

Broadcast Electronics

INSTRUCTION MANUAL

MINI-SERIES TAPE CARTRIDGE MACHINES MODELS 303C AND 305C



BROADCAST ELECTRONICS, INC.

8810 BROOKVILLE ROAD • SILVER SPRING, MD. 20910 • TEL. (301) 588-4983

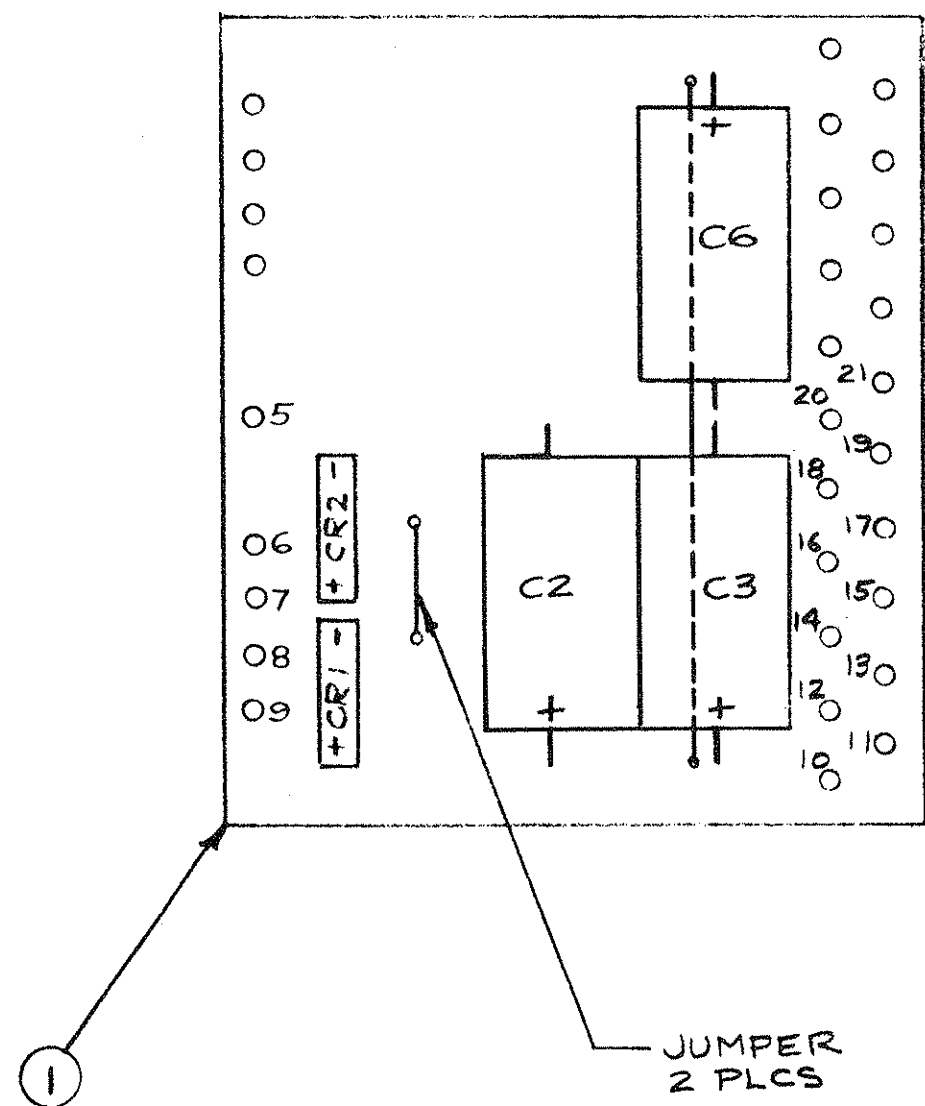
MINI-SERIES TAPE CARTRIDGE MACHINES MODELS 303C AND 305C

ADDENDUM

**Note Change in Power Supply Wiring and
P.C. Board Assemblies as They Apply to
Your Unit. New Drawings Follow:**

**303C
B914-1351
C947-0001**

**305C
B914-1350
C947-0002**



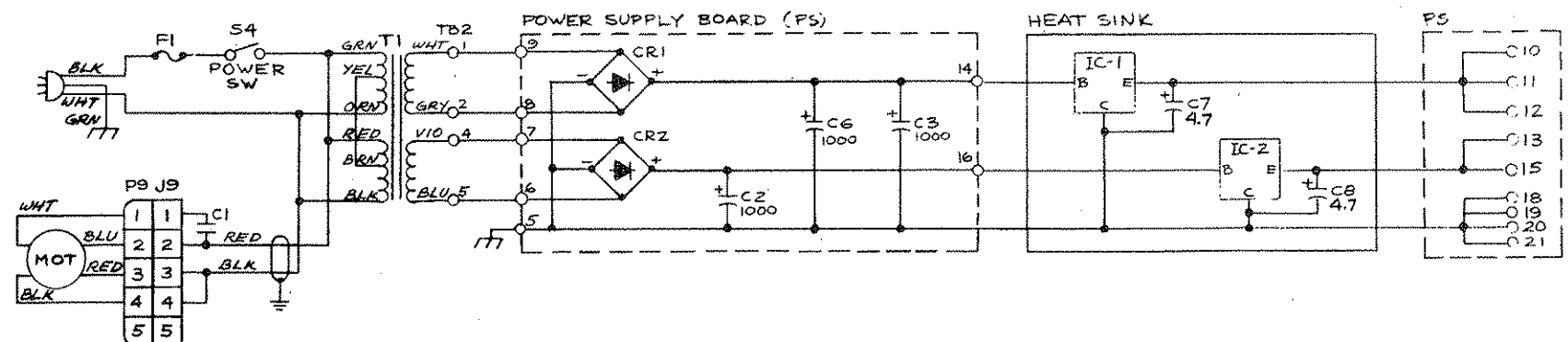
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| REVISIONS | | | |
|-----------|-------------|------|----------|
| REV | DESCRIPTION | DATE | APPROVED |

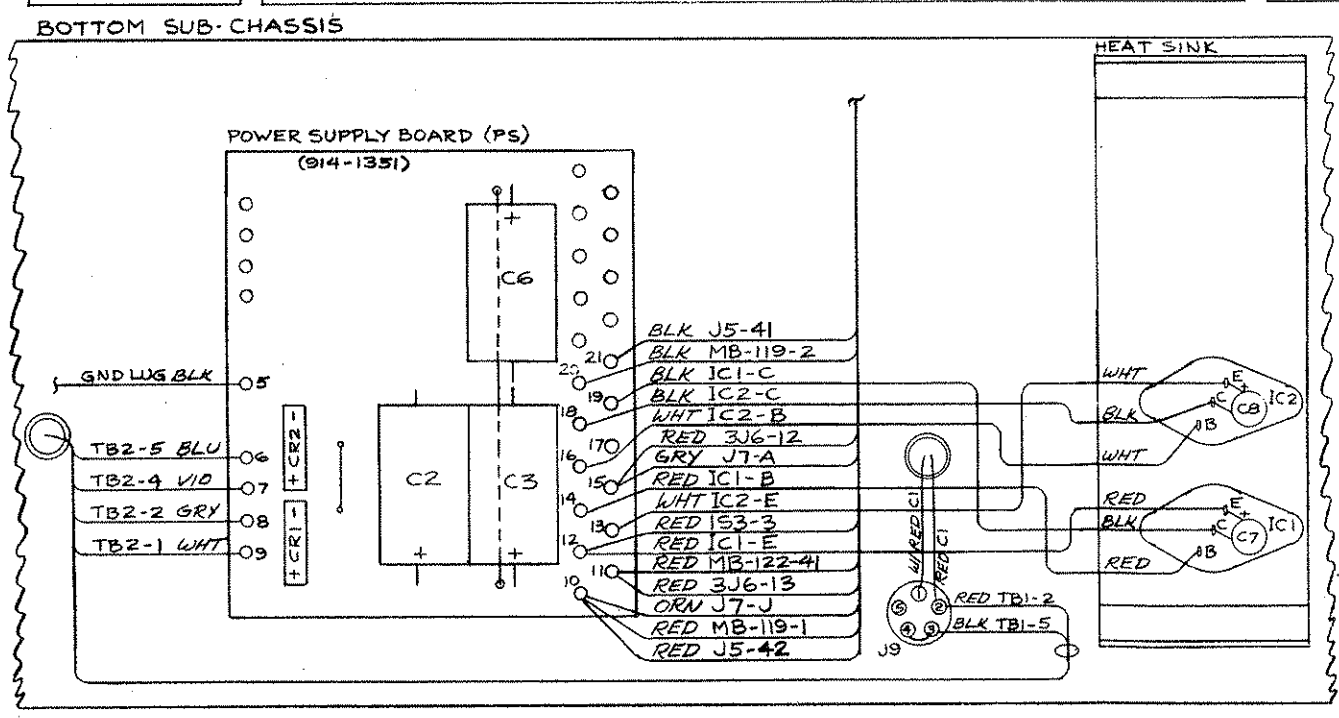
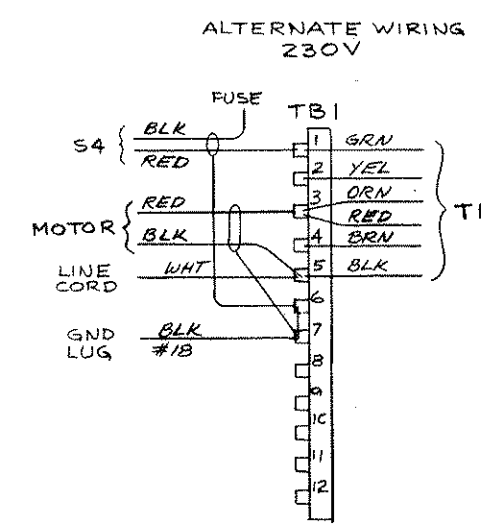
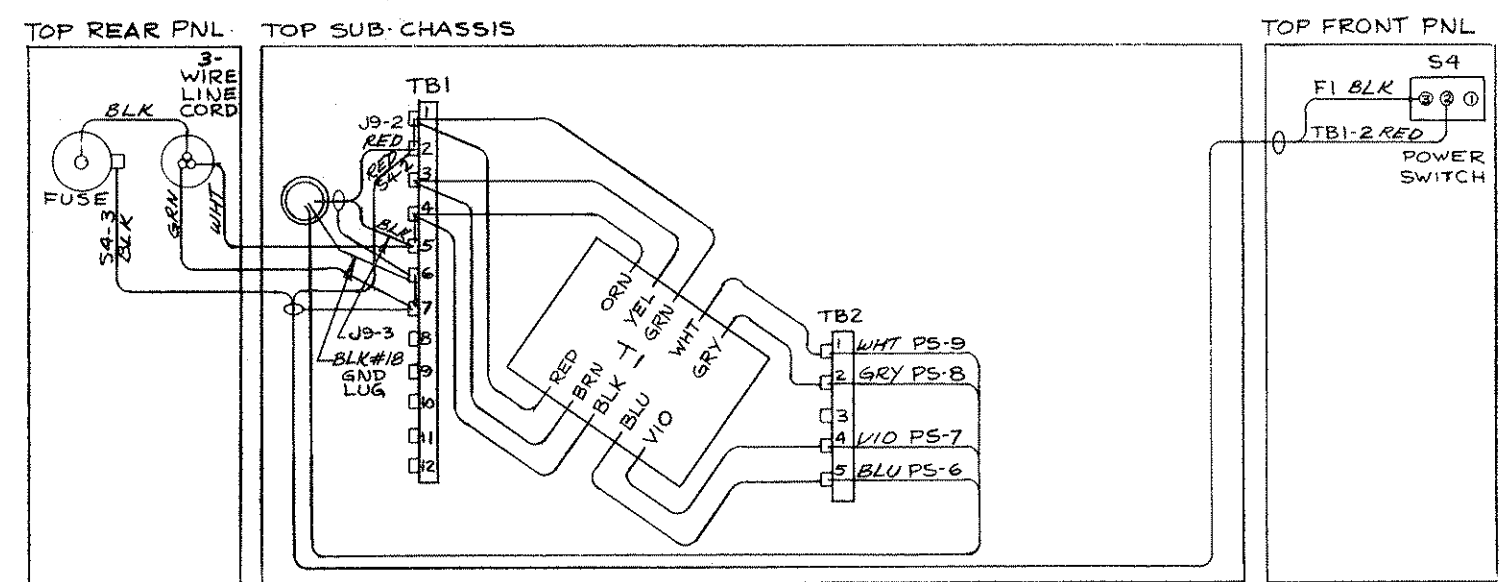
| 4 | 3 | 014-1094 | CAPACITOR, 1000 MFD/50V (C2, C3 & C6) |
|------|------------|-------------|---------------------------------------|
| 3 | 17 | 413-1597 | TERMINALS |
| 2 | 2 | 239-0003 | BRIDGE RECTIFIER (CR1 & CR2) |
| 1 | 1 | 514-1350 | BLANK P C BOARD |
| X | X | 914-1351 | POWER SUPPLY P C BD ASSY, 303D |
| ITEM | QTY RQD | PART NUMBER | DESCRIPTION |

| LIST OF MATERIAL | | | |
|--------------------------------------|--|---------------------|---------------------|
| TOLERANCE UNLESS OTHERWISE SPECIFIED | | DRAWN BY <i>MSD</i> | DATE <i>6/13/75</i> |
| DECIMAL 2 PL=.01 3 PL=.005 | | CHECKED BY | DATE |
| FRACTIONAL $\pm 1/64$ | | PROJECT ENGR | DATE |
| ANGULAR $\pm 1^\circ$ | | APPROVED BY | |
| SHARP EDGES TO | | | |
| BEND RADIUS | | | |
| FILLET RADIUS | | | |
| MATERIAL | | TREATMENT OR FINISH | |
| | | | |

| | | | |
|--|------------------|-------|----|
| BROADCAST ELECTRONICS INC. - A FILMWAYS COMPANY - | | | |
| TITLE POWER SUPPLY P C BOARD ASSEMBLY | | | |
| B | DWG NO. 914-1351 | REV | |
| 303D | SCALE FULL | SHEET | OF |



REV A-ECN 558 8/1/75

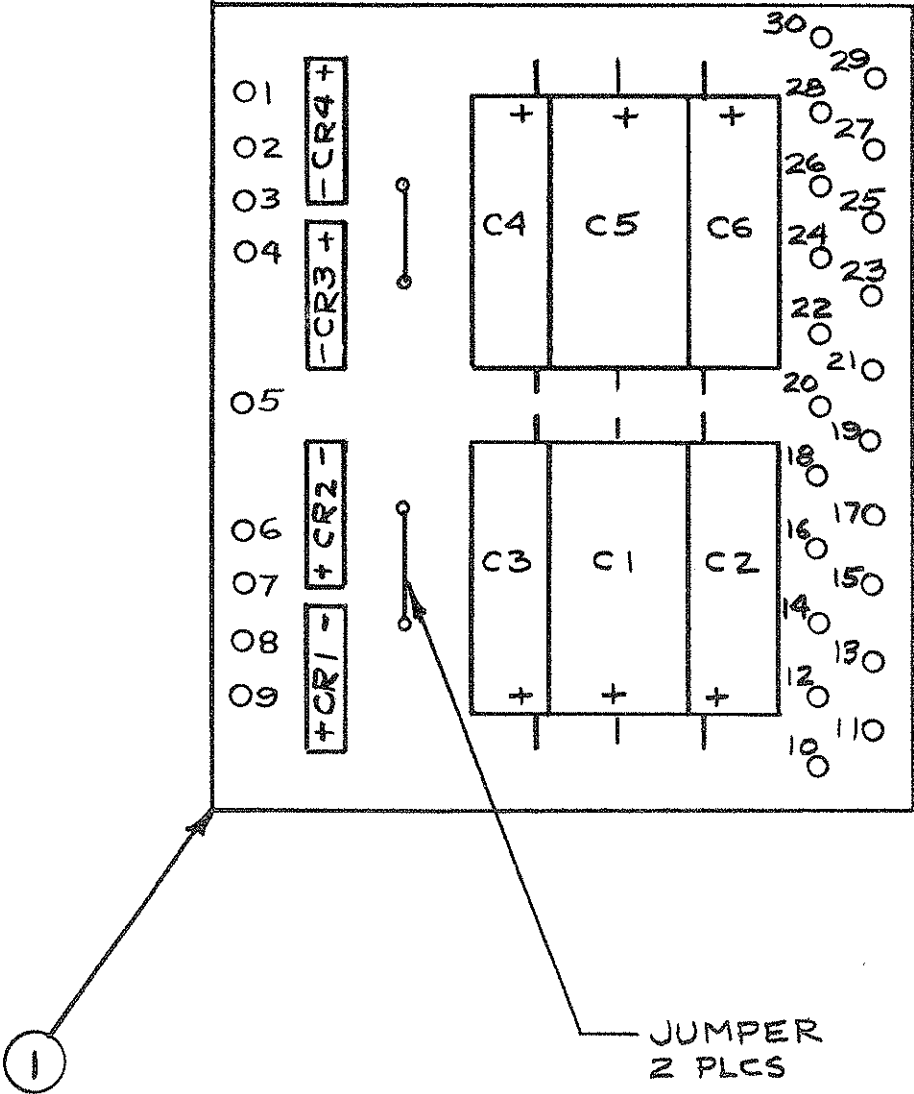


BROADCAST ELECTRONICS INC
- A FILMWAYS COMPANY -

303
POWER SUPPLY WIRING
C-947-0001
REV A

DRAWN: 1/31/75 JMSB

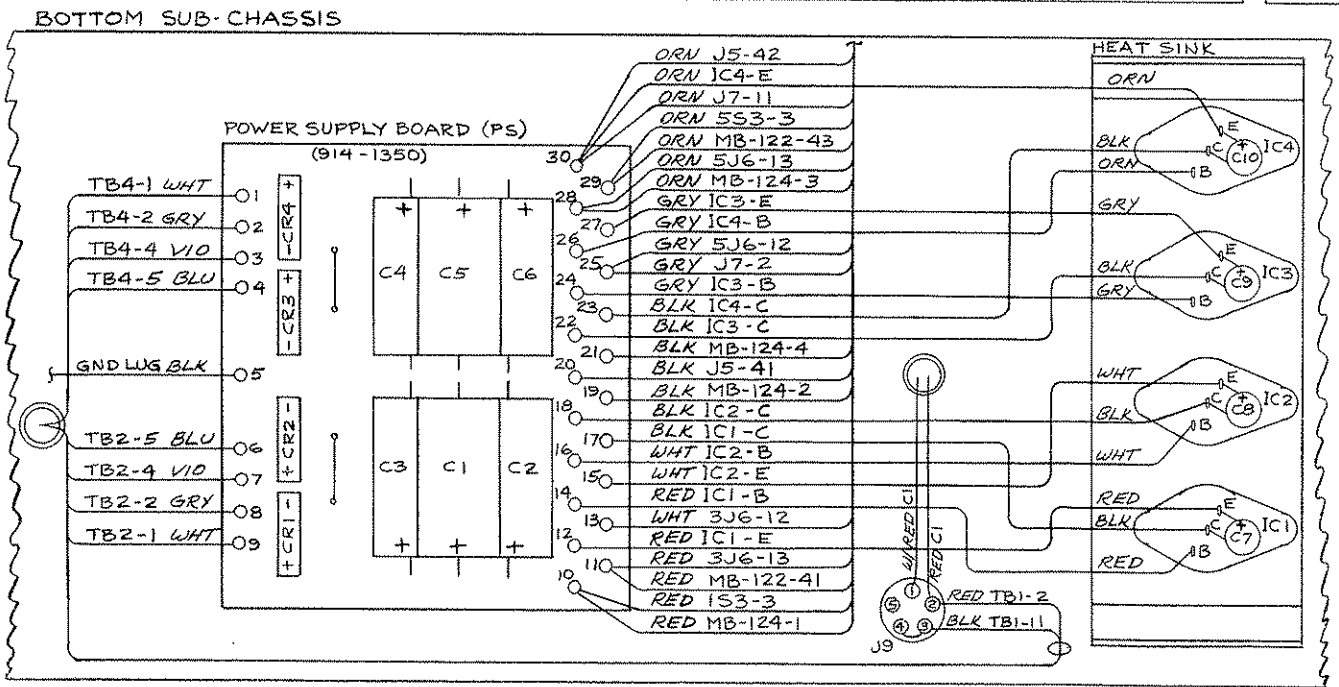
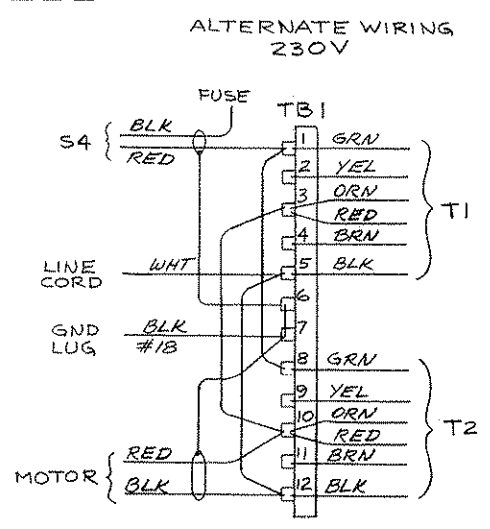
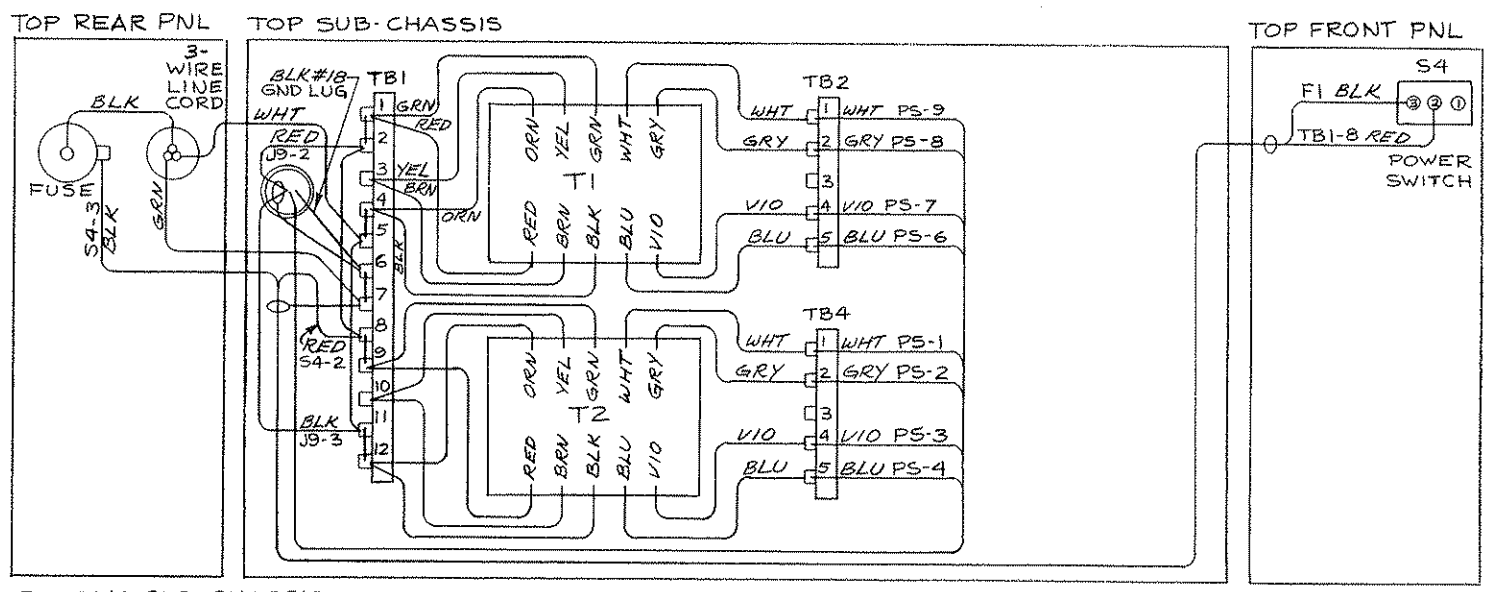
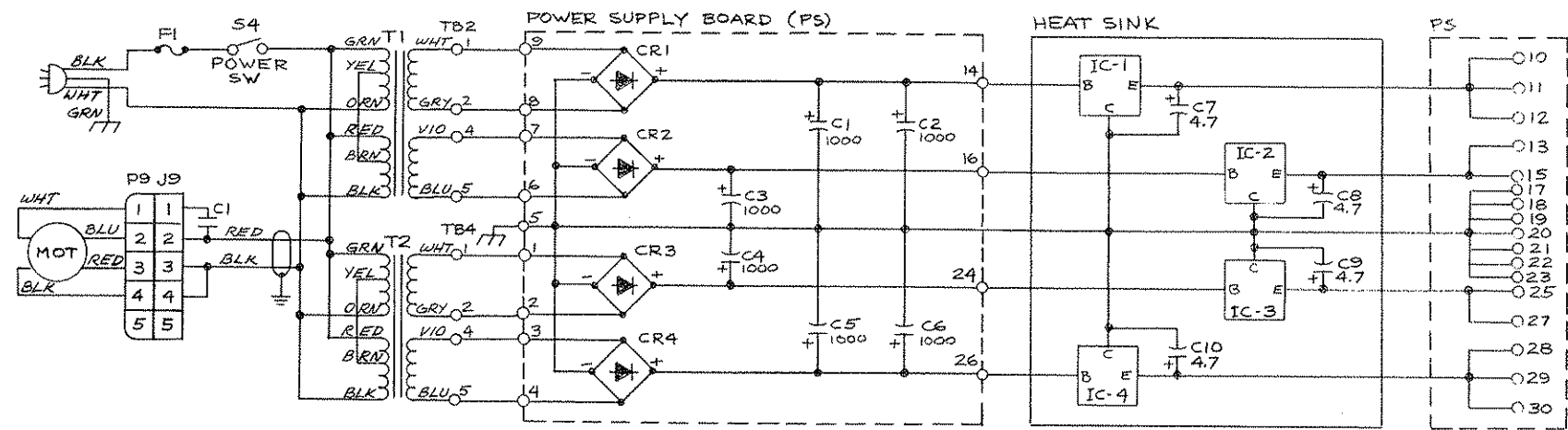
| REVISIONS | | | |
|-----------|-------------|---------|-----------|
| REV | DESCRIPTION | DATE | APPROVED |
| A | PER ECN 545 | 7/17/75 | <i>JB</i> |



| 4 | 6 | 014-1094 | CAPACITOR, 1000 MFD/ 50V (C1 THRU C6) |
|-------------------------------------|-------------------------------------|-------------|---------------------------------------|
| 3 | 30 | 413-1597 | TERMINALS |
| 2 | 4 | 239-0003 | BRIDGE RECTIFIER (CR1 THRU CR4) |
| 1 | 1 | 514-1350 | BLANK P C BOARD |
| <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | 914-1350 | POWER SUPPLY P C BD ASSY, 305D |
| ITEM | QTY RQD | PART NUMBER | DESCRIPTION |

| | | | | | |
|--------------------------------------|--|----------------------------------|--|----------------------------|--|
| TOLERANCE UNLESS OTHERWISE SPECIFIED | | DRAWN BY <i>MSD</i> DATE 6/13/75 | | BROADCAST ELECTRONICS INC. | |
| DECIMAL 2 PL=.01 3 PL=.005 | | CHECKED BY | | - A FILMWAYS COMPANY - | |
| FRACTIONAL ± 1/64 | | PROJECT ENGR | | TITLE POWER SUPPLY | |
| ANGULAR ± 1° | | APPROVED BY | | P C BOARD ASSEMBLY | |
| SHARP EDGES TO | | MATERIAL | | DWG NO. 914-1350 | |
| BEND RADII | | TREATMENT OR FINISH | | REV A | |
| FILLET RADII | | | | 305D | |
| | | | | SCALE FULL SHEET 1 OF 1 | |

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BROADCAST ELECTRONICS INC
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305
POWER SUPPLY WIRING

C-347-0002

DRAWN: 1/29/75 MMB

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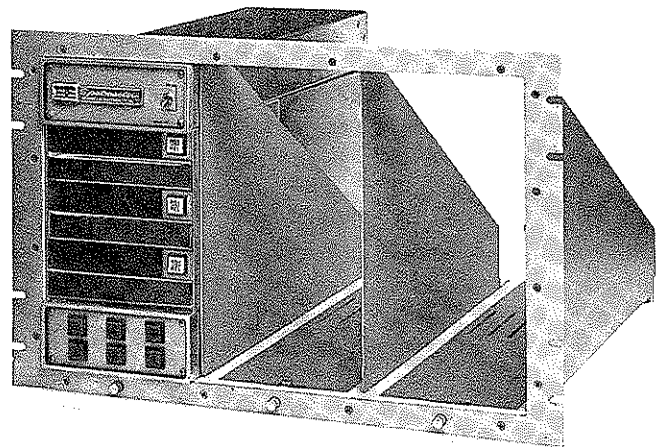
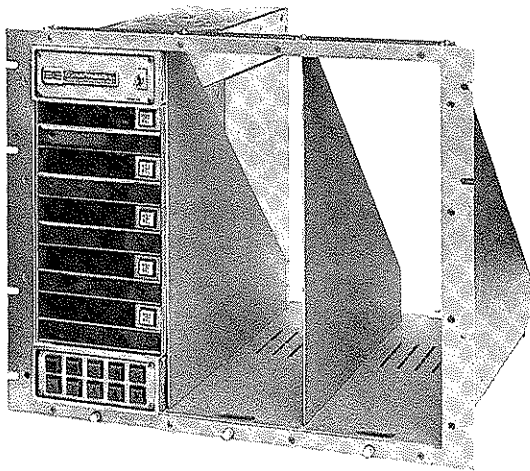
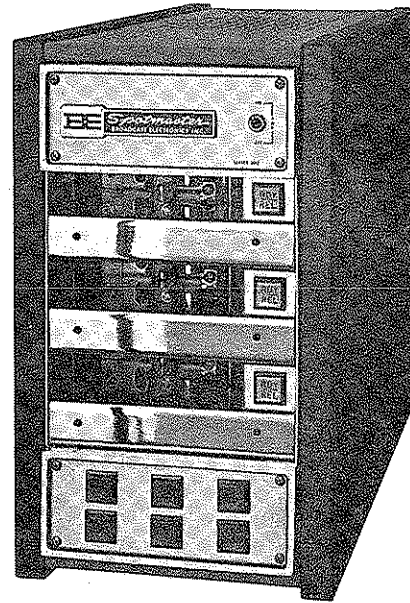
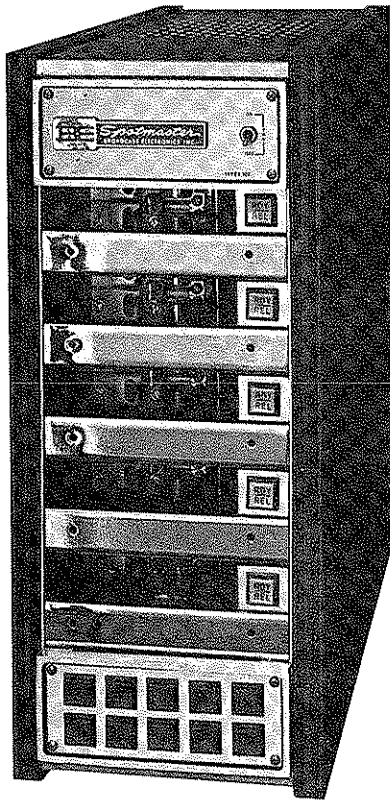


Figure 1-1. SPOTMASTER Mini-Series Models 305C and 303C, in Free Standing Walnut Enclosure and Rack Adapters.

