

INSTRUCTION MANUAL

*Series 3000*  
*Tape Cartridge Machine*

1 September 1981

IM No. 597-0300



BROADCAST ELECTRONICS INC.

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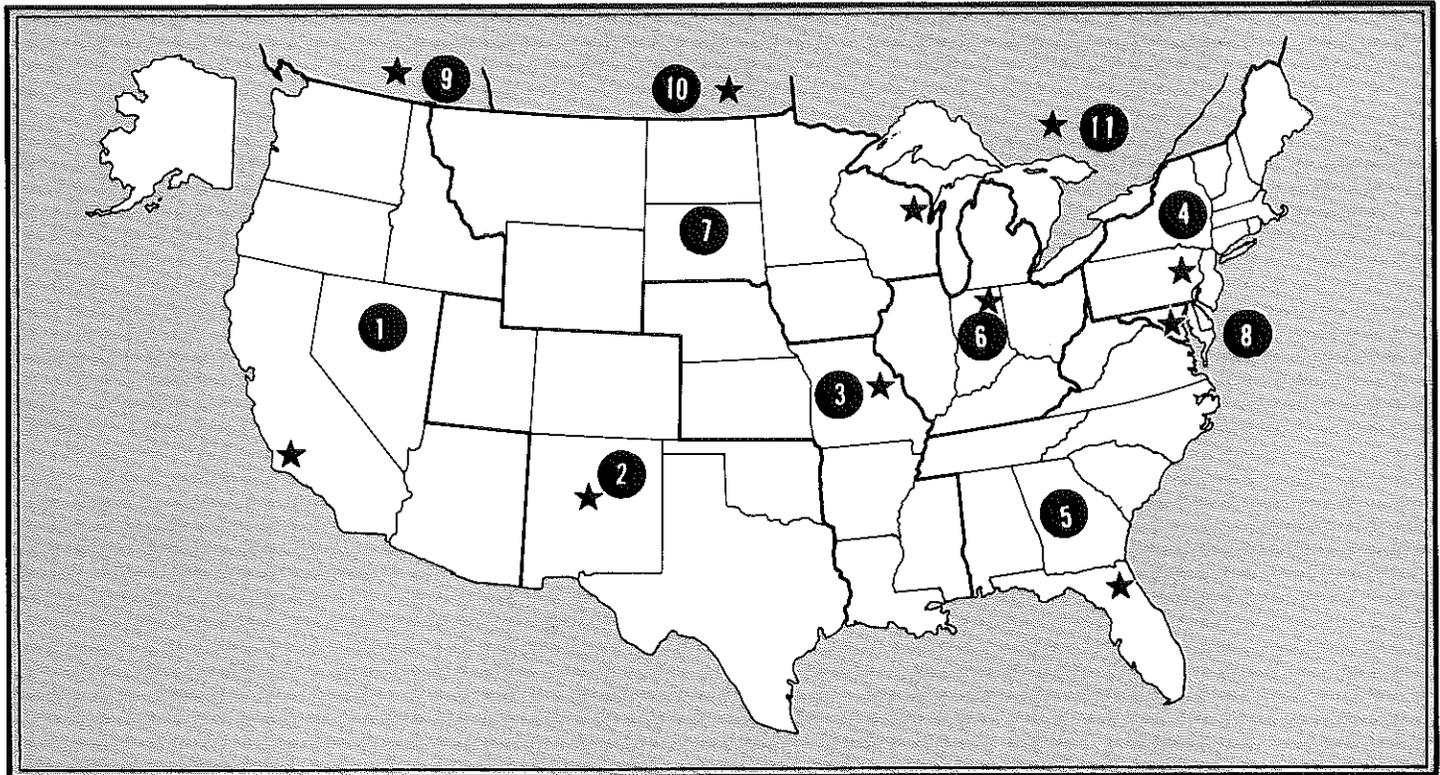
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## SECTION I INTRODUCTION

### 1-1. INTRODUCTION

This section provides equipment identification, a discussion of equipment features, and list equipment specifications.

### 1-2. GENERAL DESCRIPTION

The Series 3000 Cartridge machine is available in a wide range of monaural or stereophonic models to accommodate all sizes of cartridges (see Figure 1-1). The Series 3000 is the first Broadcast Electronics Series to incorporate an automatic release deck. The units can be rack or desk top mounted. A large air damped solenoid and a rugged machined surface ensures trouble-free operation in continuous use.

Total power consumption is low. An efficient hysteresis synchronous drive motor and a power conserving solenoid circuit keep total power consumption below 45 watts. There is no excessive heat build up to damage tape while still offering direct tape drive and optional fast forward features.

Quality construction is standard with the Series 3000. All components are readily available types chosen for proven dependability. Modern integrated circuits, gold plated card edge contacts, and internally shielded audio sections are among many features. Adjustments are accessible and modular construction is employed throughout.

Balanced transformer outputs are provided on all models. Full remote control is provided at a rear panel receptacle. Mating connectors are supplied for all interconnections. Field effect transistor output switching is built into each machine to permit easy equipment paralleling.

The Series 3000 incorporates the Phase Lok IV head bracket which allows independent azimuth adjustment to assure extremely close control of stereophonic phasing while permitting easy adjustment.

### 1-3. EQUIPMENT IDENTIFICATION

The Model 3100 is available as a monaural or stereophonic playback unit for NAB size A cartridges. Three 3100 models can be mounted in a single 19 inch (48.26 cm) rack.

The Model 3200 is available as a playback unit or with the record/playback option for monaural or stereophonic operation. The 3200 accepts both NAB size A or B cartridges. Two units can mount in a single 19 inch (48.26 cm) rack.

The Model 3300 is available in the same configuration as the model 3200 but accepts NAB size A, B, or C cartridges. A 3100 playback may be mounted next to the 3300 unit in a 19 inch (48.26 cm) configuration.

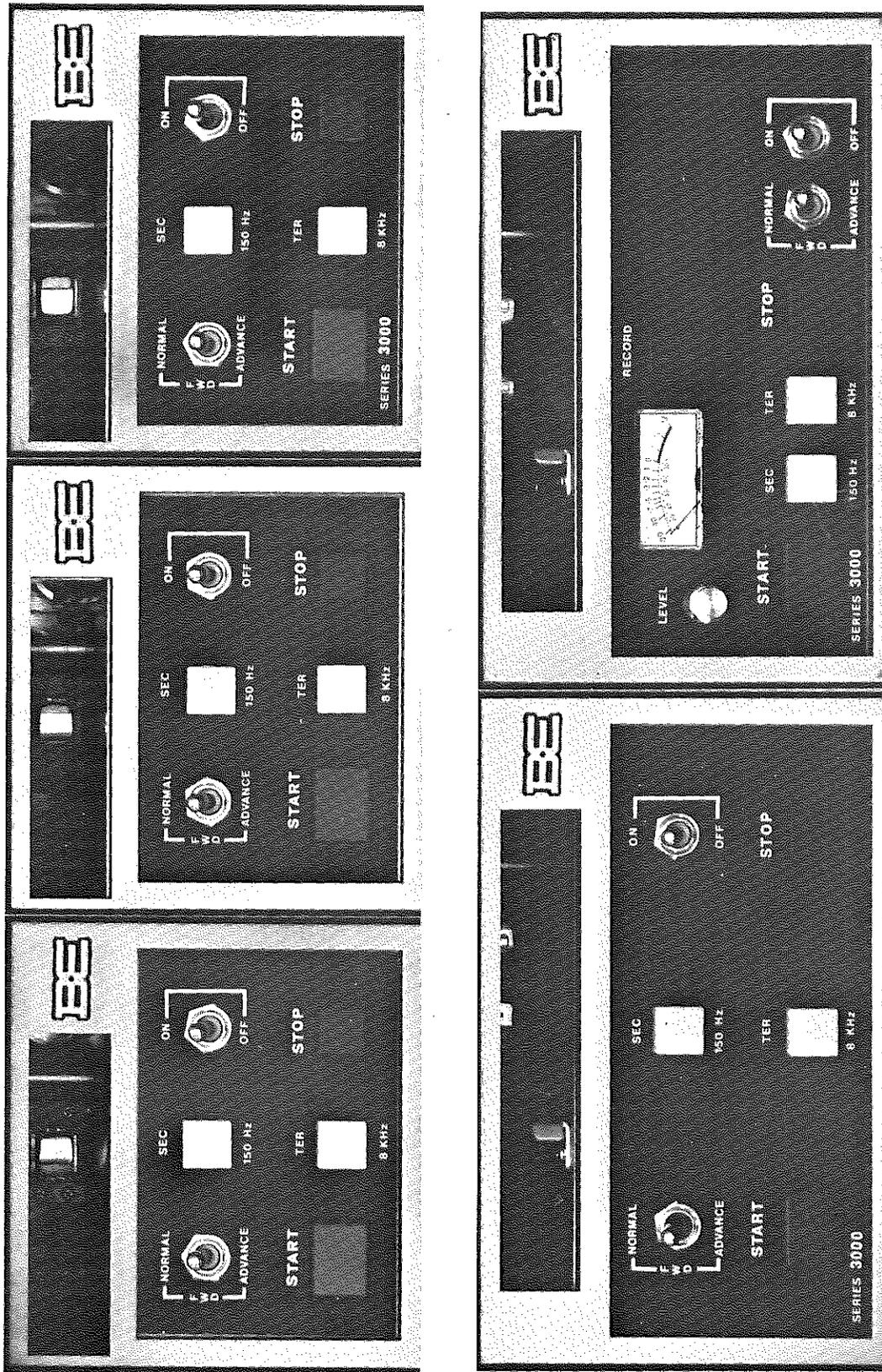


Figure 1. REPRESENTATIVE SERIES 3000 UNITS

The Model 3200 and 3300 machines are also available for delayed record/playback operation. These are designed as Models 3200 RP/DL and 3300 RP/DL respectively. These models can be operated in either a "delay" or "normal" mode. The time span of the delay is determined by the length of the tape on the cartridge. This can vary from six seconds, for example, to provide ample time for editing words or comments inappropriate for broadcast on telephone talk shows; or up to 30-minutes on C-size cartridges for delayed rebroadcast of network programs.

Both secondary 150 Hz and tertiary 8 kHz cue tone circuitry is available in record or playback only models. The secondary cue tone installed in units equipped with fast forward provides automatic fast cueing at the end of a message. The fast forward option is available in all models. Alternate tape speeds and line voltages and frequency standards are also available. In record models, a provision for microphone input is available.

1-4. SPECIFICATIONS

The following list provides electrical and physical specifications for the 3000 series audio cartridge machines.

PARAMETER	SPECIFICATIONS
Tape Speed: Fast-Forward (optional):	7.5 in/s (19.05 cm/s) $\pm$ 0.1% 22.5 in/s (57 cm/s)
AC Power Requirements:	105 to 125 V/210 to 230 V; 50 or 60 Hz 45 to 50 W maximum
Noise (Reproducer): Monophonic:  Stereophonic:	62 dB or better below reference of 400 Hz at 3% THD; 54 dB below 160 n Wb/m at 1 kHz.  60 dB or better below reference of 400 Hz at 3% THD; 52 dB below 160 n Wb/m at 1 kHz.
Distortion:	2% or less record to playback at 160 n Wb/m at 1 kHz.
Equalization:	NAB, IEC, CCIR as specified.
Frequency Response:	$\pm$ 2 dB from 50 Hz to 15 kHz exclusive of head contour effect.

PARAMETER	SPECIFICATIONS
Crosstalk (magnetic head limited):	Cue Channel to program channel, monophonic 150 Hz: -50 dB or better 1000 Hz: -55 dB or better 8000 Hz: -50 dB or better Stereo, crosstalk between program channels; better than 50 dB, 50 Hz to 15 kHz.
Input Impedance (Recorder):	
Microphone (optional):	150 Ohms (transformer) balanced floating.
Line:	50 k Ohms (transformer) balanced floating.
Input Levels:	
Microphone (optional):	-70 to -24 dBm
Line:	-24 to +20 dBm (50 mV to 7.7 V).
Audio Output:	Maximum adjustable level +8 dBm from 160 n Wb/m at 1 kHz: 600 Ohms (transformer) balanced.
Peak Output Level:	+20 dBm before clipping.
Cue Signals:	Relay contact closure for external control (150 Hz, 8 kHz). External cue/input/output available at remote control for other control functions.
Ambient Operating Temperature:	0° to 55° C (32° to 132° F).
Bias Oscillator Frequency:	100 kHz
Dimensions:	
3100:	5.25 inches H, 5.875 inches W, 15.5 inches D (13.3 X 14.9 X 39.4 cm)
3200:	5.25 inches H, 8.75 inches W, 15.5 inches D (13.3 X 29.8 X 39.4 cm)

## SECTION II INSTALLATION

### 2-1. DESK MOUNTING

To Desk Mount, install four rubber feet into the holes in the bottom cover of the unit. A wrap-around housing mounts into holes in the sides of the chassis.

### 2-2. RACK MOUNTING

To Rack Mount, remove the top and bottom covers and install any filler panels in the front of the adapter shelf. Mount the adapter shelf in the rack opening from the front, securing the shelf with No. 10 screws driven from the front through the trim spacers and the rack shelf into the rack rail. Place the units into the adapter shelf from the front and secure with the captive fasteners installed at the rear of the shelf.

### 2-3. FILLER PANELS

Filler Panels are available in 1/3 and 1/2 rack widths. Mounting is accomplished by sliding the fill panel into place in the rack chassis and securing it in place from below with the flat head screws supplied.

### 2-4. AUDIO OUTPUT CONNECTIONS

The playback audio output is balanced with a low impedance for driving a 600 Ohm load. The nominal output level of the playback is +8 dBm. P4 provides easy access to the audio (see Figure 2-1).

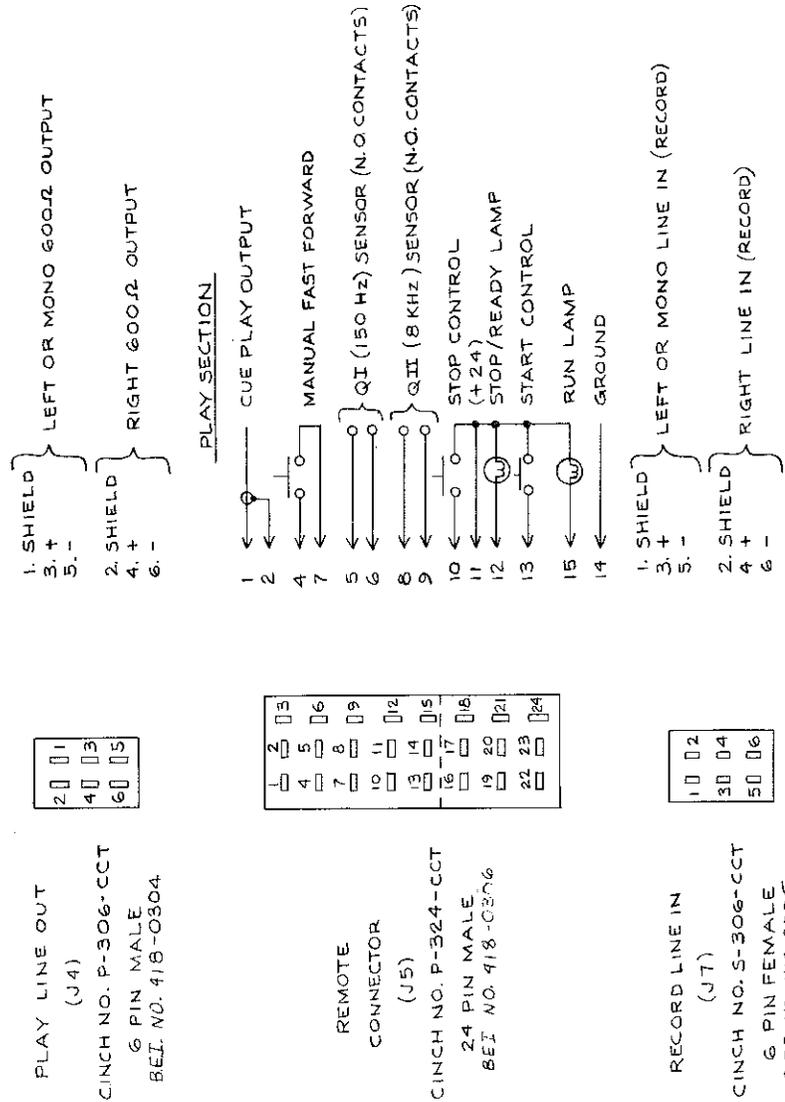
For Monaural playback connect channel A program line to terminals 3 and 5 of output jack J4. For Stereo operation connect channel B program line to terminals 4 and 6 of J4.

To ground the shields of the output cables at the cartridge unit tie the external shields to pins 1 and 2 of output jack J4. If the output shields are to be grounded at the console, no connection to pins 1 or 2 should be made.

### 2-5. AUDIO INPUT CONNECTIONS

Audio Input to the Record Amplifier is by means of Input Jack J4 (see Figure 2-1). The input is high (50k Ohms) impedance bridging for signals from -24 to +20 dBm (50 mV to 7.7 V) level. Channel A input is by means of contacts 3 (high), and 5 (low) of J7. For Stereo, use contacts 4 (high) and 6 (low) for channel B input.

- NOTES:
1. ANY 24V PIN (11 PLAY, 11, 17 & 20 RECORD/PLAY) MAY BE USED AS COMMON FOR ALL CONTROLS & LAMPS IF DESIRED.
  2. ALL LAMPS 28V, .05A OR LESS.
  3. QI & QII CONTACTS RATED 5.0A RESISTIVE, 120V RMS OR 28VDC. AVOID EXCESSIVE CURRENT INTERRUPTION TO AVOID NOISE.
  4. CUE OUTPUT LOAD 1.5KΩ MINIMUM. CUE INPUT IMPEDANCE APPROX. 50KΩ UNBALANCED.



\* IN DELAY UNITS THIS PIN BECOMES DELAY SET.

BROADCAST ELECTRONICS INC  
 - A FILMWAYS COMPANYS -  
 3000/4000 SERIES  
 REAR PANEL CONNECTOR WIRING  
 REV A  
 B-906-3104

DRAWN : 03/13/75 W.L.J.

REAR VIEW, MATING CONNECTORS

FIGURE 2-1. REAR PANEL CONNECTOR WIRING DIAGRAM

## 2-6. OPTIONAL MICROPHONE INPUT

Record models are available with an optional microphone input through a rear panel socket. This input is designed for 150 Ohm balanced microphones with an output level of -70 to -24 dBm.

### **NOTE**

WHEN OPERATING WITH THE MICROPHONE INPUT, DISCONNECT THE LINE INPUT. SET THE GAIN SWITCH (TWO FOR STEREO) ON THE RECORD AMPLIFIER/BIAS MODULE TO HI.

## 2-7. REMOTE CONTROL CONNECTIONS

A rear panel 24-pin cinch connector allows connection of remote stop, start, and record controls along with the associated indicators. When the optional auxiliary cue tones (QI 150 Hz and QII 8 kHz) are installed, the normally open relay contacts are accessible. These contacts provide a closure during tone playback. In record models, the optional cue tone generators may be remotely controlled.

Terminals are also provided for supplying an external signal to the recorder cue track and for access to the cue track playback audio. When external cue recording is employed, the EXT CUE record control is also required.

### REMOTE START AND STOP SWITCHES

Connect two wires from a SPST (normally open) momentary push-button switch to pins 13 and 11 for remote start. Connect switch between pins 10 and 11 for remote stop. The Play and Ready indicators should be connected from pins 15 and 12 respectively to pin 11.

### REMOTE FAST FORWARD

Connect two wires from a SPST switch between pins 7 and 4 of J5.

### REMOTE END CUE AND TRIP CUE LIGHTS

Connect two lamps from pins 5 and 8 respectively to pin 11 (+24V). Connect pins 6 and 9 to pin 14 (ground).

### CUE OUT

The cue out signal is available from pins 1 and ground (pin 2) for Data Logging. Output is a 0.5 volt into a 10,000 Ohm load resistance.

## 2-8. RECORDER-REPRODUCER REMOTE CONTROL

The Record-Reproduce units and the Reproduce units have identical remote functions. However, the Record-Reproduce units have the following additional features.

### RECORD SWITCH AND LIGHT

Connect two wires from a SPST switch between pins 16 and 17. Connect the Record Indicator from pin 18 (Record LT) to pin 17 (+24V).

### REMOTE SEC CUE AND TER CUE RECORD PUSHBUTTONS

Connect two wires from a single pole momentary pushbutton between pins 19 (EXT. SEC CUE) and 22 (EXT. TER CUE) to pin 20 (+24V) to record trip cues remotely.

### REMOTE CUE RECORD

The remote cueing feature allows for the recording of other than the standard cue tone for Data Logging or other external functions. To record cue tone connect a SPST switch from pin 21 (Cue Bias Enable) to pin 20 (+24V). Connect the signal to be recorded to pins 23 (Cue Input High) and 24 (Cue Input Low). When the switch grounds the Cue Bias Enable line the signal input will be recorded on the cue track. Nominal input level is 0.5 V rms into an input impedance of 10k Ohms.

## 2-9. POWER CONNECTIONS

The 3000 Series Cartridge Machines are shipped completely adjusted and wired for operation on 117 V 60 Hz ac power. Optional 220 V 50 Hz power is available.

SECTION III  
OPERATION

Table 3-1. Front Panel Controls and Indicators

NOMENCLATURE	FUNCTION
POWER SPST Switch	Controls the application of ac power.
STOP Pushbutton/Indicator Switch Ready Indicator	Stops tape and reverts system to Ready mode. Lights to indicate that system is in Ready mode of operation and cartridge is fully inserted.
START Pushbutton/Indicator Switch Play Indicator	Starts the tape running. Lights to indicate that tape is playing on line.
SEC-CUE Indicator	When the tape is running a momentary lighting indicates the playback of a SEC-Cue Tone.
TER-CUE Indicator	When the tape is running, a momentary lighting indicates the playback of a TER-Cue Tone.
FAST FORWARD SWITCH Fast Forward Manual	Normal run position. Switches unit from a Run mode to Fast Forward mode.
RECORD Pushbutton/Indicator Switch	Sets up system for Record mode. Lights to indicate that system is in the Record mode. Switches VU meters from Playback output to Record Amplifier Input.
LEVEL Potentiometers	Controls output levels of channel A (channel B, stereo) record amplifiers. Amplifier output level is indicated on adjacent VU meter.
SEC-CUE Pushbutton Switch	Inserts a 150 Hz cue on the cue track of the tape either during playback or record mode. SEC-cue is used to start external equipment, or to indicate the end of program.
TER-CUE Pushbutton Switch	Inserts an 8 kHz cue on the cue track of the tape either during playback or record mode.

### 3-1. PLAYBACK

Turn the POWER switch to ON to activate ac power. Insert a prerecorded cartridge in the deck opening to the extreme right hand side. The STOP switch indicator will illuminate to indicate the unit is in the ready mode. The 3100 models accept NAB A size cartridges. The 3200 models accept both NAB A and B size. The 3300 models accept all three size cartridges: A, B, and C.

#### **NOTE**

THE 3200 AND 3300 MODELS ARE EQUIPPED WITH A MOVABLE CARTRIDGE GUIDE TO RESTRAIN THE LEFT HAND SIDE OF THE CARTRIDGE. THIS IS POSITIONED AT THE FACTORY FOR A SIZE CARTRIDGES. IF B OR C SIZE CARTRIDGES ARE USED, THE GUIDE SHOULD BE MOVED TO THE APPROPRIATE LOCATION.

Put the tape in motion by momentarily depressing the START switch. The START switch will illuminate and the STOP switch indicator will go out. The tape runs until it is stopped by the prerecorded stop cue signal. The TER-CUE indicator will momentarily light when a TER-CUE signal passes the playback head and the SEC-CUE indicator will light momentarily when the first SEC-CUE signal passes the playback head. The VU meter on record models will indicate the playback audio level.

#### **NOTE**

THE PLAYBACK MAY BE STOPPED BY PRESSING THE STOP SWITCH BUT THE TAPE WILL NOT BE PROPERLY CUED FOR LATER PLAYBACK.

Once the unit is stopped the cartridge may be removed simply by pulling out.

### 3-2. RECORDING

Turn the Power switch to ON to activate ac power. Insert an erased cartridge in the deck opening to the extreme right hand side. The STOP switch indicator will illuminate to indicate the unit is in the ready mode.

To start the recording process, depress the RECORD switch. The RECORD indicator will light.

#### **NOTE**

AVOID RECORDING OVER THE SPLICE, AS AUDIO WILL "DROP-OUT" OR "BUMP" ON MOST SPLICES.

Adjust the front panel level control so that the VU meter indicates a maximum 0 VU (100) on peaks. (In the record mode, the meter indicates the input to the recorder.)

The tape is started by momentarily depressing the START switch. The START switch illuminates and a STOP cue signal is automatically recorded on the cue track of the tape.

The tape will automatically stop at the STOP cue recorded on the tape. The message length must be carefully timed in relation to length of tape on the cartridge used to avoid overlap.

While recording, the quality can be checked if provision is made to feed the audio output to a separate monitor system such as an audition channel of a console. The program material can be "A - B" switched by monitoring alternately the input and the output (which is the reproduction of the audio just recorded). With monitor systems of equal quality and equal volume, no difference should be detected in the signal before recording and after.

### 3-3. OPTIONAL AUXILIARY CUE TONES (Q-TRIPS)

In addition to the standard, 1,000 Hz stop (primary) cue tone, all models of the Series 3000 are available with additional frequency tones. These optional auxiliary cue tones are used to control other devices associated with the cartridge machine.

#### **NOTE**

THE AUXILIARY CUE TONES MAY BE RECORDED  
WHENEVER TAPE IS IN MOTION IN EITHER  
PLAYBACK OR RECORD.

The 150 Hz (QI) secondary tone is defined by the NAB cartridge standards as the "end of message" cue and is generally used to activate another device at the end of a recorded segment. This could be, for example, a sequence cue to an automation system. Similarly, it could be used to automatically start another cartridge machine. In Series 3000 units so equipped, this tone is used to initiate automatic fast forward cueing after a cartridge has played.

The 8 kHz (QII) tertiary tone is defined as an auxiliary tone to be used as needed. Generally, it is used to activate another device during reproduction of a recorded segment. For example, this tone can initiate slide changes during recorded commentary. Or it might provide a warning signal that a cartridge is nearing the end (a popular use in radio stations using music on cartridges in place of records). In playback, auxiliary tones close normally open relay contacts available on the rear panel remote control connector. At the same time the indicator lamp on the front panel is illuminated to visually indicate tone presence. The relay contacts remain closed and the indicator remains illuminated for the duration of the tone as recorded on the cartridge. When so equipped, the fast forward cueing begins at the end of the 150 Hz tone.

Equipped record models can both playback and record the auxiliary cue tones. The tones are recorded by pressing the appropriate front panel switch (SEC 150 Hz or TER 8 kHz). As long as the switch is depressed, the tone will be recorded on the cartridge. To insure positive operation in playback, NAB standards call for a minimum burst of 100 (at 150 Hz) or 2 (at 8 kHz) milliseconds duration. The exact positioning of the tone and its duration depends upon the requirements in the individual installation. When recording the 150 Hz (QI) tone to provide automatic fast forward, the tone must not end before the program material ends.

#### 3-4. DELAY OPTION

To provide the delay function, an erase/record head is physically substituted in place of the record head. The positions of the reproduce and record heads are transposed. As the program material is recorded, the tape passes through the cartridge, and is played back by the reproduce head. Hence, the reproduced output lags behind the input by the length of the tape in the cartridge used.

Since precise timing is usually desirable, the following table lists various lengths of seconds and the equivalent lengths in inches of tape at 7.5 ips (for 3.75 ips divide the inches equivalent by 2). Allow an additional 2 to 3 inches for the splice. Make the splice as clean as possible. Any gap or overlapping in the splice will be noticed as the splice passes over the reproduce head.

<u>SECONDS</u>	<u>INCHES</u>
5	37.5
6	45.0
7	52.5
8	60.0
9	67.5
10	75.0
11	82.5
12	90.0
13	97.5
14	105.0
15	112.5
16	120.0
17	127.5
18	135.0
19	142.5
20	150.0

Tape tension is particularly critical in short delay cartridges. Tension must be great enough so that the hub in the cartridge turns as the tape moves, but tension must not be too great. Before making the splice, check the tension. The tape loop can be tightened by gently pulling on the end where the tape enters the hub. Gently pull tape out of the center to loosen the tape wrap.

It is a good idea to check delay cartridges frequently. A delay cartridge (particularly in short lengths) wears rapidly, since the tape runs continuously rather than intermittently.

SECTION IV  
THEORY OF OPERATION

4-1. PLAYBACK/LOGIC BOARD CIRCUIT DESCRIPTION

4-2. CONFIGURATION

The Playback/Logic board contains the playback amplifiers for the program tracks, the output audio muting, the cue track amplifier, the 1 kHz stop cue sensor, and the stop/start logic. When the optional Q Trips are installed, the Q1 150 Hz and Q11 8 kHz sensors are incorporated on this board. Additionally, the 3 kHz stop cue sensor required for units equipped with the fast forward option is mounted on this board.

In all, there are eight possible configurations of the Playback/Logic board as shown in the assembly diagram in Section VI. The exact configuration used in a particular machine is indicated in Table 3-1. This varies depending upon whether a unit is monophonic or stereophonic, equipped with Q Trips, or equipped for single speed, manual or automatic fast forward. The schematic diagram in Section VI shows the most complex arrangement required for a stereophonic machine with all options.

4-3. PROGRAM CIRCUITRY

The program tracks of the playback head are coupled through C11 (C17) to the input of the preamplifier IC-1A (IC-1B). This dual integrated circuit amplifier provides gain and equalization as determined by the network R1 (R3), R2 (R4), R10 (R11), R34 (R33), C1 (C4). The variable high and low frequency trimmers permit adjusting the equalization to match individual heads to NAB or other standards (IEC, CCIR, etc.). Internal dc voltage is supplied to both halves of IC-1 through pin 14 from the decoupling network R26, C13. Bias dc is provided from the voltage divider R20, R25, C12 through R19, R24.

The output of the preamplifier is coupled through C26 (C25) to the FET program muting switch Q5 (Q6). This N channel device is controlled by the logic so that a ground on either CR7 or CR8 shuts off the audio signal. This is provided whenever the machine is in the stop mode or when units equipped for automatic fast forward are so operating. Bias (12 VDC) for the FET is provided from the voltage divider R35, R98, C24 through R36, R37, (R38), R39, (R48). Filtering is provided by C23 which shunts to ground any ac appearing on the gate.

The output of the FET is coupled through C27 (C28) to the output level control R15 (R16) mounted on the playback board. The audio signal is also available through board pin 14 (13) for the VU meter installed in record/playback models.

Signal from the level control is coupled through C30 (C31) to the output booster IC-3. This dual amplifier and the complementary symmetry drivers Q4, Q3 (Q1, Q2) provide 28 dB gain to drive the output to a maximum +18 dBm. This gain is determined by R42 (R47), R41 (R46). DC bias for Q3, Q4 (Q1, Q2) is provided by CR4, CR5, CR6 (CR1, CR2, CR3). Bias for IC-3 is supplied from the divider R16, R17, C10 through R40, R49 and internal voltage directly from the +24 VDC.

The fully amplified signal is coupled through C22 (C21) to the primary of the output transformer and the headphone jack. (The transformer adds 6 dB of gain to the output signal which then appears at the output connector).

#### 4-4. CUE TRACK AUDIO AND ONE KILOHERTZ STOP SENSOR

The cue track of the playback head is coupled through C15 to the input of IC-2A which acts as a preamplifier with gain and equalization comparable to the program preamplifiers as provided by R21, R22, R23 and C14. Bias for IC-2A is supplied through R15 from voltage divider R17 and R16.

The output of the preamplifier is direct coupled to the booster IC-2B. Inverting amplifier IC-2B provides 27 dB of gain as determined by R27 and R28. The amplified signal is coupled through C20 to the cue output (on the rear panel remote control connector) through pin 19 and to the 1 kHz sensor level control (R8).

The signal is coupled through C43 to a fixed tuned twin-T filter composed of IC-4A, R84, R85, R86, C44, C45 and C46. The 1 kHz output of the filter is ac coupled to half wave rectifier CR21, CR22. Capacitor C58 and resistor R97 provide filtering. The FET Q10 is connected to ground the signal to disable the sensor. In the stop mode, the gate of Q10 grounds to the stop/start logic through CR15 and R100 to turn on Q10. When the ground is removed as the logic changes to the run mode, C55 keeps Q10 in conduction (and the sensor muted) for approximately three seconds. Similarly, the gate of Q10 can ground through R95 and CR17 to the fast forward cue shift/mute bus. Removing this ground activates the sensor immediately.

The dc signal from R75 is connected to comparator IC-6D. When this voltage exceeds the reference from R57, R99, connected through R72, the output of IC-6D goes to +VDC to deliver a pulse through C39 to the stop control.

#### 4-5. OPTIONAL THREE KILOHERTZ STOP SENSOR

In units equipped for operation at both the normal and fast forward (3X normal) speeds, a 3 kHz stop sensor is also installed. Signal is taken from the 1 kHz level control (R8) to FET Q7. In this case the sensor is active only when the FET is conducting. This is accomplished by grounding the fast forward cue shift/mute bus.

The mute is gradually removed as C34 discharges through R55. Even if the tape is not up to full 3X normal speed, a stop tone can be sensed, since the normal 1 kHz sensor is slowly turning off as the 3 kHz sensor is turned on. When the ground is removed, Q7 immediately shuts off to disable the 3 kHz sensor.

Following Q7 the audio signal is fed to LC filter L1, C41, and to IC-4B for amplification. The output is rectified, filtered, and fed to comparator IC-6B. With 3 kHz tone present at the filter, the output of IC-6B goes high to deliver a positive pulse through CR13 and C39 to the stop control.

#### 4-6. OPTIONAL Q-TRIP SENSORS

When equipped with the optional QI 150 Hz and QII 8 kHz auxiliary cue tones, separate sensors are installed. These are similar in operation to the 1 kHz sensor. Signal is taken from the output of the cue track booster amplifier (IC-2B) through separate level controls to a fixed tuned active filter. The signal is then rectified and fed to a comparator which delivers a +VDC output during tone presence to drive relays located on the power supply. To prevent chatter by these relays when the ac power is turned on, C36 keeps the reference voltage higher than normal until the circuit stabilizes. At turn-off, C61 and CR24 hold the reference voltage as the power supply shuts down. Muting is accomplished by grounding the input to the comparator by the fast forward cue shift/mute bus. The 150 Hz (Q1) tone is sensed by IC-5B, IC-6A while the 8kHz (Q11) tone is sensed by IC-5A and IC-6C.

#### 4-7. STOP/START LOGIC

Stopping and starting are controlled by the flip-flop composed of Q8 and Q9. The circuit is a bistable multi-vibrator in which Q9 is conducting and Q8 is off, or Q8 is conducting and Q9 is off. When Q8 is off the collector is not drawing current and is at a 18 VDC level. This voltage is carried through R52 to the base of Q9 to hold Q9 in full conduction. Likewise, when Q9 is off, the voltage from its collector goes to the base of Q8 through R53 to hold Q8 in full conduction. The flip-flop will change state when a positive voltage is applied to the base of the non-conducting transistor. This is accomplished through coupling resistors R61 and R61. To prevent false triggering, capacitors C60 and C33 shunt short duration transient pulses to ground. When power is first applied, R54 ensures that the flip-flop will set to stop with Q9 conducting. The output voltages from Q8 and Q9 are available on the board pins M and 9 for use in the logic on the power supply and record boards.

#### 4-8. POWER SUPPLY BOARD

#### 4-9. CONFIGURATION

The Power Supply board contains the +24 VDC supply for the electronics, the +30 VDC supply and controlling circuitry for the solenoid, and the logic driver circuits. In units equipped with the optional Q-Trips, the QI 150 Hz and QII 8 kHz relays are mounted here. In units equipped with the optional fast forward provision, the motor control circuitry is incorporated on the Power Supply. The Power Supply is manufactured in four versions. The schematic diagram included shows the most complex configuration in which the Q-Trip and fast forward options are both included. The assembly diagram with parts lists is also included.

#### 4-10. VOLTAGE SUPPLIES

Separate secondary windings on the power transformer provide 30 VDC through J1 to diode bridge rectifiers CR1 and CR2. The low current for the amplifiers is supplied by CR1. Diodes CR16 and CR17 provide reverse voltage protection to regulator mounted on the outside of the rear panel. The regulator provides +24 VDC controlled within 24 mV with internal current and thermal overload protection. Voltage for the logic and solenoid are supplied directly from the output of CR2. Capacitor C5 provides filtering for this high current source.

#### 4-11. SOLENOID CONTROL

When the logic is in the stop mode, the base of Q5 is grounded to the flip-flop on the Playback/Logic board. The voltage on Q5 collector is high and zener diode CR20 conducts which delivers current to Pin 2 of IC1. With this current present, IC1 shuts off base drive to the 2N3055 solenoid driver located on the rear panel. The solenoid remains in the deenergized position. In this mode, pin 13 of IC1 is pulled low which turns on FET Q3. FET Q3 allows C9 to charge to a higher voltage than is present with R20. When the logic changes to the run mode, the base of Q5 goes high to turn Q5 on. The run lamp and the record logic ground to Q5 through CR12 and CR13. Diode CR20 stops conducting and IC1 delivers base drive to the solenoid driver. The voltage across the 3.3 Ohm resistor located on the inside rear panel (current through the solenoid) is input to IC1 at pin 4. IC1 will deliver base drive to keep the voltage at Pin 4 equal to the voltage at Pin 5. When the START mode is first initiated, the voltage on IC1 Pin 5 is high due to C9 being charged by Q3. IC1 delivers enough base drive to the solenoid driver to saturate this device. This places the full 30 volt supply (less 2N3055 and 3.3 Ohm drop) across the solenoid to assure fast accurate pull in. Pin 13 of IC1 goes high and Q3 turns off. Capacitor C9 discharges to a new voltage determined by R20. IC1 lowers the solenoid drive base drive until the voltage at IC1 Pin 4 equals that at Pin 5. This loop insures a constant voltage across the 3.3 Ohm resistor (constant solenoid current).

In the STOP mode, the base of Q7 goes high from the flip-flop on the playback board. Transistor Q7 turns on to provide a ground for the stop lamps and the record logic through CR13 and CR15. (The front panel stop switch lamp +24 VDC supply is connected through the deck microswitch so that this lamp lights only in the STOP mode when a cartridge is loaded).

#### 4-12. FAST FORWARD AND Q-TRIP RELAYS

The ac voltage for the drive motor is supplied from the power transformer primary through J1 and J2. When equipped for either manual or automatic fast forward, relay K1 is installed to switch power to the normal or high speed windings as required. Capacitors C1, C2, C3, and C4 provide arc suppression during switching.

When K1 is relaxed the normal speed windings are connected. The high windings are connected by energizing K1 by turning on Q2 and supplying a ground path to R6. Transistor Q2 can turn on by connecting its base through CR5. In playback units terminal P is connected directly to ground. In record models, this point is connected to the record logic so that a ground is supplied only in the playback mode (not in the record mode). The other side of the coil of K1 can only ground through CR7 and Q5 in the playback (run) mode. This can be accomplished in two separate ways.

When the front panel switch is placed in the ADVANCE position R6 is connected directly to CR7 to energize K1. The cue tone sensors on the Playback/Logic board receive a ground through terminal 15 to mute the 1 kHz, 150 Hz, and 8 kHz sensors while enabling the 3 kHz sensor. Diode CR6 prevents the audio muting circuit at terminal S from grounding.

The unit goes into fast forward and will stop on a stop cue tone. The program material on the tape is not shut off from the output jack. When the switch is released, K1 deenergizes to return the unit to normal speed.

When equipped with the option for automatic fast forward SCR Q1 is installed as well as driver Q4 which is controlled by the QI 150 Hz cue tone sensor on the Playback/Logic board. When the 150 Hz QI tone is present the QI control at terminal B goes high to turn on Q4. Relay K2 energizes providing a ground for the QI lamps and K2. Relay K2 energizes to close the normally open contacts available on the remote control connector. When the tone ends, the control goes low and shuts off Q4. A positive pulse is delivered by C10 through CR3 and S1 to the gate of SCR Q1. This pulse turns Q1 on to ground relay K1. Both the cue shift/mute and the audio mute buses ground. The unit goes into fast forward and shuts off the audio output. The unit remains in high speed until the stop tone is sensed by the 3 kHz sensor. When the unit stops, Q5 shuts off so that SCR Q1 no longer can conduct current. Q1 turns off to deenergize K1 and deactivate the cue shift/mute and audio mute buses. Manual operation of the ADVANCE switch in the automatic fast forward mode will turn off Q1 and return the unit to normal speed operation without stopping.

Relay K3 associated with the QII 8 kHz cue sensor works in the same manner as K2. When the QII 8 kHz tone is present, the base of Q6 goes high to turn on Q6 and K3. Contacts on K3 supply provide the closure available on the remote control connector. When the tone ends, the control at terminal A goes low to turn off Q8 and K3.

#### 4-13. RECORD AMPLIFIER/BIAS BOARD

#### 4-14. CONFIGURATIONS

The Record Amplifier/Bias Board, installed only in record models, contains the program track record amplifiers, the record input transformers, the 100 kHz record bias oscillator, and the cue track record control. Separate versions are manufactured for monophonic and stereophonic machines. The assembly and its parts are shown in Section VI.

