

# **INSTRUCTION MANUAL**

## **3000A SERIES CARTRIDGE MACHINES**

February, 1989

IM No. 597-3000-001

BROADCAST ELECTRONICS, INC.



# IMPORTANT INFORMATION

## EQUIPMENT LOST OR DAMAGED IN TRANSIT

When delivering the equipment to you, the truck driver or carrier's agent will present a receipt for your signature. Do not sign it until you have (a) inspected the containers for visible signs of damage and (b) counted the containers and compared with the amount shown on the shipping papers. If a shortage or evidence of damage is noted, insist that notation to that effect be made on the shipping papers before you sign them.

Further, after receiving the equipment, unpack it and inspect thoroughly for concealed damage. If concealed damage is discovered, immediately notify the carrier, confirming the notification in writing, and secure an inspection report. This item should be unpacked and inspected for damage WITHIN 15 DAYS after receipt. Claims for loss or damage will not be honored without proper notification of inspection by the carrier.

## TECHNICAL ASSISTANCE AND REPAIR SERVICE

Technical assistance is available from Broadcast Electronics by letter or prepaid telephone or telegram. Equipment requiring repair or overhaul should be sent by common carrier, prepaid, insured and well protected. Do not mail equipment. We can assume no liability for inbound damage, and necessary repairs become the obligation of the shipper. Prior arrangement is necessary. Contact Customer Service Department for a Return Authorization.

FOR TECHNICAL ASSISTANCE  
Phone (217) 224-9600 Customer Service

## WARRANTY ADJUSTMENT

Broadcast Electronics, Inc. warranty is included in the Terms and Conditions of Sale. In the event of a warranty claim, replacement or repair parts will be supplied F.O.B. factory. At the discretion of Broadcast Electronics, the customer may be required to return the defective part or equipment to Broadcast Electronics, Inc. F.O.B. Quincy, Illinois. Warranty replacements of defective merchandise will be billed to your account. This billing will be cleared by a credit issued upon return of the defective item.

## RETURN, REPAIR AND EXCHANGES

Do not return any merchandise without our written approval and Return Authorization. We will provide special shipping instructions and a code number that will assure proper handling and prompt issuance of credit. Please furnish complete details as to circumstances and reasons when requesting return of merchandise. All returned merchandise must be sent freight prepaid and properly insured by the customer.

## REPLACEMENT PARTS

Replacement and Warranty Parts may be ordered from the address below. Be sure to include equipment model and serial number and part description and part number.

Broadcast Electronics, Inc.  
4100 N. 24th St., P.O. Box 3606  
Quincy, Illinois 62305  
Tel: (217) 224-9600  
Telex: 25-0142  
Cable: BROADCAST

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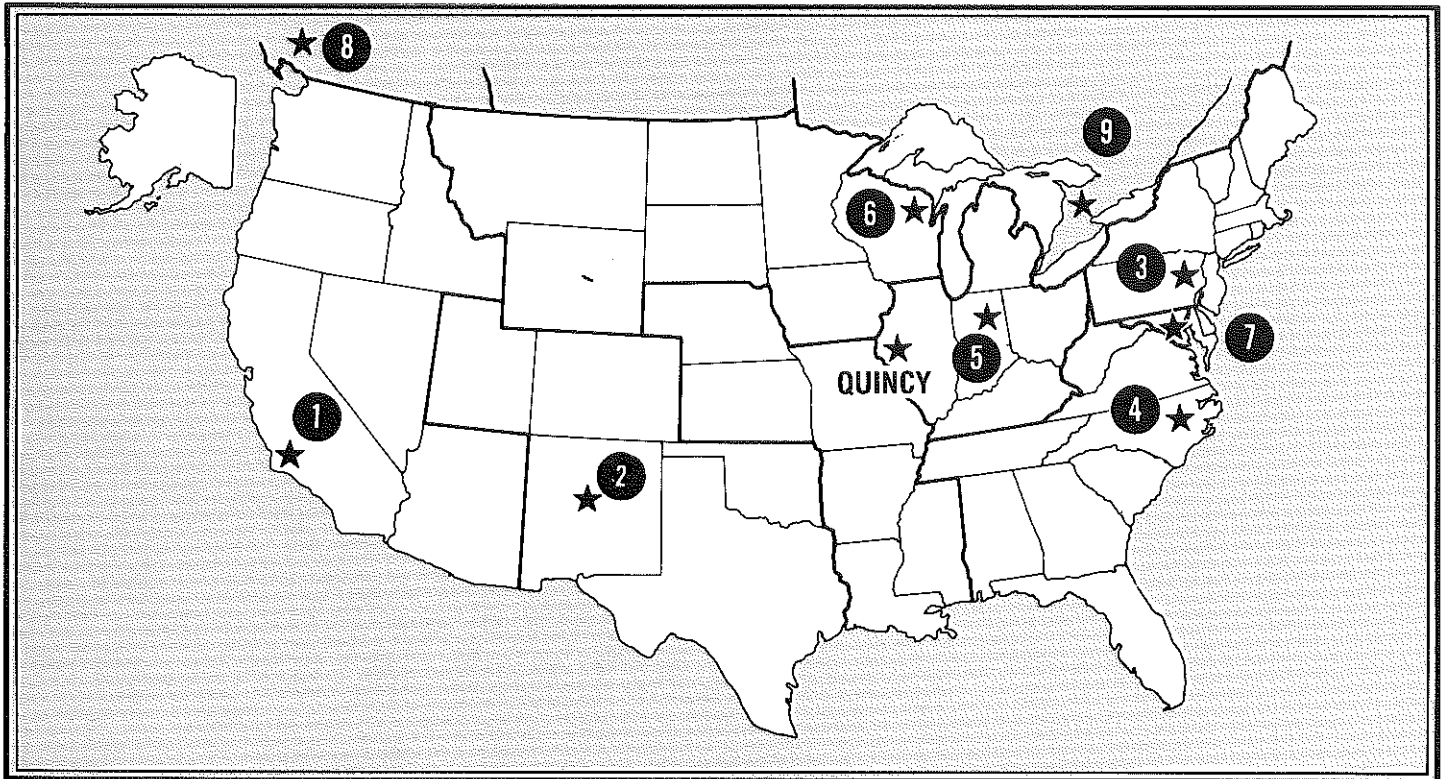
Broadcast Electronics, Inc. reserves the right to modify the design and specifications of the equipment in this manual without notice. Any modifications shall not adversely affect performance of the equipment so modified.



# AUTHORIZED SERVICE CENTERS

• Equipped to serve you with Broadcast Electronics parts and repairs—both in and out of warranty

• Regional depots reduce parts delivery time and repair turn-around time



## UNITED STATES

**1. Riggins Electronics**  
3272 E. Willow St.  
Long Beach, CA 90806  
Ph: (213) 598-7007

### States Covered:

Alaska  
Arizona  
California  
Hawaii  
Nevada  
Oregon  
Washington

**2. Dyma Engineering**  
367 Main ST. S.E.  
Box 1535  
Los Lunas, NM 87031  
Ph: (505) 867-6700

### States Covered:

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New Mexico  
Oklahoma  
Texas  
Utah

**3. Radio Systems Design**  
5131 West Chester Pike  
Edgmont, PA 19028  
Ph: (215) 356-4700

### States Covered:

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New Hampshire  
New Jersey  
New York  
Pennsylvania  
Rhode Island  
Vermont

**4. Broadcast Services**  
Rt. #3, Box 45E  
Four Oaks, NC 27524  
Ph: (919) 934-6869

### States Covered:

Alabama  
Florida  
Georgia  
North Carolina  
South Carolina  
Tennessee  
Virginia  
West Virginia

**5. Allied Broadcasting Equipment**  
635 South E. St.  
Richmond, IN 47374  
Ph: (317) 962-8596

### States Covered:

Illinois  
Indiana  
Kentucky  
Michigan  
Ohio

**6. Electronic Industries**  
19 East Irving Ave.  
Oshkosh, WI 54902  
Ph: (414) 235-8930

### States Covered:

Iowa  
Minnesota  
Montana  
North Dakota  
South Dakota  
Wisconsin  
Wyoming

**7. Midwest Telecommunications**  
4720-B Boston Way  
Lanham (Wash., D.C.) MD 20801  
Ph: (301) 577-4903

States Covered:  
District of Columbia  
Delaware  
Maryland

## CANADA

**8. Nortec West, Ltd.**  
325 West Fifth Avenue  
Vancouver V5Y 1J6,  
B.C., Canada  
Ph: (604) 872-8525

### Provinces Covered:

British Columbia  
Yukon Territory  
Alberta  
Manitoba  
NW Territory  
Saskatchewan

**9. J-Mar Electronics, Ltd.**  
6 Banigan Drive  
Toronto M4H 1E9,  
Ontario, Canada  
Ph: (416) 421-9080

### Provinces Covered:

New Brunswick  
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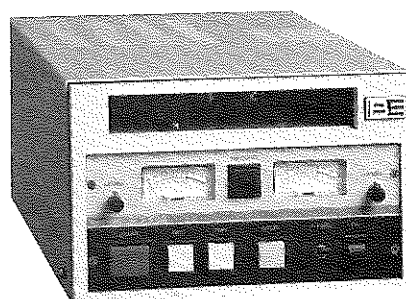
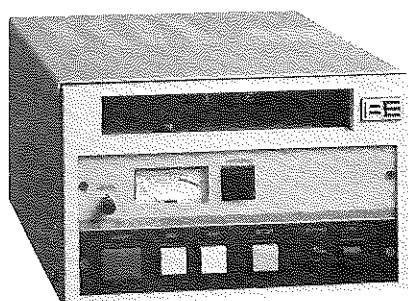
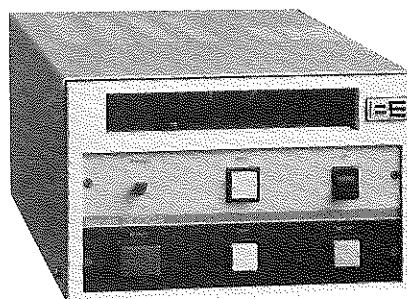
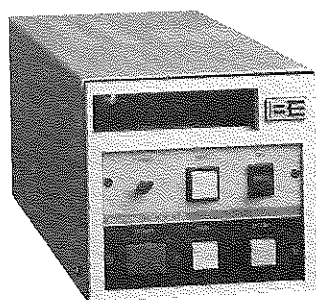


**BROADCAST  
ELECTRONICS INC**

TECHNICAL MANUAL  
BROADCAST ELECTRONICS  
3000A SERIES  
TAPE CARTRIDGE MACHINE  
597-3000-001

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TECHNICAL MANUAL  
BROADCAST ELECTRONICS, INC.  
3000A SERIES  
CARTRIDGE MACHINES



<u>MODEL</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
3100AP	900-3100-001	Single-Deck Monophonic Playback Cartridge Machine, NAB A or AA Size Cartridges, 117V ac 60 Hz Operation.
3100APS	900-3102-001	Single-Deck Stereophonic Playback Cartridge Machine, NAB A or AA Size Cartridges, 117V ac 60 Hz Operation.
3200AP	900-3200-001	Single-Deck Monophonic Playback Cartridge Machine. NAB A, AA, B, or BB Size Cartridges, 117V ac 60 Hz Operation.

<u>MODEL</u>	<u>PART NUMBER</u>	<u>DESCRIPTION</u>
3200ARP	900-3201-001	Single-Deck Monophonic Record/Playback, Cartridge Machine. NAB A, AA, B, or BB Size Cartridges, 117V ac 60 Hz Operation.
3200APS	900-3202-001	Single-Deck Stereophonic Playback Cartridge Machine. NAB A, AA, B, or BB Size Cartridges, 117V ac 60 Hz Operation.
3200ARPS	900-3203-001	Single-Deck Stereophonic Record/Playback Cartridge Machine. NAB A, AA, B, or BB Size Cartridges, 117V ac 60 Hz Operation.
3400AP	900-3400-001	Single-Deck Monophonic Playback Cartridge Machine, Rack Mount. NAB A, AA, B, BB, C, or CC Size Cartridges, 117V ac 60 Hz Operation.
3400ARP	900-3401-001	Single-Deck Monophonic Record/Playback Cartridge Machine, Rack Mount. NAB A, AA, B, BB, C, or CC Size Cartridges, 117V ac 60 Hz Operation.
3400APS	900-3402-001	Single-Deck Stereophonic Playback Cartridge Machine, Rack Mount. NAB A, AA, B, BB, C, or CC Size Cartridges, 117V ac 60 Hz Operation.
3400ARPS	900-3403-001	Single-Deck Stereophonic Record/Playback Cartridge Machine, Rack Mount. NAB A, AA, B, BB, C, or CC Size Cartridges, 117V ac 60 Hz Operation.

#### OPTIONAL ASSEMBLIES

----	900-3004	Delay programming circuitry for monophonic record/playback cartridge machines, factory installed. Includes 1 kHz and 150 Hz cue tone circuitry.
----	900-3201-401	Fast forward locking circuitry for monophonic record/playback cartridge machines, factory installed.

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## SECTION I GENERAL INFORMATION

### 1-1. INTRODUCTION.

1-2. Information presented by this section provides a general description of the Broadcast Electronics 3000A series cartridge machines and lists equipment specifications.

### 1-3. EQUIPMENT DESCRIPTION.

1-4. The Broadcast Electronics 3000A series cartridge machines are professional single-deck playback and record/playback units designed for continuous operation. The 3000A series includes monophonic and stereophonic models equipped with secondary and tertiary cue tone detection circuitry. A wide range of assemblies and accessories provide the flexibility required for any type of installation.

### 1-5. MODEL IDENTIFICATION.

1-6. MODEL 3100A. The model 3100A is a desk top playback only cartridge machine available in monophonic or stereophonic configurations. The 3100A accepts NAB A and AA size cartridges.

1-7. MODEL 3200A. The model 3200A is a desk top playback or record/playback cartridge machine available in monophonic or stereophonic configurations. The 3200A accepts NAB A, AA, B, or BB size cartridges.

1-8. MODEL 3400A. The model 3400A is a rack mount playback or record/playback cartridge machine available in monophonic or stereophonic configurations. The 3400A accepts NAB A, AA, B, BB, C, or CC size cartridges.

1-9. DELAY MODELS. Delay programming circuitry is available as an option for monophonic record/playback cartridge machines. The delay option will allow the cartridge machine to operate as a record/playback/delay unit or a normal playback only device. Refer to 3000A Delay Supplement Manual 597-0300-001 for additional information on delay unit operation and maintenance.

### 1-10. ELECTRICAL DESCRIPTION.

1-11. All 3000A series cartridge machines are equipped with a modular plug-in playback logic circuit board. The playback logic circuit board contains the deck control logic, audio amplifier circuitry, and the cue channel detection circuitry. NAB primary (1 kHz), secondary (150 Hz), and tertiary (8 kHz) cue tone detection is standard on all models. An automatic/manual fast forward feature is incorporated into the control logic design for rapid tape advance. All cartridge machine operating potentials are generated by a modular power supply circuit board. A complete remote control system is incorporated into the circuitry for external manual control.

1-12. All 3000A record models are equipped with modular plug-in record amplifier and record control circuit boards. The record amplifier circuit board houses the record amplifier and bias circuitry. The record control circuit board contains the record control logic and the cue tone generator circuitry.

1-13. MECHANICAL DESCRIPTION.

1-14. The cartridge machine deck is equipped with a cartridge guidance system, an air-damped solenoid, and the Broadcast Electronics PHASE LOK V head assembly. The cartridge guidance system is designed with spring-loaded components to channel and lock a cartridge into the proper play position. An air-damped solenoid provides a rapid response to start commands. The PHASE LOK V head assembly provides the tape heads with a secure and stable environment. The head assembly is designed to permit independent adjustment of the head height/zenith, and head azimuth.

1-15. The 3000A series cartridge machine also features a direct-drive hysteresis-synchronous motor for precise tape movement. The motor is mounted to the half-inch thick rigid aluminum deck.

1-16. OPTIONS AND ACCESSORIES.

1-17. Refer to Table 1-1 for options and accessories available for the 3000A series cartridge machines.

TABLE 1-1. 3000A SERIES CARTRIDGE MACHINE OPTIONS AND ACCESSORIES  
(Sheet 1 of 3)

OPTIONS AND ACCESSORIES	PART NUMBER
<p><u>REMOTE CONTROL UNITS</u></p> <p>FOUR MODEL RC3000 REMOTE CONTROL UNITS ARE AVAILABLE FOR THE 3000A SERIES CARTRIDGE MACHINES.</p> <ol style="list-style-type: none"> <li>1. Model RC3000 remote control unit provides remote mode functions and indications for five 3000A series cartridge machines (secondary and tertiary cue tone circuitry not included).</li> <li>2. Model RC3000 remote control unit equipped with circuitry to provide remote mode functions and indications for a single 3000A record/playback cartridge machine.</li> <li>3. Model RC3000 remote control unit provides remote mode functions and indications for a single series 3000A playback only cartridge machine with cue tones.</li> </ol>	<p>906-3016</p> <p>906-3019</p> <p>906-3020</p>

TABLE 1-1. 3000A SERIES CARTRIDGE MACHINE OPTIONS AND ACCESSORIES  
(Sheet 2 of 3)

OPTIONS AND ACCESSORIES	PART NUMBER
<p>4. Model RC3000 remote control unit with start/stop and fast forward switches for five 3000A series cartridge machines.</p>	906-3028
<p><u>AUDIO SWITCHERS</u></p>	
<p>MODEL SW5E SWITCHER FOR 3000A SERIES CARTRIDGE MACHINES</p>	904-5000
<p><u>Description:</u> The SW5E switcher provides a single audio output from three 3000A series cartridge machines. Up to three switchers can be connected in parallel to provide a single output from 9 units.</p>	
<p>MODEL SW5F SWITCHER FOR 3000A SERIES CARTRIDGE MACHINES</p>	904-5001
<p><u>Description:</u> The SW5F switcher provides a single audio output from five series 3000A cartridge machines. Up to three switchers can be connected in parallel to provide a single output from 15 units.</p>	
<p><u>TELEPHONE ANSWERING EQUIPMENT</u></p>	
<p>MODEL PC-1 TELEPHONE INTERFACE</p>	900-0010
<p><u>Description:</u> The PC-1 telephone interface provides cartridge machine/telephone network communication. The unit answers incoming telephone calls and enables a cartridge machine for the purpose of transmitting a pre-recorded message.</p>	
<p><u>RACK MOUNTING ACCESSORIES</u></p>	
<p>RACK SHELF FILLER PANEL, 1/3 RACK</p>	900-3014
<p>RACK SHELF FILLER PANEL, 1/2 RACK</p>	900-3015
<p>RACK MOUNT SHELF FOR EIA 19 INCH RACK</p>	900-3013
<p>TOP COVER FOR ABOVE SHELF</p>	900-3010

TABLE 1-1. 3000A SERIES CARTRIDGE MACHINE OPTIONS AND ACCESSORIES  
(Sheet 3 of 3)

OPTIONS AND ACCESSORIES	PART NUMBER
<u>TEST EQUIPMENT</u>	
EXTENDER CIRCUIT BOARD FOR 3000A SERIES CARTRIDGE MACHINE	919-1504
SPARE PARTS KIT FOR 3000A CARTRIDGE MACHINES	970-0092
TAPE HEAD AND TAPE GUIDE ALIGNMENT GAUGE KIT	<del>970-0103</del> <del>300-0002</del>
MOTOR ALIGNMENT GAUGE KIT	<del>300-0700</del> <del>970-0102</del>
CARTRIDGE MACHINE TEST TAPES:	
NAB Monophonic/Stereophonic Reproduce Alignment Test Tape	808-0004
Tape Alignment Cue-Away Test Cartridge	710-0132
Cue Tone Calibration Cartridge	800-1095

1-18. EQUIPMENT SPECIFICATIONS.

1-19. Refer to Table 1-2 for the electrical, mechanical, physical, and environmental specifications of the Broadcast Electronics 3000A series cartridge machines.



TABLE 1-2. 3000A SERIES CARTRIDGE MACHINE SPECIFICATIONS  
(Sheet 1 of 3)

PARAMETER	SPECIFICATIONS
<u>ELECTRICAL</u>	
MOTOR	Hysteresis-synchronous.
TAPE SPEED	
Standard	7.5 Inches/Second.
Optional	3.75 Inches/Second.
WOW AND FLUTTER, PLAYBACK OR RECORD	0.15% Maximum DIN. Referenced at 7.5 Inches/Second.
AUDIO OUTPUT IMPEDANCE	600/150 Ohms Selectable, Balanced, Transformer Coupled.
AUDIO OUTPUT LEVEL	-54 dBm to +10 dBm. Continuously Variable. +18 dBm Clip Level.
AUDIO INPUT IMPEDANCE	50 k Ohm, Bridged, Balanced, Transformer Coupled.
AUDIO INPUT LEVEL	-20 dBm to +20 dBm.
DISTORTION, PLAYBACK OR RECORD	2.0% or Less. Reference: 1 kHz at 185 nWb/m.
NOISE (See Note)	
Hum and Noise	
Monophonic	-54 dB. Reference: 1kHz at 185 nWb/m.
Stereophonic	-52 dB. Reference: 1kHz at 185 nWb/m.
Squelch Noise	-70 dB. Reference: 1kHz at 185 nWb/m.
CROSSTALK	-50 dB or greater, Program Channel-to-Program Channel or Program Channel-to-Cue Channel at 1kHz.
FREQUENCY RESPONSE (See Note)	±2 dB, 50 Hz to 15 kHz.
EQUALIZATION	
Standard	1965 NAB Standard.
Optional	I.E.C., CCIR.

TABLE 1-2. 3000A SERIES CARTRIDGE MACHINE SPECIFICATIONS  
(Sheet 2 of 3)

PARAMETER	SPECIFICATIONS
POWER REQUIREMENTS	
Standard	105V ac to 125V ac, 60 Hz.
Optional	210V ac to 240V ac, 50 Hz.
CUE TONES	1kHz (Primary), 150 Hz (Secondary) and 8 kHz (Tertiary) on all models.
<u>MECHANICAL</u>	
NUMBER OF DECKS	One
CARTRIDGE DECK SIZE	
3100A	A or AA Size Cartridges.
3200A	A, AA, B, or BB Size Cartridges.
3400A	A, AA, B, BB, C, or CC Size Cartridges.
TRANSPORT TYPE	Direct Drive Capstan.
<u>PHYSICAL</u>	
WEIGHT (Packed)	
3100A	28 Pounds (12.7 kg).
3200A	38 Pounds (15 kg).
3400A	42 Pounds (19 kg).
MOUNTING	
3100A, 3200A	
Standard	Desk-Top.
Optional	Rack Mount. 19 Inch (48.3 cm) EIA rack.
3400A	Rack Mount. 19 Inch (48.3 cm) EIA rack.
DIMENSIONS	
3100A	
Height	5.25 Inches (13.3 cm).
Width	5.875 Inches (14.9 cm).
Depth	15.5 Inches (39.4 cm).

TABLE 1-2. 3000A SERIES CARTRIDGE MACHINE SPECIFICATIONS  
(Sheet 3 of 3)

PARAMETER	SPECIFICATIONS
3200A	
Height	5.25 Inches (13.3 cm).
Width	8.75 Inches (22.2 cm).
Depth	15.5 Inches (39.4 cm).
3400A	
Height	5.25 Inches (13.3 cm).
Width	17 Inches (43.2 cm).
Depth	15.5 Inches (39.4 cm).
<u>ENVIRONMENTAL</u>	
AMBIENT OPERATING TEMPERATURE	32°F to 122°F (0°C to 50°C).
HUMIDITY	95% Maximum. Non-Condensing.
<p><u>NOTE:</u> Specifications measured using 1965 NAB Standard Equalization.</p>	

## SECTION II INSTALLATION

### 2-1. INTRODUCTION.

2-2. This section contains the information required for the installation of the Broadcast Electronics 3000A series cartridge machines.

### 2-3. UNPACKING.

2-4. The equipment becomes the property of the customer when the equipment is delivered to the carrier. Carefully unpack the cartridge machine. Perform a visual inspection to determine that no apparent damage has been incurred during shipment. All shipping materials should be retained until it is determined that the unit has not been damaged. Claims for damaged equipment must be promptly filed with the carrier or the carrier may not accept the claim.

2-5. The contents of the shipment should be as indicated on the packing lists. If the contents are incomplete, or if the unit is damaged electrically or mechanically, notify both the carrier and Broadcast Electronics, Inc.

### 2-6. INSTALLATION.

### 2-7. PLACEMENT.

2-8. The 3100A and 3200A series cartridge machines are designed for desk-top placement. The 3400A series cartridge machines are designed for rack mounting. 3100A and 3200A units designed for rack mounting are available by special assembly. To provide adequate structural support, it is recommended the rack mounted unit be installed in a 3000A rack shelf. Observe the following requirements and place the unit in any convenient location.

- A. Place the cartridge machine within reach of signal and power cables.
- B. Do not place the cartridge machine near heat generating equipment.
- C. To minimize noise, do not place the cartridge machine near equipment generating excessive 50 Hz or 60 Hz radiation.
- D. For rack mounted cartridge machines, allow one inch of rack space above and below the unit for heat dissipation.

## 2-9. AUDIO INTERFACING.

2-10. The 3000A series cartridge machines are equipped with separate remote control, audio output, and record input rear-panel connectors (refer to Figure 2-1). The PLAY LINE OUT (J4) receptacle provides audio output interfacing. The REMOTE (J5) connector interfaces the cartridge deck remote signals to external control equipment. On record models, the RECORD LINE IN (J7) connector provides audio input interfacing. PLAY LINE OUT, REMOTE, and RECORD LINE IN mating connectors are supplied with the unit for interface cable construction (located in the accessory parts kit).

2-11. **AUDIO OUTPUT CONNECTIONS.** The series 3000A cartridge machines are shipped from the factory for a 600 Ohm balanced output. Connect the left channel program line to J4 terminals 3 and 5 (refer to Figure 2-2). Connect the shield to J4 pin 1. For stereophonic cartridge machines, connect the right channel program line to J4 terminals 4 and 6. Connect the shield to J4 pin 2.

2-12. **AUDIO INPUT CONNECTIONS.** The record circuitry is designed with a bridged 50 k Ohm balanced input circuit. Connect the left channel input to J7 pins 3 and 5 (refer to Figure 2-2). Connect the shield to J7 pin 1. For stereophonic cartridge machines, connect the right channel input to J7 pins 4 and 6. Connect the shield to J7 pin 2.

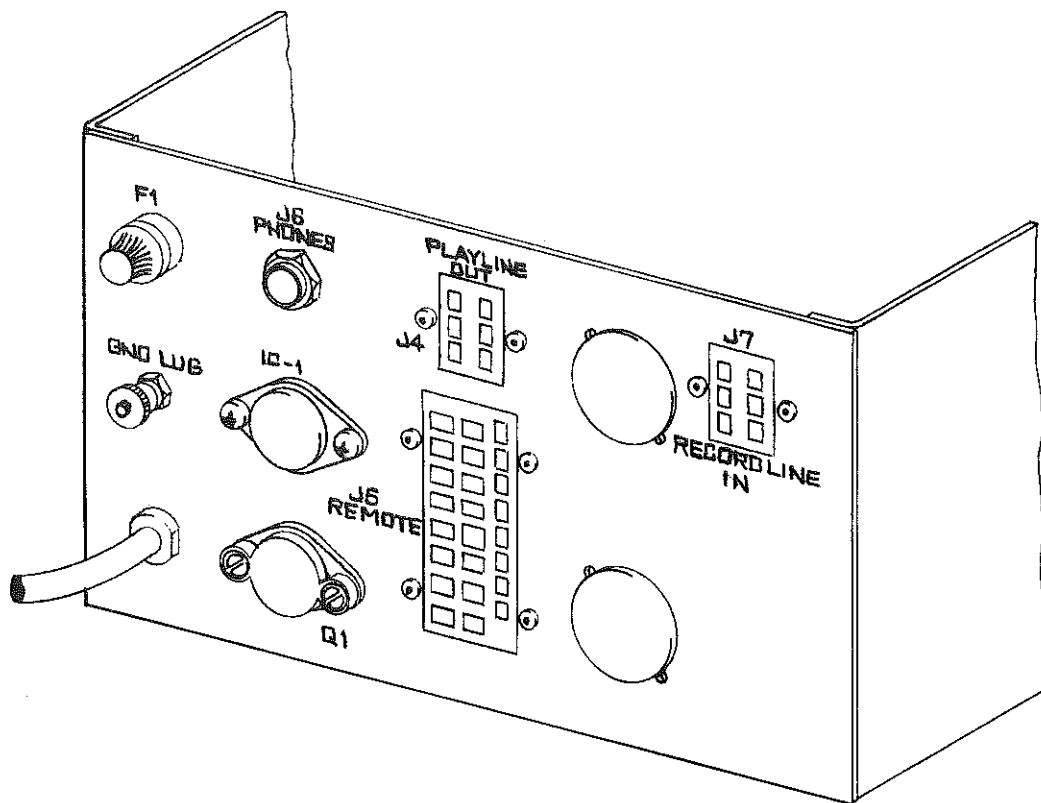
## 2-13. REMOTE CONTROL AND INDICATION CONNECTIONS.

2-14. The 3000A series cartridge machines are equipped with a complete playback and record remote control system. Refer to Figure 2-2 as required for the following connection procedures.

2-15. **PLAYBACK CONNECTIONS.** The remote circuitry provides interfacing for playback operating and indication parameters. Refer to the following information and connect the playback operating and indication functions to the remote circuitry as required.

2-16. Start and Stop Operation. SPST normally open momentary contact switches are required for remote start and stop operations. Connect conductors from a remote start switch to J5 pins 13 and 11 for remote start operation. Connect conductors from a remote stop switch to J5 pins 10 and 11 for remote stop operation. For remote stop indications, connect an indicator lamp to J5 pins 12 and 11. For remote start indications, connect an indicator lamp to J5 pins 15 and 11.

2-17. Auxiliary Cue Tone Indications. Connect an indicator lamp to J5 pins 5 and 11 for secondary cue tone indications. Connect an indicator lamp to J5 pins 8 and 11 for tertiary cue tone indications. Also, connect jumpers from J5 pins 6 and 9 to pin 14.



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FIGURE 2-1. SERIES 3000A RECORD/PLAYBACK UNIT REAR PANEL

2-18. Cue Audio Output. A cue audio output signal is provided on J5 pins 1 and 2. The cue audio circuitry will output approximately 0.5 volts into a 10 k Ohm load. Connect conductors to J5 pins 1 and 2 as required for external cue audio.

2-19. Fast Forward. Remote fast forward requires a SPST normally open switch. Connect two conductors from the switch to J5 terminals 7 and 4.

2-20. RECORD CONNECTIONS. The remote circuitry also provides interfacing for record operating and indication parameters. Refer to the following information and connect the record operating and indication functions to the remote circuitry as required.

2-21. Record Switch and Indicator. A SPST normally open momentary contact switch is required for remote record operations. Connect conductors from a remote record switch to J5 pins 16 and 17 for remote record operations. For remote record indications, connect an indicator lamp to J5 pins 18 and 17.



2-22. Secondary and Tertiary Cue Tone Record. SPST normally open momentary contact switches are required for remote secondary and tertiary cue tone record operations. Connect conductors from a secondary cue tone record switch to J5 pins 19 and 20 for remote secondary cue tone record operation. Connect conductors from a tertiary cue tone record switch to J5 pins 22 and 20 for remote tertiary cue tone record operation.

2-23. External Cue Record. The remote record circuitry is designed with an external cue tone record feature. To record external cue tones, connect a SPST normally open external cue record switch to J5 pins 20 and 21. Connect the external cue tone signal to J5 pins 23 and 24. The external cue record circuitry is designed with a 10 k Ohm input impedance and accepts an input level of 0.5V RMS.

2-24. GROUND CONNECTION.

2-25. The most important consideration in assuring low noise performance from the cartridge machine is the grounding and shielding of various audio interconnections. First, connect the cartridge machine rear-panel GND terminal to a central earth ground using a braided or solid copper conductor. Second, the shields from audio conductors must be grounded to prevent the coupling of extraneous noise. Generally, the shields are grounded at the studio audio console. However, the shields may require grounding at the cartridge machine or at a point between the cartridge machine and the studio audio console. Particular care must be exercised to avoid ground loops at patch panels, external switching equipment, uninsulated jacks on associated equipment, and grounded racks or cabinets.

2-26. AC POWER CONNECTION.

WARNING

ENSURE ALL PRIMARY POWER IS DISCONNECTED  
BEFORE PROCEEDING.

2-27. The 3000A series cartridge machines are programmed for the proper power supply voltage when shipped from the factory. The operating voltage requirement for the unit is indicated on the cartridge machine identification plate which is located on the cartridge machine rear-panel.

2-28. Remove the fuse from the rear-panel fuse-holder. Ensure the fuse and the spare fuse are slow-blow types rated at 1.0A for 105V to 125V operation or 0.5A for 210V to 240V operation.

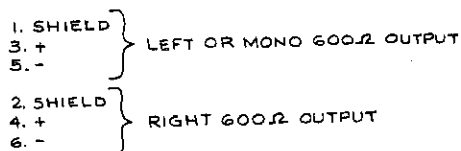
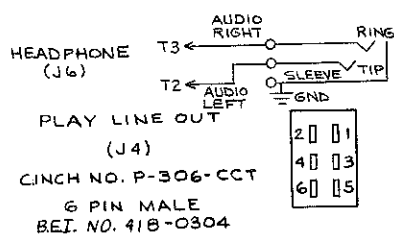
2-29. ELECTRICAL ADJUSTMENTS.

2-30. AUDIO OUTPUT LEVEL ADJUSTMENT. The audio output level is factory adjusted to 0 dBm. If an alternate output level is required, refer to the ELECTRICAL ADJUSTMENTS procedures in SECTION V, MAINTENANCE and perform the OUTPUT LEVEL ADJUSTMENT.

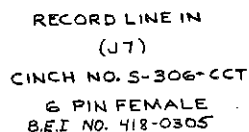
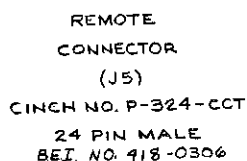
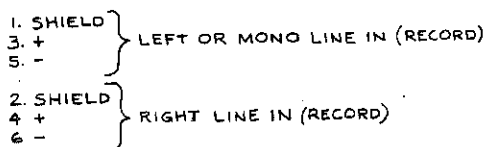
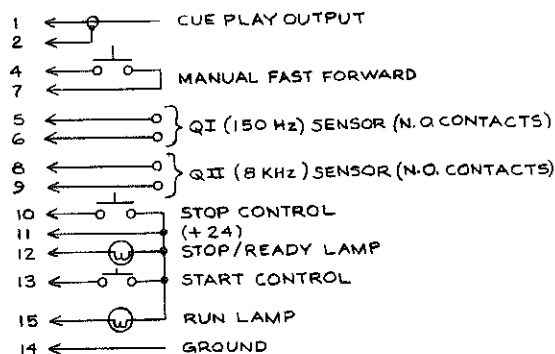
## 2-31. OPERATIONAL EQUIPMENT INSTALLATION.

2-32. GENERAL. The following list presents related publications which provide data required for the installation of options and accessories associated with the 3000A cartridge machines.

OPTIONS OR ACCESSORY	PUBLICATION NUMBER
Model SW5E/F Audio Switcher	597-5350
Model PC-1 Telephone Interface	597-0047
Model RC3000 Remote Control Unit	597-0103



### PLAY SECTION

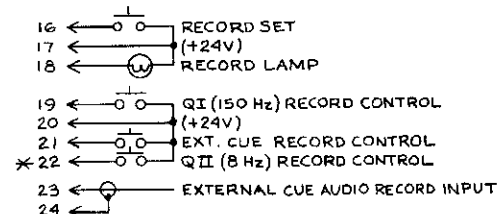


REAR VIEW, MATING CONNECTORS

### 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.

### RECORD SECTION



\* IN DELAY UNITS THIS PIN BECOMES DELAY SET.

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597-3000-80

FIGURE 2-2. REAR-PANEL CONNECTIONS (WB906-3104 REV. B)

## SECTION III

### OPERATION

#### 3-1. INTRODUCTION.

3-2. This section identifies all controls and indicators associated with the 3000A series cartridge machines and provides standard operating procedures.

#### 3-3. CONTROLS AND INDICATORS.

3-4. Refer to Figure 3-1 for the location of controls and indicators associated with the unit. The function of each control or indicator is described in Table 3-1.

#### 3-5. OPERATION.

##### NOTE

THE FOLLOWING PROCEDURE ASSUMES THAT THE CARTRIDGE MACHINE IS COMPLETELY INSTALLED AND IS FREE OF ANY DISCREPANCIES.

##### NOTE

#### 3-6. PLAYBACK.

3-7. Operate the ON/OFF PWR switch to ON.