SECTION 1

GENERAL DESCRIPTION

1.1 INTRODUCTION

The SPOTMASTER Mini-Series provides the latest innovations in multiple channel cartridge systems. Mini-Series units require minimum space but provide maximum performance and versatility. The Mini-Series is available in 3 or 5 deck configurations, monophonic or stereophonic, for NAB Type A cartridges.

Free standing units are supplied with walnut cabinets for desk top mounting. Standard 19 inch rack adapters are also available. Three 303 or 305 systems may be mounted side by side in the standard width rack.

Units are available with separate outputs from each deck, a single switched output, or a combination of switched and individual outputs. An optional sequencer turns one or more Mini-Series units into a Mini-Mation system. Other options include an audio switcher and auxiliary cue tone sensors. These options can easily be added later in the field; in most cases little more is required than plugging in a printed circuit board.

The Mini-Series features all solid state, modular electronics. Many of the modules are common to the SPOTMASTER TEN/70 single channel units. Starting and stopping control is solid state logic. No relays are used. Drive is through a single capstan shaft powered by a hysteresis synchronous motor. The deck modules plug in and may be removed without affecting the remaining decks.

1.2 SPECIFICATIONS

| | |
|--------------------|--|
| Frequency Response | ± 2 dB, 50 Hz to 15,000 Hz ± 4 dB, 30 Hz to 18,000 Hz |
| Distortion | 1.5% or less @ "0" VU, Ref: 400 Hz |
| Signal to Noise | Unweighted -55 dB or better. Ref: NAB Standards Section 2.33 |
| Cross Talk | Cue/Pgm: -55 dB or better @ 1 KHz Ref: NAB Standard 2:40 Stereo Channel A to B: -45 dB or better @ 1 KHz |
| Equalization | NAB Standard (Other Standards: CCIR, DIN, etc. available at special request). |
| Output | Three Level, Switchable: -10 dBm, 0 dBm, and +8 dBm. Adjustable 20 dB Level Trim in each position. |
| Output Impedance | 600 ohm balanced, alternate strapping for 150 ohms. |

| Cue Tones | Primary: 1,000 Hz (Stop/Re-cue) Secondary: 150 Hz (End of Message – Optional) Tertiary: 8,000 Hz (Auxiliary – Optional) | | | | | | | | |
|---|--|------------|------------|---------------------------------|---------------------------------|---------------------------------|---------------------------------|--|--|
| Cueing Accuracy | 0.1 Seconds | | | | | | | | |
| Speed | 7-1/2 ips (Standard) 3-3/4 ips (Optional) | | | | | | | | |
| Speed Accuracy | ±0.4% or better | | | | | | | | |
| Wow and Flutter | 0.2% or better @ 7-1/2 ips 0.25% or better @ 3-3/4 ips (optional) | | | | | | | | |
| Capacity NAB Standard Cartridge | Size "A" | | | | | | | | |
| Power Requirements | <table border="1"> <tr> <th>Model 303C</th><th>Model 305C</th></tr> <tr> <td>105-125 VAC 60 Hz @ 60 Watts</td><td>105-125 VAC 60 Hz @ 75 Watts</td></tr> <tr> <td>220-250 VAC 50 Hz @ 60 Watts</td><td>220-250 VAC 50 Hz @ 75 Watts</td></tr> <tr> <td colspan="2">Other Line Standard on Special Request</td></tr> </table> | Model 303C | Model 305C | 105-125 VAC 60 Hz @ 60 Watts | 105-125 VAC 60 Hz @ 75 Watts | 220-250 VAC 50 Hz @ 60 Watts | 220-250 VAC 50 Hz @ 75 Watts | Other Line Standard on Special Request | |
| Model 303C | Model 305C | | | | | | | | |
| 105-125 VAC 60 Hz @ 60 Watts | 105-125 VAC 60 Hz @ 75 Watts | | | | | | | | |
| 220-250 VAC 50 Hz @ 60 Watts | 220-250 VAC 50 Hz @ 75 Watts | | | | | | | | |
| Other Line Standard on Special Request | | | | | | | | | |
| Controls | <p>Front Panel illuminated push buttons for Start (green), Stop (red), and Ready/Cartridge Release (yellow).</p> <p>Rear Panel each channel:</p> <p>Output: 3 circuit standard phone jack.</p> <p>Level Switchable: Slide Switch.</p> <p>Level Trim: Potentiometer.</p> | | | | | | | | |
| Remote and Accessory Control Connections: | | | | | | | | | |
| Remote: | Amphenol Blue Ribbon (50 pin) connector providing remote control and indication of all front panel push-button control functions. | | | | | | | | |
| Accessory: | Amphenol Blue Ribbon (24 pin) connector providing normally open relay contacts from optional 150 Hz and 8,000 Hz auxiliary tone sensors. | | | | | | | | |
| Dimensions (Approx) | Model 303C: 10-1/2" H, 5-1/2" W, 17-3/4" D Model 305C: 14-1/2" H, 5-1/2" W, 17-3/4" D | | | | | | | | |
| Weight (Approx) | Model 303C: 30 pounds Model 305C: 42 pounds | | | | | | | | |

1.3 MODEL CONFIGURATIONS

The Mini-Series Models 303C and 305C are available in several configurations with several combinations of options. Major options include:

1. Mono or Stereo program.
2. Switcher, single or multiple output units.
3. Q-Trip, QI or QII.
4. Recorder.
5. Tape Speed.
6. AC power input.

The major combinations are summarized in Table 1-1. Similar units are available with 220 V, 50 or 60 Hz input power, 177 V, 50 Hz input power, tape speed of 3¾ ips, or a recorder.

| Table 1-1. Model 303C, 305C Configuration | | | | | |
|---|------------|-------------|----------------|---------|----------|
| Stock Number 902- | 303 or 305 | Mono/Stereo | No. of Outputs | Q-Trip | Switcher |
| 3030 | 303 | M | 3 | No | No |
| 3031 | 303 | M | 3 | QI | No |
| 3032 | 303 | M | 3 | QI, QII | No |
| 3033 | 303 | M | 3 | No | Yes |
| 3034 | 303 | M | 3 | QI | Yes |
| 3035 | 303 | M | 3 | QI, QII | Yes |
| 3036 | 303 | M | 1 | No | Yes |
| 3037 | 303 | M | 1 | QI | Yes |
| 3038 | 303 | M | 1 | QI, QII | Yes |
| 3040 | 303 | S | 3 | No | No |
| 3041 | 303 | S | 3 | QI | No |
| 3042 | 303 | S | 3 | QI, QII | No |
| 3043 | 303 | S | 3 | No | Yes |
| 3044 | 303 | S | 3 | QI | Yes |
| 3045 | 303 | S | 3 | QI, QII | Yes |
| 3046 | 303 | S | 1 | No | Yes |
| 3047 | 303 | S | 1 | QI | Yes |
| 3048 | 303 | S | 1 | QI, QII | Yes |
| 3050 | 305 | M | 5 | No | No |
| 3051 | 305 | M | 5 | QI | No |
| 3052 | 305 | M | 5 | QI, QII | No |
| 3053 | 305 | M | 5 | No | Yes |
| 3054 | 305 | M | 5 | QI | Yes |
| 3055 | 305 | M | 5 | QI, QII | Yes |
| 3056 | 305 | M | 1 | No | Yes |
| 3057 | 305 | M | 1 | QI | Yes |
| 3058 | 305 | M | 1 | QI, QII | Yes |
| 3060 | 305 | S | 5 | No | No |
| 3061 | 305 | S | 5 | QI | No |
| 3062 | 305 | S | 5 | QI, QII | No |
| 3063 | 305 | S | 5 | No | Yes |
| 3064 | 305 | S | 5 | QI | Yes |
| 3065 | 305 | S | 5 | QI, QII | Yes |
| 3066 | 305 | S | 1 | No | Yes |
| 3067 | 305 | S | 1 | QI | Yes |
| 3068 | 305 | S | 1 | QI, QII | Yes |

1.4 ACCESSORIES AVAILABLE

Broadcast Electronics carries a complete line of accessories to complement the SPOT-MASTER Mini-Series. A list of these accessories is at the back of this manual.

1.5 CUSTOMER SERVICE

The Broadcast Electronics Customer Service Department will assist users with problems with their Mini-Series cartridge tape machines. Inquiries should be sent to Customer Service Department, Broadcast Electronics, 8810 Brookville Road, Silver Spring, Maryland 20910. Or during business hours, telephone area code 301, 588-4983.

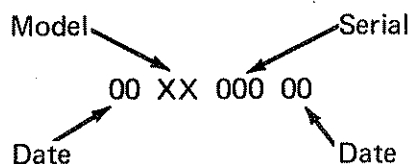
When writing, please give the unit model number and serial number, date purchased, and where purchased. Give complete details of the difficulty and any other pertinent information (such as options installed, peripheral equipment operated with the unit, etc.).

NOTE

Before returning the unit to the factory, contact Broadcast Electronics or an authorized representative.

1.5.1 Model and Serial Numbers

The serial and model numbers are stamped on a plate affixed to the rear panel. The complete serial number consists of a date code, the model designation, and the machine serial.



NOTE

When contacting Broadcast Electronics, please give complete serial number.

1.5.2 Spare Parts

Broadcast Electronics maintains an inventory of spare parts, electronic components, printed circuit boards, etc. Order by Broadcast Electronics part numbers.

1.5.3 Warranty

The Broadcast Electronics warranty is printed on the final page of this manual.

SECTION 2

INSTALLATION AND OPERATION

2.1 PHYSICAL INSTALLATION

Units should be mounted so that air may freely circulate around the top and bottom of the chassis. The machine should not be placed over other high heat producing electronic equipment. Do not install in high magnetic fields or dust locations. Units can be mounted on a desk top or in a standard 19 inch rack with the appropriate optional rack adapter.

2.1.1 Rack Mounting

See Figure 1-1.

Mini-Series rack adapters are available for either three or five deck units. Up to three units may be mounted side-by-side in a single adapter. Five deck models cannot be mounted in three deck adapters. All the adapters are designed for standard 19 inch racks.

Place the adapter through the rack opening from the front and secure with No. 10 screws driven from the front. Place the unit in the adapter facing out and latch in place by turning the thumbscrew clockwise 1/4 turn.

2.1.2 Cabinet Mounting

See figure 1-1.

Units that will not be rack mounted are normally placed in walnut enclosures. Slide the unit into the cabinet from the front until the deck fronts are flush with the cabinet side piece. Tighten the cabinet screws.

2.2 INTERCONNECTIONS

See figure 2-1.

All audio and control connections to Mini-Series units are made on the rear panel. Use shielded cable for all audio connections. Ground the shields at one end only. Connect the rear panel ground lug to the system or house ground with a grounding strap.

2.2.1 Program Output

See figure 2-2.

The audio output is available on a three conductor phone jack. In stereo units separate jacks are provided for the left and right channels. In multiple output units a separate jack is

installed for the output of each deck. Units factory equipped with the optional audio switcher have a single switched output. In stereo units the A channel is the left or upper track on the tape. The B channel is the right or middle track on the tape.

The jacks are wired for balanced output. The ring and tip carry signal, and the sleeve is the shield. The mating plug is a 1/4" stereo phone plug (Switchcraft 267 or equivalent). The ring and sleeve may be connected for unbalanced operation. For unbalanced output a standard 1/4" phone plug may be used. Be sure to use a termination resistor when the output is applied to a high impedance bridge.

The standard output impedance is 600 ohms. Optional 150 ohm output is available from the factory or by conversion in the field. For 600 ohms jumpers are installed between the following terminals on the MB-113 Output Master Board: 6 to 1, 3 to 2, 11 to 12, and 14 to 13. For 150 ohms re-connect the jumpers to these terminals: 6 to 4, 3 to 5, 11 to 15, and 14 to 10. Terminals 1 through 6 are not used in mono units.

2.2.2 Q-Trips (J4)

See figure 2-3.

This Amphenol Type 57, 24 conductor, jack carries the normally open relay contacts of the optional auxiliary cue tone sensors. External relays to be controlled by these tones should be connected to J4. The 150 Hz "end-of-message" tone is referred to as QI. The 8 KHz tone is designated QII. In three deck units pins 13 through 20 are not wired. Maximum ratings for the relay contacts are 1/2 amp (resistive) at 120 VAC or 30 VDC. The auxiliary cue tones may also be displayed remotely through lamp voltage outputs on J5 (see 2.4.3 below). Pin connections for J4 are shown in table 2-1.

| Table 2-1. J4 Pin Connections | | | | | |
|-------------------------------|------------------------|------|------------------------|------|---------------------------|
| Pin | Function | Pin | Function | Pin | Function |
| 1 } | Deck 1 QI NO Contacts | 9 } | Deck 3 QI NO Contacts | 17 } | Deck 5 QI NO Contacts |
| 2 } | | 10 } | | 18 } | |
| 3 } | | 11 } | | 19 } | |
| 4 } | Deck 1 QII NO Contacts | 12 } | Deck 3 QII No Contacts | 20 } | Deck 5 QII NO Contacts |
| 5 } | | 13 } | | 21 } | |
| 6 } | | 14 } | | 22 } | |
| 7 } | Deck 2 QI NO Contacts | 15 } | Deck 4 QI NO Contacts | 23 } | SPARES |
| 8 } | | 16 } | | 24 } | |
| | | | | | |
| | Deck 2 QII NO Contacts | | Deck 4 QII NO Contacts | | CHASSIS GROUND |

2.2.3 Remote Control Jack (J5)

See figure 2-4.

This Amphenol Type 57, 50 conductor, jack provides for remote control of all operating controls except the cartridge release. Provision is also made for remote display of all indicator lamps including the READY lamps and QI and QII indicators. Stopping and starting require momentary closure of a SPST normally open switch from the appropriate control bus to the 24 VDC supply. Only lamps rated at 12 V and 17 ma should be used to avoid overloading the power supply. The remote controls and the front panel controls are in parallel. No jumpers are required for operation without remote connections. In three deck units pins 25 through 40 are not wired. Pin connections for J5 are shown in table 2-2.

| Table 2-2. J5 Pin Connections | | | | | |
|-------------------------------|---------------|--------|-----|--------------|--------|
| Pin | Function | | Pin | Function | |
| 1 | Stop Control | DECK 1 | 25 | Stop Control | DECK 4 |
| 2 | Stop Lamp | | | | |
| 3 | Ready Lamp | | | | |
| 4 | Start Control | | | | |
| 5 | Start Lamp | | | | |
| 6 | Spare | | | | |
| 7 | QI Lamp | | | | |
| 8 | QII Lamp | | | | |
| 9 | Stop Control | DECK 2 | 33 | Stop Control | DECK 5 |
| 10 | Stop Lamp | | | | |
| 11 | Ready Lamp | | | | |
| 12 | Start Control | | | | |
| 13 | Start Lamp | | | | |
| 14 | Spare | | | | |
| 15 | QI Lamp | | | | |
| 16 | QII Lamp | | | | |
| 17 | Stop Control | DECK 3 | 41 | Ground | SPARES |
| 18 | Stop Lamp | | | | |
| 19 | Ready Lamp | | | | |
| 20 | Start Control | | | | |
| 21 | Start Lamp | | | | |
| 22 | Spare | | | | |
| 23 | QI Lamp | | | | |
| 24 | QII Lamp | | | | |
| | | | 42 | +24 VDC | |
| | | | 43 | | |
| | | | 44 | | |
| | | | 45 | | |
| | | | 46 | | |
| | | | 47 | | |
| | | | 48 | | |
| | | | 49 | | |
| | | | 50 | | |

2.2.4 Ground Lug

The rear panel ground lug should be connected to the house or system ground.

2.2.5 AC Line Cord

Mini-Series units are normally supplied for operation of 60 Hz, 105-125 VAC. Optionally, units are available for 220-240 VAC, 50 Hz operation.

2.3 OPERATING CONTROLS AND INDICATORS

See figures 2-5 (front panel) and 2-1 (rear panel).

The designations and operating functions of front and rear panel controls/indicators are described in table 2-3.

Table 2-3. Controls and Indicators

| Designation | Function |
|--|--|
| <p>FRONT PANEL</p> <p>Power ON/OFF Switch</p> <p>START Switch/Indicator (Green)</p> <p>STOP Switch/Indicator (Red)</p> <p>RDY/REL (Ready/Release) Switch/Indicator (Yellow)</p> | <p>When ON, AC power is applied. The STOP switch/indicators on the front panel illuminate when power is applied.</p> <p>Each deck has its own START switch/indicator. Depressing START activates control logic and sets the tape in motion on the appropriate deck. The indicator is illuminated when tape is in motion.</p> <p>Each deck has its own STOP switch/indicator. Depressing STOP causes the tape to stop moving. The indicator is illuminated when tape is not in motion.</p> <p>Each deck has its own RDY/REL switch/indicator. The indicator is illuminated only when a cartridge is loaded in that deck. Pressing the switch releases the pinch roller allowing the cartridge to be removed.</p> <p>NOTE A cartridge will not release if tape is in motion or the AC power is off.</p> |
| <p>REAR PANEL</p> <p>Program LEVEL Switch</p> <p>Play Level Trim</p> <p>Fuse</p> | <p>In multiple output units separate LEVEL switches are provided for each deck. In units factory equipped with the optional audio switches for a single switched output, only one LEVEL switch is installed. Three output level selections may be made: 0, -10, or +8 dBm.</p> <p>A separate level trimmer is provided for each deck. In stereo units separate trimmers are used for the A and B channels of each deck. The play level trim allows approximately 20 dB adjustment of the level into the output amplifier.</p> <p>NOTE See paragraph 5.4 for setting the output level.</p> <p>In 117 VAC, 60 Hz units use a 3 AG, 1 amp fuse. In 220-240 VAC, 50 Hz units use a 3 AG, ½ amp fuse.</p> |

2.4 OPERATION

NOTE

Prior to operation, the LEVEL switches and trim adjustments must be set for the desired output levels. Refer to paragraph 5.4.

A cartridge is inserted in the deck to the right side of the opening and against the guide flange. The cartridge is pushed in until it latches in place. Tape is put in motion by depressing the appropriate START button. The deck will run until a 1,000 Hz stop tone is detected on the cue track or the appropriate STOP button is depressed.

A cartridge is released by depressing the RDY/REL button on the front of the deck. The controls are electrically interlocked so that a cartridge cannot be removed while the deck is running.

When the deck first starts, its stop cue tone sensor is muted for approximately two seconds. When the tape stops the full tone burst may not pass the cue track reproduce head. In that case, the stop tone sensor would see a stop tone when the deck re-starts. The two second mute makes the sensor blind when the tape first begins to move.

2.4.1 Optional Audio Switcher

The optional audio switcher feeds the output of the various decks in the unit to a single output connector (or pair of connectors in stereophonic units). When a deck is started its audio is fed immediately to the output. Starting another deck switches its audio to the output immediately. The output of the first deck is shut off after approximately three seconds. The single output is available at the jack(s) for the third channel (303C) or fifth channel (305C).

2.4.2 Optional Q-Trip (Auxiliary Cue Tones)

QI and QII are two auxiliary cue tones standardized by the National Association of Broadcasters for magnetic tape cartridge systems. These tones, defined by the NAB as secondary and tertiary tones, are used to control associated equipment.

The 150 Hz (QI) secondary tone is defined as the "end-of-message" cue and is used to activate another device at the end of a recorded segment. This could be, for instance, a sequence cue to an automation system.

The 8,000 Hz (QII) tertiary tone is defined as an auxiliary tone for use as needed. Generally it is used to activate another device during reproduction of a recorded segment.

The QI and QII sensors respond to the tones by closing a normally open relay. The relay contacts remain closed for the duration of the tone burst.

Instructions for adjusting the optional QI and QII sensors are included in paragraph 5.4.8. The levels recommended are based on the NAB standards. Two considerations were taken into account. For maximum reliability the tone levels should be as high as possible. However, to minimize cross talk to the program channel, the tone levels should be as low as is practicable.

The levels chosen by NAB are roughly these: the 1,000 Hz stop tone at standard operating level, the 150 Hz tone 6 dB above operating level, and the 8,000 Hz tone 10 dB below operating level. Of course, the sensitivity of the sensors is set to operate with reproduced tone levels considerably below these standard levels.

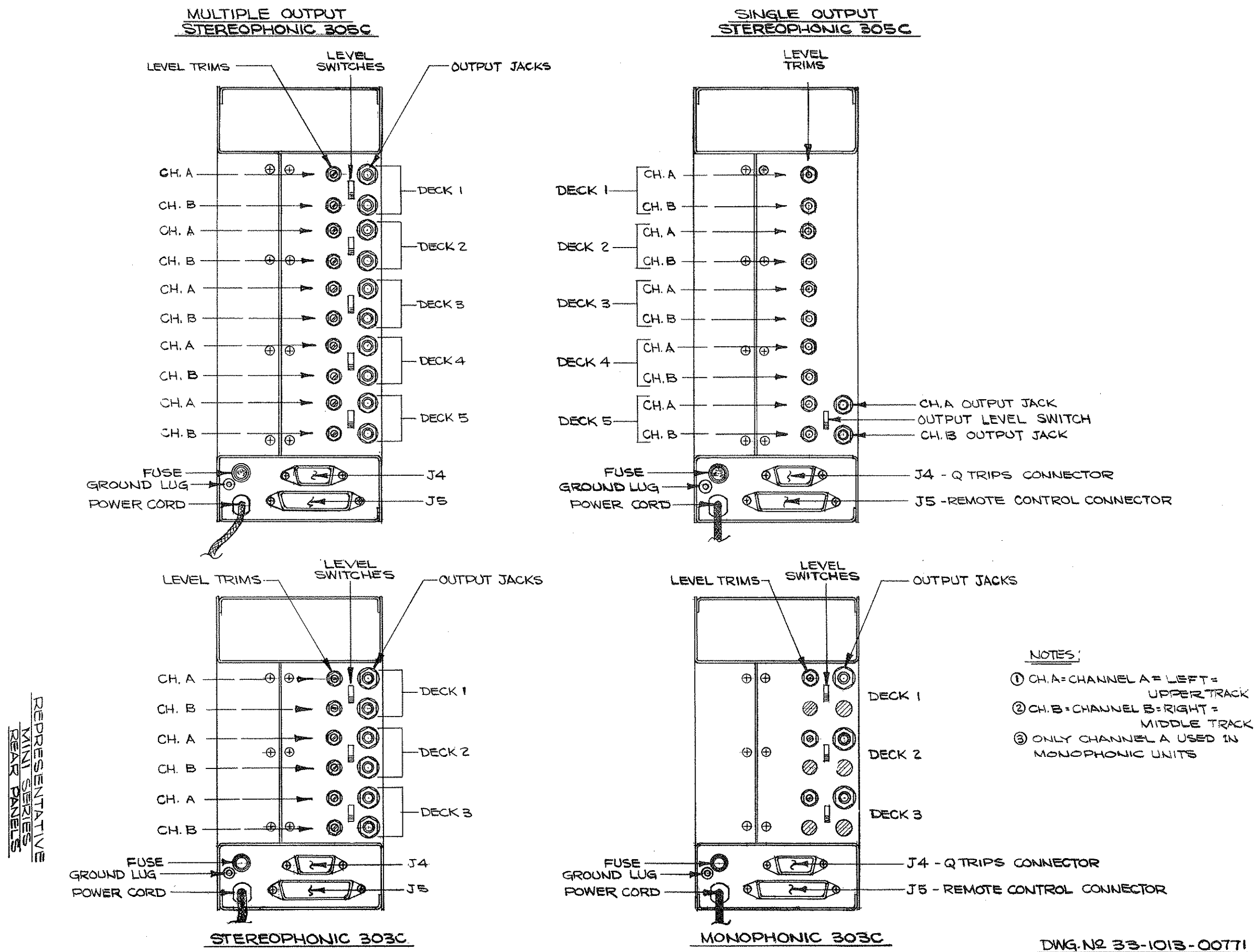
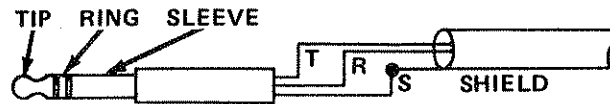
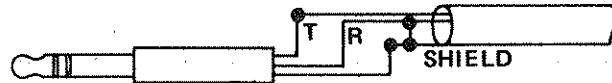


Figure 2-1. Rear Panel Controls and Connectors

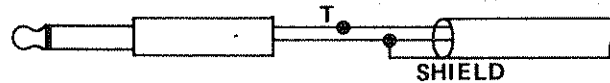
BALANCED USING 1/4" STEREO PHONE PLUG (SWITCHCRAFT 267 OR EQUIVALENT)



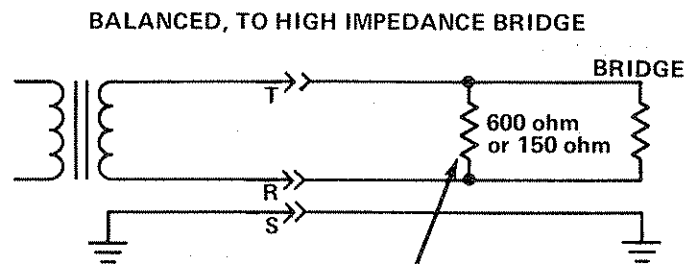
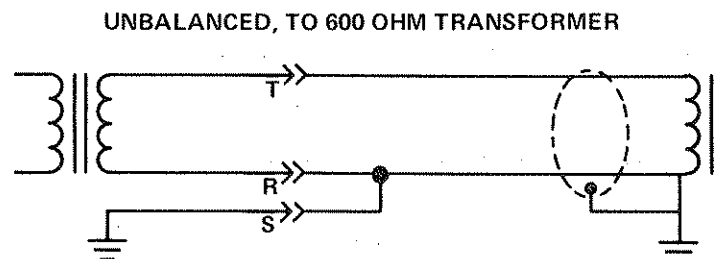
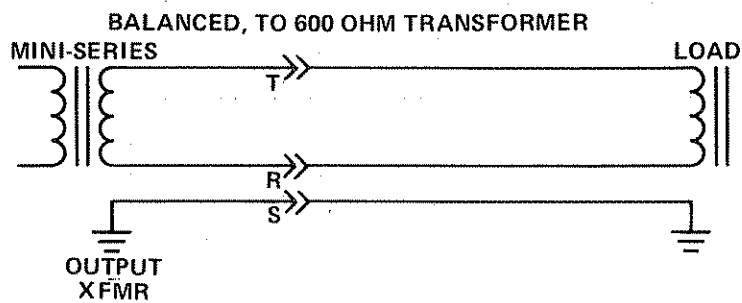
UNBALANCED USING 1/4" STEREO PHONE PLUG (SWITCHCRAFT 267 OR EQUIVALENT)