#### 4-15. BIAS OSCILLATOR

Transistors Q11 and Q12 form a push-pull oscillator providing a 100 kHz sine wave voltage. The primary of T3 and C39 form a tuned circuit resonant at 100 kHz. Positive feedback is provided by C24 and C25. To ensure smooth cut-off and minimize distortion, negative feedback is supplied to the nonconducting transistor by C26. Bias voltages for the transistors are supplied by R55, R56, R58 and R61. Emitter dropping resistors R54 and R57 provide a small amount of negative feedback to maintain purity of the 100 kHz output.

Transistor Q13 controls the oscillator. When the base of Q13 is grounded through CR1 to the record flip-flop, Q13 turns on to supply +24 VDC to the oscillator. To minimize starting transients, C23 provides a gradual turn-on. The oscillator runs whenever the unit is in the record mode.

To provide isolation and minimize cross talk, the secondary of T3 is divided into two parts. Bias for the program tracks is taken from transformer terminal 5; bias for the cue track is taken from terminal 7.

#### 4-16. PROGRAM TRACK RECORD AND BIAS CONTROL CIRCUITRY

The rear panel line and microphone input jacks are connected to separate windings of T1 (T2). The secondary of the transformer is directly coupled to the input of the preamplifier IC-1A (IC-1B). Gain in this stage is switchable 0 dB (LO) for use with line level sources or 35 dB (HI) for microphone input. The gain is determined by R15 (R17) and R14 (R16) as selected by S1. The frequency response of the preamplifier is flat. Bias is provided from the voltage divider R18, R19, and C3.

The output of IC-1A (IC-1B) is coupled through C4 (C5) to the front panel record level control. The output of the level control is returned to the Record Amplifier/Bias Board and to the VU meter amplifier (on the Record Control and Generator Board Signal is coupled through C11 (C12) to booster amplifier IC-2A (IC-2B) which supplies an additional 32 dB of gain as determined by R24 (R21) and R25 (R26). Bias for IC-2A (IC-2B) is supplied through R22 (R23).

Following amplification, the signal is coupled through C13 (C10) to the record equalizer. The record equalization network is composed of R5 (R4), R30 (R29), R31 (R32), R27 (R28), C15 (C14). The high frequency trimmer R5 (R4) permits adjusting the equalization for the individual head, type of tape used, and the various standards (NAB, IEC, CCIR, etc.).

The equalized signal is coupled through C17 (C16) to the head driver amplifier Q2 (Q3). This stage provides sufficient current to drive the record head. The amplified signal is coupled through C32 (C33), R39 (R42) to the program record control FET Q4 (Q5). This P channel FET is held off by voltage supplied to the gate through R47 and R49. When the unit is in the record mode, the gate grounds to the record flip-flop through CR6. The FET conducts to allow the program signal to reach record head. At all other times the signal is shut off.

Following the FET, the program signal is coupled through the bias trap C35 (C38), L1 (L2) which prevents the high level bias from overloading the record amplifiers. The variable inductor permits tuning the bias trap to the exact frequency of the bias oscillator. Following the bias trap, the audio signal is mixed with the bias supplied through R3 (R2) and R64 (R63). The variable bias control permits adjusting the bias level for optimum recording from the particular tape used.

To prevent bias from appearing on the program track of the record head except in the record mode, the switching circuit Q8, Q6 (Q7) is conducting C28 (C29) shunt the bias to ground. The base of Q6 (Q7) is connected through zener diode CR3 (CR4) and R46 (R45) to +24 VDC to permit Q6 (Q7) to conduct. In the record mode the base of Q8 is drawn towards ground through CR5 to the record logic. Transistor Q8 begins conducting to bring down the base of Q6 (Q7) to shut this device off and to restore the bias. When the record logic is not in the record mode, the base of Q8 is held high through R50 and R51 to keep Q8 turned off. The bias is again shunted as Q6 (Q7) is held in conduction.

Transistor Q1 in conjunction with C7 and C6 provide noise decoupling for +24 VDC supply for the record amplifiers.

#### 4-17. CUE CIRCUITRY BIAS CONTROL

The audio signal for the cue track is supplied from the Record Control and Tone Generator Board to terminal 19. The audio is coupled through the bias trap (C37, L3, C40) as in the program circuitry. The audio is mixed with the bias from R1, R62 and supplied to the cue track of the record head. As in the program circuitry switching transistors Q9 and Q10 are employed to shunt the bias except when cue tones are actually being recorded. When Q10 is conducting, the bias is shunted. When Q10 is turned off by Q9 drawing the base of Q10 low, the bias is supplied to the head.

Transistor Q9 is turned on by a positive voltage supplied to its base through R52. This voltage is supplied by the cue bias switch control on the Record Control Cue Generator Board when any of the cue generators are running or when the external cue record is activated.

#### 4-18. RECORD CONTROL AND TONE GENERATOR BOARD

#### 4-19. CONFIGURATIONS

The Record Control and Tone Generator Board installed in record models incorporates the record logic flip-flop, the VU meter amplifier, and the 1 kHz stop cue generator. In units equipped with the QI 150 Hz and QII 8 kHz Q-Trips, the generators for these cue tones are also included. The board is built in four different configurations depending on whether monophonic or stereophonic and whether or not Q-Trips are installed. These versions are shown in Section VI.

#### 4-20. RECORD LOGIC FLIP-FLOP

Transistors Q8 and Q9 form a bistable multivibrator (flip-flop) which enable the record electronics in the record mode and disable the record electronics at all other times. The two states of the flip-flop are Q9 conducting, Q8 off or Q8 conducting, Q9 off. When Q8 is off the collector is not drawing current and is at a 18 VDC level. This voltage is carried through R40 to the base of Q9 to hold Q9 in full conduction. Likewise when Q9 is off, the voltage from its collector goes to the base of Q8 through R41 to hold Q8 in full conduction.

The flip-flop will change state when a positive voltage is applied to the base of the nonconducting transistor. This is accomplished through coupling resistors R43 and R69. Capacitors C16 and C17 prevent false triggering by shunting short duration pulses. Resistor R42 sets the flip-flop to stop (not-record) when power is first applied.

When the record switch is depressed, a positive pulse is delivered to R45. If the unit is in the RUN mode this pulse will ground through CR15 to the RUN logic on the Power Supply Board. If the unit is in the STOP mode the pulse will be conducted through CR14 to set the flip-flop to record (Q8 conducting). With Q9 off Q13 turns on to supply a ground to the record indicator lamp and the program record circuitry on the Record Amplifier/Bias Board.

When the STOP switch, 1 kHz (or 3 kHz) cue sensor, or the deck microswitch (if the cartridge is withdrawn) supply a positive pulse to R69, Q9 will begin to conduct and Q8 will turn off. The base of Q12 will go high to supply a ground to the flip-flop record interlock. Transistor Q13 turns off to remove the grounds to the record lamp and program control.

#### 4-21. ONE KILOHERTZ STOP CUE GENERATOR AND CONTROL

The stop cue tone generator is composed of IC-2A and IC-2B which oscillates at 1 kHz as determined by R11, R58, R59, C14 and C15. The generator oscillates when positive feedback is available through R48 and R49. The output of the generator is taken through R55, C18, level control R6, R46, and C12 to Q5. This emitter follower stage acts as a current source to drive the cue record head. The cue output is taken from terminal 7 to the Record Amplifier/Bias Board.

The 1 kHz generator is controlled automatically to record a stop cue tone burst when the unit first starts in the record mode. This control is accomplished by IC-2C and IC-2D which are comparators in cascade to form a mono stable multivibrator. A 12 VDC reference is supplied to IC-2C and IC-2D through R64 and R66 from voltage divider R60 and R61. The output of the multivibrator will go high only when the input from R62 goes high.

A positive 24 VDC is available on S1. Normally S1 is set to the ON position. (The OFF position allows starting the unit in the record mode without recording a stop tone. This might be required in editing, for example.)

In the ON position +24 VDC is applied to R29. If the record logic is not set for record, the voltage will ground through CR8 to Q12. Similarly, the voltage will ground to the 1 kHz record interlock through CR9 if the unit is in the stop mode (tape not running). If these conditions are met the voltage will be applied through CR7 and CR18 to IC-2C. This causes IC-2C to go high; this is carried through C28 and R63 to send IC-2D high. When C28 charges fully, the dc path to IC-2D is blocked. The output of IC-2D goes low and remains low until IC-2C is unlatched and relatched.

When the multivibrator goes high, this voltage is supplied through CR17 and CR24 to the cue bias switching circuit on the Record Amplifier/Bias Board. This turns on the recording bias to the cue track. The output of the multivibrator also turns on the 1 kHz generator by turning on FET Q10. Voltage is applied to the gate of Q10 through R67 but is shunted to ground through CR20 and R68. The gate is applied to the gate of Q10 through R67 but is shunted to ground through CR20 and R68. The FET is held nonconducting and the generator is held off. When the multivibrator goes high, CR20 is back biased through CR16 to allow Q10 to turn on. When the multivibrator goes low, Q10 turns off and shuts down the generator. Since the multivibrator has a time constant of approximately three quarters second, a stop tone burst that length is recorded on the cue track.

#### 4-22. AUXILIARY CUE TONE GENERATORS AND CONTROL

When the optional Q-Trips are installed, 150 Hz and 8 kHz generators which are similar in operation to the 1 kHz generator are employed. These are two stage operational amplifier oscillators, IC-3A - IC-3B (150 Hz), IC-3C - IC-3D (8 kHz). The frequency is determined by the network R10 (R12), R50 (R92), R51 (R91), C22 (C24), and C23 (C25). Oscillation occurs when positive feedback is supplied by R73 (R93, R94). The output of the generator is supplied through the level control R8 (R7) to the cue head driver Q5.

To permit recording from an external generator, the rear panel external cue input is connected through a separate level control (R9) to Q5.

The Q-Trip generators are not automatically controlled by the machine but manually by the front panel switches or through a separate level control connector. The FET in the feedback circuit, Q11 (Q15), is held off. The voltage on its gate is shunted through CR21 (CR22) and R82 (R83) to ground. When a positive voltage is supplied to the Q control through CR29 (CR28), CR21 (CR22) is back biased to allow the FET to turn on. When the control goes low, the FET is again shut off.

When the Q control is high, the voltage is also applied through CR26 (CR27) and CR24 to the cue bias switch to enable the bias switching (on the Record Amplifier/Bias Board). To supply bias to record an external signal on the cue track positive voltage must be supplied from the remote control connector through CR25 to the cue bias switch.

To permit recording the Q-Trips or an external tone in the playback mode, transistor Q14 is installed. A positive voltage on the 150 Hz, 8 kHz, or external cue controls is coupled through R5 and CR23 to the base of Q14. Transistor Q14 turns on to supply a ground to terminal 6 to turn on the bias oscillator. The cue generators run, and the cue track receives bias from the bias oscillator, so a cue tone is recorded. The program track is undisturbed, since the program bias and audio are not turned on.

#### 4-23. VU METER AMPLIFIER

The front panel VU meter (two in stereo models) display the output level in playback and input level in record. The input signal is brought in from the Record Amplifier/Bias Board through calibration trimmer R2 (R4) to P channel FET Q2 (Q4). The output signal is brought in from the Playback/Logic Board through calibration trimmer R1 (R3) to N channel FET Q1 (Q3). These FET's are used to switch the input signal to the meter amplifier.

Bias voltage (+12 VDC) is supplied to the FET's from the voltage divider R30, R31 through R13 (R22), R15 (R23), R17 (R24). This keeps Q1 (Q3) in conduction and Q2 (Q4) shut off. Only the playback signal reaches the meter amplifier. When the record logic is in the record mode, a ground is applied to the gates of the FET's through CR1 (CR6) to Q13. FET Q1 (Q3) turns off and Q2 (Q4) turn on to connect the record signal and disconnect the playback.

The output of the FET switching is direct coupled through R18 (R36) to the amplifier IC-1A (IC-1B). Capacitors C1 (C3) and C5 (C9) act as blocking capacitors for the dc bias on the FET's. Bias for IC-1A (IC-1B) is supplied from R17 (R24). After amplification, the signal is rectified by bridge rectifier CR2 (CR10), CR3 (CR11), CR4 (CR12) and CR5 (CR13) to drive the VU meter.

Transistor Q7 provides power supply decoupling and a controlled turn on for the VU meter circuit. When ac power is first applied to the unit the meter circuit is damped to prevent full scale deflection.

#### 4-24. DELAY OPTION

The delay board contains the logic circuitry enabling the unit to operate in the delay mode. This board is located on the deck of the unit.

When the unit's logic is in the record mode, the cathode of diode CR3 is grounded and the release bias is loaded through R5.

When the DELAY switch/indicator is depressed, +24 VDC is momentarily applied to the base of Q2 through R3, turning Q2 on and passing current to ground through CR3. This action pulls the base of Q1 low. Current through R1 and CR2 to the base of Q1 through R3 latches the logic circuit in the delay mode. At the same time, Pin 5, which is connected to one side of the DELAY indicator, also goes low and the DELAY indicator illuminates. Relay K1 energizes since one side of the coil is tied to the DELAY indicator. The bias current is routed through C2 to the erase head through the normally open contacts of K1.

Release from the delay mode occurs when the unit is placed in the STOP mode (or not in the record mode) and the cathode of CR3 is no longer tied to ground. This action causes the base of Q1 to go high, turning the stage off. This in turn turns Q2 off.

SECTION V  
MAINTENANCE

5-1.        ROUTINE MAINTENANCE

Routine cleaning of the printed circuit board and connector contacts is not necessary. In case of intermittent operation, however, clean the contacts by spraying with an aerosol contact cleaner. Do not use a cleaner with abrasives. To work grime free, polish the contacts lightly with a soft pencil eraser. Be sure the power is disconnected.

Accumulated dust should be cleaned out of the chassis with a soft brush. Fingerprints and smudges can be removed from the chassis with a cloth moistened with a household ammonia solution.

At least quarterly, the performance of the electronics should be checked and compared with the Acceptance Test Results supplied by Broadcast Electronics with each Series 3000 unit.

5-2.        EXTENDER BOARD

As an aid in troubleshooting the plug-in modules, the optional 919-1504 extender board is available. This accessory raises any module approximately 3 inches above the chassis.

5-3.        COMPONENT REPLACEMENT ON PRINTED CIRCUIT BOARDS



AC POWER MUST BE TURNED OFF WHEN PRINTED  
CIRCUIT BOARDS ARE REMOVED OR REPLACED.

Great care should be exercised when working on printed circuit boards, since excessive heat may cause the foil to peel off. The Broadcast Electronics warranty on printed circuit boards is void if boards are damaged by improper handling.

When replacing components on a printed circuit board, use a small soldering iron (15 to 30 watts with a small tip). Use a brush or desoldering tool to remove excess solder. Protect the board contacts with masking tape and mount gently in a small vise.

Touch the iron to the connection to be unsoldered. When heated, quickly remove the iron and brush away the excess solder. Be careful that no solder splatters onto the board. Unbend the leads with a small pair of needle nose or diagonal cutting pliers and remove the component.

## **NOTE**

WHEN REPLACING MULTI-PIN COMPONENTS (TRANSFORMERS, CONNECTORS, ETC.) DESOLDER INDIVIDUALLY ALL THE PINS BEFORE ATTEMPTING TO REMOVE THE COMPONENT. IT IS VIRTUALLY IMPOSSIBLE TO HEAT ALL THE PINS SIMULTANEOUSLY.

Check the mounting holes in the board to be sure they are clear of solder and open before mounting the replacement. Put the leads through the holes and trim the leads to about 1/8 inch. Bend the leads over so they touch only the foil strips the leads are to be soldered to.

Touch the iron to the leads and let the solder flow onto the foil. Always use a fine rosin core solder such as No. 20 gauge. Check for "bridges" of solder between adjacent foil strips.

Clean the flux off the connection with alcohol. Solder flux left on the printed circuit board may cause noise in the circuit. If the contacts were covered with masking tape, clean them also with alcohol.

### 5-4. MODULE LOCATIONS AND ADJUSTMENT POINTS

The locations of the electronic modules are shown in the assembly diagrams in Section VI. Individual electronic parts are listed by boards in Section VI. The electronic adjustments are accessible through the card cage cover immediately behind the tape deck. All adjustments are labeled for easy reference.

### 5-5. ELECTRONIC ADJUSTMENTS

### 5-6. GENERAL

Before adjusting the electronics, clean the tape head(s) with BE-903 cleaning fluid or isopropyl alcohol. Be sure the playback (and record) head is properly aligned. In record models, the playback electronics should be adjusted before adjusting the record section.

An NAB standardized test and alignment cartridge is required for proper adjustment of the unit. The electronics may be adjusted to another standard (such as IEC, CCIR) by use of an alignment cartridge recorded to that standard. In all cases, refer to the manufacturer's instructions supplied with the cartridge.

## **WARNING**

BE CERTAIN THE LARGE ELECTROLYTIC CAPACITORS ON THE POWER SUPPLY BOARD AND THE MOTOR CAPACITORS ON THE CHASSIS ARE FULLY DISCHARGED BEFORE ATTEMPTING MAINTENANCE INSIDE THE UNIT.

5-7. PROGRAM PLAYBACK ADJUSTMENTS

5-8. OUTPUT LEVEL

While reproducing the operating level tone from the test cartridge, adjust the R OUT and L OUT controls on the Playback/Logic board for the desired output as measured on an external VU meter connected to the output.

5-9. PLAYBACK EQUALIZATION

While reproducing the frequency response series of tones from the test cartridge, adjust the PLAY EQ controls located on the Playback/Logic board. Adjust the LF R and LF L controls so that no tone between 50 Hz and 1,000 Hz rises more than 1 dB above the frequency response reference tone. Adjust the HF R and HF L so that the tones between 10 kHz and 18 kHz are within +1, -2 dB of the reference tone.

5-10. VU METER CALIBRATION (REPRODUCE UNITS ONLY)

Once the output level is set as described in Step 1, adjust the METER CAL R PLAY and L PLAY for a front panel VU meter indication of 0 VU while reproducing the operating level tone.

5-11. CUE SENSITIVITY ADJUSTMENT

The cue tones sensors are adjusted to operate on a tone at a level below the NAB standard cue tone levels. This allows for variations in tone level caused by tape wear, etc. At the factory, Series 3000 units are adjusted to sense tones 6 dB below the NAB standard levels.

When a cue tone test cartridge is available with tones recorded at a level below the NAB standard cue tone level, the sensors may be adjusted while reproducing the cue tone test cartridge.

During the 1,000 Hz stop tone, adjust the CUE SENS 1 kHz control so that the sensor just triggers and stops the unit. During the 150 Hz tone, adjust the CUE SENS 150 Hz control so that the sensor just triggers to light the Q1 150 Hz tone. During the 8,000 Hz tone, adjust the CUE SENS 8 kHz control so that the sensor just triggers to light the Q11 8 kHz indicator lamp.

**NOTE**

WHEN ADJUSTING THE 1 KHZ CONTROL WAIT 3 SECONDS  
AFTER THE CARTRIDGE STARTS. THIS SENSOR IS  
DISABLED FOR THIS TIME.

If a cue tone test cartridge is not regularly available, tones from an audio signal generator may be used to adjust the sensors. However, a cue tone test cartridge or cue tone recording of known quality must be available initially to determine the signal levels required. Proceed as follows:

1. Connect an oscilloscope to the cue playback output. Reproduce prerecorded cue tone known to be recorded at NAB cue tone level. Measure the peak to peak amplitude of the tone on the oscilloscope. Record this measurement for future reference.
2. Disconnect the ac power and mount the Playback/Logic board on the 919-1504 extender card. Referring to the assembly diagram, connect the signal generator to terminal 7 with the generator shield to terminal 6. (A 10 Ohm load is provided, so install a 560 Ohm resistor in series with the generator if its output impedance is 600 Ohms.) Reconnect the ac power. Observing the oscilloscope adjust the generator output to yield an amplitude one-half that measured in step 1.
3. Do not load a cartridge in the unit, but manually actuate the microswitch on the deck and operate the controls. Set the CUE SENS controls to minimum (extreme counter-clockwise). Adjust the controls until the sensor just triggers.

5-12. PROGRAM RECORD ADJUSTMENTS

5-13. BIAS TRAP TUNING

Disconnect the ac power and mount the Record/Amplifier Bias printed circuit board on the 919-1504 extender card. Referring to the assembly diagram connect an oscilloscope to test point L. Reconnect the ac power and place the unit in the record mode. With a non-metallic screwdriver, tune L1 for minimum 100 kHz signal as observed on the oscilloscope. In stereo units, reconnect the oscilloscope to test point R and tune L2. When finished, disconnect the ac power remove the extender board. Remount the Record Amplifier/Bias Board in the unit, and replace the card cage cover.

5-14. PROGRAM BIAS LEVEL

**NOTE**

THE BIAS SUPPLIED TO THE RECORD HEAD IS MOST IMPORTANT IN PROVIDING OPTIMUM FREQUENCY RESPONSE AND DISTORTION. BIAS REQUIREMENTS VARY BETWEEN BRANDS OF TAPE (AND BETWEEN SERIES OF ONE BRAND). IF MORE THAN ONE TYPE OF TAPE IS IN USE, CHECK THE PERFORMANCE OF EACH TYPE AT ITS OPTIMUM BIAS LEVEL OF OTHER TYPES. WHERE OLDER AND NEWER TYPES ARE BOTH IN USE (SUCH AS 3M154 AND 3M156), BIAS JUST LESS THAN THE OPTIMUM FOR THE NEWER TYPE USUALLY IS AN ACCEPTABLE COMPROMISE.

Load a bulk-erased cartridge in the unit. Connect an audio signal generator to the line record input. Set the generator for 1,000 Hz at a level of 0.5V. Adjust the record level control for -10 VU on the front panel meter. Connect an oscilloscope to the output and begin recording. Observe the oscilloscope and adjust the BIAS LEVEL L and R controls for the peak output with no distortion of the 1,000 Hz wave form.

5-15. VU METER CALIBRATION

While recording the 1,000 Hz tone, adjust the record level control until the external meter indicates the output level set in 5-7. Now adjust the METER CAL R REC and L REC so that the front panel VU meter indicates 0 VU.

5-16. RECORD EQUALIZATION

Set the signal generator for 15 kHz and reduce the generator output level 10 dB. DO NOT ADJUST THE FRONT PANEL LEVEL CONTROL. While recording the 15 kHz tone, adjust the REC EQ L and R for 10 dB below the output level set in 5-7.

5-17. CUE RECORD ADJUSTMENTS

5-18. BIAS TRAP TUNING

Referring to 5-12 connect an oscilloscope to test point Q on the Record Amplifier Board. Referring to Wiring Diagram, activate the external cue record control by connecting remote control terminal 21 to 20. With a non-metallic screwdriver, tune L3 for minimum 100 Hz signal as observed on the oscilloscope.

5-19. CUE BIAS LEVEL

Connect an audio signal generator to the external cue input and reconnect the oscilloscope to the cue playback output (refer to Wiring Diagram). Set the generator for 1,000 Hz at a level 10 dB below the reference amplitude determined in Section 5-11. Load a bulk-erased cartridge in the unit, activate the external cue record control, and begin recording the 1,000 Hz tone from the signal generator. Observing the oscilloscope, adjust the BIAS LEVEL Q control for the peak output with no distortion of the 1,000 Hz wave form.

5-20. CUE TONE GENERATOR FREQUENCY

The frequency of the 1 kHz, optional Q1 150 Hz, and optional QII 8 kHz cue generators are adjusted by trimmers R11, R10, and R12 on the Record Control and Tone Generator Board. These controls are set at the factory and should not require subsequent adjustment.

5-21. MECHANICAL ADJUSTMENT AND MAINTENANCE

## 5-22. MECHANICAL SYSTEM

A hysteresis, synchronous motor provides direct capstan drive for the Series 3000. Normally equipped with a single speed motor, a two speed motor is installed in models equipped for optional fast forward cueing. The motor is attached directly to the underside of the tape deck with the capstan shaft extending up above the deck surface.

The pressure roller in combination with the capstan shaft drives tape. Movement of tape is initiated by a dc air damped solenoid connected to the roller shaft with a chain.

The tape head or heads are mounted on a bracket attached to the top surface of the deck. All models are equipped with the unique PHASE LOK III head bracket which permits independent azimuth adjustment with full three plane head movement. Three independent tape guides are mounted to the deck surface adjacent to the head bracket(s). A cartridge hold down clip mounted above the tape guides applies pressure to the top of the cartridge at the head openings to prevent cartridge movement. Side cartridge movement is prevented by an adjustable left hand guide bracket.

## 5-23. MAINTENANCE

### 5-24. CLEANING

Once a day the heads, capstan, and pressure roller should be cleaned.

### 5-25. DEMAGNETIZING

At least once every month the heads should be demagnetized with a head degausser.

### 5-26. CARTRIDGE MAINTENANCE

The cartridge is the second half of the tape cartridge system. The cartridge needs regular care just like the cartridge recorder or reproducer. Check the cartridge before adjusting the machine.

The tape should be inspected regularly and frequently for obvious signs of wear. Cartridges should be rewound or replaced when the oxide side of the tape is shiny. If possible only one type of tape should be in use in an installation. Different brands, and even different types of the same brand, require different bias recording levels for optimum response. When rewinding cartridges use only a graphite lubricated tape. Silicone lubricated tapes cannot stand up to the rugged service in a cartridge.

A deformed shell can adversely affect frequency response by distorting the path the tape travels. In particular, a warped cartridge may cause the tape to traverse the head openings in an arc or bowed path rather than a straight line.

Periodically the cartridge center post should be cleaned. Gummy deposits on the post, in effect, increase tape tension by not allowing the tape hub to turn freely. Equally important to free movement of the hub is the teflon washer. Periodically check the pressure pads to see that they are lined up squarely with the tape.

The most frequent cause of distortion of the tape path in the cartridge is a loose corner post. The post should always be glued down so that there is 1/4 inch between the shoulder of the post and the shell. If the post is high the tape will not run straight across the heads. A loose post frequently causes muffled-sounding audio when the cartridge unit starts.

5-27. MECHANICAL PARTS REPLACEMENT

**WARNING**

BE CERTAIN THE LARGE ELECTROLYTIC CAPACITORS ON THE POWER SUPPLY BOARD AND THE MOTOR CAPACITORS ON THE CHASSIS ARE FULLY DISCHARGED BEFORE ATTEMPTING MAINTENANCE INSIDE THE UNIT.

5-28. MOTOR REPLACEMENT

**NOTE**

CARE MUST BE EXERCISED IN HANDLING AND STORING MOTORS TO AVOID DAMAGING THE BEARINGS. STORE SPARE MOTORS IN THE ORIGINAL PACKAGING. DO NOT HANDLE THE MOTOR BY THE SHAFT, BUT BY THE CASE. DO NOT SUBJECT THE MOTOR TO SHARP BLOWS OR ROUGH HANDLING.

Refer to Drawing D906-3122.

Disconnect the ac power cord and remove the top and bottom covers. Place the unit on its left side. Disconnect the motor leads connector from the Power Supply Printed Circuit Board. Grasp the motor in one hand, unscrew the two 10-32 mounting screws on the top of the deck, and remove the motor. Remove the motor mounting bracket from the motor and reinstall the bracket on the replacement motor. Install the replacement motor and reconnect the motor leads to the Power Supply printed circuit board. Perform the deck adjustments described in paragraph 5-35.

When these adjustments are complete, reconnect and turn on the ac power. The motor shaft should rotate counter-clockwise. Finally, test operate the unit with a cartridge in both normal and fast forward (if so equipped).

**NOTE**

REPLACEMENT MOTORS ARE SUPPLIED WITH THE LEADS TERMINATED IN THE PROPER CONNECTOR. THIS WIRING IS SHOWN IN SECTION VI, MOTOR WIRING AND TRANSFORMER DIAGRAM.

5-29. PRESSURE ROLLER REPLACEMENT

Manually raise the pressure roller above the deck surface by pushing in the solenoid plunger. Remove the E ring, teflon washer, and pressure roller. Perform the deck adjustments described in paragraph 5-35. Fit on the replacement roller with the teflon washer on top. Secure with the E ring.

5-30. POWER TRANSFORMER REPLACEMENT

Disconnect the ac power cord. Remove the top and bottom covers. Unplug the power transformer from the Power Supply printed circuit board. Remove the four screws which mount the transformer to the side of the chassis.

Install the replacement transformer and secure the four screws with LOCTITE or similar compound. Plug the transformer leads into the Power Supply Board. Replace the covers and reconnect the ac power cord.

**NOTE**

REPLACEMENT TRANSFORMERS ARE SUPPLIED WITH THE LEADS TERMINATED IN THE PROPER CONNECTOR. THIS WIRING IS SHOWN IN FIGURE 5-1.

5-31. TAPE HEAD REPLACEMENT

Refer to Drawing D906-3122

To replace either the playback or record head, disconnect the ac power and open the top cover. Remove the cartridge spring. Remove the clamp screw(s) and withdraw the head from the clamp. Unplug the head and connect the replacement head. Insert the head in the clamp and replace the clamp screw(s). Reconnect the ac power. Referring to paragraph 5-38, check the tracking and zenith adjustments, perform the azimuth adjustment. When these are accomplished, reinstall the cartridge spring, degauss head before using.

5-32. SOLENOID REPLACEMENT

Refer to Drawing D906-3122

Disconnect the ac power cord and remove the top and bottom covers. Mark and disconnect the solenoid leads. Loosen the lock nut on the solenoid plunger and unscrew the chain link and modified screw from the plunger. Dismount the solenoid from the deck by removing the two 10-32 screws driven from underneath the deck. Mount the replacement solenoid on the deck. Reconnect the solenoid leads. Reinsert the modified screw and chain link in the plunger. Perform the deck adjustments described in paragraph 5-35.

5-33.        SOLENOID CHAIN REPLACEMENT

Refer to Drawing D906-0000.

Disconnect the ac power cord and remove the top and bottom covers. Unhook the spring from the chain underneath the deck, remove the master chain link and slip the chain out of the modified screw. Manually raise the pressure roller and remove the screw from the roller shaft. Insert the replacement chain in the modified screw. With a small pair of needle nose pliers, fit on the master link and secure it with the lock. Manually raise the pressure roller and reinsert the screw through the chain. Feed the chain through the deck opening and around the chain mounting clamp. Underneath the deck reconnect the spring and chain. Finally, perform the tape deck adjustments described in paragraph 5-35.

5-34.        SOLENOID PLUNGER ADJUSTMENT

Solenoid plunger travel is determined by the setting of the adjustment screw which links the plunger to the solenoid chain, and is set to bring the pressure roller against the capstan drive shaft just prior to the plunger hitting its limit of travel.

With no cartridge in the machine, hold the Ready microswitch open and push the START pushbutton; the solenoid will pull the pressure roller into the drive shaft. Turn the plunger clockwise in one-half turn increments while alternately pushing the START button until an audible noise, the plunger hitting "bottom", is heard with solenoid action. Now turn the plunger counter-clockwise for 1 1/2 turns beyond the point that the noise has disappeared and tighten the locknut snugly against the end of the plunger.

**NOTE**

THE MOTOR ALIGNMENT HAS TO BE PERFORMED  
PRIOR TO THIS ADJUSTMENT.

5-35.        TAPE DECK ADJUSTMENTS

5-36.        PRESSURE ROLLER ADJUSTMENT

Refer to Drawing D906-0000.

Disconnect the ac power cord and remove the top and bottom covers. Mark and disconnect the solenoid leads. Loosen the lock nut on the solenoid plunger and unscrew the chain link and modified screw from the plunger. Dismount the solenoid from the deck by removing the two 10-32 screws driven from underneath the deck. Mount the replacement solenoid on the deck. Reconnect the solenoid leads. Reinsert the modified screw and chain link in the plunger. Perform the deck adjustments described in paragraph 5-35.

5-33.        SOLENOID CHAIN REPLACEMENT

Refer to Drawing D906-3122.

Disconnect the ac power cord and remove the top and bottom covers. Unhook the spring from the chain underneath the deck, remove the master chain link and slip the chain out of the modified screw. Manually raise the pressure roller and remove the screw from the roller shaft. Insert the replacement chain in the modified screw. With a small pair of needle nose pliers, fit on the master link and secure it with the lock. Manually raise the pressure roller and reinsert the screw through the chain. Feed the chain through the deck opening and around the chain mounting clamp. Underneath the deck reconnect the spring and chain. Finally, perform the tape deck adjustments described in paragraph 5-35.

5-34.        SOLENOID PLUNGER ADJUSTMENT

Solenoid plunger travel is determined by the setting of the adjustment screw which links the plunger to the solenoid chain, and is set to bring the pressure roller against the capstan drive shaft just prior to the plunger hitting its limit of travel.

With no cartridge in the machine, hold the Ready microswitch open and push the START pushbutton; the solenoid will pull the pressure roller into the drive shaft. Turn the plunger clockwise in one-half turn increments while alternately pushing the START button until an audible noise, the plunger hitting "bottom", is heard with solenoid action. Now turn the plunger counter-clockwise for 1 1/2 turns beyond the point that the noise has disappeared and tighten the locknut snugly against the end of the plunger.

**NOTE**

THE MOTOR ALIGNMENT HAS TO BE PERFORMED  
PRIOR TO THIS ADJUSTMENT.

5-35.        TAPE DECK ADJUSTMENTS

5-36.        PRESSURE ROLLER ADJUSTMENT

Refer to Drawing D906-3122.

5-41. AZIMUTH

Playback head azimuth is adjusted while reproducing a 15 kHz tone from the alignment cartridge. Record head azimuth is adjusted while recording a 15 kHz tone from an external signal generator at a level of -10 VU on the front panel meter. Adjust the azimuth screw for peak 15 kHz output as measured on an external VU meter. Remove and reinsert the cartridge several times and repeat the adjustment.

5-42. STEREO PHASING TEST

Once the azimuth and height are established as described in paragraphs 5-41 and 5-42, check the unit's phase response. Connect the right and left playback outputs to an oscilloscope as shown in Figure 14. Reproducing the alignment test cartridge (playback units) or recording from an external signal generator connected to both inputs (record units), observe the Lissajous pattern produced on the oscilloscope. Alternately check the phase response at 400 Hz and at 4,000 Hz tone can easily be phased 360 degrees rather than 0 degrees, so check the 400 Hz tone after adjusting the azimuth (4,000 Hz tone).

Remove and reinsert the cartridge and perform the phasing test several times.

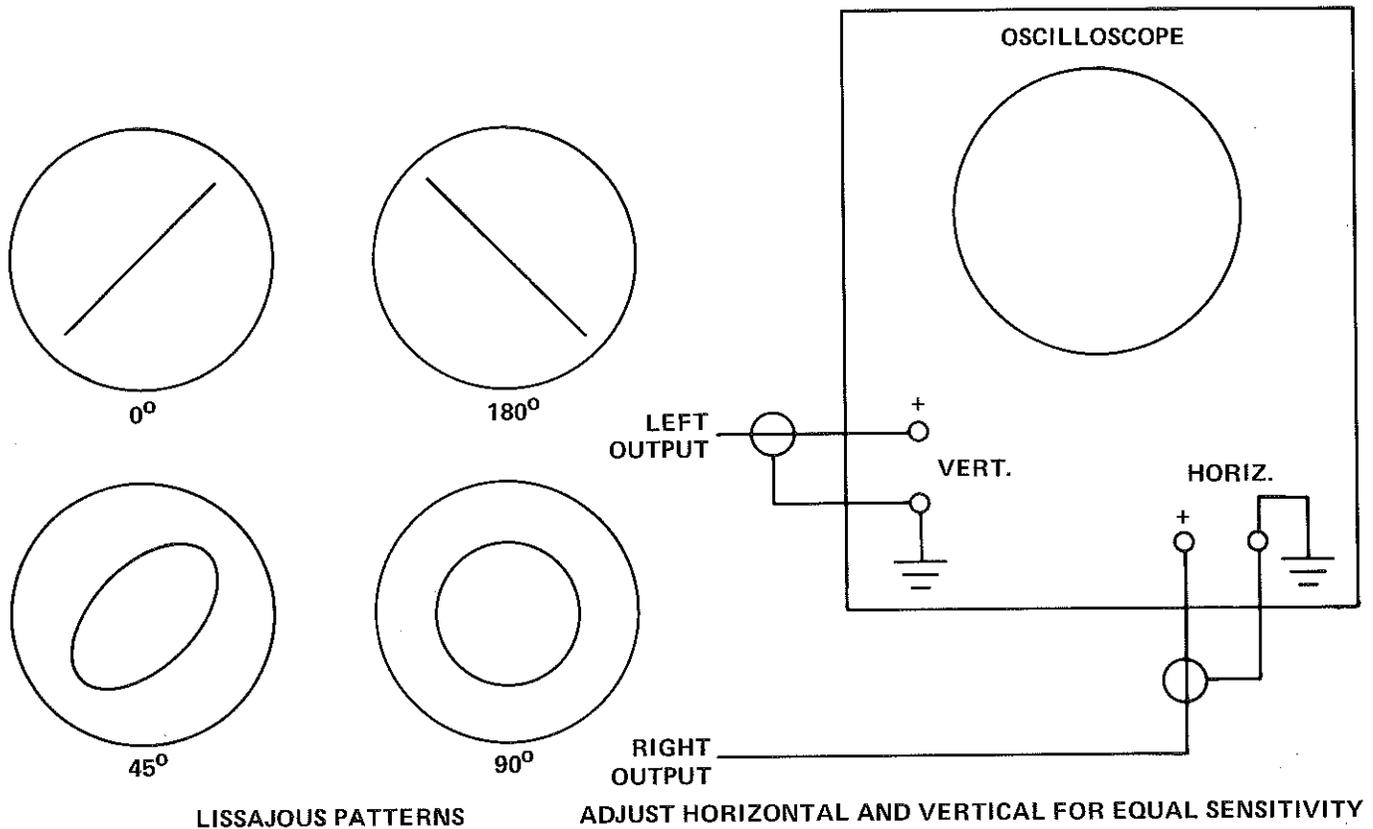


Figure 5-2. Tracking Cartridge and Stereo Phasing Test

MODEL	OPTION INSTALLED	PLAYBACK/LOGIC PCB	POWER SUPPLY PCB	RECORD AMP/BIAS PCB	RECORD CONTROL/ CUE GENERATOR PCB
3100P 3200P 3300P MONO, PLAYBACK ONLY	NONE MANUAL FF Q TRIPS ONLY FF + Q TRIPS	914-1501 914-1511 914-1521 914-1531	914-1505 914-1525 914-1515 914-1535-1	- - - -	- - - -
3100PS 3200PS 3300PS STEREO, PLAYBACK ONLY	NONE MANUAL FF Q TRIPS ONLY FF + Q TRIPS	914-1541 914-1551 914-1561 914-1571	914-1505 914-1525 914-1515 914-1535-1	- - - -	- - - -
3200RP 3300RP MONO, RECORD/PLAYBACK	NONE MANUAL FF Q TRIPS ONLY FF + Q TRIPS	914-1501 914-1511 914-1521 914-1531	914-1505 914-1525 914-1515 914-1535-1	914-1502 914-1502 914-1502 914-1502	914-1503 914-1503 914-1513 914-1513
3200RPS 3300RPS STEREO, RECORD/PLAYBACK	NONE MANUAL FF Q TRIPS ONLY FF + Q TRIPS	914-1541 914-1551 914-1561 914-1571	914-1505 914-1525 914-1515 914-1535-1	914-1512 914-1512 914-1512 914-1512	914-1523 914-1523 914-1533 914-1533

NOTES: 1) FF = FAST FORWARD  
2) Q TRIPS = QI 150 Hz AND QII 8 KHZ AUXILIARY CUES

TABLE 5-1. SERIES 3000 PRINTED CIRCUIT BOARD COMPLEMENT

## SECTION VI

### PARTS LISTS AND DRAWINGS

#### PARTS LISTS

906-3100	3100P/PS Mono and Stereo Playback Assembly
906-3201	3200RP Mono Record/Play Assembly
906-3301	3300RP Mono Record/Play Assembly
906-3303	3300RPS Stereo Record/Play Assembly
906-3304	3300 Mono Record/Play C Size Delay Option Assembly
906-3400	3400P Mono Playback Option Assembly
906-3000-1	3000 Series Deck Parts
906-3402	3400 Record/Play Option Assembly
906-3404	3400 Delay Record/Play Option Assembly
914-1501	3000 Series Mono Playback Assembly
914-1521	3000 Series Mono Playback Assembly with Cue Tones
914-1531	3000 Series Mono Playback Assembly with Cue Tones and Fast Forward
914-1541	3000 Series Stereo Playback Assembly
914-1561	3000 Series Stereo Playback Assembly with Cue Tones
914-1571	3000 Series Stereo Playback Assembly with Cue Tones and Fast Forward
914-1505	3000 Power Supply Circuit Board Assembly
914-1515	3000 Power Supply (with Cue Option) Circuit Board Assembly
914-1535-1	3000 Power Supply (with Cue and Fast Forward Option) Circuit Board Assembly
914-1502	3000 Series Record Amplifier Bias Circuit Board (Mono)
914-1512	3000 Series Record Amplifier Bias Circuit Board (Stereo)
914-1503	3000 Series Record Control and Tone Generator Circuit Board (Mono)
914-1513	3000 Series Record Control and Tone Generator Circuit Board with Cue Tones (Mono)
914-1523	3000 Series Record Control and Tone Generator Circuit Board (Stereo)
914-1533	3000 Series Record Control and Tone Generator Circuit Board with Cue Tones (Stereo)
914-1522	3000 Delay Record Amplifier Circuit Board
914-1580/ 1582	3000 Delay Circuit Board

