meter.

The Cue Oscillators are now set to record cue tones at NAB Standard levels. Return head cables to normal and install an erased cartridge. SET and START Recorder. Depress SEC and TER buttons and listen for relay actions, allow the tape to run completely through to test the cue-out function.

#### 5.4

#### DECK ADJUSTMENTS

This article is intended as a guide for maintenance of those portions of the deck assembly which affect

tape drive. If wow and flutter or other tape drive problems are encountered, it should be determined that cartridges are not at fault before adjustments are made.

LINKAGE ASSEMBLY: The purpose of the linkage assembly is to convert the reciprocating movement of the solenoid to the revolving movement necessary for the cross shaft.

CROSS SHAFT ASSEMBLY: The pinch roller mounting shaft is pressed into the rotating cross shaft and, therefore, occupies a fixed position with respect to the cross shaft. Because of this the motor capstan must be adjusted relative to this assembly.

MOTOR POSITION: The position of the drive motor is adjustable by means of two mounting screws which are accessible from above the main deck structure. To provide access to the mounting screws, the head bracket should be removed; and to facilitate replacement of the bracket, its position should be marked on the main deck prior to removal. The motor assembly should be positioned to locate the capstan shaft as far toward the head bracket position as possible and 3-9/16 inches from the front edge of the deck (where it joins the back of the front panel).

This can be set more precisely using Gates 815-1447 capstan adjustment gauge or a similar gauge made from information in Fig. 5-6. To use this gauge, remove the rubber pinch roller and hold the gauge as shown in Fig. 5-6. With the two motor mounting screws loose, push the motor to the maximum distance from the solenoid; grasp the gauge and both shafts tightly so that they are parallel and touching. Tighten the motor mounting screws securely. Check to be sure that the gauge touches the capstan shaft along its entire length to insure that the pinch roller shaft is parallel with the capstan shaft. Replace the pinch roller. DO NOT ENERGIZE SOLENOID.

NYLON SLIDE BLOCKS: Refer to Fig. 5-2. Loosen the four mounting screws. Separate the blocks at the solenoid end as far as possible. Snug the two screws on this end to hold the blocks in place. With the linkage in the rest (OFF) position, squeeze the opposite ends of the blocks against the aluminum slide without actually binding. Work the slide several times by hand to make certain no binding exists. Tighten the four mounting screws.



SOLENOID ADJUSTMENT: The adjustment of the set screw on the rear of the solenoid and the set screw on top the slide cover determines the pinch roller pressure. The pinch roller shaft should come up to a distance of 0.285 to 0.290 measured between the top of the capstan shaft and the top of the pinch roller shaft with solenoid engaged and motor running.

A Go-No-Go gauge is described in Fig.5-8. If it is determined that solenoid adjustment is needed proceed as follows:

- a) Loosen locknut and set screw on rear of solenoid to within 1/2 turn from full out. Clip or tie the deck microswitch closed.
- b) Push START switch; then adjust the set screw on the top plate of the slide cover until the solenoid plunger barely bottoms in the bore. Operate STOP and START several times, allowing four or more seconds between operations. It will be necessary to manually pull the plunger assembly to the rest position. Tighten locknut when adjustment is complete.
- c) Turn the set screw on rear of solenoid in about three turns. Press the START switch and insert the 815-0844- gauge between the capstan and end of the pinch roller shaft as shown in

Fig. 5-8. Adjust the set screw until the gauge slips into the step - but not beyond.

CROSS SHAFT RETURN SPRING: The cross shaft return spring is located on the end of the shaft and is visible when viewing the machine from above the deck. This spring should be adjusted for a positive but not excessive return of the pressure roller.

RETURN LIMIT BUMPER: The return bumper is visible at the panel end of the slide assembly and may be adjusted by its support screw which is tapped into the main deck. The bumper limits the return travel of the pressure roller and should be adjusted along the solenoid axis to a point at which the top of the roller is not above, nor more than 1/16 inch below the deck surface.

BRONZE CUSHION SPRING: The bronze cushion spring is held in place between the limit bumper support bracket and the deck. The bronze leaf extends below the aluminum slide and is free to travel vertically in the deck slot. Adjustment of the leaf should be made from the underside of the deck. Proper adjustment is obtained by bending the spring upwards to slow the return of the slide so that it does not bounce when hitting the return bumper.