UNBALANCED USING STANDARD 1/4" 2 CONDUCTOR PHONE PLUG



SCHEMATIC CONNECTIONS



TERMINATION RESISTOR ADDED
TO PROPERLY LOAD UNIT

Figure 2-2. Program Output Connection

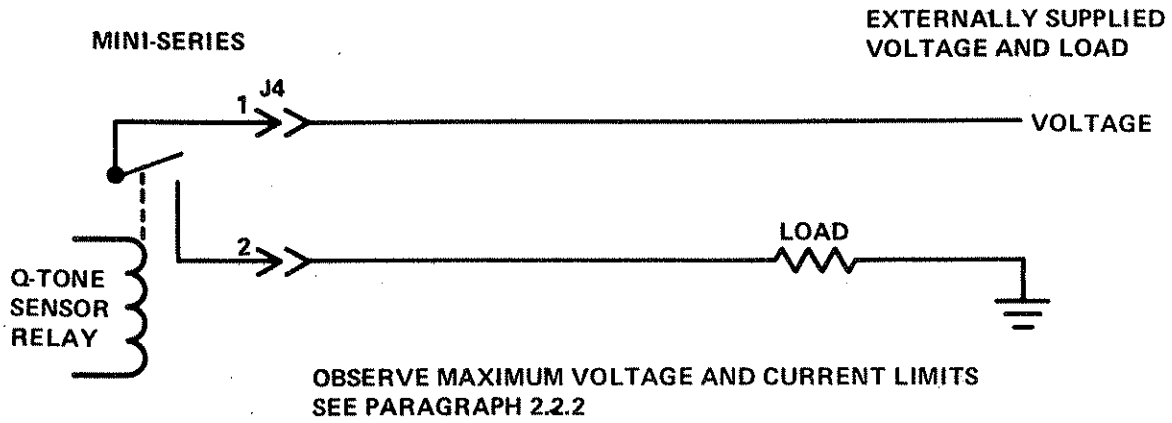


Figure 2-3. Typical Q-Trips Jack (J4) Connection

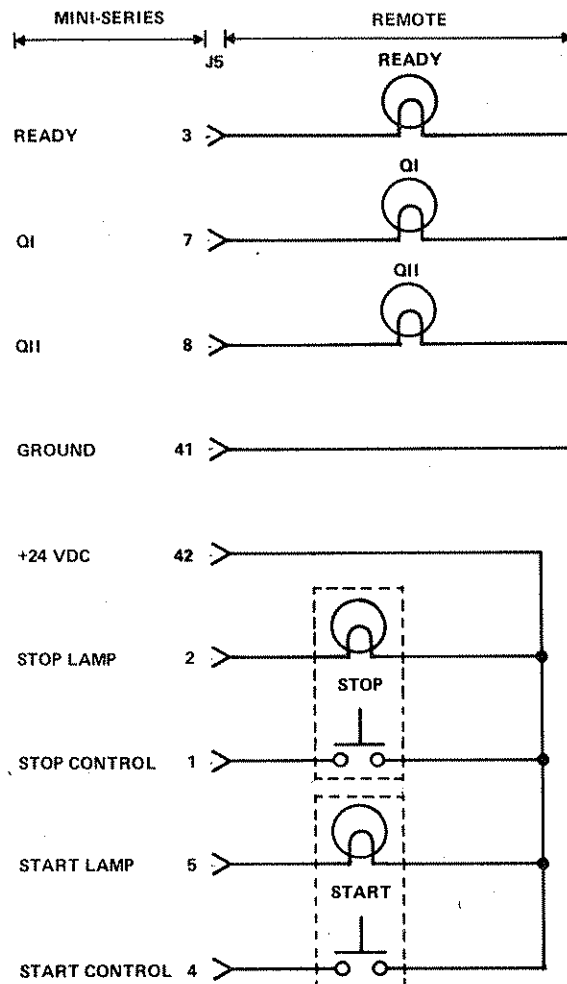


Figure 2-4. Typical Remote Control/Indicator Connections (J5)

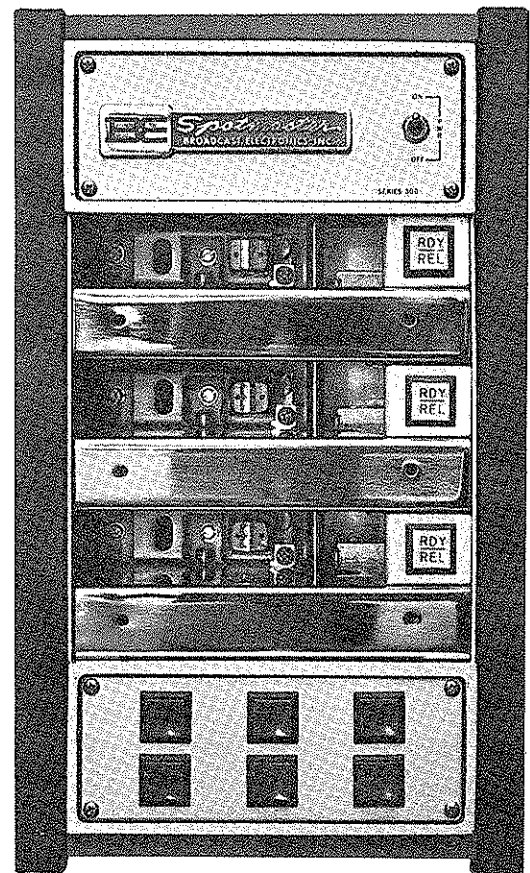
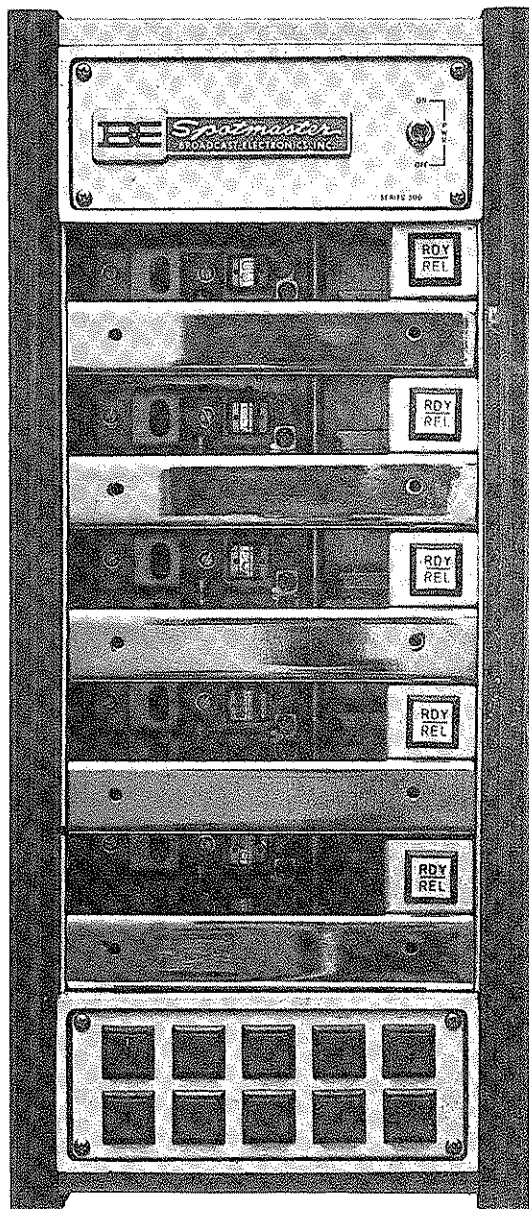


Figure 2-5. Front Panel Controls and Indicators

SECTION 3

UNIT DESCRIPTION

3.1 SYSTEM DESCRIPTION

SPOTMASTER Mini-Series units consist of plug-in deck (tape transport) modules, a tape drive system, program reproduction circuitry, control logic, and the power supply. An optional auxiliary cue tone system and audio switcher may also be included.

Three or five deck modules handle the cartridges. Tape is moved by a common capstan shaft powered by a single motor. A reproduce head mounted on each deck retrieves previously recorded information from the tape. The 300 series deck accepts the NAB type A cartridge.

The electronics of the Mini-Series units are modular. Individual modules plug into master boards to form various circuits. The same master boards are used in both the Mini 3 and Mini 5 Spots except for the Master Control board and the optional audio switcher.

Figures 3-1 and 3-2 are system diagrams of the 305C and 303C Mini-Series Units. These drawings each serve as an overall block diagram, a schematic, and a modular interconnection wiring diagram. An understanding of these drawings is essential in understanding overall system operation for troubleshooting and repair. Since the two systems are very similar, only the 5-channel 305C shown in figure 3-1 is discussed in detail.

Near the left-hand edge of the diagram is the MB-124 Machine Control Board which is common to all channels. It has, however, separate plug-in LO-103 Flip-Flop modules to implement control for each channel. Front panel START/STOP controls and indicators (shown to the right of the MB-124) and remote START/STOP controls and indicators (shown at J5 to the left of the MB-124) all connect to the control circuits of the Machine Control Board.

To the right of the MB-124 is the circuitry for the five channels, with the fifth channel shown in detail across the bottom of the diagram. Each channel has a separate and independent tape deck, Reproduce Master Board, and Output Master Board. Stereo circuitry is shown. For mono units, the right-hand (B) channel components are not used.

As shown in the diagram the tape deck, Reproduce Master Board, and Output Master Board are subdivided as follows:

Tape deck. Contains mechanical elements (solenoids, etc.), MB-107 passive circuit network, and reproduce heads.

Reproduce Master Board (MB-118). Contains left (A) channel plug-in preamp PA-101 and driver DA-104. For stereo, a second optional PA-101 and DA-104 are used. The MB-118 also contains a PA-101 cue preamp and 1KHz stop cue tone sensor.

Output Master Board (MB-113). Contains level adjustment networks and output impedance matching transformers.

Observe that the level trim pots (R4 and R8) shown to the right of each Reproduce Master Board adjust the signal level between the preamp and driver. Connections between the pots and driver inputs are permanent on the first four channels. When the optional MB-125 Audio Switcher is not used, connections between the channel 5 pots and driver inputs is made with jumpers at the Audio Switcher jack shown at the lower left of the diagram. When the Switcher is in use the jumpers are omitted so the audio from any channel may be applied to the channel 5 drivers for the single output.

The MB-123 Power Supply is shown at the upper left of the diagram. Note that it has two sections; one for three channels (1-3) and one for two channels (4, 5).

The optional MB-122 Q-Trip Master Board is shown under the Power Supply. Note that the QI and QII contact closure outputs go to J4 on the left, and the indicator lamp outputs go to J5 on the right.

3.2 INDIVIDUAL OPERATING FUNCTIONS

To better understand the overall operation of the Mini-Series, we can separate major elements such as audio reproduction, control logic, etc. These are described below.

3.2.1 Control Logic

See figure 3-3.

The Master Control Board contains one LO-103 Flip-Flop for each deck. The Flip-Flop activates starting and stopping at the command of the controls. Automatic stopping is controlled by a 1,000 Hz tone recorded on the tape's cue track at the beginning of the program material. The Flip-Flop is an electronic relay which is set to the desired state by a short duration +24 VDC pulse at its input. The output is by grounding the appropriate control buss.

The LO-103 is internally strapped to come on in the stop condition when the power is applied. When a cartridge is not loaded in a deck, no voltage appears on the start enable buss. Inserting a cartridge connects the start enable buss to +24 VDC to forward bias the start control input of the run logic,

Depressing the START button delivers a positive pulse to the run logic which changes to the run condition. The start lamp buss is grounded and the lamp illuminates. The play control buss grounds to activate the play solenoid and put tape in motion. Similarly grounded is the control buss for the optional audio switcher.

A positive pulse on the stop control buss will cancel the run condition. This trigger pulse is generated by depressing the STOP button or by the CA-101 sensing a 1,000 Hz stop tone on the cue track. In the stop state the cartridge release is enabled, and the stop mute and stop lamp busses are grounded.

Depressing the RDY/REL switch will release the cartridge.

The stop cue mute disables the CA-101 sensor while tape is not in motion and for two seconds after tape travel begins.

3.2.2 Audio Reproduction and Cue Tone Control

See figure 3-4.

The output of the reproduce head is fed to the Reproduce Master Board. The cue track signal is fed to a PA-101 preamplifier and then to the CA-101 1,000 Hz sensor. When the CA-101 Sensor detects a stop tone, a trigger pulse is sent to the Master Control Board to stop that deck. The output of the cue PA-101 preamplifier is also available for the MB-122 Q-Trip (auxiliary cue tones) Master Board. The program track (or tracks) of the tape head is fed to a PA-101 preamplifier for equalization and amplification. The audio is then taken to the level control on the rear panel and then returned to the Reproduce Master Board for final amplification in the DA-104 Driver Amplifier.

From the MB-118 the audio passes to the MB-113 Audio Output Board. The output transformer(s) and the output level pad controlled by S1 (rear panel) are on the output board.

3.2.3 Single Output Units

See figure 3-5.

When Mini-Series units are ordered from the factory with a single output rather than an individual output for each deck, the audio system electronics differ slightly from the description above. The MB-125 or MB-126 audio switcher is installed. The DA-104 Modules are left off the MB-118 Reproduce Master Boards. Only one MB-113 Audio Output Master Board and one DA-104 Driver Amplifier are installed in the final (third or fifth) deck position.

From the program channel PA-101 on the MB-118, the audio goes to the rear panel level trimmer and then to the audio switcher. The switched output of the MB-125 or MB-126 goes to the Reproduce Master Board of the final channel for amplification in the DA-104. The output is then fed to the MB-113 output board and the output transformers and the level pad. A level trim potentiometer is provided on the rear panel for each deck, but only one output level switch (S-1). Only one output jack (or pair for stereo) is provided.

3.2.4 Q-Trip Option

If the QI and QII auxiliary cue tones are to be used, the necessary sensors (CA-201) are mounted on the MB-122 board. This is available with provisions for either the 3 deck or 5 deck units. A QI and a QII sensor are provided for each deck as required. The input to the sensors is from the cue channel preamplifier on the MB-118 Reproduce Master Board. The sensor responds to its tuned frequency with the closure of a normally open relay. This contact closure appears on the Q-TRIPS jack on the rear panel. Separate outputs are provided for the QI and QII sensors of the various decks in the unit. Remote QI and QII indicators connect at the REMOTE CONTROL jack.

3.2.5 Power Supply

The power supply is mounted on the MB-123 board and an adjacent heat sink. The "A" supply, PS-102 board, powers the Reproduce Master Board and the output amplifier of the optional audio switcher. The "B" supply consists of transistors Q1 and Q2 on the MB-123 and associated Q3 and Q4 on the heat sink. The "B" supply powers the lamps, solenoids, logic, the optional auxiliary cue tone sensors, and the logic portion of the optional audio switcher. In 5 deck units the A-1 and B-1 supplies handle decks 1, 2, and 3; the A-2 and B-2 supplies handle decks 4 and 5.

3.3 PHYSICAL ARRANGEMENT OF MODULES

See figure 3-6.

The Mini-Series is constructed of individual modular units as shown in figure 3-6. Each tape deck is a separate unit that plugs in from the front. A single hysteresis synchronous motor, through a belt and pulley, drives a flywheel and capstan shaft. The capstan is common to all tape decks, and it runs continuously. Individual tape drive is initiated by the engagement of the individual pinch rollers.

The printed circuit boards associated with the program track(s) are manufactured in two separate versions for monophonic and stereophonic use. Components for the second channel are left off of boards for use in monophonic machines. This applies to the MB-113, MB-118, and MB-125 and MB-126.

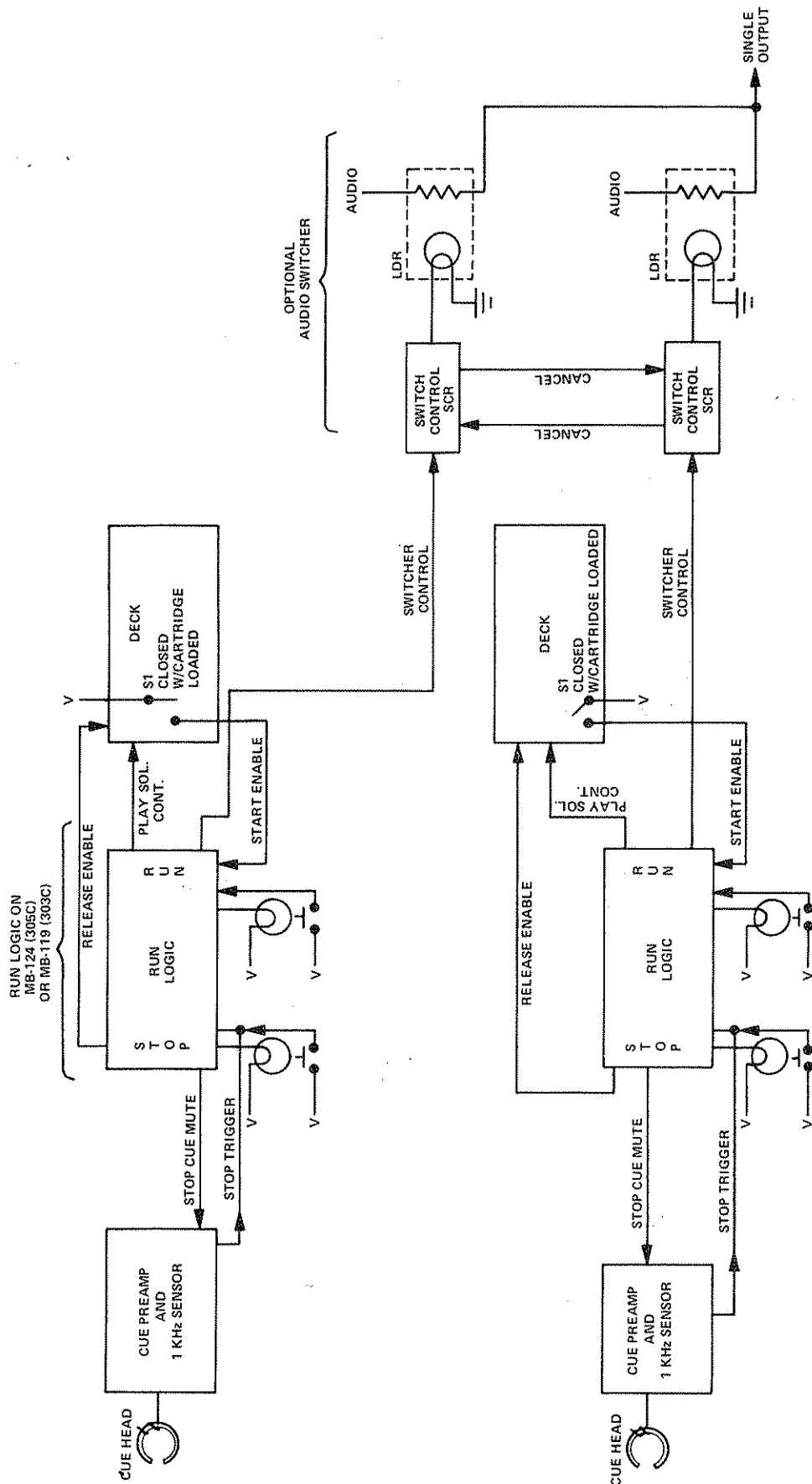


Figure 3-3. Control Logic, Block Diagram

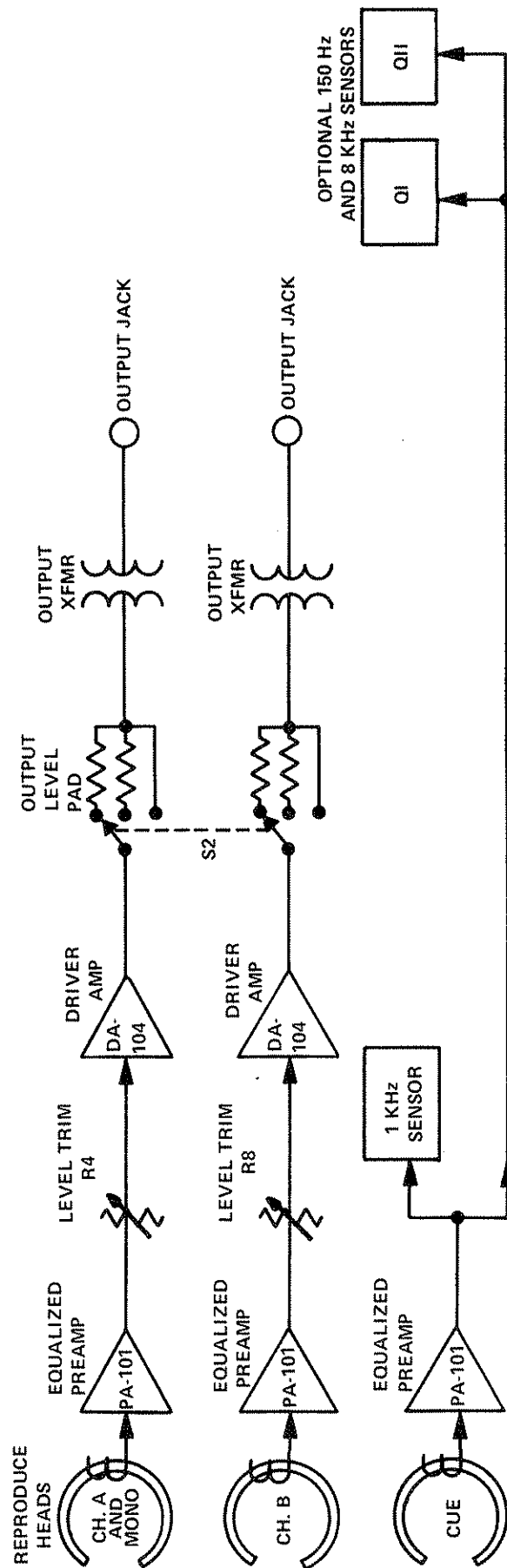


Figure 3-4. Audio Reproduction and Q-Tone Control

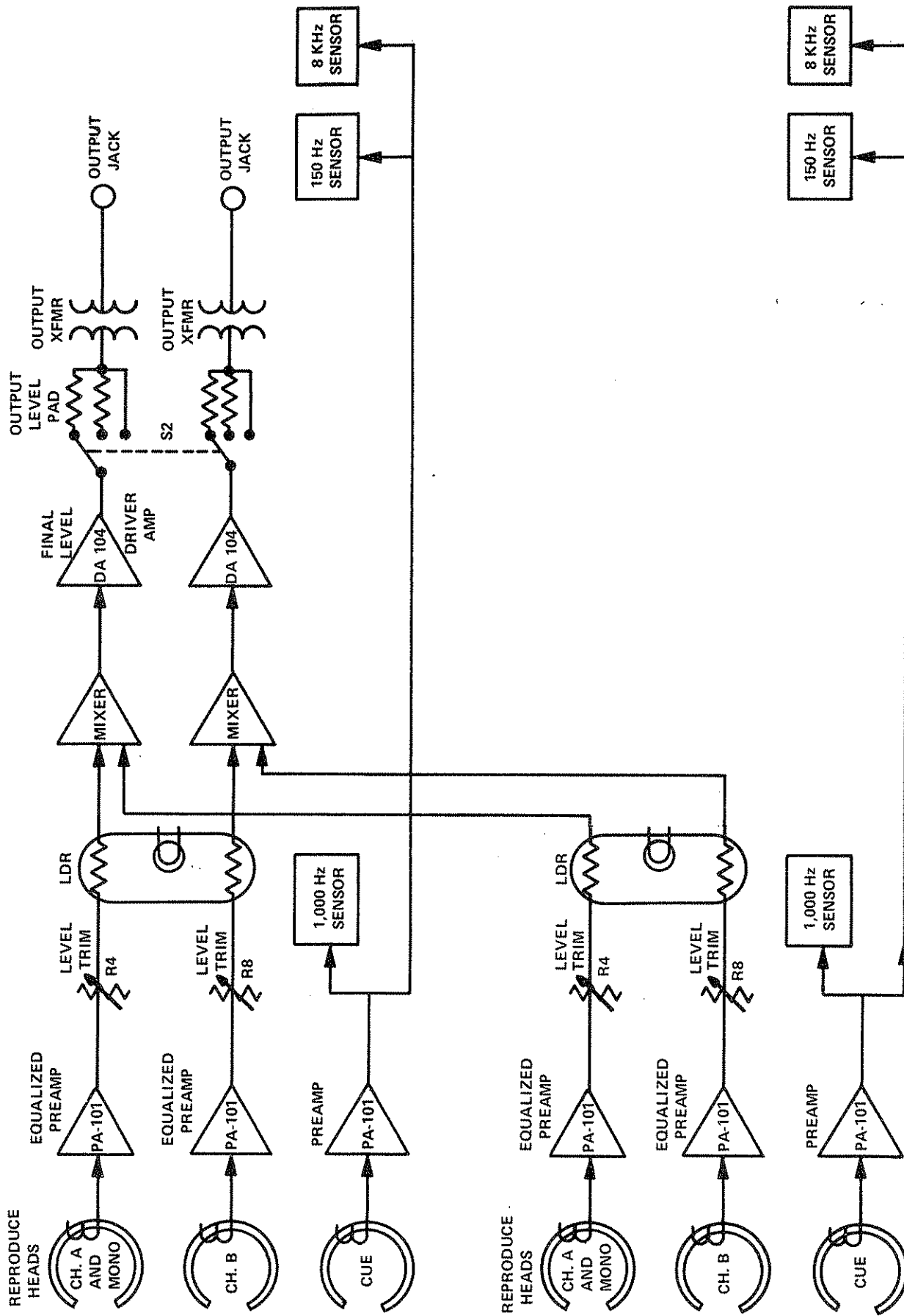


Figure 3-5. Single Output Unit - Audio Signal Flow

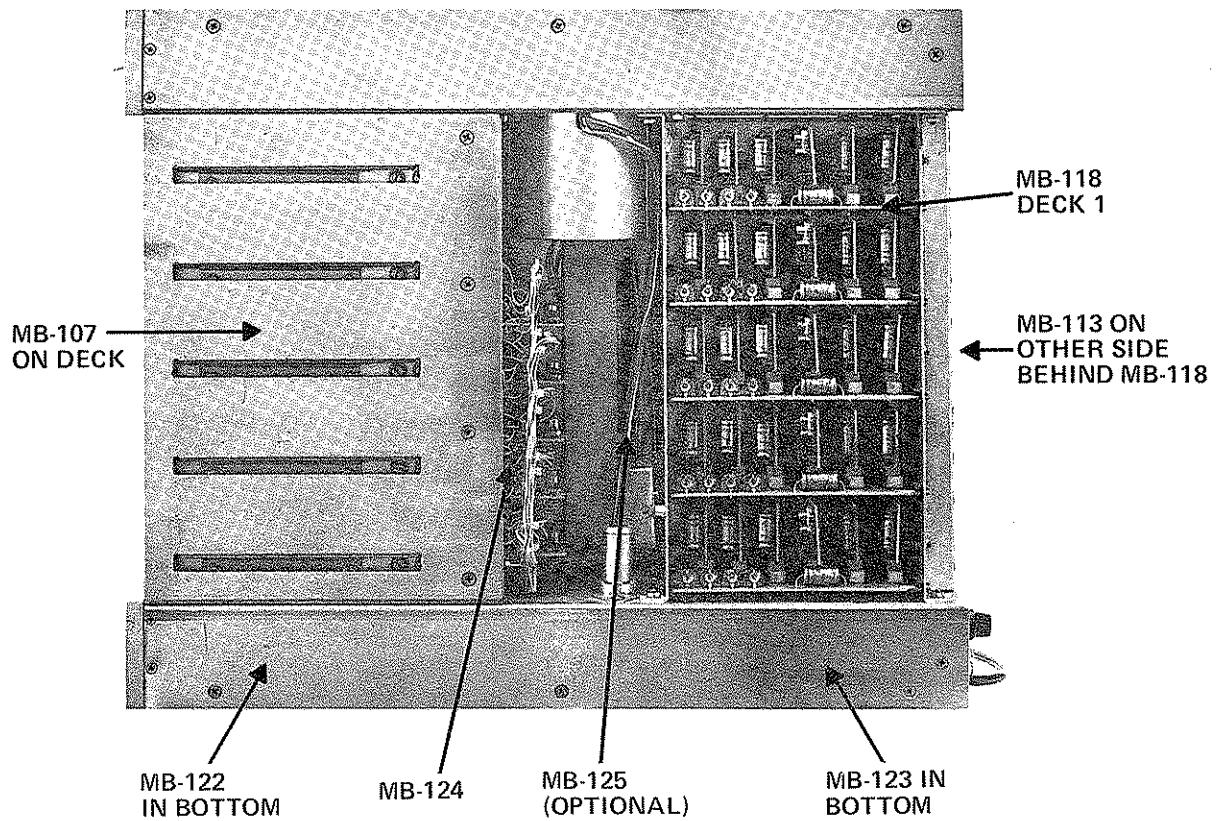
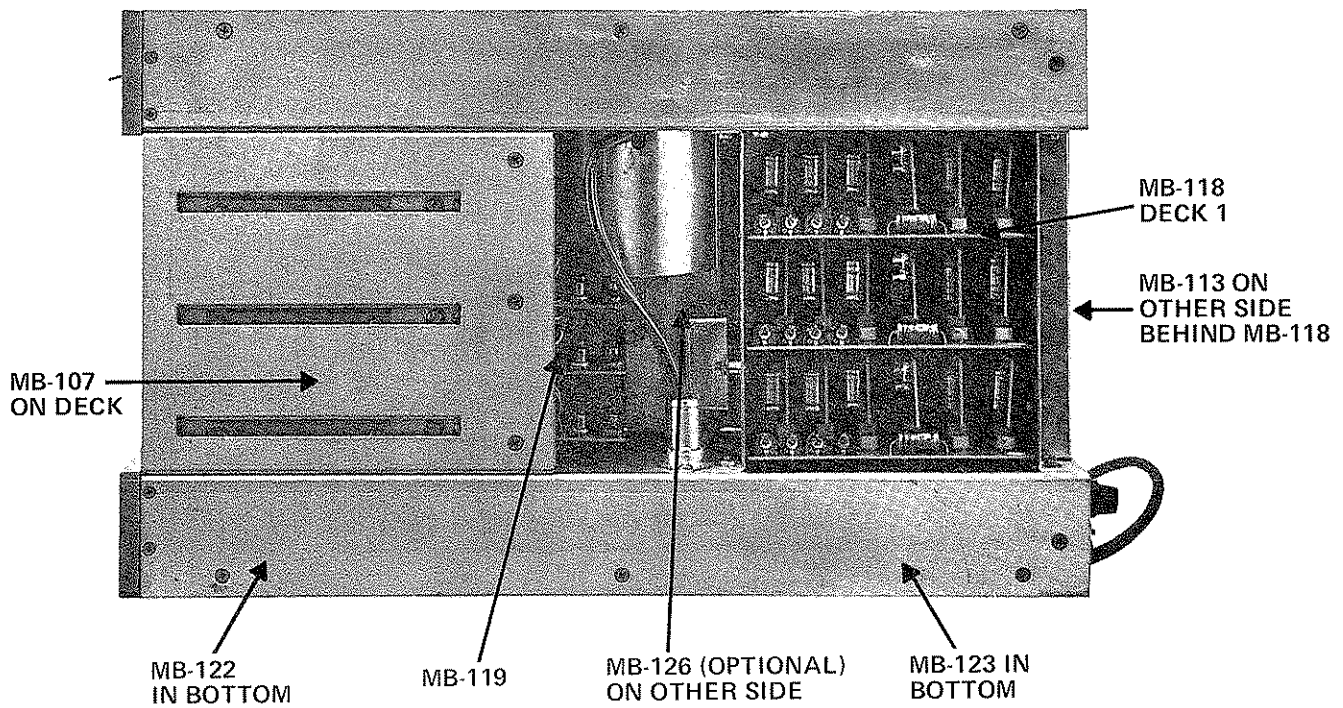


Figure 3-6. Module Locations

SECTION 4

ELECTRONIC THEORY OF OPERATION

4.1 MACHINE CONTROL SYSTEM

The machine control system consists of the Machine Control Board MB-124 (305C) or MB-119 (303C), the LO-103 Flip-Flops that plug into the MB-124 or MB-119, and the CA-101 1 KHz Tone Sensors located on the MB-118 Reproduce Master Boards.