#### DRAWINGS

D906-3141	3000 Series System Schematic Diagram
D906-3111	Playback Logic Circuit Board Schematic Diagram
C914-1571	Playback Circuit Board Assembly Drawing
D906-3142-1	Power Supply Circuit Board Schematic Diagram
D914-1535-1	Power Supply Circuit Board Assembly Drawing
D906-3110	Record Amplifier Bias Circuit Board Schematic Diagram
D914-1512	Record Amplifier Bias Circuit Board Assembly Drawing
D906-3112	Record Logic Tone Generator Circuit Board Schematic Diagram

## DRAWINGS

D914-1503 Record Control and Tone Generator Circuit Board  
-1513 Assembly Drawing  
-1523  
-1533  
D906-0000 Deck Assembly Drawing  
D906-3124 Model 3100 Final Assembly Drawing  
D906-3123 Model 3200/3300 Final Assembly Drawing  
B906-3136 Power Transformer Wiring Diagram  
B959-0009 Motor Wiring Diagram  
D906-3105 3000 Series Wiring Diagram  
D906-3139 3000 Delay Final Assembly Drawing  
D906-3130 3000 Delay Record Amplifier Bias Circuit Board  
Schematic Diagram  
D914-1522 3000 Delay Record Amplifier Bias Circuit Board  
Assembly Drawing  
B906-3127 3000 Delay Model Delay Circuit Board Schematic Diagram  
B914-1582 3000 Delay Model Delay Circuit Board Assembly Drawing  
C906-3134 3000 Delay Head Lead Wiring Diagram  
B906-3131 3000 Delay Rear Panel Connector Wiring Diagram  
D906-3129 3000 Delay Wiring Diagram

3100P,PS (Mono and Stereo) Playback Assembly - 906-3100 (Sheet 1 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Switch, Pushbutton, SPST	343-0150	1
----	Switch, Pushbutton, SPST, 5-100 mA	343-0012	1
----	Switch Cap, Red	343-0013	1
----	Lamp, 28V, 0.04A	321-0327	2
----	Switch, Toggle, SPDT, 5A-120 VAC, 2A-250 VAC	347-7101	1
----	Switch Cap, Green	343-0152	1
----	Dummy Head	407-0001	1
----	LMP Head (Mono)	252-0017	1
----	LSP Head (Stereo)	253-0014	1
----	Transformer, Audio Output	370-0025	1
----	Transformer, Power Primary: 115/108V, 50/60 Hz Secondary: 21V @ 1.3A, 23V @ 500 mA	376-7656	1
----	Connector, 6-Pin	418-0302	1
----	Connector, 24-Pin	418-0303	1
----	Plug, 6-Pin	418-0304	1
----	Plug, 24-Pin	418-0306	1
----	Phone Jack	417-0311	1
----	Fuse, 3AG, 1A, 250V	330-0100	1
----	Fuse Holder	415-2012	1
----	Transistor, Silicon, NPN, 2N3055, TO-3 Case	219-3055	1
----	Transistor, Socket	417-0298	1
----	Voltage Regulator, 24V, MC7824CK, TO-3 Case	227-7824	1
----	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
----	Resistor, 3.3 Ohm, ±5%, 2W	122-3313	1
----	Motor Assembly, 117V, 60 Hz, 7.5 IPS	954-0009	1
----	Power Supply Printed Circuit Board Assembly	914-1505	1

3100P,PS (Mono and Stereo) Playback Assembly - 906-3100 (Sheet 2 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Playback Assembly, Printed Circuit Board (Mono)	914-1501	1
----	Playback Assembly, Printed Circuit Board (Stereo)	914-1541	1

## 3200RP Mono Record/Play Assembly 906-3201 (Sheet 1 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Switch, Pushbutton, SPST	343-0150	1
----	Switch, Pushbutton, SPST, 5-100 mA	343-0012	2
----	Switch Cap (Red)	343-0013	2
----	Lamp, 28V, 0.04A	321-0327	3
----	Switch, Toggle, SPDT, 5S, 120 VAC - 2A, 250 VAC	347-7101	1
----	Potentiometer, 10 k Ohm, $\pm 10\%$ , 1/2W	191-1053	1
----	VU Meter 319-0081		
----	Switch Cap (Green)	343-0152	1
----	Head, LMP	252-0017	1
----	Head, LMR	252-0018	1
----	Transformer, Output	370-0025	1
----	Transformer, Power Primary: 115/108V, 50/60 Hz Secondary: 21V @ 1.3A, 23V @ 500mA	376-7656	1
----	Connector, 6-Pin	418-0301	1
----	Connector, 24-Pin	418-0303	1
----	Connector, 6-Pin	418-0302	1
----	Plug, 6-Pin	418-0304	1
----	Plug, 6-Pin	418-0305	1
----	Plug, 24-Pin	418-0306	1
----	Phone Jack	417-0311	1
----	Fuse, 3AG, 1A, 250V	330-0100	1
----	Power Transistor, NPN, 2N3055, TO-3 Case	219-3055	1
----	Voltage Regulator, 24V, TO-3 Case	227-7824	1
----	Capacitor, Electrolytic, 33 $\mu$ F, 35V	024-3335	1
----	Power Supply Printed Circuit Board Assembly	D914-1505	1
----	Playback Printed Circuit Board Assembly	D914-1501	1

## 3200RP Mono Record/Play Assembly - 906-3201 (Sheet 2 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
—	Record Amplifier Bias Printed Circuit Board Assembly	D914-1502	1
----	Record Control and Tone Generator Printed Circuit Board Assembly	D914-1503	1
----	Motor, 117V, 60 Hz, 7.5 IPS	954-0009	1

## 3300RP Mono Record/Play Assembly - 906-3301 (Sheet 1 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Switch, Pushbutton, SPST	343-0150	1
----	Switch, Pushbutton, SPST, 5-100 mA	343-0012	2
----	Switch Cap (Red)	343-0013	2
----	Lamp, 28V, 0.04A	321-0327	3
----	Switch, Toggle, SPDT, 5A, 120 VAC - 2A, 250 VAC	347-7101	1
----	Potentiometer, 10 k Ohm, $\pm 10\%$ , 1/2W	191-1053	1
----	VU Meter	319-0081	1
----	Switch Cap (Green)	343-0152	1
----	Head LMP	252-0017	1
----	Head LMR	252-0018	1
----	Transformer, Output	370-0025	1
----	Transformer, Power Primary: 115/108V, 50/60 Hz Secondary: 21V @ 1.3A, 23V @ 500mA	376-7656	1
----	Connector, 22-Pin	417-2100	4
----	Connector, 6-Pin	418-0301	1
----	Connector, 24-Pin	418-0303	1
----	Connector, 6-Pin	418-0302	1
----	Plug, 6-Pin	418-0304	1
----	Plug, 24-Pin	418-0306	1
----	Plug, 6-Pin	418-0305	1
----	Phone Jack	417-0311	1
----	Fuse, 1A, 3 AG, 250V	330-0100	1
----	Fuse Holder	415-2012	1
----	Transistor, Silicon, 2N3055, NPN, TO-3 Case	219-3055	1
----	Voltage Regulator, 24V	227-7824	1
----	Capacitor, Electrolytic, 33 $\mu$ F, 35V	024-3335	1
R1	Resistor, 3.3 Ohm, $\pm 5\%$ , 2W	122-3313	1
----	Motor Assembly, 117V, 60 Hz, 7.5 IPS	954-0009	1

## 3300RP Mono Record/Play Assembly - 906-3301 (Sheet 2 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Power Supply, Printed Circuit Board Assembly	914-1505	1
----	Playback, Printed Circuit Board Assembly	914-1501	1
----	Record Amplifier Bias, Printed Circuit Board Assembly	914-1502	1
----	Record Control and Tone Generator Printed Circuit Board Assembly	914-1503	1

## 3300RPS Stereo Record/Play Assembly - 906-3303 (Sheet 1 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Switch, Pushbutton, SPST	343-0150	1
----	Switch, Pushbutton, SPST, 5-100 mA	343-0012	2
----	Switch Cap (Red)	343-0013	2
----	Lamp, 28V, 0.04A	321-0327	3
----	Switch, Toggle, SPDT, 5A, 120 VAC - 2A, 250 VAC	347-7101	1
----	Potentiometer, 10 k Ohm, $\pm 10\%$ , 1/2W	191-1053	2
----	VU Meter	319-0081	2
----	Switch Cap (Green)	343-0152	1
----	Head LSP	253-0014	1
----	Head LSR	253-0015	1
----	Transformer, Output	370-0025	1
----	Transformer, Power Primary: 115/108V, 50/60 Hz Secondary: 21V @ 1.3A, 23V @ 500mA	376-7656	1
----	Connector, 21-Pin	417-2100	1
----	Connector, 6-Pin	418-0301	1
----	Connector, 24-Pin	418-0303	1
----	Connector, 6-Pin	418-0302	1
----	Plug, 6-Pin	418-0304	1
----	Plug, 24-Pin	418-0306	1
----	Plug, 6-Pin	418-0305	1
----	Phone Jack	417-0311	1
----	Fuse Holder	415-2012	1
----	Fuse, 3 AG, 1A, 250V	330-0100	1
----	Transistor, Silicon, 2N3055, NPN, TO-3 Case	219-3055	1
----	Voltage Regulator, 24V	227-7824	1
----	Capacitor, Electrolytic, 33 $\mu$ F, 35V	024-3335	1
----	Resistor, 3.3 Ohm, $\pm 5\%$ , 2W	122-3313	1
----	Power Supply, Printed Circuit Board Assembly	914-1505	1

## 3300RPS Stereo Record/Play Assembly - 906-3303 (Sheet 2 of 2)

REF NO.	DESCRIPTION	PART NO.	QTY.
----	Playback, Printed Circuit Board Assembly (Stereo)	914-1541	1
----	Record Amplifier Bias, Printed Circuit Board Assembly (Stereo)	914-1512	1
----	Record Control and Tone Generator Printed Circuit Board Assembly (Stereo)	914-1523	1
----	Motor Assembly, 117V, 60 Hz, 7.5 IPS	954-0009	1

3300 Series Mono Record/Play C Size Delay Option Assembly - 906-3304

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Switch, Illuminated, Pushbutton, SPST	343-0150	1
----	Switch, Illuminated, Pushbutton, SPST 5-100 mA	343-0012	4
----	Switch Cap (Red)	343-0013	2
----	Lamp, 28V, 0.04A	321-0327	5
----	Switch, Toggle, SPDT, 5A, 120 VAC, 2A, 250 VAC	347-7101	1
----	Potentiometer, 10 k	191-1053	1
----	VU Meter	319-0081	1
----	Switch Cap (Green)	343-0152	1
----	Switch Cap (White)	343-0014	1
----	Switch Cap (Blue)	343-0041	1
----	Transformer, Output, 8-Pin	370-0025	1
----	Transformer, Power Primary: 115/108V, 50/60 Hz Secondary: 21V @ 1.3A, 23V @ 500mA	376-7656	1
----	Phone Jack	417-0311	1
----	Fuse, 1A, 250V	330-0100	1
----	Transistor, 2N2055, Silicon, NPN, TO-3 Case	219-3055	1
----	Voltage Regulator, 24V	227-7824	1
----	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
----	Resistor, 3.3 Ohm $\pm$ 5%, 2W	122-3313	1
----	Power Supply, Printed Circuit Board	914-1515	1
----	Playback, Printed Circuit Board	914-1521	1
----	Record Amp Bias Printed Circuit Board	914-1522	1
----	Record Control and Tone Generator Printed Circuit Board Assembly	914-1513	1
----	Delay Printed Circuit Board Assembly	914-1582	1
----	Motor Assembly, 117V, 60 Hz, 7.5 IPS	954-0009	1
----	Delay Head Assembly	906-3135	1

3400P Mono Playback, Option Assembly - 906-3400

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Head, LMP	252-0017	1
----	Head, Dummy	407-0001	1
----	3000 Series Deck Parts C Size	906-3400-2	1
----	Power Supply Printed Circuit Board Assembly	914-1505	1

3000 Series Deck Parts A, B, and C 906-3000-1

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Pinch Roller	404-0001	1
----	E-Ring	454-3318	1
----	Solenoid, Air Damped, 18-36 VDC	289-2565	1
----	Switch, Micro	346-6100	1

## 3400 Record Play, Option Assembly - 906-3402

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Switch, Illuminated, Pushbutton, SPST 5-100mA	343-0012	1
----	Switch Cap (Red)	343-0013	1
----	Lamp, 28V, 0.04A	321-0327	1
----	VU Meter	319-0081	1
----	Head, Duracore, Mono, Playback	252-0017	1
----	Head, Duracore, Mono, Record	252-0018	1
----	Connector, 22-Pin	417-2100	2
----	Connector, 6-Pin	418-0301	1
----	Plug, 6-Pin	418-0305	1
----	Playback Printed Circuit Board Assembly	914-1501	1
----	Record Amp Bias Printed Circuit Board Assembly	914-1502	1
----	Record Control and Tone Printed Circuit Board Assembly	914-1503	1
----	Potentiometer, 10 k	191-1053	1
----	Power Supply Printed Circuit Board Assembly	914-1505	1

## 3400 Series Record Play Delay Option Assembly - 906-3404

REF. NO.	DESCRIPTION	PART NO.	QTY.
----	Switch, Illuminated, pushbutton, SPST 5-100mA	343-0012	3
----	Switch Cap (Red)	343-0013	1
----	Lamp, 28V, 0.04A	321-0327	3
----	VU Meter	319-0081	1
----	Head, LMP	252-0017	1
----	Connector, 22-Pin	417-2100	2
----	Connector, 6-Pin	418-0301	1
----	Plug, 6-Pin	418-0305	1
----	Playback Printed Circuit Board Assembly	914-1521	1
----	Record Amp Bias Printed Circuit Board Assembly	914-1522	1
----	Record Control and Tone Printed Circuit Board Assembly	914-1513	1
----	Potentiometer, 10 k Ohm	191-1053	1
----	Switch Cap (White)	343-0014	1
----	Switch Cap (Blue)	343-0041	1
----	Delay Head	906-3135	1
----	Delay Printed Circuit Board Assembly	914-1582	1
----	Power Supply Printed Circuit Board Assembly	914-1515	1

## 3000 Series Mono Playback Assembly - 914-1501 (Sheet 1 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1 thru C3	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	3
C7,C9	Capacitor, Mica, 150 pF, 500V	040-1522	2
C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C12	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C13	Capacitor, Electrolytic, 100 uF, 25V	623-1083	1
C14	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C15	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C16,C19,C20	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	3
C22	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C23	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C24	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C26,C27	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C29	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C30	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C33	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C36	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C39	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C43 thru C45	Capacitor, Mylar, 0.01 uF, 100V	030-1043	3
C46	Capacitor, Mylar, .001 uF, 100V	030-1033	1
C55	Capacitor, Tantalum, 2.2 uF, 35V	064-2263	1
C58,C59	Capacitor, Electrolytic, 100 uF, 25V	023-1083	2
C60	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C61	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C62	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
CR4 thru CR8, CR14,15,17,21, CR22,24	Diode, 1N4148, Silicon, 75V	203-4148	11
IC1	Integrated Circuit, Linear, Operational Amplifier, 8-Pin DIP	221-2310	1
IC2 thru IC4	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	3

## 3000 Series Mono Playback Assembly - 914-1501 (Sheet 2 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
IC6	Integrated Circuit, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
Q3	Transistor, GES5817, PNP, TO-18 Case	210-5817	1
Q4	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q5	Transistor, JFET, 2N5457, N-Channel	212-5457	1
Q8,Q9	Transistor, JFET, MPS6566, NPN, TO-92 Case	211-6566	2
Q10	Transistor, JFET, 2N5462, P-Channel	212-5462	1
R1	Potentiometer, 1 Meg Ohm, $\pm 10\%$ , 1/2W	178-1074	1
R2	Potentiometer, 50 k Ohm, $\pm 10\%$ , 1/2W	178-5054	1
R5	Potentiometer, 10 k Ohm, $\pm 10\%$ , 1/2W	178-1054	1
R8	Potentiometer, 2 k Ohm, $\pm 10\%$ , 1/2W	178-2044	1
R10,12,14	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	3
R15	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R16,R17	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	2
R18	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	1
R19	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R20	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R21	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	1
R22	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	1
R23	Resistor, 820 Ohm, $\pm 5\%$ , 1/4W	100-8233	1
R24	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R25	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R26	Resistor, 1.5 k Ohm, $\pm 5\%$ , 1/4W	100-1543	1
R27	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R28	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R34	Resistor, 820 Ohm, $\pm 5\%$ , 1/4W	100-8233	1
R35	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R36,37,39	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	3
R40	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R41	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1

3000 Series Mono Playback Assembly - 914-1501 (Sheet 3 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R42	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R43,R44	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	2
R45	Resistor, 7.5 k Ohm, $\pm 5\%$ , 1/4W	100-7543	1
R50,R51	Resistor, 1.8 k Ohm, $\pm 5\%$ , 1/2W	110-1843	2
R52,R53	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	2
R54	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	1
R57	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	1
R60	Resistor, 100 k Ohm, $\pm 5\%$ , 1/4W	100-1063	1
R61,R62	Resistor, 47 k Ohm, $\pm 5\%$ , 1/4W	100-4753	2
R72,R75	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	2
R76	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R77	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R83	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R84,R85	Resistor, 56 k Ohm, $\pm 5\%$ , 1/4W	100-5653	2
R86	Resistor, 2.2 k Ohm, $\pm 5\%$ , 1/4W	100-2243	1
R94,R95	Resistor, 560 k Ohm, $\pm 5\%$ , 1/4W	100-5663	2
R97	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R98	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R99	Resistor, 68 k Ohm, $\pm 5\%$ , 1/4W	100-6853	1
R100	Resistor, 15 k Ohm, $\pm 5\%$ , 1/4W	100-1553	1
R101	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
XIC1	Socket, 14-Pin	417-1400	1
XIC2 thru XIC4	Socket, 8-Pin	417-0800	3
XIC5	Socket, 14-Pin	417-1400	1
----	Printed Circuit Board, Playback	514-1501	1

## 3000 Series Mono Playback Assembly W/Cue Tones - 914-1521 (Sheet 1 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1,C2,C3	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	3
C7,C9	Capacitor, Mica, 150 pF, 500V	040-1522	2
C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C12	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C13	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C14	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C15	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C16,C19	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C20	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C22	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C23	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C24	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C26,C27	Capacitor, Tantalum, 1 uF, 35V	064-4763	2
C29	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C30	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C33	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C34	Capacitor,, Tantalum, 4.7 uF, 35V	064-4763	1
C35	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C36	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C37	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C39	Capacitor, Mylar, 0.047 uF, 100V	030-4763	1
C43 thru C45	Capacitor, Mylar, 0.01 uF, 35V	030-1043	3
C46	Capacitor, Mylar, 0.001 uF, 100V	030-1033	1
C47	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C48	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C49	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C50	Capacitor, Mica, 1000 pF, 500V	041-1032	1
C51	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C52	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1

## 3000 Series Mono Playback Assembly W/Cue Tones - 914-1521 (Sheet 2 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C53	Capacitor, Mica, 1000 pF, 500V	041-1032	1
C54	Capacitor, Mica, 500 pF, 500V	041-5023	1
C55	Capacitor, Tantalum, 2.2 uF, 35V	064-2263	1
C57 thru C59	Capacitor, Tantalum, 1 uF, 35V	064-1063	3
C60	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C61	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C62	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
CR4 thru CR10, CR14 thru CR24	Diode, Silicon, 1N4148, 75V	203-4148	17
IC1	Integrated Circuit, RC4739, Linear Operational Amplifier, 14-Pin DIP	221-2310	1
IC2 thru IC5	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	4
IC6	Integrated Circuit, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
Q3	Transistor, GES5817, PNP, TO-18 Case	210-5817	1
Q4	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q5	Transistor, JFET, 2N5457, N-Channel	212-5457	1
Q8, Q9	JFET, MPS6566, NPN, TO-92 Case	211-6566	2
Q10	JFET, 2N5462, P-Channel	212-5462	1
R1	Potentiometer, 1 Meg Ohm, $\pm 10\%$ , 1/2W	178-1074	1
R2	Potentiometer, 50 k Ohm, $\pm 10\%$ , 1/2W	178-5054	1
R5	Potentiometer, 10 k Ohm, $\pm 10\%$ , 1/2W	178-1054	1
R7 thru R9	Potentiometer, 2 k Ohm, $\pm 10\%$ , 1/2W	178-2044	3
R10	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	1
R12, R14	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	2
R15	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R16, R17	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	2
R18	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	1
R19	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R20	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1

## 3000 Series Mono Playback Assembly W/Cue Tones - 914-1521 (Sheet 3 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R21	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	1
R22	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	1
R23	Resistor, 120 Ohm, $\pm 5\%$ , 1/4W	100-8233	1
R24	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R25	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R26	Resistor, 1.5 k Ohm, $\pm 5\%$ , 1/4W	100-1543	1
R27	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R28	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R34	Resistor, 820 Ohm, $\pm 5\%$ , $\pm 1/4W$	100-8233	1
R35	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R36,R37,R39	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	3
R40	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R41	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R42	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R43,R44	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	2
R45	Resistor, 7.5 k Ohm, $\pm 5\%$ , 1/4W	100-7543	1
R50,R51	Resistor, 1.8 k Ohm, $\pm 5\%$ , 1/2W	110-1843	2
R52,R53	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	2
R54	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	1
R57	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	1
R58	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R60	Resistor, 100 k Ohm, $\pm 5\%$ , 1/4W	100-1063	1
R61,R62	Resistor, 47 k Ohm, $\pm 5\%$ , 1/4W	100-4753	2
R63	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R64	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	1
R69	Resistor, 3.9 k Ohm, $\pm 5\%$ , 1/4W	100-3943	1
R70	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R71 thru R73	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	3
R74	Resistor, 390 k Ohm, $\pm 5\%$ , 1/4W	100-3963	1
R75	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	1

## 3000 Series Mono Playback Assembly W/Cue Tones - 914-1521 (Sheet 4 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R76	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R77	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R78	Resistor, 3.9 k Ohm, $\pm 5\%$ , 1/4W	100-3943	1
R79	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R83	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R84,R85	Resistor, 56 k Ohm, $\pm 5\%$ , 1/4W	100-5653	2
R86	Resistor, 2.2 k Ohm, $\pm 5\%$ , 1/4W	100-2243	1
R87	Resistor, 5.1 k Ohm, $\pm 5\%$ , 1/4W	100-5143	1
R88,R89	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	2
R90,R91	Resistor, 56 k Ohm, $\pm 5\%$ , 1/4W	100-5653	2
R92,R93	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	2
R94,R95	Resistor, 560 k Ohm, $\pm 5\%$ , 1/4W	100-5663	2
R96,R97	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	2
R98	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R99	Resistor, 68 k Ohm, $\pm 5\%$ , 1/4W	100-6853	1
R100	Resistor, 15 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R101	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
XIC1	Socket, 14-Pin	417-1400	1
XIC2 thru XIC5	Socket, 8-Pin	417-0800	3
XIC6	Socket, 14-Pin	417-1400	1
----	Blank Printed Circuit Board	514-1501	1

3000 Series Mono Playback W/Fast Forward and Cue Tone Assembly - 914-1531  
(Sheet 1 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1,C2,C3	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	3
C7,C9	Capacitor, Mica, 150 pF, 500V	040-1522	2
C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C12	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C13	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C14	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C15	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C16,C19	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C20	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C22	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C23	Capacitor, Mylar Film, 0.047 uF, 100V	030-4743	1
C24	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C26,C27	Capacitor, Tantalum, 1 uF, 35V	064-4763	2
C29	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C30	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C33	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C34	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C35	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C36	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C37,C38	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
C39	Capacitor, Mylar Film, 0.047 uF, 100V	030-4743	1
C40	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C41	Capacitor, Mylar Film, 0.027 uF, 100V	030-2743	1
C42 Thru C45	Capacitor, Mylar Film, 0.01 uF, 35V	030-1043	4
C46	Capacitor, Mylar Film, 0.001 uF, 100V	030-1033	1
C47	Capacitor, Mylar Film, 0.01 uF, 35V	030-1043	1
C48	Capacitor, Mylar Film, 0.047 uF, 100V	030-4743	1
C49	Capacitor, Mylar Film, 0.01 uF, 35V	030-1043	1
C50	Capacitor, Mica, 1000 pF, 500V	041-1032	1

3000 Series Mono Playback W/Fast Forward and Cue Tone Assembly - 914-1531  
(Sheet 2 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C51	Capacitor, Mylar Film, 0.01 uF, 35V	030-1043	1
C52	Capacitor, Mylar Film, 0.047 uF, 100V	030-4743	1
C53	Capacitor, Mica, 1000 pF, 500V	041-1032	1
C54	Capacitor, Mica, 500 pF, 500V	041-5023	1
C55	Capacitor, Tantalum, 2.2 uF, 35V	064-2263	1
C56	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C57 Thru C59	Capacitor, Tantalum, 1 uF, 35V	064-1063	3
C60	Capacitor, Mylar Film, 0.01 uF, 35V	030-1043	1
C61	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C62	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
CR4 Thru CR24	Diode, 1N4148, Silicon, 75V, 10 mA	203-4148	21
IC1	Integrated Circuit, RC4739, Linear Operational Amplifier, 14-Pin DIP	221-2310	1
IC2 Thru IC5	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	4
IC6	Integrated Circuit, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
L1	Choke, 100 mH, 125 mA	364-1662	1
Q3	Transistor, GES5817, PNP, TO-18 Case	210-5817	1
Q4	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q5	JFET, 2N5457, N-Channel	212-5457	1
Q7	JFET, 2N5462, P-Channel	212-5462	1
Q8, Q9	JFET, MPS6566, NPN, TO-92 Case	211-6566	2
Q10	JFET, 2N5462, P-Channel	212-5462	1
R1	Potentiometer, 1 Meg Ohm $\pm 10\%$ , 1/2W	178-1074	1
R2	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	1
R5	Potentiometer, 10 k Ohm $\pm 10\%$ , 1/2W	178-1054	1
R7 Thru R9	Potentiometer, 1 k Ohm $\pm 10\%$ , 1/2W	178-2044	3
R10	Resistor, 150 k Ohm $\pm 5\%$ , 1/4W	100-1563	1
R12, R14	Resistor, 10 Ohm $\pm 5\%$ , 1/4W	100-1023	2
R15	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1

3000 Series Mono Playback W/Fast Forward and Cue Tone Assembly - 914-1531  
(Sheet 3 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R16,R17	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	2
R18	Resistor, 10 Ohm $\pm 5\%$ , 1/4W	100-1023	1
R19	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R20	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R21	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R22	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R23	Resistor, 820 Ohm $\pm 5\%$ , 1/4W	100-8233	1
R24	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R25	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R26	Resistor, 1.5 k Ohm $\pm 5\%$ , 1/4W	100-1543	1
R27	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R28	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R34	Resistor, 820 Ohm $\pm 5\%$ , 1/4W	100-8233	1
R35	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R36,R37,R39	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	3
R40	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R41	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R42	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R43,R44	Resistor, 27 Ohm $\pm 5\%$ , 1/4W	100-2723	2
R45	Resistor, 7.5 k Ohm $\pm 5\%$ , 1/4W	100-7543	1
R50,R51	Resistor, 1.8 k Ohm $\pm 5\%$ , 1/2W	110-1843	2
R52,R53	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R54	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R55	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R56	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R57	Resistor, 150 k Ohm $\pm 5\%$ , 1/4W	100-1563	1
R58,R59	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	2
R60	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R61,R62	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	2
R63	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1

3000 Series Mono Playback W/Fast Forward and Cue Tone Assembly - 914-1531  
(Sheet 4 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R64 Thru R66	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	3
R67	Resistor, 10 Meg Ohm $\pm 5\%$ , 1/4W	100-1083	1
R68	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R69	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	1
R70	Resistor, 10 Meg Ohm $\pm 5\%$ , 1/4W	100-1083	1
R71 Thru R73	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	3
R74	Resistor, 390 k Ohm $\pm 5\%$ , 1/4W	100-3963	1
R75	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R76	Resistor, 10 Meg Ohm $\pm 5\%$ , 1/4W	100-1083	1
R77	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R78	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	1
R79	Resistor, 10 Meg Ohm $\pm 5\%$ , 1/4W	100-1083	1
R80	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R81	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R82	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R83	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R84,R85	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	2
R86	Resistor, 2.2 k Ohm $\pm 5\%$ , 1/4W	100-2243	1
R87	Resistor, 5.1 k Ohm $\pm 5\%$ , 1/4W	100-5143	1
R88,R89	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	2
R90,R91	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	2
R92,R93	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R94,R95	Resistor, 560 k Ohm $\pm 5\%$ , 1/4W	100-5663	2
R96,R97	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	2
R98	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R99	Resistor, 68 k Ohm $\pm 5\%$ , 1/4W	100-6853	1
R100	Resistor, 15 k Ohm $\pm 5\%$ , 1/4W	100-1553	1
R101	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
XIC1	Socket, 14-Pin	417-1400	1

3000 Series Mono Playback W/Fast Forward and Cue Tone Assembly - 914-1531  
 (Sheet 5 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
XIC2 Thru XIC5	Socket, 8-Pin	417-0800	4
XIC6	Socket, 14-Pin	417-1400	1
----	Blank Printed Circuit Board	514-1501	1

## 3000 Series Stereo Playback Assembly - 914-1541 (Sheet 1 of 4)

REF NO.	DESCRIPTION	PART NO.	QTY.
C1 thru C6	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	6
C7 thru C9	Capacitor, Mica, 150 pF, 500V	040-1522	3
C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C12	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C13	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C14	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C15	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C16	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C17	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C18,C19,C20	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	3
C21,C22	Capacitor, Electrolytic, 100 uF, 25V	023-1083	2
C23	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C24	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C25 thru C28	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	4
C29	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C30,C31	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C32	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C33	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C36	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C39	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C43 thru C45	Capacitor, Mylar, 0.01 uF, 100V	030-1043	3
C46	Capacitor, Mylar, 0.001 uF, 100V	030-1033	1
C55	Capacitor, Tantalum, 2.2 uF, 35V	064-2263	1
C58,C59	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
C60	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C61	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C62	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
CR1 thru CR8, CR14,15,17,21, CR22,CR24	Diode, Silicon, 1N4148, 75V	203-4148	14

## 3000 Series Stereo Playback Assembly - 914-1541 (Sheet 2 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
IC1	Integrated Circuit, RC4739, Linear Operational Amplifier, 14-Pin DIP	221-2310	1
IC2 thru IC4	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	3
IC6	Integrated Circuit, LM3900, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
Q1	Transistor, GES5816, PNP, TO-18 Case	211-5816	
Q2,Q3	Transistor, GES5817, NPN, TO-18 Case	210-5817	2
Q4	Transistor, GES5816, PNP, TO-18 Case	211-5816	1
Q5,Q6	JFET, 2N5457, N-Channel	212-5457	2
Q8,Q9	JFET, MPS6566, NPN, TO-92 Case	211-6566	2
Q10	JFET, 2N5462, P-Channel	212-5462	1
R1	Potentiometer, 1 Meg Ohm, $\pm 10\%$ , 1/2W	178-1074	1
R2	Potentiometer, 50 k Ohm, $\pm 10\%$ , 1/2W	178-5054	1
R3	Potentiometer, 1 Meg Ohm, $\pm 10\%$ , 1/2W	178-1074	1
R4	Potentiometer, 50 k Ohm, $\pm 10\%$ , 1/2W	178-5054	1
R5,R6	Potentiometer, 10 k Ohm, $\pm 10\%$ , 1/2W	178-1054	2
R8	Potentiometer, 2 k Ohm, $\pm 10\%$ , 1/2W	178-2044	1
R10,R11	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	2
R12 thru R14	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	3
R15	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R16,R17	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	2
R18	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	1
R19	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R20	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R21	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	1
R22	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	1
R23	Resistor, 820 Ohm, $\pm 5\%$ , 1/4W	100-8233	1
R24	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R25	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R26	Resistor, 1.5 k Ohm, $\pm 5\%$ , 1/4W	100-1543	1

## 3000 Series Stereo Playback Assembly - 914-1541 (Sheet 3 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R27	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R28	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R29	Resistor, 7.5 k Ohm, $\pm 5\%$ , 1/4W	100-7543	1
R30,R31	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	2
R32	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	1
R33,R34	Resistor, 820 Ohm, $\pm 5\%$ , 1/4W	100-8233	2
R35	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R36 thru R39	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	4
R40	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R41	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R42	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R43,R44	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	2
R45	Resistor, 7.5 k Ohm, $\pm 5\%$ , 1/4W	100-7543	1
R46	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R47	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R48	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	1
R49	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R50,R51	Resistor, 1.8 k Ohm, $\pm 5\%$ , 1/4W	110-1843	2
R52,R53	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	2
R54	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	1
R57	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	1
R60	Resistor, 100 k Ohm, $\pm 5\%$ , 1/4W	100-1063	1
R61,R62	Resistor, 47 k Ohm, $\pm 5\%$ , 1/4W	100-4753	2
R72,R75	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	2
R76	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R77	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R83	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R84,R85	Resistor, 56 k Ohm, $\pm 5\%$ , 1/4W	100-5653	2
R86	Resistor, 2.2 k Ohm, $\pm 5\%$ , 1/4W	100-2243	1
R94,R95	Resistor, 560 k Ohm, $\pm 5\%$ , 1/4W	100-5663	2

## 3000 Series Stereo Playback Assembly - 914-1541 (Sheet 4 of 4)

REF NO.	DESCRIPTION	PART NO.	QTY.
R97	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R98	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R99	Resistor, 68 k Ohm, $\pm 5\%$ , 1/4W	100-6853	1
R100	Resistor, 15 k Ohm, $\pm 5\%$ , 1/4W	100-1553	1
R101	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
XIC1	I.C. Socket, 14-Pin	417-1400	1
XIC2 thru XIC4	I.C. Socket, 8-Pin	417-0800	3
XIC6	I.C. Socket, 14-Pin	417-1400	1
----	Playback, Printed Circuit Board	514-1501	1

## 3000 Series Stereo Playback Assembly W/Cue Tone - 914-1561 (Sheet 1 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1 thru C6	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	6
C7 thru C9	Capacitor, Mica, 150 pF, 500V	040-1522	3
C10	Capacitor, Tantalum, 4.7 uF, 33V	064-4763	1
C11	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C12	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C13	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C14	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C15	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C16	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C17	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C18,C19	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C20	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C21,C22	Capacitor, Electrolytic, 100 uF, 25V	023-1083	2
C23	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C24	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C25 thru C28	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	4
C29	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C30,C31	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C32	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C33	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C35	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C36	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C37	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C39	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C43 thru C45	Capacitor, Mylar, 0.01 uF, 35V	030-1043	3
C46	Capacitor, Mylar, 0.001 uF, 100V	030-1033	1
C47	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C48	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C49	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C50	Capacitor, Mica, 1000 pF, 500V	041-1032	1

## 3000 Series Stereo Playback Assembly W/Cue Tone - 914-1561 (Sheet 2 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C51	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C52	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C53	Capacitor, Mica, 1000 pF, 500V	041-1032	1
C54	Capacitor, Mica, 500 pF, 500V	041-5023	1
C55	Capacitor, Tantalum, 2.2 uF, 35V	064-2263	1
C56	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C57 thru C59	Capacitor, Tantalum, 1 uF, 35V	064-1063	3
C60	Capacitor, Mylar, 0.01 uF, 35V	030-1043	1
C61	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C62	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
CR1 thru CR10, CR14 thru CR22, CR24	Diode, Silicon, 1N4148, 75V	203-4148	20
IC1	Integrated Circuit, Linear, RC4739, Operational Amplifier, 14-Pin DIP	221-2310	1
IC2 thru IC5	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	4
IC6	Integrated Circuit, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
Q1	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q2,Q3	Transistor, GES5817, PNP, TO-18 Case	210-5817	2
Q4	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q5,Q6	JFET, 2N5457, N-Channel	212-5457	2
Q8,Q9	JFET, MPS6566, NPN, TO-92 Case	211-6566	2
Q10	JFET, 2N6462, P-Channel	212-5462	1
R1	Potentiometer, 1 Meg Ohm, $\pm 10\%$ , 1/2W	178-1074	1
R2	Potentiometer, 50 k Ohm, $\pm 10\%$ , 1/2W	178-5054	1
R3	Potentiometer, 1 Meg Ohm, $\pm 10\%$ , 1/2W	178-1074	1
R4	Potentiometer, 50 k Ohm, $\pm 10\%$ , 1/2W	178-5054	1
R5,R6	Potentiometer, 10 k Ohm, $\pm 10\%$ , 1/2W	178-1054	2
R7 thru R9	Potentiometer, 2 k Ohm, $\pm 10\%$ , 1/2W	178-2044	3
R10,R11	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	2

## 3000 Series Stereo Playback Assembly W/Cue Tone - 914-1561 (Sheet 3 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R12 thru R14	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	3
R15	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R16,R17	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	2
R18	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	1
R19	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R20	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R21	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	1
R22	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	1
R23	Resistor, 820 Ohm, $\pm 5\%$ , 1/4W	100-8233	1
R24	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R25	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R26	Resistor, 1.5 k Ohm, $\pm 5\%$ , 1/4W	100-1543	1
R27	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R28	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R29	Resistor, 7.5 k Ohm, $\pm 5\%$ , 1/4W	100-7543	1
R30,R31	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	2
R32	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	1
R33,R34	Resistor, 820 Ohm, $\pm 5\%$ , 1/4W	100-8233	2
R35	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R36 thru R39	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	4
R40	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R41	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R42	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R43,R44	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	2
R45	Resistor, 7.5 Ohm, $\pm 5\%$ , 1/4W	100-7543	1
R46	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R47	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R48	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	1
R49	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R50,R51	Resistor, 1.8 k Ohm, $\pm 5\%$ , 1/4W	110-1843	2

## 3000 Series Stereo Playback Assembly W/Cue Tone - 914-1561 (Sheet 4 of 5)

REF NO.	DESCRIPTION	PART NO.	QTY.
R52,R53	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	2
R54	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	1
R57	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	1
R58	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R60	Resistor, 100 k Ohm, $\pm 5\%$ , 1/4W	100-1063	1
R61,R62	Resistor, 47 k Ohm, $\pm 5\%$ , 1/4W	100-4753	2
R64	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	1
R69	Resistor, 3.9 k Ohm, $\pm 5\%$ , 1/4W	100-3943	1
R70	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R71 thru R73	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	3
R74	Resistor, 390 k Ohm, $\pm 5\%$ , 1/4W	100-3963	1
R75	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	1
R76	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R77	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R78	Resistor, 3.9 k Ohm, $\pm 5\%$ , 1/4W	100-3943	1
R79	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R83	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R84,R85	Resistor, 56 k Ohm, $\pm 5\%$ , 1/4W	100-5653	2
R86	Resistor, 2.2 k Ohm, $\pm 5\%$ , 1/4W	100-2243	1
R87	Resistor, 5.1 k Ohm, $\pm 5\%$ , 1/4W	100-5143	1
R88,R89	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	2
R90,R91	Resistor, 56 k Ohm, $\pm 5\%$ , 1/4W	100-5653	2
R92,R93	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	2
R94,R95	Resistor, 560 k Ohm, $\pm 5\%$ , 1/4W	100-5663	2
R96,R97	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	2
R98	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R99	Resistor, 68 k Ohm, $\pm 5\%$ , 1/4W	100-6853	1
R100	Resistor, 15 k Ohm, $\pm 5\%$ , 1/4W	100-1553	1
R101	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
XIC1	I.C. Socket, 14-Pin	417-1400	1

3000 Series Stereo Playback Assembly W/Cue Tone - 914-1561 (Sheet 5 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
XIC2 thru XIC5	I.C. Socket, 8-Pin	417-0800	4
XIC6	I.C. Socket, 14-Pin	417-1400	1
----	Playback Printed Circuit Board	514-1501	1

3000 Series Stereo Playback Assembly W/Fast Forward and Cue Tone - 914-1571  
(Sheet 1 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1 thru C6	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	6
C7 thru C9	Capacitor, Mica, 150 pF, 500V	040-1522	3
C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C12	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C13	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C14	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C15	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C16	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C17	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C18,C19	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C20	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C21,C22	Capacitor, Electrolytic, 100 uF, 25V	023-1083	2
C23	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C24	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C25 thru C28	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	4
C29	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C30,C31	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C32	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C33	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C34	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C35	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C36	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C37,C38	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
C39	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C40	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C41	Capacitor, Mylar, 0.027 uF, 100V	030-2743	1
C42 thru C45	Capacitor, Mylar, 0.01 uF, 100V	030-1043	4
C46	Capacitor, Mylar, 0.001 uF, 100V	030-1033	1
C47	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1