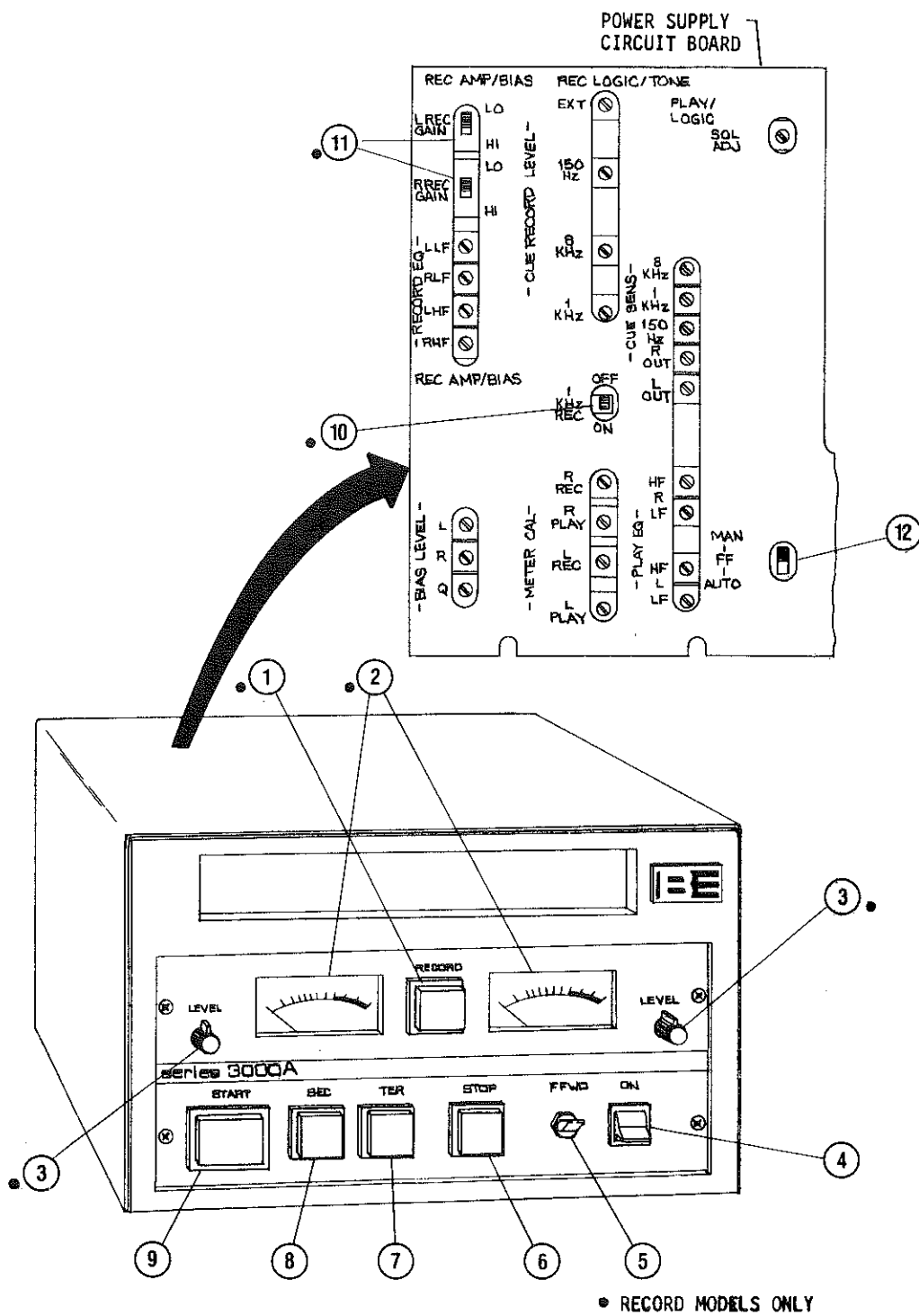
3-8. Insert an NAB tape cartridge into the deck. The deck STOP switch/indicator will illuminate.

3-9. Depress the deck START switch/indicator to begin cartridge play operation. The START switch/indicator will illuminate and the deck STOP switch/indicator will extinguish.

3-10. The deck will operate until a primary (1 kHz) stop tone is detected or the deck STOP switch/indicator is depressed. When deck operation is terminated, the START switch/indicator will extinguish. The deck STOP switch/indicator will illuminate. If the cartridge is removed, the STOP switch/indicator will extinguish.

3-11. The 3000A series cartridge machines are equipped with secondary and tertiary cue tone detection circuitry. Cue tone detection is indicated as follows:

- A. The SEC switch/indicator will illuminate to indicate the detection of a secondary (150 Hz) cue tone.
- B. The TER switch/indicator will illuminate to indicate the detection of a tertiary (8 kHz) cue tone.



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597-3000-3

FIGURE 3-1. 3000A CONTROLS AND INDICATORS

TABLE 3-1. CONTROLS AND INDICATORS  
(Sheet 1 of 2)

INDEX NO.	NOMENCLATURE	FUNCTION
1	RECORD Switch/ Indicator	<p>SWITCH: Operates the unit to the record mode. Operates VU meter(s) from playback output to record input.</p> <p>INDICATOR: Illuminates to indicate the unit is in the record mode.</p>
2	VU Meter	Provides level indication of the record signal (record mode) or playback audio (playback mode).
3	LEVEL Control	Adjusts record level.
4	ON/OFF Switch	Controls the application of ac power to the unit. (Located on the rear panel on Model 3400A units.)
5	F FWD Switch	Initiates fast forward operation from playback mode only. Tape advances at three times the normal speed until a 1 kHz stop tone is detected or the switch is released. Audio is enabled.
6	STOP Switch/ Indicator	<p>SWITCH: Terminates tape movement and operates the unit to the ready mode.</p> <p>INDICATOR: Illuminates to indicate the unit is in the ready mode (a cartridge fully inserted and power ON).</p>
7	TER Switch/ Indicator	<p>SWITCH: When depressed, records an 8 kHz tertiary cue tone on the cue channel. The tertiary cue tone may be recorded when the unit is operating in the record or playback mode.</p> <p>INDICATOR: Illuminates to indicate the detection of an 8 kHz cue tone.</p>
8	SEC Switch/ Indicator	<p>SWITCH: When depressed, records a 150 Hz secondary cue tone on the cue channel. The secondary cue tone may be recorded when the unit is operating in the record or playback mode.</p> <p>INDICATOR: Illuminates to indicate 150 Hz cue tone detection.</p>

TABLE 3-1. CONTROLS AND INDICATORS  
(Sheet 2 of 2)

INDEX NO.	NOMENCLATURE	FUNCTION
9	START Switch/ Indicator	<p>SWITCH: Initiates tape movement for play-back and record operations.</p> <p>INDICATOR: Illuminates to indicate deck operation.</p>
10	1kHz REC/ON/OFF Switch	<p>Controls the operation of the 1 kHz cue tone record circuitry.</p> <p>OFF: Disables the 1 kHz cue tone record circuitry. No effect on previously recorded tones.</p> <p>ON: Enables the 1 kHz cue tone record circuitry. The tone is recorded at the beginning of program material.</p>
11	REC GAIN/HI/LO Switch	<p>Controls the gain of the program amplifier circuitry.</p> <p>HI Position: For microphone level inputs.</p> <p>LO Position: For line level inputs.</p>
12	MAN/FF/AUTO Switch	<p>Controls the automatic fast forward circuitry.</p> <p>MAN: Disables the automatic fast forward circuitry. Allows only manual fast forward via the F FWD switch. Audio remains on for editing purposes.</p> <p>AUTO: Enables the automatic and manual fast forward circuitry. A 150 Hz cue tone detection initiates automatic fast forward operation. Tape advances at 3 times normal speed until a 1 kHz stop tone is detected.</p>



NOTE

THE FAST FORWARD CIRCUITRY IS DISABLED IN THE RECORD MODE.

3-12. FAST FORWARD.

3-13. MANUAL FAST FORWARD. To operate the unit in the manual fast forward mode, operate the MAN/FF/AUTO switch to MAN or AUTO. Depress and hold the front-panel F FWD switch and terminate tape operation at the desired point. Audio is enabled during manual fast forward operation. Detection of a 1 kHz cue tone will terminate the fast forward advance and the unit will operate to the ready mode. The STOP switch/indicator will illuminate.

3-14. AUTOMATIC FAST FORWARD. To operate the unit in the automatic fast forward mode, operate the MAN/FF/AUTO switch to AUTO. Select a cartridge with a 150 Hz tone recorded on the cue channel. Insert the cartridge into the playback deck and start the deck. When the 150 Hz tone is detected, the fast forward circuitry will be enabled. When the tone ends, the unit operates to fast forward advance with audio muted. Fast forward advance will continue until a stop tone is detected or the STOP switch/indicator is depressed. The unit may be operated to normal speed during fast forward without stopping the machine by momentarily operating the front panel F FWD switch.

3-15. RECORD CIRCUITRY PRELIMINARY SET-UP.

3-16. Select the program material to be recorded. Ensure the playback system output level is within the input level specifications.

3-17. Remove the cartridge machine top-panel. Operate the L REC GAIN HI/LO and R REC GAIN HI/LO switches to the LO positions.

3-18. Operate the 1 kHz REC ON/OFF switch to the desired position.

3-19. Replace the top-panel.

3-20. Operate the cartridge machine ON/OFF power switch to ON.

3-21. Select a bulk erased cartridge that is approximately 2 seconds longer than the selected material to be recorded.

3-22. Insert the cartridge into the deck. The STOP switch/indicator will illuminate.

3-23. Depress the START switch/indicator and play the tape for several seconds to align the tape in the guides and to locate the tape splice. Stop the deck just beyond the tape splice to avoid recording on the splice.

3-24. RECORD LEVEL ADJUSTMENT.

NOTE THE CARTRIDGE MACHINE WILL NOT OPERATE TO THE  
NOTE RECORD MODE UNLESS A CARTRIDGE IS INSERTED IN  
THE DECK.

NOTE THE CARTRIDGE MACHINE RECORD CIRCUITRY IS SHIP-  
NOTE PED FROM THE FACTORY FOR A RECORD LEVEL OF 0  
dBm WHEN THE VU METERS INDICATE 0 VU.

3-25. Ensure the bulk erased cartridge is inserted into the deck.

3-26. Operate the cartridge machine to the record mode by depressing the RECORD switch/indicator. The RECORD switch/indicator will illuminate.

3-27. Start the program material.

3-28. Adjust the record LEVEL control(s) until the VU meter(s) indicate 0 VU.

3-29. Stop and re-cue the program material and the bulk erased cartridge.

3-30. RECORDING PROGRAM MATERIAL.

3-31. Ensure the recorder is operated to the record mode. The RECORD switch/indicator will be illuminated.

3-32. Depress the deck START switch/indicator. The START switch/indicator will illuminate.

3-33. Wait approximately one-half second, then start the program material. If the 1 kHz cue tone record circuitry is enabled, a stop tone will be automatically recorded on the cue channel.

NOTE THE RECORDING PROCESS MAY BE MONITORED IF  
NOTE DESIRED BY CONNECTING A SPEAKER SYSTEM TO  
THE PLAYBACK DECK OUTPUT.

3-34. At the end of the program material, stop the deck manually by depressing the STOP switch/indicator if the 1 kHz stop tone record circuitry is disabled. If the 1 kHz record circuitry is enabled, the tape will stop automatically.

3-35. When deck operation is terminated, the following events will occur:

- A. The deck STOP switch/indicator will illuminate, indicating a ready status.

- B. The unit will automatically be operated to the playback mode. The RECORD switch/indicator will extinguish.

3-36. SECONDARY AND TERTIARY CUE TONE RECORDING.

3-37. Secondary and tertiary cue tones may be recorded in the playback or record modes of operation. If secondary and tertiary cue tone recording is desired, proceed as follows:

NOTE

DO NOT RECORD SECONDARY OR TERTIARY CUE TONES  
WITHIN THE FIRST 2.5 SECONDS OF THE PROGRAM  
MATERIAL.

NOTE

- A. Start the recording system in the playback mode or record mode of operation.
- B. Depress the SEC/150 Hz switch or the TER/8 kHz switch for the amount of time the tone is desired. Do not record a secondary or tertiary cue tone of less than one second.

## SECTION IV

### THEORY OF OPERATION

#### 4-1. INTRODUCTION.

4-2. This section contains the theory of operation for the Broadcast Electronics series 3000A cartridge machines.

#### 4-3. FUNCTIONAL DESCRIPTION.

4-4. Refer to the schematics in SECTION VII and Figure 4-1 for the following discussions of system components.

#### 4-5. PLAYBACK LOGIC CIRCUIT BOARD.

4-6. GENERAL. The playback logic circuit board contains the following circuitry: 1) the playback amplifiers, 2) the output audio muting, 3) the cue track amplifier, 4) the 1 kHz stop cue sensor, 5) the stop/start logic, and 6) the QI/150 Hz and QII/8 kHz sensors. Additionally, the 3 kHz stop cue sensor circuitry is located on this circuit board for fast forward operation.

#### 4-7. PROGRAM CIRCUITRY.

4-8. The left and right program channels are identical; therefore, only the left channel will be discussed.

4-9. The audio signal from the left playback head is applied to the input of preamplifier IC-1A through coupling capacitor C11. Resistors R1, R2, R10, R34, and capacitor C1 establish the gain and equalization for IC-1A. Equalization potentiometers R1 and R2 permit adjustment of low and high frequency levels to match NAB, IEC, or CCIR standards. Voltage divider network R20 and R25 provide bias for IC-1A.

4-10. The output of preamplifier IC-1A is coupled to the program muting switch Q5 through C26. A logic ground on either CR7 or CR8 will bias Q5 off and mute the audio signal. The audio is muted whenever the machine is in the ready mode, or when operated in the automatic fast forward mode. Twelve volt operating bias for Q5 is developed across voltage divider network R35 and R98. C24 provides supply decoupling to prevent minor power fluctuations from affecting the mute circuitry. Any ac appearing on the gate of Q5 is shunted to ground by C23.

4-11. The output of Q5 is applied to the output level control R5 through C27. The audio signal is routed to the front panel VU meter(s) in record/playback models via pin 14.

4-12. The signal from R5 is coupled through C30 to output booster IC-3B. IC-3B and complementary-symmetry drivers Q3 and Q4 provide 28 dB of gain to drive the output to a maximum +18 dBm. The ratio of R41 and R42 establishes the gain of this stage. Bias for Q3 and Q4 is provided by diodes CR4, CR5, and CR6. Bias for IC-3B is developed across voltage dividers from the +24 volt dc supply.

4-13. The amplified signal is coupled through C22 and applied to the primary of the output transformer and the headphone jack. The transformer provides an additional 6 dB of gain to the signal which is routed to rear-panel output connector J4.

4-14. CUE TRACK AUDIO AND 1 KHZ STOP SENSOR. The cue track of the playback head is coupled through C15 to the input of preamplifier IC-2A. R21, R22, R23, and C14 provide gain and equalization. Bias for IC-2A is supplied through R15 from voltage dividers R17 and R16.

4-15. The output of the preamplifier is coupled to inverting amplifier IC-2B. IC-2B provides 27 dB of gain established by R27 and R28. The amplified signal is coupled through C20 to the cue output (on J5, the rear panel REMOTE connector) through pin 19 and to 1 kHz sensor level control R8.

4-16. The 1 kHz signal from R8 is applied to an active band-pass filter consisting of IC-4A, R84, R85, R86, C44, and C45 via coupling capacitor C43. Capacitor C59 couples the output of IC-4A to a signal convertor consisting of diodes CR21, CR22, resistor 97, and capacitor C58. The dc pulse from this filter is applied to transistor switch Q10.

4-17. Transistor switch Q10 controls the routing of the 1 kHz signal. When Q10 is biased on, Q10 conducts and routes the dc pulse to ground (muted). A logic ground, from the stop/start flip-flop or the fast forward cue shift/bus, applied to capacitor C55 and the gate of Q10 will bias Q10 on. When the logic ground is removed (run mode), C55 will charge through R94 and R95. The 1 kHz cue circuit remains muted preventing a stop tone from terminating deck operation. After approximately 3 seconds, C55 will charge to bias Q10 off. When Q10 is biased off, Q10 will not conduct and routes the dc pulse to the input of IC-6D.

4-18. Integrated circuit IC-6D operates as a comparator. A reference voltage is applied to IC-6D through R72 from R57 and R99. When the dc signal from R75 exceeds the reference voltage, the output of IC-6D will go HIGH which routes a positive pulse through C39 to the stop control.

4-19. 3 KHZ STOP SENSOR. The cue audio from 1 kHz level control R8 is applied to transistor Q7. Q7 will bias ON only when the fast forward cue shift/mute bus is grounded.

4-20. When a unit is operated to the fast forward mode, Q7 will be biased ON as C34 discharges through R55. When the ground is removed, Q7 will bias OFF to disable the 3 kHz sensor.

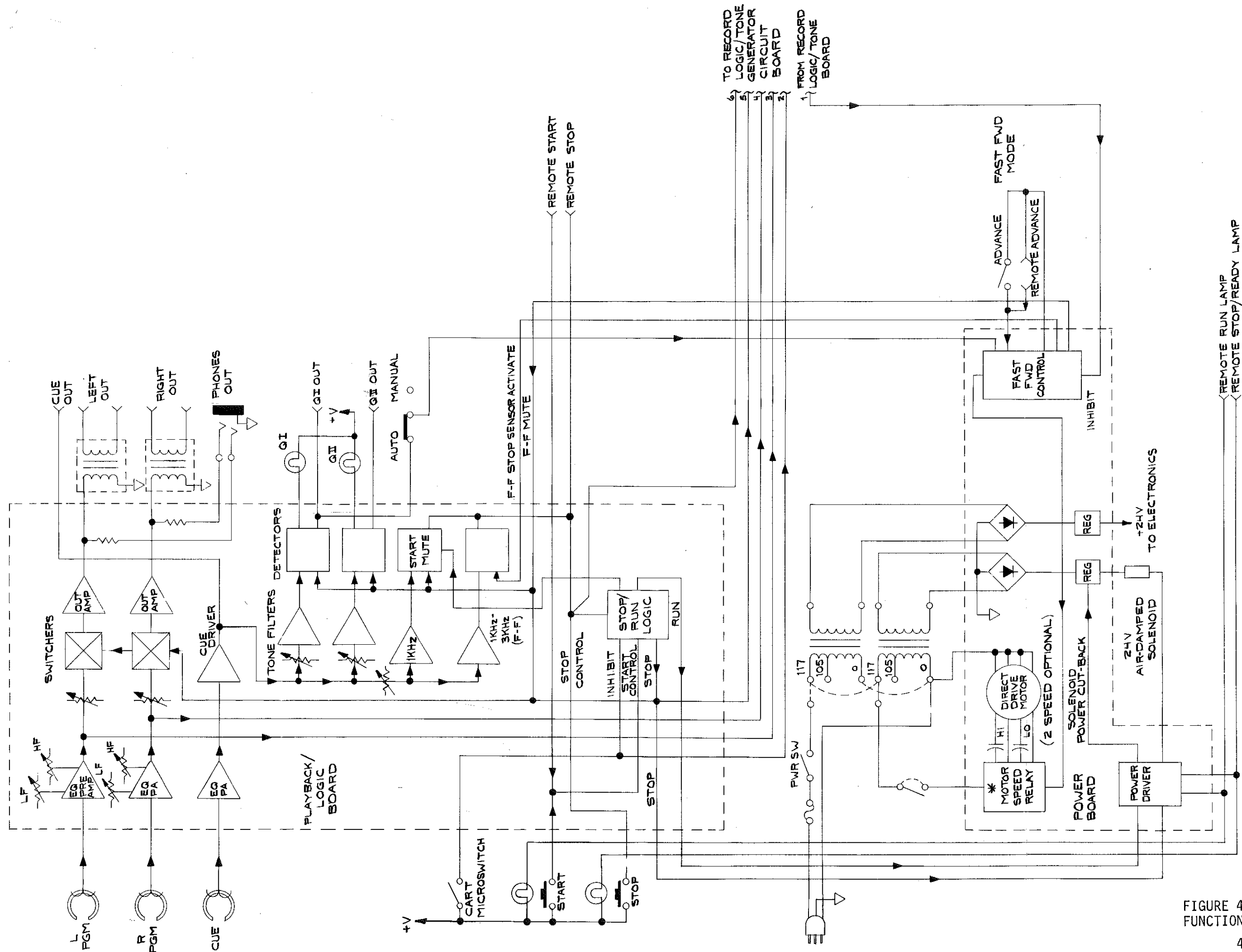
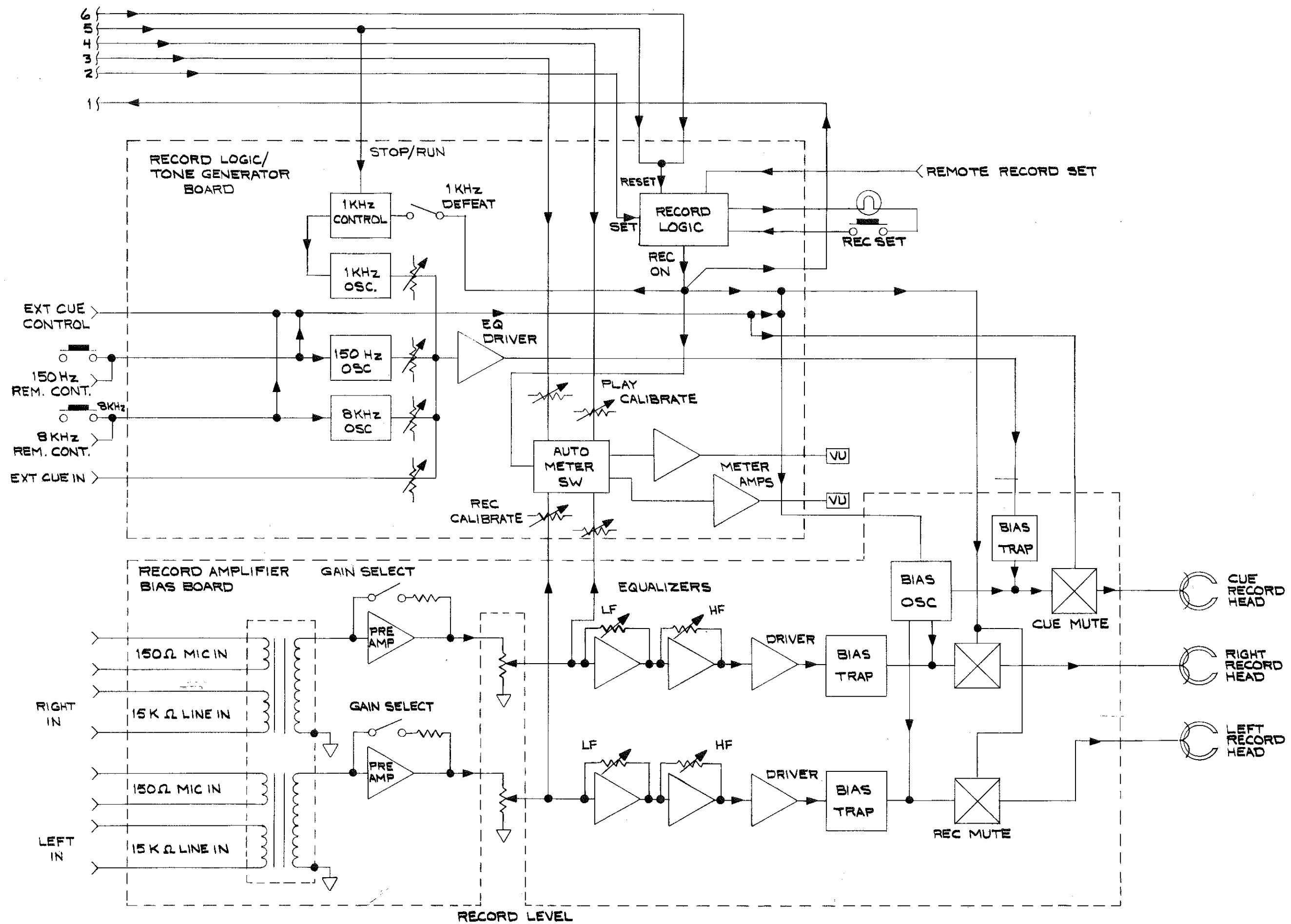


FIGURE 4-1. SHEET 1 OF 2  
FUNCTIONAL BLOCK DIAGRAM

4-3/4-4

597-3000-5A





597-3000-5B

FIGURE 4-1. SHEET 2 OF 2  
FUNCTIONAL BLOCK DIAGRAM

4-5/4-6

4-21. Following Q7, the audio signal is applied across LC network L1, C41 and routed through C42 to IC-4B for amplification. The output is rectified, filtered, and applied to comparator IC-6B. When a 3 kHz tone is present at the filter, the output of IC-6B will route a HIGH through CR13 and C39 to the stop control.

4-22. 150 HZ SENSOR. Audio from the cue channel is applied through 150 Hz level control R7 to 150 Hz band-pass filter IC-5B. This filter assures only the 150 Hz tone will be processed. The signal from the filter is rectified and applied to comparator IC-6A. When a 150 Hz tone is present, the output of IC-6A will go HIGH to drive a relay located on the power supply circuit board.

4-23. 8 KHZ SENSOR. Audio from the cue channel is applied through 8 kHz level control R9 to 8 kHz band-pass filter IC-5A. This filter assures only an 8 kHz tone will be processed. The signal from IC-5A is rectified and applied to comparator IC-6C. When an 8 kHz tone is present, the output of IC-6C will go HIGH to drive a relay located on the power supply circuit board.

4-24. To prevent intermittent power supply circuit board relay operation, C36 provides a higher than normal reference voltage for the comparator circuits until the circuits stabilize. When power is removed, capacitor C61 and diode CR24 will maintain the reference voltage until the power supply voltage decreases below +24V dc. Muting for the 150 Hz and the 8 kHz sensor circuits is accomplished by grounding the input to the comparators through diodes CR16 and CR18 with the fast forward cue shift/mute bus.

4-25. STOP/START LOGIC. Stopping and starting are controlled by the flip-flop consisting of Q8 and Q9. When Q8 is off, the collector will be at an 18V dc level. This voltage is conducted through R52 to the base of Q9 to maintain Q9 in full conduction. Likewise, when Q9 is off, the voltage from the collector of Q9 is routed to the base of Q8 through R53 to maintain Q8 in full conduction. The flip-flop will change states when a positive voltage is applied to the base of the non-conducting transistor. This is accomplished through resistors R61 and R62. To prevent intermittent operation, capacitors C60 and C33 shunt short-duration transient pulses to ground. When power is first applied, R54 ensures that the flip-flop will preset to stop with Q9 conducting. The output logic voltages from Q8 and Q9 are routed from playback logic circuit board pins M and 9 to the power supply and record amplifier bias circuit boards.

4-26. POWER SUPPLY CIRCUIT BOARD.

4-27. GENERAL. The power supply circuit board contains the +24 volt dc supply for the electronics, the +30 volt dc supply and controlling circuitry for the solenoid. In addition, QI and QII relays, and the motor control circuitry is also incorporated on this circuit board. Refer to the power supply schematic diagram in SECTION VII as required for the following discussion.

4-28. VOLTAGE SUPPLIES. AC power is applied to the cartridge machine through fuse F1 and ON/OFF switch S3. The fuse provides overload protection and the switch provides control of the primary ac power. AC voltage is applied to the primary of transformer T1. Separate secondary windings on the power transformer provide 30 volts dc through J1 to bridge rectifiers CR1 and CR2. Current for the amplifiers is supplied by CR1.

4-29. Diode CR17 provides reverse voltage protection for regulator IC-1 located on the rear-panel of the unit. This regulator provides +24 volt dc which is controlled to within 124 mV with internal current limiting and thermal overload protection. Voltage for the logic and the solenoid are supplied directly from the output of CR2. C5 provides filtering for this high current source.

4-30. SOLENOID CONTROL. In the stop mode, Q5 is biased off. The resulting potential at the collector enables CR20 to conduct. CR20 provides drive current to IC1 which operates as a constant current source. The output of IC1 will bias Q1 off and deenergize the solenoid. Q7 and Q3 are biased on, and C9 charges to approximately 2.8 volts which is applied to pin 5 of IC1.

4-31. When solenoid operation is initiated, Q5 is biased on, which prevents current flow through CR20. The absence of drive current to IC1 enables Q1 and energizes the solenoid. The resulting solenoid current develops a voltage across R1. This voltage is applied to pin 4 of IC1 to maintain the potential on pin 4 and pin 5 at the same level. If a potential exists between IC1 pins 4 and 5, additional drive will be applied to Q1 which increases solenoid current, and increases the voltage applied to pin 4. This feedback action provides a high level of drive current to Q1 to assure positive solenoid pull-in as the run mode is initiated.

4-32. Q7 and Q3 will bias off when run is initiated and C9 will discharge to the lower adjusted voltage established across the voltage divider consisting of R15, R18, and R20. As less drive current is required to compensate for the reduced voltage differential between pins 4 and 5, the feedback loop will reduce solenoid current after pull-in to a minimum holding current.

4-33. FAST FORWARD AND Q-TRIP RELAYS. Relay K1 controls the application of power to the normal and high-speed motor windings (refer to drawing B959-0009 in SECTION VII). The ac voltage for the drive motor is supplied from the primary of the power transformer through J1 and J2. Capacitors C1 through C4 provide transient suppression during switching.

4-34. The high-speed motor winding is connected to ac voltage only when K1 is energized. A +30 volt dc control voltage for the relay is supplied through Q2. Q2 is enabled when the unit is in the playback mode. In record models, pin P is connected to the record logic so that the ground for fast forward is supplied in the playback mode only. To energize K1, grounding must occur through CR7 and Q5. This ground will be provided when the unit is switched into manual or automatic fast forward operation.

4-35. Manual Fast Forward. When front-panel F FWD switch S4 is operated, R6 will be connected to CR7 which provides the ground to energize K1 and place the unit in the fast forward mode of operation. The unit will remain in fast forward until the front-panel STOP switch/indicator is depressed, a stop tone is detected, or the F FWD switch is released.

4-36. When K1 energizes, the cue tone sensors on the playback logic circuit board will be grounded through pin 15 (fast forward cue shift/mute). This ground mutes the 1 kHz, 150 Hz, and 8 kHz sensors and enables the 3 kHz sensor. Audio is routed to the output jack during manual fast forward. Diode CR6 prevents the audio muting circuit from grounding at terminal S.

4-37. Release of S4 or a low on Q5 interrupts the grounding path to K1. If S4 is released, the unit will continue to operate but at the normal motor speed. If the stop cue tone or STOP switch/indicator terminates deck operation by placing a low on Q5, the unit will operate at the normal motor speed when re-started.

4-38. Automatic Fast Forward and QI Relay. When a 150 Hz tone is detected by the cue sensor on the playback logic circuit board, the QI control signal at terminal B will go HIGH to enable Q4. A ground is provided for indicator lamp Q1 and relay K2. Relay K2 will energize to close the normally open contacts which are available through the rear-panel REMOTE connector. When the 150 Hz tone ends, the QI control signal returns to a LOW state and Q4 is disabled. If S1 is in the automatic position as C10 charges, a positive pulse will be applied through CR3 and S1 to the gate of Q1. Relay K1 will ground through Q1, as will the fast forward cue shift/mute and the automatic fast forward audio mute busses. When this occurs, the unit switches to the fast forward mode of operation with audio muted.

4-39. A stop tone detected by the 3 kHz sensor will terminate deck operation. Q5 will bias off to interrupt the ground path to Q1 and relay K1. Relay K1, the fast forward cue shift/mute, and the audio mute busses are disabled.

4-40. QII Relay. 8 kHz cue tone relay K3 operates in a similar manner as 150 Hz cue tone relay K2. When the 8 kHz tone is present, the QII control signal at terminal A will go HIGH to enable Q6. Q6 will conduct to provide a ground for relay K3 and the QII indicator lamp. Relay K3 will energize to close the normally open contacts available through the rear-panel REMOTE connector. When the cue tone ends, the relay returns to the deenergized state.

4-41. RECORD AMPLIFIER/BIAS CIRCUIT BOARD.

4-42. PROGRAM CHANNELS. The following text describes the operation of the left and right program channel amplifier circuits. The circuits operate identically, therefore only the left channel circuit will be described. Refer to schematic 910-1050/-1049/-1048 as required.

4-43. Left channel record inputs are applied to input transformer T1 which provides balanced-to-unbalanced impedance conversion. The input impedance is established by resistors R1, R2, and R3. Audio from the secondaries of T1 is applied to first-stage non-inverting amplifier U1A. The gain of U1A is determined by switch S1. S1 shunts feedback resistor R7 in the L0 position and provides an additional gain of 35 dB in the HI position.

4-44. The output of U1A is applied to front-panel level control R1 through coupling capacitor C6. The wiper of R1 applies the audio signal to second-stage non-inverting amplifier U2A through coupling capacitor C3. The gain of U2A is established by feedback resistor R11. The amplified output of U2A is routed to an equalization network through C5.

4-45. The equalization network consists of U3A, U3B, R14, R19, and subsequent associated circuitry. Low frequency equalization control R14 and operational amplifier U3A provide low frequency compensation. High frequency equalization control R19 and operational amplifier U3B provide high frequency compensation.

4-46. The equalized signal is applied to the record head drive transistor (Q1). The output of Q1 is applied to transistor Q2 which operates as a program record control switch. Q2 is controlled by the program control line (pin 16). When the system is operated to the record mode, a ground from the program control line is applied through diode D1 to D2. This ground biases Q2 on which routes program audio through record bias trap L1/C15 to the record head. When the system is operated to the playback mode, a positive voltage from the program control line reverse biases D1 and disables transistor Q2.

4-47. Program Record Head Shunt Circuit. A circuit consisting of D2, Q3, D3, Q4, and associated circuitry shunts the record head inputs to ground when the system is in the playback mode. This circuit is required to prevent the application of bias to the record head when recording secondary and tertiary cue tones in the playback mode.

4-48. Transistor Q3 controls the operation of the shunt circuit. When the system is operated to the playback mode, a positive voltage from the program control line reverse biases diode D2 and disables transistor Q3. With Q3 cut-off, voltage is applied through zener diode D3 to transistor Q4. This voltage biases Q4 on which shunts the record head input terminals to ground. When the system is operated to the record mode, a ground biases D2 on and enables Q3. With Q3 enabled, bias for transistor Q4 is shunted to ground.

4-49. Record Bias Circuit. Record bias from the secondary of bias transformer T3 is routed through LDR1 and left channel bias level control R31 to the left channel program amplifier circuit. LDR1 is controlled by the program control line and provides isolation for the application of bias. Bias is applied to the amplifier circuit when a ground from the program control line disables transistor Q14. With Q14 cut-off, bias voltage is applied to LDR1.

4-50. Left channel bias level control R31 permits the adjustment of the recording bias level for minimum distortion, maximum signal-to-noise ratio and maximum frequency response. Left channel bias trap L1/C15 isolates the bias signal from the amplifier circuitry to prevent possible intermodulation distortion of the program audio.

4-51. CUE CHANNEL. Cue record inputs from the record control and tone generator circuit board are applied to cue bias trap L3/C42 which isolates the bias signal from the cue channel driving circuit. Transistors Q12, Q13, and associated circuitry operate as a cue record head shunt circuit. The operation of the circuit is controlled by the cue bias switch control line (pin 20). When cue channel recording is required, a positive voltage from the cue bias switch control line is applied to Q12, biasing Q12 on. With Q12 on, transistor Q13 is biased off which allows cue audio to be routed to the cue record head. When cue channel recording is not required, a ground from the cue bias switch control line disables Q12. With Q12 disabled, bias is applied to Q13 which shunts the cue record head inputs to ground.

4-52. BIAS OSCILLATOR. The push-pull oscillator consisting of Q9 and Q10 provides a 100 kHz low distortion sine wave for record bias in the left channel, right channel, and cue channel record heads. Positive feedback from the collector of Q9 is applied through C37 to Q10. C38 provides positive feedback from the collector of Q10 to Q9. The operating frequency is determined by the inductance of T3 and the capacitance of C39. Low distortion is achieved by a small amount of negative feedback from emitter resistors R63, R64, and capacitor C36. Capacitor C40 minimizes start-up transients by providing a gradual turn-on of oscillation.

4-53. Control logic on the record control and tone generator circuit board enables the bias oscillator when: 1) the system is operated to the record mode and 2) the system is required to record secondary, tertiary, or external cue tones. When record bias is required, a ground from the bias switch control line is applied to bias switch transistor Q11. This ground enables Q11 which routes a +24V supply to the oscillator. When record bias is not required, a positive voltage is applied to transistor Q11. Q11 is disabled which removes the supply voltage from the oscillator.

4-54. VOLTAGE REGULATOR. A voltage regulator consisting of Q5, C20, C18, and resistor R35 regulates the +24 volt power supply for proper circuit operation.

4-55. RECORD LOGIC AND TONE GENERATOR CIRCUIT BOARD.

4-56. GENERAL. The record logic and tone generator circuit board is installed in record models only. The circuit board incorporates the record logic flip-flop, the VU meter amplifier, the 1 kHz stop cue tone generator, and the generators for the 150 Hz and 8 kHz cue tones. Refer to schematic diagram 906-3112 in SECTION VII as required for the following discussion.

4-57. RECORD FLIP-FLOP AND RECORD LOGIC. A bistable multivibrator consisting of transistors Q8 and Q9 activates all record functions and record indications of the system except for the QI and QII record modes. This flip-flop is preset in the play state when power is initially applied to the system by R42 which is connected to the base of Q8. R42 maintains the base of Q8 at a potential lower than the base of Q9 when power is applied.