5.5 SUGGESTED MAINTENANCE CHECKLIST

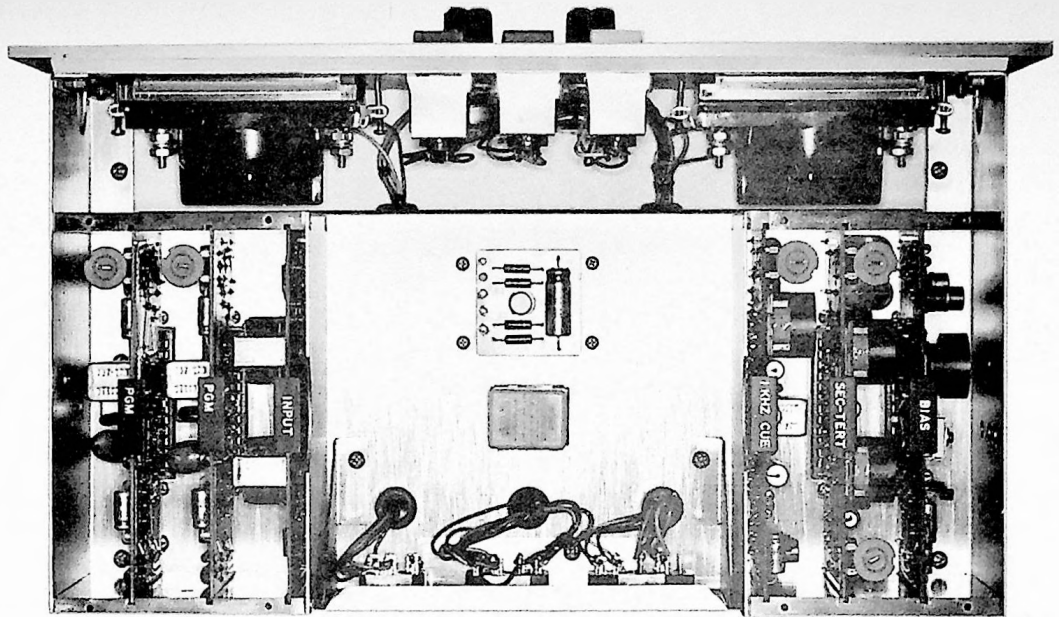
5.5.1 DAILY

- 1) Clean heads as necessary. Dirty heads may usually be detected by visual inspection. Dirty heads will cause loss of audio level, poor response and missed cues.
  - 2) Clean pressure roller and capstan. Dirty pressure rollers usually appear somewhat glazed and shiny. Poor tape drive and slippage will occur if this condition exists.
  - 3) Check alignment of tape cartridge pressure pads. Check for forward and lateral adjustment. Check for loose or missing polyurethane. This should be done each time the cartridge is handled.
  - 4) Run cartridge an instant before starting a recording. Through normal handling the tape may sag slightly in the cartridge. This will sometimes result in over-lapping of program and cue tracks, audible in Playback.
  - 5) If a poor recording is noted, check: a, cartridge pressure pads, b. left-hand white guide post for proper seating, and, c. cartridge warpage. Make certain the Record and/or Playback heads are clean.
-

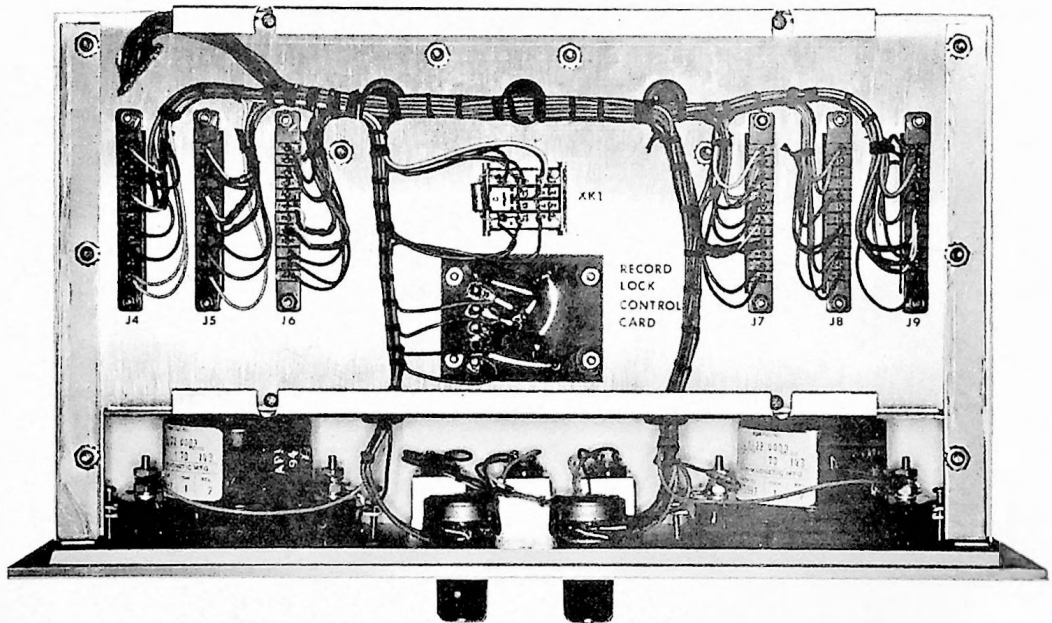
5.5.2

WEEKLY

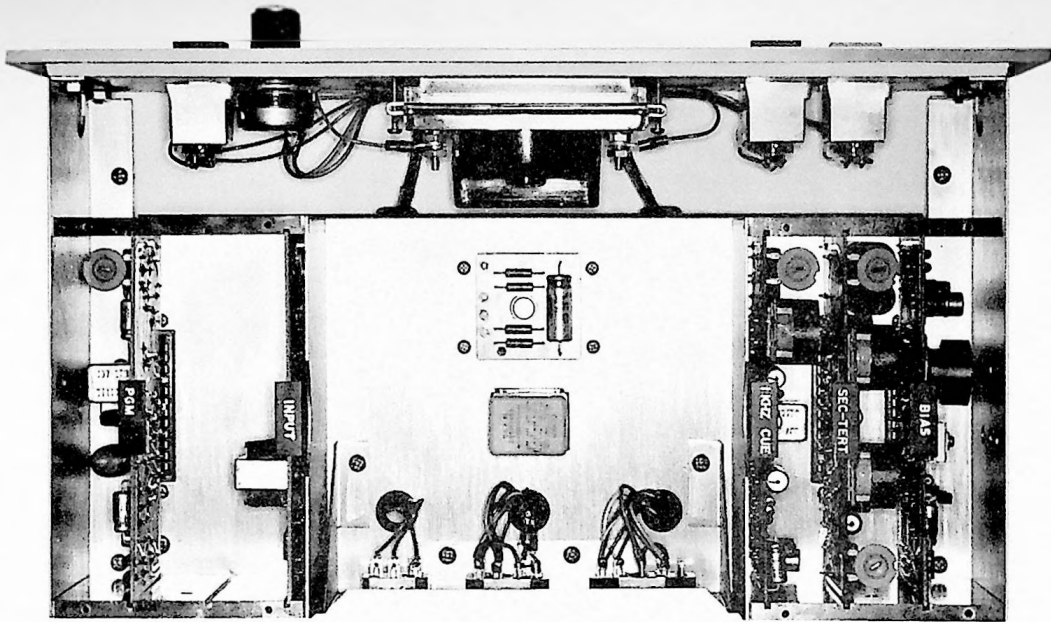
- 1) Check heads for signs of excessive wear. This will cause poor frequency response in recording or reproducing and low cue sensitivity resulting in missed cues. Under average conditions the heads and pinch roller need replacement in 6 months to one year.
- 2) Play the 15 kHz test cartridge and check the Playback level. Any deterioration of the 15 kHz level would indicate a need for head alignment or replacement.
- 3) Carefully check the pinch roller adjustment with gauge 815-0844-
- 4) Using the timing standard cartridge, carefully measure the Playback time with a stop watch. If the Playback time is extended by two seconds or more, check the pinch roller and adjustment.
- 5) Lightly oil the pinch roller bearing. Be sure all lubricant is removed from the capstan shaft.