3000 Series Stereo Playback Assembly W/Fast Forward and Cue Tone - 914-1571  
 (Sheet 2 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C48	Capacitor, Mylar, 0.047 uf, 100V	030-4743	1
C49	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C50	Capacitor, Mica, 1000 pF, 500V	041-1032	1
C51	Capacitor, Mica, 0.01 uF, 100V	030-1043	1
C52	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C53	Capacitor, Mica, 1000 pF, 500V	041-1032	1
C54	Capacitor, Mica, 500 pF, 50V	041-5023	1
C55	Capacitor, Tantalum, 2.2 uF, 35V	064-2263	1
C56	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	1
C57 thru C59	Capacitor, Tantalum, 1 uF, 35V	064-1063	3
C60	Capacitor, Mica, 0.01 uF, 100V	030-1043	1
C61	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C62	Capacitor, Electrolytic, 100 uF, 25V	023-1084	1
CR1 thru CR24	Diode, Silicon, 1N4148, 10 mA, 75V	203-4148	24
IC1	Integrated Circuit, Linear, RC4739 Operational Amplifier, 14-Pin DIP	221-2310	1
IC2 thru IC5	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	4
IC6	Integrated Circuit, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
L1	Choke, 100 mH, 125 mA	364-1662	1
Q1	Transistor, GES5816, NPN, T0-18 Case	211-5816	1
Q2,Q3	Transistor, GES5817, PNP, T0-18 Case	210-5817	2
Q4	Transistor, GES5816, NPN, T0-18 Case	211-5816	1
Q5,Q6	JFET, 2N5457, N-Channel	212-5457	2
Q7	JFET, 2N5462, P-Channel	212-5462	1
Q8,Q9	JFET, MPS6566, NPN, T0-92 Case	211-6566	2
Q10	JFET, 2N5462, P-Channel	212-5462	1
R1	Potentiometer, 1 Meg Ohm, ±10%, 1/2W	178-1074	1
R2	Potentiometer, 50 k Ohm, ±10%, 1/2W	178-5054	1
R3	Potentiometer, 1 Meg Ohm, ±10%, 1/2W	178-1074	1

3000 Series Stereo Playback Assembly W/Fast Forward and Cue Tone - 914-1571  
(Sheet 3 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R4	Potentiometer, 50 k Ohm, $\pm 10\%$ , 1/2W	178-5054	1
R5,R6	Potentiometer, 10 k Ohm, $\pm 10\%$ , 1/2W	178-1054	2
R7 thru R9	Potentiometer, 2 k Ohm, $\pm 10\%$ , 1/2W	178-2044	3
R10,R11	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	2
R12 thru R14	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	3
R15	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R16,R17	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	2
R18	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	1
R19	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R20	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R21	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	1
R22	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	1
R23	Resistor, 820 Ohm, $\pm 5\%$ , 1/4W	100-8233	1
R24	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R25	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R26	Resistor, 1.5 k Ohm, $\pm 5\%$ , 1/4W	100-1543	1
R27	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R28	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R29	Resistor, 7.5 k Ohm, $\pm 5\%$ , 1/4W	100-7543	1
R30,R31	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	2
R32	Resistor, 10 Ohm, $\pm 5\%$ , 1/4W	100-1023	1
R33,R34	Resistor, 820 Ohm, $\pm 5\%$ , 1/4W	100-8233	2
R35	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R36 thru R39	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	4
R40	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R41	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	1
R42	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R43,R44	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	2
R45	Resistor, 7.5 k Ohm, $\pm 5\%$ , 1/4W	100-7543	1
R46	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1

3000 Series Stereo Playback Assembly W/Fast Forward and Cue Tone - 914-1571  
(Sheet 4 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R47	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R48	Resistor, 330 k Ohm, $\pm 5\%$ , 1/4W	100-3363	1
R49	Resistor, 120 k Ohm, $\pm 5\%$ , 1/4W	100-1263	1
R50,R51	Resistor, 1.8 k Ohm, $\pm 5\%$ , 1/2W	110-1843	2
R52,R53	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	2
R54	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	1
R55	Resistor, 47 k Ohm, $\pm 5\%$ , 1/4W	100-4753	1
R56	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	1
R57	Resistor, 150 k Ohm, $\pm 5\%$ , 1/4W	100-1563	1
R58,R59	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	2
R60	Resistor, 100 k Ohm, $\pm 5\%$ , 1/4W	100-1063	1
R61,R62	Resistor, 47 k Ohm, $\pm 5\%$ , 1/4W	100-4753	2
R64 thru R66	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	3
R67	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R68	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R69	Resistor, 3.9 k Ohm, $\pm 5\%$ , 1/4W	100-3943	1
R70	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R71 thru R73	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	3
R74	Resistor, 390 k Ohm, $\pm 5\%$ , 1/4W	100-3963	1
R75	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	1
R76	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R77	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R78	Resistor, 3.9 k Ohm, $\pm 5\%$ , 1/4W	100-3943	1
R79	Resistor, 10 Meg Ohm, $\pm 5\%$ , 1/4W	100-1083	1
R80	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R81	Resistor, 1 K Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R82	Resistor, 47 k Ohm, $\pm 5\%$ , 1/4W	100-4753	1
R83	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R84,R85	Resistor, 56 k Ohm, $\pm 5\%$ , 1/4W	100-5653	2
R86	Resistor, 2.2 k Ohm, $\pm 5\%$ , 1/4W	100-2243	1

3000 Series Stereo Playback Assembly W/Fast Forward and Cue Tone - 914-1571  
 (Sheet 5 of 5)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R87	Resistor, 5.1 k Ohm, $\pm 5\%$ , 1/4W	100-5143	1
R88,R89	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	2
R90,R91	Resistor, 56 k Ohm, $\pm 5\%$ , 1/4W	100-5653	2
R92,R93	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	2
R94,R95	Resistor, 560 k Ohm, $\pm 5\%$ , 1/4W	100-5663	2
R96,R97	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	2
R98	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R99	Resistor, 68 k Ohm, $\pm 5\%$ , 1/4W	100-6853	1
R100	Resistor, 15 k Ohm, $\pm 5\%$ , 1/4W	100-1553	1
R101	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
XIC1	Socket, 14-Pin	417-1400	1
XIC2 thru XIC5	Socket, 8-Pin	417-0800	4
XIC6	Socket, 14-Pin	417-1400	1
----	Playback Blank Printed Circuit Board	514-1501	1

## 3000 Printed Circuit Board Power Supply Assembly - 914-1505

REF. NO.	DESCRIPTION	PART NO.	QTY.
C5	Capacitor, Electrolytic, 1000 uF, 50V	014-1094	1
C7	Capacitor, Electrolytic, 2200 uF, 50V	014-2294	1
C8	Capacitor, Electrolytic, 100 uF, 40V	014-1084	1
C9	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Ceramic Disc, 0.01 uF, 25V	000-1044	1
CR1, CR2	Bridge Rectifier, Single Phase, Full Wave, 4A, 50-200V	239-0003	2
CR12 Thru CR15, CR17	Bridge Rectifier, Silicon, 1N4005, 600V, 1A	203-4005	5
CR20	Diode, Zener, 9.1V	200-0009	1
CR21	Bridge Rectifier, 1N4005, Silicon, 600V, 1A	203-4005	1
IC1	Voltage Regulator, 14-Pin DIP	227-0723	1
J1, J2	Connector, 12-Pin	417-1276	2
Q3	JFET, 2N5462, P-Channel	212-5462	1
Q5, Q7	Transistor, GES5816, NPN, TO-92 Case	211-5816	2
R7	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	1
R8	Resistor, 1.5 k Ohm $\pm 5\%$ , 1/2W	110-1543	1
R9, R10	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R14	Resistor, 8.2 k Ohm $\pm 5\%$ , 1/4W	100-8243	1
R15	Resistor, 12 k Ohm $\pm 5\%$ , 1/4W	100-1253	1
R16	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R17	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	1
R18	Resistor, 2.2 k Ohm $\pm 5\%$ , 1/4W	100-2243	1
R19	Resistor, 220 k Ohm $\pm 5\%$ , 1/4W	100-2263	1
R20	Potentiometer, 5 k Ohm $\pm 10\%$ , 1/2W	178-5044	1
R22, R23	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
----	Socket, 14-Pin	417-1400	1
----	Blank Printed Circuit Board Power Supply	514-1505-2	1

## 3000 Printed Circuit Board Power Supply Assembly W/Q-Trips - 914-1515

REF. NO.	DESCRIPTION	PART NO.	QTY.
C5	Capacitor, Electrolytic, 1000 uF, 50V	014-1094	1
C7	Capacitor, Electrolytic, 2200 uF, 50V	014-2294	1
C8	Capacitor, Electrolytic, 100 uF, 40V	014-1084	1
C9	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Ceramic Disc, 0.01 uF, 25V	000-1044	1
CR1, CR2	Bridge Rectifier, Single Phase, Full Wave, 4A, 50-200V	239-0003	2
CR8, CR15, CR17	Bridge Rectifier, 1N4005, Silicon, 600V, 1A	203-4005	8
CR20	Diode, Zener, 9.1V	200-0009	1
CR21	Bridge Rectifier, 1N4005, Silicon, 600V, 1A	203-4005	1
IC1	Voltage Regulator, 14-Pin DIP	227-0723	1
J1, J2	Connector, 12-Pin	417-1276	2
K2, K3	Relay, SPDT, 24V	270-0024	2
Q3	JFET, 2N5462, P-Channel	212-5462	1
Q4 Thru Q7	Transistor, GES5816, NPN, TO-92 Case	211-5816	4
R7	Resistor, 3.9 k Ohm $\pm$ 5%, 1/4W	100-3943	1
R8	Resistor, 1.5 k Ohm $\pm$ 5%, 1/2W	110-1543	1
R9, R10	Resistor, 10 k Ohm $\pm$ 5%, 1/4W	100-1053	2
R12, R13	Resistor, 220 Ohm $\pm$ 5%, 1/2W	110-2233	2
R14	Resistor, 8.2 k Ohm $\pm$ 5%, 1/4W	100-8243	1
R15	Resistor, 12 k Ohm $\pm$ 5%, 1/4W	100-1253	1
R16	Resistor, 100 k Ohm $\pm$ 5%, 1/4W	100-1063	1
R17	Resistor, 3.9 k Ohm $\pm$ 5%, 1/4W	100-3943	1
R18	Resistor, 2.2 k Ohm $\pm$ 5%, 1/4W	100-2243	1
R19	Resistor, 220 k Ohm $\pm$ 5%, 1/4W	100-2263	1
R20	Potentiometer, 5 k Ohm $\pm$ 10%, 1/2W	178-5044	1
R22, R23	Resistor, 10 k Ohm $\pm$ 5%, 1/4W	100-1053	2
XIC1	Socket, 14-Pin DIP	417-1400	1
----	Blank Printed Circuit Board - Power Supply	514-1505-2	1

3000 Series Power Supply W/Fast Forward and Q-Trip Assembly - 914-1535-1  
 (Sheet 1 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1 Thru C4	Capacitor, Mylar Film, 0.47 uF, 400V	033-4753	4
C5	Capacitor, Electrolytic, 1000 uF, 50V	014-1094	1
C7	Capacitor, Electrolytic, 2200 uF, 50V	014-2294	1
C8	Capacitor, Electrolytic, 100 uF, 40V	014-1084	1
C9	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C10	Capacitor, Mylar Film, 0.047 uF, 100V	030-4743	1
C11	Capacitor, Ceramic, 0.01 uF, 25V	000-1044	1
C12 Thru C15	Capacitor, Mylar Film, 0.22 uF, 400V	033-2253	4
C16	Capacitor, Mylar Film, 0.01 uF, 100V	031-1043	1
CR1, CR2	Bridge Rectifier, Single Phase, Full Wave, 4A, 50-200V	239-0003	2
CR3 Thru CR15, CR17 Thru CR19	Bridge Rectifier, 1N4005, Silicon, 600V, 1A	203-4005	16
CR20	Diode, Zener, 9.1V ±10%, 1W	200-0009	1
CR21	Bridge Rectifier, Silicon, 1N4005, 600V, 1A	203-4005	1
IC1	Voltage Regulator, 14-Pin DIP	227-0723	1
J1, J2	Connector, 12-Pin	417-1276	2
J3	Socket for Relay	270-0031	1
K1	Relay, DPDT, 6 To 120 VAC, 50/60 Hz, 6 To 48 VDC	270-0029	1
K2, K3	Relay, SPDT, 24V, 2A	270-0024	2
Q1	Rectifier, Silicon Controlled	237-0006	1
Q2	Transistor, GES5817, PNP, TO-18 Case	210-5817	1
Q3	JFET, 2N5462, P-Channel	212-5462	1
Q4 Thru Q7	Transistor, GES5816, NPN, TO-18 Case	211-5816	4
R1	Resistor, 8.2 k Ohm ±5%, 1/4W	100-8243	1
R2	Resistor, 27 k Ohm ±5%, 1/4W	100-2753	1
R3 Thru R5	Resistor, 10 k Ohm ±5%, 1/4W	100-1053	3
R6	Resistor, 220 Ohm ±5%, 1/2W	110-2233	1
R7	Resistor, 3.9 k Ohm ±5%, 1/4W	100-3943	1

3000 Series Power Supply W/Fast Forward and Q-Trip Assembly - 914-1535-1  
 (Sheet 2 of 2)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R8	Resistor, 1.5 k Ohm $\pm 5\%$ , 1/2W	110-1543	1
R9,R10	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R11	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R12,R13	Resistor, 220 Ohm $\pm 5\%$ , 1/2W	110-2233	2
R14	Resistor, 8.2 k Ohm $\pm 5\%$ 1/4W	100-8243	1
R15	Resistor 12 k Ohm $\pm 5\%$ , 1/4W	100-1253	1
R16	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R17	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	1
R18	Resistor, 2.2 k Ohm $\pm 5\%$ , 1/4W	100-2243	1
R19	Resistor, 220 k Ohm $\pm 5\%$ , 1/4W	100-2263	1
R20	Potentiometer, 5 k Ohm $\pm 10\%$ , 1/2W	178-5044	1
R21,R22,R23	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	3
S1	Switch, Slide, SPST	345-0120	1
XIC1	Socket, 14-Pin	417-1400	1
XQ1	Transistor Pad	409-0121	1
----	Clip, Relay 270-0029	270-0032	1
----	Blank Printed Circuit Board	514-1502-2	1

3000 Series Record Amp Bias Board (Mono) Assembly - 914-1502  
(Sheet 1 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1,C3	Capacitor, Electrolytic, 100 uF, 25V	023-1083	2
C4	Capacitor, Electrolytic, 4.7 uF, 35V	015-5064	1
C6	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C7,C8	Capacitor, Electrolytic, 4.7 uF, 35V	064-4763	2
C11	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C13	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C15	Capacitor, Mylar Film, 0.003 uF, 100V	030-3033	1
C17	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C18	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C20	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C21	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C22,C23	Capacitor, Electrolytic, 33 uF, 35V	024-3335	2
C24,C25	Capacitor, Ceramic, 0.0047 uF, 100V	032-4733	2
C26	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C27,C28	Capacitor, Mylar Film, 1 uF, 100V	030-1053	2
C30	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C32	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C34	Capacitor, Mica, 200 pF, 50V	040-2223	1
C35,C37	Capacitor, Mica, 150 pF, 50V	040-1522	2
C39	Capacitor, Mylar Film, 0.02 uF, 100V	030-2043	1
C40	Capacitor, Mica, 200 pF, 50V	040-2223	1
C41	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
CR1	Diode, Silicon, 1N4148, 75V	203-4148	1
CR2,CR3	Diode, Zener, 1N4739, 9.1V, ±10%, 1W	200-0009	2
CR5,CR6	Diode, Silicon, 1N4148, 75V	203-4148	2
IC1,IC2	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	2
L1,L3	Inductor, Adjustable, 8-20 MHY	363-9061	2
Q1	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q2	Transistor, MPS6566, NPN, TO-92 Case	211-6566	1
Q4	Transistor, 2N5462, P-Channel	212-5462	1

3000 Series Record Amp Bias Board (Mono) Assembly - 914-1502  
(Sheet 2 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
Q6	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q8	Transistor, PN3644, TO-92 Case	210-3644	1
Q9,Q10	Transistor, GES5816, NPN, TO-18 Case	211-5816	2
Q11,Q12	Transistor, 2N3053, NPN	211-3053	2
Q13	Transistor, GES5817, PNP, TO-18 Case	210-5817	1
R1,R3	Potentiometer, 250 k Ohm $\pm 10\%$ , 0.5W	180-0001	2
R5	Potentiometer, 100 k Ohm $\pm 10\%$ , 0.5W	178-1064	1
R6,R7	Resistor, 18 k Ohm $\pm 5\%$ , 1/4W	100-1853	2
R10	Resistor, 62 k Ohm $\pm 5\%$ , 1/4W	100-6253	1
R12	Resistor, 8.2 k Ohm $\pm 5\%$ , 1/4W	100-8243	1
R14	Resistor, 470 Ohm $\pm 5\%$ , 1/4W	100-4733	1
R15	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R18,R19	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R20	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R21	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	1
R22	Resistor, 180 k Ohm $\pm 5\%$ , 1/4W	100-1863	1
R25	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R27	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R30,R31	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	2
R33	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R34	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R35	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R38	Resistor, 1k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R39	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R40	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R46	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R47	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R48	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R49	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R50,R51	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	2

3000 Series Record Amp Bias Board (Mono) Assembly - 914-1502  
 (Sheet 3 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R52	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R53	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R54	Resistor, 27 Ohm $\pm 5\%$ , 1/4W	100-2723	1
R55	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R56	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R57	Resistor, 27 Ohm $\pm 5\%$ , 1/4W	100-2723	1
R58	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R59,R60	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R61	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R62,R64	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R66	Resistor, 180 k Ohm $\pm 5\%$ , 1/4W	100-1863	1
S1	Switch, SPDT	345-0120	1
T1	Transformer, Input	370-0020	1
T3	Transformer, Bias Oscillator	372-0095	1
XIC1,XIC2	Socket, 8-Pin	417-0800	2
----	Blank Printed Circuit Board	514-1502	1

3000 Series Record Amp Bias Board (Stereo) Assembly - 914-1512  
(Sheet 1 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1 Thru C3	Capacitor, Electrolytic, 100 uF, 25V	023-1083	3
C4,C5	Capacitor, Electrolytic, 4.7 uF, 35V	015-5064	2
C6	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C7 Thru C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	4
C11,C12	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
C13	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C14,C15	Capacitor, Mylar Film, 0.003 uF,100V	030-3033	2
C16,C17	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
C18,C19	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	2
C20	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C21	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C22,C23	Capacitor, Electrolytic, 33 uF, 35V	024-3335	2
C24,C25	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	2
C26	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C27 Thru C29	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	3
C30,C31	Capacitor, Electrolytic, 33 uF, 35V	024-3335	2
C32,C33	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C34	Capacitor, Mica, 220 pF, 500V	040-2223	1
C35	Capacitor, Mica, 150 pF, 500V	040-1522	1
C36	Capacitor, Mica, 220 pF, 500V	040-2223	1
C37,C38	Capacitor, Mica, 150 pF, 500V	040-1522	2
C39	Capacitor, Mylar Film, 0.02 uF, 100V	030-2043	1
C40	Capacitor, Mica, 220 pF, 500V	040-2223	1
C41,C42	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	2
CR1	Diode, Silicon, 1N4148, 75V	203-4148	1
CR2 Thru CR4	Diode, Zener, 1N4739, 9.1V, ±10%, 1W	200-0009	3
CR5,CR6	Diode, Silicon, 1N4148, 75V	203-4148	2
IC1,IC2	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	2
L1 Thru L3	Inductor, 8-20 MHY	363-9061	3

3000 Series Record Amp Bias Board (Stereo) Assembly - 914-1512  
 (Sheet 2 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
Q1	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q2,Q3	Transistor, MPS6566, NPN, TO-92 Case	211-6566	2
Q4,Q5	Transistor, 2N5462, P-Channel	212-5462	2
Q6,Q7	Transistor, GES5816, NPN, TO-18 Case	211-5816	2
Q8	Transistor, PN3644, TO-92 Case	210-3644	1
Q9,Q10	Transistor, GES5816, NPN, TO-18 Case	211-5816	2
Q11,Q12	Transistor, 2N3053, NPN	211-3053	2
Q13	Transistor, GES5817,PNP, TO-18 Case	210-5817	1
R1 Thru R3	Potentiometer, 250 k Ohm $\pm 10\%$ , 0.5W	180-0001	3
R4,R5	Potentiometer, 100 k Ohm $\pm 10\%$ , 0.5W	178-1064	2
R6 Thru R9	Resistor, 18 k Ohm $\pm 5\%$ , 1/4W	100-1853	4
R10,R11	Resistor, 62 k Ohm $\pm 5\%$ , 1/4W	100-6253	2
R12,R13	Resistor, 8.2 k Ohm $\pm 5\%$ , 1/4W	100-8243	2
R14	Resistor, 470 Ohm $\pm 5\%$ , 1/4W	100-4733	1
R15	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R16	Resistor, 470 Ohm $\pm 5\%$ , 1/4W	100-4733	1
R17	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R18,R19	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R20	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R21	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	1
R22,R23	Resistor, 180 k Ohm $\pm 5\%$ , 1/4W	100-1863	2
R24	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	1
R25,R26	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	2
R27,R28	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R29 Thru R32	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	4
R33	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R34	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R35	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R36	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R37	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1

3000 Series Record Amp Bias Board (Stereo) Assembly - 914-1512  
(Sheet 3 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R38	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R39	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R40,R41	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	2
R42	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R43	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R44	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R45,R46	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	2
R47	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R48	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R49	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R50,R51	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	2
R52	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R53	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R54	Resistor, 27 Ohm $\pm 5\%$ , 1/4W	100-2723	1
R55	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R56	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R57	Resistor, 27 Ohm $\pm 5\%$ , 1/4W	100-2723	1
R58	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R59,R60	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R61	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R62 Thru R64	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	3
R65,R66	Resistor, 150 k Ohm $\pm 5\%$ , 1/4W	100-1563	2
S1,S2	Switch, SPDT	345-0120	2
T1,T2	Transformer, Input	370-0020	2
T3	Transformer, Bias Oscillator	372-0095	1
XIC1,XIC2	Socket, 8-Pin	417-0800	2
----	Blank Printed Circuit Board	514-1502	1

3000 Series Record Control and Tone Generator (Mono) Assembly - 914-1503  
(Sheet 1 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1,C5,C6	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	3
C7	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C12	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C13	Capacitor, Mylar Film, 0.002 uF,100V	030-2033	1
C14,C15	Capacitor, Mylar Film, 0.039 uF,100V	030-3942	2
C16,C17	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	2
C18	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C27	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C28	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C29	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C30	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
CR1	Diode, Silicon, 1N4148, 75V	203-4148	1
CR2 Thru CR5	Diode, Germanium 1N98, 100V	202-0098	4
CR7 Thru CR9, CR14 Thru CR20, CR23 Thru CR25	Diode, Silicon, 1N4148, 75V	203-4148	13
IC1	Integrated Circuit, RC4558, Dual Operational Amplifier, 8-Pin DIP	221-4558	1
IC2	Integrated Circuit, LM3900, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
Q1	JFET, 2N5457, N-Channel	212-5457	1
Q2	JFET, 2N5462, P-Channel	212-5462	1
Q5	Transistor, MPS6566, NPN, Silicon	211-6566	1
Q7	Transistor, GES5816, PNP, TO-18 Case	211-5816	1
Q8,Q9	Transistor, MPS6566, NPN, Silicon	211-6566	2
Q10	JFET, 2N5457, P-Channel	212-5457	1
Q12,Q13	Transistor, GES5816, PNP, TO-18 Case	211-5816	2
Q14	Transistor, MPS6566, NPN, Silicon	211-6566	1
R1,R2	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	2

3000 Series Record Control and Tone Generator (Mono) Assembly - 914-1503  
(Sheet 2 of 3)

REF NO.	DESCRIPTION	PART NO.	QTY.
R5	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R6,R9	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	2
R11	Potentiometer, 2 k Ohm $\pm 10\%$ , 1/2W	177-2044	1
R13 Thru R17	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	5
R18	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R19	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R20	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R29	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R30,R31	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	2
R32	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R34,R36	Resistor, 15 k Ohm $\pm 5\%$ , 1/4W	100-1553	2
R37	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R38,R39	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	2
R40,R41	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R42	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R43	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R44	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R45	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R46	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R48	Resistor, 180 k Ohm $\pm 5\%$ , 1/4W	100-1863	1
R49	Resistor, 68 k Ohm $\pm 5\%$ , 1/4W	100-6853	1
R52	Resistor, 75 k Ohm $\pm 5\%$ , 1/4W	100-7553	1
R53	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	1
R54	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R55	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R56,R57	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R58,R59	Resistor, 620 Ohm $\pm 5\%$ , 1/4W	100-6233	2
R60,R61	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	2
R62	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R63	Resistor, 200 k Ohm $\pm 5\%$ , 1/4W	100-2063	1

3000 Series Record Control and Tone Generator (Mono) Assembly - 914-1503  
 (Sheet 3 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R64 Thru R66	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	3
R67	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R68	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R69	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R70	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R72	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
S1	Switch, SPDT	345-0120	1
XIC1	Socket, 8-Pin	417-0800	1
XIC2	Socket, 14-Pin	417-1400	1
----	Blank Printed Circuit Board	514-1503	1

3000 Series Mono Record/Control and Tone Generator W/Q-Trips Assembly - 914-1513  
(Sheet 1 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1,C5,C6	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	3
C7	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C11	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C12	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C13	Capacitor, Mylar Film, 0.002 uF,100V	030-2033	1
C14,C15	Capacitor, Mylar Film, 0.039 uF,100V	030-3942	2
C16,C17	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	2
C18 Thru C20	Capacitor, Tantalum, 1 uF, 35V	064-1063	3
C21	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C22,C23	Capacitor, Mylar Film, 0.15 uF, 100V	030-1553	2
C24,C25	Capacitor, Mylar Film, 0.0033 uF,60V	030-3333	2
C26	Capacitor, Mica, 500 pF, 500V	041-5023	1
C27	Mylar Film, 0.01 uF, 100V	030-1043	1
C28	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C29	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C30	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
CR1	Diode, 1N4148, Silicon, 75V	203-4148	1
CR2 Thru CR5	Diode, 1N98, Germanium, 100V	202-0098	4
CR7 Thru CR9, CR14 Thru CR29	Diode, 1N4148, Silicon, 75V	203-4148	19
IC1	Integrated Circuit, RC4558, Dual Operational Amplifier, 8-Pin DIP	221-4558	1
IC2,IC3	Integrated Circuit, LM3900, Quad Operational Amplifier, 14-Pin DIP	221-3900	2
Q1	JFET, 2N5457, N-Channel	212-5457	1
Q2	JFET, 2N5462, P-Channel	212-5462	1
Q5	Transistor, NPN, Silicon, TO-92 Case	211-6566	1
Q7	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q8,Q9	Transistor, NPN, Silicon, TO-92 Case	211-6566	2
Q10,Q11	JFET, N-Channel	212-5457	2

3000 Series Mono Record/Control and Tone Generator W/Q-Trips Assembly - 914-1513  
(Sheet 2 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
Q12,Q13	Transistor, NPN, GES5816, TO-18 Case	211-5816	2
Q14	Transistor, NPN, Silicon, TO-92 Case	211-6566	1
Q15	JFET, N-Channel	212-5457	1
R1,R2	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	2
R5	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R6 Thru R9	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	4
R10,R11	Potentiometer, 2 k Ohm	177-2044	2
R12	Potentiometer, 5 k Ohm	177-5044	1
R13 Thru R17	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	5
R18	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R19	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R20	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R29	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R30,R31	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	2
R32	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R34,R36	Resistor, 15 k Ohm $\pm 5\%$ , 1/4W	100-1553	2
R37	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R38,R39	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	2
R40,R41	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R42	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R43	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R44	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R45	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R46,R47	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R48	Resistor, 180 k Ohm $\pm 5\%$ , 1/4W	100-1863	1
R49	Resistor, 68 k Ohm $\pm 5\%$ , 1/4W	100-6853	1
R50	Resistor, 2.2 k Ohm $\pm 5\%$ , 1/4W	100-2243	1
R51	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R52	Resistor, 75 k Ohm $\pm 5\%$ , 1/4W	100-7553	1
R53	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	1

3000 Series Mono Record/Control and Tone Generator W/Q-Trips Assembly - 914-1513  
(Sheet 3 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R54	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R55	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R56,R57	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R58,R59	Resistor, 620 Ohm $\pm 5\%$ , 1/4W	100-6233	2
R60,R61	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	2
R62	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R63	Resistor, 200 k Ohm $\pm 5\%$ , 1/4W	100-2063	1
R64 Thru R66	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	3
R67	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R68	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R69	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R70	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R71,R72	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R73	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R74	Resistor, 560 k Ohm $\pm 5\%$ , 1/4W	100-5663	1
R75	Resistor, 82 k Ohm $\pm 5\%$ , 1/4W	100-8253	1
R76	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	1
R77	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R78	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R79	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R80,R81	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R82,R83	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	2
R84	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R85	Resistor, 75 k Ohm $\pm 5\%$ , 1/4W	100-7553	1
R86	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	1
R87	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R89,R90	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R91,R92	Resistor, 1.5 k Ohm $\pm 5\%$ , 1/4W	100-1543	2
R93	Resistor, 220 k Ohm $\pm 5\%$ , 1/4W	100-2263	1
R94	Resistor, 68 k Ohm $\pm 5\%$ , 1/4W	100-6853	1

3000 Series Mono Record/Control and Tone Generator W/Q-Trips Assembly - 914-1513  
 (Sheet 4 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
XIC1	Socket, 8-Pin	417-0800	1
XIC2,XIC3	Socket, 14-Pin	417-1400	2
----	Switch, SPDT	345-0120	1
----	Blank Printed Circuit Board	514-1503	1

3000 Series Stereo Record Control and Tone Generator BD Assembly - 914-1523  
(Sheet 1 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1,C3,C5,C6	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	4
C7,C8	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
C9,C10	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C11	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C12	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C13	Capacitor, Mylar Film, 0.0022 uF, 100V	030-2033	1
C14,C15	Capacitor, Mylar Film, 0.039 uF, 100V	030-3942	2
C16,C17	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	2
C18	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C27	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C28	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C29	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C30,C31	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
CR1	Diode, 1N4148, Silicon, 75V	203-4148	1
CR2 Thru CR5	Diode, 1N98, Germanium, Signal, 100V	202-0098	4
CR6 Thru CR9	Diode, 1N4148, Silicon, 75V	203-4148	4
CR10 Thru CR13	Diode, 1N98, Germanium, Signal, 100V	202-0098	4
CR14 Thru CR20, CR23 Thru CR25	Diode, 1N4148, Silicon, 75V	203-4148	10
IC1	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	1
IC2	Integrated Circuit, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
Q1	JFET, N-Channel	212-5457	1
Q2	JFET, P-Channel	212-5462	1
Q3	JFET, N-Channel	212-5457	1
Q4	JFET, P-Channel	212-5462	1
Q5	Transistor, NPN, Silicon, Small Signal, TO-92 Case	211-6566	1
Q7	Transistor, NPN, Small Signal, TO-18 Case	211-5816	1
Q8,Q9	Transistor, NPN, Silicon, Small Signal, TO-92 Case	211-6566	2

3000 Series Stereo Record Control and Tone Generator BD Assembly - 914-1523  
(Sheet 2 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
Q10	JFET, N-Channel	212-5457	1
Q12,Q13	Transistor, NPN, GES5816, TO-18 Case	211-5816	2
Q14	Transistor, NPN, Silicon, Small Signal, TO-92 Case	211-6566	1
R1 Thru R4	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	4
R5	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R6,R9	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	2
R11	Potentiometer, 2 k Ohm	177-2044	1
R13 Thru R17	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	5
R18	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R19	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R20	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R21 Thru R25	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	6
R26,R27	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	2
R28	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R29	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R30,R31	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	2
R32	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R34,R36	Resistor, 15 k Ohm $\pm 5\%$ , 1/4W	100-1553	2
R37	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R38,R39	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	2
R40,R41	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R42	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R43	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R44	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R45	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R46	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R48	Resistor, 180 k Ohm $\pm 5\%$ , 1/4W	100-1863	1
R49	Resistor, 68 k Ohm $\pm 5\%$ , 1/4W	100-6853	1
R52	Resistor, 75 k Ohm $\pm 5\%$ , 1/4W	100-7553	1

3000 Series Stereo Record Control and Tone Generator BD Assembly - 914-1523  
 (Sheet 3 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R53	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	1
R54	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R55	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R56,R57	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R58,R59	Resistor, 62 Ohm $\pm 5\%$ , 1/4W	100-6233	2
R60,R61	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	2
R62	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R63	Resistor, 200 k Ohm $\pm 5\%$ , 1/4W	100-2063	1
R64 Thru R66	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	3
R67	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R68	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R69	Resistor, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R70	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R72	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
S1	Switch, SPST	345-0120	1
XIC1	Socket, 8-Pin	417-0800	1
XIC2	Socket, 14-Pin	417-1400	1
----	Blank Printed Circuit Board	514-1503	1

Stereo Record/Control and Tone Generator W/Q-Tones - 914-1533  
(Sheet 1 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1,C3,C5,C6	Capacitor, Electrolytic, 4.7 uF, 35V	024-4764	4
C7,C8	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
C9,C10	Capacitor, Electrolytic, 4.7 uF, 35V	024-4764	2
C11	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C12	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C13	Capacitor, Mylar Film, 0.002 uF,100V	030-2033	1
C14,C15	Capacitor, Mylar Film, 0.039 uF,100V	030-3942	2
C16,C17	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	2
C18 Thru C20	Capacitor, Tantalum, 1 uF, 35V	064-1063	3
C21	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C22,C23	Capacitor, Mylar Film, 0.15 uF, 100V	030-1553	2
C24,C25	Capacitor, Mylar Film, 0.0033 uF,100V	030-3333	2
C26	Capacitor, Mica, 500 pF, 500V	041-5023	1
C27	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	1
C28	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C29	Capacitor, Electrolytic, 4.7 uF, 35V	024-4764	1
C30,C31	Capacitor, Tantalum, 1 uF, 35V	064-1063	2
CR1	Diode, 1N4148, Silicon, 75V	203-4148	1
CR2 Thru CR5	Diode, 1N98, 100V, 20 mA	202-0098	4
CR6 Thru CR9	Diode, 1N4148, Silicon, 75V	203-4148	4
CR10 Thru CR13	Diode, 1N98, 100V, 20 mA	202-0098	4
CR14 Thru CR29	Diode, 1N4148, Silicon, 75V	203-4148	16
IC1	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	1
IC2,IC3	Integrated Circuit, Quad Operational Amplifier, 14-Pin DIP	221-3900	2
Q1	JFET, N-Channel, 25V, 5 mA	212-5457	1
Q2	JFET, P-Channel, 40V, 16 mA	212-5462	1
Q3	JFET, N-Channel, 25V, 5 mA	212-5457	1
Q4	JFET, P-Channel, 40V, 16 mA	212-5462	1
Q5	Transistor, NPN, Silicon, TO-92 Case	211-6566	1

Stereo Record/Control and Tone Generator W/Q-Tones - 914-1533  
(Sheet 2 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
Q7	Transistor, NPN, TO-18 Case	211-5816	
Q8,Q9	Transistor, NPN, Silicon, TO-92 Case	211-6566	2
Q10,Q11	JFET, N-Channel, 25V, 5 mA	212-5457	2
Q12,Q13	Transistor, NPN, TO-18 Case	211-5816	2
Q14	Transistor, NPN, Silicon, TO-92 Case	211-6566	1
Q15	JFET, N-Channel, 25V, 5 mA	212-5457	1
R1 Thru R4	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	4
R5	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R6 Thru R9	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	4
R10,R11	Potentiometer, 2 k Ohm $\pm 10\%$ , 1/2W	177-2044	2
R12	Potentiometer, 5 k Ohm $\pm 10\%$ , 0.5W	177-5044	1
R13 Thru R17	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	5
R18	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R19	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R20	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R21 Thru R25	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	5
R26,R27	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	2
R28	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R29	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R30,R31	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	2
R32	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R34,R36	Resistor, 15 k Ohm $\pm 5\%$ , 1/4W	100-1553	2
R37	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R38,R39	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3943	2
R40,R41	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R42	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R43	Resistor, 0.47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R44	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R45	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R46,R47	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R48	Resistor, 180 k Ohm $\pm 5\%$ , 1/4W	100-1863	1

Stereo Record/Control and Tone Generator W/Q-Tones - 914-1533  
(Sheet 3 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R49	Resistor, 68 k Ohm $\pm 5\%$ , 1/4W	100-6853	1
R50	Resistor, 2.2 k Ohm $\pm 5\%$ , 1/4W	100-2243	1
R51	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R52	Resistor, 75 k Ohm $\pm 5\%$ , 1/4W	100-7553	1
R53	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	1
R54	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R55	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R56,R57	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R58,R59	Resistor, 620 Ohm $\pm 5\%$ , 1/4W	100-6233	2
R60,R61	Resistor, 0.47 k Ohm $\pm 5\%$ , 1/4W	100-4753	2
R62	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R63	Resistor, 200 k Ohm $\pm 5\%$ , 1/4W	100-2063	1
R64,R65,R66	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	3
R67	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R68	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R69	Resistor, 0.47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R70	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R71,R72	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R73	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3953	1
R74	Resistor, 560 k Ohm $\pm 5\%$ , 1/4W	100-5663	1
R75	Resistor, 82 k Ohm $\pm 5\%$ , 1/4W	100-8253	1
R76	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	1
R77	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R78	Resistor, 0.47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R79	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	1
R80,R81	Resistor, 3.9 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R82,R83	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	2
R84	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R85	Resistor, 75 k Ohm $\pm 5\%$ , 1/4W	100-7553	1
R86	Resistor, 56 k Ohm $\pm 5\%$ , 1/4W	100-5653	1

Stereo Record/Control and Tone Generator W/Q-Tones - 914-1533  
(Sheet 4 of 4)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R87	Resistor, 120 k Ohm $\pm 5\%$ , 1/4W	100-1263	1
R88	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R89,R90	Resistor, 39 k Ohm $\pm 5\%$ , 1/4W	100-3953	2
R91,R92	Resistor, 1.5 k Ohm $\pm 5\%$ , 1/4W	100-1543	2
R93	Resistor, 220 k Ohm $\pm 5\%$ , 1/4W	100-2263	1
R94	Resistor, 68 k Ohm $\pm 5\%$ , 1/4W	100-6853	1
S1	Switch, SPDT	345-0120	1
XIC1	Socket, 8-Pin	417-0800	1
XIC2,XIC3	Socket, 14-Pin	417-1400	2
----	Blank Printed Circuit Board	514-1503	1

## 3000 Delay Record Amp Bias Board (Mono) Assembly - 914-1522 (Sheet 1 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
C1,C3	Capacitor, Electrolytic, 100 uF, 25V	023-1083	2
C4	Capacitor, Electrolytic, 4.7 uF, 64V	015-5064	1
C6	Capacitor, Electrolytic, 33 uF, 35V	064-3373	1
C7,C8	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	2
C11	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C13	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C15	Capacitor, Mylar Film, 0.003 uF, 100V	030-3033	1
C17	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C18	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C20	Capacitor, Tantalum, 1 uF, 35V	064-1063	1
C21	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C22,C23	Capacitor, Electrolytic, 33 uF, 35V	064-3373	2
C24,C25	Capacitor, Ceramic, 0.0047 uF, 200V	032-4733	2
C26	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C27,C28	Capacitor, Mylar Film, 0.1 uF, 100V	030-1053	2
C30	Capacitor, Electrolytic, 33 uF, 35V	064-3373	1
C32	Capacitor, Tantalum, 4.7 uF, 35V	064-4763	1
C34	Capacitor, Mica, 220 pF, 500V	040-2223	1
C35,C37	Capacitor, Mica, 150 pF, 500V	040-1522	2
C39	Capacitor, Mylar Film, 0.02 uF, 100V	030-2043	1
C40	Capacitor, Mica, 220 pF, 500V	040-2223	1
C41	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
CR1	Diode, Silicon, 1N4148, 75V, 10 mA	203-4148	1
CR2,CR3	Diode, Zener, 1N4739, 9.1V, $\pm 10\%$ , 1W	200-0009	2
CR5,CR6	Diode, Silicon, 1N4148, 75V, 10 mA	203-4148	2
IC1,IC2	Integrated Circuit, Dual Operational Amplifier, 8-Pin DIP	221-4558	2
L1,L3	Inductor, 8-20 MHY	363-9061	2
Q1	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q2	Transistor, MPS6566, NPN, TO-92 Case	211-6566	1