4-58. A HIGH applied to the circuit through record set terminal 12 operates the flip-flop to the record state by biasing Q8 on. This action may be inhibited, however, by the run interlock logic at terminal 11. If the cartridge is running when the RECORD switch is depressed, terminal 11 is at a low logic level and prevents the flip-flop from operating to the record state. If the cartridge is not running, terminal 11 is at a high logic level and is isolated by CR15 which permits the flip-flop to operate to the record mode. Additionally, Q9 is biased off with its collector going positive, and Q13 is biased into conduction with its collector dropping to approximately ground potential. This action places subsequent logic elements in the record mode unless it is cancelled by a high logic level at record cancel terminal 8. Cancel logic is derived from circuitry on the power supply circuit board. However, record status will be cancelled under any of the following conditions:

- 1) Cartridge not loaded.
- 2) Machine stopped manually.
- 3) Machine stopped by 1 kHz cue tone action.

4-59. When the RECORD switch/indicator is depressed, a positive pulse is routed to R45. If the unit is in the run mode, this pulse will be grounded through CR15. If the unit is in the stop mode, the pulse will be routed through CR14 to operate the flip-flop to the record state (Q8 conducting). With Q9 biased off, Q13 will supply a ground to the record indicator lamp and the program record circuitry on the record amplifier and bias circuit board.

4-60. When the STOP switch/indicator, 1 kHz (or 3 kHz) cue sensor, or the deck microswitch (if the cartridge is withdrawn) applies a positive pulse to R69, Q9 will bias on and Q8 will bias off. The base of Q12 will go HIGH to supply a ground to the record interlock. Transistor Q13 will remove the ground from the record indicator lamp and program control.

4-61. 1 KHZ STOP CUE GENERATOR AND CONTROL. The stop cue tone generator consists of IC-2A and IC-2B. R11, R58, R59, C14, and C15 establish a frequency of 1 kHz. The generator oscillates when positive feedback is available through R48 and R49. The output of the generator is routed through R55, C18, level control R6, R46, and C12 to Q5. Emitter follower stage Q5 operates as a current source to provide drive to the record head. The cue output is routed from terminal 7 to the record amplifier and bias circuit board.

4-62. The 1 kHz cue generator will record a stop cue tone burst only when the unit initiates a record sequence. IC-2C and IC-2D and associated circuitry operate as a monostable multivibrator to provide a timing pulse to Q10. Voltage divider R60 and R61 provide a +12V dc reference for IC-2C and IC-2D. The output of the multivibrator will go HIGH only when a HIGH is applied to IC-2C via R62.

4-63. A potential of +24 volts dc is available on S1. When S1 is operated to ON, the +24V dc is applied to R29. If the unit is in the playback mode, the voltage will be grounded through CR8 and Q12. Also, if deck operation is terminated, the voltage will be routed to ground through the 1 kHz interlock and CR9. If the unit is operated to the record mode and the deck is operating, the voltage from R29 will be applied through CR7 and CR18 to IC-2C. IC-2C will go HIGH and the voltage is routed through C28 and R63 to IC-2D. The output of IC-2D will go from a LOW (disable) to a HIGH (enable). When C28 is fully charged, the dc path to IC-2D is blocked. The output of IC-2D will go LOW and remain LOW until IC-2C is unlatched and relatched.

4-64. When multivibrator IC-2C/IC-2D is HIGH, a voltage is applied through CR17 and CR24 to enable the cue bias switching circuit on the record amplifier/bias circuit board. CR20 is reverse-biased through CR16, and voltage is applied to the gate of Q10 through R67 to enable Q10. Q10 operates as a switch to provide a feedback circuit through R48 and R49 which enables the 1 kHz cue generator.

4-65. When the multivibrator is LOW, the voltage applied to Q10 is shunted to ground through CR20 and R68 which biases Q10 off and disables the generator. Since the multivibrator has a time constant of approximately three-quarters of a second, a stop tone burst of that length is recorded on the cue track.

4-66. SECONDARY AND TERTIARY CUE TONE GENERATORS AND CONTROLS. The following text describes the operation of the secondary (150 Hz) and the tertiary (8 kHz) cue tone generator circuits. The circuits operate identically; therefore, only the secondary cue tone generator circuit will be described.

4-67. The secondary (150 Hz) cue tone generator consists of IC-3A and IC-3B. The resistor/capacitor network R10, R50, R51, C22, and C23 establish the frequency. Q11 operates as a switch to provide a feedback circuit through R73 which enables the generator. The output of the generator is applied to cue head driver Q5 through level control R8.

4-68. The secondary cue tone generator is operated manually through the front-panel switch or through the rear-panel remote connector. When the secondary cue tone record switch is depressed, a positive voltage is applied to the control circuit through CR29. CR21 is reverse-biased through CR16, and voltage is applied to the gate of Q11 through R74 to enable Q11 and the secondary tone generator. A positive voltage is also applied through CR26 and CR24 to enable the cue bias switching circuit on the record amplifier/bias circuit board.



4-69. When the secondary cue tone record switch is released, the bias voltage for Q11 is shunted to ground through CR21 and R82 to disable Q11 and the tone generator. To record external cue tones, +24V dc is applied through CR25 to enable the cue bias switching circuit on the record amplifier/bias circuit board. To provide external control voltage, +24V dc is routed to the rear-panel remote connector from the power supply circuit board.

4-70. To record auxiliary or external cue tones, Q14 operates as a switch which enables the bias oscillator on the record/amplifier bias circuit board. When a secondary, tertiary, or an external cue tone record control switch is operated, a positive voltage is routed through R5 and CR23 to enable Q14. Q14 applies a ground through pin 6 to enable the bias oscillator.

4-71. VU METER AMPLIFIER. The following text describes the operation of the left and right channel VU meter amplifier circuits. The circuits operate identically; therefore, only the left channel circuit will be described.

4-72. The record input signal is routed from the record amplifier/bias circuit board through calibration control R2 to transistor Q2. The output signal is routed from the playback logic circuit board through calibration control R1 to transistor Q1. Q1 and Q2 operate as switches to establish which signal is applied to the VU meter amplifier circuit.

4-73. When the unit is operated in the playback mode, a bias voltage of +12V dc from voltage divider R30 and R31 is applied to Q1 and Q2 through R13, R15, and R17. The voltage enables Q1 and disables Q2. Only the playback signal is routed to the meter amplifier. When the unit is operated in the record mode, a ground is applied to the gates of Q1 and Q2 through CR1 and Q13. The ground enables Q2 and disables Q1. Only the record signal is routed to the meter amplifier.

4-74. The VU meter amplifier circuit provides a dc signal which drives the VU meter to indicate the record or the playback audio signal level. Resistors R18 and R19 establish the gain of meter amplifier IC-1A. The audio signal is routed to IC-1A from Q1 or Q2 through R18. After amplification, the signal is rectified to drive the VU meter.

4-75. Transistor Q7 provides power supply decoupling and a controlled turn-on for the VU meter circuit. When ac power is initially applied to the unit, the meter circuit is damped to prevent full-scale deflection.

## SECTION V MAINTENANCE

### 5-1. INTRODUCTION.

5-2. This section provides general maintenance information, mechanical and electrical adjustment procedures, and troubleshooting information for the Broadcast Electronics 3000A series cartridge machines.

### 5-3. SAFETY CONSIDERATIONS.

5-4. Low voltages are used throughout 3000A series cartridge machine playback, control, and record circuitry. The power supply circuit board assembly contains primary ac line voltage. Therefore, do not perform any maintenance or troubleshooting procedures on the power supply circuit board with power energized. Maintenance with power energized is always considered hazardous and caution should be observed. Good judgment, care, and common sense must be practiced to prevent accidents. The procedures contained in this section should be performed only by experienced and trained maintenance personnel.

### 5-5. FIRST LEVEL MAINTENANCE.

5-6. First level maintenance consists of precautionary procedures applied to the equipment to prevent future failures. The procedures are performed on a regular basis and the results recorded in a performance log.

#### WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY  
POWER BEFORE ATTEMPTING ANY EQUIPMENT  
MAINTENANCE.

#### WARNING

### 5-7. GENERAL.

5-8. Periodically remove abrasions from the cartridge machine chassis with a cloth moistened with a mild household cleaner. Remove dust from the chassis exterior with a brush and vacuum cleaner as required.

### 5-9. ELECTRICAL.

5-10. The cartridge machine circuitry should be periodically cleaned of accumulated dust using a brush and vacuum cleaner. Check the circuit boards for improperly seated semiconductors and components damaged by overheating.

5-11. MECHANICAL.

WARNING

MOST SOLVENTS WHICH REMOVE TAPE RESIDUE ARE VOLATILE AND TOXIC BY NATURE AND MUST BE APPLIED IN SMALL AMOUNTS IN A WELL VENTILATED AREA. OBSERVE THE SOLVENT CONTAINER SAFETY INFORMATION AND DO NOT USE THE SOLVENT NEAR FLAME, CIGARETTES, AND HOT SOLDERING IRONS.

WARNING

WARNING

5-12. Each day clean the heads, pressure roller, tape guides, and capstan shaft with a cleaning solvent to remove accumulated oxide. Recommended cleaning solvents include: 1) Broadcast Electronics head cleaning kit 979-0064 and 2) isopropyl alcohol. Approximately once a week, demagnetize the heads and other ferrous components in the tape path. Perform the demagnetizing with an appropriate degausser. Observe the degausser operating instructions to prevent damage to the heads.

5-13. TAPE CARTRIDGES.

5-14. Regularly inspect the tape cartridges for accumulated dust, mechanical defects, and tape wear. Additional tape cartridge maintenance information is presented in SECTION VIII, APPENDIX.

5-15. SECOND LEVEL MAINTENANCE.

5-16. Second level maintenance consists of procedures required to restore a 3000A series cartridge machine to operation after a fault has occurred. The procedures are divided into mechanical adjustments, electrical adjustments, mechanical components replacement procedures, electrical component replacement procedures, and troubleshooting.

5-17. The 3000A series cartridge machine maintenance philosophy consists of isolating a problem to a specific assembly with subsequent troubleshooting to isolate defective components. The defective components may be repaired locally or the entire assembly may be returned to Broadcast Electronics, Inc. for repair or replacement.

5-18. MECHANICAL ADJUSTMENTS.

5-19. The following text provides adjustment procedures for mechanical components associated with the 3000A series cartridge machines. The procedures are presented in the following order.

ADJUSTMENT PROCEDURES

- A. Motor Alignment Procedure.
- B. Solenoid Response Adjustment.
- C. Head Adjustments.

5-20. The following test equipment is required for the mechanical adjustment procedures. Refer to the following list as required for each procedure.

#### TEST EQUIPMENT

- A. Calibrated Oscilloscope, 5 MHz Bandwidth, Dual Channel With Lissajous Display of Inputs.
- B. Calibrated Low Distortion Audio Generator, 600 Ohm Output, 20 Hz to 20 kHz Audio Range.
- C. Tape Head and Tape Guide Alignment Gauge (BE P/N 300-0002).
- D. Motor Alignment Gauge (BE P/N 300-0700).
- E. Allen Wrenches (supplied with the Cartridge Machine).
- F. Tape Alignment Cut-Away Test Cartridge (BE P/N 710-0132).
- G. Monophonic/Stereophonic Reproduce Alignment Tape (BE P/N 800-1005).
- H. No. 1 Phillips Screwdriver, 4 Inch (10.2 cm) Blade.

5-21. **MOTOR ALIGNMENT PROCEDURE.** The deck pressure roller operates in conjunction with the motor capstan shaft to provide tape movement. The pressure roller and the motor capstan shaft must be properly aligned to prevent improper tape movement across the heads.

5-22. Procedure. To align the cartridge machine motor and deck solenoid, proceed as follows:

5-23. Disconnect the cartridge machine primary power.

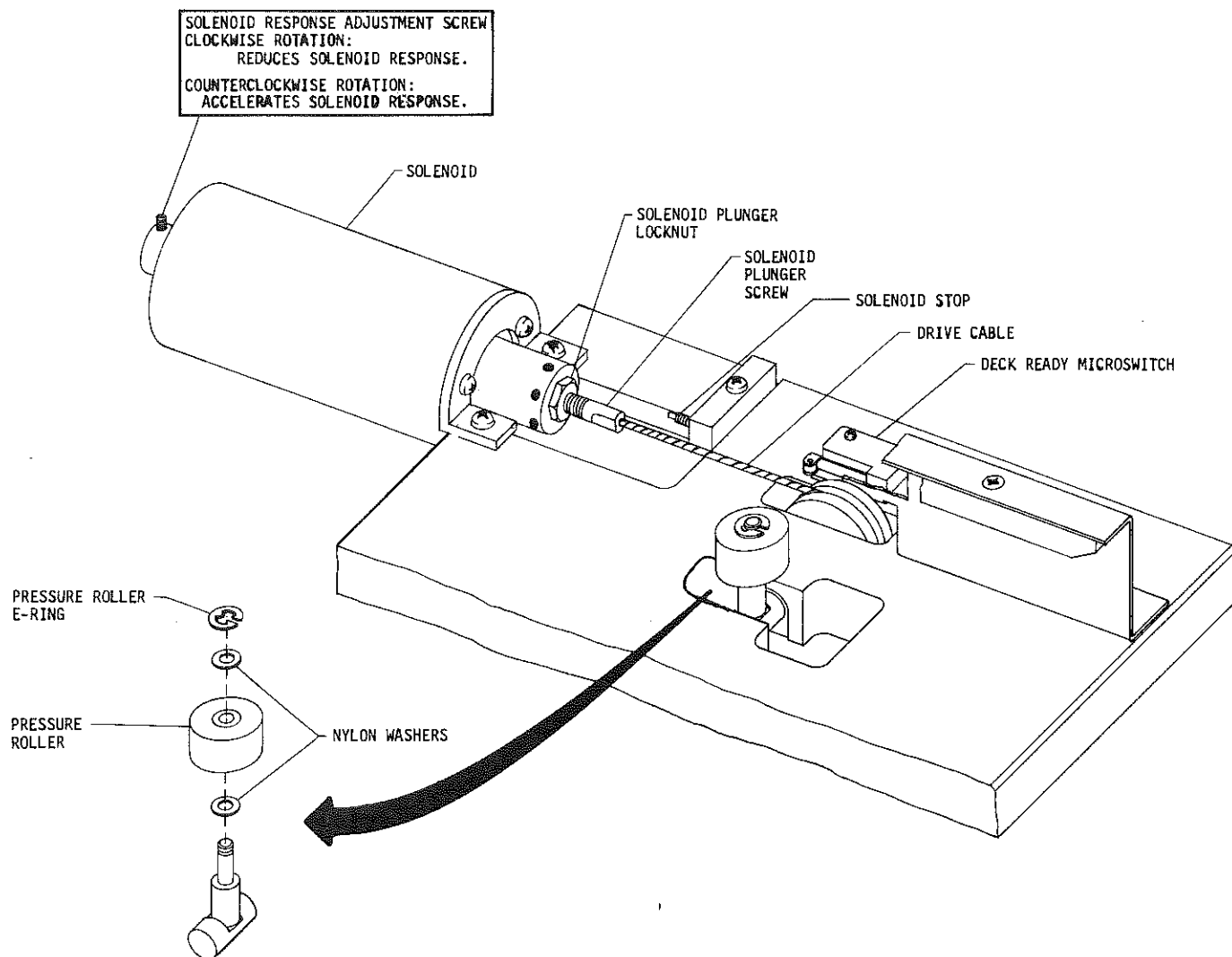
5-24. Manually retract the deck solenoid plunger (refer to Figure 5-1) and remove the pressure roller E-ring, pressure roller, and the nylon washers.

5-25. Refer to Figure 5-2 and loosen the two motor mounting screws to allow movement of the motor assembly.

5-26. Refer to Figure 5-3A and place motor alignment gauge 300-0700 on the deck pressure roller shaft.

5-27. Refer to Figure 5-3A and move the motor assembly until the capstan shaft is tangent with the alignment gauge.

5-28. Secure the two motor mounting screws. Secure the screws alternately to ensure correct motor alignment.



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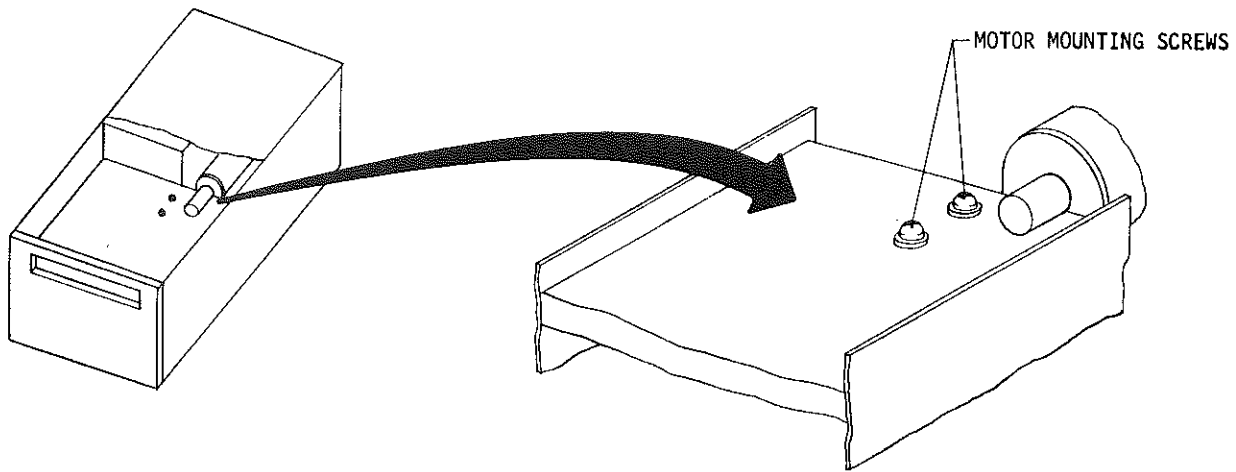
FIGURE 5-1. CARTRIDGE DECK ASSEMBLY

5-29. Refer to Figure 5-3B and adjust the solenoid plunger stroke as follows:

- A. Loosen the solenoid plunger locknut.
- B. Rotate the solenoid plunger clockwise or counter-clockwise as required until the plunger front-surface is aligned with the solenoid bracket.
- C. Secure the solenoid plunger locknut.

5-30. Remove the alignment gauge.

5-31. Refer to Figure 5-1 and re-install the pressure roller, the nylon washers, and the pressure roller E-ring.



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FIGURE 5-2. MOTOR MOUNTING SCREWS

5-32. Refer to Figure 5-1 and adjust the solenoid plunger stop until the pressure roller is just below the deck surface when the solenoid is deenergized.

5-33. Fine adjust the solenoid plunger stroke by rotating the plunger clockwise to increase solenoid pull or counterclockwise to decrease the solenoid pull as required. Once the required solenoid pull is obtained, refer to Figure 5-4 and check the pressure roller/capstan alignment. If the pressure roller and the capstan shaft are improperly aligned, re-adjust the solenoid plunger stroke.

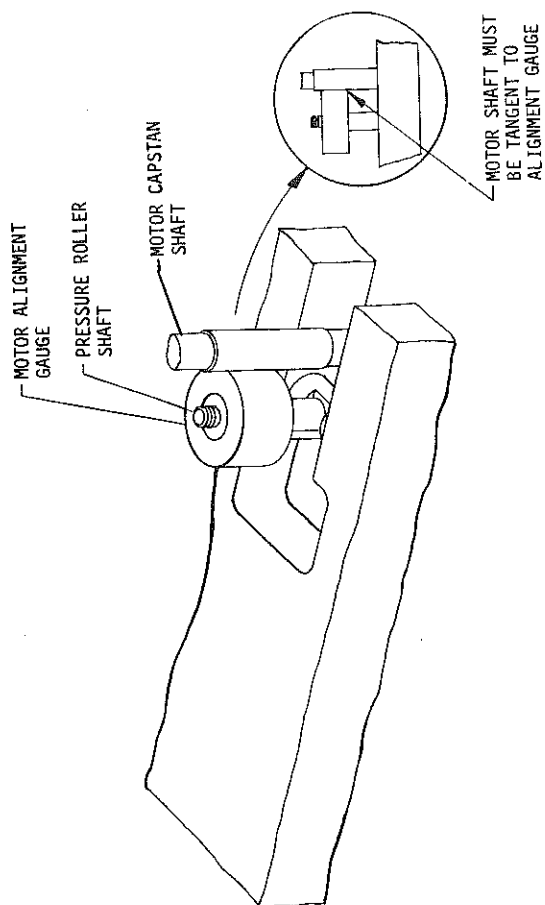
5-34. **SOLENOID RESPONSE ADJUSTMENT.** The solenoid is equipped with a control to adjust the response of the plunger. The control adjusts the rate of air movement through a relief valve to establish the response of the plunger and the level of noise generated. The control is factory adjusted for a compromise between response and noise level. Generally, the solenoid response will not require adjustment. However, the response may be adjusted to obtain any individual requirements. The solenoid response is adjusted as follows.

5-35. Procedure. To adjust the solenoid response, proceed as follows:

5-36. Disconnect the cartridge machine primary power.

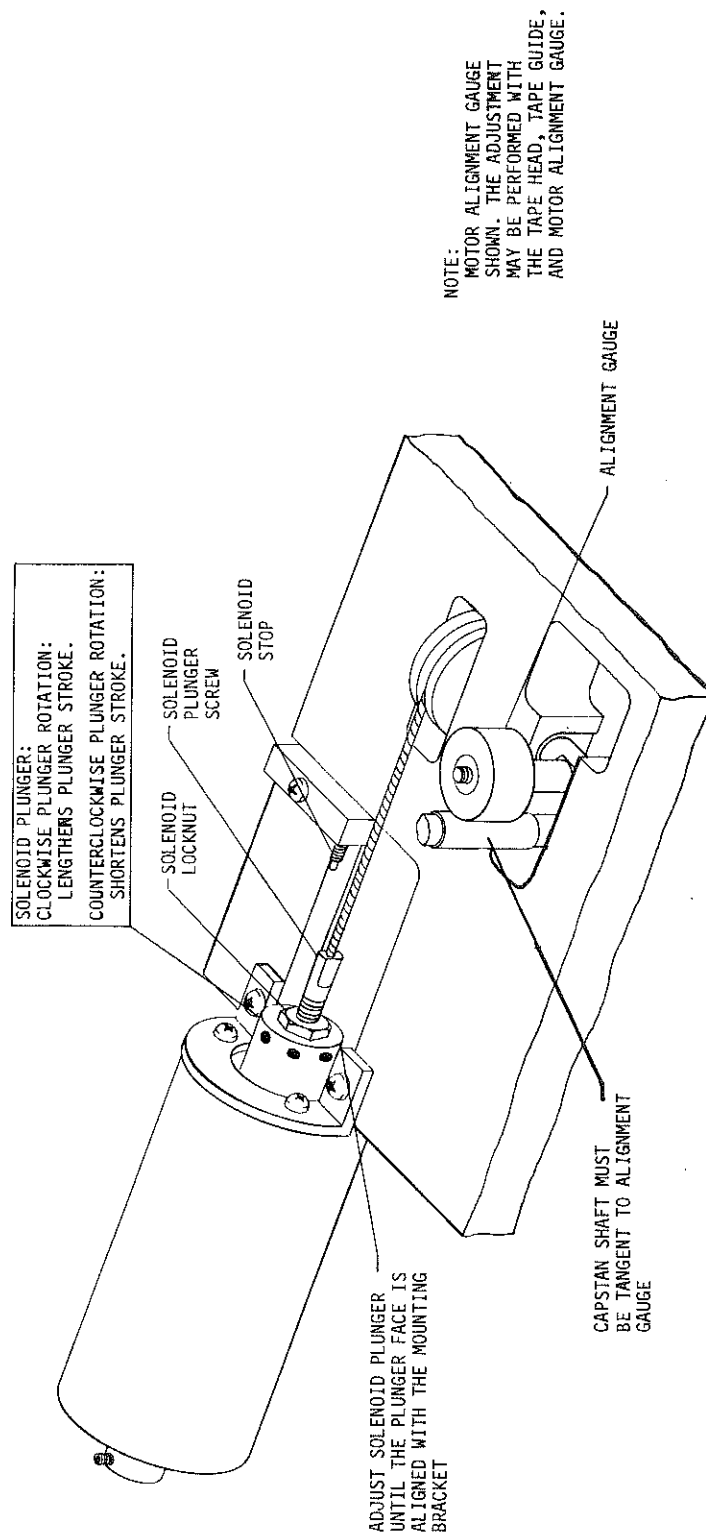
5-37. Refer to Figure 5-1 and adjust the solenoid response control clockwise 1/4 of a revolution to reduce the response and decrease the noise level of the solenoid. Adjust the solenoid response control counterclockwise 1/4 of a revolution to accelerate the response and increase the noise level of the solenoid.

# **A** MOTOR ALIGNMENT



5-6

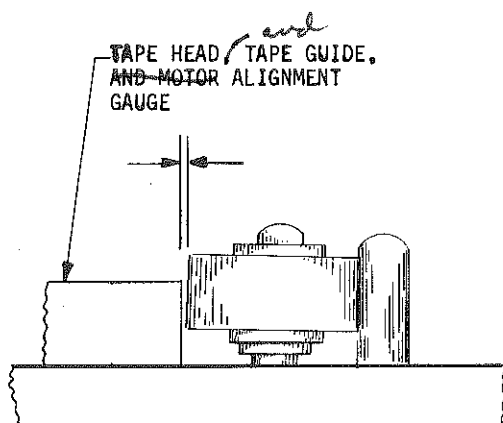
# **B** SOLENOID PLUNGER STROKE ADJUSTMENT



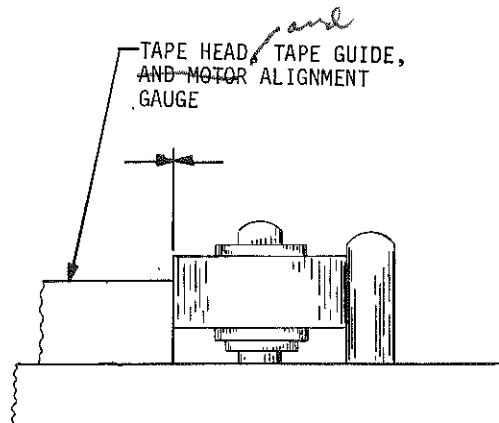
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FIGURE 5-3. MOTOR ALIGNMENT

**WARNING:** DISCONNECT PRIMARY POWER BEFORE SERVICING



IMPROPER ALIGNMENT



CORRECT ALIGNMENT

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FIGURE 5-4. CAPSTAN SHAFT/PRESSURE ROLLER ALIGNMENT

5-38. Perform an operational test to ensure the deck performs as desired. If required, repeat the procedure to obtain the desired results.

CAUTION

CAUTION

TO PREVENT DAMAGE TO THE PHASE LOK V HEAD ASSEMBLY, PERFORM ALL HEAD ASSEMBLY ADJUSTMENTS USING THE ALLEN WRENCH PROVIDED WITH THE UNIT.

5-39. HEAD ADJUSTMENTS. The head adjustments involve the alignment of the tape guide height, head height, head zenith, head azimuth, and head phase response parameters. The head parameters are presented as individual adjustment procedures. Due to the design of the PHASE LOK V head bracket, only head azimuth and the related electrical parameters will require periodic adjustment (example: prior to extensive continuous operation). The following list presents the procedures required for periodic maintenance. When a replacement head is installed, all head adjustment procedures must be performed (refer to the HEAD REPLACEMENT PROCEDURE specific replacement information).



## PERIODIC PLAYBACK HEAD ADJUSTMENT PROCEDURES

### MONOPHONIC CARTRIDGE MACHINES

- A. The Playback Head Azimuth Adjustment Procedure.
- B. The Playback Equalization Procedure.

### STEREOPHONIC CARTRIDGE MACHINES

- A. The Playback Head Azimuth Procedure.
- B. The Playback Phase Response Adjustment Procedure.
- C. The Playback Equalization Procedure.

## PERIODIC RECORD HEAD ADJUSTMENT PROCEDURES

### MONOPHONIC CARTRIDGE MACHINES

- A. The PROGRAM BIAS LEVEL ADJUSTMENT.
- B. The Record Head Azimuth Adjustment Procedure.
- C. The RECORD EQUALIZATION PROCEDURE.

### STEREOPHONIC CARTRIDGE MACHINES

- A. The PROGRAM BIAS LEVEL ADJUSTMENT.
- B. The Record Head Azimuth Procedure.
- C. The Record Phase Response Adjustment Procedure.
- D. The RECORD EQUALIZATION PROCEDURE.

5-40. The following text presents adjustment procedures for the playback, dummy, and record heads. For record/playback models, align the playback head before adjusting the record head.

5-41. An adjustment tool (located in the Accessory Parts Kit) is provided with the unit for head assembly alignment. Perform all head alignments using the adjustment tool.

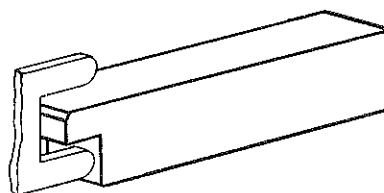
5-42. Tape Guide Height Adjustment Procedure. To ensure proper tape movement, perform the height adjustment procedure for each tape guide. To adjust the tape guide height, proceed as follows:

5-43. Refer to Figure 5-5A and check the tape guide height. The inside edge of the upper tape guide must be aligned with the top surface of the alignment gauge as shown.

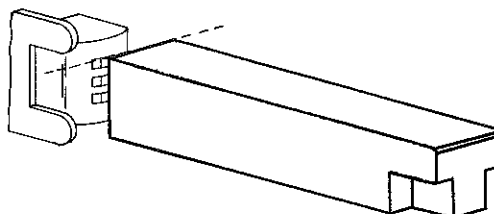
5-44. If adjustment is required, refer to Figure 5-6 and loosen the tape guide adjustment screws.

5-45. Adjust the tape guide to obtain proper alignment.

**A**  
TAPE GUIDE ADJUSTMENT  
 THE INSIDE EDGE OF UPPER TAPE  
 GUIDE MUST BE ALIGNED WITH  
 THE T-END OF ALIGNMENT GAUGE.



**B**  
HEAD HEIGHT ADJUSTMENT  
 THE UPPER HEAD POLE  
 MUST BE ALIGNED WITH THE  
 TOP OF THE ALIGNMENT GAUGE.



**C**  
ZENITH ADJUSTMENT  
 THE HEAD MUST BE  
 PERPENDICULAR TO  
 DECK SURFACE.



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FIGURE 5-5. HEAD AND TAPE GUIDE ADJUSTMENTS

- 5-46. Secure the tape guide adjustment screws.
- 5-47. Head Height Adjustment Procedure. To adjust the playback, record, or dummy head height, proceed as follows:
- 5-48. Refer to Figure 5-5B and check the playback or record head height. The head upper pole must be aligned with the top of the alignment gauge.
- 5-49. Insert the tape alignment cut-away test cartridge into the cartridge deck and begin deck operation to visually inspect the tape movement across the heads. The magnetic tape must cover the top and bottom of the head poles (refer to Figure 5-7).

5-50. If adjustment is required, refer to Figure 5-6 and loosen the appropriate head height/zenith lock-screw.

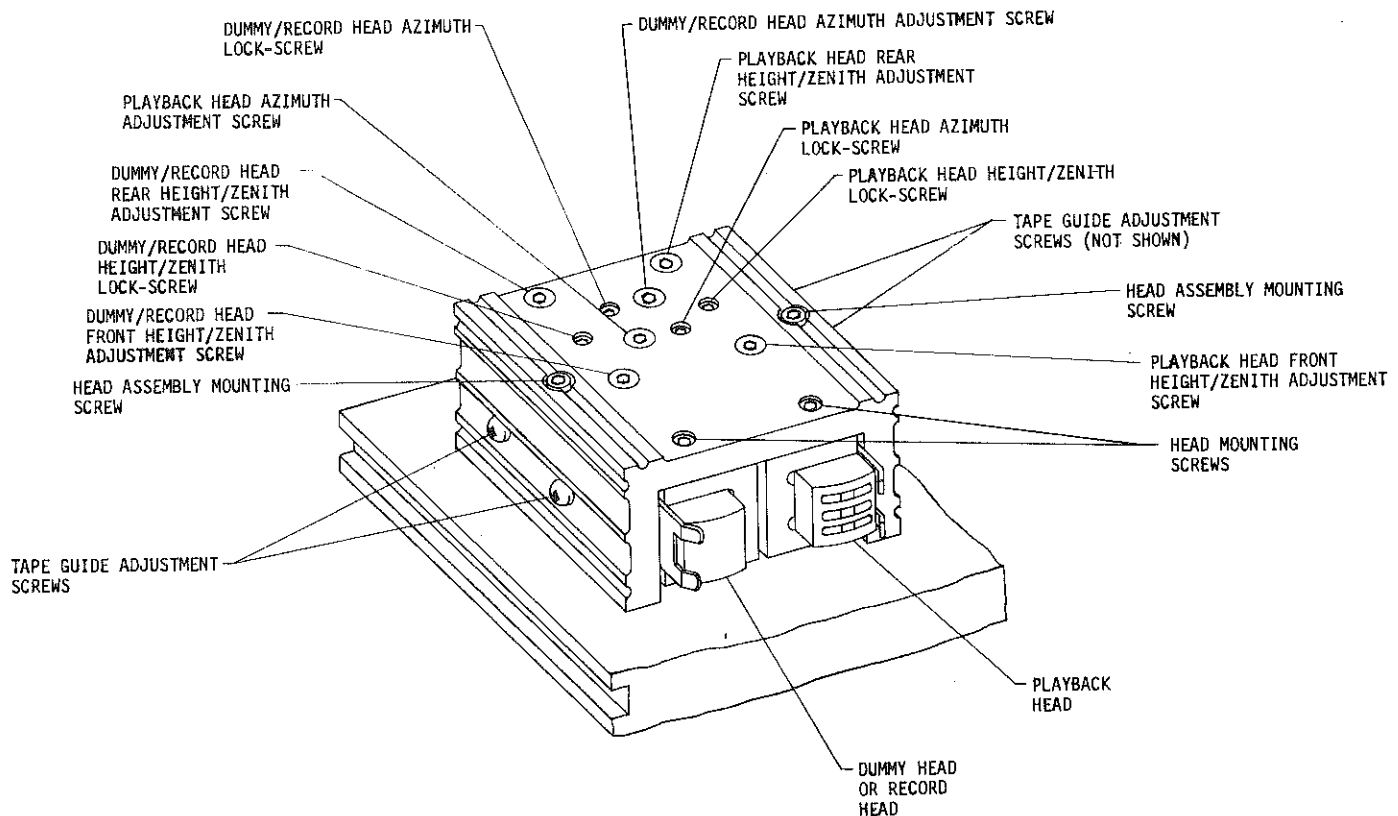
5-51. Refer to Figure 5-6 and adjust the appropriate front and rear head height/zenith adjustment screws as required to obtain the proper head height. The height/zenith screws must be adjusted equally to retain the zenith adjustment.

5-52. Secure the head height/zenith lock-screw.

5-53. For playback only cartridge machines, the top of the dummy head must be aligned with the top of the playback head. Visually check the height of the dummy head. If required adjust the dummy head height as required. Refer to Figure 5-6 for the location of the dummy head height/zenith adjustment screws.

5-54. Head Zenith Adjustment Procedure. To adjust the playback, record, or dummy head zenith, proceed as follows:

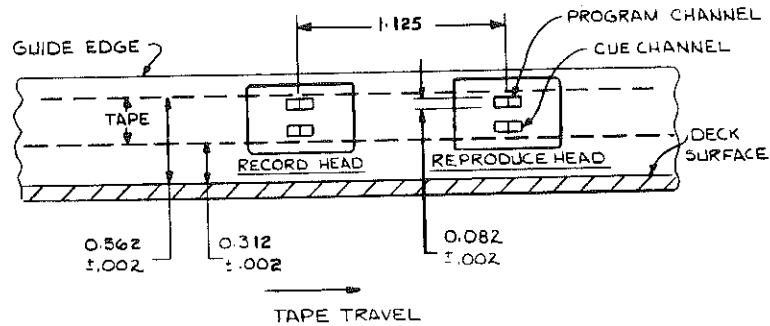
5-55. Refer to Figure 5-5C and check the playback or record head zenith. The head must be perpendicular to the deck surface.