4.1.1 Machine Control Master Boards MB-124, MB-119

The Machine Control Boards contain the stopping and starting logic for the unit. One LO-103 Flip-Flop is used for each deck. The blocking diodes and resistors for the front panel lamps and remote lamps are also mounted on this board. Refer to the system diagrams in Section 3 for schematics of the MB-124 and MB-119. Assembly drawings for these two boards are shown in figures 4-1 and 4-2.

4.1.2 Flip-Flop Board LO-103

See figure 4-3.

The LO-103 acts as an electronic relay to control the stopping and starting of tape motion.

The heart of the circuit is a bi-stable multi-vibrator composed of Q2 and Q3. The two states are Q2 conducting and Q3 off, or Q3 conducting and Q2 off. When Q2 is off, the collector is not drawing current and is at a 18 VDC level. This voltage level is carried through R5 to the base of Q3, holding this device in full conduction. Likewise, when Q3 is off, the voltage from its collector goes to the base of Q2 through R4, holding Q2 at full conduction.

The flip-flop will change state when a positive voltage is applied to the base of the non-conducting transistor (NPN type). This is accomplished through the coupling resistors R2 and R8 from pins 1 and 10 respectively. CR1 provides an inhibit feature by conducting to ground any +24 VDC applied to pin 10 unless +24 VDC is applied to terminal 8 to back bias CR1. To prevent false triggering, RC networks R11-C1 and R10-C2 shunt short duration transient pulses to ground.

The output voltages from Q2 and Q3 are coupled to the output drivers Q1 and Q4 by R1 and R9 respectively. Therefore, when Q2 is conducting, its collector is at "zero" volts. Q1 has no base bias and does not conduct. At the same time, Q3 is not conducting and its collector is at approximately 18 V. Q4 has forward bias and Q4 will conduct.

The collectors of the driver transistors are connected with Q1 to pin 2 and Q4 to pin 9. Their load is provided by the logic circuit being used. As an example, if one side of the play Solenoid is connected to pin 2, +24 volts DC is being supplied to the other side of the solenoid, and Q1 is conducting, the solenoid will draw current through Q1.

4.1.3 1 KHz Cue Tone Sensor CA-101

See figure 4-4.

The CA-101 sensor detects 1 KHz stop tones on the cue track and commands the control circuitry to stop tape motion. This command is a positive going 24 volt trigger pulse. Maximum sensitivity is -36 dBm detected in 90 milliseconds.

Signal enters on pin 1, passes through potentiometer R20, to a parallel tuned network of L1, C1, and C2. All frequencies except 1 KHz are shunted to ground by the LC circuit.

Q1 and Q2 form a large signal amplifier with a gain of 500 to 1,000. This amplifier goes into saturation at operating levels, thus acting as a limiter and providing some immunity to fluctuations in level from the tape.

The output of Q1 and Q2 is applied to diode detector CR2 and CR3 and converted to a DC voltage proportional to the amplifier's output. This DC voltage charges C8 through R12. This RC network has a time constant of approximately 50 milliseconds, which provides immunity to noise.

The voltage across C8 is applied to the base of Q4. When the voltage across C8 exceeds approximately 8 volts, Q4 conducts and Q5 turns off. A positive trigger is coupled to pin 10 (CA-101 output) through C9.

Q4 and Q5 comprise a Schmitt Trigger Circuit. At rest, no bias is applied to the base of Q4, so it does not conduct. Q4's collector is a +24 V which provides bias to the base of Q5 through R17. Q5 conducts into saturation, drawing current limited only by R18 and R19. When Q4 conducts, its collector is pulled down and bias is removed from Q5. As Q5 turns off, its collector goes to 24 volts, which is coupled to pin 10 through C9.

When it is necessary for the sensor to be inactive, pin 4 is grounded. Q3 conducts and shunts the detector output to ground. When the ground is removed from pin 4, C7 charges to +24 volts through R11. When the base of Q4 is more positive than the signal necessary to trigger the Schmitt circuit, Q3 no longer conducts and the sensor functions normally. The time constant of C7 and R11 is approximately 1 to 2 seconds.

4.2 PROGRAM REPRODUCE SYSTEM

The program reproduce system consists of the Reproduce Master Board MB-118 with its plug-in PA-101 Preamps and DA-104 Driver, and the Output Master Board MB-113. Although the CA-101 Tone Sensor plugs into the MB-118, this module is really part of the control system discussed above.

4.2.1 Reproduce Master Board MB-118

Refer to system diagrams in Section 3 for the schematic of the MB-118. The MB-118 assembly drawing is shown in figure 4-5.

The MB-118 contains the playback amplifiers for the program and cue channels. The outputs of the tape reproduce head are fed directly to the MB-118 and the input of separate PA-101 preamplifiers. The program channel audio is amplified and equalized in the preamplifier. The proper reproduction response is provided by the feedback network R1 (R5), R2 (R6), R3 (R7), C2 (C5), and C3 (C6) for the preamplifier. The normal values of these components are selected to yield the NAB 7.5 ips response curve. Variable resistors R1, R2 and R5, R6 allow varying the response of the equalization network to compensate for variations in tape, head, and system characteristics.

The output of the program channel PA-101's are taken from the MB-118 to the rear panel level trimmers (potentiometers R4 and R8) and then returned to the MB-118 to the input of the DA-104 Driver Amplifier. The response and gain of this output amplifier is determined by the feedback resistor R11 (R14). The output of the DA-104 is delivered to the audio output Master Board.

The output of the cue reproduce head is fed directly to a PA-101 Preamplifier for amplification. A fixed feedback network of R9, C8, and C9 controls the gain. The cue channel PA-101 output is connected to board terminal 19 and to the input of the CA-101 Stop Cue Sensor. Terminal 19 feeds the cue track signal to the optional QI (150 Hz) and QII (8 KHz) cue sensors. When a stop tone is detected, the CA-101 delivers a +24 VDC pulse to terminal 15. The voltage for the stop pulse is brought from the B power supply into the MB-118 on terminal 13.

4.2.2 Preamplifier PA-101

See figure 4-6.

The PA-101 is a voltage amplifier utilizing low noise field effect transistors and an emitter-follower output. Total gain without feedback (open loop gain) is approximately 53 dB. Input impedance is high with a very low equivalent input noise level.

The input signal enters the first FET amplifier stage at pin 1. The output of this stage is RC coupled to Q2. To control frequency response and gain, feedback is taken from pin 9 (the output of Q3) to an external network. This feedback re-enters the amplifier through pin 3.

The output of the second FET amplifier is direct coupled to the emitter-follower. The output of Q3 is AC coupled to pin 10.

Q4 decouples power supply noise and prevents its appearance in the output of the amplifier. Power is supplied on pin 6. Pin 5 is grounded. Pin 2 is the input shield.

4.2.3 Driver Amplifier DA-104

See figure 4-7.

The DA-104 is a DC coupled high gain voltage amplifier. The gain and response characteristics are controlled by an external negative feedback network. The input impedance is high (100K), but the output impedance is low.

Signal enters the board on pin 1 and is applied through C1 to the base of Q1 for amplification. The signal is further amplified by Q3. Q4 and Q5 form a complementary symmetry output stage with an impedance of less than one ohm. Q4 and Q5 are biased just above cut-off to prevent their going into saturation on signal peaks. CR1, CR2, and CR3 in conjunction with the voltage divider R9 and R10 provide bias for Q4 and Q5.

Unity gain DC feedback is utilized to maintain stable DC operation regardless of fluctuations of DC supply voltage or drift in transistor parameters. Diodes CR1, CR2, and CR3 maintain the proper voltage differential between the bases of Q4 and Q5 for all conditions of drive voltage. The DC feedback path is through R6 to the base of Q2. Q1 and Q2 form a differential amplifier with a relative current determined by the voltage difference between the bases of Q1 and Q2. Through R6, the R9, R10 junction is maintained at the same voltage as the junction of divider R1, R2.

The DA-104 without the external feedback network has a gain of approximately 55 dB and a bandwidth of 10 Hz to 50 KHz. AC feedback is taken from the output pin 9 and returned to Q2 through pin 3. The gain will be determined by the ratio of the parallel configuration of R6 and the external feedback resistor to R5.

4.2.4 Output Master Board MB-113

Refer to system diagrams in Section 3 for the schematic of the MB-113. The MB-113 assembly drawing is shown in figure 4-8.

The MB-113 printed circuit board mounts the output transformers and the resistors for the output level pad. The board is manufactured in monophonic or stereophonic versions. One transformer and its associated level pad are left off the board in the monophonic configuration.

Provision is made on the board for the selection of 600 ohm or 150 ohm output impedance. The necessary jumpers are equipped with a push on connector for easy conversion in the field.

Signal enters the board from the DA-104 Driver Amplifier on the MB-118 Reproduce Master Board. Depending on the setting of rear panel switch S1, resistors R1 to R8 are inserted to form the proper attenuation for the desired nominal output level. The signal then passes through the output transformer to the output impedance selection terminals. Finally, the signal leaves the board for the output connector on the rear panel.

4.3 POWER SUPPLY

The power supply consists of the MB-123 Power Supply Master Board and individual plug-in PS-102 supplies.

4.3.1 Power Supply Master Board MB-123

See figure 4-9.

The power transformers, the PS-102 A Power Supplies, and the components for the B Supplies are mounted on the MB-123 Master Board. The MB-123 is manufactured in separate versions for the 303C and 305C units. In 3 deck units, T2, PS-102 A2 and the B2 supply are not included. The B supplies power logic and controls. The A supplies are more highly regulated to power the amplifiers.

The AC line voltage enters the board on terminals 1 and 3. AC for the capstan drive motor leaves the board on terminals 2 and 4 for the motor socket (J9). The secondary of T1 (T2) provides 28 VAC for the input of the PS-102 supply and 30 VAC for the diode bridge rectifier CR1 (CR3). Capacitor C1 (C2) smoothes out ripple. Transistor Q1 (Q2) acts as a pre-regulator for power transistor Q3 (Q4). Q3 and Q4 are mounted on heat sinks adjacent to the MB-123. Zener diode CR2 (CR4) provides regulation of the output of Q3 (Q4). Fuse F1 (F2) guards against catastrophic failure of this B supply. Terminals 17 and 16 (9 and 10) are the output (+24 VDC) of the B1 (B2) power supply.

Terminals 18 and 19 (11 and 12) carry the output of the A1 (A2) supply for the electronics.

Terminals 13, 14, and 15 are grounds connected to the various modules in the unit. Terminal 5 is the chassis ground connection for the power supply.

4.3.2 Power Supply PS-102

See figure 4-10.

The PS-102 supplies highly regulated +24 volts DC. The AC power is brought into the board through pins 1 and 2 to a bridge rectifier, CR1. The output of the rectifier is then filtered by R1 and C1. This filtered voltage is connected to the collector of Q1 which serves as a series pre-regulator.

The pre-regulated output is then connected through R4 to pin E of IC1 (the output regulator). The output of IC1 (E_o) is connected to pin 10. IC1 is a self-contained voltage regulator with an internal precision voltage reference ($\pm 1\%$).

Transistor Q2, the current overload switch, turns off the output regulator should the output short circuit. The switching occurs when the load current flowing through R4 produces a voltage drop sufficiently high to cause Q2 to conduct. When Q2 conducts, voltage is connected to pin L of IC1, limiting the current output.

4.4 OPTIONAL AUDIO SWITCHER

The optional audio switcher permits the audio from all decks to be combined into a single output. When a deck is started its audio is switched immediately to the output. The audio of any other deck which is running is then faded out after three seconds.

The switcher is available in monophonic or stereophonic versions for both three deck and five deck Mini Series units. The MB-125 is used with the 305C, and the MB-126 is used with the 303C. These are shown in figures 4-11 through 4-14. Circuit operation of the two boards is identical.

Dual Light Dependent Resistors (LDR) for each channel perform the audio switching. The LDR consists of a single lamp and two separate resistors in a light-tight case. The LDR provides smooth, noiseless switching. The dual configuration insures low crosstalk in stereo units. When the lamp is on the resistor shows a resistance of 500 to 1,000 ohms. The resistance increases to a maximum 10 to 15 megohms as the lamp extinguishes.

The audio output of the LDR's is applied, through fixed resistors, to a common base amplifier, Q5 (Q7), which supplies about 6 dB gain. This circuit has an input impedance of about 50 ohms to prevent interaction between the audio of the various decks. The output of Q5 (Q7) is fed to emitter-follower Q6 (Q8) which provides a low output impedance for the switcher. The output level is determined by potentiometer R17 (R27) in series with the output. R16 (R26) and C13 (C23) provide power supply decoupling. C12 (C22) by-passes to ground any AC on the base to ground connection of Q5 (Q7) to insure a low input impedance to the mixer. R18 (R28) in the final deck provides proper termination and operation of the level control for this deck's audio.

The lamp in the LDR is driven by Q1 through R3 which drops the +24 VDC to the required 9 or 10 VAC. When a deck starts, its control input to the switcher is grounded through the run logic (LO-103). Q1 conducts as its base goes to ground through R4 and C2. The collector of Q1 goes positive and turns on Q2 (the SCR). The anode and cathode of Q2 are effectively a short circuit, allowing C3 (at +24 V) to discharge through CR2. With C3 at zero volts, Q1 is held in conduction by the current through R4, CR1, CR2, and Q2. Even if the control input ground is removed, Q1 remains in conduction. This turns on the LDR to feed that deck's audio to the output.

As C3 discharges, the voltage change is coupled through C2 to the cancel control buss. As the control buss goes to -24 V, Q4 stops conducting. With no current in R9 and R8, the base of Q3 goes positive and Q3 shuts off. This removes the voltage from the cancel buss which is connected through CR3 to the anodes of all the SCR's. With no voltage on the anode, the current across Q2 is insufficient to keep it in conduction. All of the SCR's are shut off.

The time constant of C4 and R32 is approximately 5 milliseconds, after which Q4 again conducts and voltage is restored to the cancel buss. The time constant of C1, R5, and R6 (on the gate of Q2) is approximately 10 milliseconds; however, so the SCR for the most recently started deck can turn back on when the voltage is restored to the cancel buss.

When Q2 stops conducting, C3 begins charging through R4 and CR1 keeping Q1 and the LDR on. After approximately 3 seconds C3 is fully charged and Q1 stops conducting. Thus, even after the SCR is extinguished, the audio from its channel remains "on" for approximately 3 seconds.

To insure proper operation, C6 keeps voltage off the cancel buss for approximately 3 seconds, when the power is first applied to the switcher.

To provide for flexibility in operation of the switcher, the control inputs pass through jumpers after entering the board. Operation of any deck into the switcher can be disabled by removing this jumper (between terminals X-1 and X-2). This prevents grounding of the control input and operation of the switching logic for that deck. The entire switcher may be disabled by removing the jumpers which connect terminal 1 to 2 and 3 to 4. By reconnecting 1 to 4, the bottom deck channel is switched continuously on and the switching logic is disconnected.

NOTE

To prevent damage, the jumpers, the transistors, or the switcher board itself must not be unplugged or plugged in while the AC power is connected.

4.5 OPTIONAL Q-TRIP

The Q-Trip option consists of the MB-122 Q-Trip board which contains the required plug-in CA-201 150 Hz and 8 KHz cue tone sensors.

4.5.1 Q-Trip Master Board MB-122

See figures 4-15 and 4-16.

The optional 150 Hz (QI) and 8 KHz (QII) sensors mount on the MB-122 master board. Sockets are provided for a QI and a QII sensor for each deck in the unit. The resistors for the sensor operated indicator lamps are also mounted on the MB-122. The Sensors are added as required. The audio input for the sensors, the sensor outputs, and indicator lamps enter or leave the board through connector J1 which mates with P8.

Separate grounds and +24 VDC supplies are provided for the sensors for decks 1, 2, and 3 (B1) and decks 4 and 5 (B2).

The MB-122 is manufactured in separate versions for the 305C and 303C units.

4.5.2 Q-Tone Sensor CA-201

The CA-201 gives a contact closure output for external use whenever a 150 Hz or 8 KHz tone is detected on the cue track. Normal operating level is approximately -27 dBm for 150 Hz and -37 dBm for 8 KHz. Maximum sensitivity is approximately -45 dBm.

The input signal is applied through pin 1 to potentiometer R15 which determines the threshold of sensitivity of the sensor. The output of R15 goes to R1 and then to a parallel tuned filter (L1 and C1). L1 and C1 are chosen for resonance at either 150 Hz or 8 KHz depending on the sensor's use. Since the tuned circuit is effectively an open circuit at resonance, a minimum of attenuation occurs across R1 at resonance. To off-resonance frequencies, the network is effectively a short-circuit and full atten-

uation occurs across R1. The Q of the resonant circuit is fairly low to accommodate the NAB tolerances on the tones: ± 30 Hz for the 150 Hz (QI) and ± 1 KHz for the 8 KHz (QII).

The output of the filter is fed to Q1 and Q2 which form an amplifier with a gain of 1,000 or more. Q2 is driven to saturation and cut-off. The wave form is clipped, limiting the signal and minimizing effects of level fluctuations and noise.

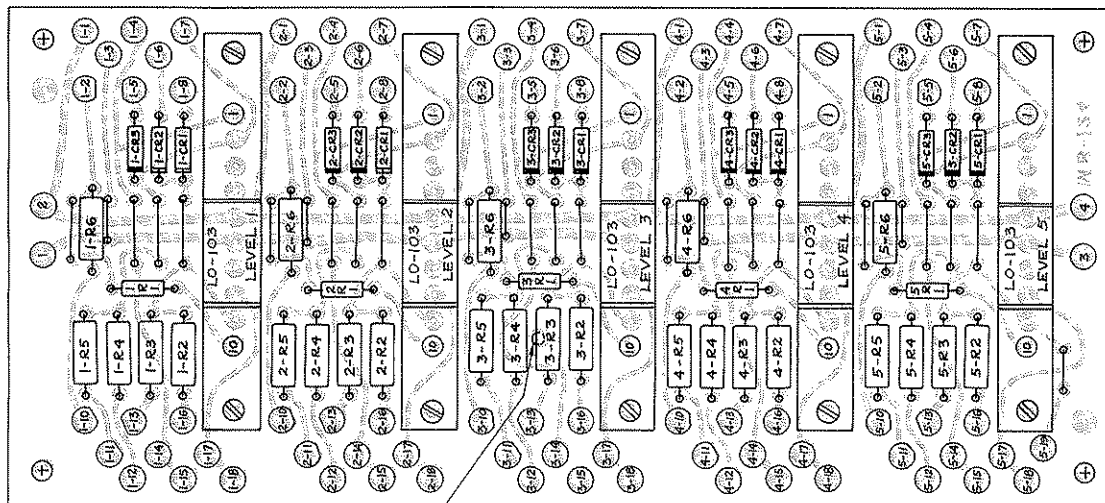
The output of the amplifier is delivered to the voltage doubler rectifier CR1 and CR2, which drives the RC network, R10 and C6. C6 stores a charge proportional to the rectifier's output. The RC time constant is approximately 50 milliseconds, preventing random noise from triggering the circuit. C6's charge is applied to the base of Q4. When Q4 conducts, relay K1 closes.

Q3 provides muting. When pin 4 is grounded, Q3 conducts, preventing C6 from building any charge even if tone is present at the CA-20I input. When the ground is removed from pin 4, C7 charges to a positive voltage through R12, cutting off Q3. Q4 can operate normally. The time constant of R12 and C7 is approximately 2 to 3 seconds.

The relay contacts connected to +24 VDC supply the QI and QII indicator contacts on the remote control jack. The other relay contacts are brought out to the Q-Trips jack for external use.

MB-124

TOP OF MACHINE



TOP VIEW

FUNCTION LIST

| PIN | FUNCTION | DESTINATION |
|------|------------------------------|-------------|
| 1 | +24VDC B-1 (LEVELS 1, 2 & 3) | MB-123-16 |
| 2 | GROUND (LEVELS 1, 2 & 3) | MB-123-15 |
| 3 | +24VDC B-2 (LEVELS 4 & 5) | MB-123-10 |
| 4 | GROUND (LEVELS 4 & 5) | MB-123-13 |
| X-1 | GROUND TO DECK X | X-J1-5 |
| X-2 | START ENABLE | X-J1-13 |
| X-3 | 24VDC TO DECK X | X-J1-12 |
| X-4 | STOP TRIGGER (1KHz SENSOR) | X-MB-118-15 |
| X-5 | PLAY SOLENOID CONTROL | X-J1-6 |
| X-6 | CARTRIDGE RELEASE ENABLE | X-J1-14 |
| X-7 | AUDIO SWITCHER CONTROL | MB-125 |
| X-8 | CUE MUTE | X-MB-118-14 |
| X-9 | NOT USED | |
| X-10 | REMOTE READY LAMP | J5 |
| X-11 | REMOTE START LAMP | J5 |
| X-12 | LOCAL START LAMP | X-62-4 |
| X-13 | LOCAL STOP LAMP | X-53-1 |
| X-14 | LOCAL STOP TRIGGER | X-53-2 |
| X-15 | REMOTE STOP TRIGGER | J5 |
| X-16 | REMOTE STOP LAMP | J5 |
| X-17 | REMOTE START TRIGGER | J5 |
| X-18 | LOCAL START TRIGGER | X-52-2 |
| X-19 | RECORD CONTROL | |

PARTS LIST

| PART NO. | SYM | QTY | DESCRIPTION |
|----------|-----|-----|-----------------------------|
| 100-4753 | R1 | 5 | 47K OHM, 1/4W, 10% RESISTOR |
| 110-6233 | R2 | 5 | 620 Ω , 1/2W, " |
| 110-6233 | R3 | 5 | 620 Ω , " |
| 110-6233 | R4 | 5 | 620 Ω , " |
| 110-6233 | R5 | 5 | 620 Ω , " |
| 110-6233 | R6 | 5 | 620 Ω , " |
| 203-4005 | CR1 | 5 | 1N4005 DIODE |
| 203-4005 | CR2 | 5 | 1N4005 " |
| 203-4005 | CR3 | 5 | 1N4005 " |
| 417-1000 | --- | 5 | 10-PIN CONNECTORS |
| 417-1001 | --- | 5 | POLARIZING KEYS |
| 912-1030 | --- | 5 | LO-103 FLIP FLOPS |
| 514-1240 | --- | 1 | MB-124 PC BOARDS |

NOTES:

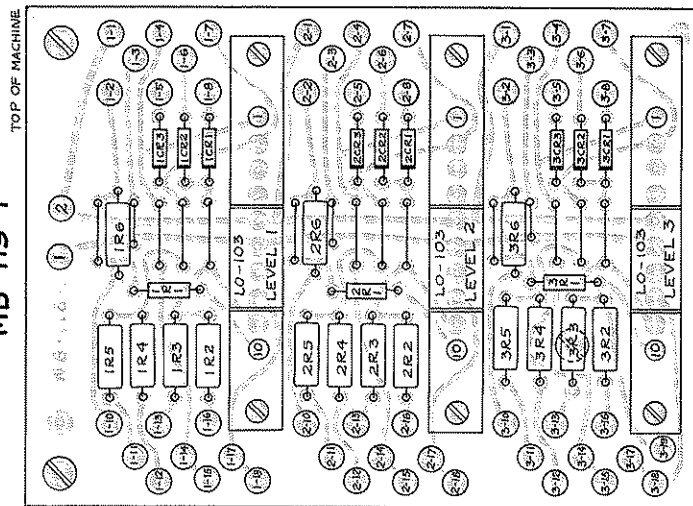
- IN FUNCTION LIST X DENOTES TERMINALS REDUNDANT ON THE FIVE LEVELS.
- LAST COMPONENTS USED:
R6 & CR3.

| | | |
|----------|--------------|----------------------------|
| DESIGN | DATE 1/14/72 | BROADCAST ELECTRONICS INC. |
| BY | DATE 1/14/72 | -A FILMWAYS COMPANY- |
| PROJECT | DATE | TITLE |
| APPROVED | DATE | 305C |
| BY | DATE | MASTER CONTROL BOARD |
| | DATE | C 33-1013-00617 |
| | DATE | PART NO. 914-1240 |

MB-124

Figure 4-1. MB-124 Assembly

MB-119-1



PARTS LIST

| PART NO. | SYM | QTY | DESCRIPTION | PIN | FUNCTION | DESTINATION |
|----------|-----|-----|-----------------------------|------|---------------------------|-------------|
| 100-4753 | R1 | 3 | 47K OHM, 1/4W, 10% RESISTOR | 1 | +24VDC B-1 | MB-123-16 |
| 110-6233 | R2 | 3 | 620 * 1/2W, " " | 2 | GROUND | MB-123-15 |
| 110-6233 | R3 | 3 | 620 " " " " | X-1 | GROUND TO DECK X | X-J1-5 |
| 110-6233 | R4 | 3 | 620 " " " " | X-2 | START ENABLE | X-J1-13 |
| 110-6233 | R5 | 3 | 620 " " " " | X-3 | 24VDC TO DECK X | X-J1-12 |
| 110-6233 | R6 | 3 | 620 " " " " | X-4 | STOP TRIGGER (KHz SENSOR) | X-MB-118-15 |
| 203-4005 | CR1 | 3 | IN4005 DIODE | X-5 | PLAY SOLENOID CONTROL | X-J1-6 |
| 203-4005 | CR2 | 3 | IN4005 " " | X-6 | CARTRIDGE RELEASE ENABLE | X-J1-14 |
| 203-4005 | CR3 | 3 | IN4005 " " | X-7 | AUDIO SWITCHER CONTROL | MB-125 |
| 417-1000 | --- | 3 | 10-PIN CONNECTORS | X-8 | CUE MUTE | X-MB-118-14 |
| 417-1001 | --- | 3 | POLARIZING KEYS | X-9 | NOT USED | J5 |
| 912-1030 | --- | 3 | LO-103-2 FLIP FLOPS | X-10 | REMOTE READY LAMP | J5 |
| 514-1190 | --- | 1 | MB-119 PC BOARD | X-11 | REMOTE START LAMP | X-52-4 |
| | | | | X-12 | LOCAL START LAMP | X-53-1 |
| | | | | X-13 | LOCAL STOP LAMP | X-53-2 |
| | | | | X-14 | LOCAL STOP TRIGGER | J5 |
| | | | | X-15 | REMOTE STOP TRIGGER | J5 |
| | | | | X-16 | REMOTE STOP LAMP | J5 |
| | | | | X-17 | REMOTE START TRIGGER | J5 |
| | | | | X-18 | LOCAL START TRIGGER | X-52-2 |
| | | | | X-19 | RECORD CONTROL | |

NOTES:
 1. IN FUNCTION LIST X DENOTES TERMINALS REDUNDANT ON THE THREE LEVELS.
 2. LAST COMPONENTS USED:
 RG & CR3.