## 3000 Delay Record Amp Bias Board (Mono) Assembly - 914-1522 (Sheet 2 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
Q4	Transistor, JFET, 2N5462, P-Channel	212-5462	1
Q6	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
Q8	Transistor, PN3644, TO-92 Case	210-3644	1
Q9,Q10	Transistor, GES5816, NPN, TO-18 Case	211-5816	2
Q11,Q12	Transistor, NPN, 2N3053	211-3053	2
Q13	Transistor, GES5817, PNP, TO-18 Case	210-5817	1
R1,R3	Potentiometer, 250 k Ohm, $\pm 10\%$ , 0.5W	180-0001	2
R5	Potentiometer, 100 k Ohm, $\pm 10\%$ , 0.5W	178-1064	1
R6,R7	Resistor, 18 k Ohm, $\pm 5\%$ , 1/4W	100-1853	2
R10	Resistor, 62 k Ohm, $\pm 5\%$ , 1/4W	100-6253	1
R12	Resistor, 8.2 k Ohm, $\pm 5\%$ , 1/4W	100-8243	1
R14	Resistor, 470 Ohm, $\pm 5\%$ , 1/4W	100-4733	1
R15	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	1
R18,R19	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	2
R20	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R21	Resistor, 3.9 k Ohm, $\pm 5\%$ , 1/4W	100-3943	1
R22	Resistor, 180 k Ohm, $\pm 5\%$ , 1/4W	100-1863	1
R25	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	1
R27	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	1
R30,R31	Resistor, 4.7 k Ohm, $\pm 5\%$ , 1/4W	100-4743	2
R33	Resistor, 22 k Ohm, $\pm 5\%$ , 1/4W	100-2253	1
R34	Resistor, 270 k Ohm, $\pm 5\%$ , 1/4W	100-2763	1
R35	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	1
R38	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R39	Resistor, 2.7 k Ohm, $\pm 5\%$ , 1/4W	100-2743	1
R40	Resistor, 100 k Ohm, $\pm 5\%$ , 1/4W	100-1063	1
R46	Resistor, 22 k Ohm, $\pm 5\%$ , 1/4W	100-2253	1
R47	Resistor, 100 k Ohm, $\pm 5\%$ , 1/4W	100-1063	1
R48	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	1
R49	Resistor, 1 Meg Ohm, $\pm 5\%$ , 1/4W	100-1073	1

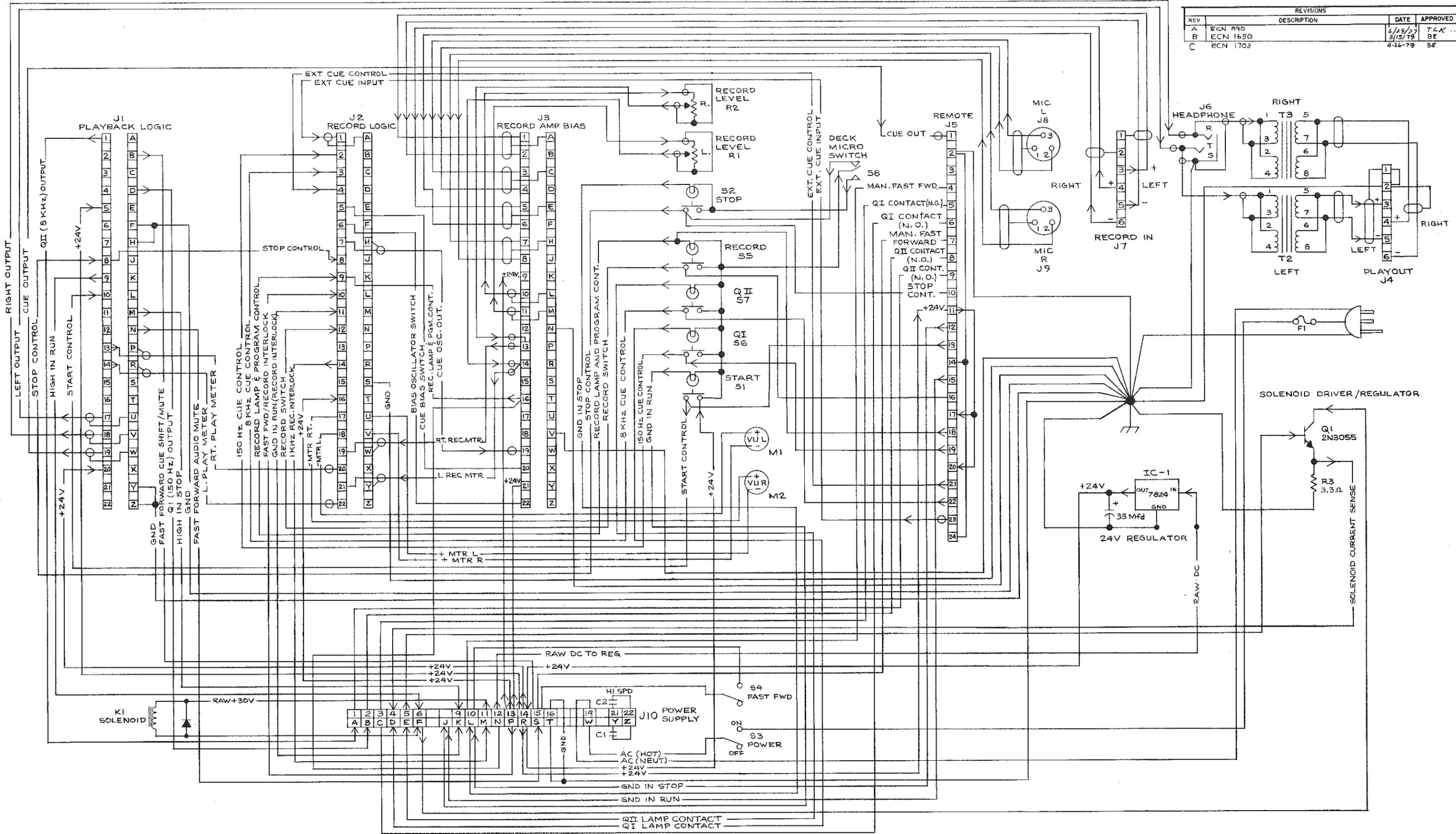
## 3000 Delay Record Amp Bias Board (Mono) Assembly - 914-1522 (Sheet 3 of 3)

REF. NO.	DESCRIPTION	PART NO.	QTY.
R50,R51	Resistor, 27 k Ohm, $\pm 5\%$ , 1/4W	100-2753	2
R52	Resistor, 47 k Ohm, $\pm 5\%$ , 1/4W	100-4753	1
R53	Resistor, 39 k Ohm, $\pm 5\%$ , 1/4W	100-3953	1
R54	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	1
R55	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R56	Resistor, 22 k Ohm, $\pm 5\%$ , 1/4W	100-2253	1
R57	Resistor, 27 Ohm, $\pm 5\%$ , 1/4W	100-2723	1
R58	Resistor, 1 k Ohm, $\pm 5\%$ , 1/4W	100-1043	1
R59,R60	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	2
R61	Resistor, 22 k Ohm, $\pm 5\%$ , 1/4W	100-2253	1
R62,R64	Resistor, 10 k Ohm, $\pm 5\%$ , 1/4W	100-1053	2
R66	Resistor, 180 k Ohm, $\pm 5\%$ , 1/4W	100-1863	1
S1	Switch, SPST	345-0120	1
T1	Transformer, Input	370-0020	1
T3	Transformer, Bias Oscillator	372-0095	1
XIC1,XIC2	I.C. Socket, 8-Pin	417-0800	2
----	Blank Printed Circuit Board	514-1502	1

## 3000 Series Delay Board (Mono and Stereo) Assembly - 914-1580/-1582

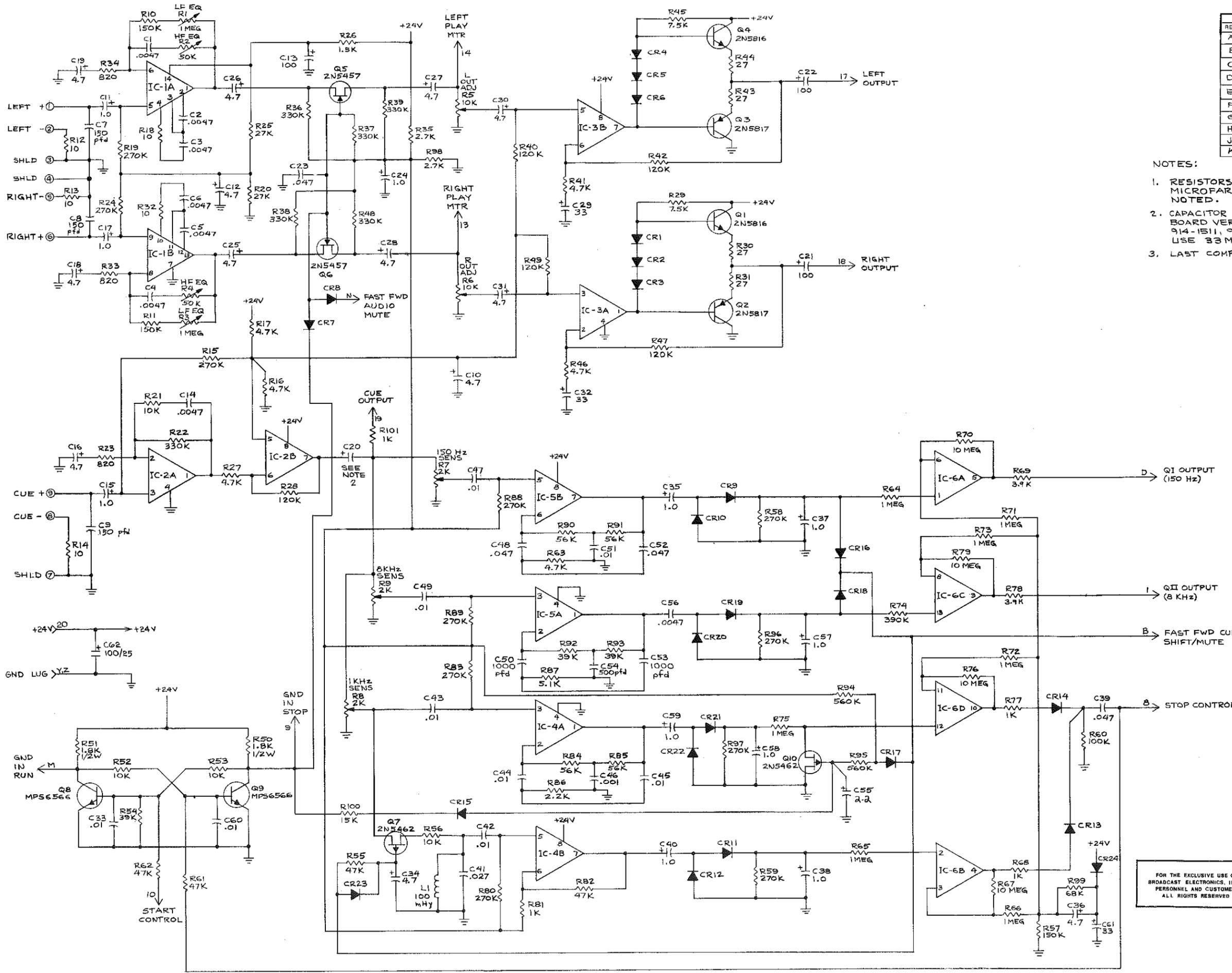
REF. NO.	DESCRIPTION	PART NO.	QTY.
C1	Capacitor, Mylar Film, 0.01 uF, 100V	030-1043	1
C2	Capacitor, Mica, 270 pF, 500V	041-2722	1
CR1 Thru CR6	Bridge Rectifier, Silicon, 600V, 1A	203-4005	6
R1	Relay, DPST, 24V, 2A	270-0024	1
Q1	Transistor, GES5817, PNP, TO-18 Case	210-5817	1
Q2	Transistor, GES5816, NPN, TO-18 Case	211-5816	1
R1 Thru R4	Resistor, 10 k Ohm $\pm$ 5%, 1/4W	100-1053	4
R5	Resistor, 10 k Ohm $\pm$ 5%, 2W	130-1053	1
----	Blank Printed Circuit Board	514-1580	1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ECN R90	6/29/77	T.L.K.
B	ECN 1650	3/15/79	BE
C	ECN 1703	4-26-79	BF



NOTES:  
 1. ARROWS SHOW SIGNAL AND CURRENT FLOW.  
 2. S8 SHOWN WITH DECK UNLOADED.

TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN BY W.M.	DATE 10/5/76	BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -
DECIMAL 2 PL +01 3 PL +005	FRACTIONAL 1/64	CHECKED BY J.L.S.	DATE 10-15-76	
ANGULAR 1/64	TO	PROJECT ENGR P.L.S.	DATE 10-20-76	TITLE 3000 SERIES SYSTEM SCHEMATIC
SHARP EDGES		APPROVED BY		DWG NO. 906-3141
BEND RADI				REV C
FILLET RADI				3000 SERIES
MATERIAL	TREATMENT OR FINISH		SCALE	SHEET 1 OF 1



REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ADDED R100, C61 & CR11	4/2/75	
B	PER ECN # 497	5-19-75	MB
C	PER ECN # 543	7/14/75	MB
D	PER ECN # 671	12-10-75	MB
E	PER ECN # 684	1-7-76	MB
F	PER ECN # 738	3/5/76	MB
G	PER ECN # 866	8-7-76	MB
H	PER ECN # 1247	7-19-78	MH
J	PER ECN # 1500	1-5-79	MH
K	PER ECN # 1715	5-8-79	GH

- NOTES:
- RESISTORS IN OHMS, 1/4 WATT; CAPACITORS IN MICROFARADS; DIODES IN 457, UNLESS OTHERWISE NOTED.
  - CAPACITOR C20 VALUE VARIES DEPENDING UPON BOARD VERSION. 4.7 MFD IS USED WITH 914-1501, 914-1511, 914-1541, & 914-1551. ALL OTHER VERSIONS USE 33 MFD.
  - LAST COMPONENTS USED: R101, C62, CR11, Q10, IC-6 & L1.

SEE PC ASSY DWGS # D-914-1501, -1511, -1521, -1531, -1541, -1551, -1561, -1571 & -1581

DRAWN: MMB CHECKED: MMB PROJECT ENGR: MMB APPROVED BY:	DATE: 4/1/75 DATE: 4/1/75	<b>BROADCAST ELECTRONICS INC.</b> - A FILMWAYS COMPANY - <b>TITLE</b> SCHEMATIC PLAYBACK LOGIC PCB DWG NO. 906-3111 3000 SERIES	REV. K SCALE: - SHEET 1 OF 1
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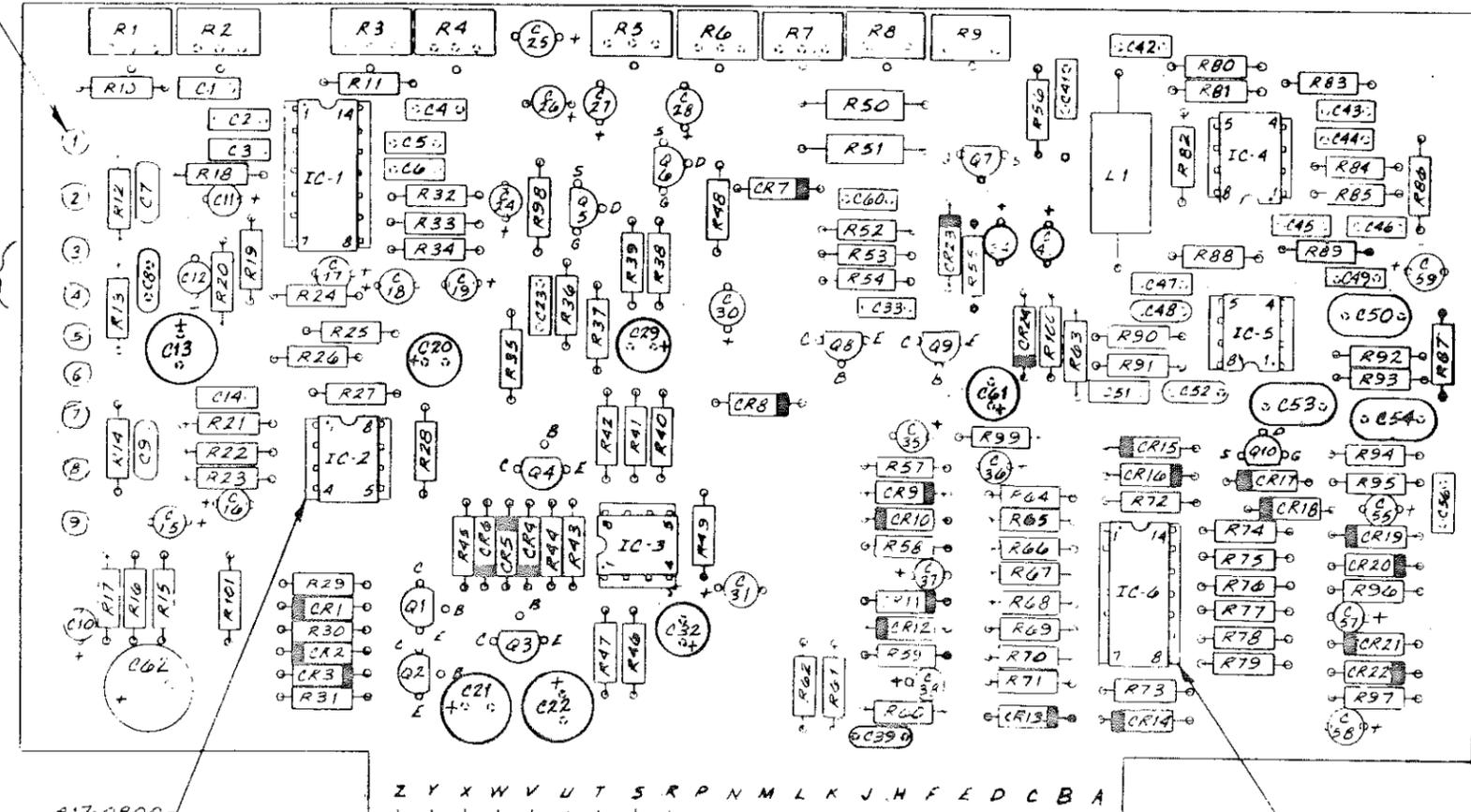
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REV.	DESCRIPTION	DATE	APPROVED
A	GENERAL UPDATE TO REV - A FOLIO	4/22/78	H.B.
B	ECN 437	5/16/78	H.B.
C	ECN 543	10/7/78	H.C.
D	ECN 564	11/21/78	H.B.
E	ECN 644	11/26/78	H.B.
F	ECN 671	12/10/78	H.B.
G	ECN 738	3/30/79	H.B.
H	ECN 774	4/27/79	H.B.
J	ECN 866	9/10/79	H.B.
K	ECN 1096	11/16/79	2LC
L	ECN 1247	1/18/80	H.H.
M	ECN 1560	1/15/79	H.H.
N	ECN 1715	3/17/79	GH
P	ECN 2633	4/11/81	CRF
R	PER ECN #3111	12/15/81	-AH
S	PER ECN #3861	3-23-82	MERK
T	PER ECN #3394	4-15-82	CRF
U	ECN 3538	6/11/82	2RT
V	ECN 3547	6-17-82	CWK
W	PER ECN 3651	7-15-82	CWK
X	PER ECN 3772	9-8-82	CWK

418-0161  
(2 PLCS.)

LEFT -  
LEFT -  
SHIELD  
RIGHT -  
RIGHT +  
CUE SHIELD  
CUE -  
CUE +

COMPONENT SIDE



417-0800  
(2 PLCS.)

Z Y X W V U T S R P N M L K J H F E D C B A

GROUND LUG  
GROUND LUG  
SHIELD  
SHIELD  
SHIELD  
SHIELD  
SHIELD  
SHIELD  
FAST FWD AUDIO MUTE  
GROUND IN RUN  
START CONTROL  
GROUND IN STOP  
STOP CONTROL  
+24V  
CUE OUTPUT  
RIGHT OUTPUT  
LEFT OUTPUT  
LEFT PLAY METER  
RIGHT PLAY METER  
GROUND IN RUN  
+24V  
AI (150 Hz) OUTPUT  
FAST FWD CUE SHIFT/MUTE  
AI (80 Hz) OUTPUT

417-1400  
(2 PLCS.)

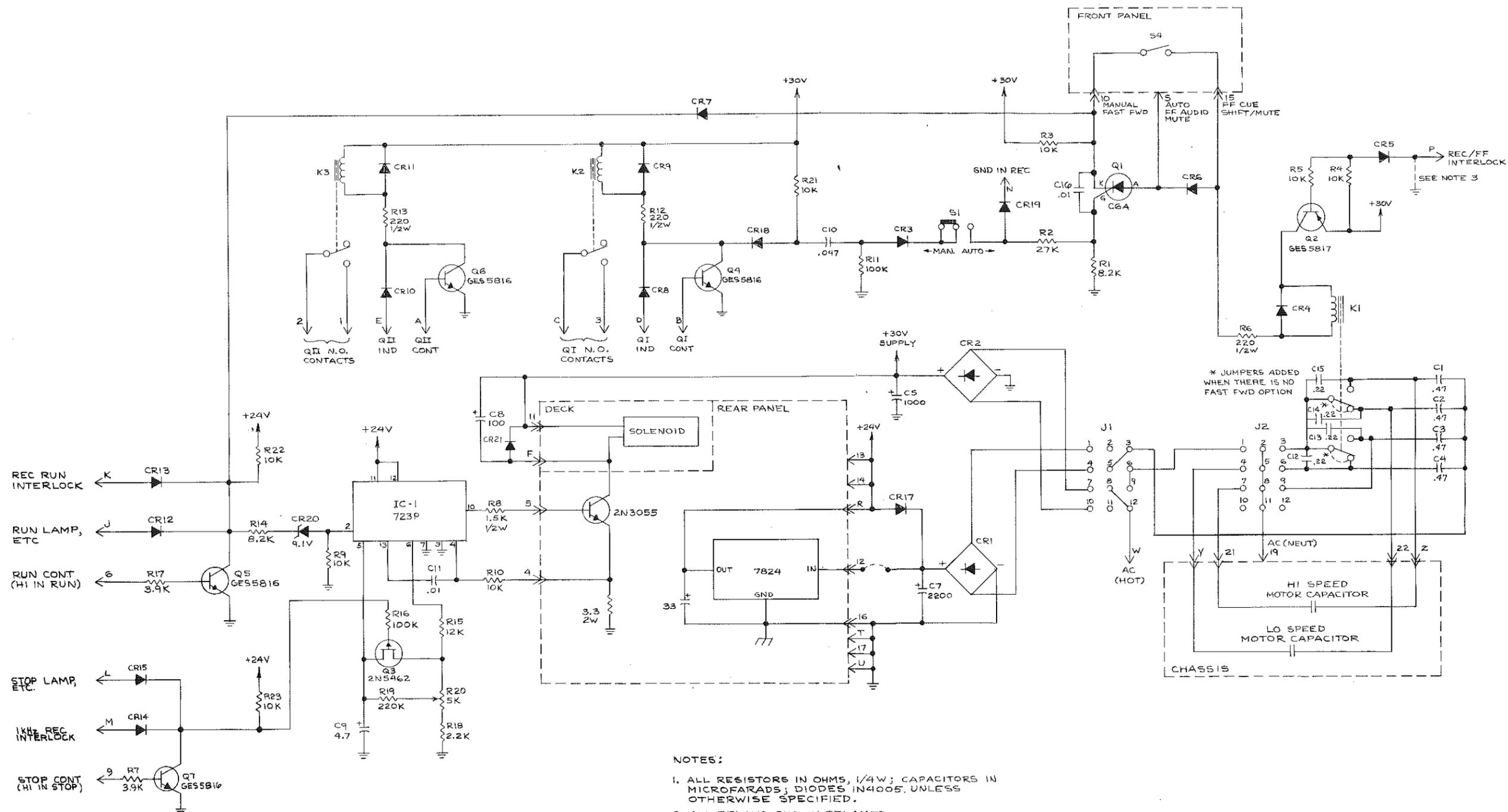
514-1501

NOTES  
1. SEE SCHEMATIC #D906-3111  
2. SEE B/M # 914-1571

22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

CIRCUIT SIDE

PROPRIETARY RIGHTS are included in information disclosed herein. This information is submitted in confidence and neither this document nor the information disclosed herein shall be reproduced or transferred to other documents or used or disclosed to others for manufacturing or for any other purpose except as specifically authorized in writing by Broadcast Electronics, Inc.	TOLERANCE UNLESS OTHERWISE SPECIFIED DIMENSIONS: 2 PL - 01 SPL - 505 FRACTIONAL 2/1/84 BOARD DIMS FILLET RADIUS	DRAWN BY: <b>MERK</b> CHECKED BY: _____ PROJECT: _____ APPROVED BY: _____ TREATMENT OR FINISH: _____	DATE: <b>7-8-82</b> DATE: _____ DATE: _____ DATE: _____	<b>BROADCAST ELECTRONICS INC.</b> -A FILMWAYS COMPANY- TITLE: <b>PLAYBACK BD ASSY. STEREO W/ TRIPS &amp; FAST FWD</b> DWG NO: <b>914-1571</b> SCALE: <b>2/1</b> SHEET 1 OF 1
	3000 SERIES	SHEET 1 OF 1	DATE: _____	DATE: _____
	3000 SERIES	SHEET 1 OF 1	DATE: _____	DATE: _____
	3000 SERIES	SHEET 1 OF 1	DATE: _____	DATE: _____



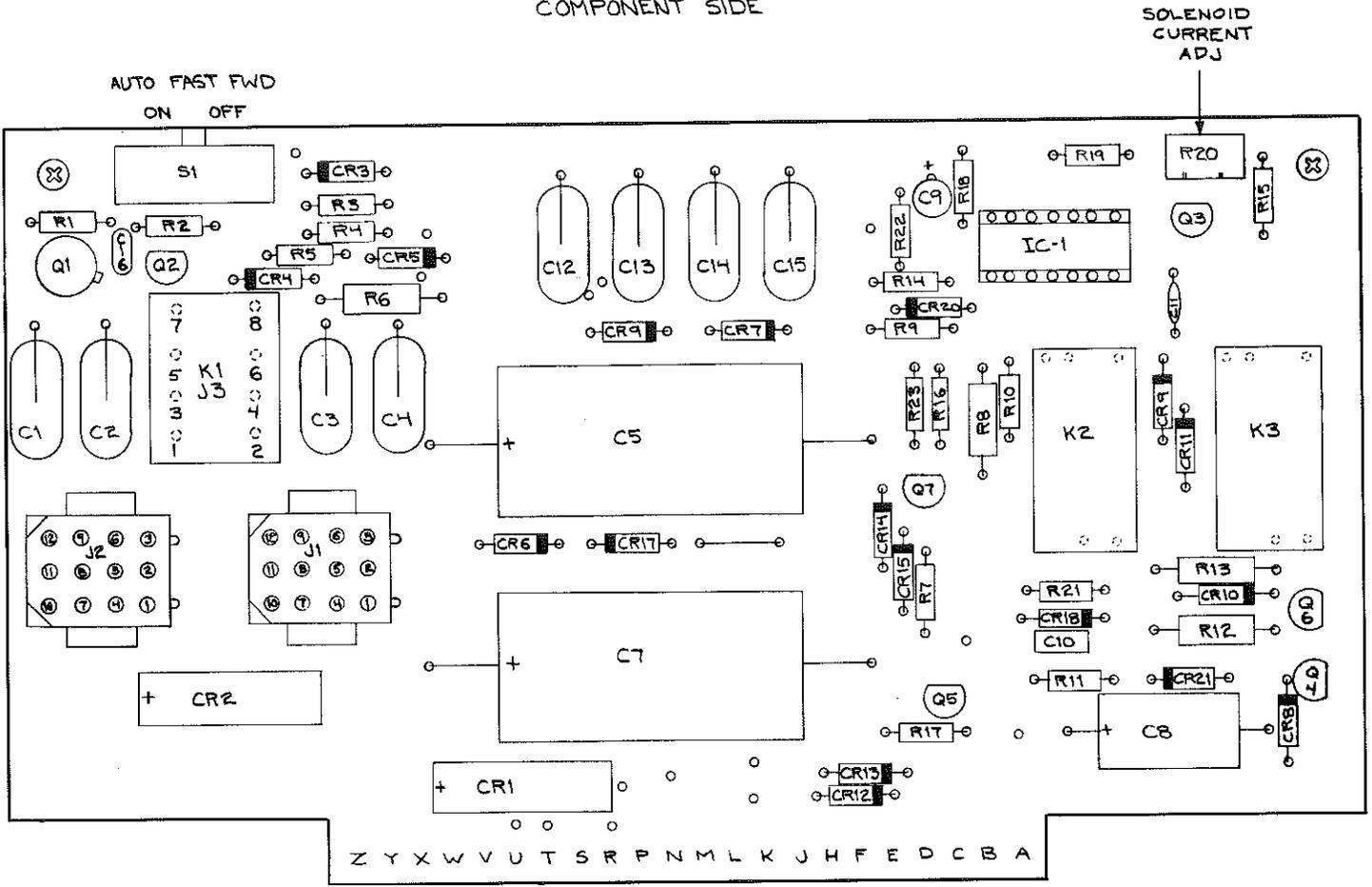
NOTES:

1. ALL RESISTORS IN OHMS, 1/4W; CAPACITORS IN MICROFARADS; DIODES IN4005, UNLESS OTHERWISE SPECIFIED.
2. ALL RELAYS SHOWN RELAXED.
3. IN PLAYBACK-ONLY MACHINES PIN P MUST BE JUMPED TO GROUND (PIN 16) TO ALLOW FAST FORWARD OPERATION.
4.  $\leftarrow \frac{N}{N}$  PIN ON PC BOARD CONN (J10),  
 $\perp$  PC BOARD GROUND  
 $\perp$  CHASSIS GROUND

SEE PCB ASSY DWG # D-914-1505, -1515, -1525 & -1535.

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	DECIMAL 2 PL-01 3PL-005	CHECKED BY:	DATE:	
	FRACTIONAL 1/64	PROJECT ENGR:	DATE:	
	ANGULAR ± 1°	APPROVED BY:	DATE:	
SHARP EDGES BEND RADI FILLET RADI	MATERIAL:	TREATMENT OR FINISH:		TITLE: SCHEMATIC POWER SUPPLY PCB
				DWG NO: 906-3142-1
				3000 SERIES
				SCALE: SHEET 1 OF 1

COMPONENT SIDE



SOLENOID  
CURRENT  
ADJ

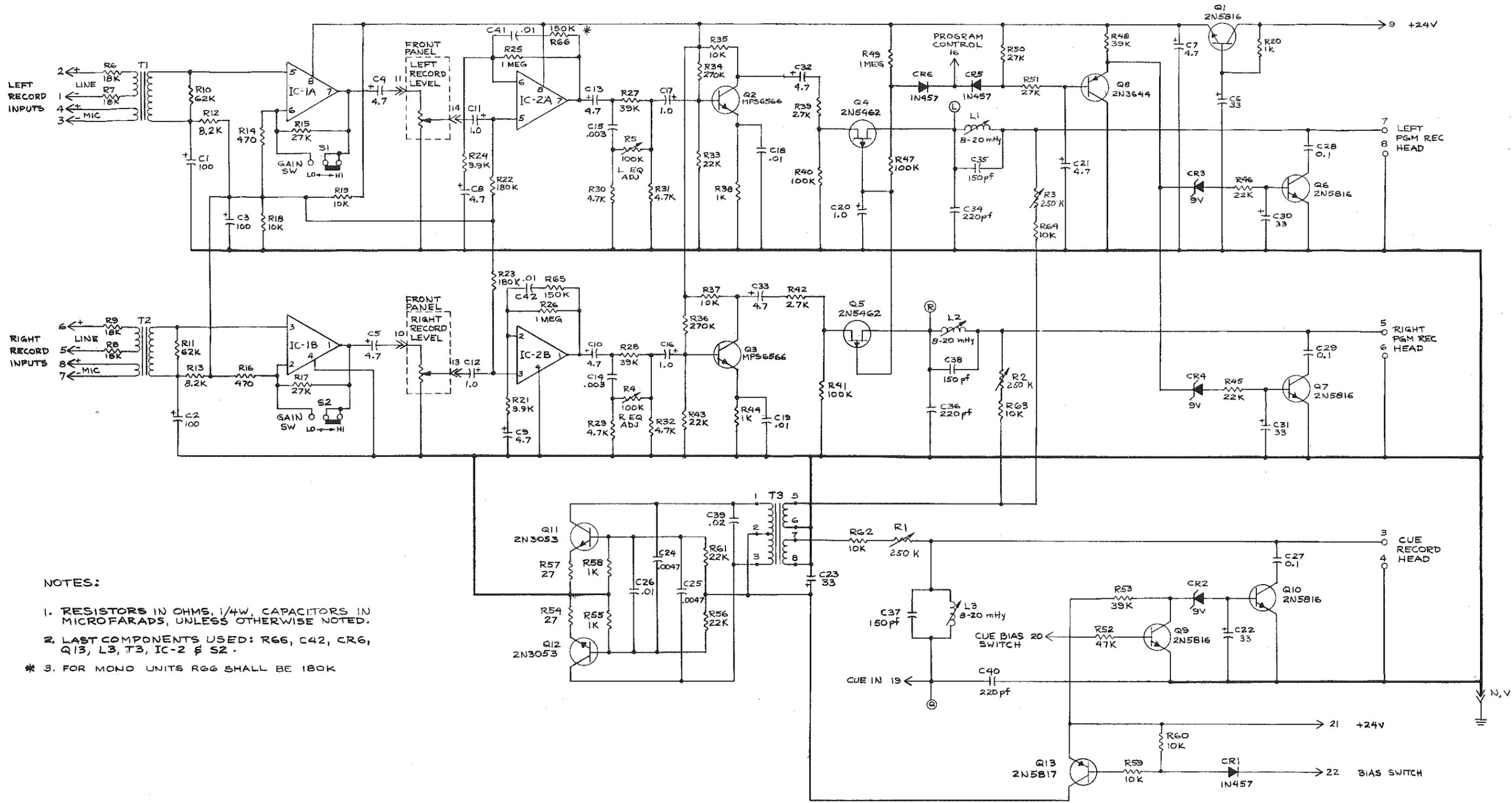
AUTO FAST FWD  
ON OFF

N Y X Z V U T S R Q P Z I F X C I T F D C B A

- HI SPEED MOTOR CAP
- HI SPEED MOTOR
- AC (NEUT)
- GROUND
- GROUND
- FF CUE SHIFT/MUTE
- +24V
- +24V
- RAW DC TO REG
- RAW +30V
- MANUAL FAST FWD
- STOP CONT (HI IN STOP)
- LO SPEED MOTOR CAP
- LO SPEED MOTOR CAP
- AC (HOT)
- GROUND
- GROUND
- AUTO FF AUDIO MUTE
- +24V
- REC/FF INTERLOCK
- 1 KHZ REC INTERLOCK
- STOP LAMP, ETC
- REC RUN INTERLOCK
- RUN LAMP, ETC
- SOLENOID
- QII IND
- QI IND
- QI N.O. CONTACT
- QI CONT
- QII CONT
- RUN CONT (HI IN RUN)
- SOLENOID DRIVER
- SOLENOID CURRENT SENSE
- QI N.O. CONTACT
- QII N.O. CONTACT
- QII N.O. CONTACT

22 21 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1

CIRCUIT SIDE



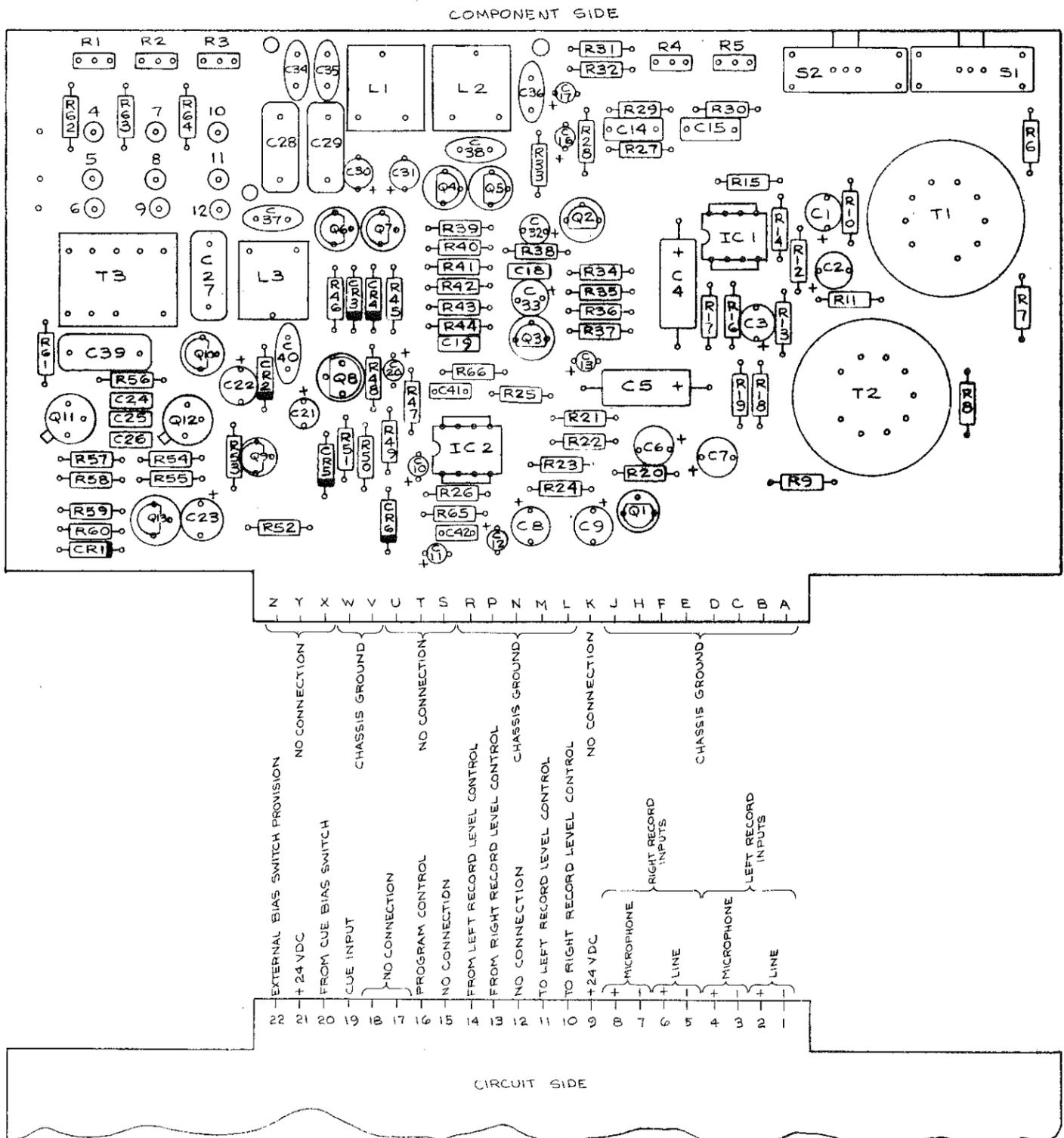
**NOTES:**

1. RESISTORS IN OHMS, 1/4W, CAPACITORS IN MICROFARADS, UNLESS OTHERWISE NOTED.
2. LAST COMPONENTS USED: R66, C42, CR6, Q13, L3, T3, IC-2 & S2.
- \* 3. FOR MONO UNITS R66 SHALL BE 180K

REV	DESCRIPTION	DATE	APPROVED
E	PER ECN # 2215	8-7-80	mm
D	PER ECN # 2191	7-19-80	mm
C	PER ECN # 1861	12/31/79	JH
B	PER ECN # 648	11/14/75	
A	PER ECN # 583	7-9-75	

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TOLERANCE UNLESS OTHERWISE SPECIFIED	DRAWN <i>gjs</i>	DATE <i>6/30/75</i>	BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -
FRACTIONAL ± 1/64	CHECKED <i>[initials]</i>	DATE <i>7-9-75</i>	
DECIMAL 2 PL ± 0.1 3 PL ± 0.005	PROJECT ENGR	DATE	TITLE
ANGULAR ± 1°	APPROVED BY		RECORD AMP BIAS PC BOARD
SHARP EDGES			DWG NO. 906-3110
BEND RADI			3000 & 4000 SCALE
FILLET RADI			SHEET 1 OF 1