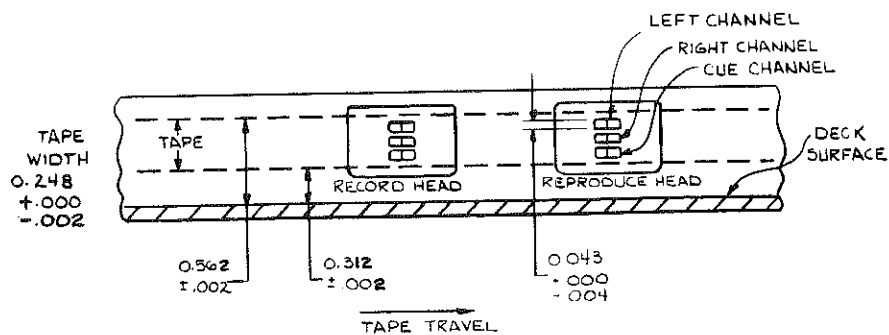
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597-3000-10

FIGURE 5-6. HEAD ADJUSTMENT CONTROLS

## MONOPHONIC STANDARD



## STEREOPHONIC STANDARD



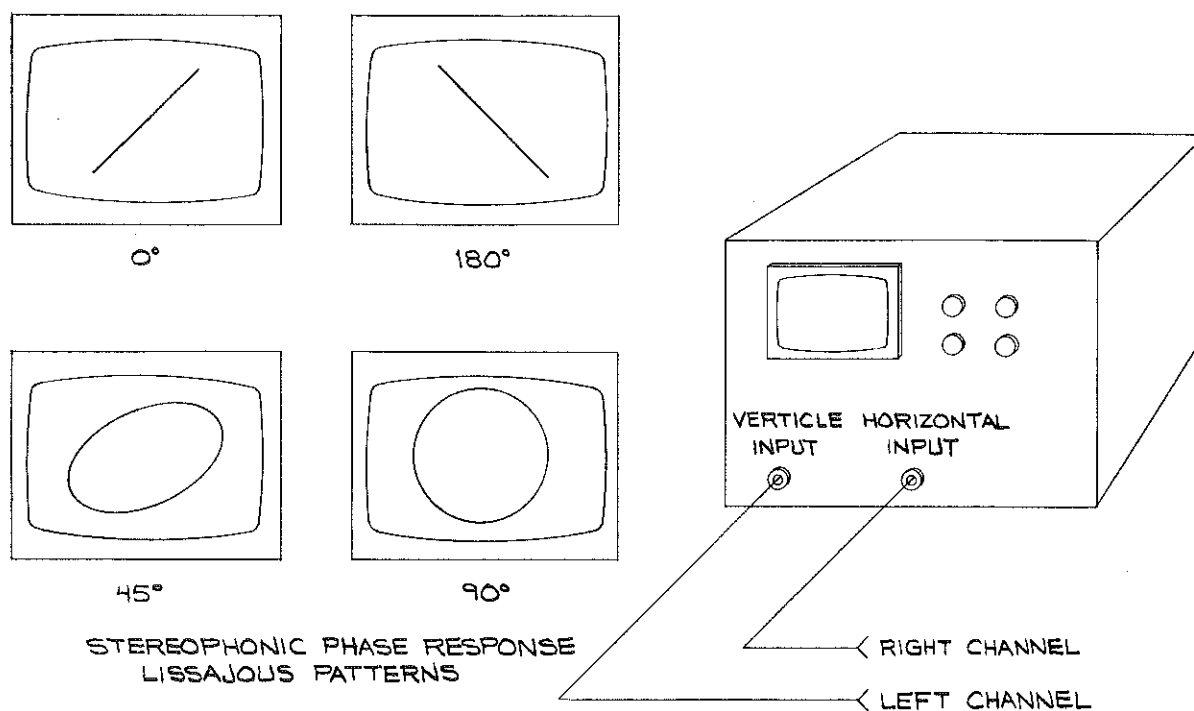
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FIGURE 5-7. HEIGHT CARTRIDGE TAPE TRACKING

- 5-56. If adjustment is required, refer to Figure 5-6 and loosen the appropriate head height/zenith lock-screw.
- 5-57. Refer to Figure 5-6 and adjust the appropriate head front or rear height/zenith screw to obtain the proper alignment.
- 5-58. Refer to the Head Height Adjustment Procedure and check the head height. If required, re-adjust the head height.
- 5-59. Repeat the procedure until the head zenith and head height are properly adjusted.
- 5-60. Secure the head height/zenith lock-screw.
- 5-61. For playback only cartridge machines, repeat the procedure for the dummy head. Refer to Figure 5-6 for the location of the dummy head height/zenith adjustment screws.

- 5-62. Playback Head Azimuth Adjustment Procedure. To adjust the playback head azimuth, proceed as follows:
- 5-63. Disconnect the cartridge machine primary power.
- 5-64. Demagnetize the playback head, the dummy head, and all surrounding ferrous components.
- 5-65. Refer to the OUTPUT LEVEL ADJUSTMENT procedure (located in the ELECTRICAL ADJUSTMENT procedures) and calibrate the cartridge deck for the desired output level.
- 5-66. Connect the oscilloscope to the cartridge deck left channel output on the output receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-67. Refer to Figure 5-6 and loosen the playback head azimuth lock-screw.
- 5-68. Apply power to the cartridge machine.
- 5-69. Insert the reproduce alignment test tape into the cartridge deck and reproduce the 12.5 kHz test tone.
- 5-70. Refer to Figure 5-6 and adjust the playback head azimuth screw for a maximum peak-to-peak voltage indication.
- 5-71. Secure the playback head azimuth lock-screw.
- 5-72. Disconnect power from the cartridge machine and remove the test equipment.
- 5-73. Record Head Azimuth Adjustment Procedure. To adjust the record head azimuth, proceed as follows:
- 5-74. Disconnect the cartridge machine primary power.
- 5-75. Refer to the ELECTRICAL ADJUSTMENTS procedures in the following text and perform the PROGRAM BIAS LEVEL ADJUSTMENT procedure.
- 5-76. Demagnetize the record head, playback head, and all surrounding ferrous components.
- 5-77. Connect the audio generator to the left channel input on the RECORD LINE IN receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-78. Connect the oscilloscope to the left channel output on the PLAY LINE OUT receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.

- 5-79. Refer to Figure 5-6 and loosen the record head azimuth lock-screw.
- 5-80. Apply power to the cartridge machine.
- 5-81. Adjust the audio generator for a 15 kHz output at -20 dBm.
- 5-82. Operate the recording system and begin recording the 15 kHz tone.
- 5-83. Refer to Figure 5-6 and adjust the record head azimuth screw for a maximum peak-to-peak voltage indication.
- 5-84. Secure the record head azimuth lock-screw.
- 5-85. Disconnect power from the cartridge machine and remove the test equipment.
- 5-86. Playback Head Phase Response Adjustment Procedure (For Stereophonic Cartridge Machines Only). The phase adjustment involves the fine alignment of the playback head azimuth for maximum phase response. To adjust the playback head phase response, proceed as follows:
- 5-87. Disconnect the cartridge machine primary power.
- 5-88. Demagnetize the playback head, the dummy head, and all surrounding ferrous components.
- 5-89. Refer to the OUTPUT LEVEL ADJUSTMENT procedure (located in the ELECTRICAL ADJUSTMENT procedures) and calibrate the cartridge deck for the desired output level.
- 5-90. Connect the oscilloscope to the cartridge deck outputs on the output/remote receptacle as shown in Figure 5-8. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-91. Refer to Figure 5-6 and loosen the playback head azimuth lock-screw.
- 5-92. Apply power to the cartridge machine.
- 5-93. Operate the oscilloscope for lissajous display of inputs.
- 5-94. Insert the reproduce alignment test tape into the cartridge deck and reproduce the 12.5 kHz test tone.
- 5-95. Refer to Figure 5-6 and adjust the playback head azimuth screw for a  $0^\circ$  lissajous pattern (refer to Figure 5-8).
- 5-96. Secure the playback head azimuth lock-screw.



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FIGURE 5-8. STEREOPHONIC PHASE RESPONSE LISSAJOUS PATTERNS

5-97. Disconnect power from the cartridge machine and remove the test equipment.

5-98. Record Phase Adjustment Procedure (For Stereophonic Record/Playback Models Only). The record phase adjustment involves the fine alignment of the record head azimuth for maximum phase response. The record phase response is adjusted as follows:

5-99. Disconnect the cartridge machine primary power.

5-100. Demagnetize the record head, playback head, and all surrounding ferrous components.

5-101. Connect the audio generator to the left and right channel inputs on the RECORD LINE IN receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.

5-102. Connect the oscilloscope to the left and right channel outputs on the PLAY LINE OUT receptacle as shown in Figure 5-8. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.

- 5-103. Refer to Figure 5-6 and loosen the record head azimuth lock-screw.
- 5-104. Apply power to the cartridge machine.
- 5-105. Adjust the audio generator for a 15 kHz output at -20 dBm.
- 5-106. Operate the recording system and begin recording the 15 kHz tone.
- 5-107. Refer to Figure 5-6 and adjust the record head azimuth screw for a  $\emptyset$  lissajous pattern (refer to Figure 5-8).
- 5-108. Secure the record head azimuth lock-screw.
- 5-109. Disconnect power from the cartridge machine and remove the test equipment.
- 5-110. ELECTRICAL ADJUSTMENTS.
- 5-111. The following text provides electrical adjustment procedures for all controls associated with the 3000A cartridge machines. The procedures are presented in the following order.
- A. SOLENOID ADJUSTMENTS.
    - 1. Solenoid Current Adjustment.
  - B. PLAYBACK ADJUSTMENTS.
    - 1. Output Level Adjustment.
    - 2. Playback Equalization.
    - 3. Cue Tone Detection Adjustment.
  - C. RECORD ADJUSTMENTS.
    - 1. Program Bias Trap Adjustment.
    - 2. Program Bias Level Adjustment.
    - 3. Record Equalization.
    - 4. Cue Bias Trap Adjustment.
    - 5. Cue Bias Level Adjustment.
    - 6. Cue Tone Record Level Adjustments.
    - 7. Cue Tone Frequency Adjustments.
  - D. METER ADJUSTMENTS.
    - 1. VU Meter Calibration.
- 5-112. The following equipment is required for electrical adjustment procedures:



- A. Hex Wrenches: supplied with the unit.
- B. Oscilloscope: any general purpose model.
- C. Reproduce Alignment Test Tape (BE P/N 808-0004).
- D. Miniature Flat-tip Screwdriver 1/8 inch (0.125 cm) tip.

RECORD MODELS ONLY

- E. Voltmeter.
- F. External Audio Signal Generator (audio range 20 Hz to 20 kHz).
- G. External VU Meter (or decibel calibrated voltmeter).
- H. Frequency Counter.
- I. Audio Analyzer.
- J. Bulk-Erased Cartridge.
- K. Cue Tone Calibration Cartridge (P/N 800-1095).
- L. Circuit Board Extender Card (BE P/N 919-1504).

5-113. SOLENOID ADJUSTMENTS.

5-114. SOLENOID CURRENT ADJUSTMENT. SOL ADJ R20 on the power supply circuit board adjusts the solenoid current. The solenoid current is adjusted as follows.

5-115. Procedure. To adjust the solenoid current, proceed as follows:

WARNING DISCONNECT POWER FROM THE UNIT BEFORE PROCEEDING.

5-116. Disconnect power from the unit.

5-117. Remove the cartridge machine top and bottom panels.

5-118. Connect a voltmeter between J10 pin 11 and J10 pin F and replace the cartridge machine bottom panel.

5-119. Apply power to the unit.

5-120. Insert a cartridge into the deck and depress the start switch to operate the solenoid.

5-121. Refer to Figure 3-1 and adjust SOL ADJ control R20 until the voltmeter indicates +12V dc.

WARNING

DISCONNECT POWER FROM THE UNIT BEFORE  
PROCEEDING.

- 5-122. Disconnect power from the unit.
- 5-123. Remove the test equipment and replace the top and bottom panels.
- 5-124. PLAYBACK ADJUSTMENTS.
- 5-125. OUTPUT LEVEL ADJUSTMENT. The OUT level control(s) on the playback logic circuit board adjust the cartridge deck output level. The output level control(s) are adjusted as follows.
- 5-126. Procedure. To adjust the deck output level, proceed as follows:
- 5-127. Disconnect the cartridge machine primary power.
- 5-128. Connect an external VU meter to the left channel output on the PLAY LINE OUT receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-129. Apply power to the cartridge machine.
- 5-130. Insert the alignment tape into the deck and reproduce the operating reference level portion of the test tape.
- 5-131. Refer to Figure 3-1 and adjust the L OUT control for the desired output level.
- 5-132. For stereophonic cartridge machines, repeat the procedure for the right channel. Adjust the right channel output level with the R OUT control (refer to Figure 3-1).
- 5-133. Disconnect power from the cartridge machine and remove the test equipment.
- 5-134. PLAYBACK EQUALIZATION. Playback equalization involves the adjustment of the playback logic circuit board equalization controls to obtain the required playback response. The playback equalization is adjusted as follows.
- 5-135. Procedure. To adjust the equalization controls, proceed as follows:
- 5-136. Disconnect the cartridge machine primary power.
- 5-137. Connect an external VU meter to the left channel output on the PLAY LINE OUT receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.

- 5-138. Apply power to the cartridge machine.
- 5-139. Insert the reproduce alignment tape and reproduce the test tones.
- 5-140. At the 50 Hz test tone, adjust the left channel PLAY EQ LF control (refer to Figure 3-1) until the external VU meter indicates a level within -1 dB to 0 dB of the reference tone level.
- 5-141. At the 12.5 kHz test tone, adjust the left channel PLAY EQ HF control (refer to Figure 3-1) until the external VU meter indicates the level of the reference tone.
- 5-142. For stereophonic cartridge machines, repeat the procedure for the right channel. Adjust the right channel equalization with the right channel PLAY EQ LF control and PLAY EQ HF control (refer to Figure 3-1).
- 5-143. Disconnect power from the cartridge machine and remove the test equipment.
- 5-144. CUE TONE DETECTION ADJUSTMENT. The cue tone controls on the playback logic circuit board adjust the sensitivity of the 1 kHz, 150 Hz, and 8 kHz cue tone detection circuits. The cue tone detection controls are adjusted as follows.
- 5-145. Procedure. To adjust the cue tone detection controls, proceed as follows:
- 5-146. Insert the cue tone calibration cartridge into the deck and reproduce the 1 kHz test tones.
- 5-147. Refer to Figure 3-1 and adjust the 1 kHz CUE SENS control to terminate deck operation during a test tone.
- 5-148. Insert the cue tone calibration cartridge into the deck and reproduce the 150 Hz test tones.
- 5-149. Refer to Figure 3-1 and adjust the 150 Hz CUE SENS control until the SEC switch/indicator illuminates.
- 5-150. Insert the cue tone calibration cartridge into the deck and reproduce the 8 kHz test tones.
- 5-151. Refer to Figure 3-1 and adjust the 8 kHz CUE SENS control until the TER switch/indicator illuminates.
- 5-152. RECORD ADJUSTMENTS.
- 5-153. PROGRAM BIAS TRAP ADJUSTMENT. Left channel bias trap control L1 and right channel bias trap control L2 on the record amplifier/bias circuit board isolate the program amplifier circuitry from the 100 kHz program bias. The bias trap controls are adjusted as follows.

5-154. Procedure. To adjust the controls, proceed as follows:

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER  
BEFORE PROCEEDING.

5-155. Disconnect power from the cartridge machine and remove the top-panel.

5-156. Remove the cartridge machine circuit board cage cover-plate.

5-157. Insert the record amplifier/bias circuit board into the extender circuit board.

5-158. Refer to Figure 5-9 and connect the oscilloscope to left channel bias trap test point TP1.

5-159. Apply power to the cartridge machine.

5-160. Operate the cartridge machine to the record mode.

WARNING

DO NOT TOUCH ANY CIRCUIT BOARD TRACES OR COMPONENTS ON THE POWER SUPPLY CIRCUIT BOARD WITH POWER ENERGIZED.

WARNING

5-161. With the non-metallic adjustment tool, adjust left channel bias trap control L1 (refer to Figure 5-9) to minimize the 100 kHz bias indication.

5-162. For stereophonic cartridge machines, adjust the right channel bias trap as follows:

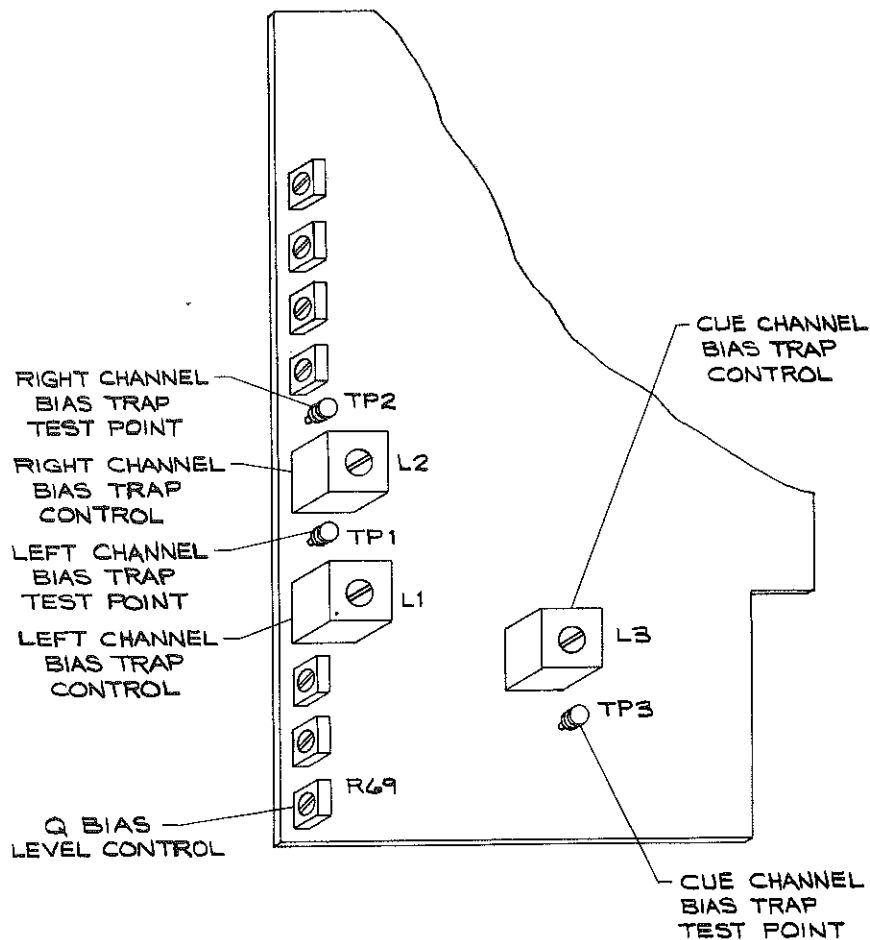
- A. Refer to Figure 5-9 and connect the oscilloscope to right channel bias trap test point TP2.
- B. With the non-metallic adjustment tool, adjust right channel bias trap control L2 (refer to Figure 5-9) to minimize the 100 kHz bias indication.

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER  
BEFORE PROCEEDING.

5-163. Disconnect power from the cartridge machine.

5-164. Remove all test equipment, replace the record amplifier/bias circuit board, and replace the cartridge machine chassis panels.



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FIGURE 5-9. RECORD AMPLIFIER/BIAS CIRCUIT BOARD CONTROLS

5-165. PROGRAM BIAS LEVEL ADJUSTMENT. The L BIAS LEVEL and R BIAS LEVEL controls on the record control and tone generator circuit board adjust the level of program bias. The bias level controls are adjusted as follows.

5-166. Procedure. To adjust the controls, proceed as follows:

5-167. Calibrate the cartridge machine record circuitry for a -10 dBm record level as follows:

- A. Disconnect power from the cartridge machine.
  - B. Connect the audio generator to the left channel input on the RECORD LINE IN receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
  - C. Connect the external VU meter to the left channel output on the PLAY LINE OUT receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
  - D. Apply power to the cartridge machine.
  - E. Adjust the audio generator for a 1 kHz output at -20 dBm.
  - F. Operate the record circuitry and begin recording the 1 kHz tone.
  - G. Adjust the cartridge machine left channel LEVEL control until the external VU meter indicates -10 dBm.
  - H. Depress the deck STOP switch/indicator.
  - I. For stereophonic cartridge machines, repeat steps A through H for the right channel.
  - J. Disconnect power from the cartridge machine and remove the VU meter.
- 5-168. Connect the oscilloscope to the left channel output on the PLAY LINE OUT receptacle.
- 5-169. Apply power to the cartridge machine.
- 5-170. Operate the record circuitry and begin recording the 1 kHz tone.
- 5-171. Refer to Figure 3-1 and adjust the L BIAS LEVEL control for a maximum peak-to-peak 1 kHz waveform without distortion.
- 5-172. For stereophonic cartridge machines, repeat the procedure for the right channel. Adjust the right channel bias level with the R BIAS LEVEL control (refer to Figure 3-1).
- 5-173. Re-calibrate the record circuitry for a 0 dBm record level by performing the VU METER CALIBRATION procedure in the following text.
- 5-174. Disconnect power from the cartridge machine and remove the test equipment.

- 5-175. RECORD EQUALIZATION. Record equalization involves the adjustment of the RECORD EQ controls to obtain the required record response. The record equalization is adjusted as follows.
- 5-176. Procedure. To adjust the record equalization controls, proceed as follows:
- 5-177. Calibrate the cartridge machine record circuitry for a -10 dBm record level by performing the procedure described in the PROGRAM BIAS LEVEL ADJUSTMENT.
- 5-178. Disconnect power from the cartridge machine.
- 5-179. Connect the audio generator to the left channel input on the RECORD LINE IN receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-180. Connect the external VU meter to the left channel output on the PLAY LINE OUT receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-181. Apply power to the cartridge machine.
- 5-182. Adjust the audio generator for a 50 Hz output at -20 dBm.
- 5-183. Operate the record circuitry and begin recording the 50 Hz tone.
- 5-184. Refer to Figure 3-1 and adjust the LLF RECORD EQ control until the external VU meter indicates -10 dBm.
- 5-185. Adjust the audio generator for a 12 kHz output at -20 dBm.
- 5-186. Refer to Figure 3-1 and adjust the LHF RECORD EQ control until the external VU meter indicates -10 dBm.
- 5-187. Repeat the procedure for the right channel. Adjust the right channel equalization with the RLF and RHF RECORD EQ controls (refer to Figure 3-1).
- 5-188. Re-calibrate the record circuitry for a 0 dBm record level by performing the VU METER CALIBRATION procedure in the following text.
- 5-189. Disconnect power from the cartridge machine and remove the test equipment.
- 5-190. CUE BIAS TRAP ADJUSTMENT. Cue bias trap control L3 on the record amplifier/bias circuit board isolates the cue tone generator circuitry from the 100 kHz cue bias. The cue bias trap control is adjusted as follows.

- 5-191. Procedure. To adjust the control, proceed as follows:
- 5-192. Refer to the PROGRAM BIAS TRAP ADJUSTMENT procedure in the preceding text and perform the procedure for the cue bias trap control. Refer to Figure 5-9 as required for the location of cue bias trap test point TP3 and cue bias trap control L3.
- 5-193. CUE BIAS LEVEL ADJUSTMENT. The Q BIAS LEVEL control on the record control and tone generator circuit board adjusts the level of cue bias. The cue bias control is adjusted as follows.
- 5-194. Procedure. To adjust the control, proceed as follows:
- WARNING DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER BEFORE PROCEEDING.
- 5-195. Disconnect power from the cartridge machine.
- 5-196. Remove the cartridge machine top-panel and the circuit board cage cover-plate.
- 5-197. Remove the record control and tone generator circuit board.
- 5-198. Activate the 1 kHz oscillator on the record control and generator circuit board by connecting a temporary jumper from the cathode of diode CR16 to the cathode of diode CR17. Refer to record control and tone generator circuit board assembly 914-1503/-1513/-1523/-1533 as required for the component locations.
- 5-199. Re-insert the record control and tone generator circuit board and replace the circuit board cage cover-plate.
- 5-200. Activate the cue bias switch by connecting a temporary jumper between pins 20 and 21 on REMOTE connector J5 (refer to Figure 2-2 in SECTION II).
- 5-201. Connect the oscilloscope to the CUE PLAY OUTPUT on the REMOTE receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-202. Apply power to the cartridge machine.
- 5-203. Operate the record circuitry and begin recording the 1 kHz cue tone.
- 5-204. Refer to Figure 3-1 and adjust the Q BIAS LEVEL control for a maximum peak-to-peak 1 kHz waveform without distortion.



WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER  
BEFORE PROCEEDING.

- 5-205. Disconnect power from the cartridge machine.
- 5-206. Remove the test equipment, the temporary jumpers, and replace circuit boards and chassis panels.
- 5-207. CUE TONE RECORD LEVEL ADJUSTMENTS. The CUE RECORD LEVEL controls allow adjustment of the record circuitry cue tone levels. The following text is divided into 1 kHz, 150 Hz, 8 kHz, and external cue tone level adjustment procedures.
- 5-208. 1 kHz Cue Tone Record Level Adjustment. To adjust the 1 kHz cue tone level, proceed as follows:
- 5-209. Measure the NAB 1 kHz cue tone level standard as follows:
- A. Disconnect power from the cartridge machine.
  - B. Connect the oscilloscope to the cue channel output on the REMOTE receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
  - C. Apply power to the cartridge machine.
  - D. Insert the cue tone calibration cartridge into the cartridge deck.
  - E. Reproduce the 1 kHz cue tones and record the peak-to-peak voltage indication \_\_\_\_\_.

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER  
BEFORE PROCEEDING.

- 5-210. Disconnect power from the cartridge machine.
- 5-211. Remove the top-panel and the circuit board cage cover-plate.
- 5-212. Remove the record control and tone generator circuit board.
- 5-213. Activate the 1 kHz oscillator on the record control and tone generator circuit board by connecting a temporary jumper from the cathode of diode CR16 to the cathode of diode CR17. Refer to record control and tone generator circuit board assembly 914-1503/-1513/-1523/-1533 as required for the component locations.
- 5-214. Re-insert the record control and tone generator circuit board and replace the circuit board cage cover-plate.

- 5-215. Activate the cue bias switch by connecting a temporary jumper between pins 20 and 21 on rear-panel REMOTE connector J5.
- 5-216. Apply power to the cartridge machine.
- 5-217. Operate the record circuitry and begin recording the 1 kHz cue tone.
- 5-218. Refer to Figure 3-1 and adjust the 1 kHz CUE RECORD LEVEL control for the recorded NAB standard level.

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER  
BEFORE PROCEEDING.

- 5-219. Disconnect power from the cartridge machine.
- 5-220. Remove the test equipment, the temporary jumpers, and replace all circuit boards and chassis panels.
- 5-221. 150 Hz Cue Tone Record Level Adjustment. To adjust the 150 Hz cue tone level, proceed as follows:
- 5-222. Measure the NAB 150 Hz cue tone level standard by performing the level measurement steps described at the beginning of the 1 kHz Cue Tone Record Level Adjustment procedure. Record the peak-to-peak voltage indication \_\_\_\_\_.
- 5-223. Operate the record circuitry and begin recording a 150 Hz cue tone.
- 5-224. Refer to Figure 3-1 and adjust the 150 Hz CUE RECORD LEVEL control for the recorded NAB standard level.
- 5-225. Disconnect power from the cartridge machine.
- 5-226. Remove the test equipment and replace all circuit boards and chassis panels.
- 5-227. 8 kHz Cue Tone Record Level Adjustment. To adjust the 8 kHz cue tone level, proceed as follows:
- 5-228. Measure the NAB 8 kHz cue tone level standard by performing the level measurements steps described in 1 kHz Cue Tone Record Level Adjustment procedure. Record the peak-to-peak voltage indication \_\_\_\_\_.
- 5-229. Operate the record circuitry and begin recording an 8 kHz cue tone.
- 5-230. Refer to Figure 3-1 and adjust the 8 kHz CUE RECORD LEVEL control for the recorded NAB standard level.

- 5-231. Disconnect power from the cartridge machine.
- 5-232. Remove the test equipment and replace all circuit boards and chassis panels.
- 5-233. External Cue Tone Record Level Adjustment. To adjust the external cue tone level, proceed as follows:
- 5-234. Disconnect power from the cartridge machine.
- 5-235. Activate the cue bias switch by connecting a temporary jumper between pins 20 and 21 on rear-panel REMOTE connector J5.
- 5-236. Connect the audio generator to the external cue tone input on the REMOTE receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-237. Connect the external VU meter to the cue channel output on the REMOTE receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-238. Apply power to the cartridge machine.
- 5-239. Adjust the audio generator for a 1 kHz output at 0 dBm.
- 5-240. Operate the record circuitry and begin recording the 1 kHz tone.
- 5-241. Refer to Figure 3-1 and adjust the EXT CUE LEVEL control until the external VU meter indicates 0 dBm.
- 5-242. Disconnect power from the cartridge machine.
- 5-243. Remove all test equipment, the temporary jumper, and replace the cartridge machine top-panel.
- 5-244. CUE TONE FREQUENCY ADJUSTMENTS. The cue tone frequency adjustment procedures involve the calibration of the cue tone frequencies. The following text is divided into 1 kHz, 150 Hz, and 8 kHz adjustment procedures.
- 5-245. 1 kHz Cue Tone Frequency Adjustment. To calibrate the 1 kHz cue tone frequency, proceed as follows:

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER  
BEFORE PROCEEDING.

- 5-246. Disconnect power from the cartridge machine.

5-247. Remove the cartridge machine top-panel and the circuit board cage cover-plate.

5-248. Remove the record control and tone generator circuit board.

5-249. Activate the 1 kHz oscillator on the record control and tone generator circuit board by connecting a temporary jumper from the cathode of diode CR16 to the cathode of diode CR17. Refer to record control and tone generator circuit board assembly 914-1503/-1513/-1523/-1533 as required for the component locations.

5-250. Insert the record control and tone generator circuit board into the extender circuit board.

5-251. Activate the cue bias switch by connecting a temporary jumper between pins 20 and 21 on rear-panel REMOTE connector J5.

5-252. Connect the frequency counter to the cue channel output on the REMOTE receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.

5-253. Apply power to the cartridge machine.

5-254. Operate the record circuitry and begin recording the 1 kHz tone.

5-255. Refer to Figure 5-10 and adjust 1 kHz frequency calibrate control R11 until the frequency counter indicates 1 kHz  $\pm$ 50 Hz.

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER BEFORE PROCEEDING.

5

5-256. Disconnect power from the cartridge machine.

5-257. Remove the test equipment and replace all circuit boards and chassis panels.

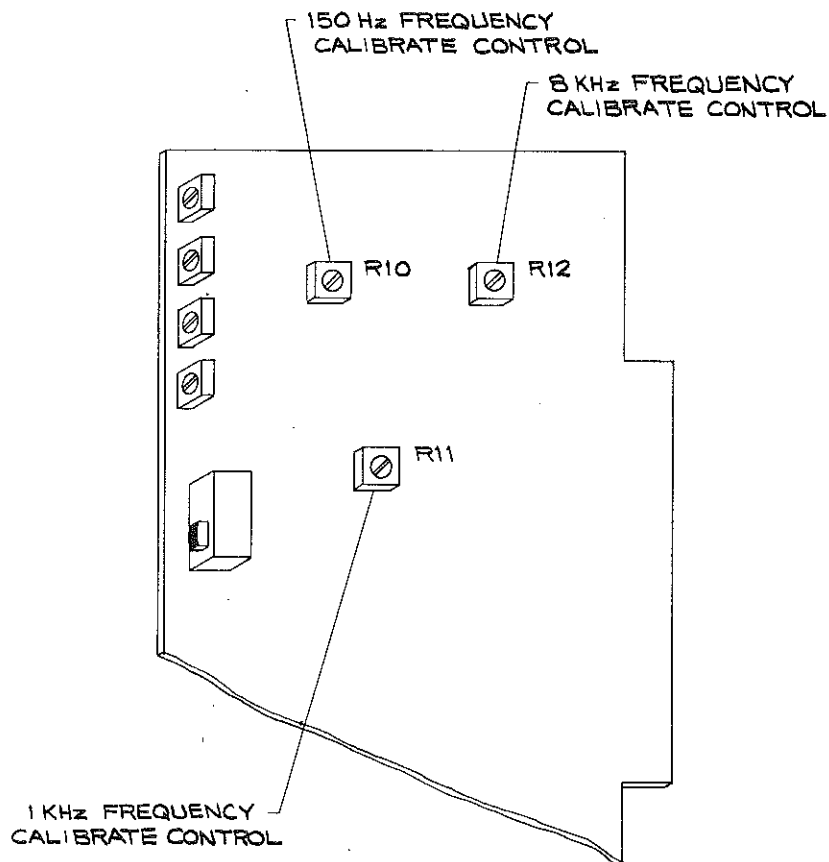
5-258. 150 Hz Cue Tone Frequency Adjustment. To calibrate the 150 Hz cue tone, proceed as follows:

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER BEFORE PROCEEDING.

5-259. Disconnect power from the cartridge machine.

5-260. Remove the cartridge machine top-panel and the circuit board cage cover-plate.



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FIGURE 5-10. RECORD CONTROL AND TONE GENERATOR CIRCUIT BOARD CONTROLS

- 5-261. Insert the record control and generator circuit board into the extender circuit board.
- 5-262. Connect the frequency counter to the cue channel output on the REMOTE receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.
- 5-263. Operate the record circuitry and begin recording a 150 Hz cue tone.
- 5-264. Refer to Figure 5-10 and adjust 150 Hz frequency calibrate control R10 until the frequency counter indicates 150 Hz  $\pm$ 8 Hz.

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER BEFORE PROCEEDING.

- 5-265. Disconnect power from the cartridge machine.

5-266. Remove the test equipment and replace all circuit boards and chassis panels.

5-267. 8 kHz Cue Tone Frequency Adjustment. To calibrate the 8 kHz cue tone, proceed as follows:

5-268. Refer to the 150 Hz Cue Tone Frequency Adjustment procedure in the preceding text and perform the procedure for the 8 kHz cue tone. Adjust 8 kHz frequency calibrate control R12 (refer to Figure 5-10) until the frequency counter indicates 8 kHz  $\pm$ 400 Hz.

5-269. METER ADJUSTMENTS.

5-270. VU METER CALIBRATION. The METER CAL controls on the record control and tone generator circuit board calibrate the cartridge machine VU meters. The controls are divided into record and playback adjustments. The following text is divided into record and playback adjustment procedures.

5-271. Record VU Meter Calibration Procedure. To adjust the record VU meter calibration controls, proceed as follows:

5-272. Disconnect power from the cartridge machine and remove the top-panel.

5-273. Connect the audio generator to the left channel input on the RECORD LINE IN receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.

5-274. Connect the external VU meter to the left channel output on the PLAY LINE OUT receptacle. The receptacle pin designations are shown in Figure 2-2 in SECTION II, INSTALLATION.

5-275. Apply power to the cartridge machine.

5-276. Adjust the audio generator for 1 kHz output at -20 dBm.

5-277. Operate the record circuitry and begin recording the 1 kHz tone.

5-278. Refer to Figure 3-1 and adjust the left channel LEVEL control until the external VU meter indicates 0 dBm.

5-279. Refer to Figure 3-1 and adjust the L REC METER CAL control until the left channel meter indicates 0 VU.

5-280. For stereophonic cartridge machines, repeat the procedure for the right channel. Adjust the right channel meter with the right channel LEVEL and R REC METER CAL control (refer to Figure 3-1).

- 5-281. Disconnect power from the cartridge machine.
- 5-282. Remove the test equipment and replace the cartridge machine top-panel.
- 5-283. Playback VU Meter Calibration Procedure. To adjust the playback meter calibration controls, proceed as follows:
- 5-284. Remove the cartridge machine top-panel.
- 5-285. Refer to the OUTPUT LEVEL adjustment procedure in the preceding text and adjust the cartridge machine for a 0 dBm output level.
- 5-286. Insert the NAB 1 kHz tone test tape into the deck and reproduce the test tones.
- 5-287. Refer to Figure 3-1 and adjust the L PLAY METER CAL control until the left channel VU meter indicates 0 VU.
- 5-288. For stereophonic cartridge machines, adjust the right channel VU meter with the R PLAY METER CAL control (refer to Figure 3-1).
- 5-289. Replace the cartridge machine top-panel.
- 5-290. MECHANICAL PARTS REPLACEMENT PROCEDURES.
- 5-291. The following text provides mechanical parts replacement procedures. The procedures are presented in the following order.
- A. Pressure Roller Replacement.
  - B. Head Replacement.
  - C. Motor Replacement.
- 5-292. The following equipment is required for the replacement procedures. Refer to the list as required for each procedure.

#### EQUIPMENT

- A. No. 1 Phillips Screwdriver, 4 Inch (10.2 cm) Blade.
  - B. Needle-nose pliers.
  - C. Allen Wrenches (supplied with the cartridge machine).
- 5-293. PRESSURE ROLLER REPLACEMENT PROCEDURE. To replace a cartridge deck pressure roller, proceed as follows:
- 5-294. Disconnect the cartridge machine primary power.
- 5-295. Refer to Figure 5-1 and manually retract the solenoid plunger.

- 5-296. Remove the pressure roller E-ring, the pressure roller, and the nylon washers (refer to Figure 5-1).
- 5-297. Refer to Figure 5-1 and replace the washers, the pressure roller, and the pressure roller E-ring.
- 5-298. Check the solenoid plunger stroke by performing the plunger adjustment steps described in the MOTOR ALIGNMENT PROCEDURE.
- 5-299. HEAD REPLACEMENT. To replace a tape head, proceed as follows:
- 5-300. Disconnect the cartridge machine primary power.
- 5-301. Loosen the head assembly mounting screws (refer to Figure 5-6) and remove the entire head assembly from the cartridge deck.
- 5-302. Refer to Figure 5-6 and loosen the defective tape head mounting screw.
- 5-303. Remove the defective head from the head assembly and disconnect the head leads.
- 5-304. Refer to Figure 5-11 and connect the head leads to the replacement head.
- 5-305. Firmly seat the replacement head into the head assembly and secure the mounting screw.
- 5-306. Replace the head assembly and secure the mounting screws.
- 5-307. Align the head by performing all the HEAD ADJUSTMENTS and associated ELECTRICAL ADJUSTMENT procedures.
- 5-308. MOTOR REPLACEMENT. To replace the cartridge machine motor, proceed as follows:

WARNING

DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER BEFORE PROCEEDING.