MB-119-1

| | | | |
|----------|---------|----------------------------|-----------------------|
| DATE | 3/11/73 | BROADCAST ELECTRONICS INC. | |
| BY | WJS | -A FILMWAYS COMPANY- | |
| CHECKED | DS | TITLE | |
| PROJECT | DATE | 303C | |
| APPROVED | BY | MASTER CONTROL BOARD | |
| | | C | OWS NO. 33-1010-00752 |
| | | PART NO. 314-1190 | |

Figure 4-2. MB-119 Assembly

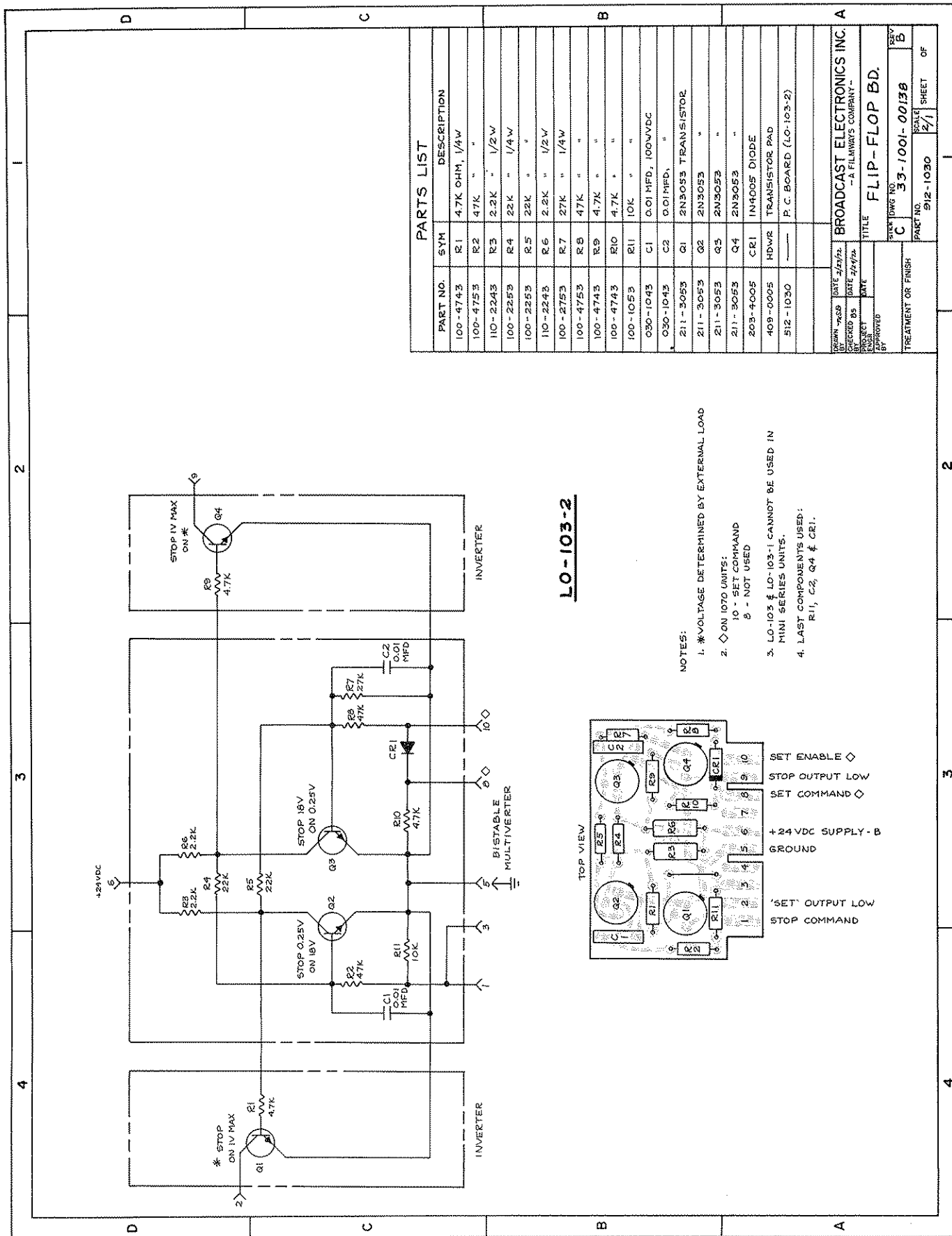
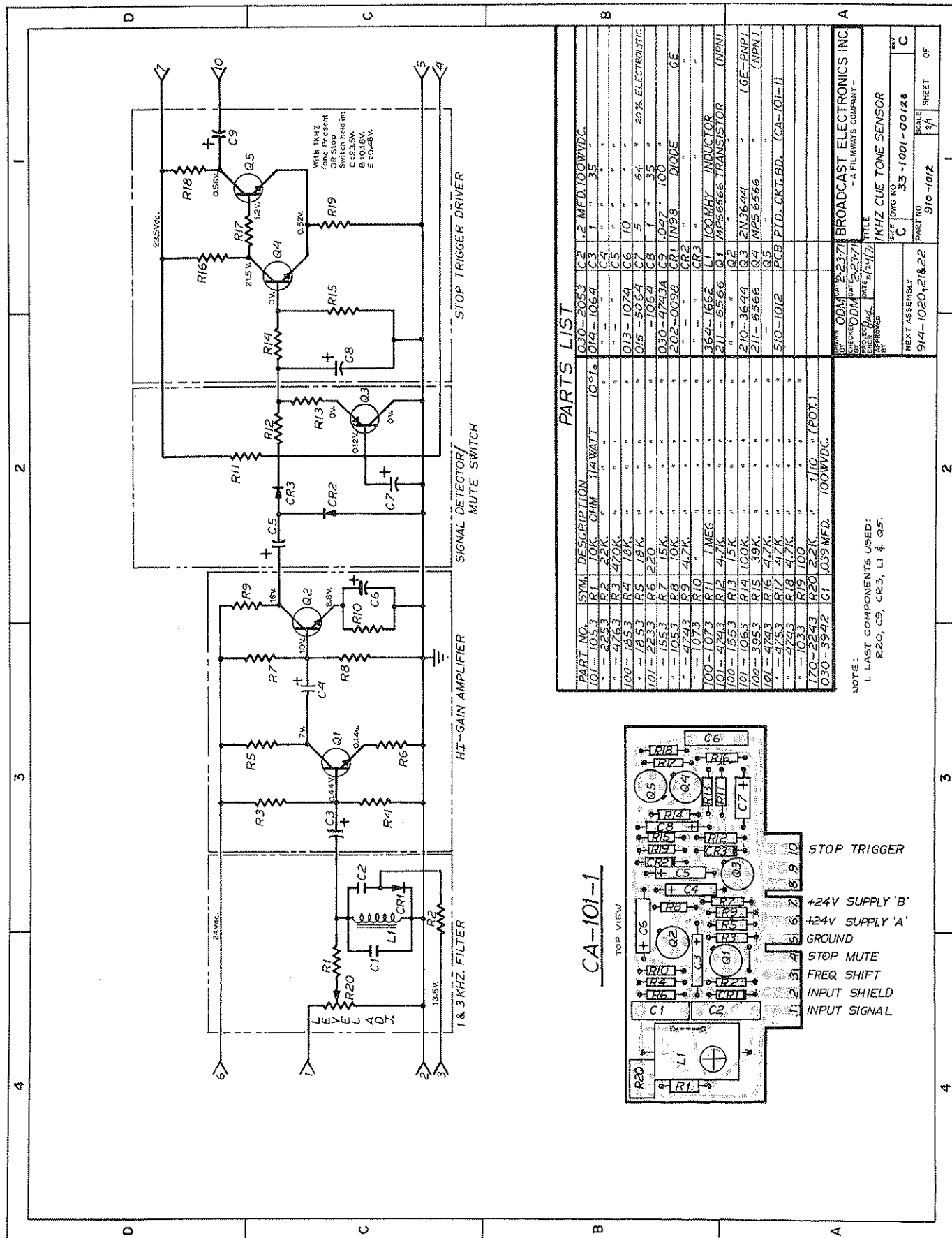


Figure 4-3. LO-103 Schematic/Assembly



PARTS LIST

| PART NO. | SYM | DESCRIPTION | QTY | REMARKS |
|-----------|------|------------------|-----|---------|
| 101-1053 | R1 | 10K OHM | 1 | |
| 101-2253 | R2 | 22K | 1 | |
| 101-4763 | R3 | 470K | 1 | |
| 101-1853 | R4 | 18K | 1 | |
| 101-1853 | R5 | 18K | 1 | |
| 101-2233 | R6 | 220 | 1 | |
| 101-1553 | R7 | 15K | 1 | |
| 101-1053 | R8 | 10K | 1 | |
| 101-4743 | R9 | 47K | 1 | |
| 101-1073 | R10 | 10K | 1 | |
| 101-1073 | R11 | 10K | 1 | |
| 101-4743 | R12 | 47K | 1 | |
| 101-1543 | R13 | 15K | 1 | |
| 101-1063 | R14 | 10K | 1 | |
| 101-3953 | R15 | 39K | 1 | |
| 101-4743 | R16 | 47K | 1 | |
| 101-4743 | R17 | 47K | 1 | |
| 101-4743 | R18 | 47K | 1 | |
| 101-1033 | R19 | 10K | 1 | |
| 101-2243 | R20 | 22K | 1 | |
| 101-3942 | R21 | 39K | 1 | |
| 030-2053 | C2 | 0.2 MFD. 100WDC. | 1 | |
| 014-1064 | C3 | 1064 | 1 | |
| 013-1074 | C4 | 1074 | 1 | |
| 015-5064 | C5 | 5064 | 1 | |
| 030-4743A | C6 | 4743A | 1 | |
| 030-4743A | C7 | 4743A | 1 | |
| 202-0098 | C8 | 0.047 | 1 | |
| 030-4743A | C9 | 4743A | 1 | |
| 202-0098 | C10 | 0.047 | 1 | |
| 030-4743A | C11 | 4743A | 1 | |
| 202-0098 | C12 | 0.047 | 1 | |
| 030-4743A | C13 | 4743A | 1 | |
| 202-0098 | C14 | 0.047 | 1 | |
| 030-4743A | C15 | 4743A | 1 | |
| 202-0098 | C16 | 0.047 | 1 | |
| 030-4743A | C17 | 4743A | 1 | |
| 202-0098 | C18 | 0.047 | 1 | |
| 030-4743A | C19 | 4743A | 1 | |
| 202-0098 | C20 | 0.047 | 1 | |
| 030-4743A | C21 | 4743A | 1 | |
| 202-0098 | C22 | 0.047 | 1 | |
| 030-4743A | C23 | 4743A | 1 | |
| 202-0098 | C24 | 0.047 | 1 | |
| 030-4743A | C25 | 4743A | 1 | |
| 202-0098 | C26 | 0.047 | 1 | |
| 030-4743A | C27 | 4743A | 1 | |
| 202-0098 | C28 | 0.047 | 1 | |
| 030-4743A | C29 | 4743A | 1 | |
| 202-0098 | C30 | 0.047 | 1 | |
| 030-4743A | C31 | 4743A | 1 | |
| 202-0098 | C32 | 0.047 | 1 | |
| 030-4743A | C33 | 4743A | 1 | |
| 202-0098 | C34 | 0.047 | 1 | |
| 030-4743A | C35 | 4743A | 1 | |
| 202-0098 | C36 | 0.047 | 1 | |
| 030-4743A | C37 | 4743A | 1 | |
| 202-0098 | C38 | 0.047 | 1 | |
| 030-4743A | C39 | 4743A | 1 | |
| 202-0098 | C40 | 0.047 | 1 | |
| 030-4743A | C41 | 4743A | 1 | |
| 202-0098 | C42 | 0.047 | 1 | |
| 030-4743A | C43 | 4743A | 1 | |
| 202-0098 | C44 | 0.047 | 1 | |
| 030-4743A | C45 | 4743A | 1 | |
| 202-0098 | C46 | 0.047 | 1 | |
| 030-4743A | C47 | 4743A | 1 | |
| 202-0098 | C48 | 0.047 | 1 | |
| 030-4743A | C49 | 4743A | 1 | |
| 202-0098 | C50 | 0.047 | 1 | |
| 030-4743A | C51 | 4743A | 1 | |
| 202-0098 | C52 | 0.047 | 1 | |
| 030-4743A | C53 | 4743A | 1 | |
| 202-0098 | C54 | 0.047 | 1 | |
| 030-4743A | C55 | 4743A | 1 | |
| 202-0098 | C56 | 0.047 | 1 | |
| 030-4743A | C57 | 4743A | 1 | |
| 202-0098 | C58 | 0.047 | 1 | |
| 030-4743A | C59 | 4743A | 1 | |
| 202-0098 | C60 | 0.047 | 1 | |
| 030-4743A | C61 | 4743A | 1 | |
| 202-0098 | C62 | 0.047 | 1 | |
| 030-4743A | C63 | 4743A | 1 | |
| 202-0098 | C64 | 0.047 | 1 | |
| 030-4743A | C65 | 4743A | 1 | |
| 202-0098 | C66 | 0.047 | 1 | |
| 030-4743A | C67 | 4743A | 1 | |
| 202-0098 | C68 | 0.047 | 1 | |
| 030-4743A | C69 | 4743A | 1 | |
| 202-0098 | C70 | 0.047 | 1 | |
| 030-4743A | C71 | 4743A | 1 | |
| 202-0098 | C72 | 0.047 | 1 | |
| 030-4743A | C73 | 4743A | 1 | |
| 202-0098 | C74 | 0.047 | 1 | |
| 030-4743A | C75 | 4743A | 1 | |
| 202-0098 | C76 | 0.047 | 1 | |
| 030-4743A | C77 | 4743A | 1 | |
| 202-0098 | C78 | 0.047 | 1 | |
| 030-4743A | C79 | 4743A | 1 | |
| 202-0098 | C80 | 0.047 | 1 | |
| 030-4743A | C81 | 4743A | 1 | |
| 202-0098 | C82 | 0.047 | 1 | |
| 030-4743A | C83 | 4743A | 1 | |
| 202-0098 | C84 | 0.047 | 1 | |
| 030-4743A | C85 | 4743A | 1 | |
| 202-0098 | C86 | 0.047 | 1 | |
| 030-4743A | C87 | 4743A | 1 | |
| 202-0098 | C88 | 0.047 | 1 | |
| 030-4743A | C89 | 4743A | 1 | |
| 202-0098 | C90 | 0.047 | 1 | |
| 030-4743A | C91 | 4743A | 1 | |
| 202-0098 | C92 | 0.047 | 1 | |
| 030-4743A | C93 | 4743A | 1 | |
| 202-0098 | C94 | 0.047 | 1 | |
| 030-4743A | C95 | 4743A | 1 | |
| 202-0098 | C96 | 0.047 | 1 | |
| 030-4743A | C97 | 4743A | 1 | |
| 202-0098 | C98 | 0.047 | 1 | |
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| 030-4743A | C239 | 4743A | 1 | |
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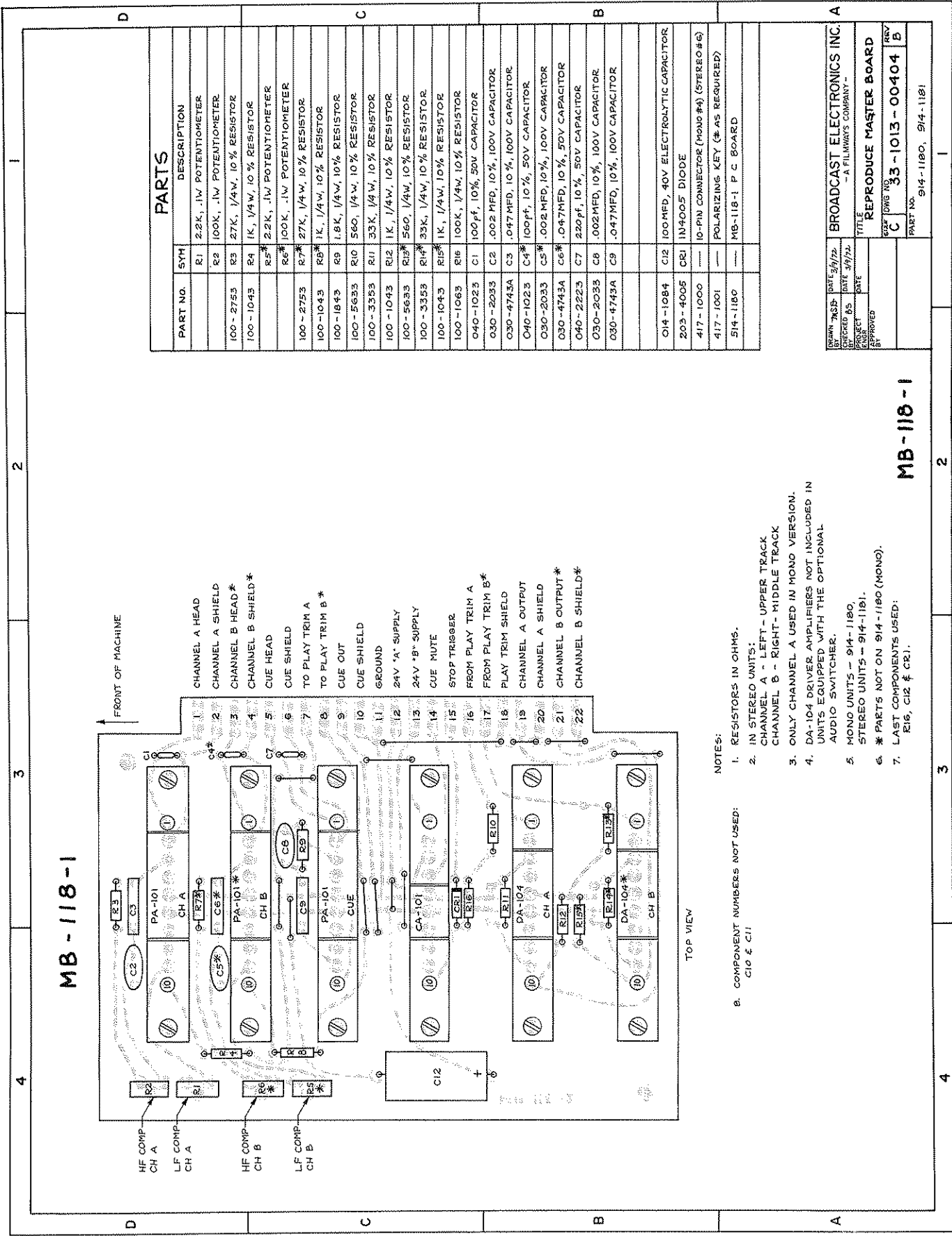


Figure 4-5. MB-118 Assembly

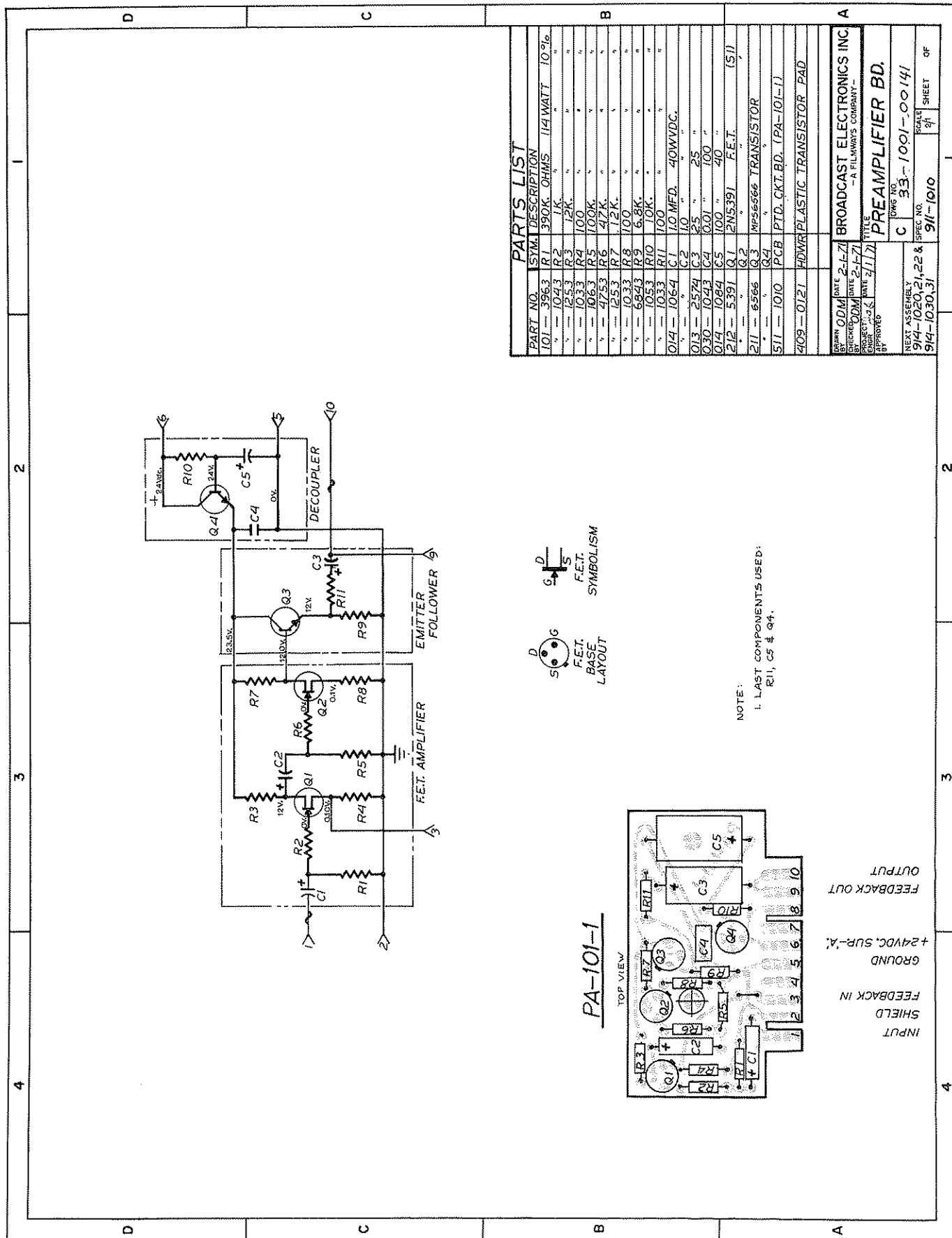


Figure 4-6. PA-101 Schematic/Assembly

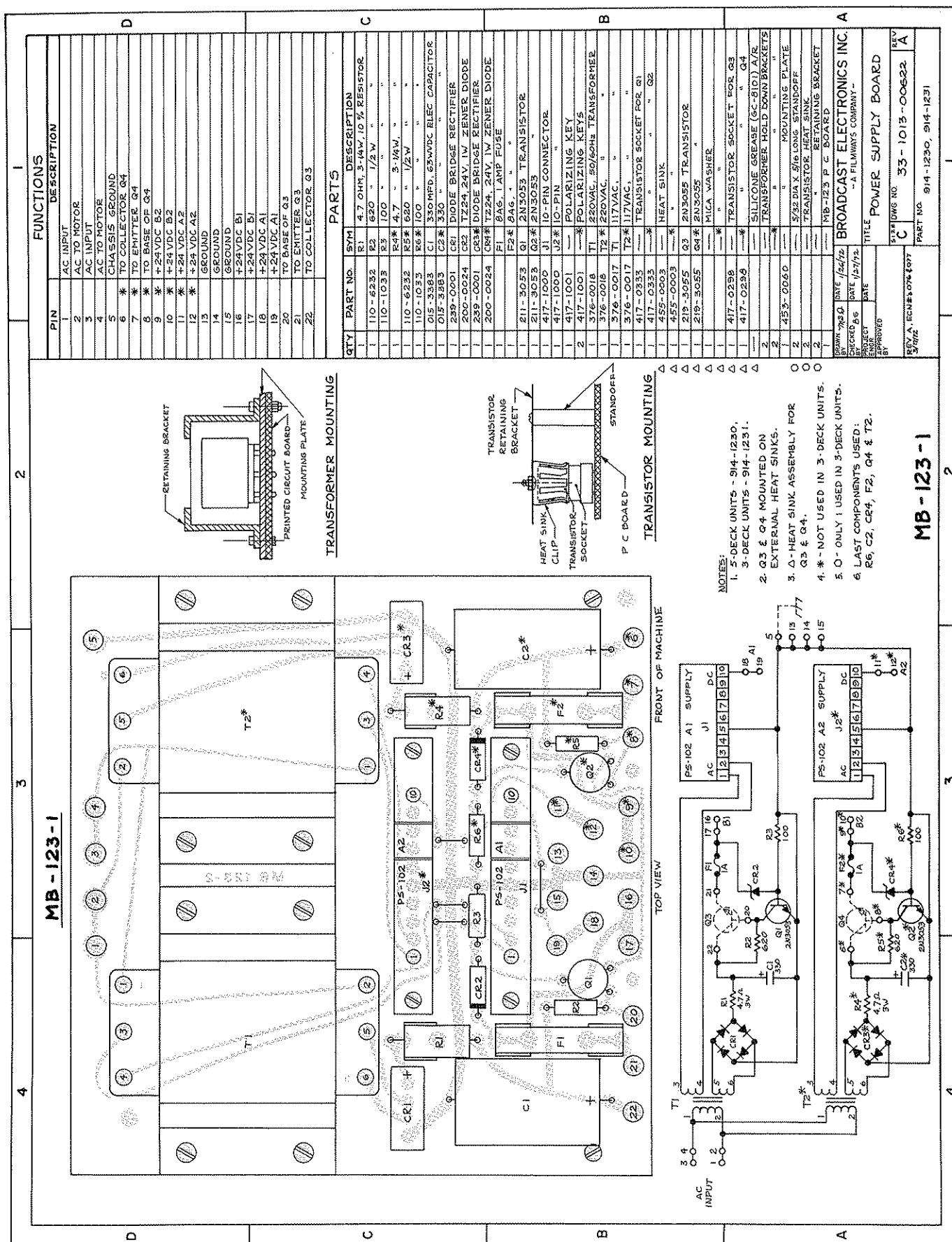
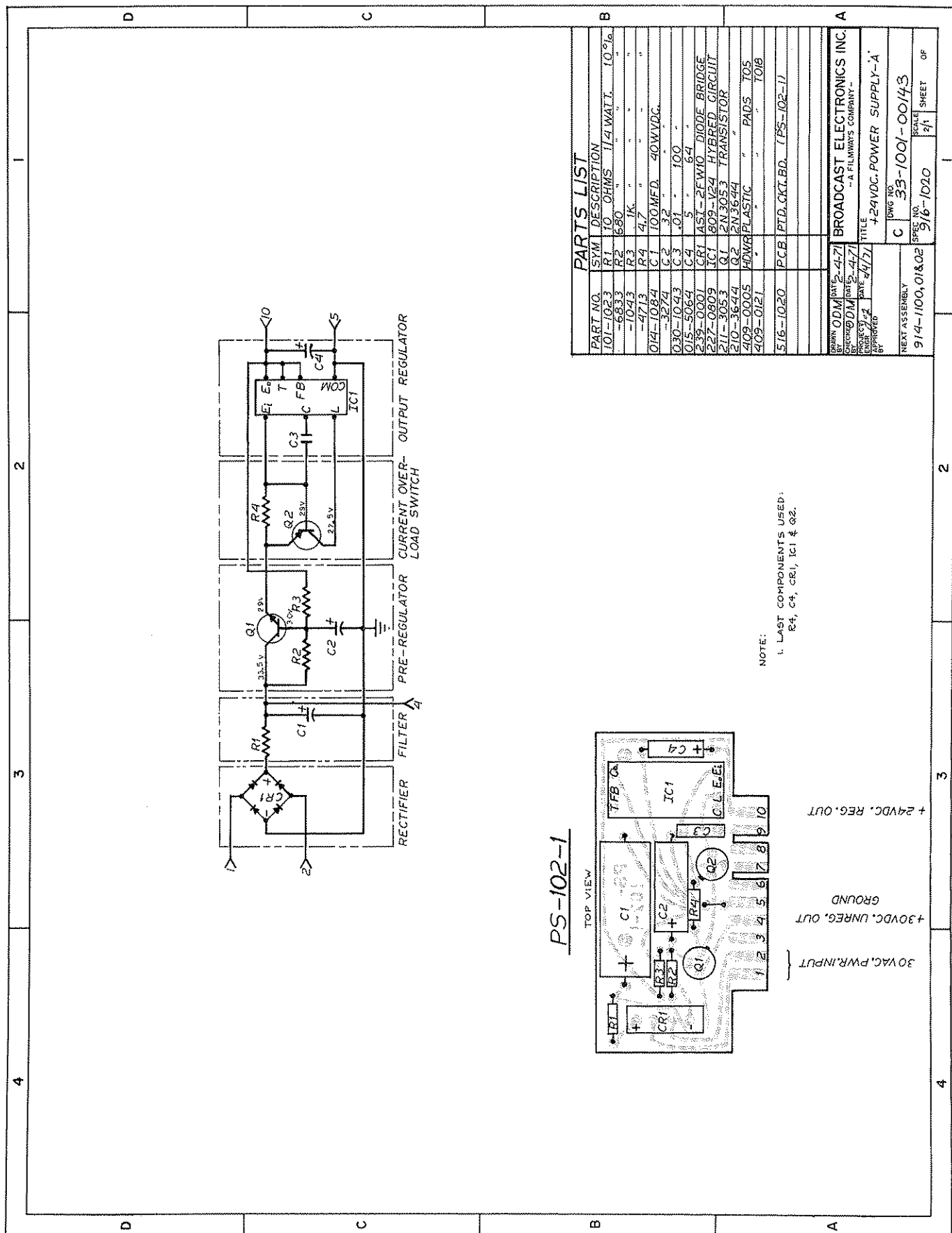