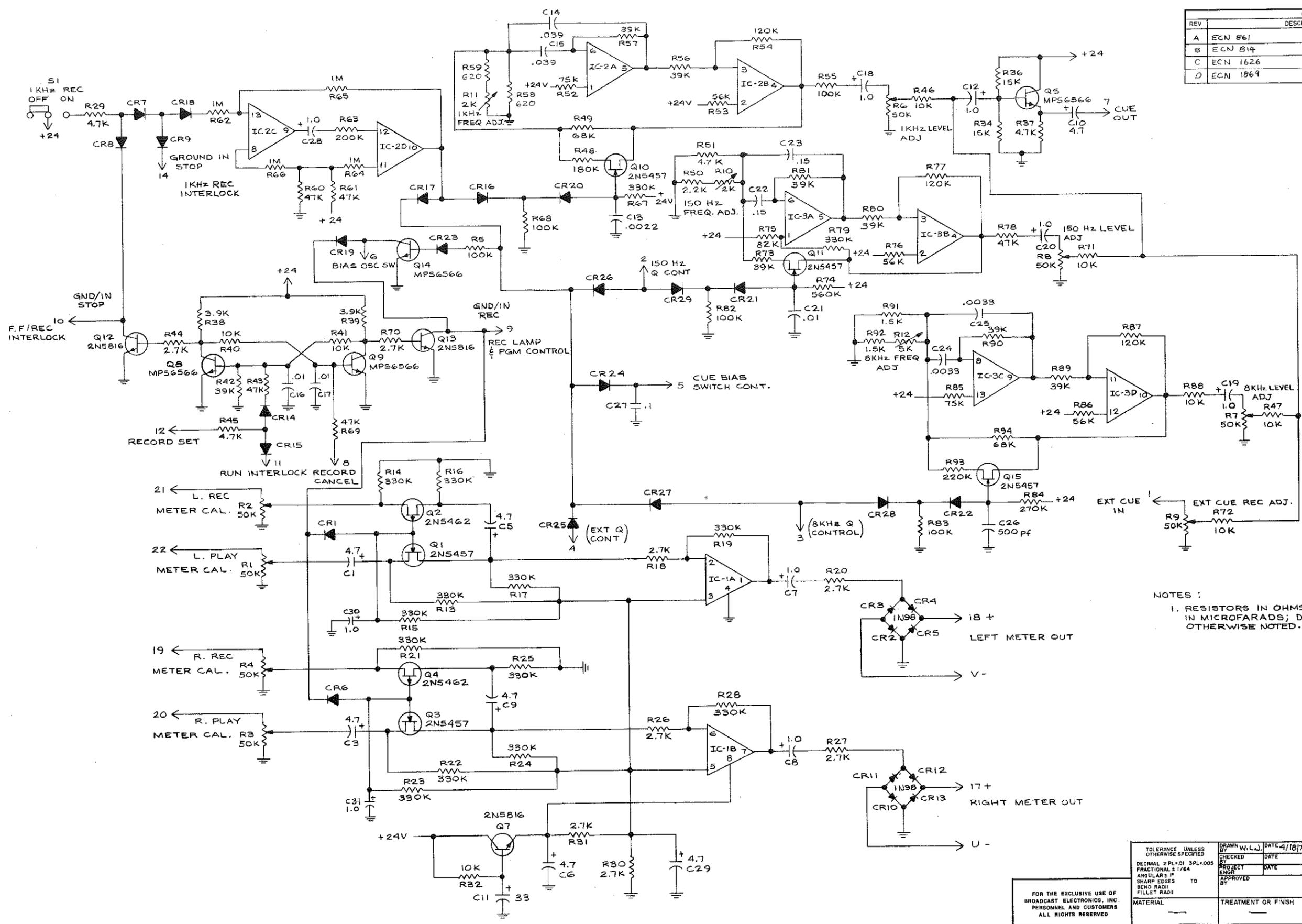


REV	DESIGN	DATE	APPROVED
B	PER ECN # 50	7/1/75	
C	PER ECN # 648	11/14/75	
D	PER ECN # 713	2-76	
E	PER ECN # 1096	1-16-78	CLO
F	PER ECN # 1861	12-31-79	JDH
G	PER ECN # 2286	9-5-80	mm
H	PER ECN # 2633	4-1-81	ORF

SEE SCHEMATIC # D906-3110  
SEE B/M # 914-1512

ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
LIST OF MATERIAL				
TOLERANCE UNLESS OTHERWISE SPECIFIED			DRAWN (Jm)	DATE 7/2/75
DECIMAL 2 PL ± 0.1 3 PL ± 0.005			CHECKED BY	DATE
FRACTIONAL ± 1/64			PROJECT ENGR	DATE
ANGULARS ±			APPROVED BY	
SHARP EDGES TO				
BEND RADI				
FILLET RADI				
MATERIAL			TREATMENT OR FINISH	
BROADCAST ELECTRONICS, INC.			BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -	
			(STEREO) RECORD AMP BIAS BOARD	
			DWG NO. 914-1512	REV 77
			3000 & 4000 SERIES	SCALE 2/1 SHEET 1 OF 1

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	ECN 561	8/11/75	JDA
B	ECN 814	5-26-76	JDA
C	ECN 1626	2-26-79	BE
D	ECN 1869	1-8-80	JDA

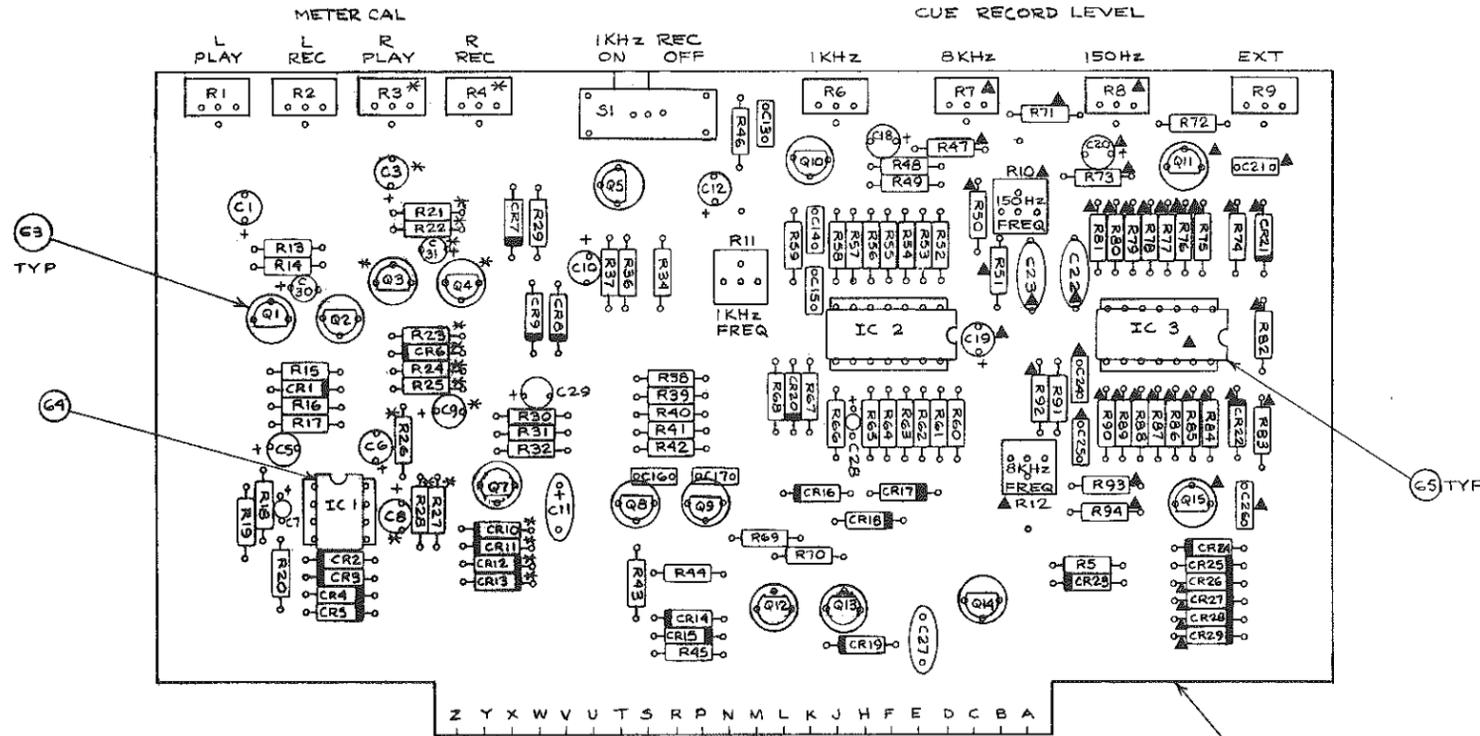


NOTES:  
 1. RESISTORS IN OHMS, 1/4 WATT; CAPACITORS IN MICROFARADS; DIODES IN 457 UNLESS OTHERWISE NOTED.

TOLERANCE UNLESS OTHERWISE SPECIFIED DECIMAL 2 PL ± 0.1 3 PL ± 0.05 FRACTIONAL 1/64 ANGULAR R ± 0.1 SHARP EDGES TO BEND RADIUS FILLET RADIUS	DRAWN BY W.L.J. DATE 4/18/75	<b>BROADCAST ELECTRONICS INC.</b> - A FILMWAYS COMPANY - TITLE (SCHEMATIC) <b>RECORD LOGIC TONE GENERATOR</b> DWG NO. <b>906-3112</b> 3000 SERIES SCALE SHEET 1 OF 1
	CHECKED BY DATE PROJECT ENGR. TO APPROVED BY MATERIAL TREATMENT OR FINISH	

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COMPONENT SIDE



SHIELD  
SHIELD  
SHIELD  
SHIELD  
+ METER LEFT  
+ METER RIGHT

LEFT PLAYBACK METER IN  
LEFT RECORD METER IN  
RIGHT PLAYBACK METER IN  
RIGHT RECORD METER IN  
- METER LEFT OUT  
- METER RIGHT OUT  
+24V  
GND  
1KHz RECORD INTERLOCK  
BLANK RECORD SWITCH  
GND IN RUN  
FAST FORWARD/RECORD INTERLOCK  
RECORD LAMP & PROGRAM CONTROL  
STOP SWITCH  
CUE OUT  
BIAS OSCILLATOR SWITCH  
CUE BIAS SWITCH  
EXTERNAL CUE CONTROL  
8 KHz CUE CONTROL  
150 Hz CUE CONTROL  
EXTERNAL CUE IN

CIRCUIT SIDE

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	GENERAL UPDATE TO REV-A FOIL	4-28-75	
B	ECN 561	9/11/75	
C	ECN 649	11/18/75	
D	ECN 1096	1-16-76	CLD
E	ECN 1626	2-26-79	BE
F	ECN 1869	7-8-80	JDA

NOTES:

- PART NUMBER 914-1503 - MONOPHONIC  
914-1513 - " " W/QTRIPS  
" " 914-1523 - STEREOHONIC  
914-1533 - " " " "
- \* ITEMS NOT USED WITH MONO VERSIONS  
914-1503 & 914-1513.  
▲ ITEMS NOT USED WITH STANDARD  
VERSIONS 914-1503 & 914-1523.

ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
				38		030-1043	.01 MFD (C16,C17,C27)	
				37	2	030-3942	.039 MFD (C14, C15)	
				36	1	030-2033	.0022 MFD 100V (C18)	
				35	1	064-3373	33 MFD (C11)	
				34		064-1063	1 MFD (C30, C31, C19, C24, C28)	
				33	7	064-4763	4.7 MFD 35V CAPACITOR (C1, C9)	
				32				
				31	2	100-3943	3.9K, 1/4W RESISTOR (R38, R39)	
				30				
				29		100-7553	75K (R62, R63)	
				28				
				27	2	100-6233	620Ω (R58, R59)	
				26				
				25	1	100-2062	200K (R63)	
				24	4	100-1073	1 MEG (R62, R64, R65, R66)	
				23		100-5663	560K (R74)	
				22		100-8253	82K (R75)	
				21		100-2763	270K (R64)	
				20		100-5653	56K (R63, R76, R66)	
65		417-1400	IC SOCKET, 14 PIN (IC-2, IC-3)	19		100-1263	120K (R54, R77, R68)	
64	1	417-0800	IC SOCKET, 8 PIN (IC-1)	18		100-1543	1.5K (R91, R92)	
63		409-1814	TRANSISTOR PAD	17		100-2263	220K (R93)	
62	1	345-0120	SPDT SWITCH (S1)	16		100-2243	2.2K (R50)	
61				15		100-6853	68K (R49, R94)	
60				14	1	100-1863	180K (R48)	
59							R78, R69	
58		221-3900	LM 3900 (IC 2, IC 3)	13		100-4753	47K (R43, R60, R61)	
57	1	221-4558	RC 4558 IC (IC 1)				R88, R90	
56							R56, R57, R62, R63	
55				12		100-3953	39K (R73, R48)	
54				11	2	100-1553	15K (R34, R35)	
53	3	211-5816	6ES5816 (Q7, Q12, Q13)	10			R71, R72, R88	
52	4	211-6566	MP5 6566 (Q5, Q8)				R46, R47	
51		212-5462	2N5462 (Q2, Q4)	9	8	100-1053	10K (R32, R40, R41)	
50		212-5457	2N5457 TRANSISTOR (Q1, Q3, Q10)	8	4	100-4743	4.7K (R29, R37, R45, R51)	
49				7		100-2743	2.7K (R18, R20, R21, R22)	
48				6		100-1063	100K, (R5, R55)	
47							R19, R23, R24, R25, R26, R27, R28, R31, R33, R35, R36, R37, R38, R39, R42, R43, R44, R47, R49, R52, R53, R54, R55, R56, R57, R58, R59, R60, R61, R62, R63, R64, R65, R66, R67, R68, R69, R70, R71, R72, R73, R74, R75, R76, R77, R78, R79, R80, R81, R82, R83, R84, R85, R86, R87, R88, R89, R90, R91, R92, R93, R94	
46		201-0457	1N457 DIODE (CR1, CR6, CR7, CR8)	5		100-3363	330K 1/4W, RESISTOR (R14, R15, R16)	
45								
44								
43		202-0098	1N98 DIODE (CR2, CR3, CR4, CR5)	4		178-3054	50K RESISTOR, TRIMMER (R1, R2, R3)	
42	1	041-5023	500 PFD 500V CAPACITOR (C26)	3	1	177-5044	5KΩ " " (R12)	
41	1	030-1053	.1MFD 100V (C24, C25)	2		177-2044	2K RESISTOR, TRIMMER (R10, R11)	
40	2	030-3833	.0033 MFD " (C24, C25)	1	1	514-1503	BLANK PC BOARD	
39	2	030-1553	.15 MFD 100V CAPACITOR (C23, C23)	1	1	(SEE NOTE 1)	RECORD CONTROL & TONE GENERATOR ASSY. BD.	

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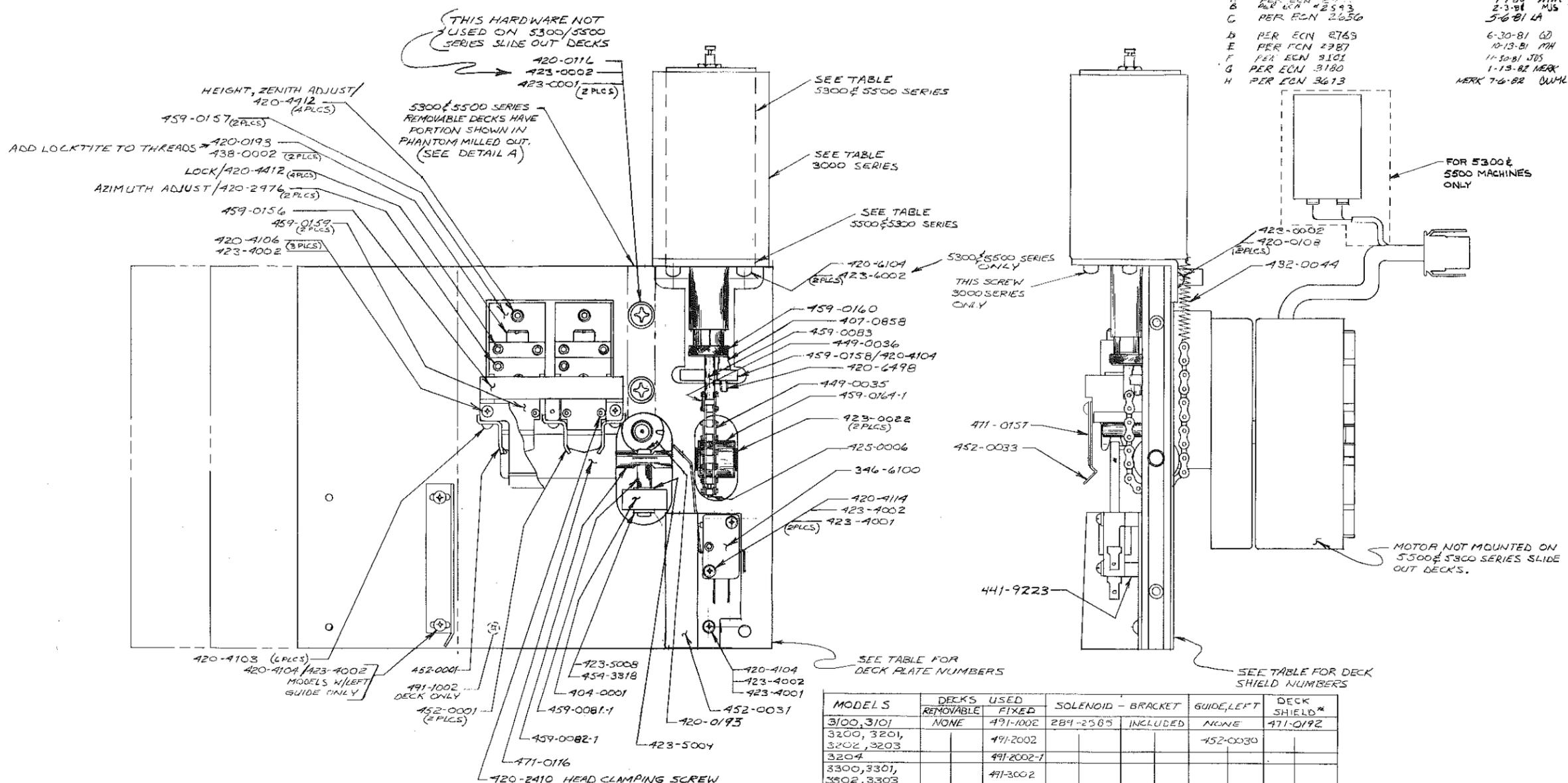
LIST OF MATERIAL

TOLERANCE UNLESS OTHERWISE SPECIFIED  
DECIMAL 2 PL. DI 3 PL. 008  
FRACTIONAL 1/64  
ANGULAR ± 1°  
SHARP EDGES  
BEND RADIUS  
FILLET RADIUS

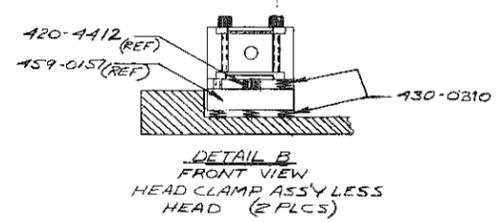
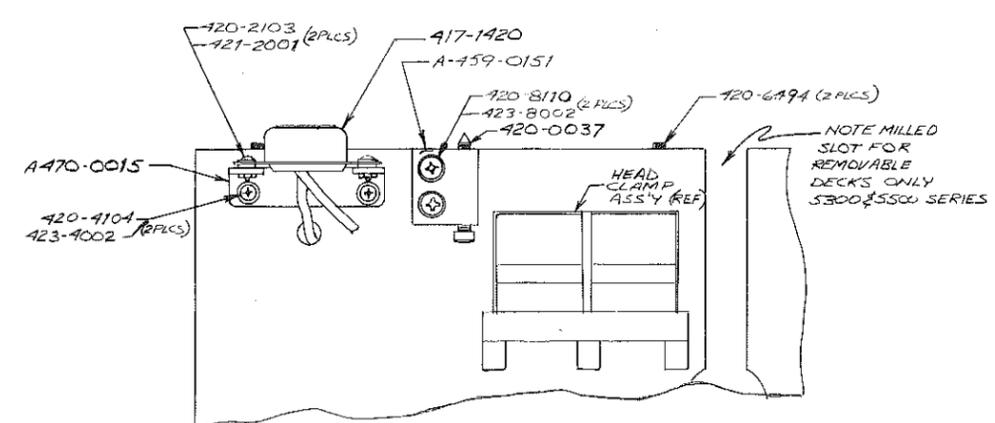
DRAWN BY W.L.J. DATE 02/24/75  
CHECKED BY DATE  
PROJECT ENGINEER DATE  
APPROVED BY

BROADCAST ELECTRONICS INC.  
- A FILMWAYS COMPANY -  
TITLE RECORD CONTROL & TONE GENERATOR  
DWG NO. D 914-1503, 1513, 1523, 1533 REV F  
3000 SERIES SCALE 2/1 SHEET 1 OF 1

REVISIONS		DATE	APPROVED
REV. A	PER ECN 2777	1-9-80	MJM
B	PER ECN 2893	2-3-81	MJS
C	PER ECN 2856	5-6-81	LA
D	PER ECN 2763	6-30-81	GD
E	PER ECN 2987	10-13-81	MH
F	PER ECN 3101	11-30-81	JDS
G	PER ECN 3180	1-13-82	NEER
H	PER ECN 3613	MEXX 7-6-82	DUHL



MODELS	DECKS USED REMOVABLE	FIXED	SOLENOID - BRACKET	GUIDE, LEFT	DECK SHIELD #
3100, 3101	NONE	491-1002	289-2565	INCLUDED	NONE
3200, 3201, 3202, 3203		491-2002			452-0030
3204		491-2002-1			
3300, 3301, 3302, 3303		491-3002			
3304		491-3002-1			
3400, 3401, 3402, 3403		491-4002			
3404	NONE	491-4002-1	289-2565	INCLUDED	452-0030
5501, 5502, 5503	491-1002-1	491-1002	289-2566	471-0122	NONE
5301B, 5302B, 5303B, 5304B	491-2002-3	491-2002-2	289-2566	471-0122	471-0192 BOTTOM DECK ONLY



DETAIL A  
PARTS LISTED IN THIS  
DETAIL ARE ON 5300 SERIES  
MACHINES ONLY.

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TOLERANCE UNLESS OTHERWISE SPECIFIED  
DECIMAL ± .01  
FRACTIONAL ± .005  
ANGULAR ± 1°  
SHARP EDGES  
BEND RADIUS  
FILLET RADIUS

DRAWN BY: [Signature]  
CHECKED BY: [Signature]  
PROJECT ENGR: [Signature]  
APPROVED BY: [Signature]

DATE: [Date]  
DATE: [Date]  
DATE: [Date]

BROADCAST ELECTRONICS INC.  
—A FILMWAYS COMPANY—

TITLE: ASSEMBLY DECK

DWG. NO. 906-0000

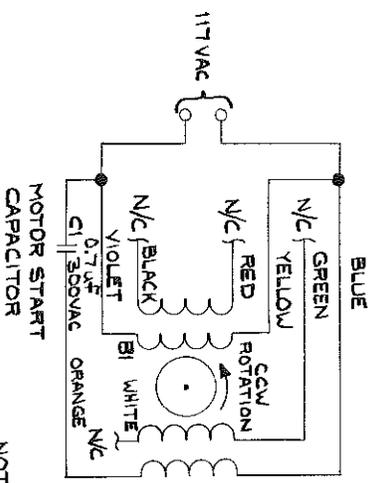
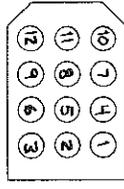
SCALE: 1/1

SHEET 1 OF 1



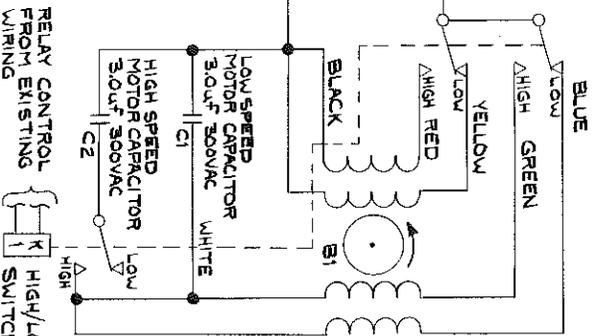


MATING SIDE OF MOTOR PLUG  
 SOCKET PART NO. 418-1271  
 PINS PART NO. 417-0053



WIRING CONNECTIONS  
 FOR SINGLE SPEED  
 EQUIPMENT.  
 CCW ROTATION VIEWING  
 SHAFT END.

NOTES:  
 1. N/C = NO CONNECTION  
 2. GREEN, WHITE, RED AND  
 BLACK WIRES CUT AND  
 INSULATED



WIRING CONNECTIONS  
 FOR EQUIPMENT WITH  
 MANUAL AND/OR  
 AUTOMATIC FAST FORWARD.  
 CCW ROTATION VIEWING  
 SHAFT END.

RELAY CONTROL  
 FROM EXISTING  
 WIRING

NOTE:  
 1. \* JUMPER NORMALLY INSTALLED BETWEEN  
 PINS 1 & 3. WHEN DECK MICROSWITCH IS USED  
 TO TURN OFF MOTOR WHEN CART IS REMOVED,  
 BREAK JUMPER & WIRE SWITCH BETWEEN PINS 1 & 3.

PIN	SINGLE SPEED	TWO SPEED
1	*	*
2	VIOLET	VIOLET
3	*	*
4	BLUE	BLUE
5	ORANGE	ORANGE
6	YELLOW	YELLOW
7	(OPEN)	GREEN
8	↓	BLACK
9		RED
10		(OPEN)
11	↑	WHITE
12	(OPEN)	(OPEN)

**BROADCAST ELECTRONICS INC.**

TITLE: **MOTOR WIRING DIAGRAM**

DWG. NO. **959-0009**

3000 CART. MACH. SCALE SHEET 1 OF 1

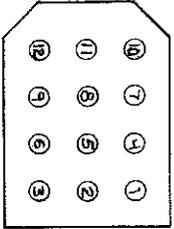
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TOLERANCE UNLESS OTHERWISE SPECIFIED  
 DECIMAL 2 PL ± .01 3PL ± .005  
 FRACTIONAL ± 1/64  
 ANGULAR ± 1°  
 SHARP EDGES  
 TO BEND RADI  
 FILLET RADI

DATE: 2-14-83  
 DRAWN BY: JAH  
 CHECKED BY: JWS  
 PROJECT ENGR. APPROVED BY: [Signature]

REVISIONS: [Table with columns: REV., DESCRIPTION, DATE, APPROVED]

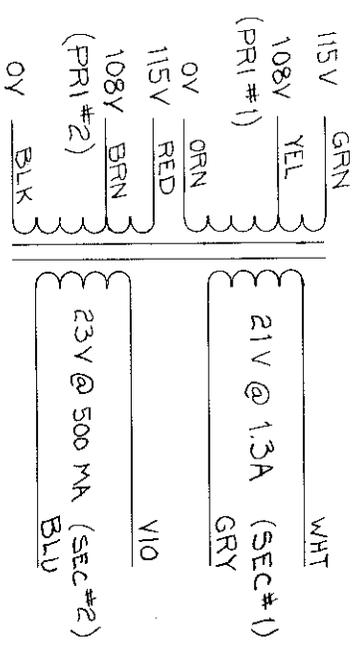
MATING SIDE OF TRANSFORMER PLUG  
 SOCKET PART NO. 418-1271  
 PINS PART NO. 417-0053



POWER TRANSFORMER (376-7656 & 376-7660 WIRING

PIN	120V	110V	240V	220V
1	VIO	VIO	VIO	VIO
2	BRN	RED	BRN	RED
3	BLK	BLK	BLK	BLK
4	BLU	BLU	BLU	BLU
5	ORN	ORN	(OPEN)	(OPEN)
6	RED	BRN	RED	BRN
7	WHT	WHT	WHT	WHT
8	} JUMPER	} JUMPER	(OPEN)	(OPEN)
9			ORN	ORN
10	GRY	GRY	GRY	GRY
11	YEL	GRN	YEL	GRN
12	GRN	YEL	GRN	YEL

REV	DESCRIPTION	DATE	APPROVED
A	110V WAS 105V; 220V WAS 210V	3/27/75	
B	ECN 739 (Dwg # WAS 906-3100)	3/30/75	
C	ECN 3024	JAH 10/21/81	
D	ECN 3878	JAH 10/29/82 SK	
E	ECN 4089	JAH 2/14/83 SK	



REF	1	376-7656	3000 SERIES CART. MACH. PWR XMFR
REF.	1	376-7660	5000 SERIES CART. MACH. PWR XMFR
ITEM	QTY	PART NUMBER	DESCRIPTION
LIST OF MATERIAL			
TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN <i>JAS</i>	DATE <i>2/24/75</i>
DECIMAL 2 PL = 0.1 3 PL = 0.005		CHECKED	DATE
FRACTIONAL 1/64		DESIGNED	DATE
ANGULAR 1/8		APPROVED	DATE
SHARP EDGES		BY	
BEND RADI		TREATMENT OR FINISH	
FILLET RADI		MATERIAL	
MATERIAL		TITLE	
B		POWER XMFR WIRING	
DWG NO.		906-3136	
SCALE		SHEET 1 OF 1	
REV		E	

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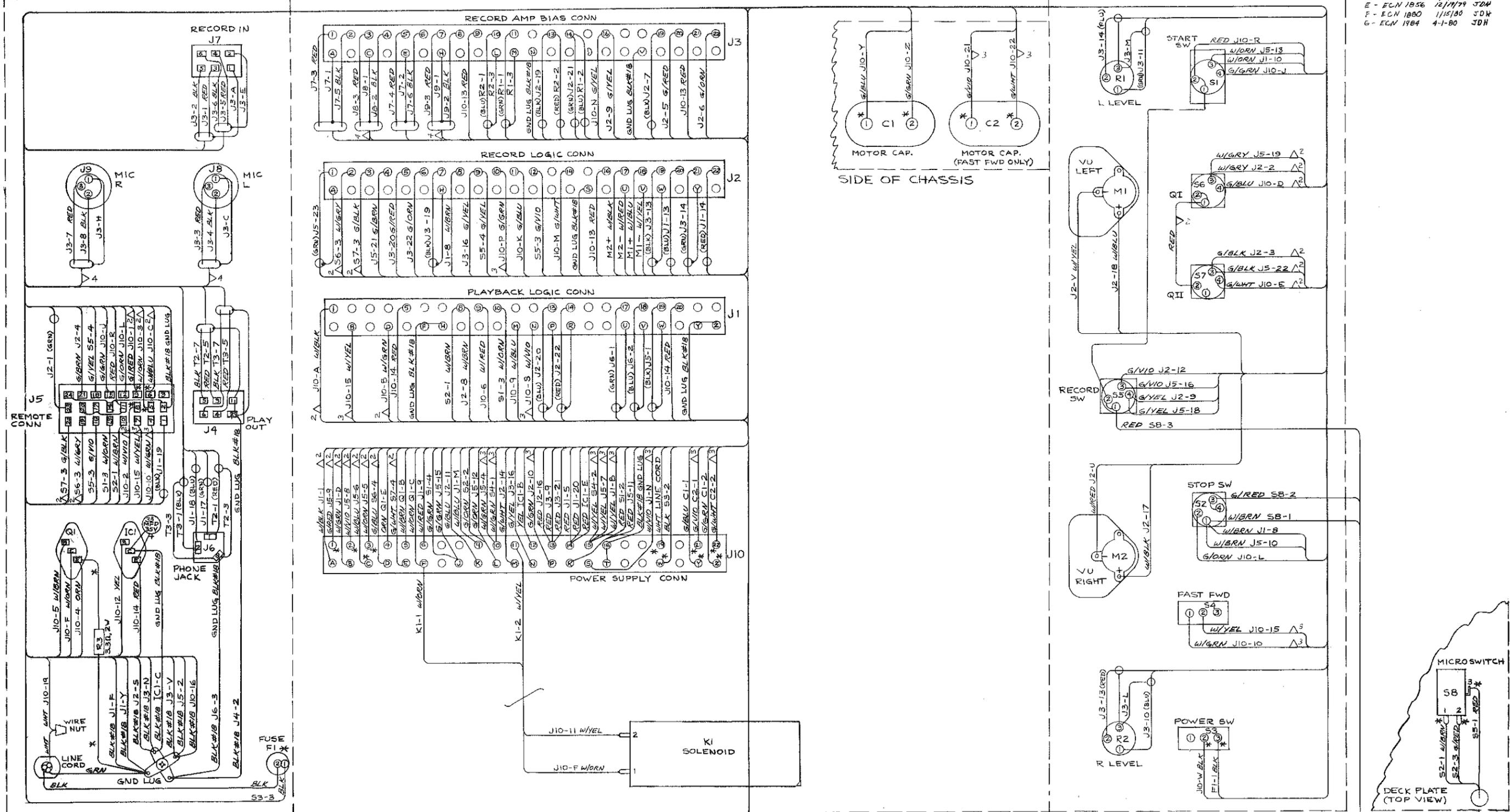
FORMERLY B-906-3100.

REAR

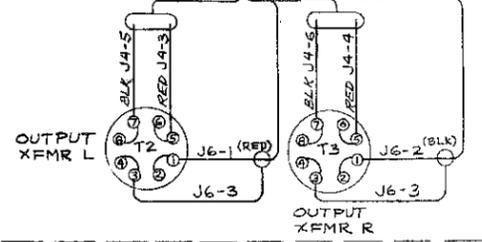
CHASSIS

FRONT

REV A - REVISED 4/10/75  
 REV B - ECN 600 10/1/75  
 REV C - ECN 890 6/10/77  
 REV D - ECN 1012 11/1/77  
 REV E - ECN 1856 12/1/79  
 REV F - ECN 1880 1/15/80  
 REV G - ECN 1984 4-1-80

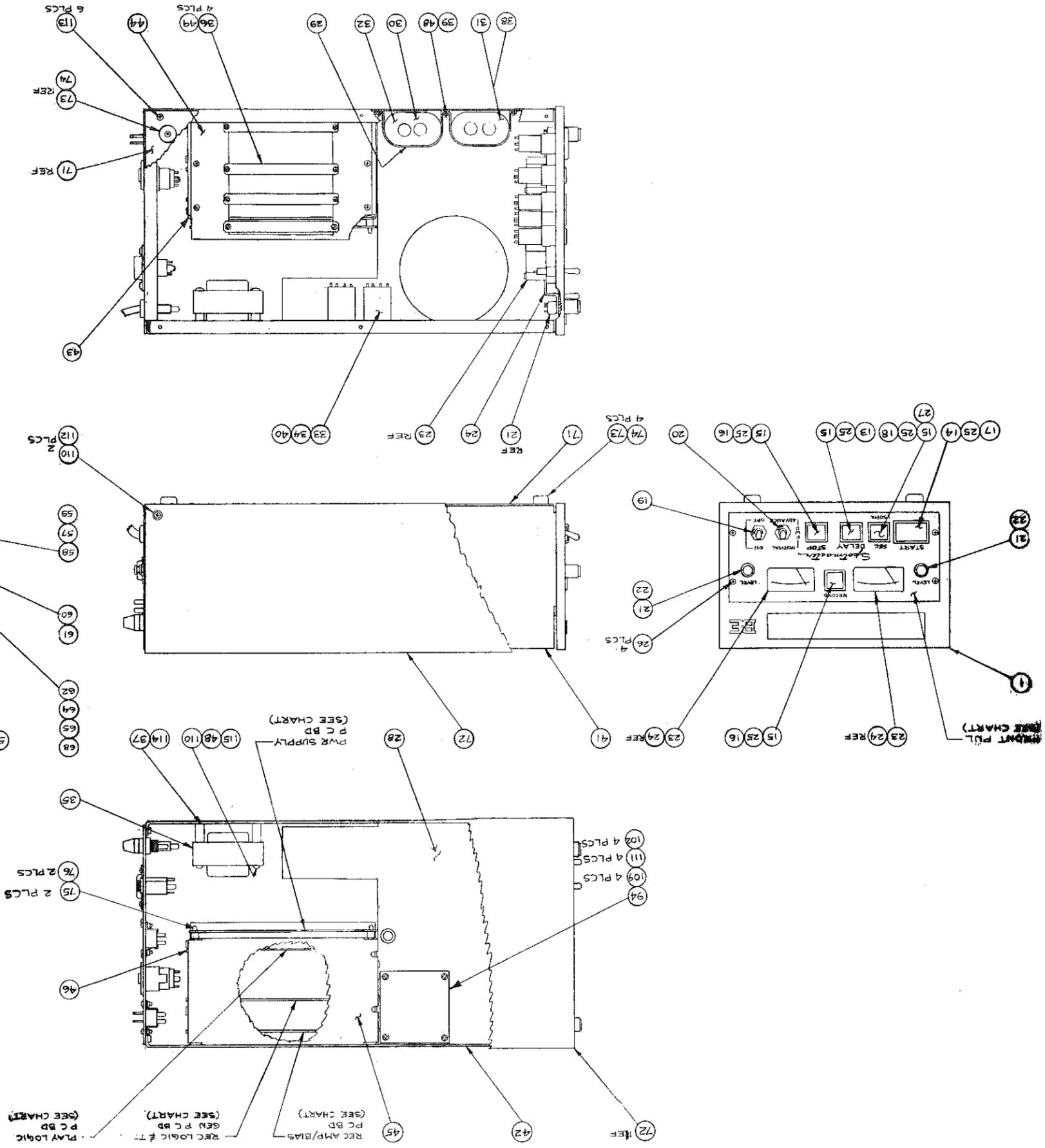


- NOTES:
- \* SLEEVING TO BE APPLIED AT THESE POINTS.
  - WIRES USED WITH A TRIP OPTION ONLY, TIE BACK IF NOT USED.
  - USE WITH FAST FORWARD OPTION ONLY, WHEN FAST FORWARD IS NOT USED, OMIT C2 & S4 & TIE BACK WIRES.
  - WIRE NOT PART OF CABLE, IF MIC INPUT OPTION REQUIRED, ADD WIRE TO CABLE.



SIDE OF CHASSIS

TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN: M.S.D. DATE: 3/6/75		BROADCAST ELECTRONICS INC.	
DECIMAL 2 PL (+) 01 3 PL (-) 005		CHECKED: DATE: 6/1/77		- A FILMWAYS COMPANY -	
FRACTIONAL 5/164		BY: T.E.K.		TITLE: 3000 RPS WIRING DIAGRAM	
SHARP EDGES TO ANGULAR 5°		PROJECT: 906-3105 DATE: 12-22-74		Dwg NO: 906-3105	
BEND RADI: R1		APPROVED: R1		REV: 6	
Fillet Radi		MATERIAL:		SCALE: 1" = 1"	
TREATMENT OR FINISH:		SHEET 1 OF 1			
FOR THE EXCLUSIVE USE OF BROADCAST ELECTRONICS, INC. PERSONNEL AND CUSTOMERS. ALL RIGHTS RESERVED.					