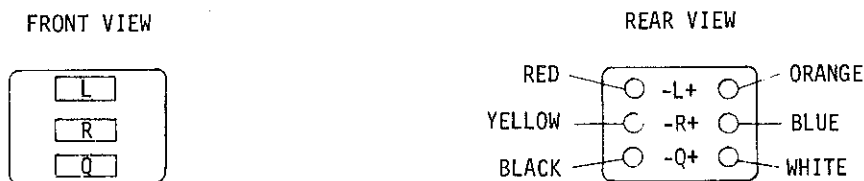
- 5-309. Disconnect the cartridge machine primary power.
- 5-310. Remove the cartridge machine top-panel and bottom-panel.
- 5-311. Place the cartridge machine on a side-panel.
- 5-312. Refer to the cartridge machine final assembly diagram in SECTION VII, DRAWINGS and perform the following:



# MONOPHONIC PLAYBACK/RECORD HEAD



# STEREOPHONIC PLAYBACK/RECORD HEAD



P= PROGRAM TRACK (MONO)  
 Q= CUE TRACK  
 L= LEFT PROGRAM TRACK (STEREO)  
 R= RIGHT PROGRAM TRACK (STEREO)

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FIGURE 5-11. TAPE HEAD CONFIGURATIONS

- A. Disconnect motor power supply connector P2 from the power supply circuit board (located near the bottom of the cartridge machine).
- B. Disconnect the motor capacitor wiring.

5-313. Refer to Figure 5-2 and locate the motor mounting screws. While supporting the motor, remove the motor mounting screws and carefully remove the motor from the cartridge machine chassis.

## CAUTION

EXERCISE CARE WHEN HANDLING THE CARTRIDGE MACHINE MOTOR TO AVOID DAMAGING THE BEARINGS. NEVER HANDLE THE MOTOR BY THE CAPSTAN SHAFT.

## CAUTION

5-314. Carefully insert the new motor into the cartridge machine chassis and replace the motor mounting screws. Do not tighten the motor mounting screws at this time.

5-315. Reconnect motor power supply connector P2 and the motor capacitor wiring.

5-316. Align the motor by performing the MOTOR ALIGNMENT PROCEDURE described in the preceding text.

5-317. Replace the cartridge machine top-panel and bottom-panel.

5-318. TROUBLESHOOTING.

5-319. Low voltages are used throughout the 3000A series cartridge machine playback, control, and record circuitry. The power supply circuit board assembly contains primary ac line voltage. Therefore, do not perform any maintenance or troubleshooting procedures on the power supply circuit board with power energized. Troubleshooting with power energized is always considered hazardous and caution should be observed. Good judgment, care, and common sense must be practiced to prevent accidents.

5-320. The troubleshooting philosophy for the 3000A cartridge machines consists of isolating a problem to a specific circuit board. The problem may be isolated by referencing the following information and Table 5-1 which presents 3000A cartridge machine troubleshooting.

<u>WARNING</u>	DISCONNECT ALL CARTRIDGE MACHINE PRIMARY POWER BEFORE REMOVING OR INSERTING PRINTED CIRCUIT
<u>WARNING</u>	BOARDS OR REPLACING ANY COMPONENTS.

<u>CAUTION</u>	INADVERTENT CONTACT BETWEEN ADJACENT COMPONENTS OR CIRCUIT BOARDS WITH TEST EQUIPMENT MAY CAUSE
<u>CAUTION</u>	SERIOUS DAMAGE TO THE CARTRIDGE MACHINE.

5-321. Once trouble is isolated and power is totally deenergized, refer to the schematic diagrams and the theory of operation to assist in problem resolution. The defective component may be repaired locally or the entire device may be returned to Broadcast Electronics Inc. for repair or replacement.

<u>WARNING</u>	DISCONNECT POWER BEFORE REMOVING OR REPLACING CIRCUIT BOARDS OR COMPONENTS.
----------------	---

<u>CAUTION</u>	WHEN REPLACING A COMPONENT MOUNTED ON A HEAT-SINK, ENSURE A THIN FILM OF A ZINC-BASED
<u>CAUTION</u>	HEAT-SINK COMPOUND IS USED TO ASSURE GOOD HEAT DISSIPATION.

5-322. COMPONENT REPLACEMENT. The circuit boards used in the 3000A cartridge machines are double-sided with plated-through holes. Due to the plated-through hole design, solder fills the holes by capillary action. This condition requires that defective components be removed carefully to avoid damage to the circuit board.

TABLE 5-1. 3000A SERIES TROUBLESHOOTING  
(Sheet 1 of 3)

SYMPTOM	DEFECT/REMEDY
NO MOTOR OPERATION	<ol style="list-style-type: none"> <li>1. Check the ac line fuse on the cartridge machine rear-panel.</li> <li>2. Check the motor power supply connector on the power supply circuit board.</li> <li>3. Check the cartridge machine motor.</li> </ol>
NO SOLENOID OPERATION	<ol style="list-style-type: none"> <li>1. Check front-panel start switch/indicator S1.</li> <li>2. Check the deck microswitch.</li> <li>3. Check stop/start flip-flop Q8 and Q9 on the playback logic circuit board.</li> <li>4. Check the solenoid control circuitry on the power supply circuit board.</li> <li>5. Check transistor Q1 on the cartridge machine rear-panel.</li> <li>6. Check the deck solenoid.</li> </ol>
NO OUTPUT AUDIO	<ol style="list-style-type: none"> <li>1. Check the cartridge machine playback head.</li> <li>2. Check the audio amplifier circuitry on the playback logic circuit board.</li> <li>3. Check audio output transformers T2 and T3.</li> </ol>
NO 1 kHz STOP TONE OPERATION	<ol style="list-style-type: none"> <li>1. Check cue channel amplifier IC-2A/IC-2B on the playback logic circuit board.</li> <li>2. Check the 1 kHz stop tone detection circuitry (IC-4A, IC-6D, and transistor Q10) on the playback logic circuit board.</li> </ol>

TABLE 5-1. 3000A SERIES TROUBLESHOOTING  
(Sheet 2 of 3)

SYMPTOM	DEFECT/REMEDY
NO SECONDARY CUE TONE OPERATION	<ol style="list-style-type: none"> <li>1. Check cue channel amplifier IC-2A/IC-2B on the playback logic circuit board.</li> <li>2. Check the secondary tone detection circuitry (IC-5B and IC-6A) on the playback logic circuit board.</li> </ol>
NO TERTIARY CUE TONE OPERATION	<ol style="list-style-type: none"> <li>1. Check cue channel amplifier IC-2A/IC-2B on the playback logic circuit board.</li> <li>2. Check the tertiary tone detection circuitry (IC-5A and IC-6C) on the playback logic circuit board.</li> </ol>
NO RECORD MODE OPERATION	<ol style="list-style-type: none"> <li>1. Check front-panel record switch/indicator S5.</li> <li>2. Check record control flip-flop on the record control and tone generator circuit board.</li> </ol>
NO RECORD AUDIO	<ol style="list-style-type: none"> <li>1. Check the record amplifier circuitry on the record amplifier/bias circuit board.</li> <li>2. Check the record bias circuitry on the record amplifier/bias circuit board.</li> </ol>
NO 1 kHz CUE TONE RECORD OPERATION	<ol style="list-style-type: none"> <li>1. Check the 1 kHz record switch on the record control and tone generator circuit board.</li> <li>2. Check the 1 kHz record control and tone generator circuitry on the record control and tone generator circuit board.</li> </ol>

TABLE 5-1. 3000A SERIES TROUBLESHOOTING  
(Sheet 3 of 3)

SYMPTOM	DEFECT/REMEDY
NO SECONDARY CUE TONE RECORD OPERATION	<ol style="list-style-type: none"> <li>1. Check front-panel secondary record switch/indicator S6.</li> <li>2. Check the secondary record control and tone generator circuitry on the record control and tone generator circuit board.</li> </ol>
NO TERTIARY CUE TONE RECORD OPERATION	<ol style="list-style-type: none"> <li>1. Check front-panel tertiary record switch/indicator S7.</li> <li>2. Check the tertiary record control and tone generator circuitry on the record control and tone generator circuit board.</li> </ol>

5-323. On all circuit boards, the adhesion between the copper trace and the circuit board fails at almost the same temperature as solder melts. A circuit board trace can be destroyed by excessive heat or lateral movement during soldering. Use of a small soldering iron with steady pressure is required for circuit board repairs.

5-324. To remove a soldered component from a circuit board, cut the leads from the body of the defective component while the device is still soldered to the board. Grip a component lead with needle-nose pliers. Touch the soldering iron to the lead at the solder connection on the circuit side of the board. When the solder begins to melt, push the lead through the back side of the board and cut off the clinched end of the lead. Each lead may now be heated independently and pulled out of each hole. The holes may be cleared by careful re-heating with a low wattage iron and removing the residual solder with a soldering vacuum tool.

5-325. Install the new component and apply solder from the circuit side of the board. If no damage has been incurred to the plated-through holes, soldering of the component side of the board will not be required.

WARNING

MOST SOLVENTS WHICH REMOVE ROSIN FLUX ARE VOLATILE AND TOXIC BY NATURE AND SHOULD BE USED ONLY IN SMALL AMOUNTS IN A WELL VENTILATED AREA AWAY FROM FLAME, CIGARETTES, AND HOT SOLDERING IRONS.

WARNING

WARNING

WARNING

OBSERVE THE MANUFACTURERS CAUTIONARY INSTRUCTIONS.

5-326. After soldering, remove residual flux with a suitable solvent. Rubbing alcohol is highly diluted and is not effective.

5-327. The board should be checked to ensure the flux has been completely removed. Rosin flux is not normally corrosive, however in time, the flux will absorb enough moisture to become conductive and create problems.

5-328. INTEGRATED CIRCUITS. Special care should be exercised with integrated circuits. Each integrated circuit must be installed by matching the integrated circuit notch with the notch on the socket. Do not attempt to remove an integrated circuit from a socket with your fingers. Use an integrated circuit puller to lightly pry the component from the socket.

# SECTION VI

## PARTS LISTS

### 6-1. INTRODUCTION.

6-2. This section provides descriptions and part numbers of electrical components, assemblies, and selected mechanical parts required for maintenance of the Broadcast Electronics 3000A series cartridge machines. Each table entry in this section is indexed by reference designators appearing on the applicable schematic diagram. Table 6-1 presents the 3000A series replaceable parts list index.

TABLE 6-1. REPLACEABLE PARTS LIST INDEX  
(Sheet 1 of 2)

TABLE	DESCRIPTION	PART NO.	PAGE
6-2	3100A CARTRIDGE MACHINE FINAL ASSEMBLY	950-310X-XXX	6-3
6-3	3200A CARTRIDGE MACHINE FINAL ASSEMBLY	950-320X-XXX	6-3
6-4	3400A CARTRIDGE MACHINE FINAL ASSEMBLY	950-340X-XXX	6-5
6-5	HEAD BOX ASSEMBLY	950-0302	6-6
6-6	DUAL SPEED MOTOR ASSEMBLIES, 117V 60 Hz AND 220V 50 Hz	950-2070, 950-2080	6-6
6-7	MONOPHONIC/STEREOPHONIC PLAYBACK LOGIC WITH FAST FORWARD AND CUE TONE CIRCUIT BOARD ASSEMBLIES	914-1531, 914-1571	6-7
6-8	MONOPHONIC/STEREOPHONIC RECORD CONTROL AND TONE GENERATOR WITH CUE TONE CIRCUIT BOARD ASSEMBLIES	914-1513, 914-1533	6-9
6-9	MONOPHONIC AND STEREOPHONIC RECORD AMPLIFIER/BIAS CIRCUIT BOARD ASSEMBLIES	910-1049, 910-1050	6-11
6-10	3000A BASIC ASSEMBLIES	950-3100, 950-320X-XXX, 950-340X-XXX	6-14
6-11	3000A BASIC CABLE ASSEMBLIES	940-3113-001, 940-3409-001, 940-3415-001	6-17

TABLE 6-1. REPLACEABLE PARTS LIST INDEX  
(Sheet 2 of 2)

TABLE	DESCRIPTION	PART NO.	PAGE
6-12	3000A BASIC CABLE ASSEMBLIES	940-3411-001, 940-3414-001	6-17
6-13	3000A BASIC CABLE ASSEMBLIES	940-3102-001, 940-3412-001	6-17
6-14	3000A DECK ASSEMBLIES	950-0300-006, 950-0300-007, 950-0300-008	6-17
6-15	POWER SUPPLY CIRCUIT BOARD ASSEMBLY	914-1535-1	6-18
6-16	POWER TRANSFORMER ASSEMBLY	950-7656	6-19
6-17	3000A PLAYBACK AND RECORD PACKING ASSEMBLY	950-3000-022, 950-3000-023	6-19



TABLE 6-2. 3100A CARTRIDGE MACHINE FINAL ASSEMBLY - 950-310X-XXX

REF. DES.	DESCRIPTION	PART NO.	QTY.
F1	Fuse, 3AG, 1 Ampere, Fast-Blow	330-0100	1
C2	Capacitor, Motor, 3 uF $\pm 10\%$ , 300V, With Clamp	029-1076	1
----	Head Box, Phase LOK V Assembly	950-0302	1
----	3100A Basic Assembly	950-3100-000	1
----	3000A Packing Assembly	950-3000-022	1
----	3100A Final Assembly Parts	950-3100-002	1
<hr/>			
117V 60 Hz Assembly			
----	Motor Assembly, 117V 60 Hz, 2-Speed	950-2070	1
C1	Capacitor, Motor, 0.7 uF, 300V	029-1067	1
<hr/>			
220V 50 Hz Assembly			
F1	Fuse, 3AG, 1/2 Ampere	330-0050	1
----	Motor Assembly, 220V 50 Hz, 2-Speed	950-2080	1
C1	Capacitor, Motor, 0.95 uF, 300V	029-1075	1
----	AC Line Cord, CEE 7/7 3-Wire European Plug	681-0001	1

ADDITIONAL PARTS FOR MONOPHONIC  
900-3100-XXX

----	Monophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1531	1
----	Head, Playback, Monophonic, 2-Channel, Model NPD1484 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0006	1
----	Head, Dummy, H801A016	407-0001	1

ADDITIONAL PARTS FOR STEREOPHONIC  
900-3102-XXX

----	Stereophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1571	1
----	Head, Playback, Stereophonic, 3-Channel, Model NPD1496 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0007	1
----	Head, Dummy, H801A016	407-0001	1

TABLE 6-3. 3200A CARTRIDGE MACHINE FINAL ASSEMBLY - 950-320X-XXX  
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
F1	Fuse, 3AG, 1 Ampere, Fast-Blow	330-0100	1
C2	Capacitor, Motor, 3 uF $\pm 10\%$ , 300V, With Clamp	029-1076	1
----	Head Box, Phase LOK V Assembly	950-0302	1
----	3200A Final Assembly Parts	950-3200-003	1
<hr/>			
117V 60 Hz Assembly			
----	Motor Assembly, 117V 60 Hz, 2-Speed	950-2070	1
C1	Capacitor, Motor, 0.7 uF, 300V	029-1067	1
<hr/>			
220V 50 Hz Assembly			
F1	Fuse, 3AG, 1/2 Ampere	330-0050	1
----	Motor Assembly, 220V 50 Hz, 2-Speed	950-2080	1
C1	Capacitor, Motor, 0.95 uF, 300V	029-1075	1
----	AC Line Cord, CEE 7/7 3-Wire European Plug	681-0001	1

TABLE 6-3. 3200A CARTRIDGE MACHINE FINAL ASSEMBLY - 950-320X-XXX  
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
ADDITIONAL PARTS FOR MONOPHONIC 900-3200-XXX			
----	Monophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1531	1
----	Head, Playback, Monophonic, 2-Channel, Model NPD1484 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0006	1
----	Head, Dummy, H801A016	407-0001	1
----	3200A Basic Assembly	950-3200-000	1
----	3000A Packing Assembly	950-3000-022	1
ADDITIONAL PARTS FOR MONOPHONIC 900-3201-XXX			
----	Monophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1531	1
----	Head, Playback, Monophonic, 2-Channel, Model NPD1484 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0006	1
----	Head, Record, LPB2H4RNOX10, 2-Track, Longlife	252-0018	1
----	3200RP Basic Assembly	950-3201-000	1
----	3000A Record Packing Assembly	950-3000-023	1
----	Monophonic Record Control and Tone Generator Circuit Board Assembly	914-1513	1
----	Monophonic Record Amplifier Bias Circuit Board Assembly	910-1049	1
ADDITIONAL PARTS FOR STEREOPHONIC 900-3202-XXX			
----	Stereophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1571	1
----	Head, Playback, Stereophonic, 3-Channel, Model NPD1496 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0007	1
----	Head, Dummy, H801A016	407-0001	1
T2	Transformer, Audio Output, 8-Pin Package Dual Primary: 600 Ohm/150 Ohm Impedance Dual Secondary: 2 k Ohm/500 Ohm Impedance Maximum Level: +15 dBm Frequency Response: $\pm 1$ dB, 50 Hz to 15 kHz	370-0035	1
----	3200A Basic Assembly	950-3200-000	1
----	3000A Packing Assembly	950-3000-022	1
ADDITIONAL PARTS FOR STEREOPHONIC 900-3203-XXX			
----	Stereophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1571	1
----	Head, Playback, Stereophonic, 3-Channel, Model NPD1496 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0007	1
----	Head, Record, LPB3Q4RNOX10, 3-Track, Longlife	253-0015	1
----	3200RPS Basic Assembly	950-3203-001	1
----	3000A Record Packing Assembly	950-3000-023	1
----	Stereophonic Record Control and Tone Generator Circuit Board Assembly	914-1533	1
----	Stereophonic Record Amplifier Bias Circuit Board Assembly	910-1050	1

TABLE 6-4. 3400A CARTRIDGE MACHINE FINAL ASSEMBLY - 950-340X-XXX  
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
F1	Fuse, 3AG, 1 Ampere, Fast-Blow	330-0100	1
C2	Capacitor, Motor, 3 uF $\pm 10\%$ , 300V, With Clamp	029-1076	1
----	Head Box, Phase LOK V Assembly	950-0302	1
----	3400A Final Assembly Parts	950-3400-003	1
<hr/>			
117V 60 Hz Assembly			
----	Motor Assembly, 117V 60 Hz, 2-Speed	950-2070	1
C1	Capacitor, Motor, 0.7 uF, 300V	029-1067	1
<hr/>			
220V 50 Hz Assembly			
F1	Fuse, 3AG, 1/2 Ampere	330-0050	1
----	Motor Assembly, 220V 50 Hz, 2-Speed	950-2080	1
C1	Capacitor, Motor, 0.95 uF, 300V	029-1075	1
----	AC Line Cord, CEE 7/7 3-Wire European Plug	681-0001	1

ADDITIONAL PARTS FOR MONOPHONIC  
900-3400-XXX

----	Monophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1531	1
----	Head, Playback, Monophonic, 2-Channel, Model NPD1484 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0006	1
----	Head, Dummy, H801A016	407-0001	1
----	3400A Basic Assembly	950-3400-000	1
----	3000A Packing Assembly	950-3000-022	1

ADDITIONAL PARTS FOR MONOPHONIC  
900-3401-XXX

----	Monophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1531	1
----	Head, Playback, Monophonic, 2-Channel, Model NPD1484 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0006	1
----	Head, Record, LPB2H4RNOX10, 2-Track, Longlife	252-0018	1
----	3400RP Basic Assembly	950-3401-000	1
----	3000A Record Packing Assembly	950-3000-023	1
----	Monophonic Record Control and Tone Generator Circuit Board Assembly	914-1513	1
----	Monophonic Record Amplifier Bias Circuit Board Assembly	910-1049	1

ADDITIONAL PARTS FOR STEREOPHONIC  
900-3402-XXX

----	Stereophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1571	1
----	Head, Playback, Stereophonic, 3-Channel, Model NPD1496 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0007	1
----	Head, Dummy, H801A016	407-0001	1
----	3400A Basic Assembly	950-3400-000	1
----	3000A Packing Assembly	950-3000-022	1

TABLE 6-4. 3400A CARTRIDGE MACHINE FINAL ASSEMBLY - 950-340X-XXX  
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
ADDITIONAL PARTS FOR STEREOPHONIC 900-3403-XXX			
----	Stereophonic Playback Logic with Fast Forward and Cue Tone Circuit Board Assembly	914-1571	1
----	Head, Playback, Stereophonic, 3-Channel, Model NPD1496 Inductance at 1 kHz: 475 mH Impedance at 1 kHz: 3.3 Ohms DC Resistance: 500 Ohms	250-0007	1
----	Head, Record, LPB3Q4RNOX10, 3-Track, Longlife	253-0015	1
----	3400RPS Basic Assembly	950-3403-001	1
----	3000A Record Packing Assembly	950-3000-023	1
----	Stereophonic Record Control and Tone Generator Circuit Board Assembly	914-1533	1
----	Stereophonic Record Amplifier Bias Circuit Board Assembly	910-1050	1

TABLE 6-5. HEAD BOX ASSEMBLY - 950-0302

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Tape Guide	445-0004	2
----	Spring, Head Box	430-0012	6

TABLE 6-6. DUAL SPEED MOTOR ASSEMBLIES, 117V 60 Hz AND 220V 50 Hz  
950-2070, 950-2080

REF. DES.	DESCRIPTION	PART NO.	QTY.
117V AC 60 Hz Assembly			
----	Motor, Synchronous, 60 Hz Speed 1: 600 rpm @ 7 oz-in, 7.5 in/s (19.05 cm/s), 17W @ 117V ac $\pm 10\%$ Speed 2: 1800 rpm @ 9 oz-in, 22.5 in/s (57 cm/s), 52W @ 117V ac $\pm 10\%$ Model: NAH-4125B6C	382-2070	1
220V AC 50 Hz Assembly			
----	Motor, Synchronous, 50 Hz Speed 1: 500 rpm @ 10 oz-in, 7.5 in/s (19.05 cm/s), 25W @ 117V ac Speed 2: 1500 rpm @ 10 oz-in, 22.5 in/s (57 cm/s), 60W @ 117V ac Model: NAH-4125B5C	382-2080	1
----	Bearing, Ball, 608ZZ Outside Diameter: 0.8661 Inches (2.199 cm) Inside Diameter: 0.315 Inches (0.800 cm) Height: 0.275 Inches (0.698 cm)	442-1020	2
----	Connector Housing, 12-Pin	418-1271	1
----	Pins, Connector	417-0053	10

TABLE 6-7. MONOPHONIC/STEREOPHONIC PLAYBACK LOGIC WITH FAST FORWARD AND CUE TONE  
CIRCUIT BOARD ASSEMBLIES - 914-1531, 914-1571 (Sheet 1 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C3	Capacitor, Ceramic, 0.0047 uF $\pm 10\%$ , 200V	032-4733	3
C11	Capacitor, Electrolytic, 1 uF, 35V, Tantalum	064-1063	1
C13	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C14	Capacitor, Ceramic, 0.0047 uF $\pm 10\%$ , 200V	032-4733	1
C15	Capacitor, Electrolytic, 1 uF, 35V, Tantalum	064-1063	1
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, Electrolytic, 1 uF, 35V, Tantalum	064-1063	1
C25, C26	Capacitor, Electrolytic, 4.7 uF, 35V, Tantalum	064-4763	2
C29	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C33	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C35, C37, C38	Capacitor, Electrolytic, 1 uF, 35V, Tantalum	064-1063	3
C39	Capacitor, Mylar, 0.047 uF, 100V	030-4743	1
C40	Capacitor, Electrolytic, 1 uF, 35V, Tantalum	064-1063	1
C41	Capacitor, Mylar, 0.027 uF, 100V	030-2743	1
C42, C43	Capacitor, Mylar, 0.01 uF, 100V	030-1043	2
C44, C45	Capacitor, Ceramic, 0.01 uF, 100V	003-1013	2
C46	Capacitor, Ceramic, 470 pF $\pm 5\%$ , 200V	003-4713	1
C47	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C48	Capacitor, Ceramic, 0.047 uF $\pm 5\%$ , 50V	003-4733	1
C49	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C50	Capacitor, Mica, 1000 pF $\pm 5\%$ , 500V dc	041-1032	1
C51	Capacitor, Ceramic, 0.0068 uF, 100V	003-6823	1
C52	Capacitor, Ceramic, 0.047 uF $\pm 5\%$ , 50V	003-4733	1
C53	Capacitor, Mica, 1000 pF $\pm 5\%$ , 500V dc	041-1032	1
C54	Capacitor, Ceramic, 500 pF, 500V	041-5023	1
C55	Capacitor, Electrolytic, 4.7 uF, 35V, Tantalum	064-4763	1
C56	Capacitor, Ceramic, 0.0047 uF $\pm 10\%$ , 200V	032-4733	1
C57 THRU C59	Capacitor, Electrolytic, 1 uF, 35V, Tantalum	064-1063	3
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 CR24	Diode, 1N4148, Silicon, 75V @ 0.3 Ampere	203-4148	21
IC1	Integrated Circuit, RC4739, Low Noise, Linear Operational Amplifier, 14-Pin DIP	221-2310	1
IC2 THRU IC5	Integrated Circuit, RC4558, Dual Operational Amplifier, 8-Pin DIP	221-4558	4
IC6	Integrated Circuit, LM3900, Quad Operational Amplifier, 14-Pin DIP	221-3900	1
L1	Choke, 100 mH, 125 mA	364-1662	1
Q3	Transistor, GES5817, Silicon, PNP, TO-92 Case	210-5817	1
Q4	Transistor, GES5816, Silicon, NPN, TO-92 Case	211-5816	1
Q5, Q6	Transistor, 2N5457, N-Channel, JFET, TO-92 Case	212-5457	2
Q7	Transistor, 2N5462, P-Channel, JFET, TO-92 Case	212-5462	1
Q8, Q9	Transistor, MPS6566, Silicon, NPN, TO-92 Case	211-6566	2
Q10	Transistor, 2N5462, P-Channel, JFET, TO-92 Case	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
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, 7.5 k Ohm $\pm 5\%$ , 1/4W	100-7543	1

TABLE 6-7. MONOPHONIC/STEREOPHONIC PLAYBACK LOGIC WITH FAST FORWARD AND CUE TONE  
CIRCUIT BOARD ASSEMBLIES - 914-1531, 914-1571 (Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
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 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
R48	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	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, 4640 Ohm $\pm 1\%$ , 1/4W	103-4641	1
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, 56.2 k Ohm $\pm 1\%$ , 1/4W	103-5651	2
R86	Resistor, 2210 Ohm $\pm 1\%$ , 1/4W	103-2241	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, 56.2 k Ohm $\pm 1\%$ , 1/4W	103-5651	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
----	Socket, 14-Pin DIP	417-1404	2
----	Socket, 8-Pin DIP	417-0804	4
----	Blank Circuit Board	514-1501	1

ADDITIONAL PARTS FOR ASSEMBLY  
914-1531

C7,C9	Capacitor, Mica, 150 pF, 500V	040-1522	2
C10,C12,C16, C19,C26,C27, C30,C34,C36	Capacitor, Electrolytic, 47 uF, 35V, Tantalum	064-4763	9
----	Turret Terminal, Printed Circuit Board Disconnect	418-0161	6

TABLE 6-7. MONOPHONIC/STEREOPHONIC PLAYBACK LOGIC WITH FAST FORWARD AND CUE TONE  
CIRCUIT BOARD ASSEMBLIES - 914-1531, 914-1571 (Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
ADDITIONAL PARTS FOR ASSEMBLY 914-1571			
C4 THRU C6	Capacitor, Ceramic, 0.0047 uF $\pm 10\%$ , 200V	032-4733	3
C7 THRU C9	Capacitor, Mica, 82 pF $\pm 5\%$ , 500V	042-8212	3
C10,C12,C16	Capacitor, Electrolytic, 4.7 uF, 35V	024-4753	3
C17	Capacitor, Electrolytic, 1 uF, 35V, Tantalum	064-1063	1
C18,C19	Capacitor, Electrolytic, 4.7 uF, 35V	024-4753	2
C21	Capacitor, Electrolytic, 100 uF, 25V	023-1083	1
C25 THRU	Capacitor, Electrolytic, 4.7 uF, 35V	024-4753	6
C28,C30,C31			
C32	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C34,C36	Capacitor, Electrolytic, 4.7 uF, 35V	024-4753	2
CR1 THRU	Diode, 1N4148, Silicon, 75V @ 0.3 Ampere	203-4148	3
CR3			
Q1	Transistor, GES5816, Silicon, NPN, TO-92 Case	211-5816	1
Q2	Transistor, GES5817, Silicon, PNP, TO-92 Case	210-5817	1
Q6	Transistor, 2N5457, N-Channel, JFET, TO-92 Case	212-5457	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
R6	Potentiometer, 10 k Ohm $\pm 10\%$ , 1/2W	178-1054	1
R11	Resistor, 150 k Ohm $\pm 5\%$ , 1/4W	100-1563	1
R13	Resistor, 10 Ohm $\pm 5\%$ , 1/4W	100-1023	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	Resistor, 820 Ohm $\pm 5\%$ , 1/4W	100-8233	1
R38	Resistor, 330 k Ohm $\pm 5\%$ , 1/4W	100-3363	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
----	Turret Terminal, Printed Circuit Board Disconnect	418-0161	9

TABLE 6-8. MONOPHONIC/STEREOPHONIC RECORD CONTROL AND TONE GENERATOR WITH CUE TONE  
CIRCUIT BOARD ASSEMBLIES - 914-1513, 914-1533 (Sheet 1 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C7	Capacitor, Electrolytic, 1 uF $\pm 10\%$ , 35V, Tantalum	064-1063	1
C11	Capacitor, Electrolytic, 33 uF, 35V	024-3335	1
C12	Capacitor, Electrolytic, 1 uF $\pm 10\%$ , 35V, Tantalum	064-1063	1
C13	Capacitor, Ceramic, 2200 pF $\pm 10\%$ , 200V	030-2033	1
C14,C15	Capacitor, Mylar, 0.039 uF, 100V	030-3942	2
C16,C17	Capacitor, Mylar, 0.01 uF, 100V	030-1043	2
C18 THRU	Capacitor, Electrolytic, 1 uF $\pm 10\%$ , 35V, Tantalum	064-1063	3
C20			
C21	Capacitor, Mylar, 0.01 uF, 100V	030-1043	1
C22,C23	Capacitor, Mylar, 0.15 uF, 100V	030-1553	2
C24,C25	Capacitor, Mylar, 0.0033 uF, 100V	030-3333	2
C26	Capacitor, Mica, 500 pF, 500V	041-5023	1
C27	Capacitor, Mylar, 0.1 uF $\pm 10\%$ , 100V	030-1053	1
C28	Capacitor, Electrolytic, 1 uF $\pm 10\%$ , 35V, Tantalum	064-1063	1
C30	Capacitor, Electrolytic, 1 uF $\pm 10\%$ , 35V, Tantalum	064-1063	1
CR1	Diode, 1N4148, Silicon, 75V @ 0.3 Ampere	203-4148	1
CR2 THRU	Diode, 1N98, Germanium, 80V @ 0.2 Ampere	202-0098	4
CR5			
CR7 THRU	Diode, 1N4148, Silicon, 75V @ 0.3 Ampere	203-4148	19
CR9,CR14 THRU CR29			
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

TABLE 6-8. MONOPHONIC/STEREOPHONIC RECORD CONTROL AND TONE GENERATOR WITH CUE TONE  
CIRCUIT BOARD ASSEMBLIES - 914-1513, 914-1533 (Sheet 2 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
Q1	Transistor, 2N5457, N-Channel, JFET, TO-92 Case	212-5457	1
Q2	Transistor, 2N5462, P-Channel, JFET, TO-92 Case	212-5462	1
Q5	Transistor, MPS6566, Silicon, NPN, TO-92 Case	211-6566	1
Q7	Transistor, GES5816, Silicon, NPN, TO-92 Case	211-5816	1
Q8,Q9	Transistor, MPS6566, Silicon, NPN, TO-92 Case	211-6566	2
Q10,Q11	Transistor, 2N5457, N-Channel, JFET, TO-92 Case	212-5457	2
Q12,Q13	Transistor, GES5816, Silicon, NPN, TO-92 Case	211-5816	2
Q14	Transistor, MPS6566, Silicon, NPN, TO-92 Case	211-6566	1
Q15	Transistor, 2N5457, N-Channel, JFET, TO-92 Case	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 R8	Potentiometer, 10 k Ohm $\pm 10\%$ , 1/2W	178-1054	3
R9	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	1
R10	Potentiometer, 5 k Ohm $\pm 10\%$ , 1/2W	177-5044	1
R11	Potentiometer, 2 k Ohm $\pm 10\%$ , 1/2W	177-2044	1
R12	Potentiometer, 5 k Ohm $\pm 10\%$ , 1/2W	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, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	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, 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 Ohms $\pm 5\%$ , 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



TABLE 6-8. MONOPHONIC/STEREOPHONIC RECORD CONTROL AND TONE GENERATOR WITH CUE TONE  
CIRCUIT BOARD ASSEMBLIES - 914-1513, 914-1533 (Sheet 3 of 3)

REF. DES.	DESCRIPTION	PART NO.	QTY.
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, Slide, 300 mA @ 125V ac (ON/OFF - 1kHz Record)	345-0120	1
----	Socket, 8-Pin DIP	417-0804	1
----	Socket, 14-Pin DIP	417-1404	2
----	Blank Circuit Board	514-1503	1

ADDITIONAL PARTS FOR ASSEMBLY  
914-1513

C1,C5,C6, C10,C29	Capacitor, Electrolytic, 4.7 $\mu\text{F} \pm 10\%$ , 35V Tantalum	064-4763	5
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ADDITIONAL PARTS FOR ASSEMBLY  
914-1533

C1,C3,C5,C6	Capacitor, Electrolytic, 4.7 $\mu\text{F}$ , 35V	024-4753	4
C8	Capacitor, Electrolytic, 1 $\mu\text{F} \pm 10\%$ , 35V, Tantalum	064-1063	1
C9,C10,C29	Capacitor, Electrolytic, 4.7 $\mu\text{F}$ , 35V	024-4753	3
C31	Capacitor, Electrolytic, 1 $\mu\text{F} \pm 10\%$ , 35V, Tantalum	064-1063	1
CR6	Diode, 1N4148, Silicon, 75V @ 0.3 Ampere	203-4148	1
CR10 THRU CR13	Diode, 1N98, Germanium, 80V @ 0.2 Ampere	202-0098	4
Q3	Transistor, 2N5457, N-Channel, JFET, TO-92 Case	212-5457	1
Q4	Transistor, 2N5462, P-Channel, JFET, TO-92 Case	212-5462	1
R3,R4	Potentiometer, 50 k Ohm $\pm 10\%$ , 1/2W	178-5054	2
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

TABLE 6-9. MONOPHONIC AND STEREOPHONIC RECORD AMPLIFIER/BIAS CIRCUIT BOARD ASSEMBLIES  
910-1049, 910-1050 (Sheet 1 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1,C2	Capacitor, Electrolytic, 100 $\mu\text{F}$ , 25V	023-1083	2
C3	Capacitor, Electrolytic, 4.7 $\mu\text{F}$ , 35V	024-4764	1
C4	Capacitor, Electrolytic, 47 $\mu\text{F}$ , 16V	013-4750	1
C5,C6	Capacitor, Electrolytic, 10 $\mu\text{F}$ , 35V	023-1076	2
C7	Capacitor, Mylar, 0.1 $\mu\text{F} \pm 10\%$ , 100V	030-1053	1
C8	Capacitor, Ceramic, 10 pF $\pm 10\%$ , 1kV, Non-Polarized	001-1014	1
C9	Capacitor, Mica, 150 pF $\pm 5\%$ , 500V	040-1522	1
C10	Capacitor, Electrolytic, 1 $\mu\text{F}$ , 50V	024-1064	1
C11	Capacitor, Electrolytic, 4.7 $\mu\text{F}$ , 35V	024-4764	1
C12	Capacitor, Ceramic, 0.01 $\mu\text{F} \pm 10\%$ , 200V	030-1043	1
C13	Capacitor, Electrolytic, 1 $\mu\text{F}$ , 50V	024-1064	1
C14	Capacitor, Mica, 220 pF $\pm 5\%$ , 500V	040-2223	1
C15	Capacitor, Mica, 150 pF $\pm 5\%$ , 500V	040-1522	1
C16	Capacitor, Electrolytic, 4.7 $\mu\text{F}$ , 35V	024-4764	1
C17	Capacitor, Electrolytic, 33 $\mu\text{F}$ , 35V	024-3335	1
C18	Capacitor, Electrolytic, 4.7 $\mu\text{F}$ , 35V	024-4764	1
C19	Capacitor, Mylar, 0.1 $\mu\text{F}$ , 100V	030-1053	1
C20	Capacitor, Electrolytic, 33 $\mu\text{F}$ , 35V	024-3335	1
C36 THRU C38	Capacitor, Ceramic, 0.0047 $\mu\text{F} \pm 10\%$ , 200V	032-4733	3
C39	Capacitor, Mylar, 0.02 $\mu\text{F}$ , 100V	030-2043	1
C40	Capacitor, Electrolytic, 33 $\mu\text{F}$ , 35V	024-3335	1
C41	Capacitor, Mica, 220 pF $\pm 5\%$ , 500V	040-2223	1