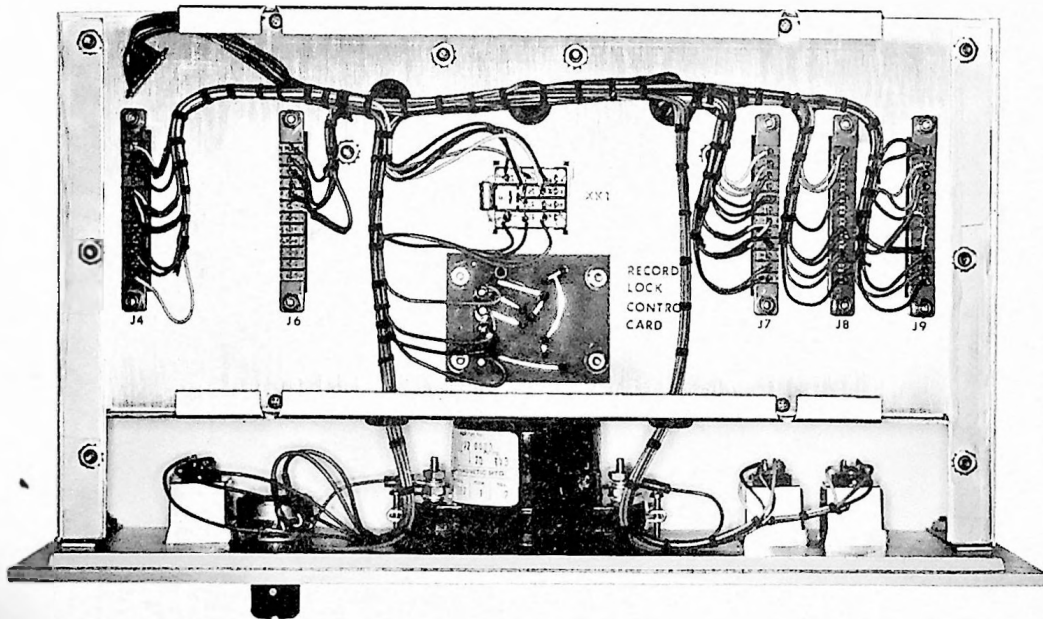
TOP VIEW STEREO RECORD AMPLIFIER



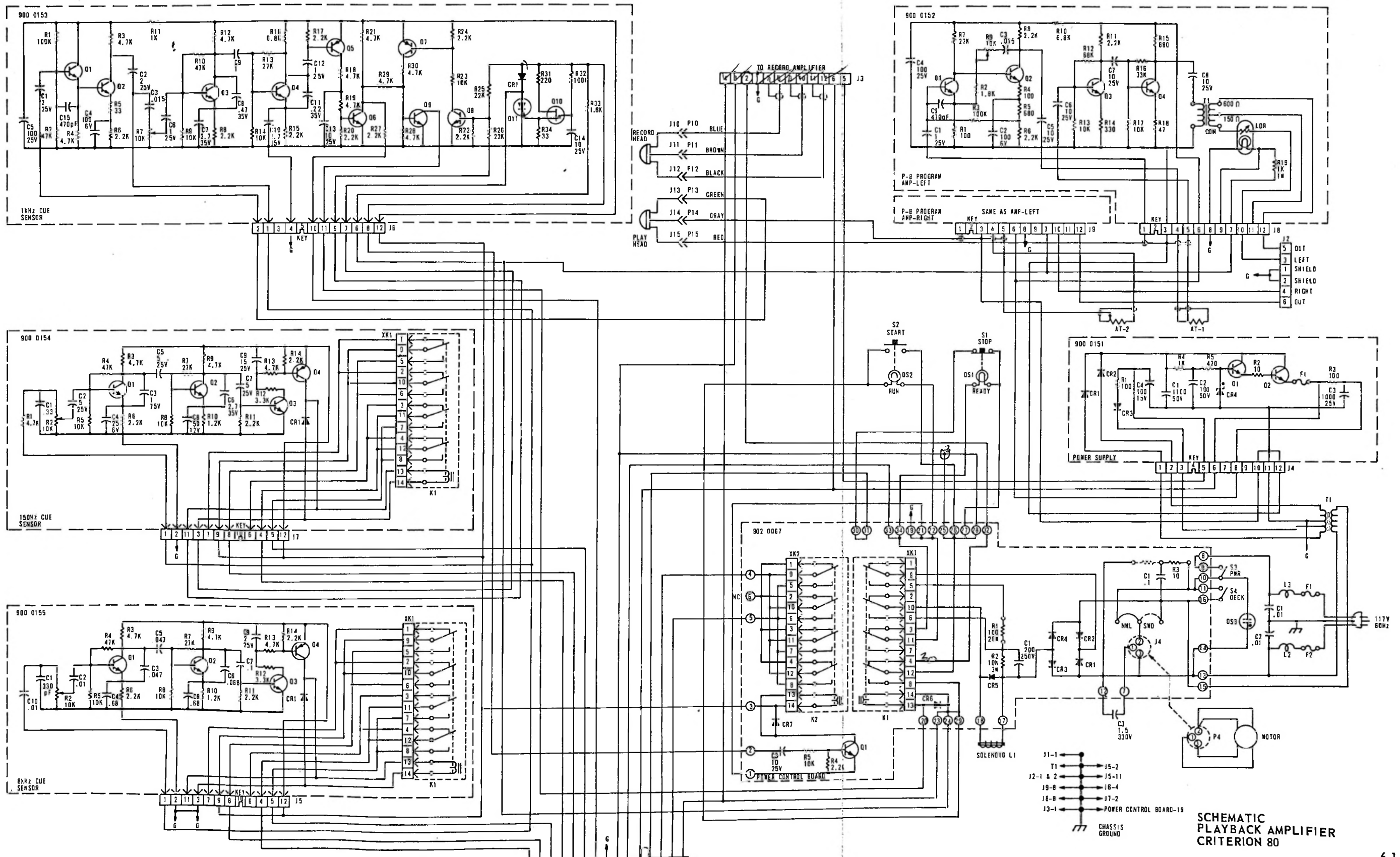
BOTTOM VIEW STEREO RECORD AMPLIFIER



TOP VIEW MONO RECORD AMPLIFIER



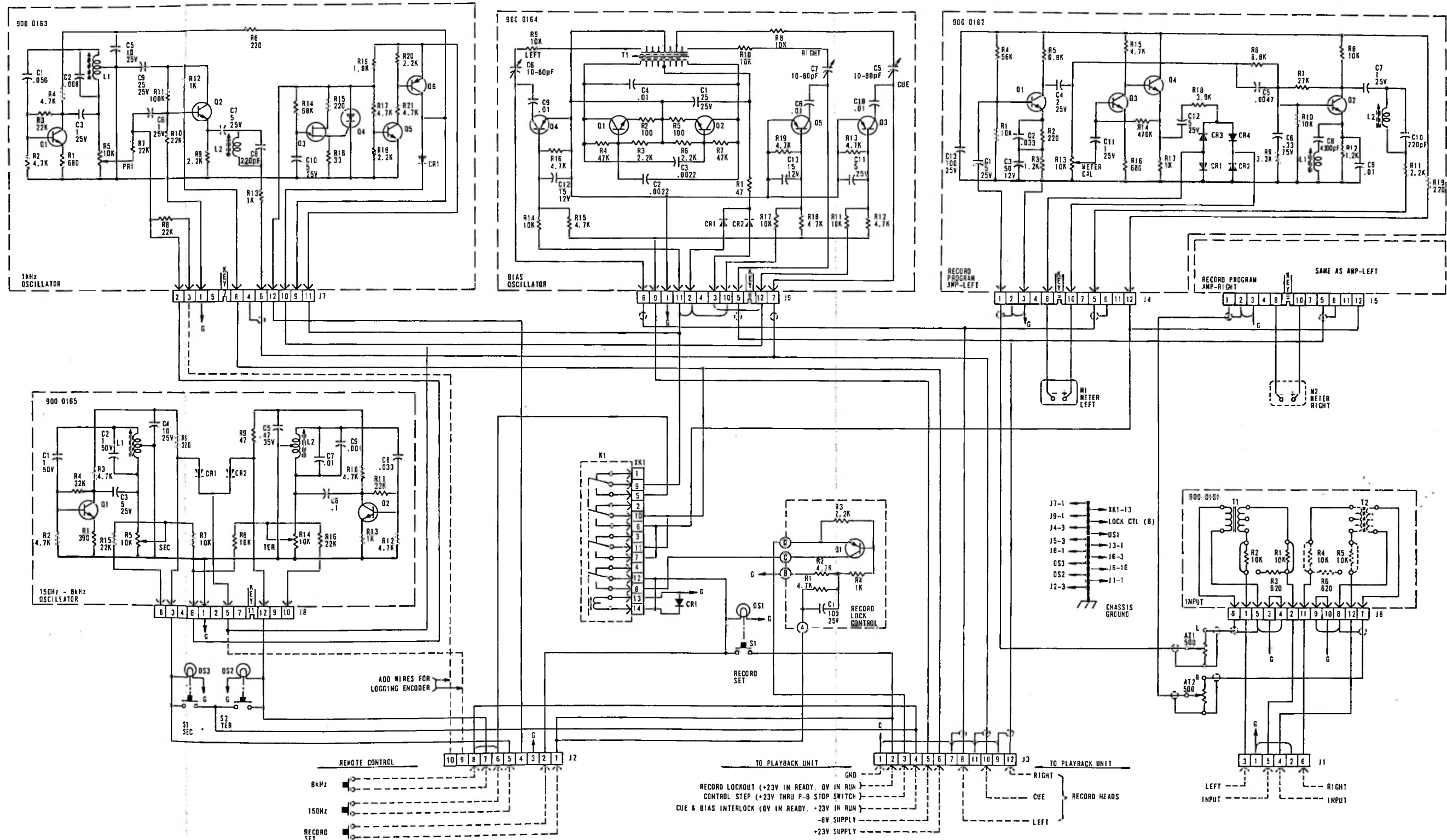
BOTTOM VIEW MONO RECORD AMPLIFIER



4. INDUCTANCE IN  $\mu$ H  
 3. CAPACITANCE IN  $\mu$ F  
 2. RESISTORS ARE 1/2 WATT  
 1. RESISTANCE IN OHMS  
 UNLESS OTHERWISE NOTED ALL:

SCHEMATIC  
 PLAYBACK AMPLIFIER  
 CRITERION 80





SCHMATIC  
RECORD AMPLIFIER  
CRITERION 80

SECTION 7 - PARTS LIST

CIRCUIT CARDS

CRITERION 80

The following list of Plug-in Circuit Cards is used for a stereo, 3-tone, Record/Playback pair. Other configurations do not require all these cards.

A. PLAYBACK

2	P-B Program Amplifier	900-0152
1	1 kHz Cue Sensor	900-0153
1	150 Hz Cue Sensor	900-0154
1	8 kHz Cue Sensor	900-0155
1	Power Supply	900-0151

B. RECORDER

1	Input Card	900-0161
2	Record Program Amplifier	900-0162