Figure 4-9. MB-123 Schematic/Assembly



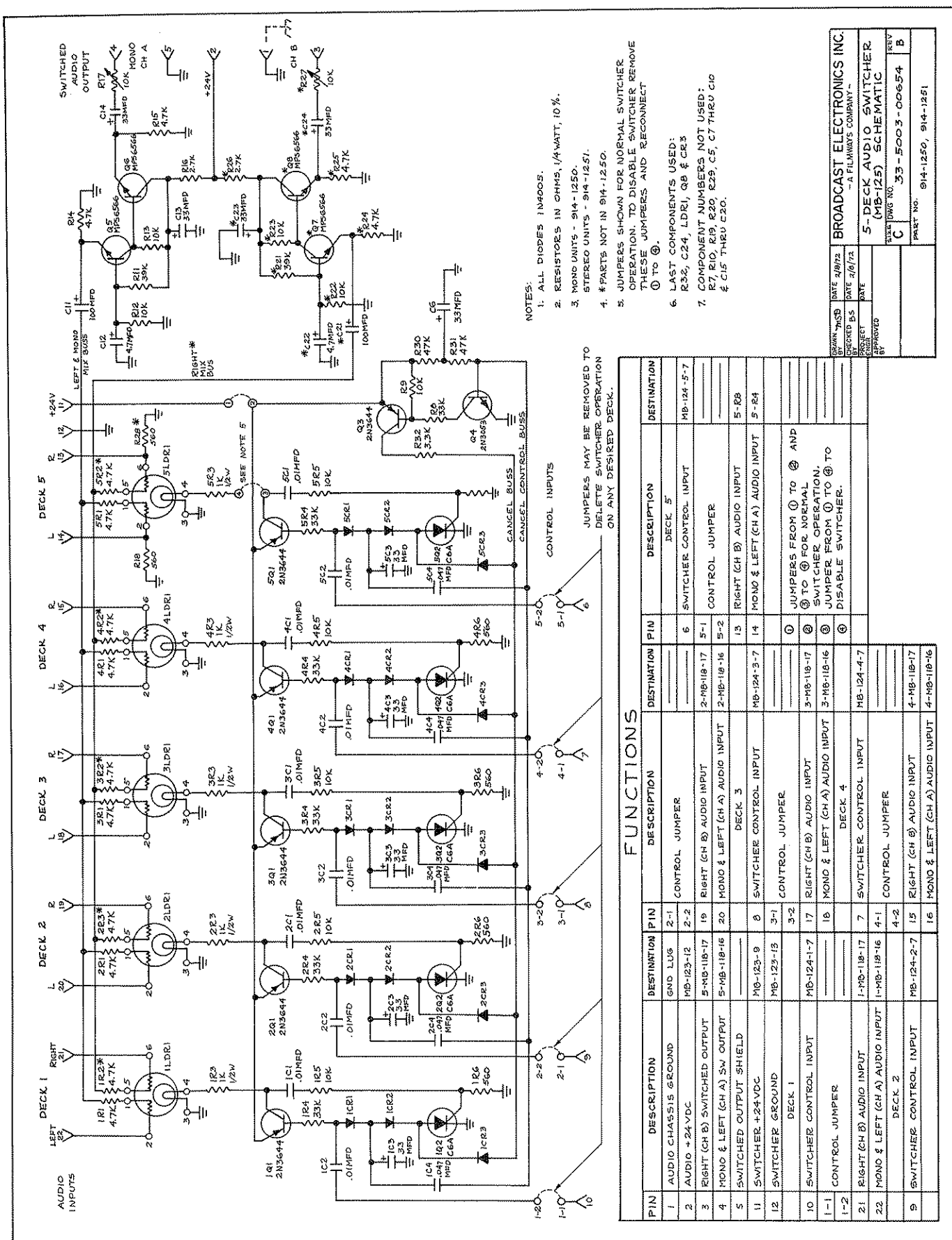
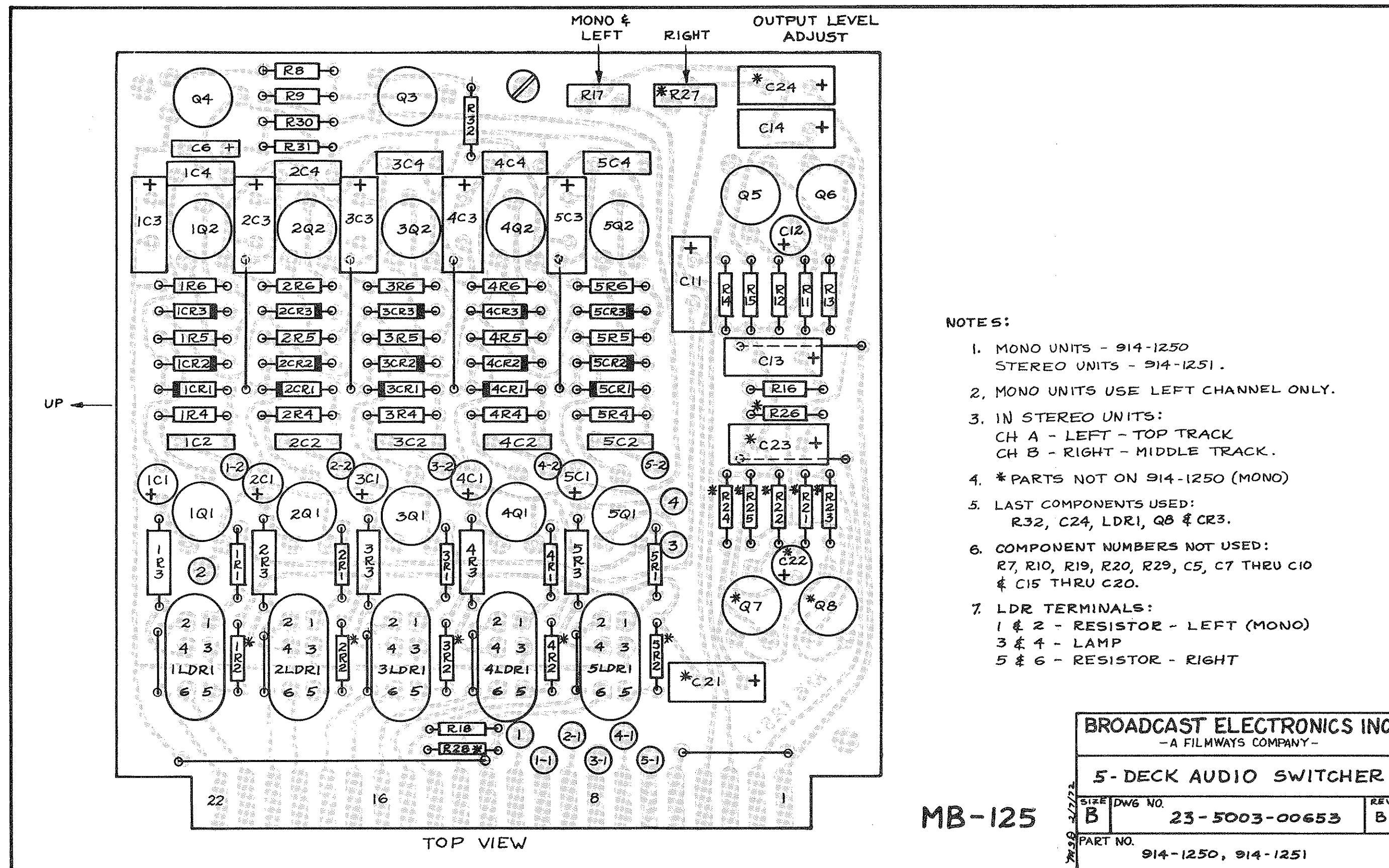


Figure 4-11. MB-125 Schematic



NOTES:

1. MONO UNITS - 914-1250
STEREO UNITS - 914-1251.
2. MONO UNITS USE LEFT CHANNEL ONLY.
3. IN STEREO UNITS:
CH A - LEFT - TOP TRACK
CH B - RIGHT - MIDDLE TRACK.
4. *PARTS NOT ON 914-1250 (MONO)
5. LAST COMPONENTS USED:
R32, C24, LD1, Q8 & CR3.
6. COMPONENT NUMBERS NOT USED:
R7, R10, R19, R20, R29, C5, C7 THRU C10
& C15 THRU C20.
7. LDR TERMINALS:
1 & 2 - RESISTOR - LEFT (MONO)
3 & 4 - LAMP
5 & 6 - RESISTOR - RIGHT

Figure 4-12. MB-125 Assembly

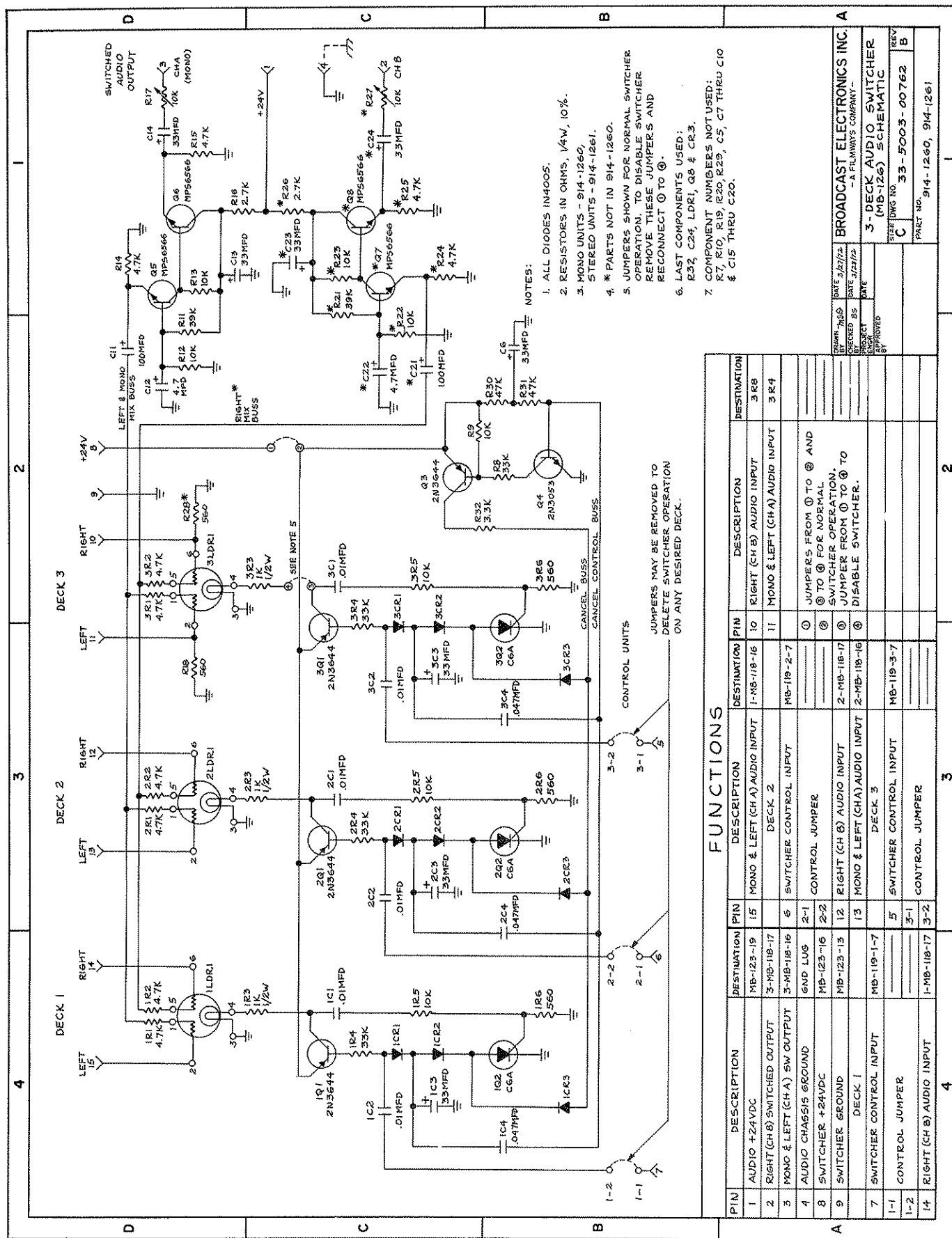
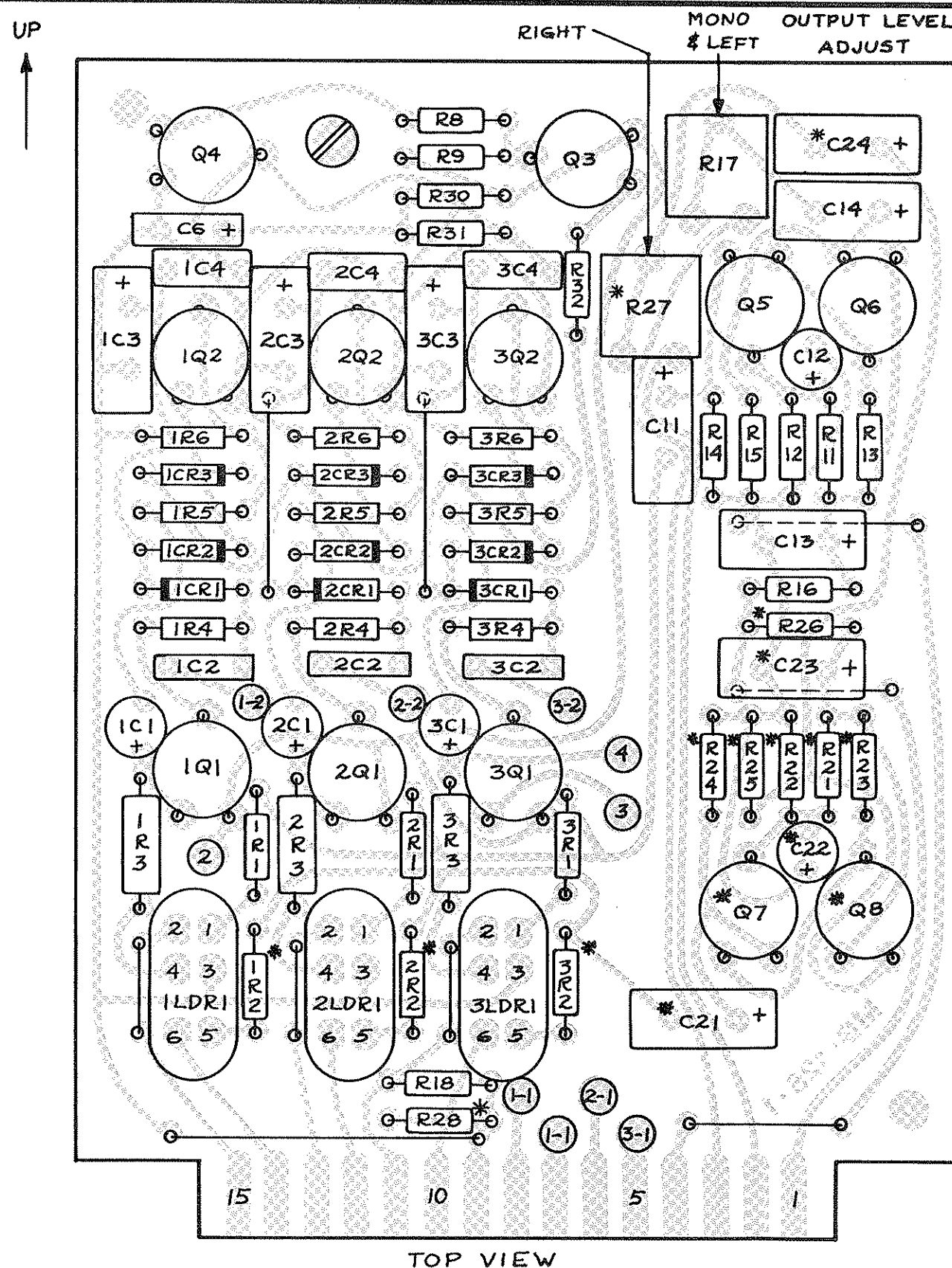


Figure 4-13. MB-126 Schematic



NOTES:

1. MONO UNITS - 914-1260,
STEREO - 914-1261.
2. MONO UNITS USE LEFT CHANNEL ONLY.
3. IN STEREO UNITS:
CH A - LEFT - TOP TRACK
CH B - RIGHT - MIDDLE TRACK.
4. *PARTS NOT ON 914-1260 (MONO).
5. LAST COMPONENTS USED:
R32, C24, LDRI, Q8 & CR3.
6. COMPONENT NUMBERS NOT USED:
R7, R10, R19, R20, R29, C5, C7 THRU C10
& C15 THRU C20.
7. LDR TERMINALS:
1 & 2 - RESISTOR - LEFT (MONO)
3 & 4 - LAMP
5 & 6 - RESISTOR - RIGHT.

MB-126

| | | | |
|----------------------------|---------------|--|-----|
| BROADCAST ELECTRONICS INC. | | | |
| -A FILMWAYS COMPANY- | | | |
| TITLE | | | |
| 3-DECK AUDIO SWITCHER | | | |
| SIZE | DWG NO. | | REV |
| B | 23-5003-00761 | | B |
| PART NO. | | | |
| 914-1260, 914-1261 | | | |

Figure 4-14. MB-126 Assembly

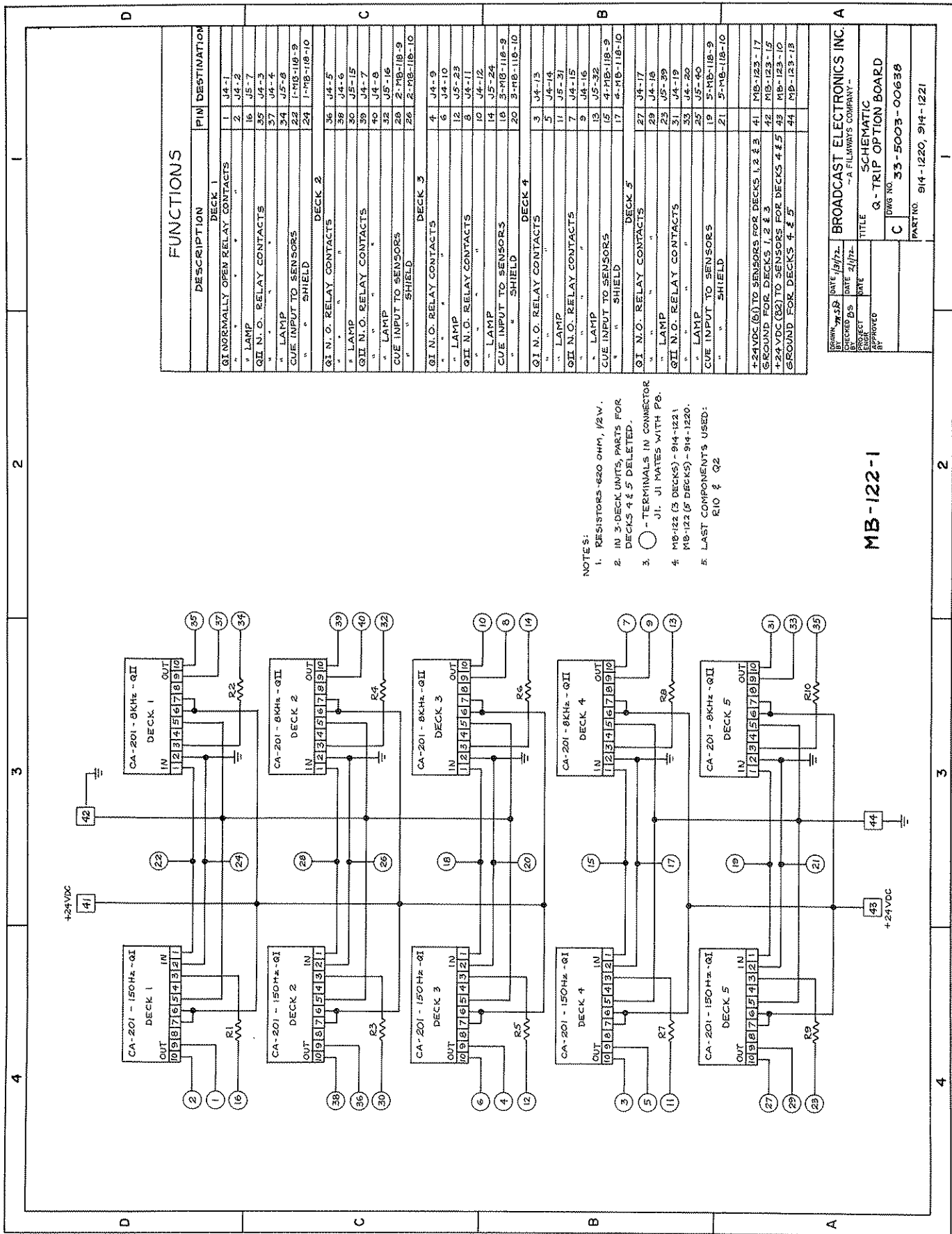


Figure 4-15. MB-122 Schematic

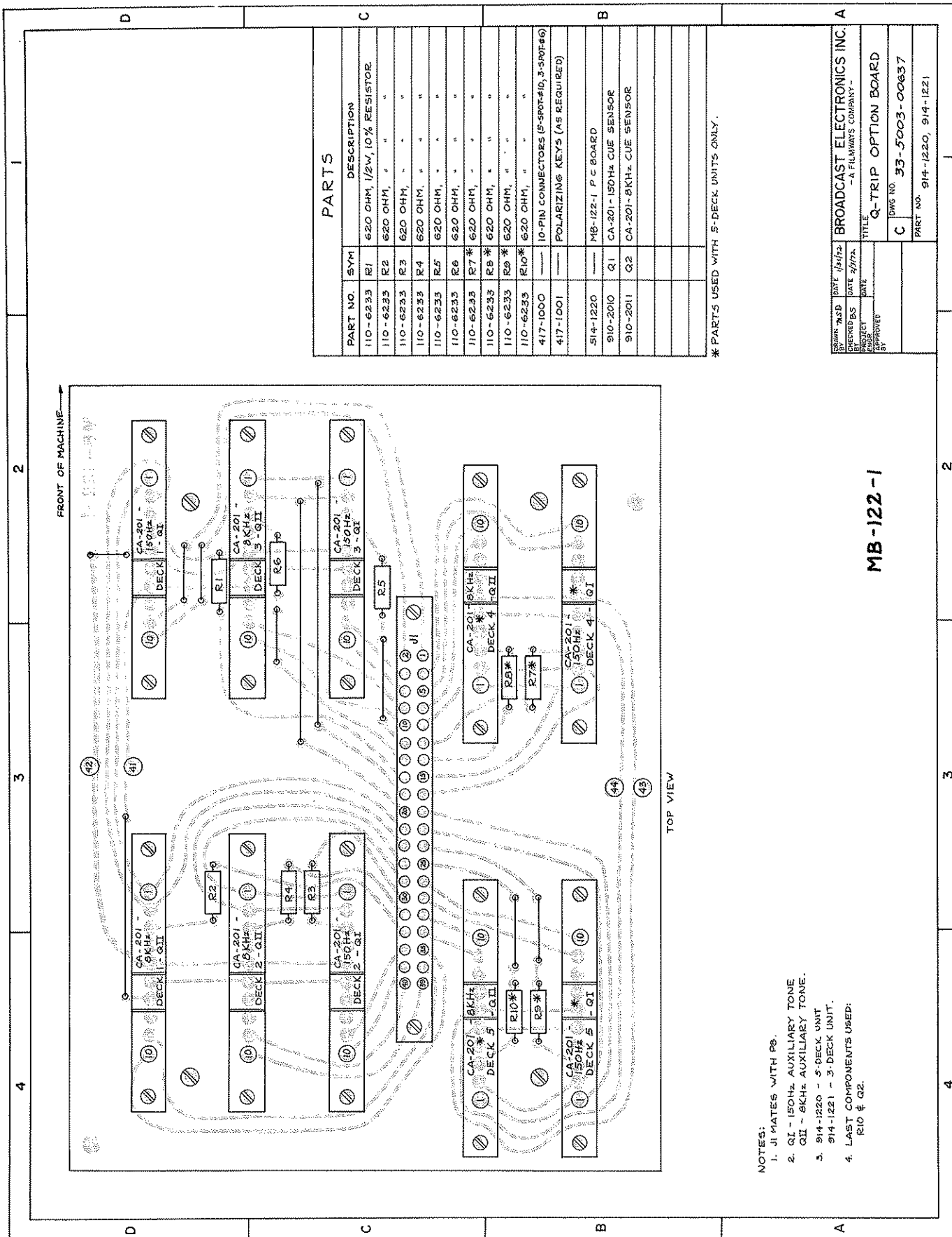


Figure 4-16. MB-122 Assembly

SECTION 5

ELECTRONIC MAINTENANCE AND ADJUSTMENTS

5.1 SCOPE

This section describes various electronic maintenance and adjustment procedures required for continued optimum performance of the Mini-Series. Refer to the next section for mechanical maintenance.

5.2 GENERAL MAINTENANCE

Routine cleaning of the printed circuit board and connector contacts is not necessary. In case of intermittent operation, however, clean the contacts by spraying with an aerosol contact cleaner. Do not use a cleaner with abrasives. To work grime free, polish the contacts lightly with a soft pencil eraser. Be sure the power is disconnected. The push on connectors may loosen after repeated disconnection. To tighten, pinch lightly with a pair of pliers. Be careful not to force the connector out of round, however.

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

At least quarterly the performance of the electronics should be checked and compared with the Acceptance Test Results supplied by Broadcast Electronics with each Mini-Series unit. The NAB alignment cartridge contains the necessary tones and reference levels for checking the program and cue systems.

5.3 PRINTED CIRCUIT BOARD REPAIRS

All printed circuit boards with the same number etched on the board (e.g. PA-101, CA-101, etc.) may be interchanged for trouble shooting. However, permanent interchange is not recommended without re-optimizing levels and equalizations.

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

Broadcast Electronics maintains a complete inventory of parts (e.g. resistors, transistors, etc.) as well as complete board assemblies. Order by Broadcast Electronics part number.

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

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

NOTE

When replacing multi-pin components (transformers, connectors, etc.) de-solder all the pins before attempting to remove the component. It is virtually impossible to heat all the pins simultaneously.

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

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

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

5.4 ELECTRONIC ADJUSTMENTS

Before adjusting the electronics make sure the reproduce heads are properly aligned (head azimuth and tracking height) as described in the next section. The heads should be cleaned with BE-903 cleaning fluid or isopropyl alcohol.

The EB-102 Extender Board (figure 5-1) facilitates maintenance of the MB-118 and the MB-125 (305C) boards. The EB-102 is equipped with movable support ears which should be extended for use with the MB-118. These ears engage the PC board guides on the card rack assembly. When used with the MB-125, the support ears should be collapsed to clear the harness and motor.

NOTE

The extender board must be inserted with the screened surface facing the same direction as the component side of the MB-118 or MB-125. The MB-118 or MB-125 plugs into the EB-102 with the same orientation.

Adjustments to the program channel should be made with the unit's output referenced to the NAB Standard Operating Level. This is a most important point. If the unit is normally operated at a different level, it should be compared to the standard level before adjusting the electronics. Use an alignment cartridge of known quality. The NAB alignment cartridge is available from Broadcast Electronics (stock number 808-0003).

If levels are incorrect, distortion and signal to noise figures will suffer. If frequency response is not properly set, cartridge interchangeability will suffer. This is most critical in Mini-Series units. The quality of the reproduced audio is greatly dependent on the proper adjustment of both the Mini-Series unit and the unit used to record the cartridges.

Different types of tape will yield different levels when recorded under identical conditions. If different types of tape are used, the recorder electronics should be adjusted for the best compromise between the various types.

Worn, damaged, or dirty tape will have poor response characteristics. Do not attempt to adjust the electronics to compensate for deteriorated tape.

Response also depends on proper tape wrap around the head. Worn or misshapen pressure pads in the cartridge should be discarded. Broadcast Electronics maintains a supply of cartridge parts, cartridges, and cartridge tape. A cartridge repair and rewinding service is also available.

In recording magnetic tapes, magnetic saturation limits the maximum output. Completely flat response cannot be obtained at NAB Standard Operating levels. The tones on the NAB alignment cartridge are recorded 10 dB below standard level. The equalization adjustments should be made 10 dB below operating level.

For the following electronic adjustments you will have to use various internal controls as shown in figure 5-2.

5.4.1 Output Level, Multiple Output Units (see figure 5-2)

Separate output level controls for each deck are located on the rear panel. Set the switch for the desired nominal output: -10, 0, or +8 dBm. While reproducing the 400 Hz operating level tone from the NAB test cartridge, adjust the level trimmer for "0" level on subsequent equipment. In stereo units, separate trimmers are provided for both the left and right.

5.4.2 Output Level, Single Output Units (see Figure 5-2)

Units equipped with the optional audio switcher for operation with a single switched output must be adjusted in two steps. First set the level of the audio switcher. Second the decks are adjusted individually to yield a consistent output level regardless of which deck is operated through the switcher. Proceed as explained below.

5.4.3 Audio Switcher Level

Set the audio switcher level control(s) to mid-range. Set the rear panel level switch to the desired nominal output: -10, 0 or +8 dBm. Set the rear panel level trimmer(s) to the maximum (clockwise) position. Load the NAB test cartridge in the final deck: deck 5 in 5 deck units; deck 3 in 3 deck units. While reproducing the 400 Hz operating level tone, adjust the switcher's level control for "0" level on subsequent equipment.

5.4.4 Balancing the Decks

The levels of the individual decks are balanced by adjusting the rear panel level trimmers. Reproduce the 400 Hz operating level tone from the NAB test cartridge in each of the decks. Adjust the trimmer(s) for each deck as required to yield an output level of "0" on subsequent equipment. Re-adjust the audio switcher control(s) slightly if necessary; but readjust all decks if this is necessary.

5.4.5 Monophonic Frequency Response (see figure 5-2)

The high and low frequency compensation networks are located on the MB-118 Reproduce Master Board.

Load the NAB test cartridge in the appropriate deck and set the tape in motion. During the 50 Hz tone adjust the low frequency compensator for a level of -10 on subsequent equipment. During the 15 kHz tone adjust the high frequency compensator for a -10 level on subsequent equipment.

5.4.6 Stereophonic Frequency Response (see figure 5-2)

The equalization adjustments for the stereophonic units are performed much the same as described in the paragraph above. Separate compensation networks are provided for the A and B channels.

However, a stereophonic NAB test cartridge is not presently available. The monophonic cartridge can satisfactorily be used to adjust the A channel. The B channel can be adjusted by feeding the A channel head output to the B channel electronics.

Once the A channel has been adjusted as above, disconnect the AC power and remove the MB-118 from its socket. Mount the EB-102 extender board in place of the MB-118. Referring to the MB-118 assembly drawing (figure 4-5), remove the A channel PA-101 Preamplifier. With masking tape cover the MB-118 pins 3 and 4 (channel B head connection). Connect pin 1 of the A channel PA-101 socket to pin 1 of the B channel PA-101 socket. Also, connect pins 2 of these two sockets. Mount the MB-118 in the socket of the extender board. Reconnect the AC power and adjust the B channel compensators.

NOTE

To minimize hum and noise pick-up, keep the jumpers between the PA-101 sockets as short as possible.

Finally, disconnect the AC power. Remove the jumpers and masking tape from the MB-118. Clean the tape residue from the contacts and conductors with Varsol. Re-mount the A channel PA-101 Preamplifier. Remove the extender board and re-mount the MB-118 in its socket in the chassis.

5.4.7 1,000 Hz Cue Sensor Sensitivity (see figure 5-2)

One CA-101 Stop Cue Sensor is mounted on each MB-118 Reproduce Master Board. The sensitivity control (R20) of the CA-101 should be set to trigger on a 1,000 Hz tone burst of -28 dBm output from the Cue Channel Preamplifier.

Disconnect the AC power and replace the appropriate MB-118 board with the EB-102 extender board. Plug the MB-118 into the extender's socket. Referring to figure 4-5 (MB-118 assembly diagram), remove the cue channel PA-101 Reamplifier. Connect the hot side of an audio signal generator to pin 10 of the cue channel PA-101 socket. Connect the ground to pin 5 of the same socket. Set the generator for 1,000 Hz at a level of approximately .03 V RMS.

Manually cock the pressure roller of the deck being adjusted and depress the START button. Slowly adjust R20 until the sensor just triggers and the deck stops. The sensor is muted for three seconds after the deck starts, so check the operation of the sensor several times.

When finished, disconnect the AC power. Disconnect the signal generator and replace the cue channel PA-101 Preamplifier. Remove the extender board and replace the MB-118 Board in the chassis.

5.4.8 Optional 150 Hz and 8 kHz Cue Sensors Sensitivity (see figure 5-2)

The optional CA-201 150 Hz (QI) and CA-201 8 kHz (QII) sensors are mounted in the bottom compartment of the chassis on the MB-122 Q-Trip Master Board. The sensitivity of the CA-201 is adjusted by R15. The 150 Hz version should be set to detect a tone burst at -22 dBm and the 8 kHz to detect a burst at -37 dBm.

Place the unit on its side so that the MB-118 Reproduce Master Boards and the MB-122 Q-Trip Master Board are accessible simultaneously. Replace the MB-118 for the deck to be adjusted with the EB-102 extender board. Referring to the MB-118 assembly diagram (figure 4-5), remove the cue channel PA-101 Preamplifier. Connect the hot side of an audio signal generator to pin 10 of the cue channel PA-101 socket. Connect the ground to pin 5 of the same socket.