TABLE 6-9. MONOPHONIC AND STEREOPHONIC RECORD AMPLIFIER/BIAS CIRCUIT BOARD ASSEMBLIES  
910-1049, 910-1050 (Sheet 2 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
C42	Capacitor, Mica, 150 pF $\pm 5\%$ , 500V	040-1522	1
C43	Capacitor, Electrolytic, 33 $\mu$ F, 35V	024-3335	1
C44	Capacitor, Mylar, 0.1 $\mu$ F $\pm 10\%$ , 100V	030-1053	1
C45	Capacitor, Mica, 22 pF $\pm 5\%$ , 500V	040-2213	1
D1,D2	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes, Fast Switching	203-4148	2
D3	Diode, Zener, 1N4739A, 9.1V $\pm 5\%$ , 1W	200-0009	1
D5	Diode, 1N4148, Silicon, 75V @ 0.3 Amperes, Fast Switching	203-4148	1
D6	Diode, Zener, 1N4739A, 9.1V $\pm 5\%$ , 1W	200-0009	1
J4 THRU J6, J10 THRU J12	Pins, Disconnect, Male, Circuit Board Mount	418-0161	6
L1,L3	Adjustable Shielded Coil, 8-20 mH	363-9061	2
LDR1	Optical Isolator, LDR/LED Type, VTL5C2 On Resistance: 500 Ohms Off Resistance: 1 Meg Ohm Cell Voltage: 200V Maximum Cell Current: 10 to 40 mA	323-7345	1
Q1	Transistor, MPS6566, Silicon, NPN, Small Signal, TO-92 Case	211-6566	1
Q2	Transistor, 2N5462, JFET, P-Channel, 40V, TO-92 Case	212-5462	1
Q3	Transistor, PN3644, Silicon, PNP, TO-92 Case	210-3644	1
Q4,Q5	Transistor, GES5816, Silicon, NPN, Small Signal, TO-18 Case	211-5816	2
Q9,Q10	Transistor, 2N3053, Silicon, NPN, TO-5 Case	211-3053	2
Q11	Transistor, GES5817, Silicon, PNP, TO-92 Case	210-5817	1
Q12,Q13	Transistor, GES5816, Silicon, NPN, Small Signal, TO-18 Case	211-5816	2
Q14	Transistor, 2N3904, Silicon, NPN, TO-92 Case	211-3904	1
R1,R2	Resistor, 18 k Ohm $\pm 5\%$ , 1/4W	100-1853	2
R3	Resistor, 62 k Ohm $\pm 5\%$ , 1/4W	100-6253	1
R4	Resistor, 8.2 k Ohm $\pm 5\%$ , 1/4W	100-8243	1
R5	Resistor, 470 Ohm $\pm 5\%$ , 1/4W	100-4733	1
R6	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R7	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R8	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R9	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R10	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R11	Resistor, 2.2 k Ohm $\pm 5\%$ , 1/4W	100-2243	1
R12	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R13	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R14	Potentiometer, 250 k Ohm $\pm 10\%$ , 1/2W	180-0001	1
R15,R16	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R17	Resistor, 240 k Ohm $\pm 5\%$ , 1/4W	100-2463	1
R18	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R19	Potentiometer, 100 k Ohm $\pm 10\%$ , 1/2W	178-1064	1
R20	Resistor, 240 k Ohm $\pm 5\%$ , 1/4W	100-2463	1
R21	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R22	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R23	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R24	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R25	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R26	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R27	Resistor, 1 Meg Ohm $\pm 5\%$ , 1/4W	100-1073	1
R28	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R29	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R30	Resistor, 5.6 k Ohm $\pm 5\%$ , 1/4W	100-5643	1
R31	Potentiometer, 250 k Ohm $\pm 10\%$ , 1/2W	180-0001	1
R32	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R33	Resistor, 8.2 k Ohm $\pm 5\%$ , 1/4W	100-8243	1
R34	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R35	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R63,R64	Resistor, 12 Ohm $\pm 5\%$ , 1/4W	100-1223	2
R65,R66	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	2
R67,R68	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	2
R69	Potentiometer, 250 k Ohm $\pm 10\%$ , 1/2W	180-0001	1
R70	Resistor, 5.6 k Ohm $\pm 5\%$ , 1/4W	100-5643	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, 47 k Ohm $\pm 5\%$ , 1/4W	100-4753	1
R75	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1

TABLE 6-9. MONOPHONIC AND STEREOHONIC RECORD AMPLIFIER/BIAS CIRCUIT BOARD ASSEMBLIES  
910-1049, 910-1050 (Sheet 3 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
R77	Resistor, 4.7 k Ohm $\pm 5\%$ , 1/4W	100-4743	1
R78,R79	Resistor, 470 Ohm $\pm 5\%$ , 1/2W	110-4733	2
S1	Switch, Slide, MSS1200R, SPDT, 300 mA @ 125V ac (Gain Switch)	345-0120	1
T1	Transformer, Audio Input, 0.5 k $\Omega$ , 30 Hz to 20 kHz Dual Primary: 150 Ohm and 15 k Ohm Secondary: 60 k Ohm	370-0020	1
T3	Transformer, Bias Oscillator, BE Manufactured, 100 kHz $\pm 5\%$ , dc Supply, 24V dc $\pm 0.1\%$	370-0095	1
TP1,TP3	Pin, Amplifier Disconnect	418-0161	2
U1 THRU U3	Integrated Circuit, TL072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	3
XU1 THRU XU3	Socket, 8-Pin DIP	417-0804	3
----	Transistor Mounting Pads (for Q9, Q10)	409-0005	2
----	Blank Circuit Board	510-1050	1

ADDITIONAL PARTS FOR STEREOHONIC CIRCUIT  
BOARD ONLY - 910-1050

C21	Capacitor, Electrolytic, 100 $\mu$ F, 25V	023-1083	1
C22	Capacitor, Electrolytic, 4.7 $\mu$ F, 35V	024-4764	1
C23	Capacitor, Electrolytic, 47 $\mu$ F, 16V	013-4750	1
C24,C25	Capacitor, Electrolytic, 10 $\mu$ F, 35V	023-1076	2
C26	Capacitor, Mylar, 0.1 $\mu$ F, 100V	030-1053	1
C27	Capacitor, Ceramic, 10 pF $\pm 10\%$ , 1kV, Non-Polarized	001-1014	1
C28	Capacitor, Mica, 150 pF $\pm 5\%$ , 500V	040-1522	1
C29	Capacitor, Electrolytic, 1 $\mu$ F, 50V	024-1064	1
C30	Capacitor, Electrolytic, 4.7 $\mu$ F, 35V	024-4764	1
C31	Capacitor, Ceramic, 0.01 $\mu$ F $\pm 10\%$ , 200V	030-1043	1
C32	Capacitor, Mica, 220 pF $\pm 5\%$ , 500V	040-2223	1
C33	Capacitor, Mica, 150 pF $\pm 5\%$ , 500V	040-1522	1
C34	Capacitor, Electrolytic, 33 $\mu$ F, 35V	024-3335	1
C35	Capacitor, Mylar, 0.1 $\mu$ F, 100V	030-1053	1
C46	Capacitor, Mica, 22 pF, 500V	040-2213	1
D4	Diode, Zener, 1N4739A, 9.1V $\pm 5\%$ , 1W	200-0009	1
J7 THRU J9	Pin, Disconnect, Male, Printed Circuit Board Mount	418-0161	3
L2	Adjustable Shielded Coil, 8-20 $\mu$ H	363-9061	1
Q6	Transistor, MPS6566, Silicon, NPN, Small Signal, TO-92 Case	211-6566	1
Q7	Transistor, 2N5462, JFET, P-Channel, 40V, TO-92 Case	212-5462	1
Q8	Transistor, GES5816, Silicon, NPN, Small Signal, TO-18 Case	211-5816	1
R36,R37	Resistor, 18 k Ohm $\pm 5\%$ , 1/4W	100-1853	2
R38	Resistor, 62 k Ohm $\pm 5\%$ , 1/4W	100-6253	1
R39	Resistor, 8.2 k Ohm $\pm 5\%$ , 1/4W	100-8243	1
R40	Resistor, 470 Ohm $\pm 5\%$ , 1/4W	100-4733	1
R41	Resistor, 27 k Ohm $\pm 5\%$ , 1/4W	100-2753	1
R42	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R43	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R44	Resistor, 2.2 k Ohm $\pm 5\%$ , 1/4W	100-2243	1
R45	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R46	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R47	Potentiometer, 250 k Ohm $\pm 10\%$ , 1/2W	180-0001	1
R48,R49	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	2
R50	Resistor, 240 k Ohm $\pm 5\%$ , 1/4W	100-2463	1
R51	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R52	Potentiometer, 100 k Ohm $\pm 10\%$ , 1/2W	178-1064	1
R53	Resistor, 240 k Ohm $\pm 5\%$ , 1/4W	100-2463	1
R54	Resistor, 270 k Ohm $\pm 5\%$ , 1/4W	100-2763	1
R55	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R56	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1
R57	Resistor, 1 k Ohm $\pm 5\%$ , 1/4W	100-1043	1
R58	Resistor, 2.7 k Ohm $\pm 5\%$ , 1/4W	100-2743	1
R59	Resistor, 100 k Ohm $\pm 5\%$ , 1/4W	100-1063	1
R60	Resistor, 5.6 k Ohm $\pm 5\%$ , 1/4W	100-5643	1
R61	Potentiometer, 250 k Ohm $\pm 10\%$ , 1/2W	180-0001	1
R62	Resistor, 22 k Ohm $\pm 5\%$ , 1/4W	100-2253	1
R76	Resistor, 10 k Ohm $\pm 5\%$ , 1/4W	100-1053	1

TABLE 6-9. MONOPHONIC AND STEREOPHONIC RECORD AMPLIFIER/BIAS CIRCUIT BOARD ASSEMBLIES  
910-1049, 910-1050 (Sheet 4 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
ADDITIONAL PARTS FOR STEREOPHONIC CIRCUIT BOARD ONLY - 910-1050 (Cont'd)			
S2	Switch, Slide, MSS1200R, SPST, 300 mA @ 125V ac (Gain Switch)	345-0120	1
Y2	Transformer, Audio Input, 0.5 dB, 30 Hz to 20 kHz Dual Primary: 150 Ohm and 15 k Ohm Secondary: 60 k Ohm	370-0020	1
YP2	Pin, Amplifier Disconnect	418-0161	1
U4	Integrated Circuit, YL072CP, Dual JFET-Input Operational Amplifier, 8-Pin DIP	221-0072	1
XU4	Socket, 8-Pin DIP	417-0804	1

TABLE 6-10. 3000A BASIC ASSEMBLIES - 950-3100, 950-320X-XXX, 950-340X-XXX  
(Sheet 1 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
J4	Connector, 6-Pin (PLAYOUT)	418-0302	1
J5	Connector, 24-Pin (REMOTE)	418-0303	1
J6	Phone Jack, 1/4 Inch (0.635 cm), 3-Conductor	417-0311	1
IC1	Integrated Circuit, MC7824CK, Fixed Positive Voltage Regulator, +24V @ 1.0A, TO-3 Case	227-7824	1
Q1	Transistor, 2N3055, Silicon, NPN, Power, TO-3 Case	219-3055	1
R3	Resistor, 3.3 Ohm $\pm 5\%$ , 2W, W/W	122-3313	1
S1	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (START Switch/Indicator)	343-0150	1
S3	Switch, Rocker, SPDT, (ON Switch) 5 Amperes @ 120V ac/28V dc 2 Amperes @ 250V ac	340-0088	1
S4	Switch, Toggle, SPDT, (FAST FORWARD Switch) 5 Amperes @ 120V ac/28V dc 2 Amperes @ 250V ac	340-0087	1
XF1	Fuse Holder, AGC	415-2012	1
----	Switch Cap, Green	343-0152	1
----	Switch Cap, White	343-0014	2
----	Capacitor, Electrolytic, 33 $\mu$ F, 35V	024-3335	1
----	Power Cord, N.E.M.A., 3-Wire North American Plug (for 117V ac 60 Hz Assemblies)	681-1723	1
----	Socket, Transistor, TO-3	417-0298	2
----	Insulator, Transistor Mounting, TO-3	418-0010	1
----	Power Transformer Assembly	950-7656	1
----	Power Supply Circuit Board Assembly	914-1535-1	1

ADDITIONAL PARTS FOR 3100A ASSEMBLIES  
950-3100-000

S2	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (STOP Switch/Indicator)	343-0012	1
Y2	Transformer, Audio Output, 8-Pin Package Dual Primary: 600 Ohm/150 Ohm impedance Dual Secondary: 2 k Ohm/500 Ohm impedance Maximum Level: +15 dBm Frequency Response: $\pm 1$ dB, 50 Hz to 15 kHz	370-0025	1
----	Switch Cap, Yellow	340-0096	1
----	Subminiature Lamp, #327, Y-1 3/4 Base, 28V @ 0.040 Amperes	321-0327	4
----	Lamp Holder	324-0125	2
----	Receptacle, Circuit Board, 22-Pin	417-2100	2
----	Connector, Key	417-2101	1
----	Overlay, Front-Panel, Monophonic, Playback, 3100A Series	595-0069	1
----	Guides, Circuit Board	409-0020	2
----	3100A Cable Assembly	940-3113-001	1
----	Assembly Deck Parts, A Size	950-0300-006	1

TABLE 6-10. 3000A BASIC ASSEMBLIES - 950-3100, 950-320X-XXX, 950-340X-XXX  
(Sheet 2 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
ADDITIONAL PARTS FOR 3200A ASSEMBLIES 950-3200-000			
S2	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (STOP Switch/Indicator)	343-0012	1
Y2	Transformer, Audio Output, 8-Pin Package Dual Primary: 600 Ohm/150 Ohm impedance Dual Secondary: 2 k Ohm/500 Ohm impedance Maximum Level: +15 dBm Frequency Response: $\pm 1$ dB, 50 Hz to 15 kHz	370-0025	1
----	Switch Cap, Yellow	340-0096	1
----	Subminiature Lamp, #327, Y-1 3/4 Base, 28V @ 0.040 Amperes	321-0327	4
----	Lamp Holder	324-0125	2
----	Receptacle, Circuit Board, 22-Pin	417-2100	2
----	Overlay, Front-Panel, Monophonic, Playback, 3200A Series	595-0022	1
----	Guides, Circuit Board	409-0020	2
----	3200A Cable Assembly	940-3415-001	1
----	Assembly Deck Parts, B Size	950-0300-007	1
ADDITIONAL PARTS FOR 3200ARP ASSEMBLIES 950-3201-000			
M1	Meter, VU, 1.5 inch (3.81 cm) dc Microammeter Type, 200 uA movement, 225 Ohm resistance	319-0081	1
R1	Potentiometer, Log Taper, Type W, 10 k Ohm $\pm 10\%$ , 1/2W (LEVEL Control)	191-1053	1
S2	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (STOP Switch/Indicator)	343-0012	1
S5 THRU S7	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (RECORD, SEC, and YER Switch/Indicators)	343-0012	3
Y2	Transformer, Audio Output, 8-Pin Package Dual Primary: 600 Ohm/150 Ohm impedance Dual Secondary: 2 k Ohm/500 Ohm impedance Maximum Level: +15 dBm Frequency Response: $\pm 1$ dB, 50 Hz to 15 kHz	370-0025	1
----	Switch Cap, Yellow	340-0096	2
----	Subminiature Lamp, #327, Y-1 3/4 Base, 28V @ 0.040 Amperes	321-0327	5
----	Receptacle, Circuit Board, 22-Pin	417-2100	4
----	Knob, Rogan, Black, 1/4 Inch ID (0.64 cm)	481-0021	1
----	Plug, Connector, 6-Pin (RECORD Connector)	418-0301	1
----	Overlay, Front-Panel, Monophonic, Record/Playback, 3200A Series	595-0020	1
----	Guides, Circuit Board	409-0020	6
----	3201A Cable Assembly	940-3414-001	1
----	Assembly Deck Parts, B Size	950-0300-007	1
ADDITIONAL PARTS FOR 3200ARPS ASSEMBLIES 950-3203-001			
M1,M2	Meter, VU, 1.5 inch (3.81 cm) dc Microammeter Type, 200 uA movement, 225 Ohm resistance	319-0081	2
R1,R2	Potentiometer, Log Taper, Type W, 10 k Ohm $\pm 10\%$ , 1/2W (LEVEL Control)	191-1053	2
S2	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (STOP Switch/Indicator)	343-0012	4
S5 THRU S7	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (RECORD, SEC, and YER Switch/Indicators)	343-0012	3
Y2,Y3	Transformer, Audio Output, 8-Pin Package Dual Primary: 600 Ohm/150 Ohm impedance Dual Secondary: 2 k Ohm/500 Ohm impedance Maximum Level: +15 dBm Frequency Response: $\pm 1$ dB, 50 Hz to 15 kHz	370-0025	2
----	Switch Cap, Yellow	340-0096	2
----	Subminiature Lamp, #327, Y-1 3/4 Base, 28V @ 0.040 Amperes	321-0327	5
----	Receptacle, Circuit Board, 22-Pin	417-2100	4

TABLE 6-10. 3000A BASIC ASSEMBLIES - 950-3100, 950-320X-XXX, 950-340X-XXX  
(Sheet 3 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
ADDITIONAL PARTS FOR 3200ARPS ASSEMBLIES 950-3203-001 (Cont'd)			
----	Knob, Rogan, Black, 1/4 Inch ID (0.64 cm)	481-0021	2
----	Plug, Connector, 6-Pin (RECORD Connector)	418-0301	1
----	Overlay, Front-Panel, Stereophonic, Record/Playback,	595-0009	1
----	Guides, Circuit Board	409-0020	6
----	3203A Cable Assembly	940-3102-001	1
----	Assembly Deck Parts, B Size	950-0300-007	1
ADDITIONAL PARTS FOR 3400A ASSEMBLIES 950-3400-000			
S2	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (STOP Switch/Indicator)	343-0012	1
T2	Transformer, Audio Output, 8-Pin Package Dual Primary: 600 Ohm/150 Ohm impedance Dual Secondary: 2 k Ohm/500 Ohm impedance Maximum Level: +15 dBm Frequency Response: ±1 dB, 50 Hz to 15 kHz	370-0025	1
----	Switch Cap, Yellow	340-0096	1
----	Subminiature Lamp, #327, T-1 3/4 Base, 28V @ 0.040 Amperes	321-0327	4
----	Lamp Holder	324-0125	2
----	Receptacle, Circuit Board, 22-Pin	417-2100	2
----	Guides, Circuit Board	409-0020	2
----	3400A Cable Assembly	940-3409-001	1
----	Assembly Deck Parts, C Size	950-0300-008	1
ADDITIONAL PARTS FOR 3400ARP ASSEMBLIES 950-3401-000			
M1	Meter, VU, 1.5 inch (3.81 cm) dc Microammeter Type, 200 uA movement, 225 Ohm resistance	319-0081	1
R1	Potentiometer, Log Taper, Type W, 10 k Ohm ±10%, 1/2W (LEVEL Control)	191-1053	1
S2,S5 THRU S7	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (STOP, RECORD, SEC, and TIE Switch/Indicators)	343-0012	4
T2	Transformer, Audio Output, 8-Pin Package Dual Primary: 600 Ohm/150 Ohm impedance Dual Secondary: 2 k Ohm/500 Ohm impedance Maximum Level: +15 dBm Frequency Response: ±1 dB, 50 Hz to 15 kHz	370-0025	1
----	Switch Cap, Yellow	340-0096	2
----	Subminiature Lamp, #327, T-1 3/4 Base, 28V @ 0.040 Amperes	321-0327	5
----	Receptacle, Circuit Board, 22-Pin	417-2100	4
----	Knob, Rogan, Black, 1/4 Inch ID (0.64 cm)	481-0021	1
----	Plug, Connector, 6-Pin (RECORD Connector)	418-0301	1
----	Guides, Circuit Board	409-0020	6
----	3401A Cable Assembly	940-3411-001	1
----	Assembly Deck Parts, C Size	950-0300-008	1
ADDITIONAL PARTS FOR 3400ARPS ASSEMBLIES 950-3403-001			
M1,M2	Meter, VU, 1.5 inch (3.81 cm) dc Microammeter Type, 200 uA movement, 225 Ohm resistance	319-0081	2
R1,R2	Potentiometer, Log Taper, Type W, 10 k Ohm ±10%, 1/2W (LEVEL Controls)	191-1053	2
S2,S5 THRU S7	Switch, Push, Illuminated, SPST N.O., 3A @ 125V ac/30V dc (STOP, RECORD, SEC, and TIE Switch/Indicators)	343-0012	4
T2,T3	Transformer, Audio Output, 8-Pin Package Dual Primary: 600 Ohm/150 Ohm impedance Dual Secondary: 2 k Ohm/500 Ohm impedance Maximum Level: +15 dBm Frequency Response: ±1 dB, 50 Hz to 15 kHz	370-0025	2

TABLE 6-10. 3000A BASIC ASSEMBLIES - 950-3100, 950-320X-XXX, 950-340X-XXX  
(Sheet 4 of 4)

REF. DES.	DESCRIPTION	PART NO.	QTY.
ADDITIONAL PARTS FOR 3400ARPS ASSEMBLIES 950-3403-001 (Cont'd)			
----	Switch Cap, Yellow	340-0096	2
----	Subminiature Lamp, #327, T-1 3/4 Base, 28V @ 0.040 Amperes	321-0327	5
----	Receptacle, Circuit Board, 22-Pin	417-2100	4
----	Knob, Rogan, Black, 1/4 Inch ID (0.64 cm)	481-0021	2
----	Plug, Connector, 6-Pin (RECORD Connector)	418-0301	1
----	Guides, Circuit Board	409-0020	6
----	3403A Cable Assembly	940-3412-001	1
----	Assembly Deck Parts, C Size	950-0300-008	1

TABLE 6-11. 3000A BASIC CABLE ASSEMBLIES - 940-3113-001, 940-3409-001, 940-3415-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Connector, Pins	417-0160	9

TABLE 6-12. 3000A BASIC CABLE ASSEMBLIES - 940-3411-001, 940-3414-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Connector, Pins	417-0160	12

TABLE 6-13. 3000A BASIC CABLE ASSEMBLIES - 940-3102-001, 940-3412-001

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Connector, Pins	417-0160	18

TABLE 6-14. 3000A DECK ASSEMBLIES - 950-0300-006, 950-0300-007, 950-0300-008  
(Sheet 1 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
K1	Solenoid, 32V dc, 1.75 Diameter, Resistance: 37.5 Ohm $\pm 10\%$	280-0003	1
S8	Switch, Micro, Roller Actuator, SPDT, 5 Amperes @ 125V ac	346-0027	1
----	Pressure Roller	444-0700	1
----	Pressure Roller Shaft	446-0056	1
----	Pressure Roller Cross Shaft	446-0059	1
----	Retainer, "E" Ring	454-3318	1
----	Solenoid Return Spring	430-0014	1
----	Cartridge Guide, Right	445-0006	1
----	Pressure Pad, Cartridge Guide	459-0123	2
----	Spring, Pressure Pad	430-0011	4
----	Spring, Left Cartridge Guide	430-0010	1
----	Washer, Nylon (for Pressure Roller)	423-5008	1
	Outside Diameter: 0.312 Inches (0.792 cm)		
	Inside Diameter: 0.190 Inches (0.483 cm)		
	Height: 0.010 Inches (0.254 cm)		
----	Washer, Nylon (for Pressure Roller)	423-5009	1
	Outside Diameter: 0.312 Inches (0.792 cm)		
	Inside Diameter: 0.190 Inches (0.483 cm)		
	Height: 0.015 Inches (0.381 cm)		

TABLE 6-14. 3000A DECK ASSEMBLIES - 950-0300-006, 950-0300-007, 950-0300-008  
(Sheet 2 of 2)

REF. DES.	DESCRIPTION	PART NO.	QTY.
ADDITIONAL PARTS FOR 950-0300-006			
----	Cartridge Guide, Left	445-0008	1
ADDITIONAL PARTS FOR 950-0300-007, 950-0300-008			
----	Cartridge Guide, Left	445-0007	1

TABLE 6-15. POWER SUPPLY CIRCUIT BOARD ASSEMBLY - 914-1535-1

REF. DES.	DESCRIPTION	PART NO.	QTY.
C1 THRU C4	Capacitor, Polypropylene Film, 0.47 $\mu$ F $\pm$ 10%, 600V	033-4763	4
C5	Capacitor, Electrolytic, 1000 $\mu$ F, 50V	014-1094	1
C7	Capacitor, Electrolytic, 2200 $\mu$ F, 50V	014-2294	1
C8	Capacitor, Electrolytic, 100 $\mu$ F, 40V	014-1084	1
C9	Capacitor, Electrolytic, 1 $\mu$ F $\pm$ 10%, 35V, Tantalum	064-1063	1
C10	Capacitor, Mylar, 0.047 $\mu$ F, 100V	030-4743	1
C11	Capacitor, Ceramic Disc, 0.01 $\mu$ F, 25V	000-1044	1
C12 THRU C15	Capacitor, Ceramic Disc, 0.1 $\mu$ F $\pm$ 20%, 1kV	001-1044	4
C16	Capacitor, Mylar, 0.01 $\mu$ F, 100V	031-1043	1
CR1,CR2	Diode, Bridge Rectifier, MDA970-3, Full Wave, 200V, 4 Ampere	239-0003	2
CR3 THRU CR15,CR17 THRU CR19	Diode, 1N4005, Rectifier, Silicon, 600V @ 1 Ampere	203-4005	16
CR20	Diode, Zener, 1N4739, Silicon, 9.1V $\pm$ 10%, 1W	200-0009	1
CR21	Diode, 1N4005, Rectifier, Silicon, 600V @ 1 Ampere	203-4005	1
IC1	Integrated Circuit, MC723CL, Adjustable Positive Voltage Regulator, 37V to 2V @ 150 mA, 14-Pin DIP	227-0723	1
J1,J2	Connector, 12-Pin (to Motor and Power Transformer)	417-1276	2
J3	Socket, Relay (for K1)	270-0031	1
K1	Relay, DPDT, 24V dc @ 1.2 Ampere	270-0029	1
K2,K3	Relay, SPDT, 24V @ 2 Ampere	270-0024	2
Q1	Silicon Controlled Rectifier, GE6CA, 100V @ 1.6 Ampere	237-0006	1
Q2	Transistor, GES5817, Silicon, PNP, TO-92 Case	210-5817	1
Q3	Transistor, 2N5462, P-Channel, JFET, TO-92 Case	212-5462	1
Q4 THRU Q7	Transistor, 2N5816, Silicon, NPN, TO-92 Case	211-5816	4
R1	Resistor, 8.2 k Ohm $\pm$ 5%, 1/4W	100-8243	1
R2	Resistor, 27 k Ohm $\pm$ 5%, 1/4W	100-2753	1
R3 THRU R5	Resistor, 10 k Ohm $\pm$ 5%, 1/4W	100-1053	3
R6	Resistor, 68 Ohm $\pm$ 5%, 1/2W	110-6823	1
R7	Resistor, 3.9 k Ohm $\pm$ 5%, 1/4W	100-3943	2
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	2
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 THRU R23	Resistor, 10 k Ohm $\pm$ 5%, 1/4W	100-1053	3
R24	Resistor, 4.7 k Ohm $\pm$ 5%, 1/4W	100-4743	1
S1	Switch, Slide, SPDT, 300 mA @ 125V ac (FF MAN/AUTO)	345-0120	1
X1C1	Socket, 14-Pin DIP	417-1404	1
XQ1	Transistor Socket	417-0330	1
----	Clip, Relay (for K1)	270-0032	1
----	Blank Circuit Board	514-1505-2	1



TABLE 6-16. POWER TRANSFORMER ASSEMBLY - 950-7656

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Transformer: Dual Primary: 115V to 108V @ 50/60 Hz Dual Secondary: 21V @ 1.3 Amperes, 23V @ 0.5 Amperes	376-7656	1
----	Connector Housing, 12-Pin	418-1271	1
----	Pins, Connector	417-0053	12

TABLE 6-17. 3000A PLAYBACK AND RECORD PACKING ASSEMBLY - 950-3000-022, 950-3000-023

REF. DES.	DESCRIPTION	PART NO.	QTY.
----	Plug, 6-Pin (OUTPUT Connector)	418-0304	1
----	Plug, 24-Pin (REMOTE Connector)	418-0306	1

## SECTION VII DRAWINGS

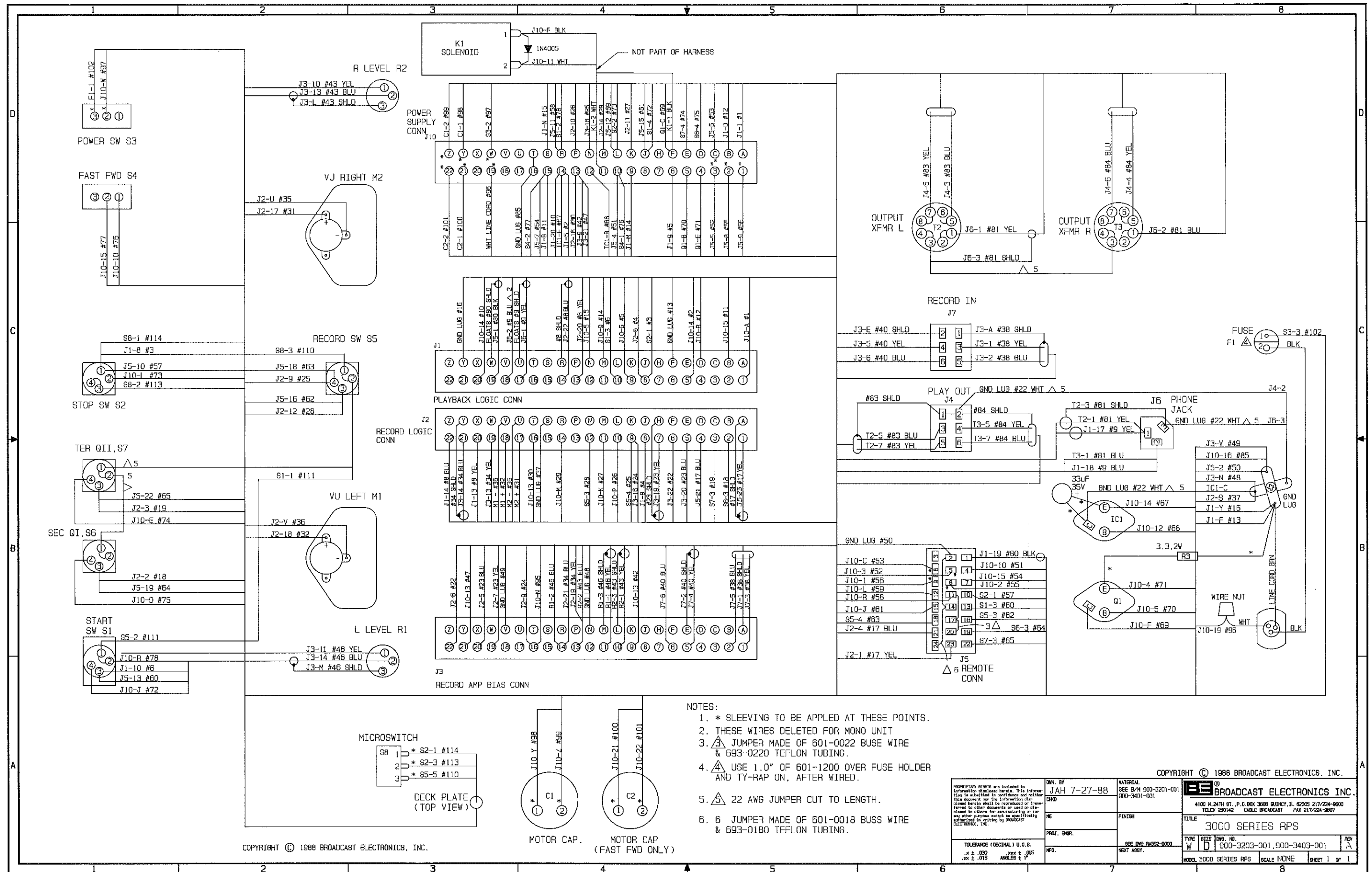
### 7-1.        INTRODUCTION.

7-2.        This section provides assembly drawings, wiring diagrams, and schematic diagrams as listed below for the Broadcast Electronics 3000A series cartridge machines.