1	Bias Oscillator	900-0164
1	1 kHz Oscillator	900-0163
1	150 Hz-8 kHz Oscillator	900-0165

C. EXTENDER CARD 915-0675

## SECTION 7 - PARTS LIST

## PLAYBACK CHASSIS

## CRITERION 80

<u>SYMBOL</u>	<u>GATLS PART NO.</u>	<u>DESCRIPTION</u>
AT1,AT2	550 0067 000	Program Gain Potentiometer, 10K ohm, 2 W.
C1,C2	516 0081 000	Line Filter Capacitor, .01 uF, 1000 V.
C3	524 0156 000	Motor Capacitor, 1.5 uF, 330 V.
DS-1,DS-2	396 0060 000	Lamp
DS-3	406 0410 000	Red Lamp Assembly, Neon
F1,F2	398 0053 000	Fuse, .8 Amp, Slo-Blo
J1	612 0465 000	Socket, 15 conductor
J2	612 0461 000	Socket, 6 conductor
J3	612 0464 000	Socket, 12 conductor
J4-J9	612 0490 000	Socket, PC Board
J10-J15	612 0404 000	Socket, 2 conductor
L2,L3	494 0227 000	RF Choke, 2.2 uH
S1	604 0453 000	Stop Switch
S2	604 0451 000	Start Switch
S3	604 0435 000	Power Switch, SPST
	598 0133 000	Lens, Green, START
	598 0134 000	Lens, Yellow, STOP
T1	472 0648 000	Power Transformer