For the CA-201 QI sensor, set the generator for 150 Hz at a level of .06 V RMS. For the CA-201 QII sensor set the generator for 8 kHz at .01 V RMS. Adjust the sensitivity control on the appropriate sensor until the sensor just triggers. Check the operation of the sensor several times.

When the adjustments are complete, disconnect the AC power and the signal generator. Replace the cue channel PA-101 Preamplifier on the MB-118 Reproduce Master Board. Remove the extender board and replace the MB-118 in its chassis socket.

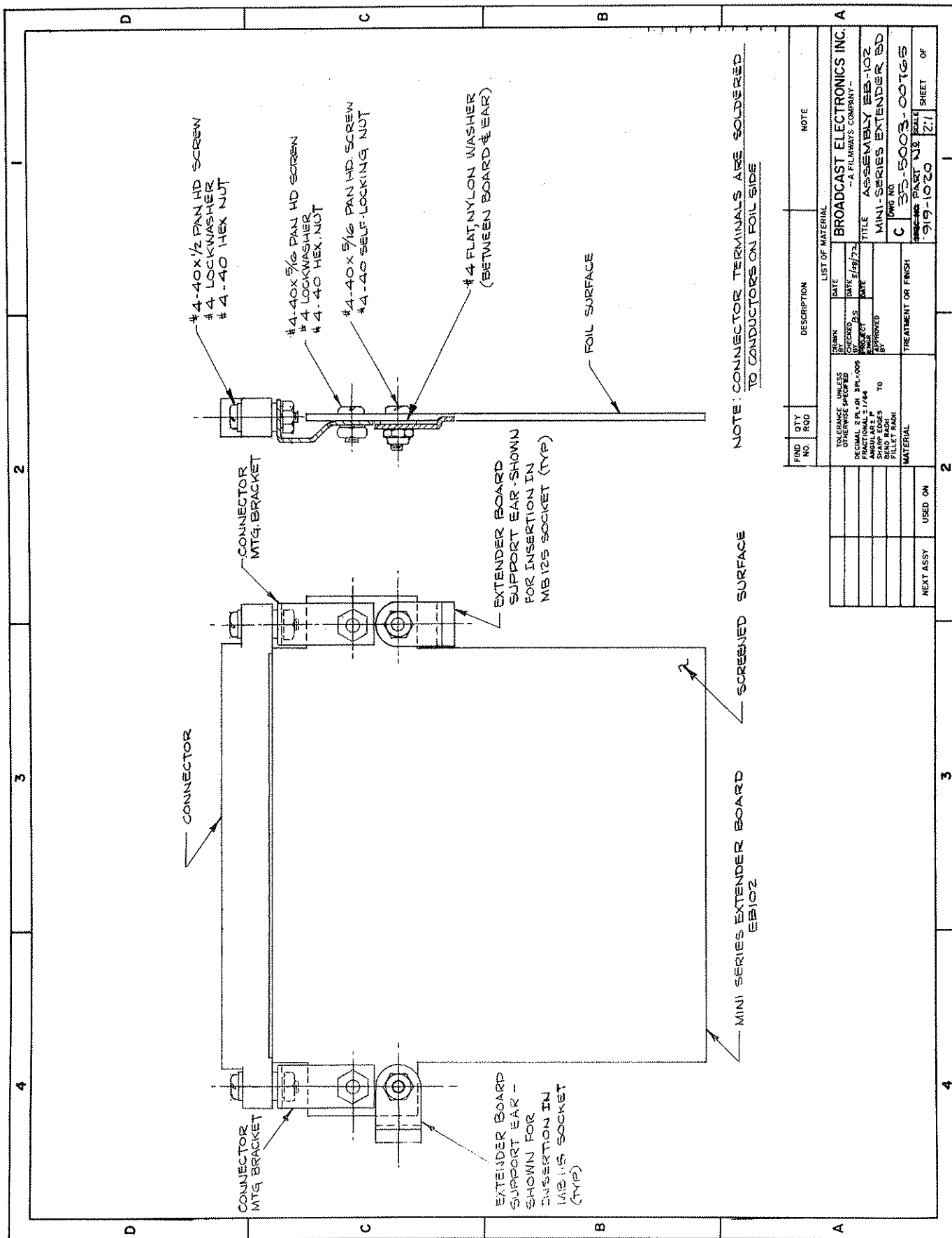
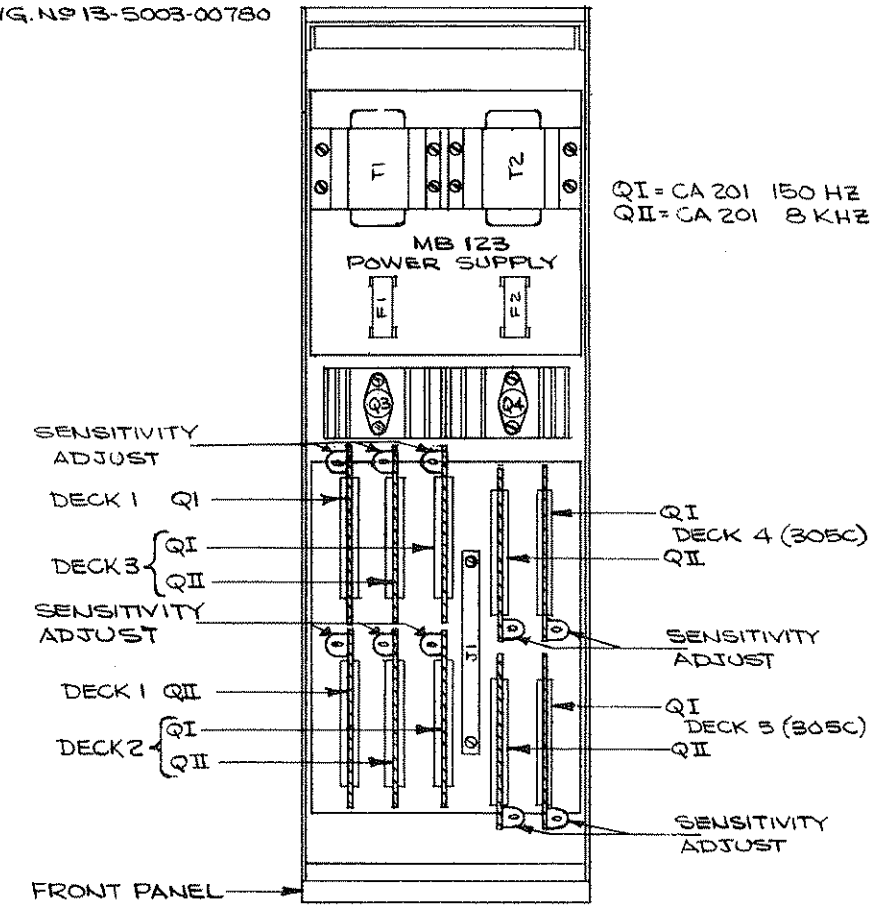
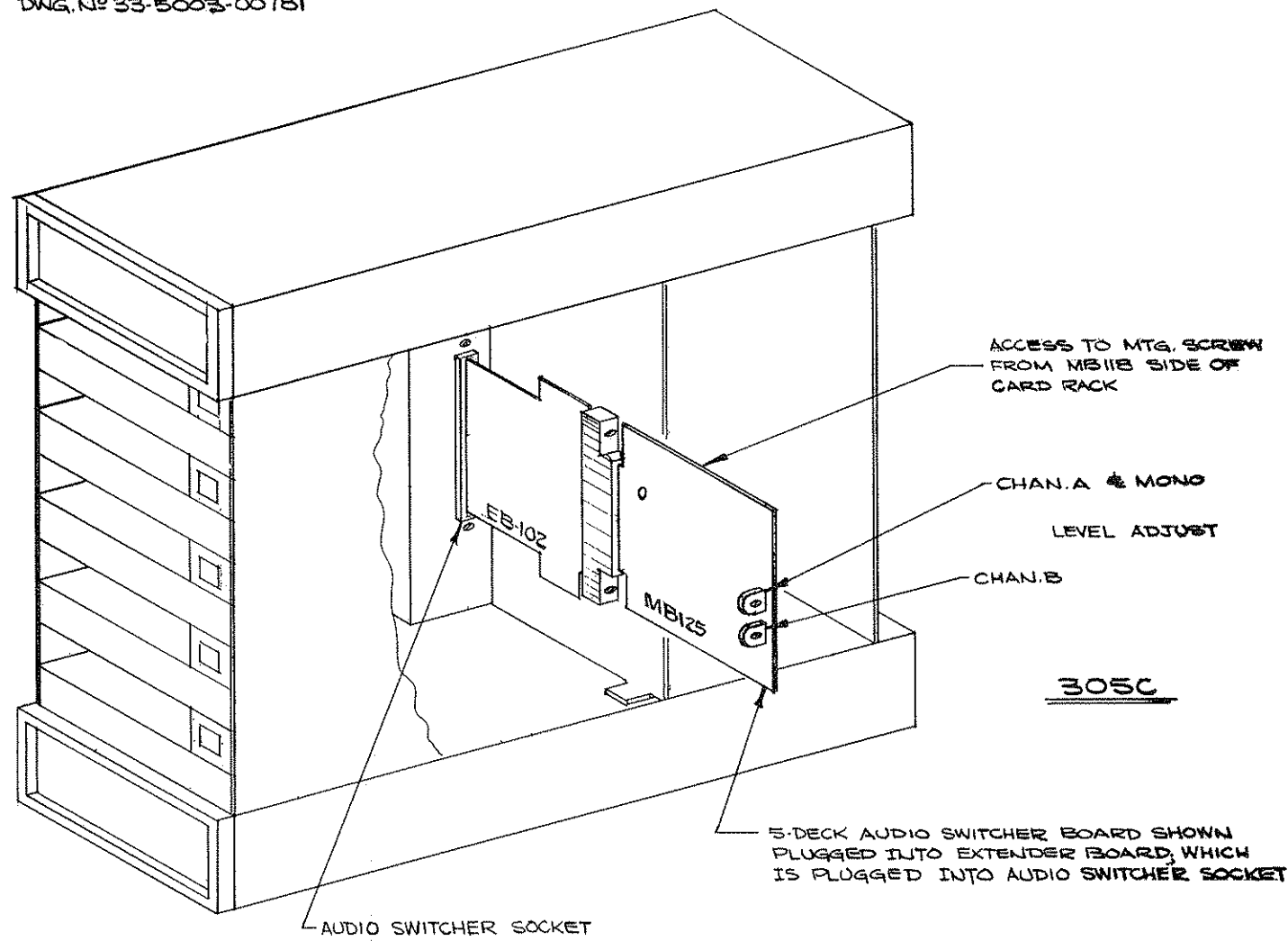
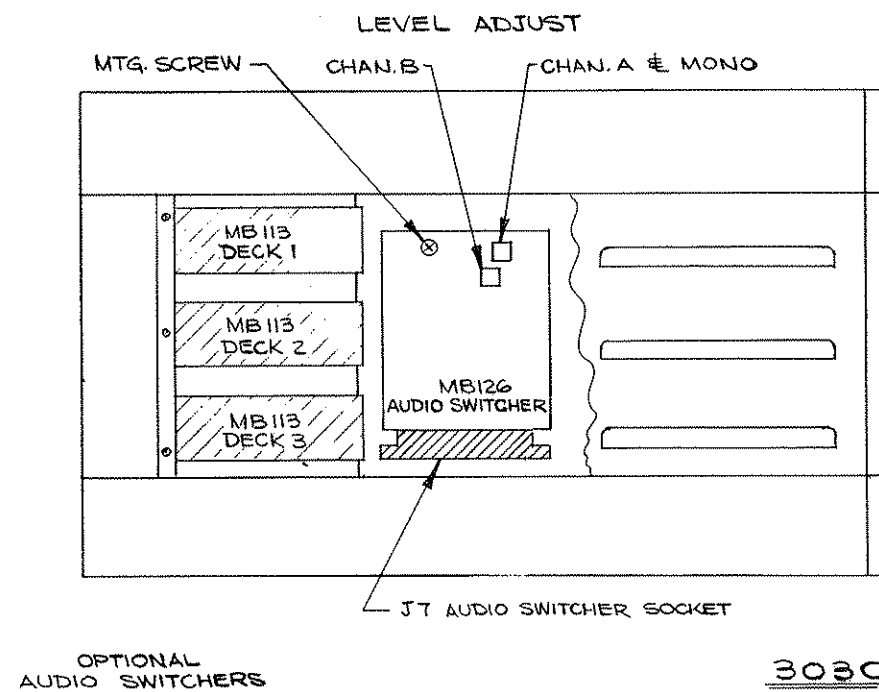


Figure 5-1. EB-102 Extender Board Assembly



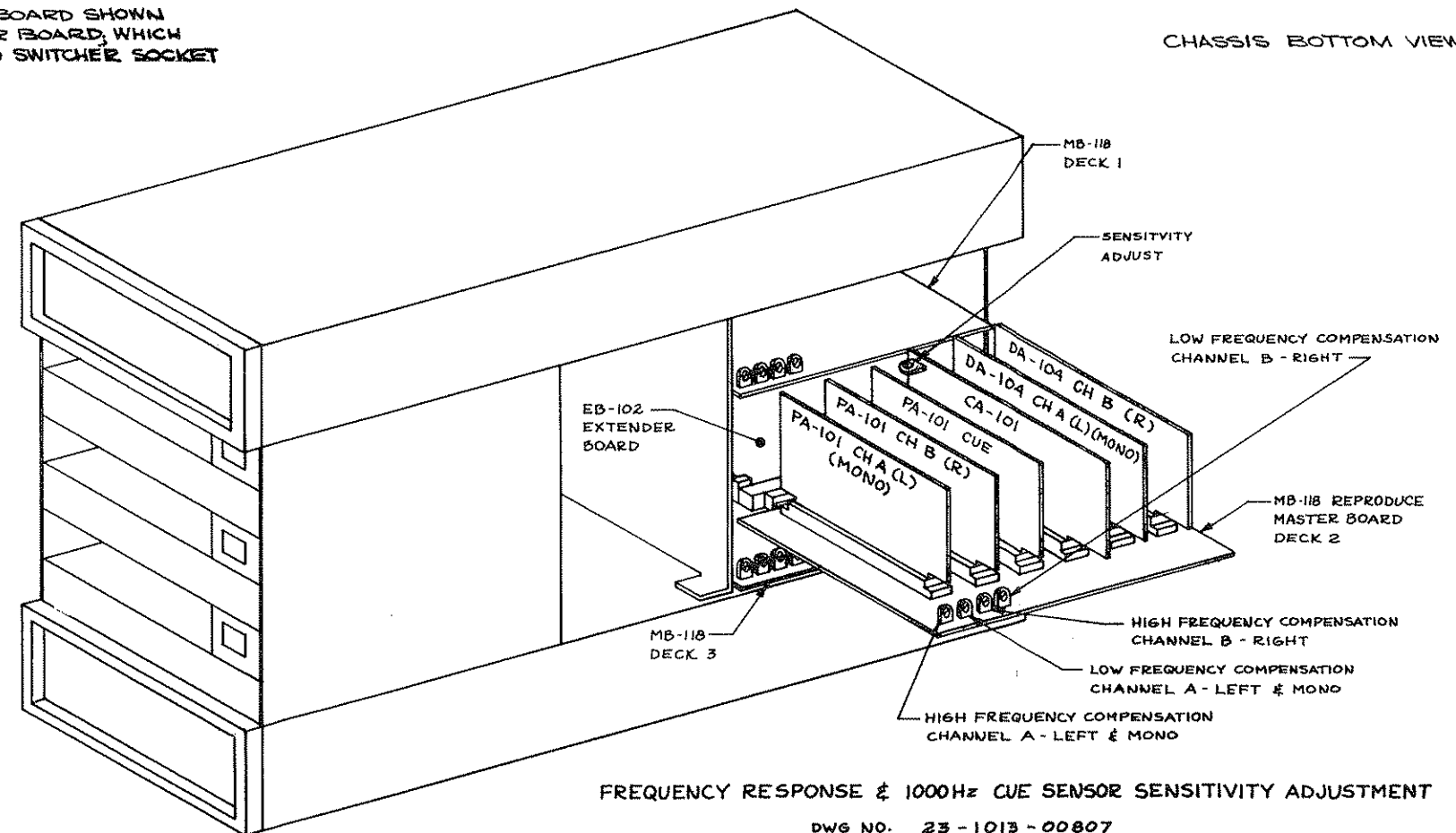
CHASSIS BOTTOM VIEW

OPTIONAL MB-122 Q TRIP MASTER BOARD



OPTIONAL AUDIO SWITCHERS

303C



FREQUENCY RESPONSE & 1000HZ CUE SENSOR SENSITIVITY ADJUSTMENT

Figure 5-2. Locations of Electronic Adjustments

SECTION 6

MECHANICAL MAINTENANCE AND ADJUSTMENTS

6.1 ROUTINE MAINTENANCE

To keep your SPOTMASTER Mini-Series unit operating at the optimum, several maintenance procedures should be followed at regular intervals.

6.1.1 Cleaning

Once a day the heads, pressure rollers, and capstan shaft should be cleaned with BE-903 cleaning fluid or isopropyl alcohol. Use enough fluid to remove accumulated dirt and graphite but not enough to leave the head or roller wet. The pressure roller must be smooth and supple. With use, dirt and graphite will form a hard glaze. The pressure roller should then be replaced.

NOTE

When cleaning the heads be careful
not to scratch them.

6.1.2 Demagnetizing

At least once every six months demagnetize the heads with a SPOTMASTER head degausser.

6.1.3 Cartridge Maintenance

Periodically, the cartridges should be examined to see that the corner guide post is glued down, the hub turns freely, the pressure pads line up squarely with the tape, the tape moves smoothly, and that the oxide surface of the tape is clean and not shiny. Check new or newly wound cartridges for frequency response, proper tape tension, and flutter.

6.1.4 Lubrication

The drive motor is equipped with permanently sealed ball bearings, so it does not need lubrication.

About once every six months the Oilite sleeve bearings and the top bronze bearing in which the capstan shaft rotates should be lightly oiled with a good grade of number 10 non-detergent machine oil. Wipe off any excess with a soft, lint-free cloth and clean the shaft with BE-903 cleaning fluid.

At six month intervals apply Lubriplate to the nylon thrust bearings at the top and bottom of the capstan shaft.

The pressure roller shaft assembly pivot points, and friction areas in the deck, are lubricated at the factory with Lubriplate. These should not need attention for several years unless the deck is disassembled and these parts cleaned.

6.2 MECHANICAL SYSTEM

A single hysteresis synchronous motor, through a belt and pulley, drives a flywheel and capstan shaft which powers the decks. The pressure roller pinches the tape in the cartridge against the capstan to move tape.

The reproduce head is mounted on a bracket attached to the top surface of the deck. A single 14 pin connector mounted on the rear of the deck carries all electrical connections to the deck and the head. Interconnections are made on the MB-107 printed circuit board which is mounted behind the RDY/REL switch.

The deck is held in place by the anchor block screw. A deck is removed by loosening the anchor block screw and sliding the deck out of the chassis.

The head assemblies are covered in detail later in this section. Section 8 contains a listing of the parts in the chassis, the drive system, the deck, and the head assembly.

6.2.1 Operation of the Deck

See figure 6-1.

Inserting a cartridge moves the push link assembly (A), rotates the pivot lever actuator (B), and, through the wire link and cam (C), rotates the pressure roller shaft assembly (D), bringing the pressure roller into the vertical ready position. The roller is held in place by the pressure roller latch (E), seating in the slot in cam (C). The switch actuator on the pivot actuator lever contacts switch S-1 to enable the control logic.

The play solenoid (F) is energized when the START button is depressed, pulling the roller shaft assembly towards the rear of the deck. This brings the pressure roller against the capstan.

When the cartridge re-cues or the STOP button is depressed, the play solenoid de-energizes and the return spring (G) brings the roller shaft assembly back to the ready position. When the Ready/Release button is depressed, the release solenoid (H) unseats the latch (E) from the cam (C) allowing the roller assembly to return to the horizontal position.

NOTE

The release and play solenoids are electrically interlocked so that a cartridge can only be removed when the deck is not moving tape. A cartridge cannot be removed when the AC power is off.

6.3 DECK ADJUSTMENTS

When making adjustments on the deck, keep in mind the inter-dependence of the various assemblies. One adjustment will necessitate another. Normally only the pressure roller needs to be adjusted by the user. However, should the deck not appear to function properly refer to the set-up procedures outlined in paragraph 6.3.2.

6.3.1 Pressure Roller Pressure and Azimuth Adjustments

See figure 6-1.

From time to time as the pressure roller wears, it will be necessary to readjust the pressure the roller exerts on the capstan shaft. Before beginning, clean the roller and capstan as described in paragraph 6.1.1. Be sure the deck is properly seated so that the anchor block is flush against the bulkhead of the chassis. To gain access to the area where the roller contacts the capstan shaft, remove the deck above the deck being adjusted. The top deck can be moved to another location. When the adjustments are complete, return each deck to its original location.

There are two access holes in the front edge of the deck. Behind the opening on the right, below the Ready/Release button is the screw to adjust roller PRESSURE. Behind the other opening is the screw to adjust the roller's AZIMUTH or perpendicularity with respect to the deck surface.

NOTE

The AZIMUTH adjustment screw (on the left) SHOULD NOT BE USED TO ADJUST THE ROLLER PRESSURE. To confuse these two adjustments will cause improper adjustment and operation of the deck.

With the deck in place in the chassis, press the push link assembly (A) back until the pressure roller latches in the vertical ready position. Observe the gap between the roller and the capstan shaft. Check to see that the roller's shaft is parallel to the capstan. With the finger press back slightly on the pressure roller to take up any slack in the roller shaft assembly. Should this slack exceed 1/32 inch or if the two shafts are not parallel, refer to paragraph 6.3.2 for complete mechanical adjustment procedures. Before adjusting roller pressure, the roller azimuth should always be checked.

To set the roller pressure, press the START button. Insert a 7/64 inch Allen wrench through the access hole on the RIGHT FRONT edge of the deck (below the Ready/Release button). Turn this roller pressure adjustment screw counterclockwise until the pressure roller just contacts the capstan. Now turn the pressure adjustment screw $\frac{3}{4}$ turn CLOCKWISE. Greater pressure is not needed and will only cause sluggish latching of the cartridge.

NOTE

Never force the pressure adjusting screw. The linkages will bend if forced.

When a flutter meter is available, the pressure roller adjustment may be made by adjusting for a minimum pressure and minimum flutter output when playing a standard flutter test tape.

Finally, run several cartridges in the deck to check operation. Test with the longest length cartridge the deck will have to handle.

6.3.2 Mechanical Set-up Procedure

See figure 6-1.

The following is a step-by-step procedure to be used if the deck fails to operate properly.

Loosen the anchor block screw and slide the deck out of the chassis. Loosen the three play solenoid mounting screws. Square the solenoid by PRESSING the armature against the coil plate and tightening the mounting screw.

Travel of the play solenoid is controlled by the rubber-tipped bumper strip mounted underneath the deck, just forward of the play solenoid. In the de-energized position the armature should be .045 inches (a little less than the thickness of a dime) away from the coil plate.

Insert a 7/64 inch Allen wrench through the front of the deck to the pressure roller PRESSURE adjustment screw (the right hand opening just below the Ready/Release button). Adjust this screw until the pin on the end of the roller shaft assembly (D) is centered in the slot in the play solenoid armature assembly.

Now cock the pressure roller into the vertical ready position manually. Insert an XCELITE No. X100 Phillips screwdriver in the pressure roller AZIMUTH adjustment screw. Adjust this screw until the pressure roller is perpendicular to the surface of the deck.

Now check the roller shaft assembly for play. The pressure roller should not be able to move more than 1/32 inch. Loosen the two roller shaft mounting screws and adjust the assembly for minimum play. The roller assembly should move freely without binding. Be sure the two mounting screws are retightened securely.

To manually release the roller assembly, press on the lever of the release solenoid (H). Manually cock the pressure roller several times to see when the switch actuator contacts S-1. Adjust the switch actuator so that it will activate S-1 without striking the body of the switch.

Next check the release solenoid (H). The armature should sit down flat against the coil when the solenoid is energized. Loosen the two mounting screws and press the armature against the coil so the solenoid squares itself. Retighten the mounting screws.

Now set the travel of the release solenoid by cocking the pressure roller in the vertical ready position. Loosen the travel adjustment screw. Hold the armature against the coil and tighten (clockwise) the travel adjustment screw until the pressure roller releases. Give the screw an additional 1/4 turn clockwise.

The set screw next to the travel adjustment on the release solenoid determines the slack between the release lift and the pressure roller latch (E). With a .050 inch Allen wrench adjust the slack until there is enough play so that the latch does not rest on the release lift. If there is too much slack, however, the release solenoid will not be able to pull in when energized.

Slide the deck back in the chassis and tighten the anchor block screw. Be sure the anchor block screw draws the anchor block flush against the bulkhead of the chassis.

The screw a cartridge butts against on the push link assembly (A) controls how far back on the deck a cartridge can travel. If this screw is set too far out the roller will interfere with the cartridge housing or the clutch spring in the cartridge. Turn the screw clockwise until it is screwed all the way into its lock nut.

By hand cock the pressure roller in the vertical ready position. The pressure roller will bear against the capstan. Insert a 7/64 inch Allen wrench through the hole in the front of the deck just below the Ready/Release button (roller PRESSURE adjustment screw) and adjust counterclockwise until the pressure roller is 1/32 inch away from the capstan.

With your hand, pull back slightly on the pressure roller. Notice whether or not the pressure roller's shaft is parallel with the capstan. If it is not, the hole on the left gives access to the pressure roller AZIMUTH adjustment screw. With your finger keep a light tension on the pressure roller and adjust the roller AZIMUTH with an XCELITE No. X100 Phillips screwdriver until the two shafts are parallel.

NOTE

Do not force the pressure roller azimuth or pressure adjustment screws. These parts will bend if forced.

When the pressure roller azimuth is set, press the START button. Insert the 7/64 inch Allen wrench through the access hole below the Ready/Release button. Turn this roller PRESSURE adjustment screw clockwise until the pressure roller just contacts the capstan and the roller just begins to turn. Now turn the PRESSURE adjustment screw 3/4 turn CLOCKWISE. The pressure the roller exerts on the capstan is now set.

Press the STOP button. The pressure roller should move back to the vertical ready position. Now press the Ready/Release button. The pressure roller should return to its horizontal position below the deck surface.

Now adjust the screw on the push link assembly (A) by turning it counterclockwise in steps of no more than one turn. After each step, SLOWLY push in a cartridge, pushing on the cartridge on the side next to the Ready/Release button so that the cartridge is not skewed as it is pushed in. The cartridge must be inserted slowly so that the linkage is not forced. Keep adjusting the push link assembly screw in one turn steps until the cartridge will latch into place with the pressure roller in the vertical ready position.

When adjusted properly, the cartridge will latch into place smoothly and tape will not move if the cartridge is pushed in. Some play is necessary or the clutch spring in the cartridge may not release or the play solenoid may not pull in.

If the deck will not properly handle a cartridge, re-check the adjustments. In particular, the two screws which hold the play solenoid bumper strip must be tight. If not, tape will move when the cartridge is pushed. Repeat the mechanical setup procedures.

An indication of improper adjustment is the amount of adjustment necessary to set the pressure roller azimuth and pressure. After the procedures with the deck removed from the chassis, the roller azimuth and pressure adjustment screws should be tightened two (2) turns at the most. If more turns are used, repeat the mechanical set-up procedure.

Always adjust the deck in the following order.

With the deck out of the chassis:

1. Square the play solenoid.
2. Set the travel of the play solenoid.
3. Center the pin of the roller shaft assembly in the play solenoid armature assembly.
4. Adjust the roller shaft azimuth so the pressure roller is perpendicular to the deck surface.
5. Minimize play in the roller shaft assembly.
6. Set the switch actuator.
7. Square the release solenoid.
8. Set the release solenoid travel.
9. Set the slack of the release lift.

With the deck in the chassis:

10. Turn the push link assembly screw clockwise until it is all the way into its lock nut.
11. Set the pressure roller AZIMUTH.
12. Set the pressure roller PRESSURE.
13. Adjust the push link assembly.

Once the deck is operating properly, check the cartridge hold down spring. It should press down on the cartridge slightly but not enough to hold the cartridge in place when the Ready/Release button is pushed.

6.4 DRIVE SYSTEM PARTS REPLACEMENT

6.4.1 Motor Replacement

See figure 6-2.

To replace the motor, first remove the top and right side covers from the chassis. On model 305 units, remove the MB-125 card to provide clearance for removing the motor. Unplug the motor AC power cord (P-9). Remove the motor shield by rotating it counterclockwise. Work loose the nylon cooling fan which is press-fitted to the motor shaft. With an .062 inch Allen wrench loosen the set screw in the drive pulley. Remove the pulley. Now remove the four screws closest to the shaft. These screws attach the motor to the mounting plate. Remove the old motor.

Slide the replacement motor into place and replace the mounting screws. Replace the drive pulley with the lip towards the motor and the set screw away from the motor. Press the fan back on the shaft so that it will draw air into the chassis from the bottom. Fit the motor shield back in place so that the motor leads pass through the U-shaped cut-out. Reconnect P-9.

The motor should turn freely; the drive belt should not slip. Turn on the AC power and check the operation of the motor and capstan shaft. Before closing the top and side covers, be certain that the motor leads will not rub against the chassis and that the fan will clear the top.

6.4.2 Drive Belt Replacement

See figure 6-2.

To replace the drive belt, remove the top cover. To maintain proper tension on the belt, the motor assembly is mounted so that it is free to move in an arc towards the capstan shaft. Push the motor assembly towards the capstan shaft until there is enough slack to remove the belt. Fit the new belt in place.

Check to see that the belt does not slip and that the motor turns freely. The flywheel is machined so that the belt is self-centering. If the belt runs on the edges of the drive pulley or slips off, check the height of the motor shaft drive pulley.