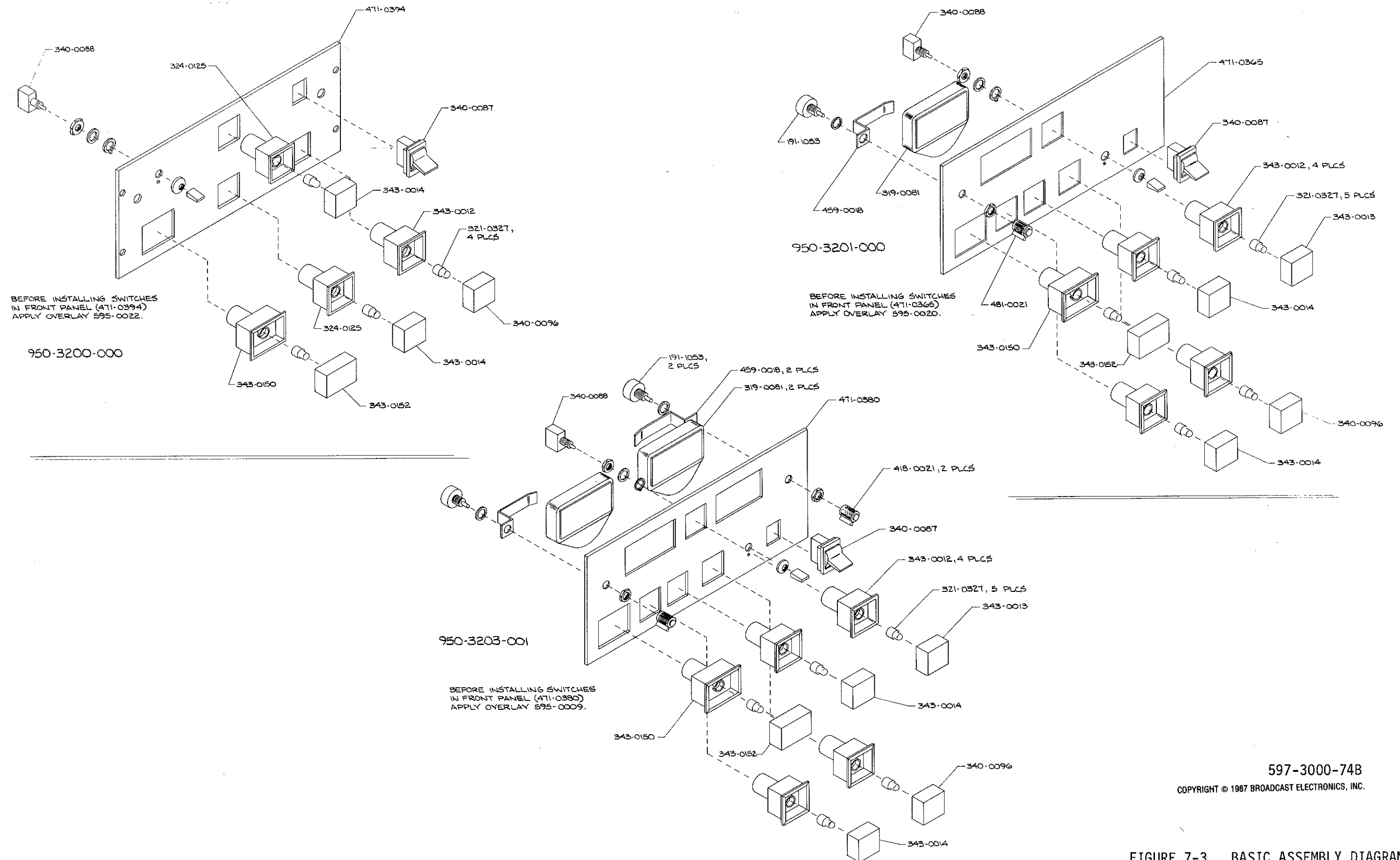
<u>FIGURE</u>	<u>TITLE</u>	<u>NUMBER</u>
7-1	3000A SERIES DIAGRAM SCHEMATIC	SD906-3141
7-2	3000A SERIES RPS WIRING DIAGRAM	WD900-3203-001, 900-3403-001
7-3	BASIC ASSEMBLY DIAGRAM, 3000A SERIES (5 Sheets)	597-3000-74
7-4	POWER SUPPLY CIRCUIT BOARD SCHEMATIC	SD906-3142-1
7-5	POWER SUPPLY CIRCUIT BOARD ASSEMBLY	AD914-1535-1
7-6	MONOPHONIC/STEREOPHONIC PLAYBACK LOGIC WITH FAST FORWARD AND CUE TONE CIRCUIT BOARD SCHEMATIC	SD906-3111
7-7	MONOPHONIC/STEREOPHONIC PLAYBACK LOGIC WITH FAST FORWARD AND CUE TONE CIRCUIT BOARD ASSEMBLY	AC914-1571
7-8	MONOPHONIC/STEREOPHONIC RECORD AMPLIFIER/BIAS CIRCUIT BOARD SCHEMATIC	SD910-1050, -1049, -1048
7-9	MONOPHONIC/STEREOPHONIC RECORD AMPLIFIER/BIAS CIRCUIT BOARD ASSEMBLY	AC910-1050, -1049, -1048
7-10	MONOPHONIC/STEREOPHONIC RECORD LOGIC AND TONE GENERATOR CIRCUIT BOARD SCHEMATIC	SD906-3112
7-11	MONOPHONIC/STEREOPHONIC RECORD LOGIC AND TONE GENERATOR CIRCUIT BOARD ASSEMBLY	AC914-1503, -1513, -1523, -1533
7-12	HEAD LEAD TO CIRCUIT BOARD WIRING DIAGRAM	C906-3140

<u>FIGURE</u>	<u>TITLE</u>	<u>NUMBER</u>
7-13	MOTOR WIRING DIAGRAM	B959-0009
7-14	CAPSTAN MOTOR ASSEMBLY DIAGRAM	597-3000-57
7-15	POWER TRANSFORMER WIRING DIAGRAM	AB950-7656



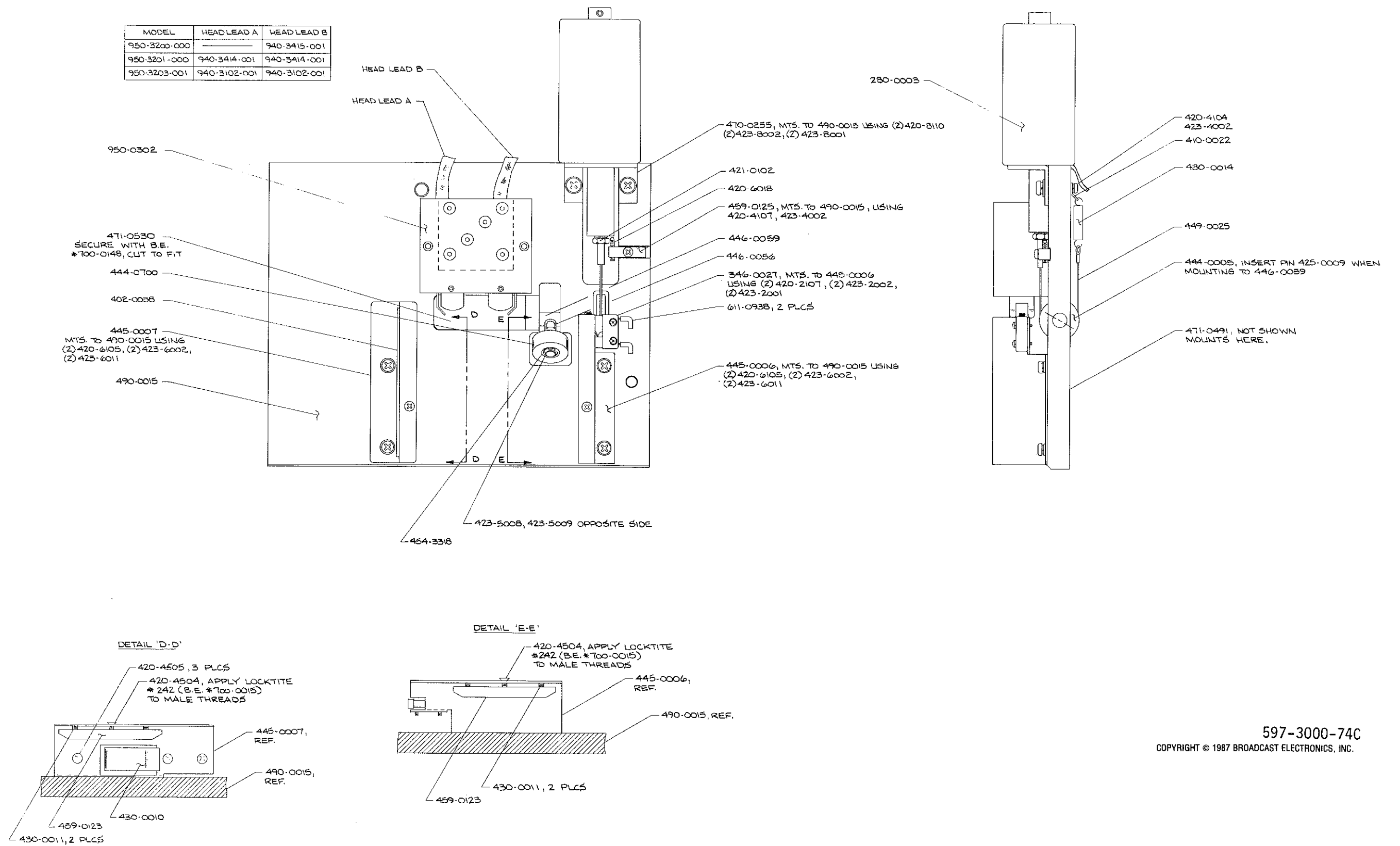






597-3000-74B  
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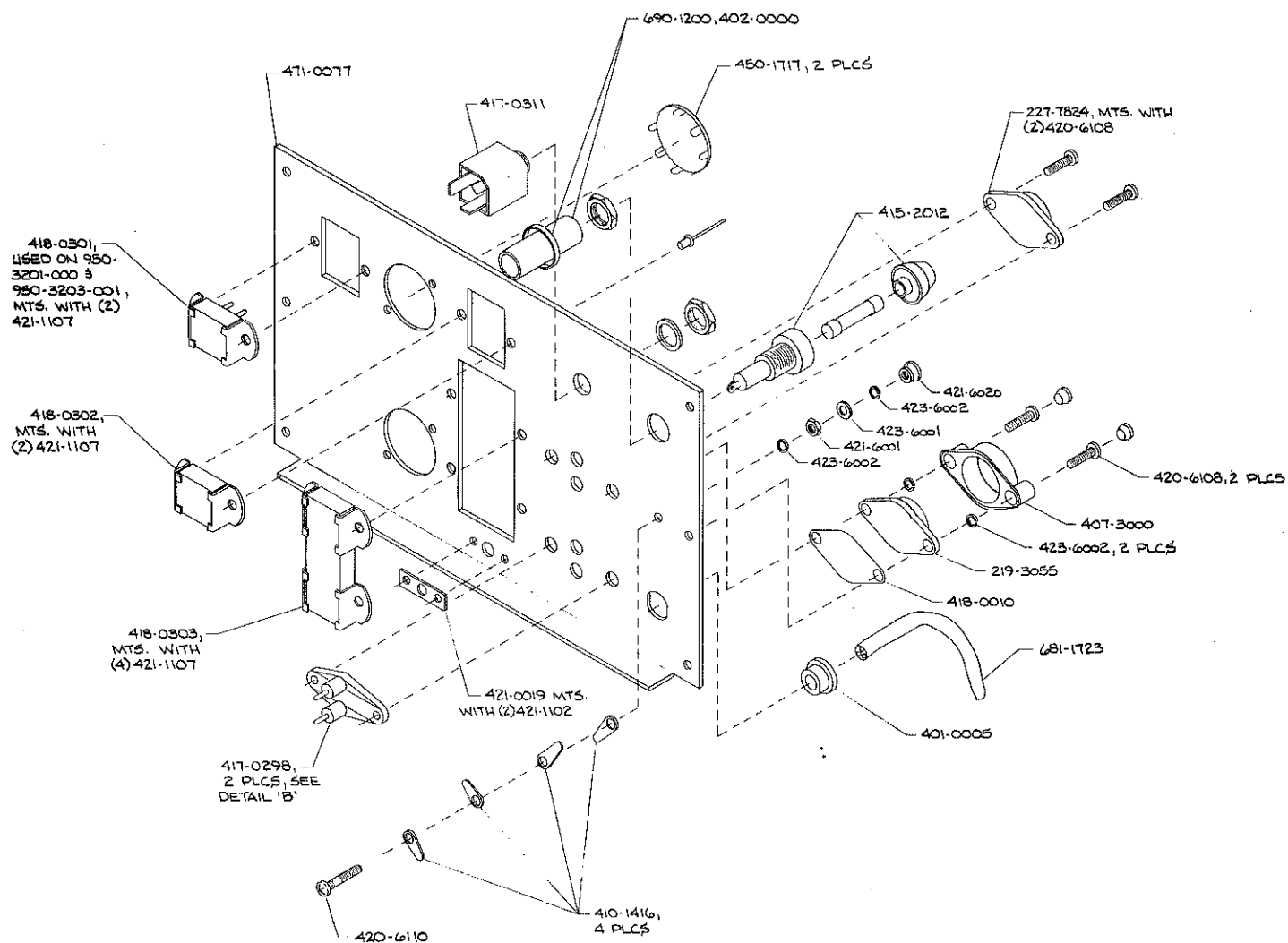
FIGURE 7-3. BASIC ASSEMBLY DIAGRAM,  
 3000A SERIES



597-3000-74C  
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FIGURE 7-3. BASIC ASSEMBLY DIAGRAM,  
3000A SERIES

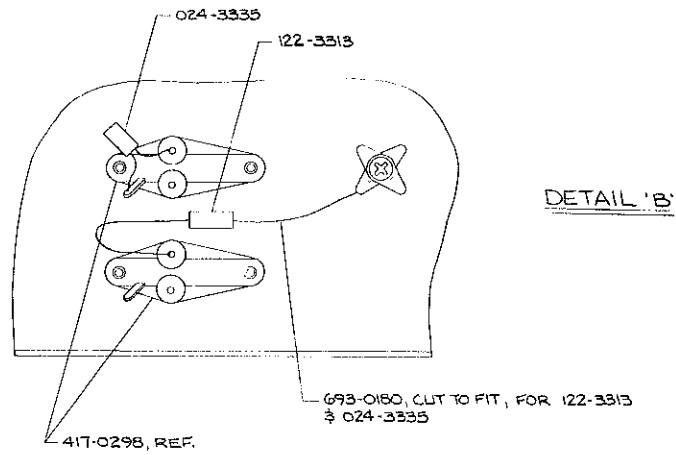




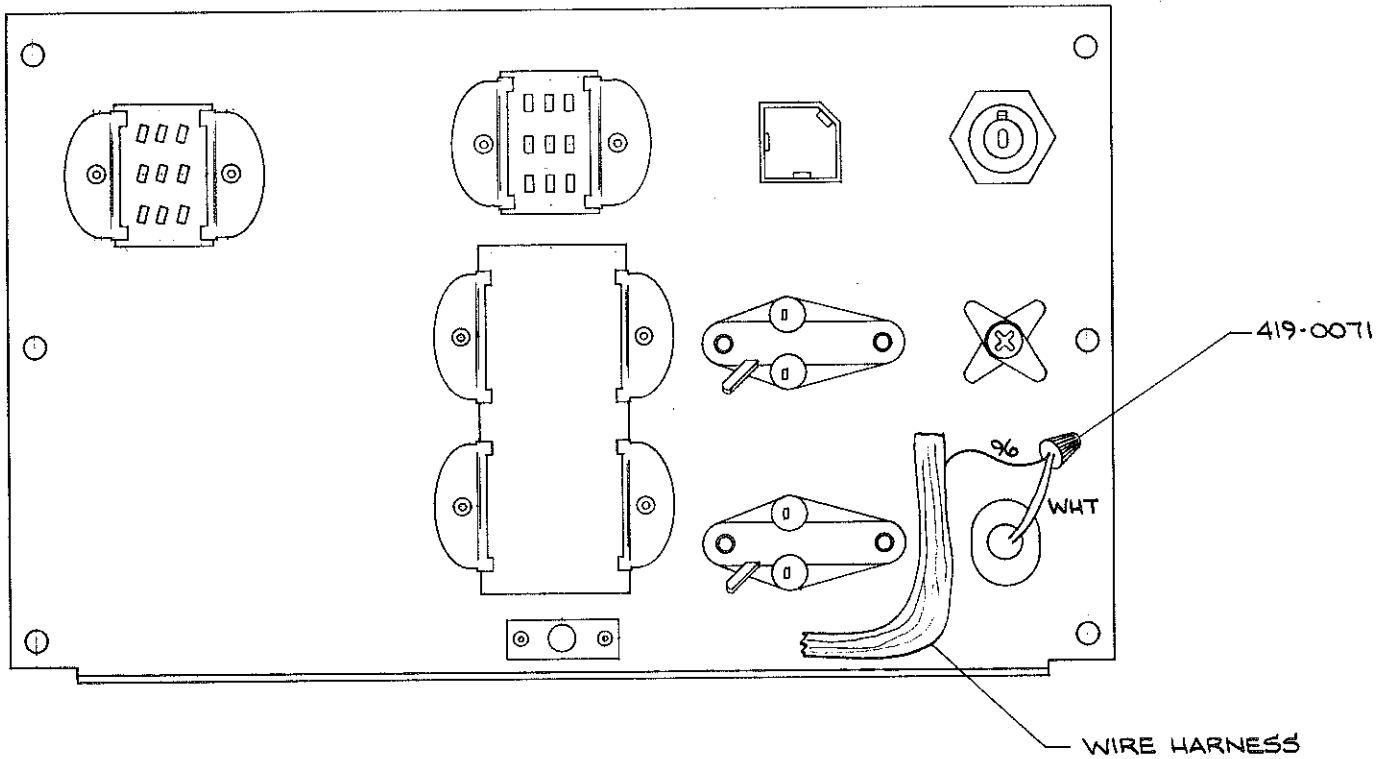
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597-3000-74D

FIGURE 7-3. BASIC ASSEMBLY DIAGRAM, 3000A SERIES



DETAIL 'C'



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597-3000-74E

FIGURE 7-3. BASIC ASSEMBLY DIAGRAM, 3000A SERIES



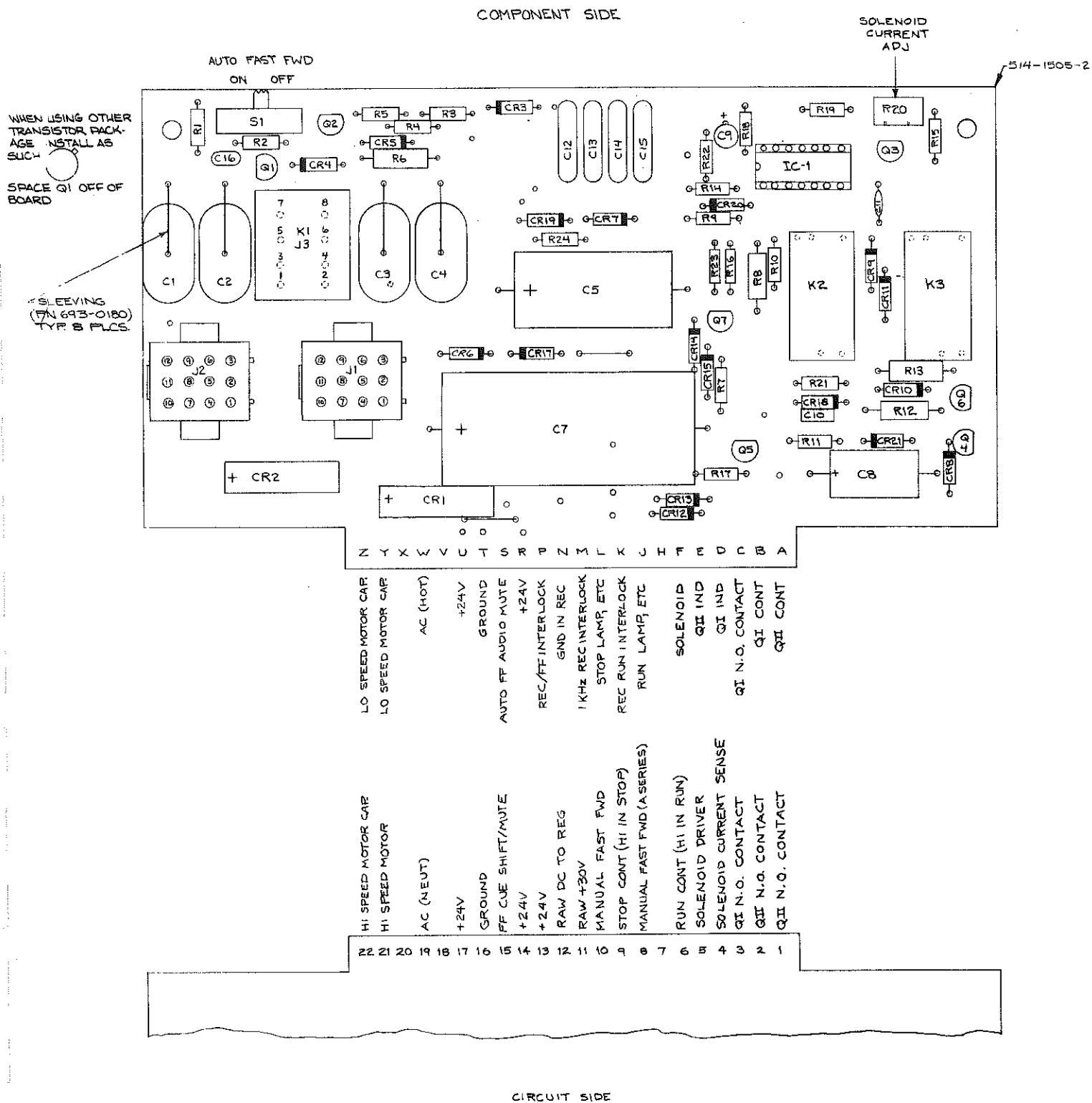
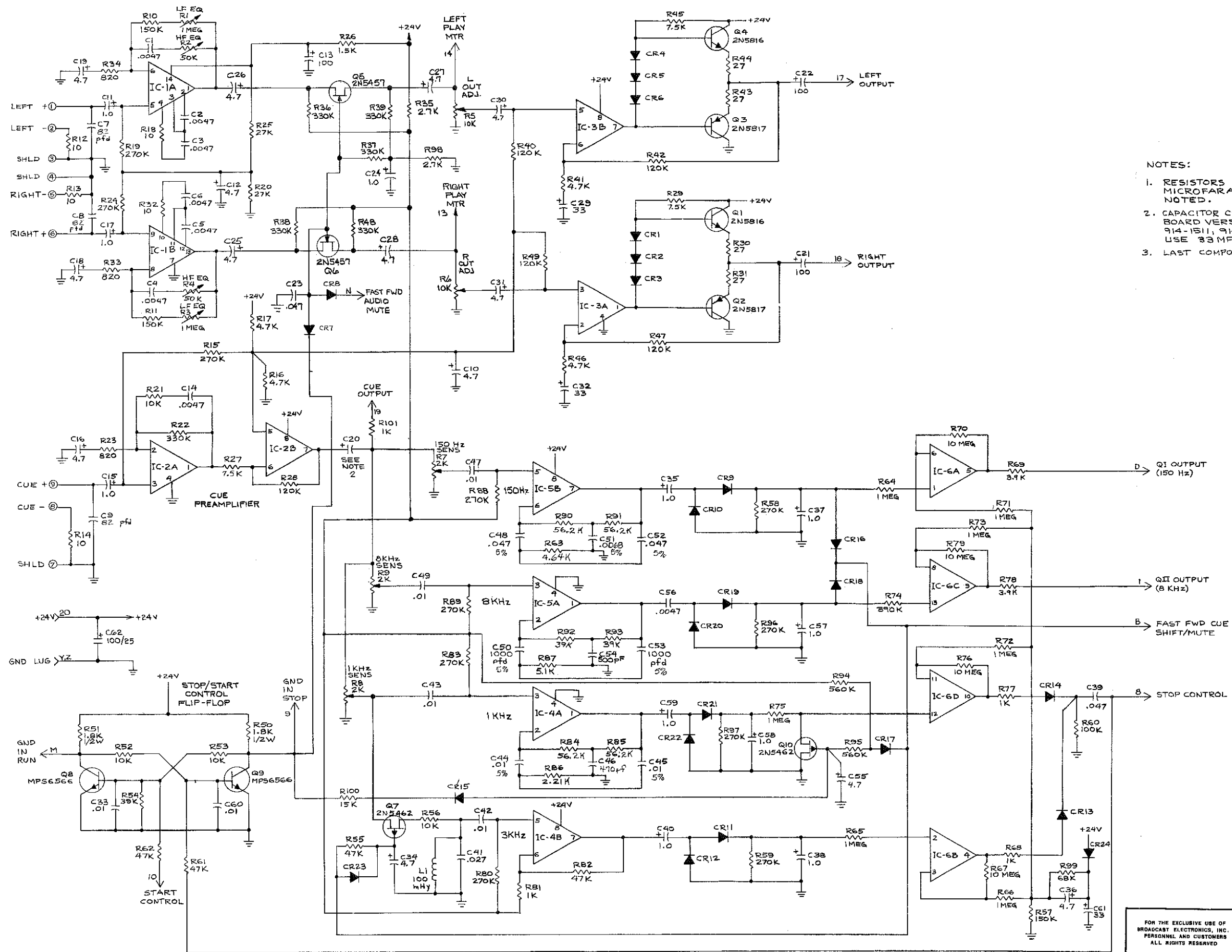


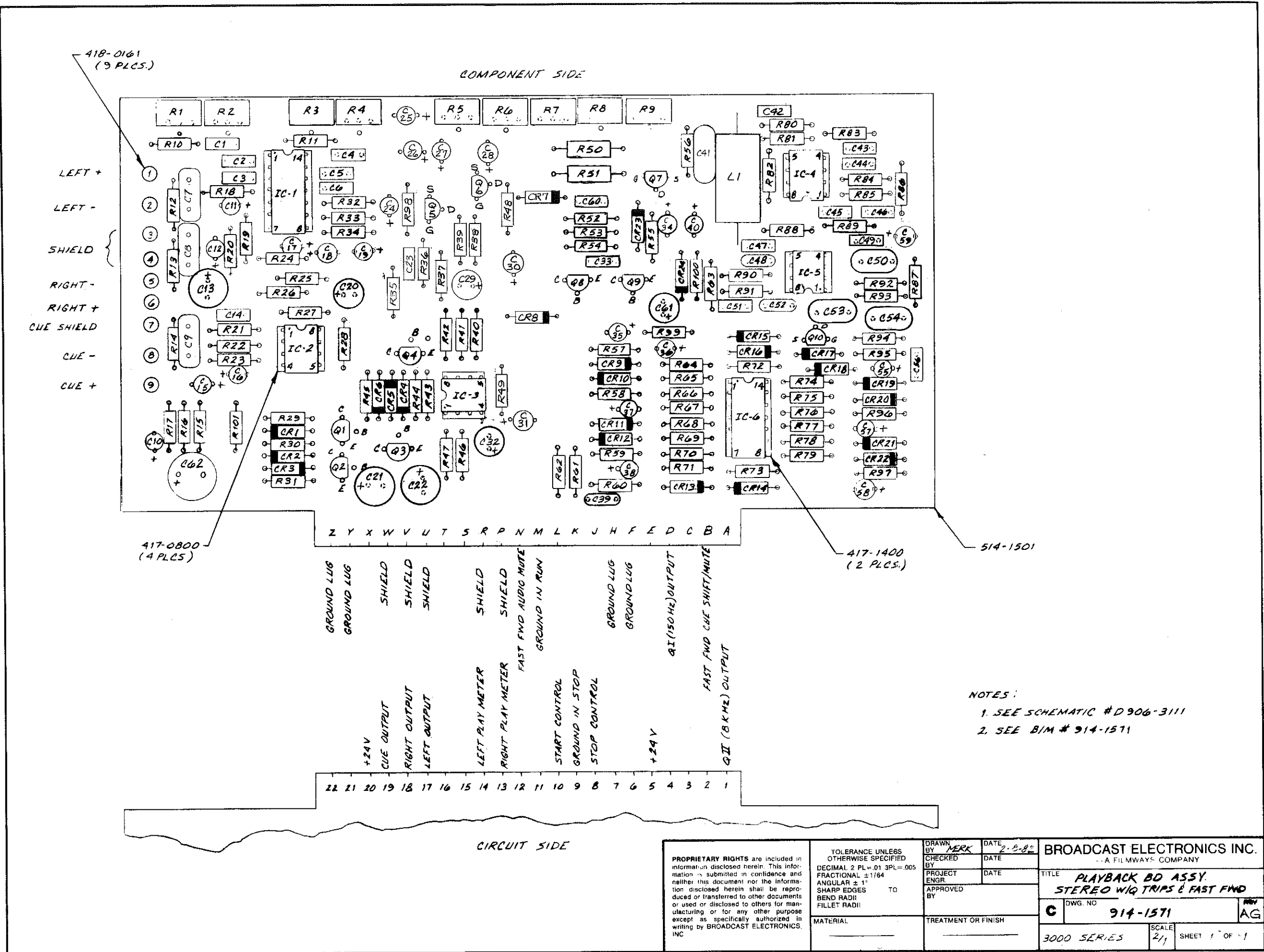
FIGURE 7-5. 3000 CARTRIDGE MACHINE POWER SUPPLY ASSEMBLY DRAWING (D914-1535-1 REV. N)



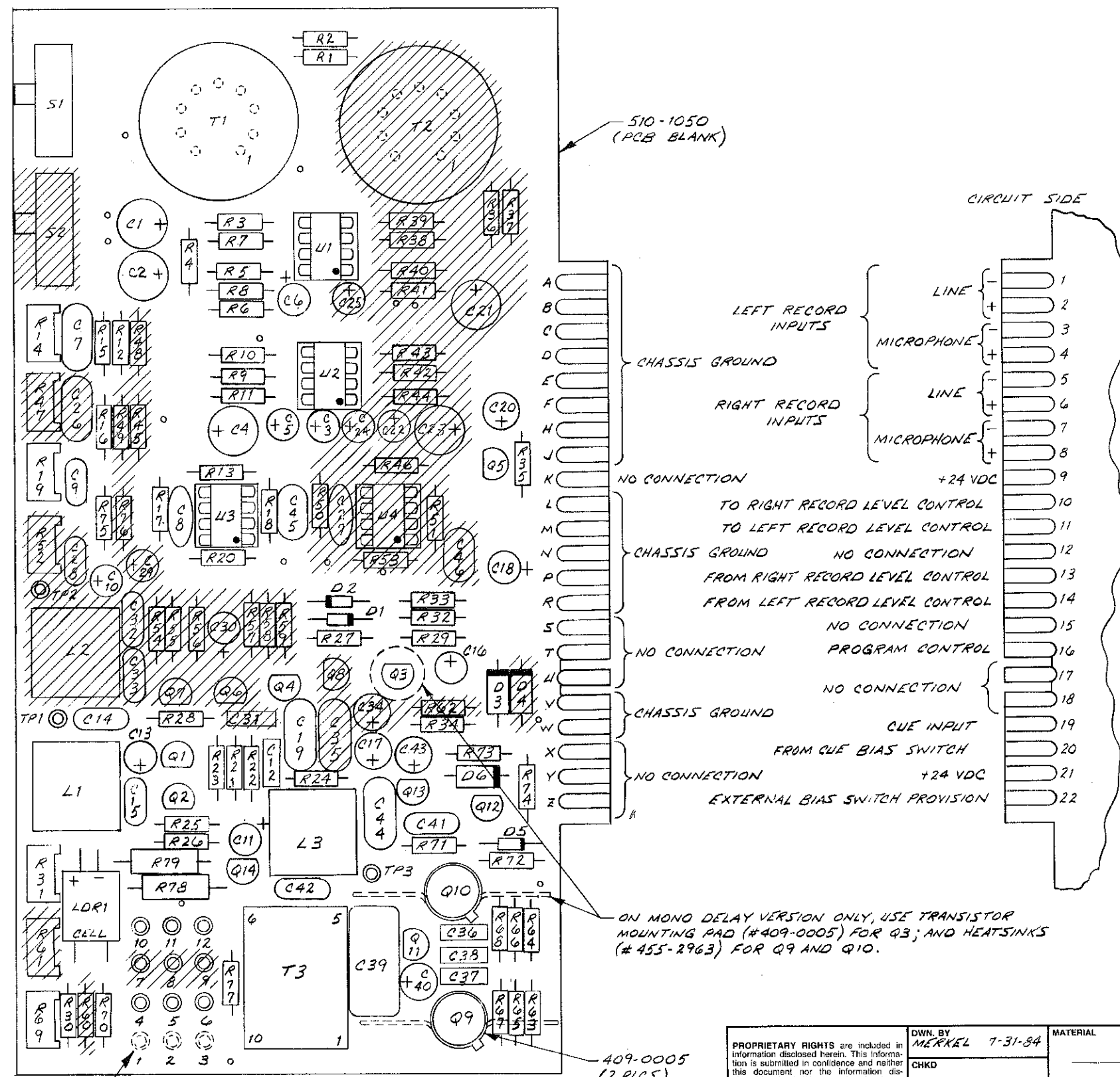
- NOTES:
1. RESISTORS IN OHMS, 1/4 WATT; CAPACITORS IN MICROFARADS; DIODES IN 457, UNLESS OTHERWISE NOTED.
  2. CAPACITOR C20 VALUE VARIES DEPENDING UPON BOARD VERSION. 4.7 MFD. IS USED WITH 914-1501, 914-1511, 914-1541, & 914-1551. ALL OTHER VERSIONS USE 33 MFD.
  3. LAST COMPONENTS USED: R104, C60, CR11, Q12, IC-7 & L1.

SEE P.C. ASSY DWGS # D-914-1501, -1511, -1521, -1531, -1541, -1551, -1561, & -1571

DRAWN: M.S.D.		DATE: 4/1/75		BROADCAST ELECTRONICS INC.	
CHECKED: M.A.		DATE: 4/1/75		- A FILMWAYS COMPANY -	
PROJECT: M.A.		DATE: 4/1/75		TITLE: SCHEMATIC	
APPROVED: M.A.		DATE: 4/1/75		DWG NO: 906-3111	
TREATMENT OR FINISH: —		SCALE: —		REV: 7.8	
FOR THE EXCLUSIVE USE OF BROADCAST ELECTRONICS, INC. PERSONNEL AND CUSTOMERS ALL RIGHTS RESERVED		3000 SERIES		SHEET 1 OF 1	







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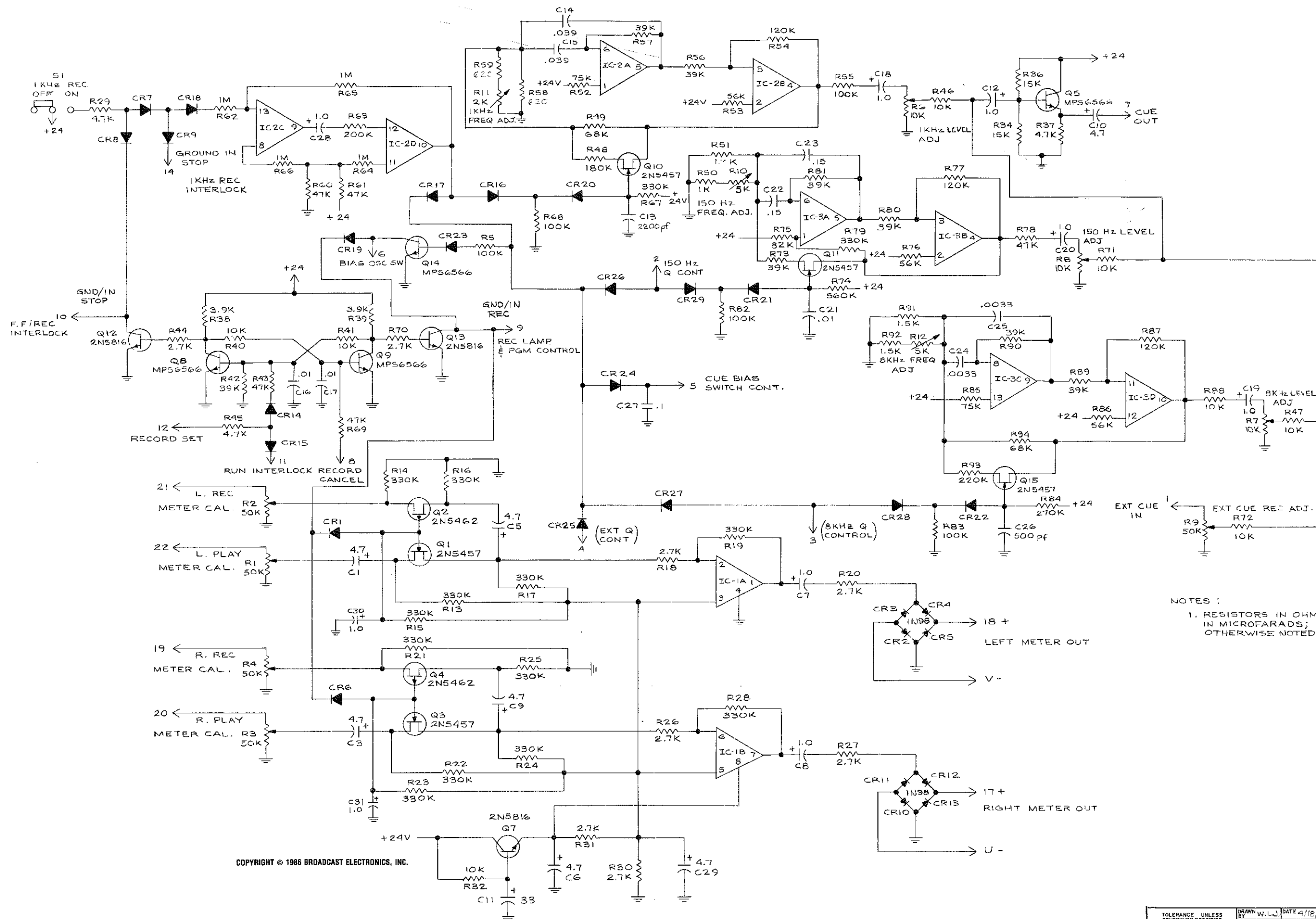
PINS 1, 2 & 3 USED ONLY ON MONO DELAY VERSION (#910-1048)  
(SEE NOTE # 3.)

- NOTES:
1. FOR 910-1050, 910-1050-001 (STEREO), USE ALL PARTS.
  2. // - INDICATES COMPONENTS NOT USED ON 910-1049, 910-1049-001, (MONO).
  3. FOR 910-1048 (MONO DELAY), USE PINS 1, 2 & 3; DO NOT USE COMPONENTS INDICATED IN NOTE #2.
  4. SEE B/M # 910-1050 (STEREO)  
# 910-1050-001 (STEREO)  
# 910-1049 (MONO)  
# 910-1049-001 (MONO)  
# 910-1048 (MONO DELAY)
  5. SEE SCHEMATIC # SD 910-1050;  
910-1050-001; 910-1049;  
910-1049-001; 910-1048.