SECTION 7 - PARTS LIST  
POWER CONTROL BOARD - PLAYBACK CHASSIS

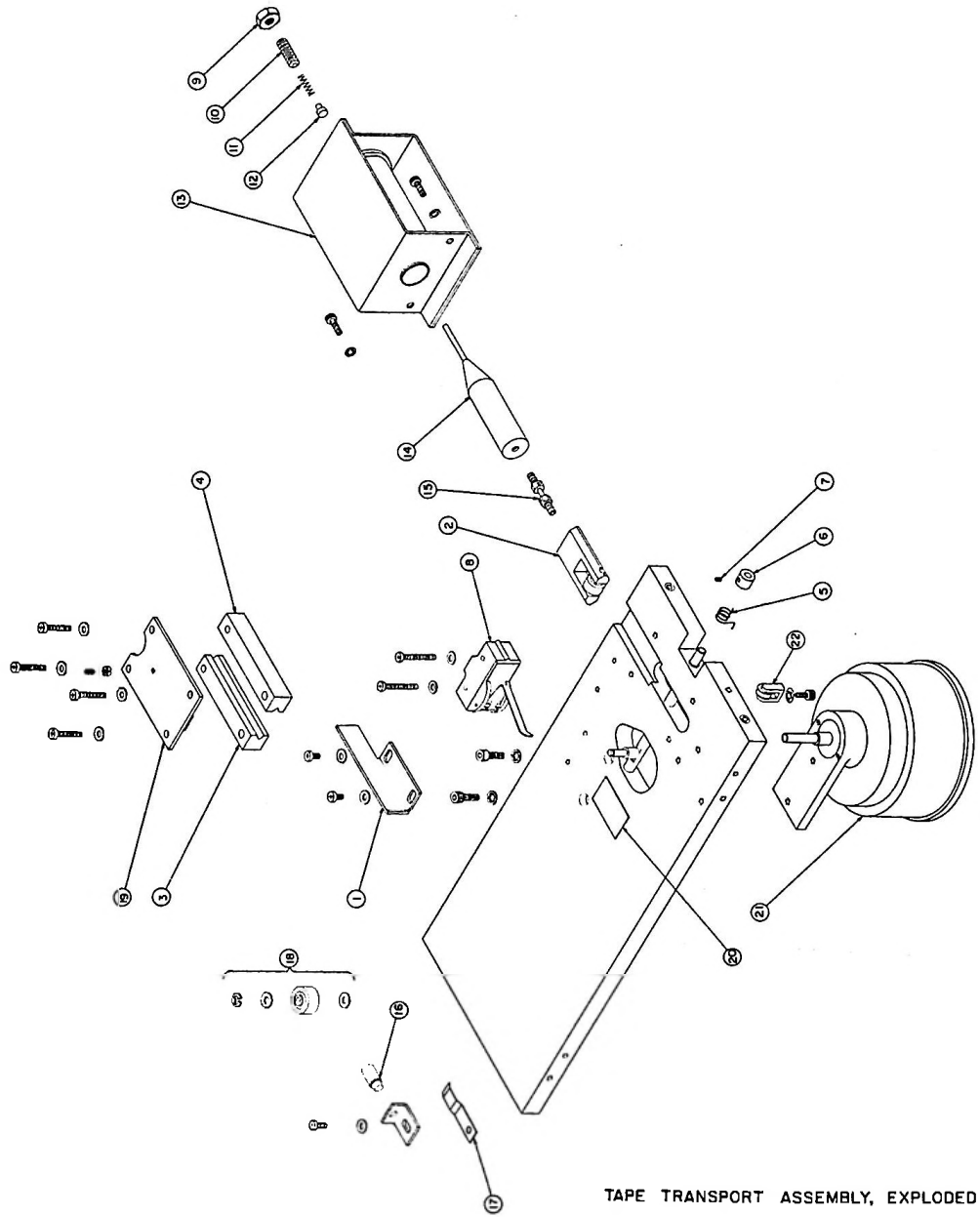
<u>SYMBOL</u>	<u>GATLS PART NO.</u>	<u>DESCRIPTION</u>
C1	522 0411 000	Capacitor, 200 uF, 250 V.
C2	506 0097 000	Capacitor, .1 uF, 400 V.
C3	522 0239 000	Capacitor, 10 uF, 25 V.
CR1,CR2, CR3,CR4, CR5	384 0263 000	Diode, RCA 1N3255
CR6,CR7	384 0258 000	Diode, RCA 1N3254
J4	612 0488 000	Socket, 3 conductor
K1,K2	574 0162 000	Relay, 4PDT, 24 V.
Q1	380 0143 000	Transistor, RCA 40311
R1	542 0119 000	Resistor, 100 ohm, 20 W, 10%
R2	542 1141 000	Resistor, 10k ohm, 3 W, 5%
R3	540 0001 000	Resistor, 10 ohm, 1/2 W, 5%
R4	540 0057 000	Resistor, 2200 ohm, 1/2 W, 5%
R5	540 0073 000	Resistor, 10k ohm, 1/2 W, 5%
	730 1153 000	Head, Playback, Mono
	730 1155 000	Head, Record, Mono
	730 1156 000	Head, Playback, Stereo
	730 1157 000	Head, Record, Stereo

## SECTION 7 - PARTS LIST

## DECK ASSEMBLY

## CRITERION 80

<u>ITEM NO.</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
1	811 0142 401	Guide, Cartridge
2	911 0141 401	Slide Assembly
3	811 0179 401	Guide, Slide, Left
4	811 0113 401	Guide, Slide, Right
5	811 0121 401	Spring, Slide Return
6	811 0148 401	Holder, Return Spring
7	811 0158 401	Set Screw
8	911 0116 401	Switch, Micro
9	304 0010 000	Nut, Lock
10	344 0039 000	Set Screw
11	811 0123 401	Spring, Solenoid Cushion
12	811 0122 401	Cushion, Solenoid Plunger
13	923 0096 401	Solenoid
14	911 0133 401	Plunger Assembly, Solenoid
15	911 0151 401	Link, Drag Assembly
16	424 0138 000	Bumper, Rubber
17	811 0152 401	Spring, Bumper
18	900 0259 001	Pinch Roller, Replacement Kit
19	911 0185 401	Roller Plate Assembly
20	811 0044 401	Pad, Cartridge Support
21	923 0243 401	Motor, 60 Hz
21	923 0243 402	Motor, 50 Hz
22	911 0127 401	Bearing Assembly