FOR THE EXCLUSIVE USE OF PERSONNEL AND CUSTOMERS		MATERIAL	
ALL RIGHTS RESERVED		TREATMENT OR FINISH	
BROADCAST ELECTRONICS, INC.		3000 DELAY	
SEND RADI TO		SCALE 1/2	
SHARP EDGES TO		SHEET 1 OF 2	
FRACTIONAL 1/164		REV	
DECIMAL 2 PL. OF 3 PL. 005		D	
BY PLM		DMG NO. 906-3139	
CHECKED DATE 6/29/77		TITLE	
DRAWN V.M.L. DATE 1/14/76		FINAL ASSEMBLY	
OTHERWISE SPECIFIED		3000 DL	
BROADCAST ELECTRONICS, INC.		- A FILMWAYS COMPANY -	

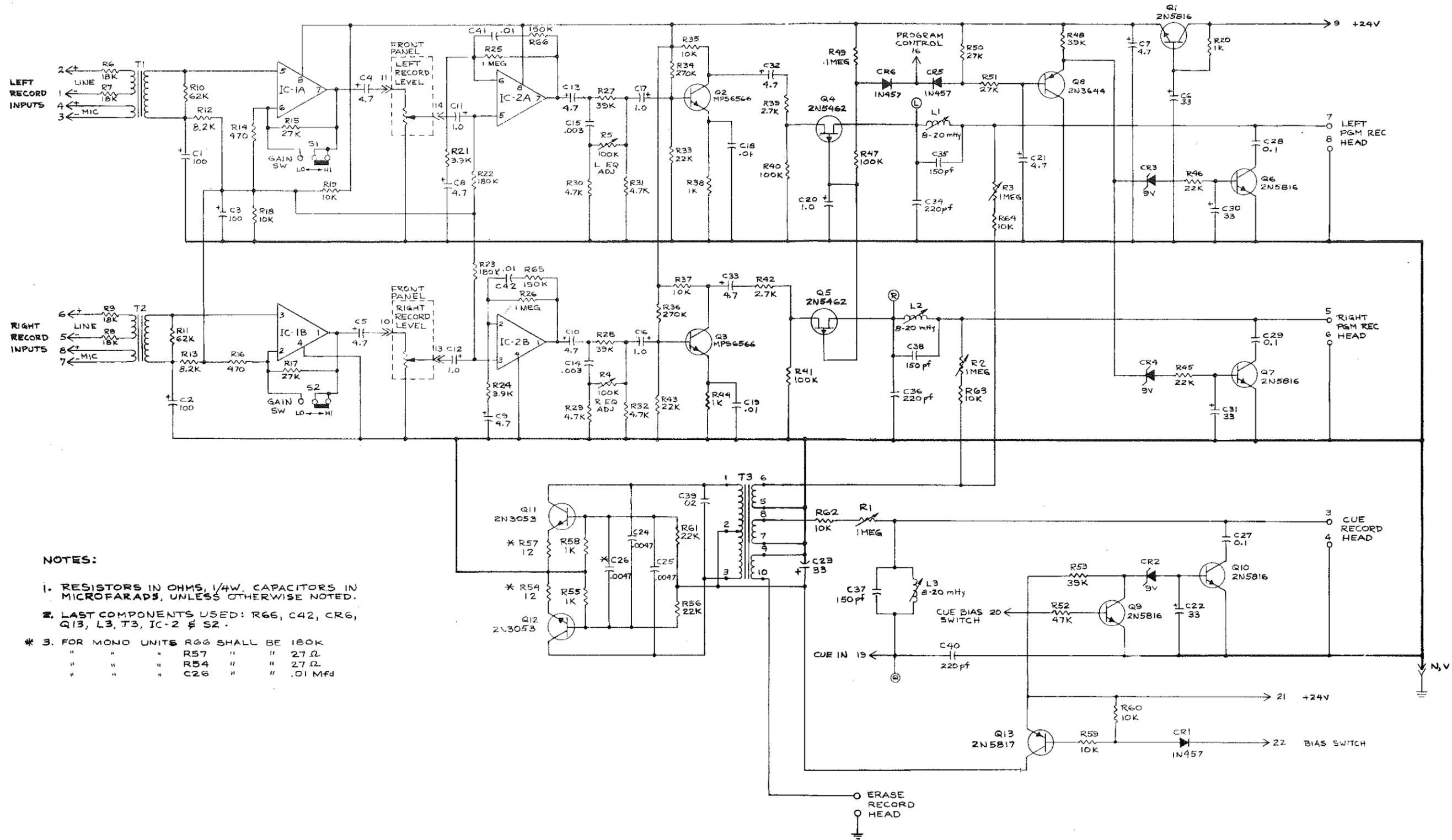
LIST OF MATERIALS				LIST OF MATERIALS				LIST OF MATERIALS			
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
116	A/R	906-3118-1	HEAD LEAD CABLE*(MODEL 3200)	57	1	681-1723	LINE CORD	X	X		FINAL ASSEMBLY, MODELS 3200, 3300
117	A/R	906-3118-2	X(MODEL 3200)	58	1	401-0005	STRAIN RELIEF	1	1	460-0006	FRONT PANEL MOUNT, MODEL 3200
118	A/R	906-3118-3	X(MODEL 3200) (STEREO ONLY)	59	1	419-0071	WIRE NUT	1	1	460-0007	FRONT PANEL MOUNT, MODEL 3300
119	A/R	906-3119-1	X(MODEL 3300)	60	4	410-1416	#6 SPADE LUG	2	1	503-0002	FRONT PANEL
120	A/R	906-3119-2	X(MODEL 3300)	61	1		#6 KNURLED NUT	3	1	503-0003	
121	A/R	906-3119-3	HEAD LEAD CABLE*(MODEL 3300) (STEREO ONLY)	62	2	417-0298	TRANSISTOR SOCKET	4	1	503-0004	
122				63	1	219-3055	POWER TRANSISTOR, Q1	5	1	503-0005	
123				64	1	227-7824	24V REGULATOR, IC-1	6	1	503-0006	
124				65	1	064-3373	CAPACITOR, 33 MFD, 35V, TANTALUM	7	1	503-0007	
125				66	1	407-3000	TRANSISTOR COVER	8	1	503-0008	
126				67	A/R	417-0303A	MIC INPUT JACK, J8 (LEFT), J9 (RIGHT)	9	1	503-0009	
127				67	A/R	451-1200	HOLE PLUG	10	1	503-0010	
128				68	A/R		SELF TAPPING SCREW #6 X 1/2"	11	1	503-0011	
129				69	1	402-0006	CABLE TIE MOUNT	12	1	503-0013	
130				70				13	1	503-0014	FRONT PANEL
131				71	1	471-0080	BOTTOM PLATE, MODEL 3200	14	1	343-0150	SWITCH, ILLUMINATED P.B., S1 START
				71	1	471-0081	BOTTOM PLATE, MODEL 3300	15	A/R	343-0012	SWITCH, ILLUMINATED P.B., S2 STOP, S6 Q1, S7 QII
				72	1	471-0083	COVER, MODEL 3200	16	A/R	343-0013	CAP, RED
				72	1	471-0084	COVER, MODEL 3300	17	1	343-0152	CAP, GRN
				73	4	403-2194	FOOT, RUBBER	18	2	343-0014	CAP, WHT
				74	A/R		PHMS #8-32 X 3/8	19	1	347-7101	MIN, TOGGLE, SPST, S3 ON/OFF
				75				20	1	347-7108	SWITCH, MIN, TOGGLE, SPST, S4 FF
				76	A/R		PHMS #6-32 X 3/8	21	1	450-1700	HOLE PLUG
				77	1	914-1505	POWER SUPPLY P.C. BD	21	A/R	191-1053	POTENTIOMETER, 10K
				78	1	914-1515	W/Q TRIPS	22	A/R	484-0500	KNOB
				79	1	914-1525	W/FF	23	A/R	319-0081	VU METER
				80	1	914-1535	POWER SUPPLY P.C. BD, W/FF & Q TRIPS	24	A/R	459-0018	VU METER CLAMP
				81	1	914-1501	PLAYBACK LOGIC P.C. BD, MONO	25	A/R	321-0327	LAMP
				82	1	914-1511	W/FF	26	A/R		PHMS #4-40 X 3/8
				83	1	914-1521	W/Q TRIPS	27	2	324-0125	INDICATOR LAMP HOLDER, 56 #57 (PLAY ONLY UNITS)
				84	1	914-1531	MONO, W/FF & Q	28	1		DECK ASSEMBLY, MODEL 3200
				85	1	914-1541	STEREO	28	1		DECK ASSEMBLY, MODEL 3300
				86	1	914-1551	W/FF	29	A/R	453-0007	MOTOR CAPACITOR, CLAMP
				87	1	914-1561	W/Q TRIPS	30	1	029-2063	2 MFD
				88	1	914-1571	PLAYBACK LOGIC P.C. BD, STEREO, W/FF & Q	31	1	029-3063	3 MFD
				89	1	914-1502	RECORD AMP/BIAS P.C. BD, MONO	32	1	029-1065	MOTOR CAPACITOR, 1 MFD
				90	1	914-1512	RECORD AMP/BIAS P.C. BD, STEREO	33	A/R	370-0025	OUTPUT TRANSFORMER
				91	1	914-1503	REC CONT & TONE GEN P.C. BD, MONO, W/O Q	34	A/R	370-0017	TRANSFORMER SHIELD
				92	1	914-1513	MONO, W/O Q	35	1	376-7656	POWER TRANSFORMER
				93	1	914-1523	STEREO, W/O Q	36	A/R	417-2100	22-PIN CARD EDGE CONNECTOR
				94	1	914-1533	REC CONT & TONE GEN P.C. BD, STEREO, W/O Q	37	4	441-8158	STANDOFF, 1/4 X 5/8 LG X 6-32 TAP
				95	1	919-1504	EXTENDER P.C. BD *	38	1	029-4064	MOTOR CAPACITOR, 4MFD
				96				39	A/R		HEX NUT #6-32
				97				40	A/R		PHMS #2-56 X 3/16
				98	1	418-0304	6-PIN PLUG, CINCH (M), J4 PLAY OUT *	41	1	471-0070	SIDE PLATE, RIGHT
				99	1	418-0306	24-PIN PLUG, CINCH (M), J5 REMOTE *	42	1	471-0071	SIDE PLATE, LEFT
				100	1	418-0305	6-PIN PLUG, CINCH (F), J7 REC IN *	43	1	471-0072	WRAPAROUND, P.C. CARD CAGE
				101				44	1	471-0074	MOUNTING PLATE, CONN
				102				45	1	471-0086	COVER, P.C. CARD
				103				46	A/R	409-0020	GUIDE, P.C. CARD
				104				47	A/R		PHMS #6-32 X 1/4
				105				48	A/R		L/WASHER #6
				106	2	441-9311	SUPPORT	49	A/R	417-2101	KEY, CONNECTOR
				107	2	421-1102	POP RIVET	50	1	471-0077	REAR PANEL, MODEL 3200
				108	1	421-0019	FASTENER, RACK	50	1	471-0078	REAR PANEL, MODEL 3300
				109				51	1	418-0302	6-PIN CONNECTOR, CINCH (F), J4
				110	A/R		F/WASHER #6	52	1	418-0303	24-PIN CONNECTOR, CINCH (F), J5
				111				53	1	418-0301	6-PIN CONNECTOR, CINCH (M), J7
				112	A/R		PHMS #6-32 X 3/8	53	1	451-1200	HOLE PLUG
				113	A/R		PHMS #6-32 X 1/4	54	1	415-2012	FUSE HOLDER
				114	A/R		PHMS #6-32 X 3/16	55	1	330-0100	FUSE, 1 AMP
				115	A/R		PHMS #6-32 X 1-3/8	56	1	417-0311	PHONE JACK, J6

NOTES:  
1. \* ITEMS NOT SHOWN ON DRAWING.

ITEM NUMBERS						
FRONT PANEL	POWER SUPPLY P.C. BD	PLAYBACK LOGIC P.C. BD	RECORD AMP/BIAS P.C. BD	REC CONT & TONE GEN P.C. BD	7.5 IPS MOTOR CAPACITOR	7.5 IPS MOTOR CAPACITOR (220V/50 Hz)

MODEL	DESCRIPTION	2	77	81	89	91	30	30
MODEL 3200P 906-3200	STANDARD	2	77	81	—	—	30	30
	MANUAL FAST FWD 906-3005	2	79	82	—	—	31 # 32	30 # 38
	Q-TRIPS 906-3000	12	78	83	—	—	30	30
	AUTO F FWD & Q TRIPS 906-3006	12	80	84	—	—	31 # 32	30 # 38
MODEL 3200RP 906-3201	STANDARD	3	77	81	89	91	30	30
	MANUAL FAST FWD 906-3005	3	79	82	89	91	31 # 32	30 # 38
	Q-TRIPS 906-3001	4	78	83	89	92	30	30
	AUTO F FWD & Q TRIPS 906-3007	4	80	84	89	92	31 # 32	30 # 38
MODEL 3200PS 906-3202	STANDARD	2	77	85	—	—	30	30
	MANUAL FAST FWD 906-3005	2	79	86	—	—	31 # 32	30 # 38
	Q TRIPS 906-3000	12	78	87	—	—	30	30
	AUTO F FWD & Q TRIPS 906-3006	12	80	88	—	—	31 # 32	30 # 38
MODEL 3200RPS 906-3203	STANDARD	5	77	85	90	93	30	30
	MANUAL FAST FWD 906-3005	5	79	86	90	93	31 # 32	30 # 38
	Q TRIPS 906-3001	6	78	87	90	94	30	30
	AUTO F FWD & Q TRIPS 906-3007	6	80	88	90	94	31 # 32	30 # 38
MODEL 3300P 906-3300	STANDARD	7	77	81	—	—	30	30
	MANUAL FAST FWD 906-3005	7	79	82	—	—	31 # 32	30 # 38
	Q TRIPS 906-3000	13	78	83	—	—	30	30
	AUTO F FWD & Q TRIPS 906-3006	13	80	84	—	—	31 # 32	30 # 38
MODEL 3300RP 906-3301	STANDARD	8	77	81	89	91	30	30
	MANUAL FAST FWD 906-3005	8	79	82	89	91	31 # 32	30 # 38
	Q TRIPS 906-3001	9	78	83	89	92	30	30
	AUTO F FWD & Q TRIPS 906-3007	9	80	84	89	92	31 # 32	30 # 38
MODEL 3300PS 906-3302	STANDARD	7	77	85	—	—	30	30
	MANUAL FAST FWD 906-3005	7	79	86	—	—	31 # 32	30 # 38
	Q TRIPS 906-3000	13	78	87	—	—	30	30
	AUTO F FWD & Q TRIPS 906-3006	13	80	88	—	—	31 # 32	30 # 38
MODEL 3300RPS 906-3303	STANDARD	10	77	85	90	93	30	30
	MANUAL FAST FWD 906-3005	10	79	86	90	93	31 # 32	30 # 38
	Q TRIPS 906-3001	11	78	87	90	94	30	30
	AUTO F FWD & Q TRIPS 906-3007	11	80	88	90	94	31 # 32	30 # 38

TOLERANCE UNLESS OTHERWISE SPECIFIED		DECIMAL 2 PL ± 0.1 3 PL ± 0.05	FRACTIONAL 1/64	ANGULAR ± 1°	SHARP EDGES	BEND RADIUS	FILLET RADIUS	DRAWN BY: <i>msb</i> DATE: <i>4/19/83</i>		BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -	
PROJECT ENGR APPROVED BY:		DATE:		TITLE: 3200 & 3300 FINAL ASSEMBLY		DWG NO: 906-3123		REV: G		SHEET 2 OF 2	
MATERIAL:		TREATMENT OR FINISH:		3000 SERIES		SCALE:					
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**NOTES:**

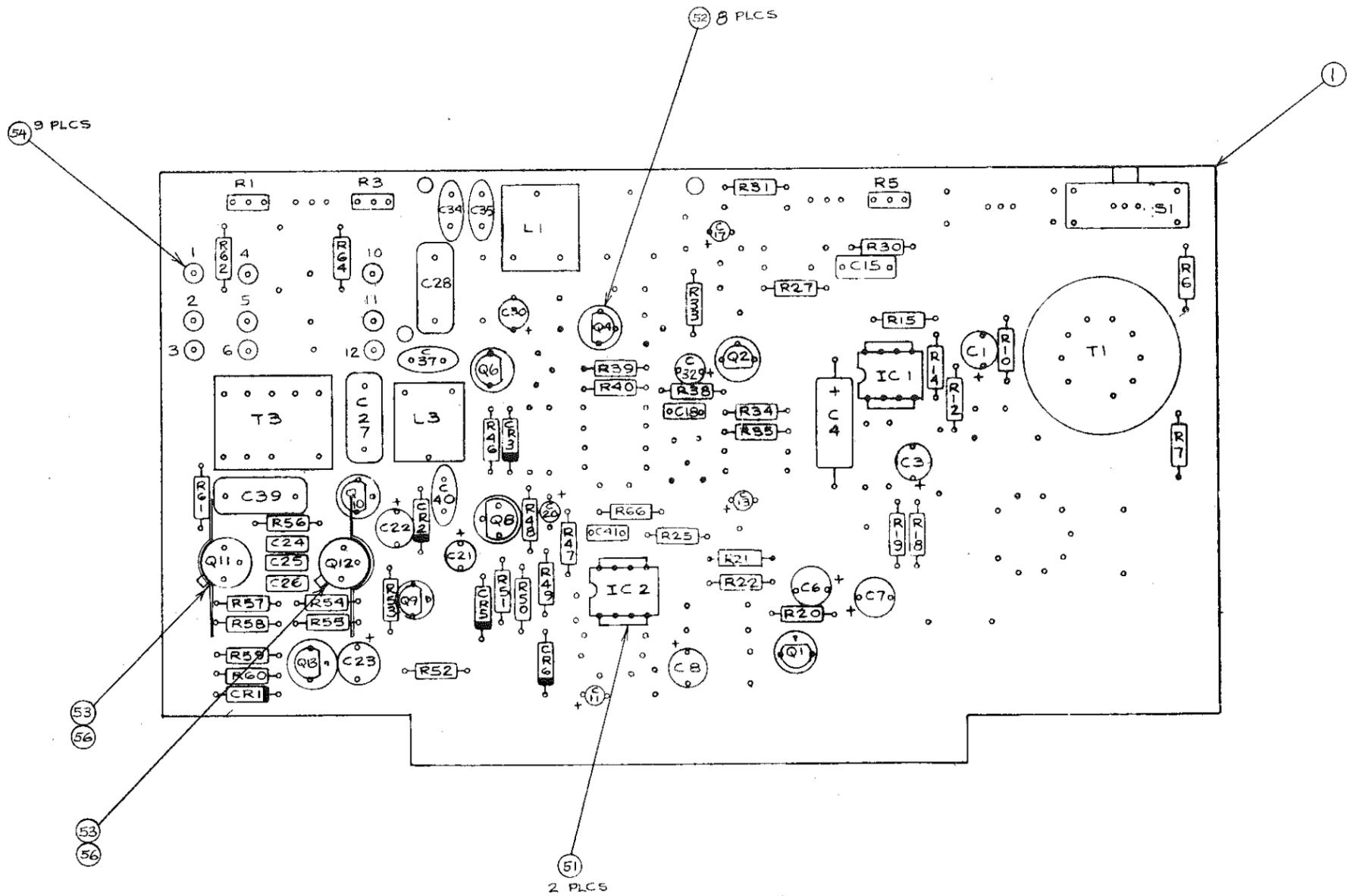
1. RESISTORS IN OHMS, 1/4W. CAPACITORS IN MICROFARADS, UNLESS OTHERWISE NOTED.
2. LAST COMPONENTS USED: R66, C42, CR6, Q13, L3, T3, IC-2 & S2.
- \* 3. FOR MONO UNITS R66 SHALL BE 180K  
 " " " R57 " " 27Ω  
 " " " R54 " " 27Ω  
 " " " C26 " " .01 Mfd

SEE PC ASSY DWG # D-914-1522 - 1533

TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN W.M.	DATE 11/26/75	BROADCAST ELECTRONICS INC.	
DECIMAL 2 PL. 01 3 PL. 005		CHECKED	DATE	- A FILMWAYS COMPANY -	
FRACTIONAL 1/164		PROJECT ENGR	DATE	TITLE SCHEMATIC	
ANGULARS 1°		APPROVED BY		RECORD AMP BIAS DELAY	
SHARP EDGES TO				DWG NO 906-3130	
BEND RADI		TREATMENT OR FINISH		REV A	
FILLET RADI				3000 DELAY	
MATERIAL				SCALE	
				SHEET 1 OF 1	

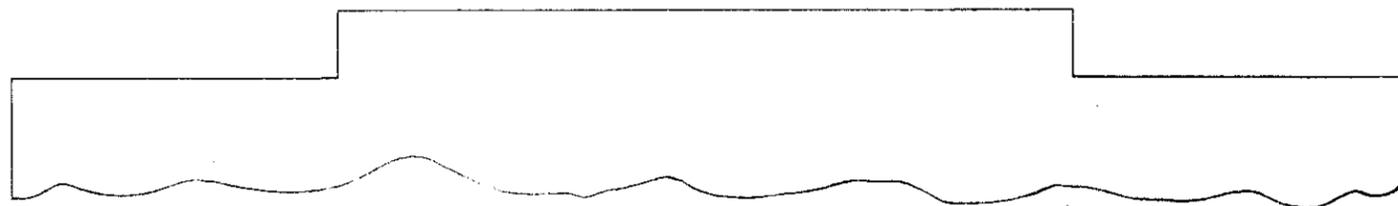
REV	DESCRIPTION	DATE	APPROVED
A	PER ECN # 827	6/14/76	

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REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	PER ECN # 735	3/24/76	
B	PER ECN # 827	6/14/76	
C	PER ECN # 1096	1-16-78	CLD
D	PER ECN # 1944	2-7-80	JH
E	PER ECN # 2286	7-15-80	mm
F	PER ECN # 2633	4-1-81	CRF

SEE SCHEMATIC # D906-3130  
SEE B/M # 914-1522



ITEM	QTY	PART NUMBER	DESCRIPTION	NOTE
LIST OF MATERIAL				
TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN BY	DATE	BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -
DECIMAL 2 PL-DI SPL-008		CHECKED BY	DATE	
FRACTIONAL 1/64		PROJECT ENGR	DATE	TITLE
ANGULAR: 1°		APPROVED BY		(1281) DL RECORD AMP BIAS BOARD
SHARP EDGES TO				DWG NO 914-1522
BEND RADI:				REV
FILLET RADI:				FE
MATERIAL		TREATMENT OR FINISH		3000 DELAY
			SCALE	SHEET 1 OF 1
			2/1	

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LIST OF MATERIALS				LIST OF MATERIALS				LIST OF MATERIALS			
ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION	ITEM	QTY	PART NUMBER	DESCRIPTION
116	1	906-3118-1	HEAD LEAD CABLE *	57	1	681-1723	LINE CORD	X	X		FINAL ASSEMBLY, MODELS 3200 <sup>RP</sup> & 3200 <sup>RPS</sup>
117	1	906-3118-2	HEAD LEAD CABLE *	58	1	401-0005	STRAIN RELIEF	1	1	460-0006	FRONT PANEL MOUNT
118	1	906-3118-3	HEAD LEAD CABLE * (USED ON STEREO ONLY)	59	1	419-0071	WIRE NUT				
119				60	4	410-1416	#6 SPADE LUG		2		
120				61	1		#6 KNURLED NUT		3		
121				62	2	417-0298	TRANSISTOR SOCKET	4	1	503-0004	FRONT PANEL, MONO
122				63	1	219-3055	POWER TRANSISTOR, Q1	5			
123				64	1	227-7824	24V REGULATOR, IC-1	6	1	503-0006	FRONT PANEL, STEREO
124				65	1	014-3274	CAPACITOR, 33 MFD, 35V	7			
125				66	1	407-3000	TRANSISTOR COVER	8			
126				67	A/R	417-0303A	MIC INPUT JACK, J8 (LEFT), J9 (RIGHT)	9			
127				68	A/R	450-1717	HOLE PLUG	10			
128				69	A/R		SELF TAPPING SCREW #6 X 1/2"	11			
129				70		122-3312	RESISTOR, 3.3Ω, 2W	12			
130				71	1	471-0080	BOTTOM PLATE,	13	1	343-0041	SWITCH CAP, BLU (FOR S9)
131								14	1	343-0150	SWITCH, ILLUMINATED P.B. S1 START
								15	3	343-0012	SWITCH, ILLUMINATED P.B. S2 STR, S6 Q1, S9 DLY
				72	1	471-0083	COVER,	16	1	343-0013	CAP, RED (FOR S2)
								17	1	343-0152	CAP, GRN (FOR S1)
				73	4	403-2194	FOOT, RUBBER	18	1	343-0014	CAP, WHT (FOR S6)
				74	A/R		PHMS #8-32 X 3/8	19	1	347-7101	MIN, TOGGLE, SPST, S3 ON/OFF
				75	2	441-9311	SUPPORT	20	1	347-7108	SWITCH, MIN, TOGGLE, SPST, S4 FF
				76	A/R		PHMS #6-32 X 3/8	21	1	450-1700	HOLE PLUG
				77	1	914-1505	POWER SUPPLY P.C. BD	22	A/R	191-1053	POTENTIOMETER, 10K
				78	1	914-1515	W/Q TRIP	23	A/R	484-0800	KNOB
				79	1	914-1525	W/FF	24	A/R	319-0081	VU METER
				80	1	914-1535	POWER SUPPLY P.C. BD, W/FF & Q TRIP	25	A/R	459-0018	VU METER CLAMP
				81	1	914-1501	PLAYBACK LOGIC P.C. BD, MONO	26	A/R	321-0327	LAMP
				82	1	914-1511	W/FF	27	1		FHMS #4-40 X 3/8
				83	1	914-1521	W/Q TRIP	28	1	324-0125	INDICATOR LAMP HOLDER, 56 (UNITS W/O Q)
				84	1	914-1531	MONO, W/FF & Q	29	1	906-3138	DECK ASSEMBLY,
				85	1	914-1581	PLAYBACK LOGIC P.C. BD, STEREO/DELAY	30	1		MOTOR CAPACITOR, CLAMP
				86				31	1	029-1066	2 MFD
				87				32	1	029-1065	3 MFD
				88				33	1	029-1065	MOTOR CAPACITOR, 1 MFD
				89	1	914-1522	RECORD AMP/BIAS P.C. BD, MONO/DLY	34	A/R	370-0025	OUTPUT TRANSFORMER
				90	1	914-1532	RECORD AMP/BIAS P.C. BD, STEREO/DLY	35	A/R	370-0017	TRANSFORMER SHIELD
				91	1	914-1503	REC CONT & TONE GEN P.C. BD, MONO, W/O Q	36	4	417-2100	POWER TRANSFORMER
				92	1	914-1513	REC CONT & TONE GEN P.C. BD, MONO, W/Q	37	4	441-8158	22-PIN CARD EDGE CONNECTOR
				93	1	914-1543	REC CONT & TONE GEN P.C. BD, STEREO/DLY	38	1	029-4064	STANDOFF, 1/4 X 5/8 LG X 6-32 TAP
				94	1	914-1580	DELAY PCB	39	A/R		MOTOR CAPACITOR, 4 MFD (220V, 50HZ ONLY)
				95	1	919-1504	EXTENDER P.C. BD *	40	A/R		HEX NUT #6-32
				96				41	1	471-0070	FHMS #2-56 X 3/16
				97				42	1	471-0071	SIDE PLATE, RIGHT
				98	1	418-0304	6-PIN PLUG, CINCH (M), J4 PLAY OUT *	43	1	471-0072	SIDE PLATE, LEFT
				99	1	418-0306	24-PIN PLUG, CINCH (M), J5 REMOTE *	44	1	471-0074	WRAPAROUND, P.C. CARD CAGE
				100	1	418-0305	6-PIN PLUG, CINCH (F), J7 REC IN *	45	1	471-0086	MOUNTING PLATE, CONN
				101				46	6	409-0020	COVER, P.C. CARD
				102	4	441-9317	STANDOFF, 1/4 L X 3/8 DIA. #6 HOLE	47	A/R		GUIDE, P.C. CARD
				103	2	421-1102	POP RIVET	48	A/R		FHMS #6-32 X 1/4
				104	1	421-0019	RACK FASTENER	49	4	417-2101	L/WASHER #6
				105				50	1	471-0077	KEY, CONNECTOR
				106				51	1	418-0302	REAR PANEL,
				107				52	1	418-0303	L/WASHER #6
				108				53	1	418-0301	6-PIN CONNECTOR, CINCH (F), J4
				109	A/R		L/WASHER #6	54	1	415-2012	24-PIN CONNECTOR, CINCH (F), J5
				110	A/R		F/WASHER #6	55	1	330-0100	6-PIN CONNECTOR, CINCH (M), J7
				111	A/R		PHMS #6-32 X 5/8	56	1	417-0311	FUSE HOLDER
				112	A/R		PHMS #6-32 X 3/8				FUSE, 1 AMP
				113	A/R		PHMS #6-32 X 1/4				PHONE JACK, J6
				114	A/R		PHMS #6-32 X 3/16				
				115	A/R		PHMS #6-32 X 1-3/8				

NOTES:  
1. \* ITEMS NOT SHOWN ON DRAWING.

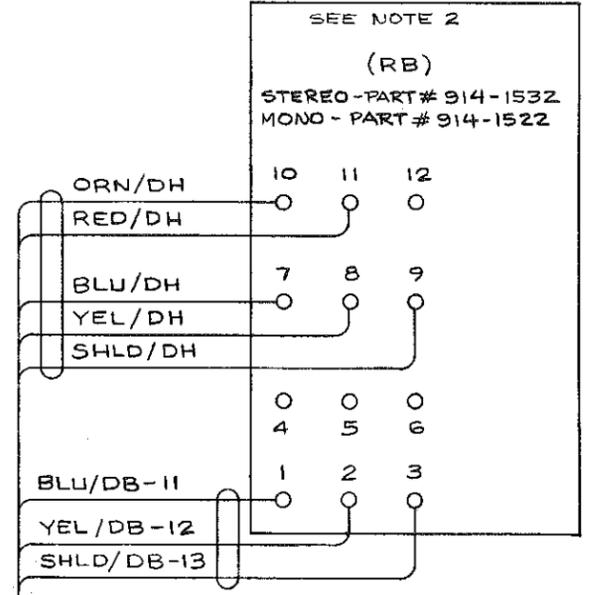
ITEM NUMBERS										
	FRONT PANEL									
	POWER SUPPLY P.C. BD									
	PLAYBACK LOGIC P.C. BD									
	RECORD AMP/BIAS P.C. BD									
	REC CONT & TONE GEN P.C. BD									
	7.5 IFS MOTOR CAPACITOR									
	7.5 IFS MOTOR CAPACITOR (220V/50 HZ)									

MODEL 3200 RP/DELAY 906-3204	STANDARD	4	77	81	89	91	30	30
	MANUAL FAST FWD 906-3005	4	79	82	89	91	31	30
	Q TRIP I 906-3001	4	78	83	89	92	30	30
	AUTO F FWD & Q TRIP I 906-3007	4	80	84	89	92	31	30
MODEL 3200 RPS/DELAY 906-3205	STANDARD	6	77	85	90	93	30	30
	MANUAL FAST FWD 906-3005	6	79	85	90	93	31	30

TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN BY	DATE	BROADCAST ELECTRONICS INC.	
DECIMAL 2 PL. 01 SPL. 005	FRACTIONAL 1/64	Wm.	6/14/76	- A FILMWAYS COMPANY -	
ANGULAR ± 1/2	SHARP EDGES TO	CHECKED BY	DATE	TITLE	
BEND RADIUS	FILLET RADIUS	PROJECT	DATE	3000 DELAY	
MATERIAL	TREATMENT OR FINISH	APPROVED BY		FINAL ASSEMBLY	
				D 906-3139 - A	
FOR THE EXCLUSIVE USE OF BROADCAST ELECTRONICS, INC. PERSONNEL AND CUSTOMERS. ALL RIGHTS RESERVED.			SCALE	SHEET 2 OF 2	

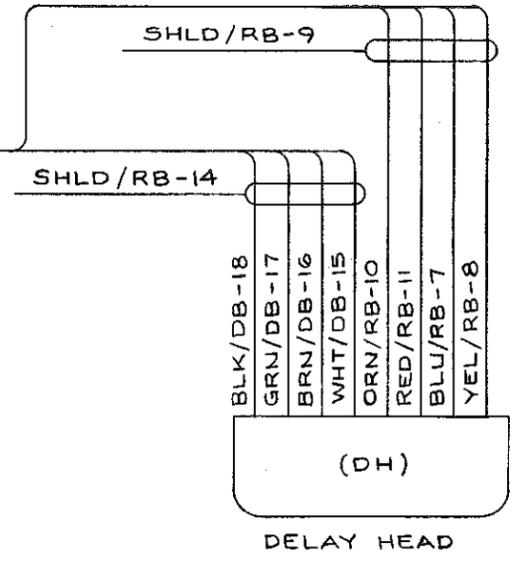
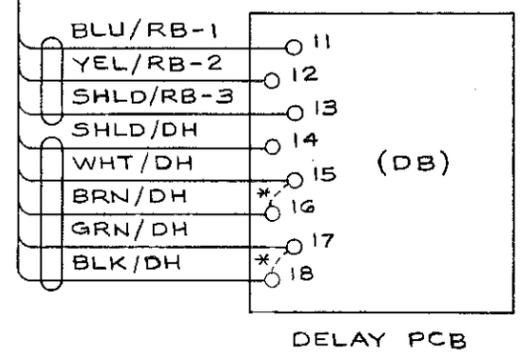
REVISIONS			
REV	DESCRIPTION	DATE	APPROVED

RECORD AMP/BIAS BD



NOTES:

- \* ADD JUMPERS TO DELAY PCB AS SHOWN FOR STEREO UNITS.
- REC AMP/BIAS PCB SHOWN WIRED FOR STEREO. FOR MONO UNITS SHIELDED BLU & YEL WIRES ON PINS 7, 8 & 9 ARE ATTACHED TO PINS 4, 5 & 6 (BLU TO PIN 4, YEL TO PIN 5 & SHLD TO PIN 9).

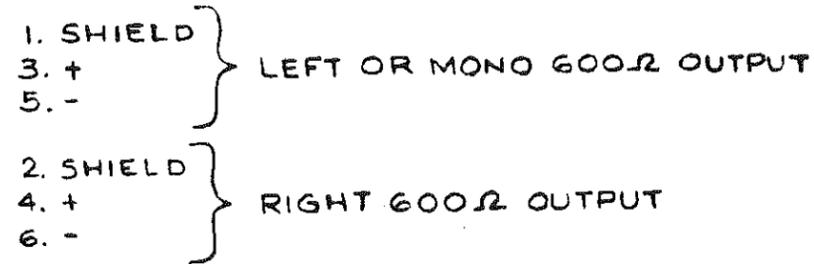
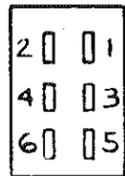


SEE CABLE ASSY DWG # B-906-3135

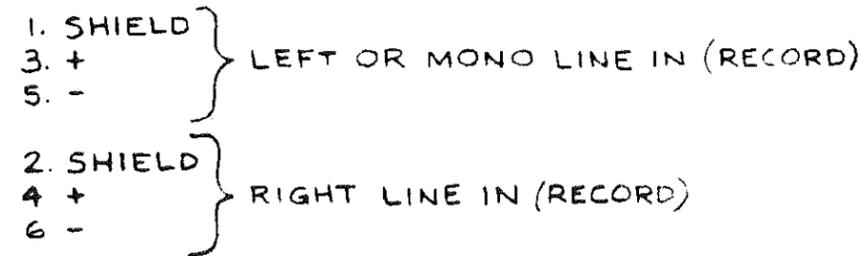
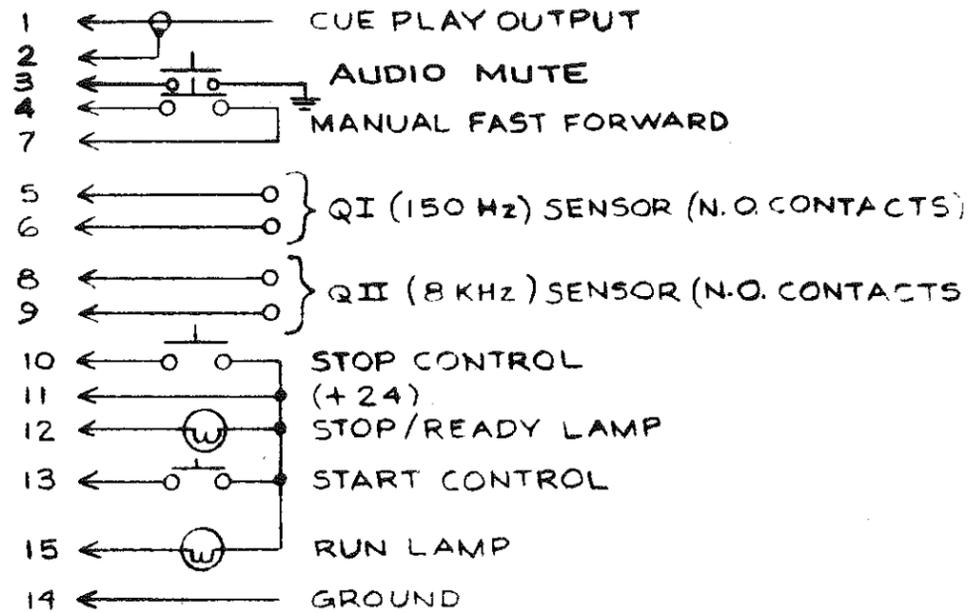
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ITEM	QTY RQD	PART NUMBER	DESCRIPTION	NOTE
LIST OF MATERIAL				
TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN Wm.	DATE 2/12/76	BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -
DECIMAL 2 PL ± .01 3 PL ± .005		CHECKED	DATE	
FRACTIONAL ± 1/64		BY	DATE	TITLE (3000 DELAY)
ANGULAR ± 1°		PROJECT ENGR	DATE	DELAY HEAD LEAD WIRING
SHARP EDGES TO		APPROVED BY		DWG NO. C 906-3134
BEND RADIUS				REV
FILLET RADIUS				3000 SERIES
MATERIAL		TREATMENT OR FINISH	SCALE	SHEET 1 OF 1

PLAY LINE OUT  
(J4)  
CINCH NO. P-306-CCT  
6 PIN MALE  
B.E.I. NO. 418-0302



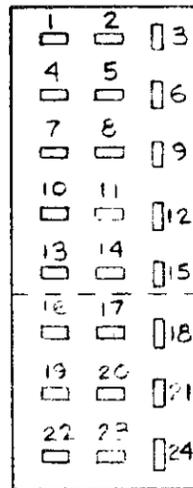
PLAY SECTION



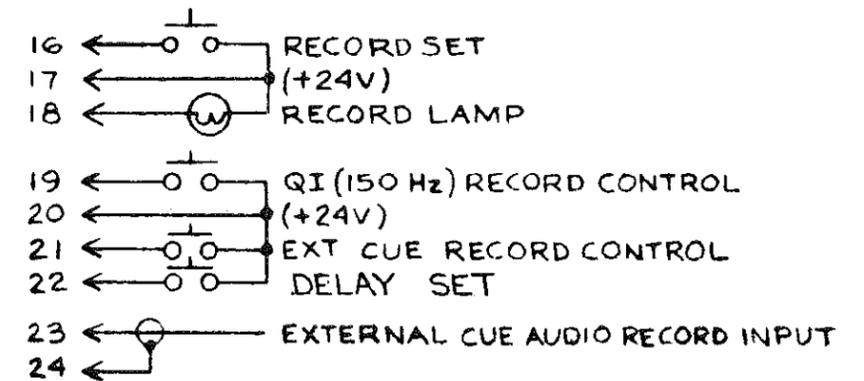
NOTES:

1. ANY 24V PIN (11 PLAY; 11, 17 & 20 RECORD/PLAY) MAY BE USED AS COMMON FOR ALL CONTROLS & LAMPS IF DESIRED.
2. ALL LAMPS 28V, .05A OR LESS.
3. QI & QII CONTACTS RATED 5.0A RESISTIVE, 120V RMS OR 28VDC. AVOID EXCESSIVE CURRENT INTERRUPTION TO AVOID NOISE.
4. CUE OUTPUT LOAD 1.5KΩ MINIMUM. CUE INPUT IMPEDANCE APPROX. 50KΩ UNBALANCED.

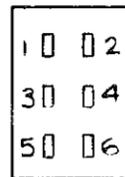
REMOTE  
CONNECTOR  
(J5)  
CINCH NO. P-324-CCT  
24 PIN MALE  
B.E.I. NO. 418-0306



RECORD SECTION



RECORD LINE IN  
(J7)  
CINCH NO. S-306-CCT  
6 PIN FEMALE  
B.E.I. NO. 418-0305



REAR VIEW, MATING CONNECTORS

BROADCAST ELECTRONICS INC  
- A FILMWAYS COMPANY -

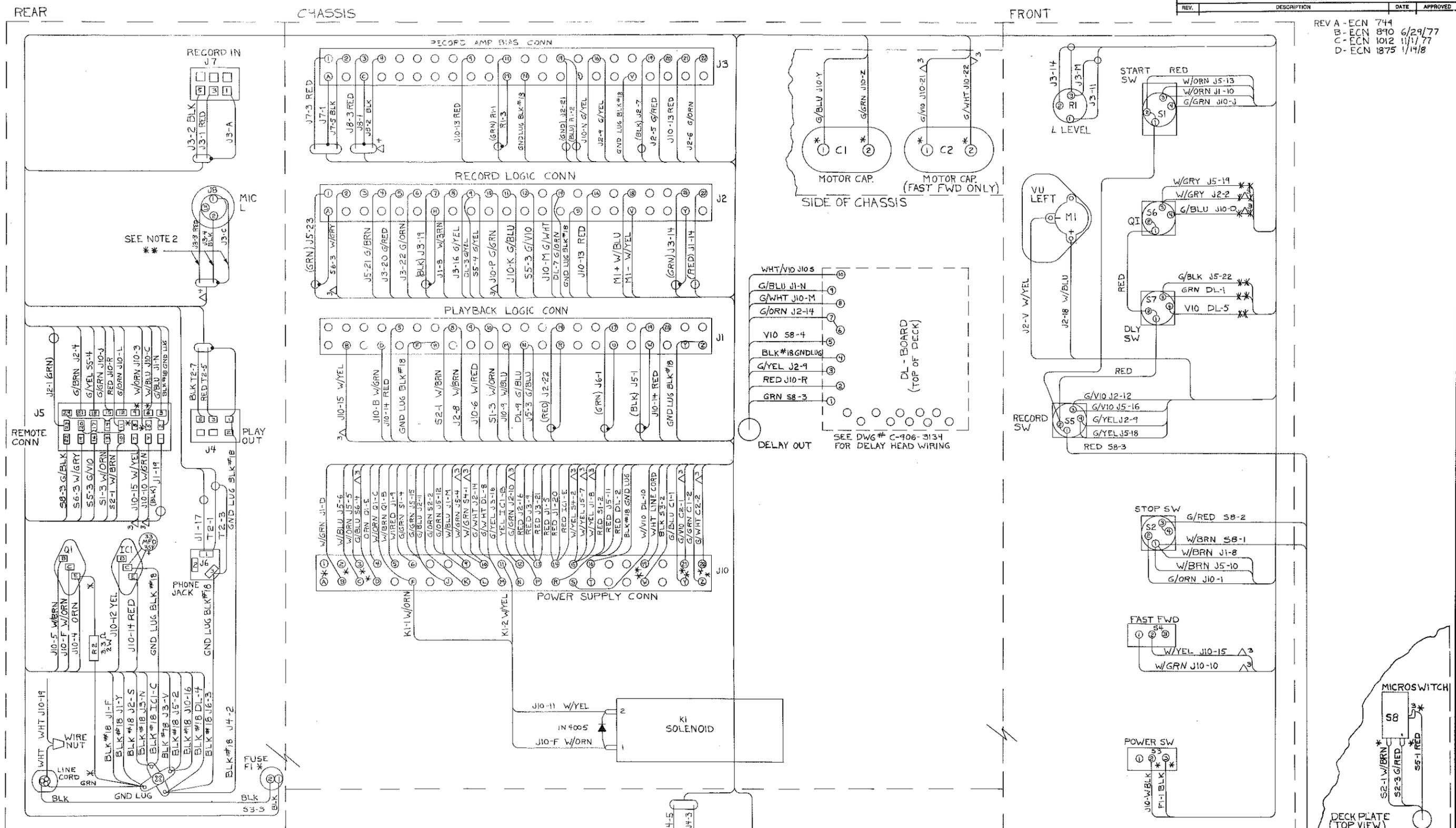
3000 DL SERIES

REAR PANEL CONNECTOR WIRING

B-906-3131

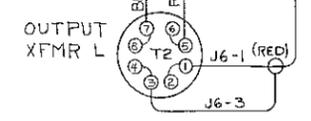
DRAWN: 11/26/75 W.L.J.