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TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°		CHKD ME PROJ. ENGR. MFG.	FINISH NEXT ASSY.
BROADCAST ELECTRONICS, INC. 4100 N. 24TH ST., P.O. BOX 3606 QUINCY, IL 62305 217/224-9600 TELEX 250142 CABLE BROADCAST		TITLE PCB ASSEMBLY - RECORD AMP BIAS	
TYPE A	SIZE C	DWG. NO. 910-1050; 910-1050-001; 910-1049; 910-1049-001; 910-1048	REV H
MODEL 3000 SERIES	SCALE 21	SHEET 1 OF 1	





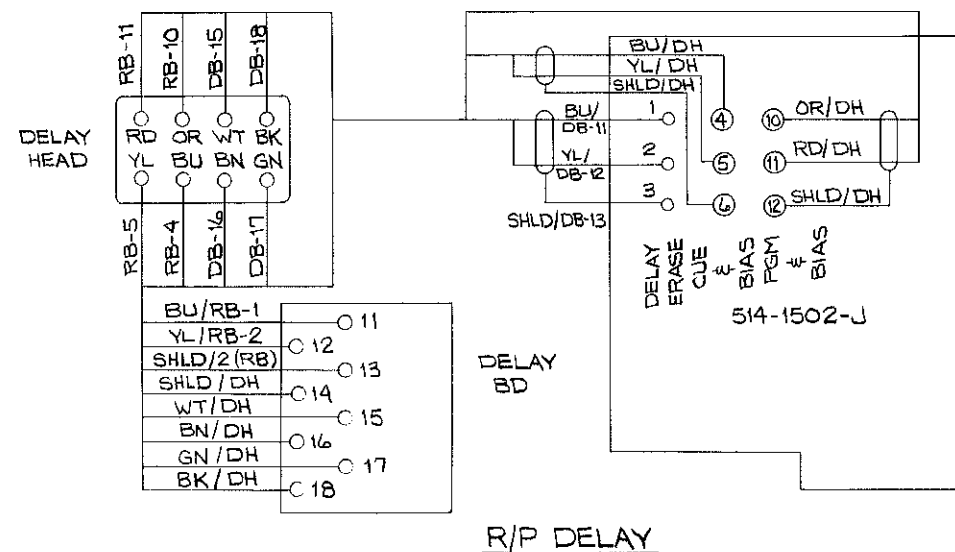
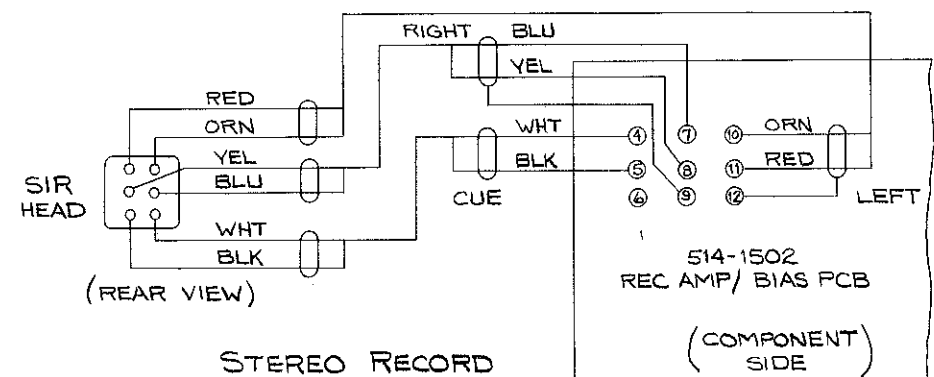
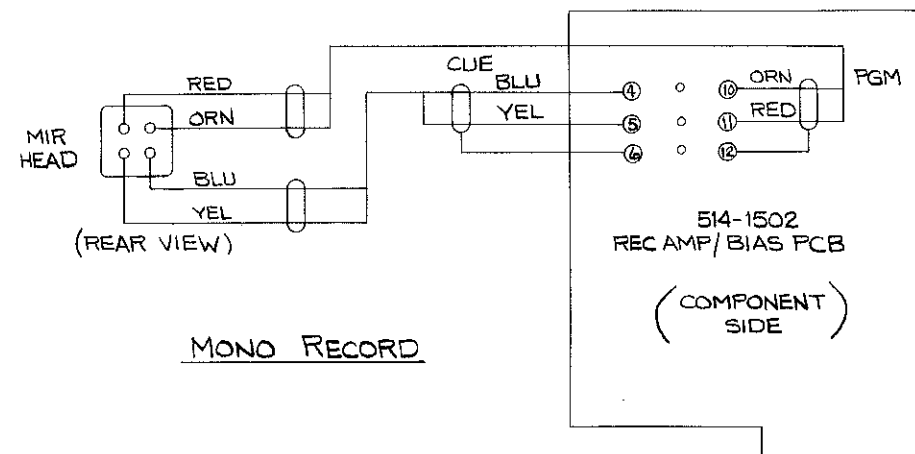
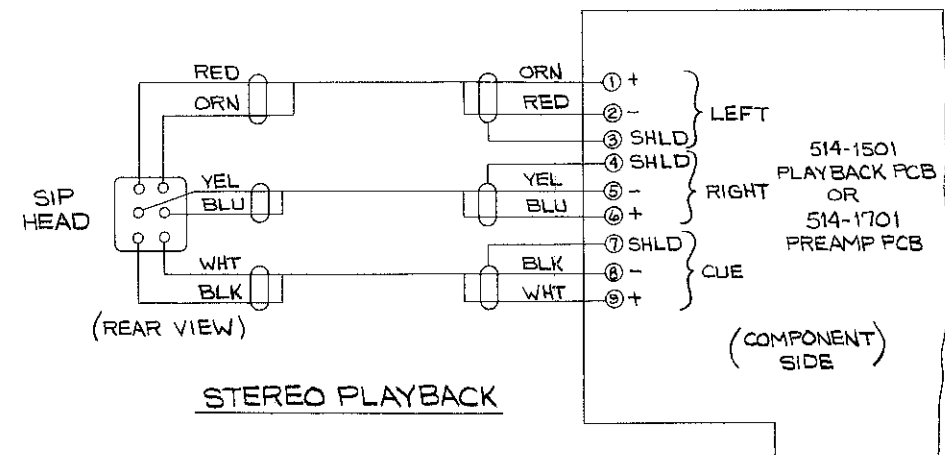
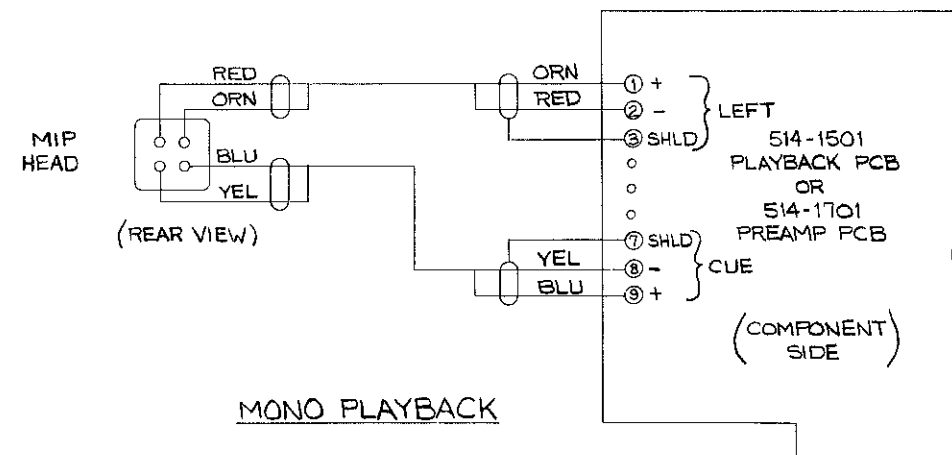
NOTES:  
1. RESISTORS IN OHMS, 1/4 WATT; CAPACITORS IN MICROFARADS; DIODES IN 457 UNLESS OTHERWISE NOTED.

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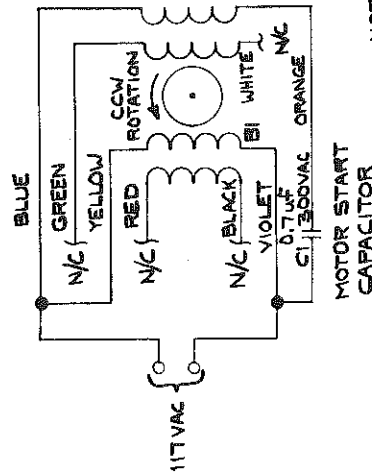
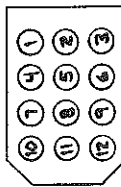
TOLERANCE UNLESS OTHERWISE SPECIFIED		DRAWN W.L.J.		DATE 4/18/75		BROADCAST ELECTRONICS, INC.	
DECIMAL 2 PL ± 0.1 3 PL ± 0.005		CHECKED BY		DATE		- A FILMWAYS COMPANY -	
FRACTIONAL 1/64		PROJECT ENGR		DATE		TITLE (SCHEMATIC)	
ANGULAR: ° TO		APPROVED BY		DATE		RADIO LOGIC TONE GEN.	
SHARP EDGES		MATERIAL		TREATMENT OR FINISH		DWG NO. 900-2112	
BEND RADI		SCALE		SHEET 1 OF 1		REV G	
FILLET RADI		3000 SERIES					
FOR THE EXCLUSIVE USE OF BROADCAST ELECTRONICS, INC. PERSONNEL AND CUSTOMERS ALL RIGHTS RESERVED							





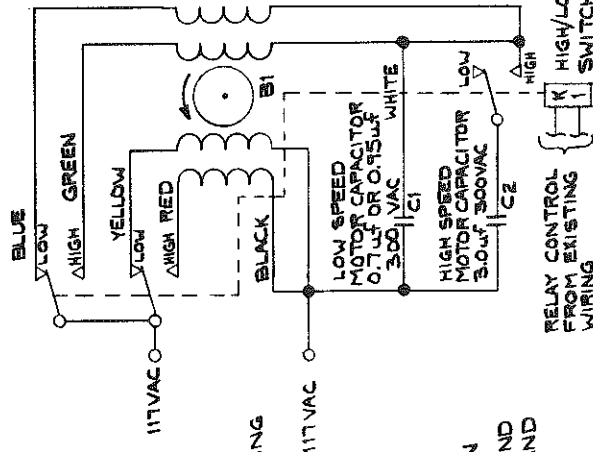
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	CHKD	FINISH	
	ME RA 9-9-86	PROJ. ENGR. NRC 9-7-86	
	MFG.	NEXT ASSY.	
TOLERANCE (DECIMAL) U.O.S. .x ± .030 .xxx ± .005 .xx ± .015 ANGLES ± 1°	TITLE HEAD LEAD TO PCB WIRING		TYPE W C
DWG. NO. 906-3140		REV B	
MODEL 3000-4000 SER. SCALE 1/1		SHEET 1 OF 1	

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



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

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



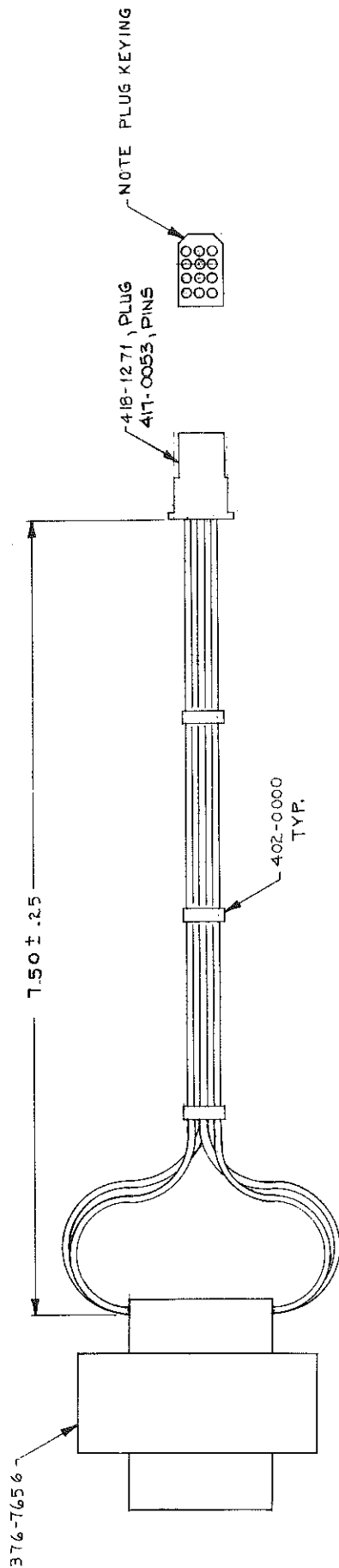
WIRING CONNECTIONS FOR EQUIPMENT WITH MANUAL AND/OR AUTOMATIC FAST FORWARD. CCW ROTATION VIEWING SHAFT END.

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)

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.

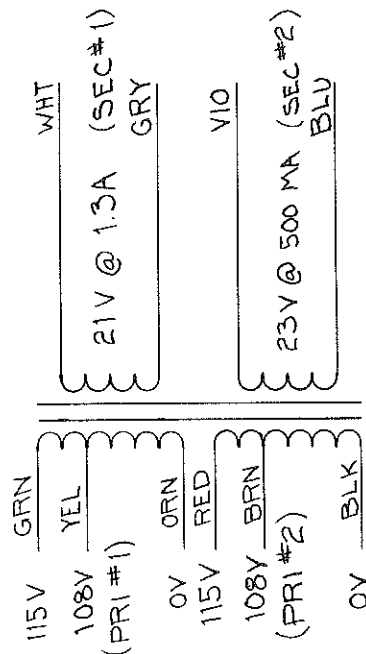
TOLERANCE UNLESS OTHERWISE SPECIFIED DECIMAL 2 PLACES $\pm 0.005$ FRACTIONAL $\pm 1/64$ ANGULAR $\pm 1'$ DIMENSIONS TO SHOWN UNLESS OTHERWISE SPECIFIED FILLET RADIUS		DATE 2-14-83 CHECKED PROJECT ENGR APPROVED BY	DATE 5/11/83
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TITLE MOTOR WIRING DIAGRAM		REV. A	
DWG. NO. 959-0009		SCALE 1 OF 1	
3000 CART. MACH.		SHEET 1 OF 1	





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	GRY	GRY	ORN	ORN
10	YEL	GRN	GRY	GRY
11	GRN	YEL	YEL	GRN
12	GRN	YEL	GRN	YEL



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JUMPERS TO BE B.E.I. # 601-2209 WHITE  
22 GA., 2.5" LG.

DRAWN BY SAWYER		DATE 5-30-83	BROADCAST ELECTRONICS INC.	
CHECKED BY JMS	DATE 4-13-83	TITLE ASSEMBLY, TRANSFORMER		
PROJECT 34	DATE 5-12-83	REV. C		
APPROVED BY MH	DATE 4-13-83	DWG. NO. 950-7656		
TREATMENT OR FINISH		FM 600, 3000, 5000 CART		
MATERIAL		SCALE N/A		
		SHEET 1 OF 1		

SECTION VIII  
APPENDIX

8-1. INTRODUCTION.

8-2. This appendix provides technical data associated with the maintenance of the Broadcast Electronics 3000A series cartridge machines. The information contained in this appendix is presented in the following order.

A. The NAB Tape Cartridge and Associated Maintenance.

BROADCAST ELECTRONICS, INC.

The NAB Tape Cartridge and Associated Maintenance

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TABLE OF CONTENTS	PAGE NO.
The NAB Tape Cartridge	1
Cartridge Maintenance Tips	6
Cartridge Recording Procedure	10
Cartridges for Stereophonic Systems	10

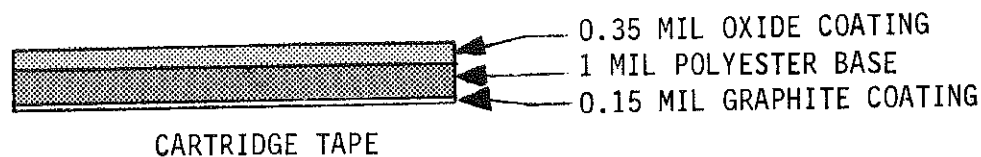


## THE NAB TAPE CARTRIDGE

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 various manufacturers differ slightly in design, but all cartridges used in NAB standardized systems fit the preceding definition.

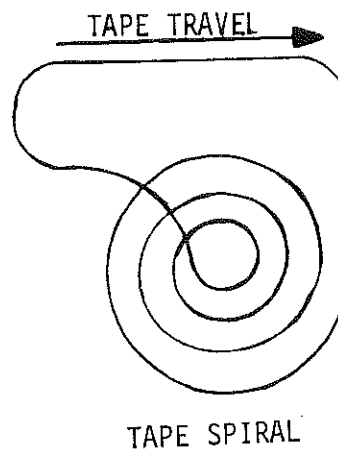
### THE TAPE

Cartridge tape consists of a synthetic base material approximately 1 mil (0.001 inch) thick. One side of the base is coated with ferrite 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 0.248 (+0/-0.002) inches wide.



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An 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, the tape passes across the tape heads and returns to the outside of the tape spiral.

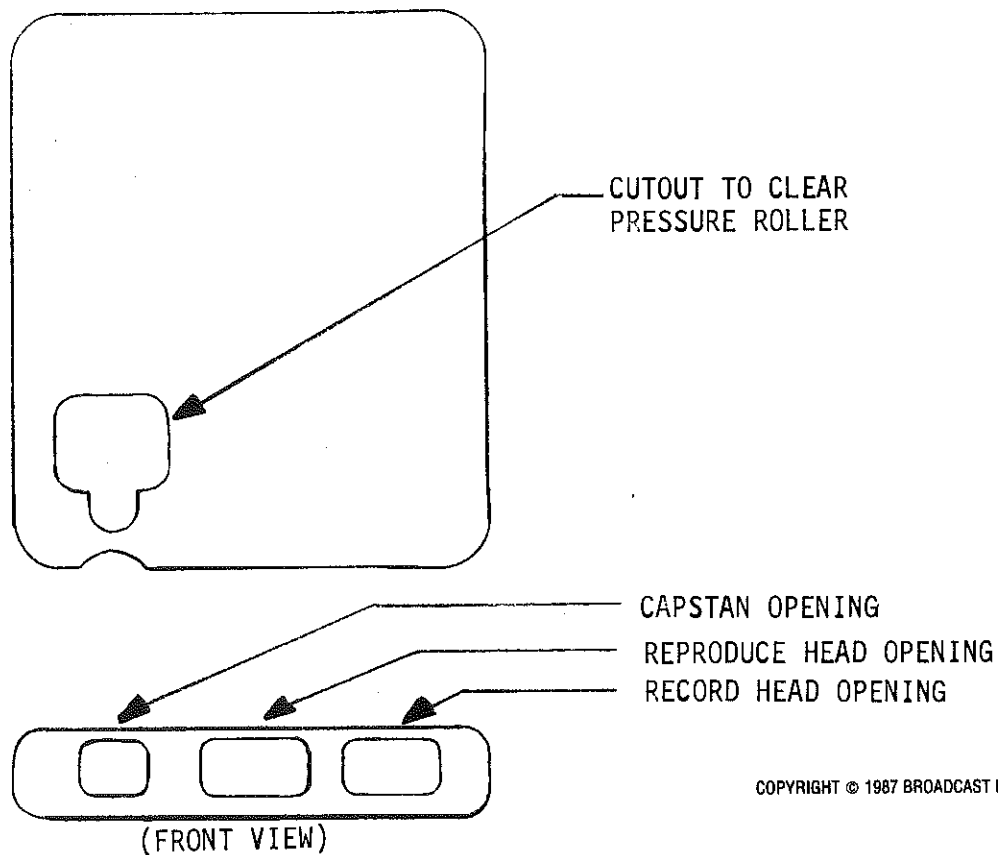


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## THE SHELL

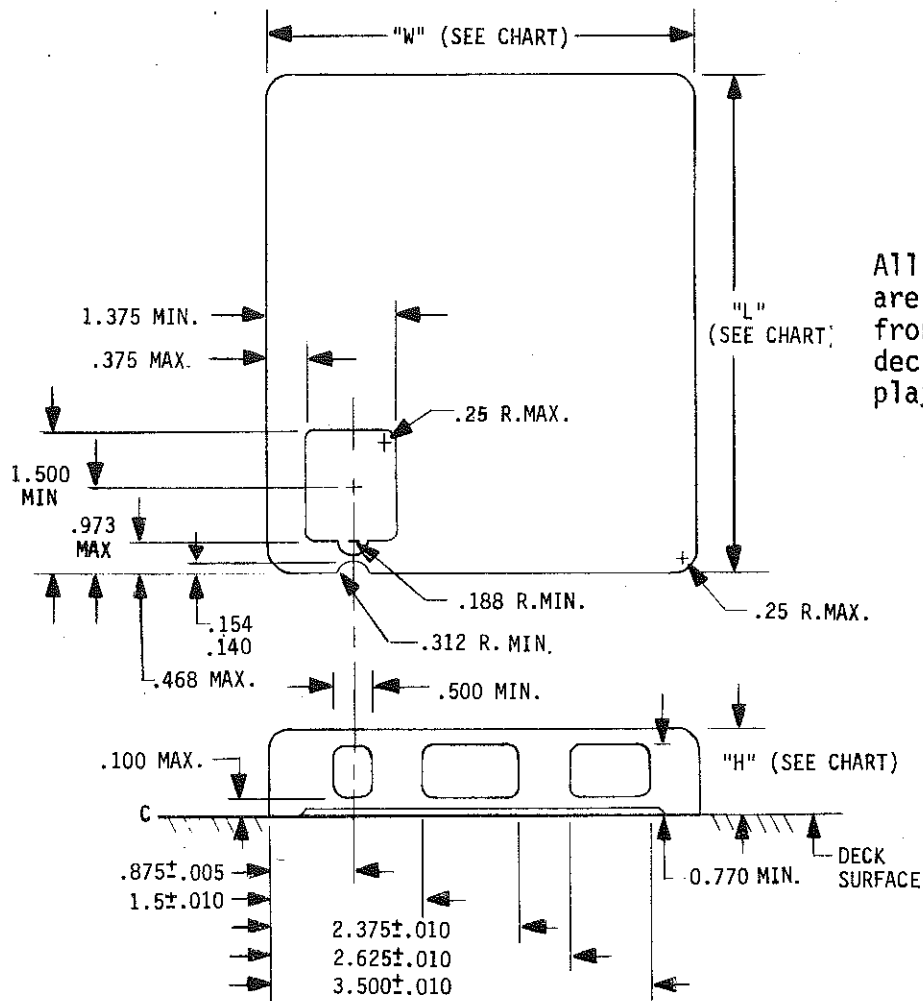
The shell houses the tape and other mechanical components. Three nominal NAB size shells are available: 1) A or AA, 2) B or BB, or 3) C or CC. Assuming 1.5 mil tape, the A/AA size cartridge can be installed with up to 395 feet of tape, the B/BB with 650 feet, and the C/CC with 1,250 feet.

Three openings across the front of the cartridge allows the heads and capstan to penetrate the shell and contact the tape. In addition, an opening in the bottom is provided for the pressure roller to rotate through the cartridge behind the tape. Unlike cartridges used in consumer entertainment systems, the pressure roller (pinch roller or capstan idler) is a component of the cartridge player and not the cartridge.



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



All dimensions are in inches and are referenced from the side and front of the cartridge and the deck surface of the cartridge tape player.

CARTRIDGE NAB TYPE	WIDTH ±0.015625	LENGTH MAXIMUM	HEIGHT MAXIMUM
A,AA	4"	5.25"	0.9375" FOR A 0.895" FOR AA
B,BB	6"	7"	0.9375" FOR B 0.895" FOR BB
C,CC	7.625"	8.5"	0.9375" FOR C 0.895" FOR CC

FIGURE 1. NAB CARTRIDGE DIMENSION STANDARDS

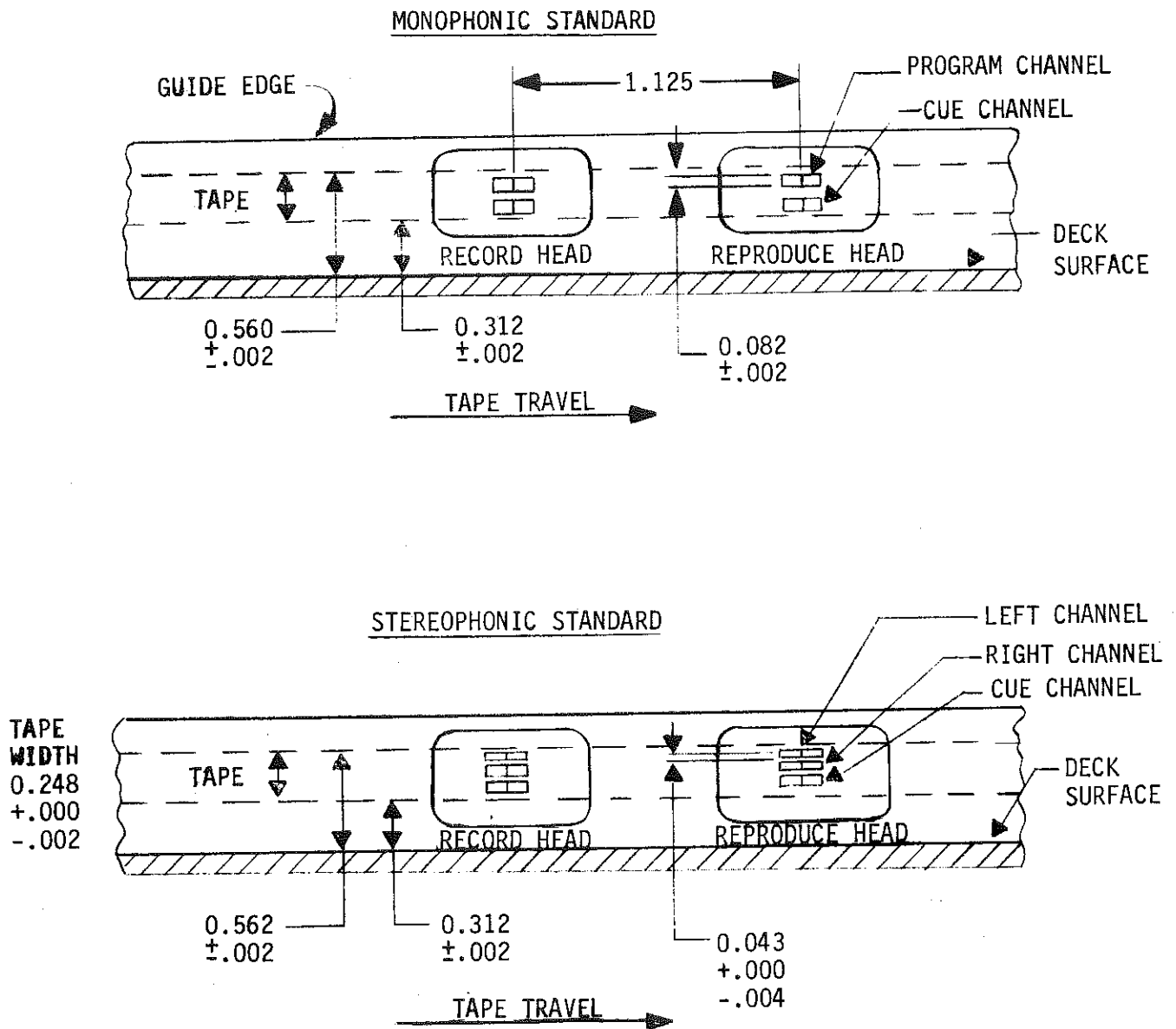
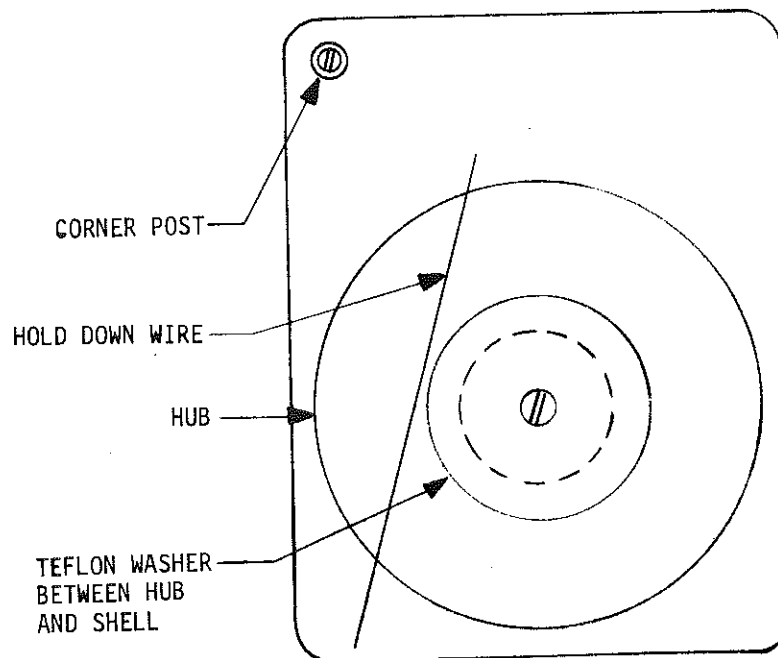


FIGURE 2. NAB TAPE HEAD DIMENSION STANDARDS

## TAPE HUB, TEFLON WASHER, AND CENTER POST

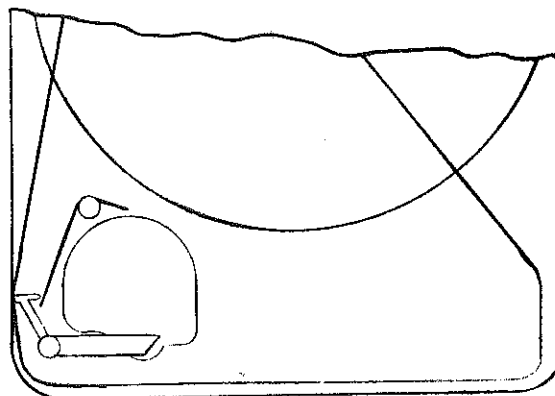
The tape hub contains all cartridge tape. The hub is designed to rotate around a center post. To allow free rotation, a teflon washer is installed between the hub and the shell. To maintain proper tape placement on the hub, the cartridge design will include: 1) a separate hub cover, 2) a close-tolerance molded cover, or 3) a hold-down wire.



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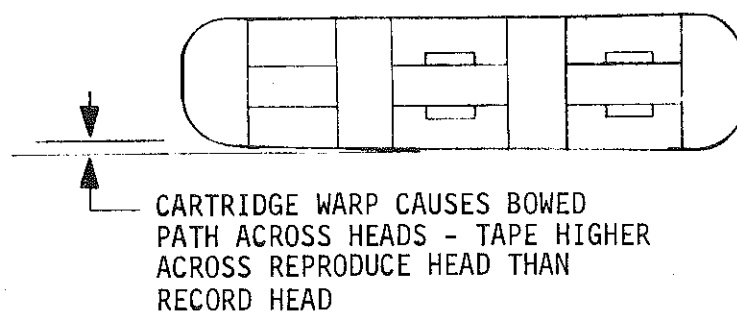
## CLUTCH SPRING OR HUB BRAKE

The clutch spring or hub brake prevents tape movement when the cartridge is not in operation. This is accomplished 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 play position.



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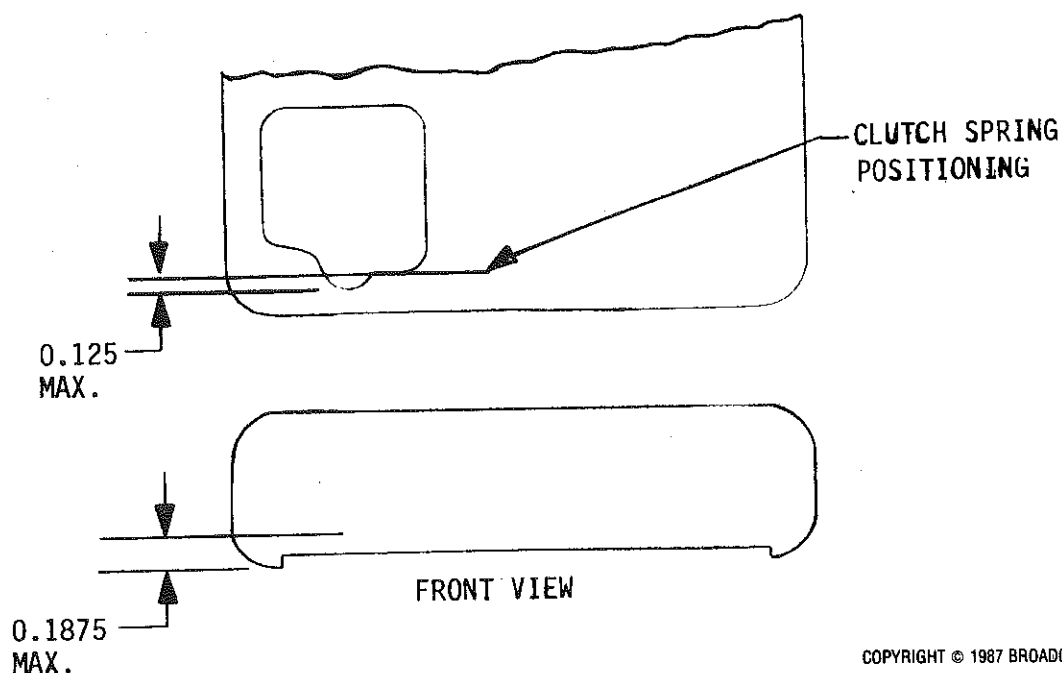
Periodically, the cartridge center post should be cleaned. Deposits on the post increase tape tension by not allowing the tape hub to rotate freely. Also, check the tape hub washer. This washer should always be in place underneath the tape hub, between the hub and the shell. This washer is easily misplaced when the cartridge is opened and the hub removed.



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#### CLUTCH SPRING OR HUB BRAKE

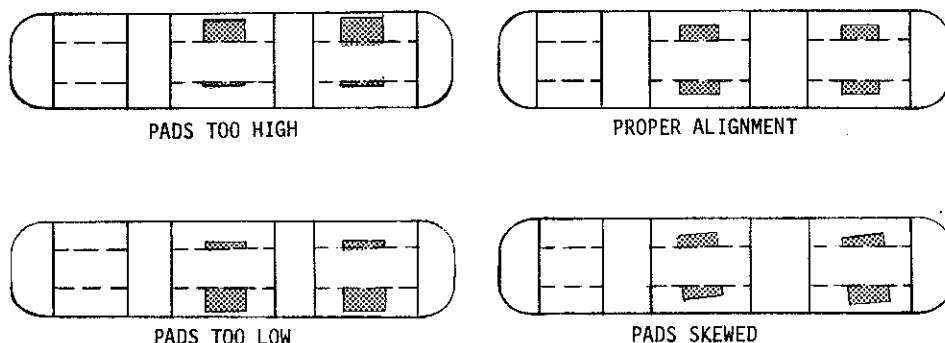
The clutch spring or hub brake should completely release when the pressure roller is in the vertical position. This allows the hub and the tape to move freely. An improperly adjusted clutch spring or defective hub brake may prevent the roller from engaging or dis-engaging. The clutch should be parallel to the bottom of the shell and no more than 0.1875 inches 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.



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## PRESSURE PADS

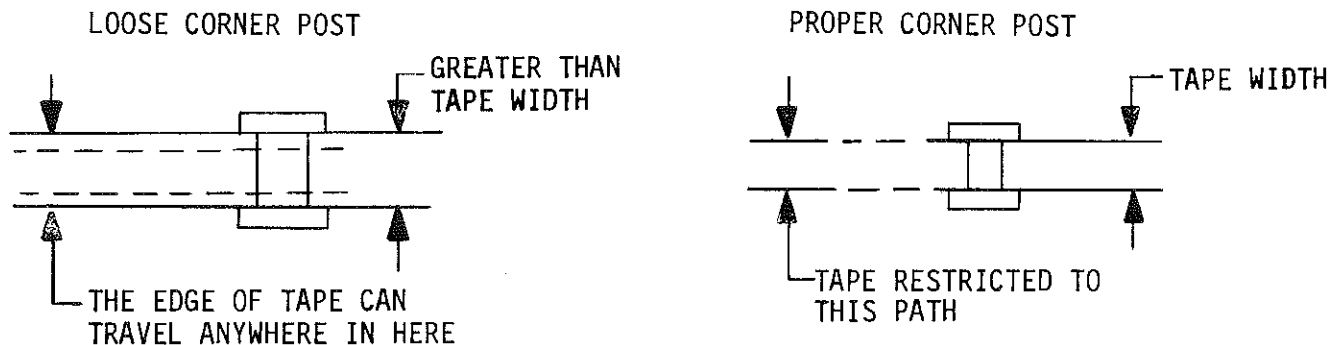
The pressure pads must wrap the tape around the front of the heads. The pressure applied must be uniform across the tape as it is in contact with the head. Periodically check the pads for proper alignment. If a portion of the tape is not in contact with the pads, the improper tape-to-head contact will occur. This will result in poor frequency response from an individual cartridge.



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## THE TAPE PATH

The most frequent cause of distortion of the tape path in the cartridge is a loose corner post. The post must be mounted 0.250 inches from the bottom of the shell. If the distance between the shell and post is greater than 0.250 inches, the tape will not pass straight across the heads. A loose post frequently causes muffled-sounding audio when the cartridge unit starts.



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The hold-down wire used in many cartridges is important in maintaining proper tape travel. This wire maintains proper tape placement on the hub as tape is pulled from the center. 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 cartridge 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, operate the deck to allow the tape to seat properly in the tape guides.

Stop the tape. Do not remove the cartridge after the initial operation. Ensure the tape splice is between the end and the beginning of the program material.

#### CARTRIDGES FOR STEREOPHONIC SYSTEMS

##### MAINTENANCE

Cartridges operated in a stereophonic format require rigorous maintenance due to the generation of phase errors by improper tape movement. When the program material is combined, phase differences cause degradation of the frequency response.

The most important characteristic of a cartridge operated in a stereophonic format is the ability to maintain an identical tape path each time the cartridge is inserted in the deck. This ensures reliable recording and subsequent accurate reproduction.

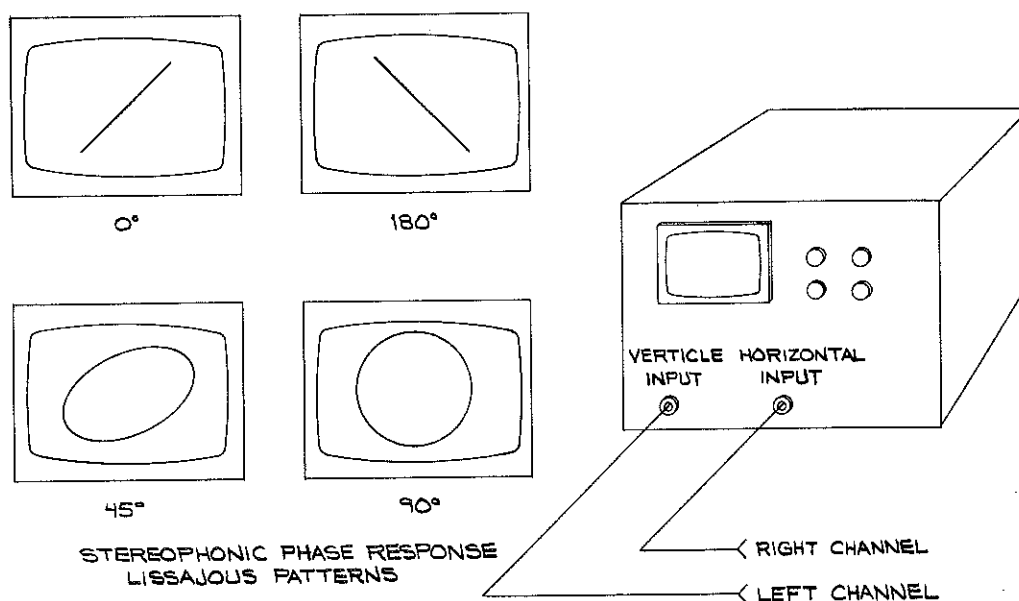
Cartridges used in a stereophonic system should initially be selected for phase repeatability using the phasing test outlined below. This test should be repeated on a regular basis throughout the life of the cartridge. A cartridge which fails this test should be discarded.

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 reproduce signals. Remove and re-insert the cartridge several times. Cartridges which exhibit poor phase repeatability or stability should be discarded. Do not test only at higher frequencies, also check selected frequencies across the audio band.



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## 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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4100 North 24th Street, P. O. Box 3606, Quincy, Illinois 62305