TAPE TRANSPORT ASSEMBLY, EXPLODED VIEW

FIG 7-1

## SECTION 7 - PARTS LIST

## PLAYBACK CIRCUIT CARDS

P-B Program Amplifier Card 900 0152

CRITERION 80

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
C1	522 0232 000	Capacitor, 1 uF, 25 V.
C2	522 0185 000	Capacitor, 100 uF, 6 V.
C3	508 0357 000	Capacitor, .015 uF, 200 V.
C4	522 0246 000	Capacitor, 100 uF, 25 V.
C5,C6,C7,C8	522 0239 000	Capacitor, 10 uF, 25 V.
C9	500 0908 000	Capacitor, 470 pF, Mica
LDR	670 0015 000	Light Dependent Resistor
Q1,Q2,Q3	380 0140 000	Transistor, RCA 40397
Q4	380 0139 000	Transistor, RCA 40453
R1,R4	540 0025 000	Resistor, 100 ohm, 1/2 W, 5%
R2	540 0055 000	Resistor, 1800 ohm, 1/2 W, 5%
R3	540 0097 000	Resistor, 100 k ohm, 1/2 W, 5%
R5,R8,R11	540 0057 000	Resistor, 2200 ohm, 1/2 W, 5%
R6, R15	540 0045 000	Resistor, 680 ohm, 1/2 W, 5%
R7	540 0081 000	Resistor, 22k ohm, 1/2 W, 5%
R9	550 0272 000	Potentiometer, 10k ohm, 1/4 W.
R10	540 0069 000	Resistor, 6800 ohm, 1/2 W, 5%
R12	540 0093 000	Resistor, 68k ohm, 1/2 W, 5%
R13,R17	540 0073 000	Resistor, 10k ohm, 1/2 W, 5%
R14	540 0037 000	Resistor, 330 ohm, 1/2 W, 5%
R16	540 0085 000	Resistor, 33k ohm, 1/2 W, 5%
R18	540 0017 000	Resistor, 47 ohm, 1/2 W, 5%
R19	540 0468 000	Resistor, 1000 ohm, 1 W, 5%

## SECTION 7 - PARTS LIST

## PLAYBACK CIRCUIT CARDS

1 kHz Cue Sensor 900 0153

<u>SYMBOL NO.</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
C1,C2	522 0233 000	Capacitor, 2 uF, 25 V.
C3	508 0357 000	Capacitor, .015 uF, 200 V.
C4	522 0185 000	Capacitor, 100 uF, 6 V.
C5	522 0246 000	Capacitor, 100 uF, 25 V.
C6,C9,C12	522 0232 000	Capacitor, 1 uF, 25 V.
C7,C10	526 0059 000	Capacitor, 2.7 uF, 35 V.
C8	526 0017 000	Capacitor, .47 uF, 35 V.
C11	526 0013 000	Capacitor, .22 uF, 35 V.
C13,C14	522 0239 000	Capacitor, 10 uF, 25 V.
C15	500 0908 000	Capacitor, 470 pF, Mica
CR1	384 0258 000	Diode, RCA 1N3254
Q1,Q2,Q3,Q4	380 0140 000	Transistor, RCA 40397
Q5,Q7	380 0145 000	Transistor, Motorola MPS-404-A
Q6,Q8,Q9	380 0143 000	Transistor, RCA 40311
Q10	380 0141 000	Transistor, Motorola 2N4870
Q11	384 0261 000	Rectifier, Motorola 2N5061
R1,R32	540 0097 000	Resistor, 100k ohm, 1/2 W, 5%
R2,R16	540 0089 000	Resistor, 47k ohm, 1/2 W, 5%
R3,R4,R12, R18,R19,R21, R28,R29,R30	540 0065 000	Resistor, 4700 ohm, 1/2 W, 5%
R5,R34	540 0013 000	Resistor, 33 ohm, 1/2 W, 5%
R6,R8,R15, R17,R20,R22, R24,R27	540 0057 000	Resistor, 2200 ohm, 1/2 W, 5%



## SECTION 7 - PARTS LIST

## PLAYBACK CIRCUIT CARDS

1 kHz Cue Sensor 900 0153

<u>SYMBOL NO.</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
R7	550 0272 000	Potentiometer, 10k ohm, 1/4 W, 5%
R9,R14,R23	540 0073 000	Resistor, 10k ohm, 1/2 W, 5%
R11	540 0049 000	Resistor, 1000 ohm, 1/2 W, 5%
R13	540 0083 000	Resistor, 27k ohm, 1/2 W, 5%
R16	540 0069 000	Resistor, 6800 ohm, 1/2 W, 5%
R25,R26	540 0081 000	Resistor, 22k ohm, 1/2 W, 5%
R31	540 0033 000	Resistor, 220 ohm, 1/2 W, 5%
R33	540 0055 000	Resistor, 1800 ohm, 1/2 W, 5%
--- 150 Hz Cue Sensor 900 0154 ---		
C1	508 0373 000	Capacitor, .33 uF, 75 V.
C2,C5,C7	522 0236 000	Capacitor, 5 uF, 25 V.
C3	508 0375 000	Capacitor, 1 uF, 75 V.
C4	522 0178 000	Capacitor, 25 uF, 6 V.
C6	526 0059 000	Capacitor, 2.7 uF, 35 V.
C8	522 0208 000	Capacitor, 50 uF, 12 V.
C9	522 0240 000	Capacitor, 15 uF, 25 V.
CR1	384 0258 000	Diode RCA 1N3254
K1	574 0162 000	Relay, 4PDT, 24 V.
Q1,Q2	380 0140 000	Transistor, RCA 40397
Q3	380 0143 000	Transistor, RCA 40311
Q4	380 0044 000	Transistor, RCA 40319