REV A - ECN 744  
 B - ECN 890 6/29/77  
 C - ECN 1012 11/1/77  
 D - ECN 1875 1/14/78



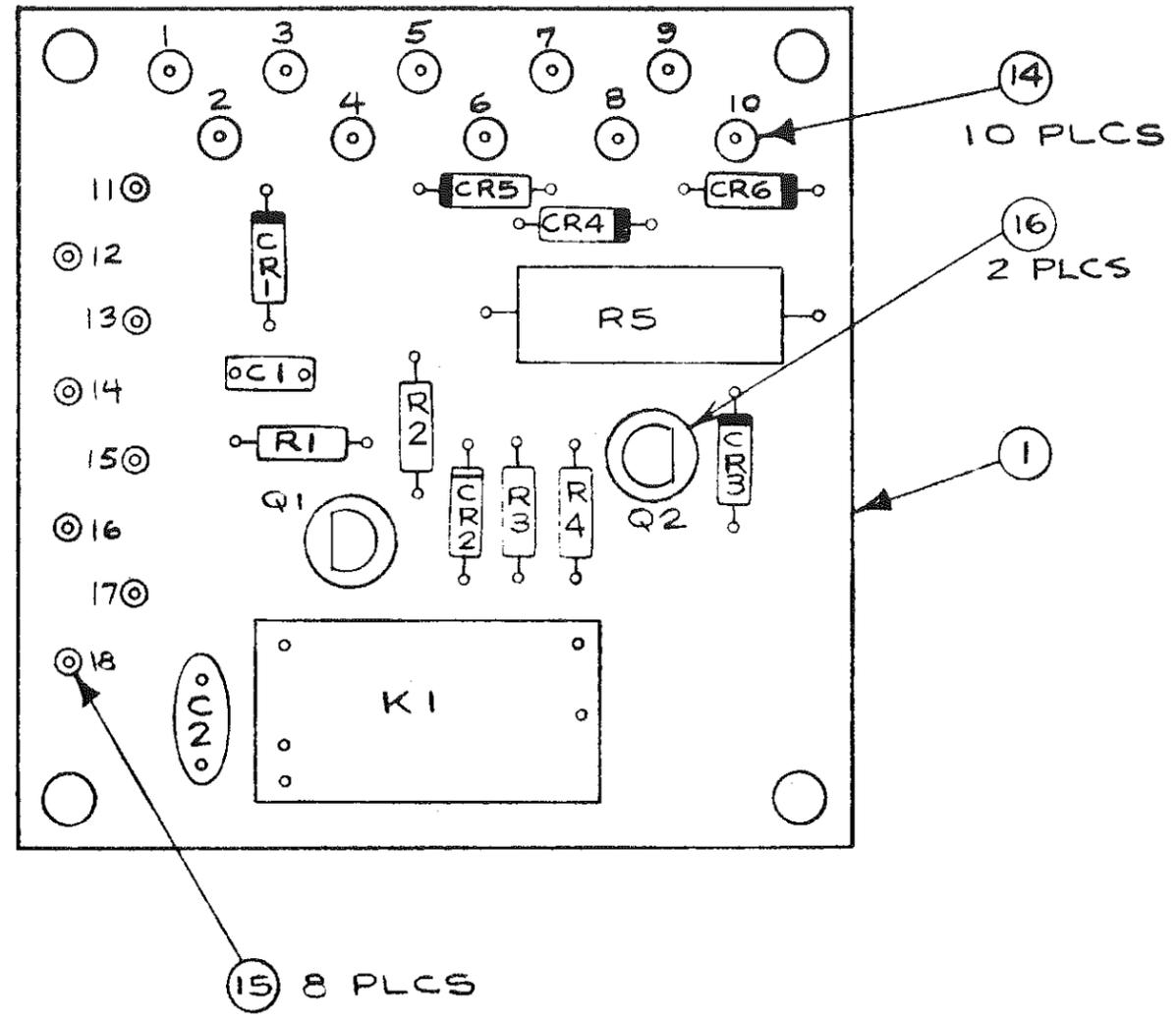
- NOTES:
- \* SLEEVING TO BE APPLIED AT THESE POINTS.
  - \*\* SLEEVING TO BE APPLIED TO WIRES WHEN OPTION NOT USED.
  - CONNECTIONS FOR FAST FORWARD. DELETE IF OPTION NOT USED.
  - WIRE NOT PART OF CABLE; IF MIC INPUT OPTION REQUIRED ADD WIRE.

SIDE OF CHASSIS



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	MATERIAL	TREATMENT OR FINISH	DWG. NO. <b>906-3129</b>	REV. D
	3000 DELAY		SCALE	SHEET 1 of 1
	DECK PLATE (TOP VIEW)			

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	PER ECN 1096	1-16-78	CLO



ITEM	QTY	REF	PART NUMBER	DESCRIPTION	NOTE
20			B-906-3127	SCHEMATIC	
19					
18					
17					
16	2		409-1814	TRANSISTOR PAD	
15	8		418-0161	QUICK DISCONNECT TERMINAL	
14	10		413-1597	TURRET TERMINAL	
13	1		270-0024	DPST RELAY	(K1)
12					
11	1		210-5817	TRANSISTOR GES5817	(Q1)
10	1		211-5816	TRANSISTOR GES5816	(Q2)
9					
8	6		203-4005	DIODE IN4005	(CR1 THRU CR6)
7					
6	1		041-2722	CAPACITOR 270 pf, 500V	(C2)
5	1		030-1043	CAPACITOR .01 MFD, 100V	(C1)
4					
3	1		130-1053	RESISTOR, 10 KΩ 2W	(R5)
2	4		100-1053	RESISTOR, 10KΩ 1/4W	(R1 THRU R4)
1	1		514-1580	BLANK P.C. BOARD	
X	X		914-1580	P. C. BOARD ASSEMBLY	

ITEM	QTY	REF	PART NUMBER	DESCRIPTION	NOTE
------	-----	-----	-------------	-------------	------

LIST OF MATERIAL

TOLERANCE UNLESS OTHERWISE SPECIFIED DECIMAL 2 PL ± .01 3 PL ± .005 FRACTIONAL ± 1/64 ANGULAR ± P° SHARP EDGES TO BEND RADI FILLET RADI	DRAWN BY Wm.	DATE 11/22/75	BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY -	
	CHECKED BY L. BLUM	DATE 6-17-76	TITLE (MONO) DELAY BOARD (ASSY)	
MATERIAL	TREATMENT OR FINISH	DWG NO. B 914-1582	REV A	
		3000 SERIES	SCALE 2:1	SHEET 1 OF 1

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BROADCAST ELECTRONICS, INC.

The NAB Tape Cartridge and Its Maintenance

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TABLE OF CONTENTS	PAGE NO.
The NAB Tape Cartridge	1
Cartridge Maintenance Tips	7
Cartridge Recording Procedure	10
Cartridges in Stereophonic Systems	11

## THE NAB TAPE CARTRIDGE

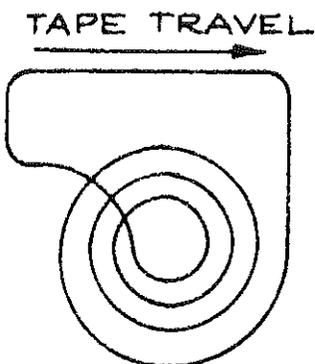
The National Association of Broadcasters (NAB) defines a cartridge as "a plastic or metal enclosure containing an endless loop of lubricated tape, wound on a rotatable hub in such a fashion as to allow continuous motion." Cartridges from the various manufacturers differ slightly in details, but all cartridges usable in NAB standardized systems fit the preceding definition.

### THE TAPE

Cartridge tape consists of a synthetic base material approximately 1 mil (0.001 inch) thick. One side of the base is coated with ferric oxide particles for magnetic recording. The other surface is coated with a graphite layer. The total thickness of the tape is approximately 1.5 mils (0.0015 inch). The tape is 0.246  $\pm$  0.002 inches wide.



The endless loop is formed by wrapping the tape with the oxide side out into a spiral. The two ends are spliced together so that as the tape is pulled from the center, it passes across the tape heads and winds back onto the outside of the tape spiral.

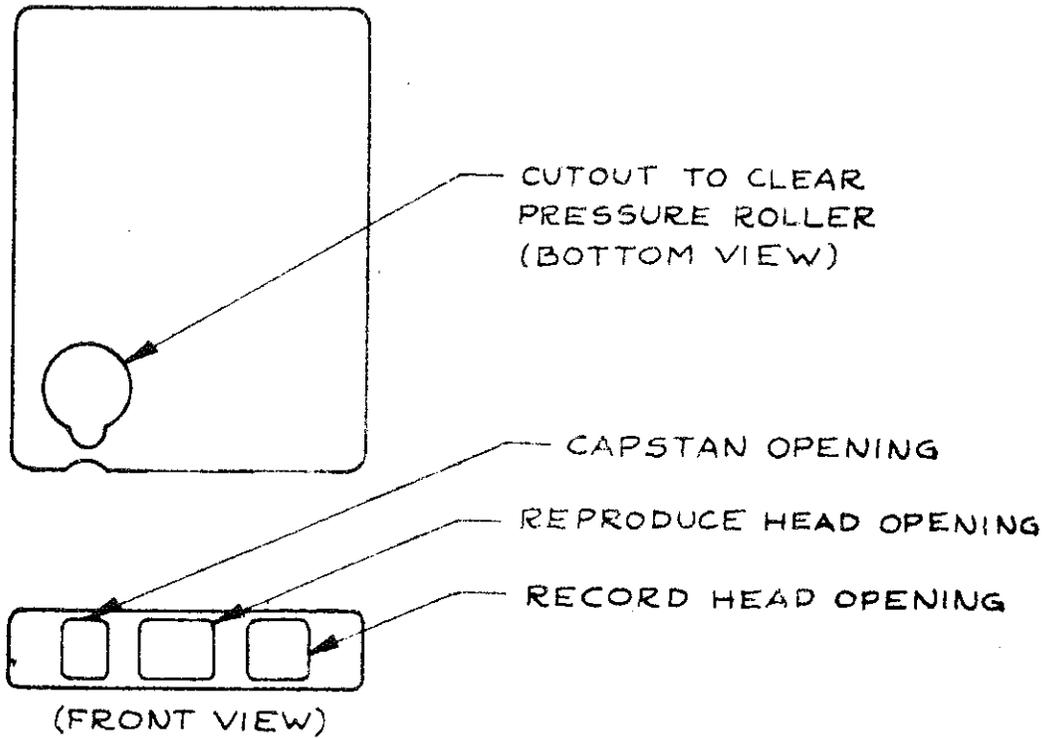


**TAPE SPIRAL**

### THE SHELL

The shell holds the tape and other parts. There are three standard sizes of shells: A (Broadcast Electronics 300 series), B (600 series), and C (1200 series). Assuming 1.5 mil tape, the type A cartridge can be loaded with up to 395 feet of tape, the B with up to 650 feet, and the C with up to 1250 feet.

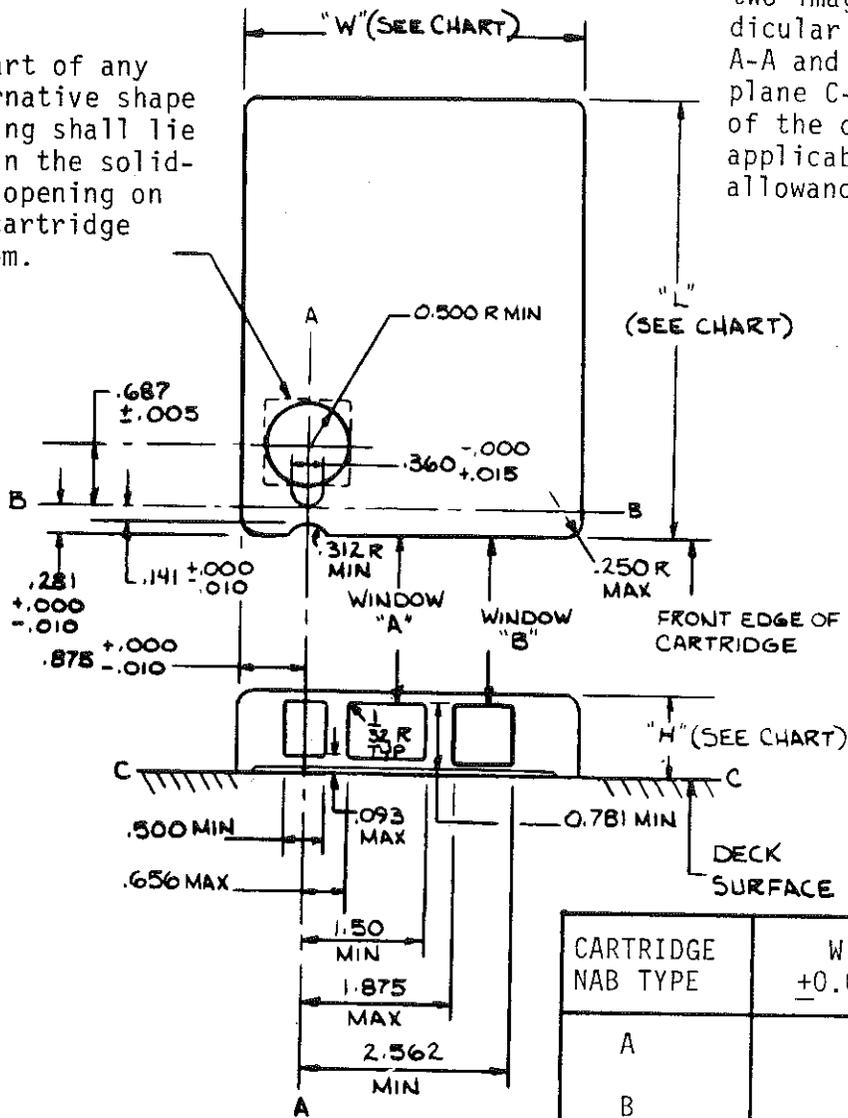
There are three openings across the front of the cartridge that allow the heads and capstan to penetrate the shell and contact the tape. In addition, there is an opening in the bottom for the pressure roller to rotate through the cartridge behind the tape. Unlike some cartridges used in consumer entertainment systems, the pressure roller (pinch roller or capstan idler) is part of the cartridge player and not the cartridge.



NAB tape cartridge dimension standards are presented in Figure 1 and NAB tape head dimension standards are presented in Figure 2.

All important operating dimensions (in inches) are referenced from two imaginary mutually perpendicular vertical planes marked A-A and B-B, and a third horizontal plane C-C, representing the deck surface of the cartridge tape player. Where applicable, dimensions include draft allowances.

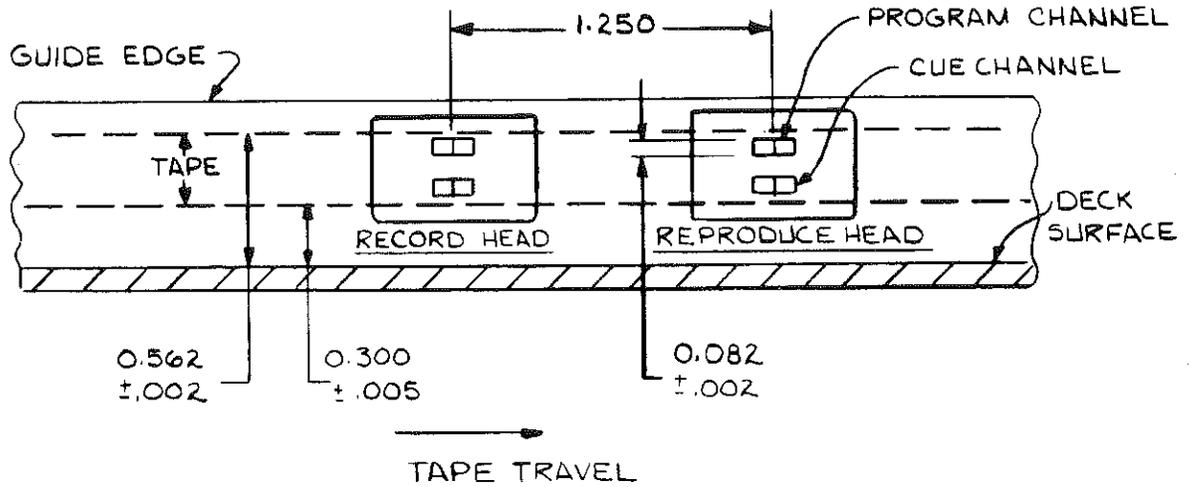
No part of any alternative shape opening shall lie within the solid-line opening on the cartridge bottom.



CARTRIDGE NAB TYPE	WIDTH ±0.015625	LENGTH MAXIMUM	HEIGHT MAXIMUM
A	4"	5.25	0.9375"
B	6"	7"	0.9375"
C	7.625	8.5	0.9375"

Figure 1. NAB CARTRIDGE DIMENSION STANDARDS

## MONOPHONIC STANDARD



## STEREOPHONIC STANDARD

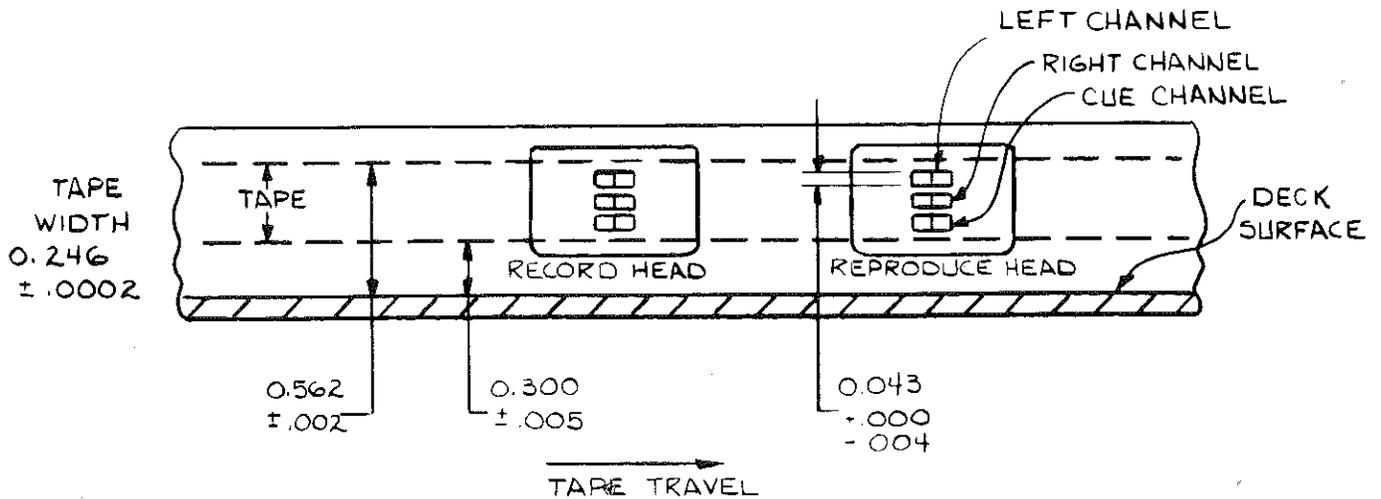
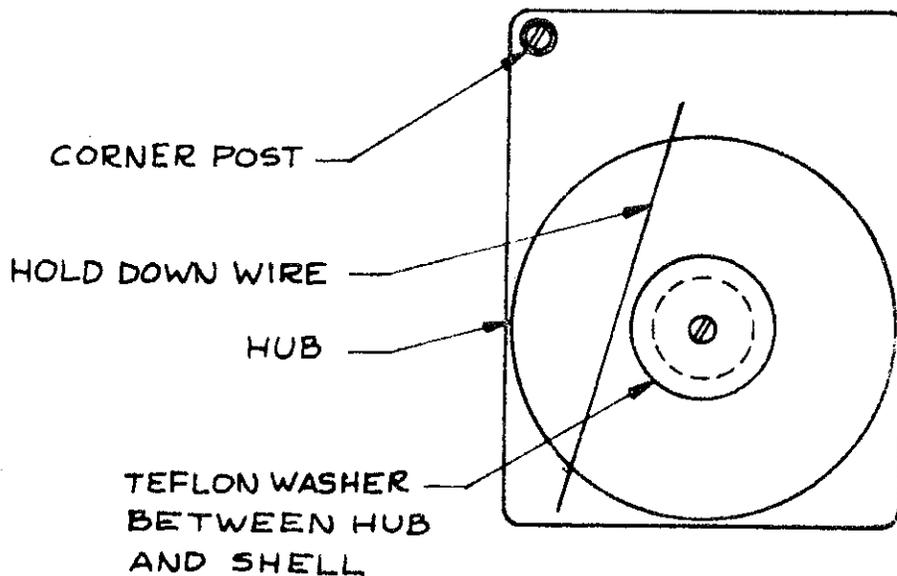


Figure 2. NAB TAPE HEAD DIMENSION STANDARDS

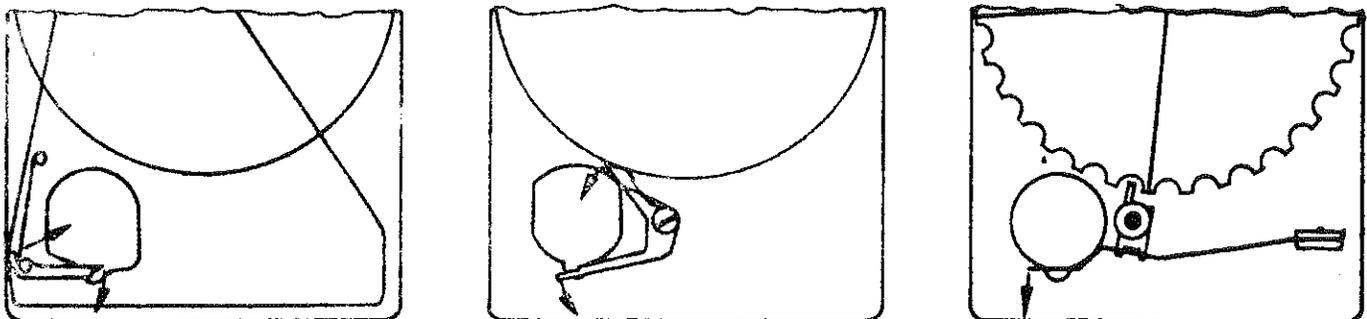
## TAPE HUB, TEFLON WASHER, AND CENTER POST

The tape hub stores the tape which is not passing by the cartridge openings. The hub is free to rotate around the center post. To allow free rotation, a teflon washer is used between the hub and the shell. Some means must be provided to keep the tape flat on the hub. A separate cover may fit over the hub, the top may be molded so that the clearance between the hub and the shell is just greater than the tape width, or a hold-down wire may be placed so that it passes above one side of the hub.



## CLUTCH SPRING OR HUB BRAKE (SPRING ACTION DEVICE)

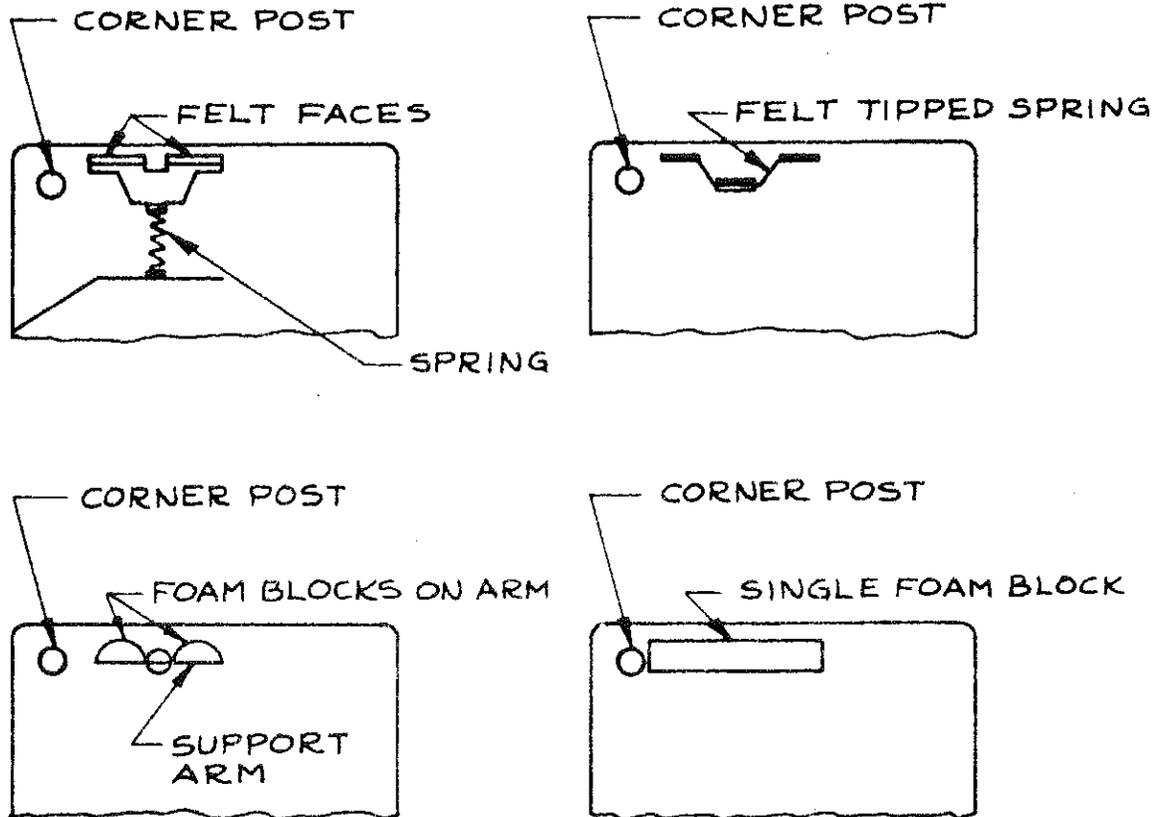
The clutch spring or hub brake keeps the tape from moving when the cartridge is not in place in a machine. This is done either by applying a brake to the hub or by pressing the tape against the shell. The clutch or brake is released by the shaft of the pressure roller when the roller is in the vertical position.



## PRESSURE PADS

The pressure pads ensure the tape remains in contact with the heads. A foam plastic is the most commonly used material for the pressure pads. The compression of the foam provides pressure to wrap the tape slightly around the heads. Felt is less frequently used. To provide pressure on the tape, the felt is mounted on a phosphor bronze arm or a spring-loaded plastic block.

The foam may be a single block mounted behind the two openings for the record and reproduce heads and held in place by ridges cast into the shell. Alternately, the foam may be in two separate pieces fastened to a metal or plastic arm. A third type mounts the foam on a spring-loaded plastic block. To ensure smooth tape travel, teflon is usually applied to the face of the foam.



## TAPE GUIDANCE

Primary control of the tape as it moves across the heads is maintained by external guides in the head bracket. Guidance is provided within the cartridge to keep the tape traveling the same path. This is generally accomplished with tabs and grooves molded into the shell. Of primary importance is the corner post which must straighten the tape before it passes across the front openings of the shell. This post may be molded into the shell or a separate piece glued into a dimple in the shell.

## CARTRIDGE MAINTENANCE TIPS

The cartridge is the second half of the tape cartridge system. The cartridge needs regular care just like the cartridge recorder or reproducer. The service department of Broadcast Electronics has developed over the years a rule of thumb for trouble-shooting. Check the cartridge before adjusting the machine.

## TAPE

For maximum performance, the tape must be in good condition. The tape in cartridges wears rapidly, particularly in short length cartridges (70 seconds or less) and cartridges that are used frequently. The tape should be inspected regularly and frequently for obvious signs of wear.

Cartridges should be rewound or replaced when the oxide side of the tape is shiny. Likewise the tape should be discarded if it is wrinkled, or contaminated with fingerprints, grease, or dirt. Less obvious are drop-outs or areas where the iron oxide particles have come loose from the base of the tape. Drop-outs may not be visible, but will show up as a loss of audio signal.

If possible only one type of tape should be used in a single installation. Different brands, and even different types of the same brand of tape require different bias recording levels for optimum response.

When rewinding cartridges use only a graphite lubricated tape. Silicone lubricated tapes cannot stand up to the rugged service in a cartridge.

Every cartridge tape must have one splice, but multiple splices can cause problems. If the top tape ends overlap at the splice or do not meet squarely, the audio may dropout. In addition, a poor splice will catch on the cartridge or the hub. After a splice has been in use for some time, the tape tension may pull the two ends of the tape apart, slightly opening splice.

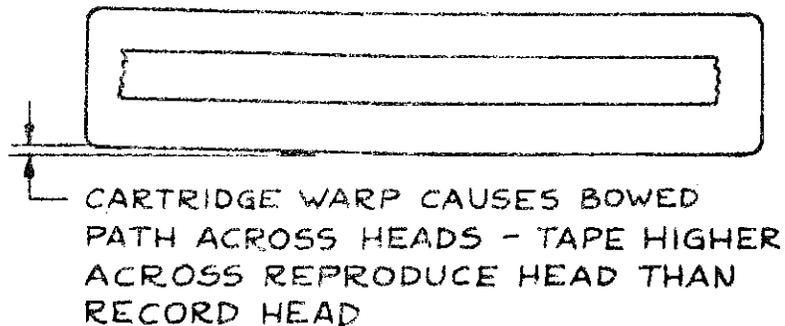
Proper tape tension is most critical. If the tension is too great, the tape will wear rapidly as it is squeezed against the hub, the pressure pads, the corner post, and the tape on the hub. If the tension is too light, the tape will not be pulled back into the hub.

The NAB specifies that tape tension at the capstan should not exceed 6 ounces. Cartridges over 70 seconds in length tend to have too little tension, while those less than 70 seconds tend to have too much. When running, a properly wound cartridge moves tape freely with no reluctance to wind onto the hub. To increase the tension in a cartridge, open up the splice and gently pull on the tape as it wraps onto the hub. To decrease the tension, open up the splice and gently pull out several loops from the center of the hub. Trim off the excess and resplice the tape.

#### THE SHELL

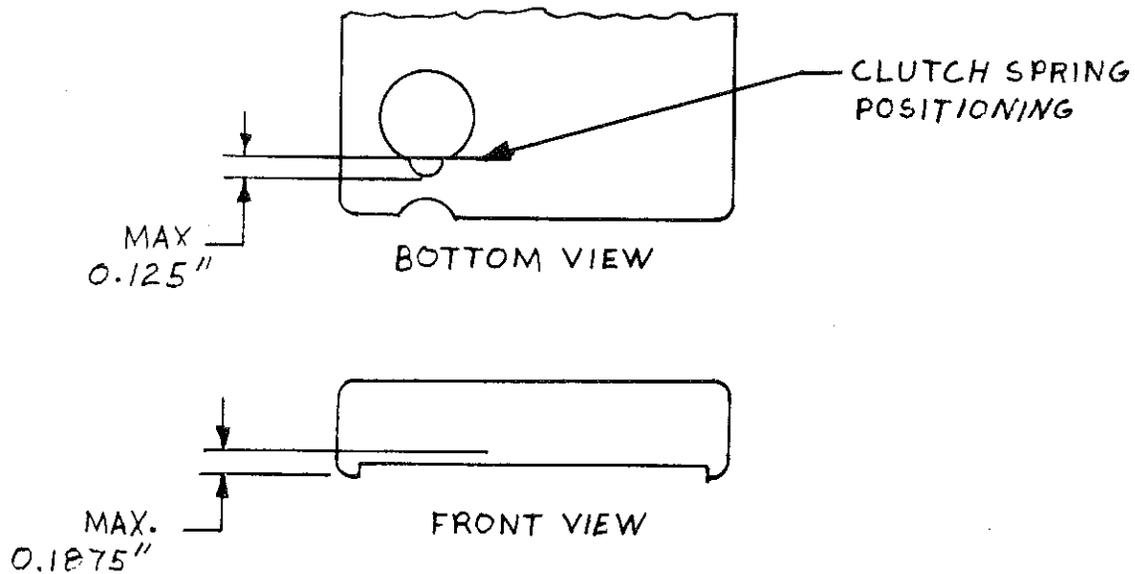
A deformed shell can adversely affect frequency response by distorting the tape path. In particular, a warped cartridge may cause the tape to traverse the head openings in an arc or bowed path rather than a straight line. Sometimes an ill-fitting top can spread the sides of the cartridge enough to cause this same bowing. Check suspect cartridges on a flat surface.

Periodically the cartridge center post should be cleaned. Gummy deposits on the post increase tape tension by not allowing the tape hub to turn freely. Equally important to free movement of the hub is the washer. This washer should always be in place underneath the tape hub, between the hub and the shell. This washer is easily misplaced when the cartridge is opened and the hub removed.



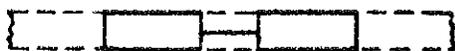
## CLUTCH SPRING OR HUB BRAKE

The clutch spring or hub brake should completely release when the pressure roller is in the vertical position. This allows the hub, and the tape, to move freely. An improperly adjusted clutch spring or defective hub brake may prevent the roller from engaging or disengaging. The clutch should be parallel to the bottom of the shell and no more than 0.1875 inch above the surface of the tape deck. The clutch must not protrude more than 0.125 inch into the opening for the pressure roller. Less than 8 ounces should be required to release the clutch.

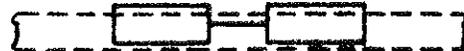


## PRESSURE PADS

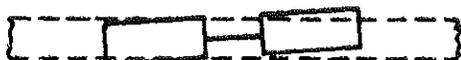
The pressure pads must wrap the tape around the face of the heads. The pressure applied must be uniform across the tape as it is in contact with the head. Periodically check the pads to see that they are lined up squarely with the tape. If one portion of the tape is not in contact with the pads, that portion of the tape will make poor contact with the head. This may show up as poor frequency response from an individual cartridge.



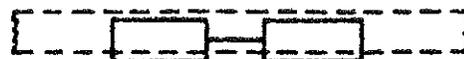
PROPER ALIGNMENT



PADS TOO HIGH



PADS SKEWED

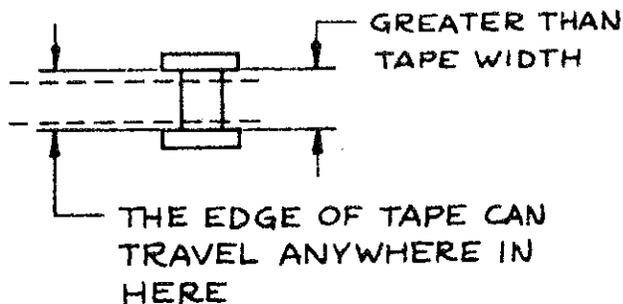


PADS TOO LOW

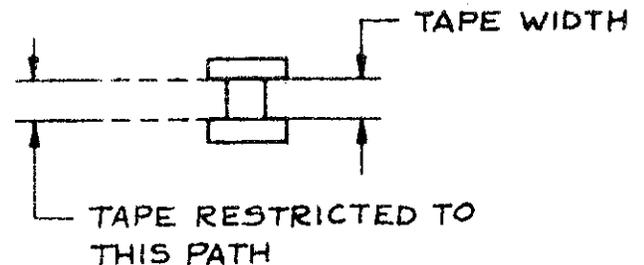
## THE TAPE PATH

The most frequent cause of distortion of the tape path in the cartridge is a loose corner post. The post should always be glued down so that there is 0.250 inch between the shoulder of the post and the shell. If the post is high, the tape will not run straight across the heads. A loose post frequently causes muffled-sounding audio when the cartridge unit starts.

### LOOSE CORNER POST



### PROPER CORNER POST



The hold-down wire used in many cartridges is important in maintaining proper tape travel. This wire keeps the tape flat on the hub as tape is pulled from the center and returned to the outside. The wire must not exert any pressure on the stored tape or the tape may wrinkle and jam. If a cartridge is dropped this hold-down wire may unseat.

### CARTRIDGE STORAGE

The cartridges should be stored away from direct sunlight, or heat from electronic equipment, radiators, etc. Ideal conditions are a temperature of 70° and a relative humidity of 50%. The cartridges storage area should be as free from dust as possible.

### CARTRIDGE RECORDING PROCEDURE

The following procedure is particularly important when recording cartridges. When the cartridge is first inserted into the machine, put the tape in motion in playback for several seconds. This allows the tape to seat properly in the tape guides and across the heads.

Stop the tape. Do not remove the cartridge after the initial run-in. Ensure the tape splice is positioned in an unrecorded portion of the tape between the end and the beginning of the program material.

The tape may now be recorded with satisfactory results.

## CARTRIDGES IN STEREOPHONIC SYSTEMS

### MAINTENANCE

Rigorous maintenance is a must for cartridges used in a stereophonic system, since any distortion of the tape path can cause phase differences between the program material on the two tracks. When the program material is mixed, phase differences cause degradation of the frequency response.

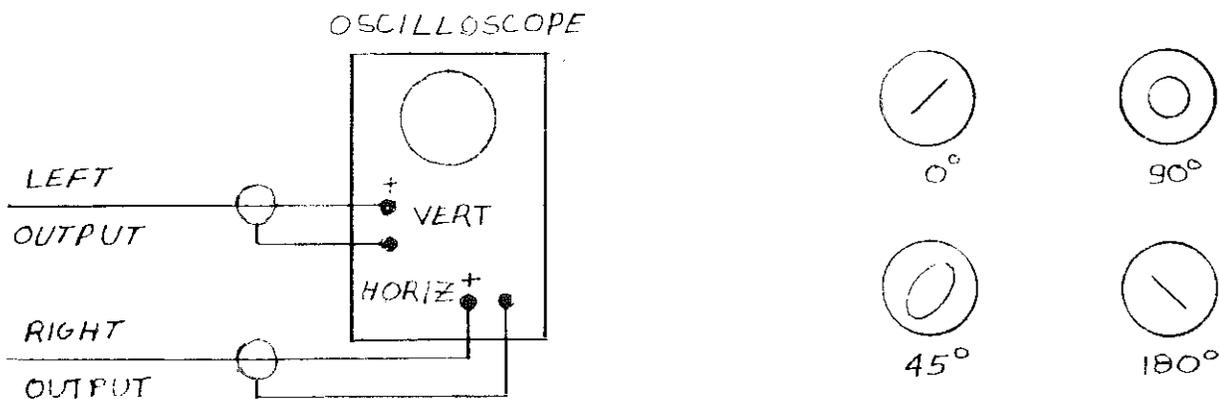
The most important characteristic of a cartridge for stereophonic use is the ability to consistently maintain the identical tape path each time the cartridge is inserted in the player. This allows reliable recording and subsequent accurate reproduction.

Cartridges used in a stereophonic system should initially be selected for phase repeatability using the phasing test outlined below. This test should be repeated on a regular basis throughout the life of the cartridge. A cartridge which fails this test should be discarded.

To provide better guidance within the cartridge, several manufacturers have introduced cartridges with an adjustable corner post. The post is threaded into the shell so that the precise post height may be maintained. These and other cartridges designed to improve performance should be considered for use in a stereophonic system.

### STEREO PHASING TEST

Connect the output of a record/playback unit to an oscilloscope as shown. Connect an audio signal generator to both inputs of the recorder. While recording observe the phase of the reproduced signals. Remove and re-insert the cartridge several times. Cartridges which exhibit poor phase repeatability or stability should be discarded. Do not test only for the higher frequencies, but check selected frequencies across the audio band.



## PRODUCT WARRANTY

LIMITED ONE YEAR

While this warranty gives you specific legal rights, which terminate one (1) year (6 months on turntable motors) from the date of shipment, you may also have other rights which vary from state to state.

Broadcast Electronics, Inc. ("BE"), 4100 North 24th Street, P. O. Box 3606, Quincy, Illinois 62305, hereby warrants cartridge machines, consoles, transmitters and other new Equipment manufactured by BE against any defects in material or workmanship at the time of delivery thereof, that develop under normal use within a period of one (1) year (6 months for turntable motors) from the date of shipment. Other manufacturers' Equipment, if any, shall carry only such manufacturers' standard warranty. This warranty extends to the original user and any subsequent purchaser during the warranty period. BE's sole responsibility with respect to any Equipment or parts not conforming to this warranty is to replace such equipment or parts upon the return thereof F.O.B. BE's factory or authorized repair depot within the period aforesaid.

In the event of replacement pursuant to the foregoing warranty, only the unexpired portion of the warranty from the time of the original purchase will remain in effect for any such replacement. However, the warranty period will be extended for the length of time that the original user is without the services of the Equipment due to its being serviced pursuant to this warranty. The terms of the foregoing warranty shall be null and void if the Equipment has been altered or repaired without specific written authorization of BE, or if Equipment is operated under environmental conditions or circumstances other than those specifically described in BE's product literature or instruction manual which accompany the Equipment purchased. BE shall not be liable for any expense of any nature whatsoever incurred by the original user without prior written consent of BE.

BE shall not be liable to the original user for any and all incidental or consequential damages for breach of either expressed or implied warranties. However, some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you. All express and implied warranties shall terminate at the conclusion of the period set forth herein.

Except as set forth herein, and except as to title, there are no warranties, or any affirmations of fact or promises by BE, with reference to the Equipment, or to merchantability, fitness for a particular application, signal coverage, infringement, or otherwise, which extend beyond the description of the Equipment in BE's product literature or instruction manual which accompany the Equipment. Any card which is enclosed with the Equipment will be used by BE for survey purposes only.

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