## SECTION 7 - PARTS LIST

## PLAYBACK CIRCUIT CARDS

150 Hz Cue Sensor 900 0154

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
R1,R3,R9 R13	540 0065 000	Resistor, 4700 ohm, 1/2 W, 5%
R2	550 0272 000	Potentiometer, 10k ohm, 1/4 W.
R4	540 0089 000	Resistor, 47k ohm, 1/2 W, 5%
R5,R8	540 0074 000	Resistor, 10k ohm, 1/2 W, 5%
R6,R11,R14	540 0057 000	Resistor, 2200 ohm, 1/2 W, 5%
R7	540 0083 000	Resistor, 27k ohm, 1/2 W, 5%
R10	540 0051 000	Resistor, 1200 ohm, 1/2 W, 5%
R12	540 0061 000	Resistor, 3300 ohm, 1/2 W, 5%
--- 8 kHz Cue Sensor 900 0155 ---		
C1	500 0894 000	Capacitor, 330 uF, 500 V.
C2,C10	508 0356 000	Capacitor, .01 uF, 200 V.
C3,C5	508 0363 000	Capacitor, .047 uF, 200 V.
C4,C8	508 0374 000	Capacitor, .68 uF, 75 V.
C6	508 0368 000	Capacitor, .068 uF, 200 V.
C7	508 0371 000	Capacitor, .1 uF, 200 V.
C9	522 0233 000	Capacitor, 2 uF, 25 V.
CR1	384 0258 000	Diode, RCA 1N3254
K1	574 0162 000	Relay, 4PDT, 24 V.
Q1,Q2	380 0140 000	Transistor, RCA 40397
Q3	380 0143 000	Transistor, RCA 40311
Q4	380 0044 000	Transistor, RCA 40319

## SECTION 7 - PARTS LIST

## PLAYBACK CIRCUIT CARDS

8 kHz Cue Sensor 900 0155

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
R2	550 0272 000	Potentiometer, 10k ohm, 1/4 W.
R3,R9,R13	540 0065 000	Resistor, 4700 ohm, 1/2 W, 5%
R4	540 0089 000	Resistor, 47k ohm, 1/2 W, 5%
R5,R8	540 0073 000	Resistor, 10k ohm, 1/2 W, 5%
R6,R11,R14	540 0057 000	Resistor, 2200 ohm, 1/2 W, 5%
R7	540 0083 000	Resistor, 27k ohm, 1/2 W, 5%
R10	540 0051 000	Resistor, 1200 ohm, 1/2 W, 5%
R12	540 0061 000	Resistor, 3300 ohm, 1/2 W, 5%
---- Power Supply 900 0151 ----		
C1	522 0376 000	Capacitor, 1100 uF, 50 V.
C2	522 0394 000	Capacitor, 100 uF, 50 V.
C3	522 0417 000	Capacitor, 1000 uF, 25 V.
C4	522 0229 000	Capacitor, 100 uF, 15 V.
CR1,CR2, CR3	384 0258 000	Diode, RCA 1N3254
CR4	386 0077 000	Diode, IR 1N4749A
F1	398 0115 000	Fuse, 1 Amp.
Q1	380 0143 000	Transistor, RCA 40311
Q2	380 0137 000	Transistor, RCA 40372
R1,R3	540 0025 000	Resistor, 100 ohm, 1/2 W, 5%
R2	540 0001 000	Resistor, 10 ohm, 1/2 W, 5%
R4	540 0049 000	Resistor, 1000 ohm, 1/2 W, 5%
R5	540 0041 000	Resistor, 470 ohm, 1/2 W, 5%

## SECTION 7 - PARTS LIST

## RECORD CHASSIS

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
AT1,AT2	550 0338 000	Potentiometer, 500 ohm, 2 W, Record Level
C1	522 0246 000	Capacitor, 100 uF, 25 V.
CR1	384 0258 000	Diode, RCA 1N3254
DS-1,DS-2, DS-3	396 0060 000	Lamp, 327
J1	612 0461 000	Socket, 6 conductor
J2	612 0463 000	Socket, 10 conductor
J3	612 0464 000	Socket, 12 conductor
K1	574 0162 000	Relay, 4PDT, 24 V.
M1	630 0136 000	Meter, 0-200 Micro Amp.
Q1	380 0044 000	Transistor, RCA 40319
R1,R2	540 0065 000	Resistor, 4700 ohm, 1/2 W, 5%
R3	540 0057 000	Resistor, 2200 ohm, 1/2 W, 5%
R4	540 0049 000	Resistor, 1000 ohm, 1/2 W, 5%
S1	604 0451 000	Set Switch
S2	604 0451 000	Tertiary Cue Switch
S3	604 0451 000	Secondary Cue Switch
	598 0131 000	Lens, Orange, SET
	598 0132 000	Lens, White, SEC
	598 0135 000	Lens, Blue, TER
	612 0490 000	Socket, P.C. Board

## SECTION 7 - PARTS LIST

## RECORD PLUG-IN CARDS

INPUT CARD 900 0161

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
R1,R2,R4,R5	540 0073 000	Resistor, 10k ohm, 1/2 W, 5%
R3,R6	540 0044 000	Resistor, 620 ohm, 1/2 W, 5%
T1,T2	478 0299 000	Transformer, Line-Line
--- RECORD PROGRAM AMPLIFIER 900 0162 ---		
C1,C12	522 0236 000	Capacitor, 5 uF, 25 V.
C2	508 0359 000	Capacitor, .033 uF, 200 V.
C3	522 0208 000	Capacitor, 50 uF, 12 V.
C4	522 0233 000	Capacitor, 2 uF, 25 V.
C5	508 0361 000	Capacitor, .0047 uF, 200 V.
C6	508 0373 000	Capacitor, .33 uF, 75 V.
C7,C11	522 0247 000	Capacitor, 1 uF, 25 V.
C8	500 0899 000	Capacitor, 4300 pF.
C9	508 0356 000	Capacitor, .01 uF, 200 V.
C10	500 0893 000	Capacitor, 220 pF, 500 V.
C13	522 0246 000	Capacitor, 100 uF, 25 V.
CR1,CR2, CR3,CR4	384 0267 000	Diode, Sylvania 1N276
L1,L2	492 0363 000	Inductor, Var. 8k to 20k uH.
Q1,Q2,Q3,Q4	380 0140 000	Transistor, RCA 40397
R1,R8,R10	540 0073 000	Resistor, 10k ohm, 1/2 W, 5%
R2,R19	540 0033 000	Resistor, 220 ohm, 1/2 W, 5%
R3,R12	540 0051 000	Resistor, 1200 ohm, 1/2 W, 5%

## SECTION 7 - PARTS LIST

## RECORD PLUG-IN CARDS

## RECORD PROGRAM AMPLIFIER 900 0162

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
R4	540 0091 000	Resistor, 56k ohm, 1/2 W, 5%
R5,R6	540 0069 000	Resistor, 6800 ohm, 1/2 W, 5%
R7	540 0083 000	Resistor, 27k ohm, 1/2 W, 5%
R9	540 0061 000	Resistor, 3300 ohm, 1/2 W, 5%
R11	540 0057 000	Resistor, 2200 ohm, 1/2 W, 5%
R13	550 0272 000	Potentiometer, 10k ohm, 1/2 W.
R14	540 0113 000	Resistor, 470k ohm, 1/2 W, 5%
R15	540 0065 000	Resistor, 4700 ohm, 1/2 W, 5%
R16	540 0045 000	Resistor, 680 ohm, 1/2 W, 5%
R17	540 0049 000	Resistor, 1000 ohm, 1/2 W, 5%
R18	540 0063 000	Resistor, 3900 ohm, 1/2 W, 5%
--- BIAS OSCILLATOR 900 0164 ---		
C1	522 0242 000	Capacitor, 25 uF, 25 V.
C2,C3	508 0354 000	Capacitor, .0022 uF, 200 V.
C4,C8, C9,C10	508 0356 000	Capacitor, .01 uF, 200 V.
C5,C6,C7	500 0909 000	Capacitor, Trimmer 10-80 pF.
C11	522 0236 000	Capacitor, 5 uF, 25 V.
C12,C13	522 0204 000	Capacitor, 15 uF, 12 V.
CR1,CR2	384 0258 000	Diode, RCA 1N3254
Q1,Q2	380 0143 000	Transistor, RCA 40311
Q3,Q4,Q5	380 0145 000	Transistor, Motorola MPS-404A

## SECTION 7 - PARTS LIST

## RECORD PLUG-IN CARDS

## BIAS OSCILLATOR 900-0164

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
R1	540 0017 000	Resistor, 47 ohm, 1/2 W, 5%
R2,R5	540 0025 000	Resistor, 100 ohm, 1/2 W, 5%
R3,R6	540 0057 000	Resistor, 2200 ohm, 1/2 W, 5%
R4,R7	540 0089 000	Resistor, 47k ohm, 1/2 W, 5%
R8,R9,R10, R11,R14,R17	540 0073 000	Resistor, 10k ohm, 1/2 W, 5%
R12,R13,R15 R16,R18,R19	540 0065 000	Resistor, 4700 ohm, 1/2 W, 5%
T1	478 0304 000	Transformer, .285-.315 uH
--- 1 kHz OSCILLATOR 900 0163 ---		
C1	508 0366 000	Capacitor, .056 uF, 200 V.
C2	508 0368 000	Capacitor, .068 uF, 200 V.
C3,C6	522 0232 000	Capacitor, 1 uF, 25 V.
C5	522 0239 000	Capacitor, 10 uF, 25 V.
C7,C10	522 0236 000	Capacitor, 5 uF, 25 V.
C8	500 0893 000	Capacitor, 220 pF.
C9	522 0242 000	Capacitor, 25 uF, 25 V.
CR1	384 0258 000	Diode, RCA 1N3254
L1	492 0368 000	Inductor, Var, .475-.525 uH
L2	492 0363 000	Inductor, Var, 8k to 20 k uH.
Q1,Q5	380 0143 000	Transistor, RCA 40311
Q2	380 0140 000	Transistor, RCA 40397
Q3	380 0141 000	Transistor, Motorola, 2N4870
Q4	384 0261 000	SCR, Motorola 2N5061

## SECTION 7 - PARTS LIST

## RECORD PLUG-IN CARDS

1 kHz OSCILLATOR 900 0163

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
Q6	380 0044 000	Transistor, RCA 40319
R1	540 0045 000	Resistor, 680 ohm, 1/2 W, 5%
R2,R4 R17,R21	540 0065 000	Resistor, 4700 ohm, 1/2 W, 5%
R3,R7, R8,R10	540 0081 000	Resistor, 22k ohm, 1/2 W, 5%
R5	550 0272 000	Potentiometer, 10k ohm, 1/4 W.
R6,R15	540 0033 000	Resistor, 220 ohm, 1/2 W, 5%
R9,R18,R20	540 0057 000	Resistor, 220 ohm, 1/2 W, 5%
R11	540 0097 000	Resistor, 100k ohm, 1/2 W, 5%
R12,R13	540 0049 000	Resistor, 1000 ohm, 1/2 W, 5%
R14	540 0093 000	Resistor, 68k ohm, 1/2 W, 5%
R16	540 0013 000	Resistor, 33 ohm, 1/2 W, 5%R19
R19	540 0055 000	Resistor, 1800 ohm, 1/2 W, 5%

--- 150 Hz-8kHz OSCILLATOR 900 0165

C1,C2	508 0381 000	Capacitor, 1 uF, 50 V.
C3	522 0236 000	Capacitor, 5 uF, 25 V.
C4	522 0239 000	Capacitor, 10 uF, 25 V.
C5	526 0017 000	Capacitor, .47uF, 35 V.
C6	508 0371 000	Capacitor, .1 uF, 400 V.
C7	508 0356 000	Capacitor, .01 uF, 200 V.
C8	508 0359 000	Capacitor, .033 uF, 200 V.
C9	508 0352 000	Capacitor, .001 uF, 200 V.



## SECTION 7 - PARTS LIST

## RECORD PLUG-IN CARDS

150 Hz - 8 kHz OSCILLATOR 900 0165

<u>SYMBOL</u>	<u>GATES PART NO.</u>	<u>DESCRIPTION</u>
CR1,CR2	384 0258 000	Diode, RCA 1N3254
L1	492 0369 000	Inductor, Var., 1.045 to 1.155 Hly.
L2	492 0367 000	Inductor, Var., 38 to 42 mH.
Q1,Q2	380 0143 000	Transistor, RCA 40311
R1	540 0039 000	Resistor, 390 ohm, 1/2 W, 5%
R2,R3,R10, R12	540 0065 000	Resistor, 4700 ohm, 1/2 W, 5%
R4,R15,R11, R16	540 0081 000	Resistor, 22k ohm, 1/2 W, 5%
R5,R14	550 0272 000	Potentiometer, 10k ohm, 1/4 W.
R6	540 0033 000	Resistor, 220 ohm, 1/2 W, 5%
R7,R8	540 0073 000	Resistor, 10k ohm, 1/2 W, 5%
R9	540 0017 000	Resistor, 47 ohm, 1/2 W, 5%
R13	540 0049 000	Resistor, 1k ohm, 1/2 W, 5%