6.4.3 Capstan Shaft Replacement

See figure 6-2.

To remove the capstan shaft, remove the top cover. Remove the two screws which hold the shaft retainer plate. The capstan and flywheel assembly can now be lifted up and out.

NOTE

It is imperative that extreme care be used when handling the capstan shaft assembly. If it is bent, however slightly, it will be unusable. Use extreme care when removing or replacing the capstan shaft. If the bearings are deformed, the assembly will be ruined.

The capstan shaft is held in proper alignment by a casting in which Oilite sleeve bearings are mounted. This casting is aligned at the factory. **THIS CASTING MUST NOT BE LOOSENEED OR ADJUSTED.**

6.4.4 Top Bearing Replacement

See figure 6-2.

The capstan shaft rides in a bronze bearing where the shaft passes through the bottom plate of the top compartment. To replace this bearing, remove the capstan shaft. Loosen the two Phillips screws which hold the bearing mounting plates. Remove the bearing assembly and insert the replacement.

Replace the Phillips screws but leave them loose so that the bearing assembly can move freely. Replace the capstan shaft and line up the access holes in the flywheel with the screws. Alternately tighten the screws so that the bearing can align itself.

NOTE

If the top bronze bearing is not allowed to align itself as the screws are tightened the bearing will be mounted off-center. If mounted off-center, this bearing will bend the capstan shaft and ruin it.

Finally, replace the nylon thrust bearing plate. If this top thrust bearing is adjusted to minimize vertical play in the capstan shaft, the unit will operate on its side or upside down. This might be desirable for test purposes, although cartridges will not work upside down.

6.4.5 Pressure Roller Replacement

See figure 6-1.

To replace the pressure roller, remove the deck by loosening the anchor block screw and sliding the deck out of the chassis. Manually cock the pressure roller in the vertical ready position by pressing on the push link assembly (A). Remove the retaining washer and the Teflon friction washers. Slip the roller off its shaft and fit the replacement on. Replace the Teflon washer and then the retaining washer.

Adjust the roller pressure as outlined in paragraph 6.3.1. Whenever the pressure roller is replaced or removed, the roller pressure should be checked.

6.5 MICROADJUSTABLE HEAD BRACKET

NOTE

Your SPOTMASTER Mini-Series unit may be equipped with either the microadjustable head bracket described herein or the optional Phase-Lok stereo head bracket described in paragraph 6.6.

See figure 6-3.

The reproduce head is mounted in a precision assembly designed to provide ease of adjustment but a secure mounting. The head fits through the mounting bracket and is threaded into the brass hex-headed collar, the clamping nut. A single screw secures the collar in the clamping block. The block is held between a spring on its underside and the two adjustment screws on the top. A brass Belleville conical washer between the clamping block and the mounting bracket restricts the movement of the head and the clamping block. This keeps the head in gross adjustment. Fine adjustment is provided by the two set screws which bear on the top of the clamping block.

6.5.1 Head Alignment — Microadjustable Head Bracket

The alignment of a new head or the realignment of a head requires two adjustments: tracking height and azimuth. Clean the head with BE-903 cleaning fluid or isopropyl alcohol before beginning. For easy access to the head, remove the deck above the one being adjusted. The top deck can be moved to another position. When the adjustments are complete return each deck to its original position.

Check the tracking height of the reproduce head. Remove the pressure pads from a cartridge so that the tape is visible as it passes the head. The top can be left off of the cartridge if the hold down wire is glued in place. Or a section can be cut out of the top in the area of the pressure pads. See figure 6-4.

NOTE

When adjusting head tracking height and azimuth, final turns on the set screws should be made clockwise so that the spring under the mounting block is being compressed. These adjusting screws are .050 Allen; a proper size wrench is shipped with each Mini-Series unit.

Place the tracking cartridge in the deck and set the tape in motion. Observe the tape path across the head. Adjust the tracking height screw until the top edge of the tape just covers the top of the pole piece and the bottom edge of the tape just covers the bottom pole piece.

Remove and re-insert the tracking test cartridge and stop and start tape motion several times. If the tape does not repeat the proper path each time, check the tape guides on the head bracket. The guides should be down square against the surface of the deck.

When the tracking height is adjusted, remove the tracking test cartridge and insert a 15 kHz azimuth test cartridge. Set the tape in motion and observe the reproduced output level on a VU meter. Adjust the azimuth adjustment screw for maximum output.

NOTE

When aligning a newly installed head, it may not be possible to get correct azimuth if the brass collar (clamping nut) has been tightened too much. This will compress the washer so much that the head cannot move.

Remove the azimuth test cartridge and re-insert the tracking test cartridge. If the tracking height must be re-adjusted, also re-adjust the azimuth.

NOTE

The azimuth adjustment of stereo heads is most critical, since a small error will cause phase differences between the A and B channels (see paragraph 6.6.3). When aligning stereo heads, always check the phasing as described in 6.6.4. Adjust the head azimuth for optimum stereo operation.

6.5.2 Head Replacement

Remove the deck from the chassis by loosening the anchor block screw and sliding the deck out. Disconnect the head leads from the deck connector. Remove the two screws which hold the head mounting bracket to the deck. Loosen the screw which holds the head in the clamping block. Now remove the brass clamping nut from the threaded bushing of the head, being careful not to lose the conical (Belleville) washer.

Fit the replacement head's bushing through the mounting bracket (printing side up), the conical washer, and the clamping block. Thread on and tighten the clamping nut. This brass collar should be just tight enough to hold the assembly in the mounting block. Press down on one end of the clamping block. If it moves back up to its original position, the clamping nut is tight enough. It is too tight if the block remains down.

Remount the bracket on the deck with the two mounting screws. Position the bracket so that its back edge is 1.312 inches from the back edge of the deck. The bracket must be parallel to the front edge of the deck and at a right angle to the cartridge guide flange.

Re-solder the head leads to the deck connector. Head tracking height and azimuth adjustments should be performed as described in paragraph 6.5.1.

6.5.3 DM1B Monophonic Reproduce Head Leads

The leads to the monophonic reproduce head are connected to connector J1 as follows:

| Color | Description | Pin |
|--------|--------------------|-----|
| Orange | Program Track High | 1 |
| Blue | Cue Track High | 3 |
| Red | Program Track Low | 8 |
| Yellow | Cue Track Low | 10 |

6.5.4 DISA Stereophonic Reproduce Head Leads

The leads to the stereophonic reproduce head are connected to connector J1 as follows:

| Color | Description | Pin |
|--------|----------------|-----|
| Orange | Channel A High | 1 |
| Blue | Channel B High | 2 |
| Black | Cue Track High | 3 |
| Red | Channel A Low | 8 |
| Yellow | Channel B Low | 9 |
| White | Cue Track Low | 10 |

NOTE

Channel A is the left or upper track on the tape. Channel B is the right or middle track on the tape. The cue track is the bottom track on the tape.

6.6 OPTIONAL PHASE-LOK STEREO HEAD BRACKET

NOTE

Your SPOTMASTER Mini-Series unit may be equipped with either the optional Phase-Lok stereo head bracket described herein or the microadjustable head bracket described in paragraph 6.5.

See figure 6-6.

The Phase-Lok head bracket was designed to minimize tape travel deviation across the head to maximize phase accuracy and repeatability. The head is held in the mounting angle by the flat washer and head nut. Two screws hold the mounting angle (and the head) to the mounting block. The mounting block is suspended above the base plate by three compression springs. Three adjusting screws pass through the mounting block into the base plate. Tightening the adjusting screws compresses the springs and moves the head to set azimuth, zenith, and tracking height. The head position is secured after adjustment by the lock screw which is threaded through the mounting block and bears against the base plate.

Three precision tape guides engage the tape and stabilize its path across the head. The wire cartridge hold-down spring ensures that the cartridge is held flat against the deck surface across the

entire front of the cartridge. The cartridge guide attached to the outboard side of the base plate minimizes cartridge skew when the cartridge is inserted.

6.6.1 Head Alignment of the Phase-Lok Head Bracket

Head alignment of the Phase-Lok Bracket requires adjusting the tracking height, the zenith, the azimuth, and the phase response. To gain access to the bracket, remove the deck above the one being adjusted. The top deck can be moved to another location. Return each deck to its original location, however, when the adjustments are complete. The adjustment screws require an XCELITE No. X100 Phillips screwdriver or equivalent.

6.6.2 Tracking Height and Zenith

NOTE

When re-aligning a head the complete procedures for setting the tracking height and zenith should not be necessary. Do visually check the zenith and tracking height. If necessary, the front and rear height screws should be trimmed. The complete procedures may not be necessary when replacing a head, if the adjustment screws are not disturbed when the mounting angle is removed and replaced.

Loosen the lock screw and tighten both the front and back height adjustment screws completely until the mounting block is drawn flush against the base plate. With a feeler gauge set the approximate height by loosening the height adjustment screws until the mounting block is inches above the base plate. To keep the head level, be careful to take equal turns on the front and back screws.

Once the approximate height is set, use a square to trim the zenith. Adjust the back height screw (Zenith Trim) until the face of the head is perpendicular with the surface of the deck.

NOTE

Front and back height screws interact.

When the zenith is set, use a stereo test alignment cartridge to trim the height adjustment. While reproducing a 400 Hz tone, adjust the front height screw for peak output. If a stereo alignment cartridge is not available, set the tracking height visually as described in paragraph 6.5.1.

6.6.3 Azimuth

For stereophonic operation, azimuth adjustment is most critical. Minor azimuth error causes phase differences between the program material on the two tracks. When mixed, the phase differences cause deterioration of the frequency response. If head alignment is within ± 2 dB of the optimum 15 kHz output, the inherent azimuth error is great enough to cause a 90 degrees phase shift at 3 kHz and a 180 degree shift at 6 kHz. In other words, the response at 3 kHz is down 6 dB, and all frequencies above 6 kHz are phase inverted causing loss of directional information in stereo and cancellation in the mono portion of FM multiplex broadcast.

In addition, apparent azimuth errors can be introduced by the angle of the travel of the tape across the head. Assuming standard tolerances for tape width and tape guide aperture, an azimuth error as great as above is possible.

The cumulative results of tape travel and head alignment can easily cause a 90 degree phase shift at 1.5 kHz and complete cancellation at 3 kHz.

Careful head alignment and strict attention to cartridge and guide maintenance are imperative. To allow cartridge interchangeability, all machines in an installation must be adjusted for optimum SYSTEM response. This can best be done by preparing a reproduce alignment cartridge on a record unit. All other machines in the installation can then be adjusted to this one standard. If pre-recorded cartridges are used, the units must be matched to the record machine used to prepare the cartridges.

While a stereophonic NAB alignment cartridge is not presently available, the monophonic version can be used satisfactorily to align the reproduce head. Alternatively, an alignment tape could be made up on a reel to reel recorder and loaded into cartridge. Be certain to use a graphite-lubricated tape intended for cartridge use (such as SCOTCH 156 or equivalent).

The azimuth is adjusted while reproducing a 15 kHz tone from an alignment cartridge. Adjust the azimuth screw for peak 15 kHz output. Remove and re-insert the alignment cartridge several times and repeat the adjustment.

6.6.4 Phasing Test

Once the azimuth and height are established as described above, the reproduce head should be checked for phasing. Connect the unit's right and left channel outputs to an oscilloscope as shown in figure 6-7. Using the monophonic NAB or a prepared test cartridge, observe the Lissajous pattern produced on the oscilloscope. Alternately check the phase response of a 400 Hz and a 4,000 Hz tone. Make minor adjustments of the azimuth adjustment to yield the best overall stereo response. The 4 kHz tone can easily be phased 360 degrees rather than 0, so re-check the 400 Hz tone after adjusting the azimuth with the 4 kHz tone.

Remove and re-insert the cartridge and repeat the phasing test several times. This is to prevent improper adjustment caused by poor tape seating when the cartridge is inserted. When the adjustments are complete, tighten the lock screw.

NOTE

This same phasing test set-up can be used to test cartridges. Cartridges which show poor repeatability when removed and re-inserted should be discarded.

6.6.5 Head Replacement with the Phase-Lok Head Bracket

See figure 6-6.

To remove the reproduce head, remove the deck from the chassis by loosening the anchor block screw and sliding the deck out. Disconnect the head leads from the deck leads connector. Loosen the two screws which attach the head mounting angle to the mounting block. Remove the nut from the head bushing. Remove the head from the mounting angle.

Fit the replacement head's bushing through the opening in the mounting angle and fit on the washer and nut. Before tightening the nut, orient the head in the angle with the printed side up and top surface parallel with the top of the angle. Re-attach the mounting angle to the mounting block. Reconnect the head leads to the deck leads connector. (See paragraph 6.5.4).

Perform the head alignment procedures described in paragraphs 6.6.1 through 6.6.3.

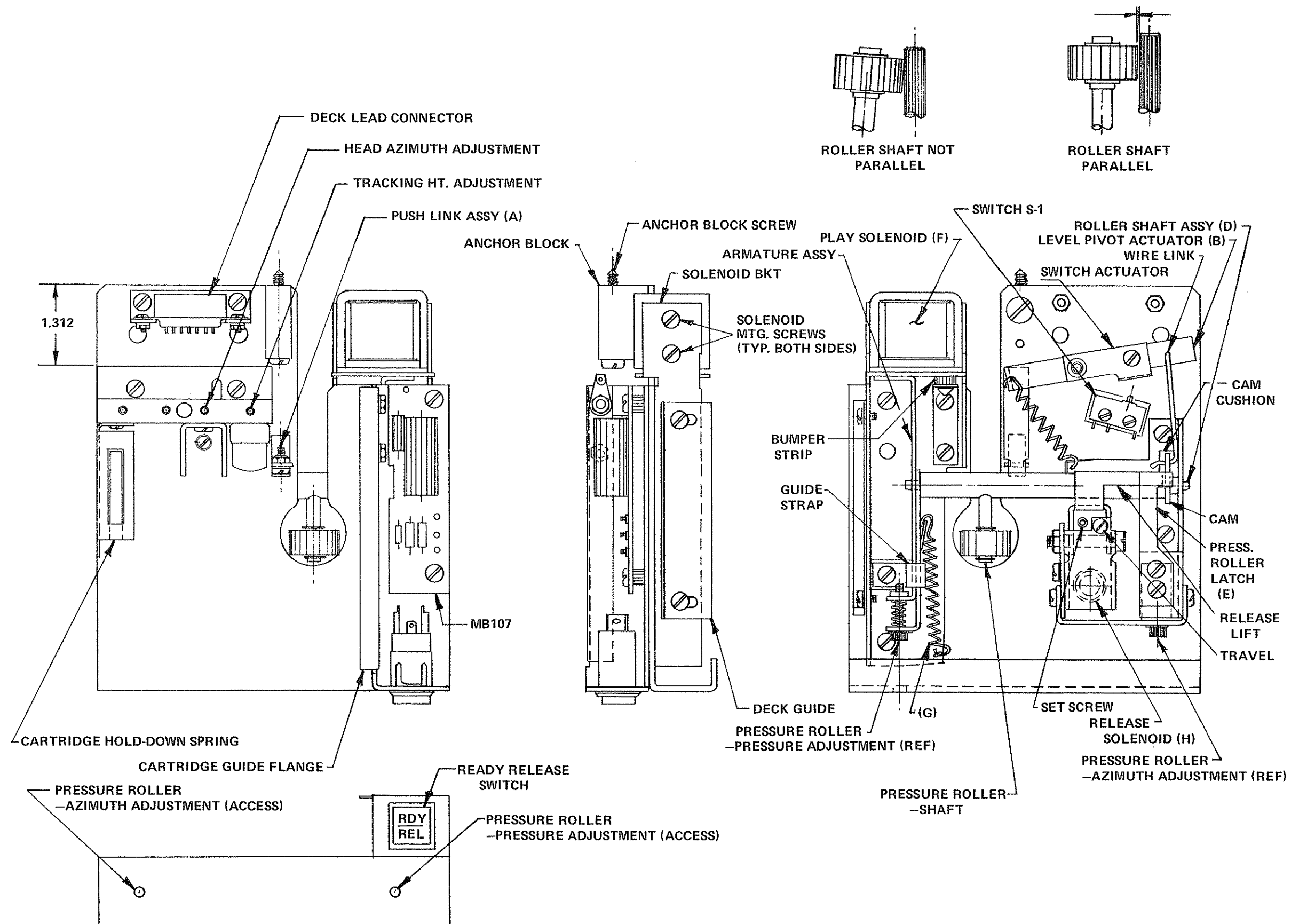


Figure 6-1. 300 Series Deck

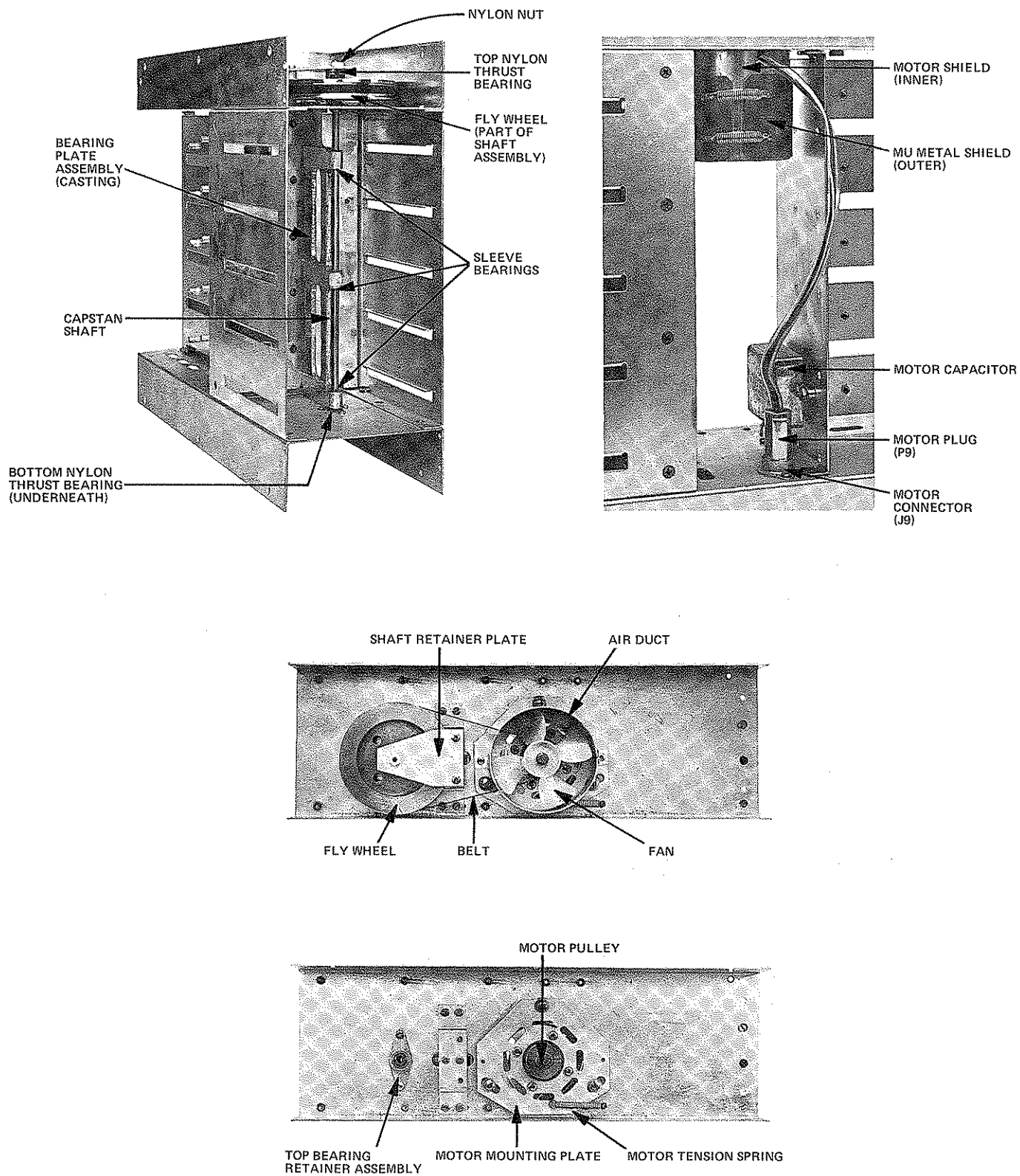


Figure 6-2. Drive System Parts

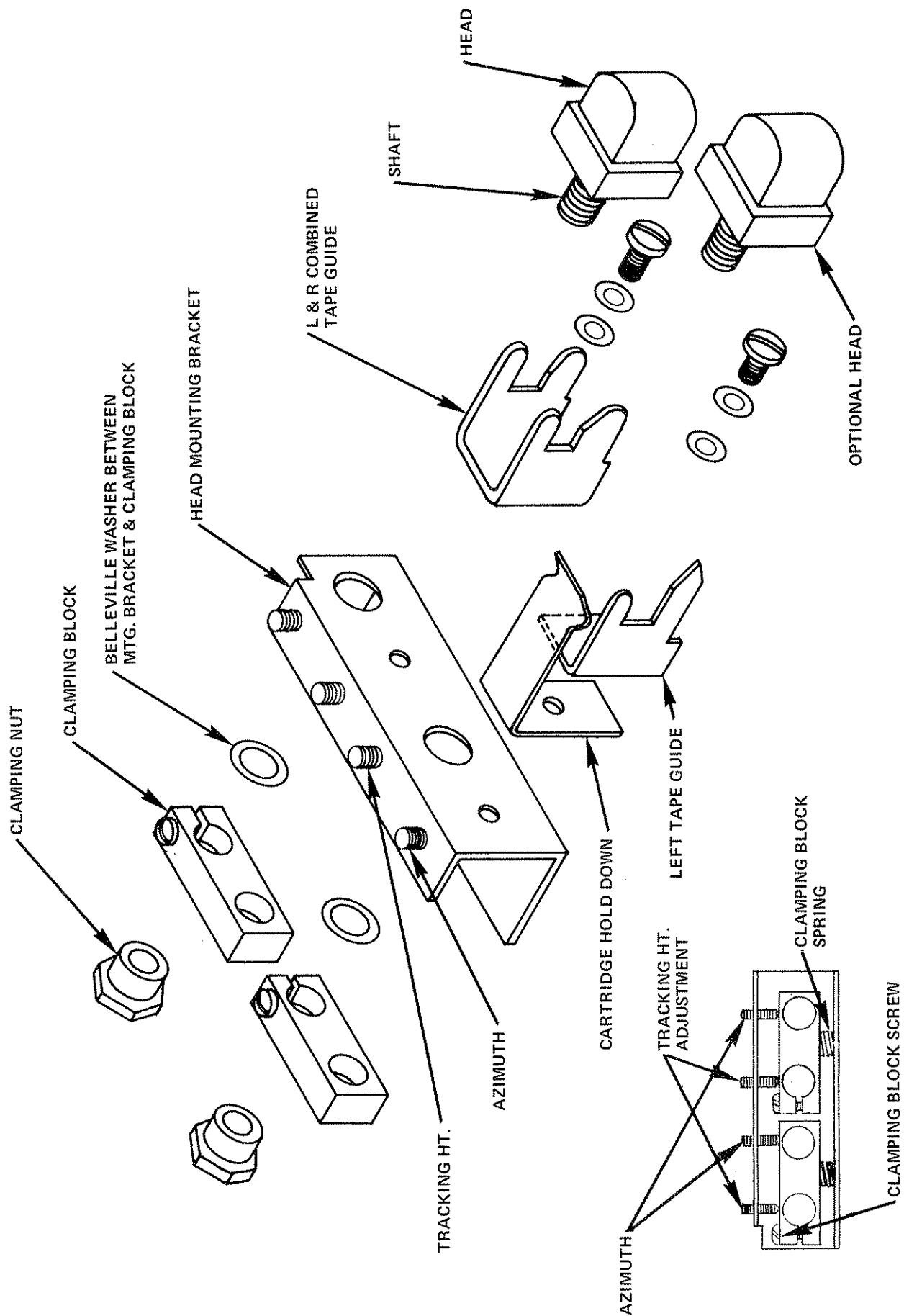


Figure 6-3. Microadjustable Head Assembly

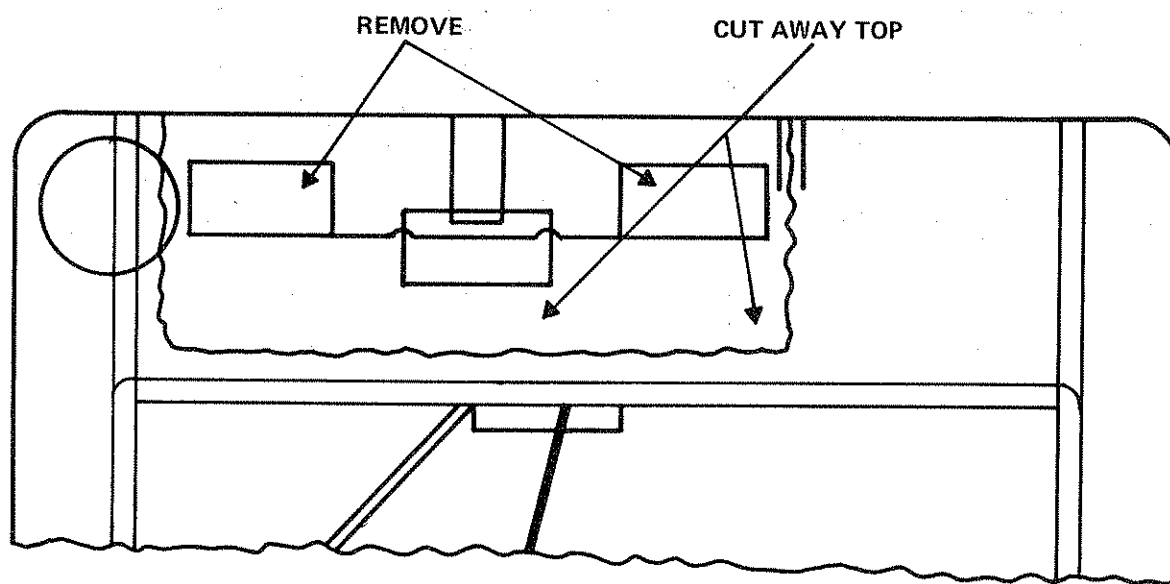
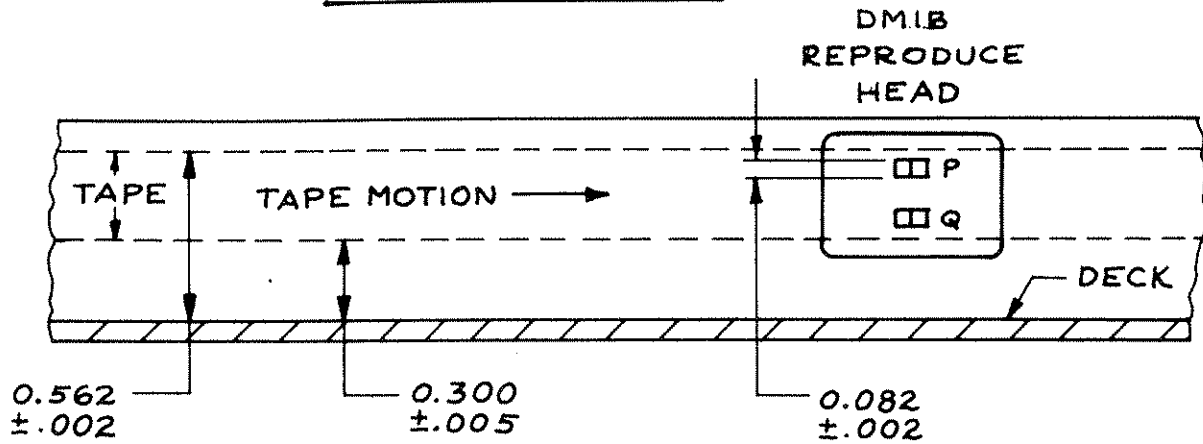
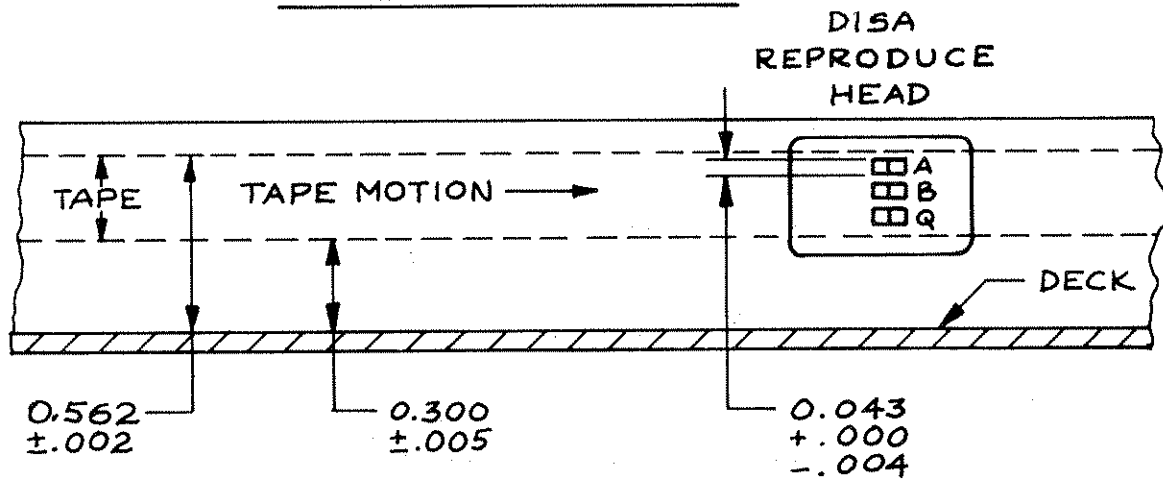


Figure 6-4. Tracking Cartridge

MONOPHONIC UNITS



STEREOPHONIC UNITS



P - PROGRAM
 A - LEFT CHANNEL
 B - RIGHT CHANNEL
 Q - CUE CHANNEL

BROADCAST ELECTRONICS INC.
 - A FILMWAYS COMPANY -

HEAD CONFIGURATIONS

13-1013-00773

Figure 6-5. Head Configurations

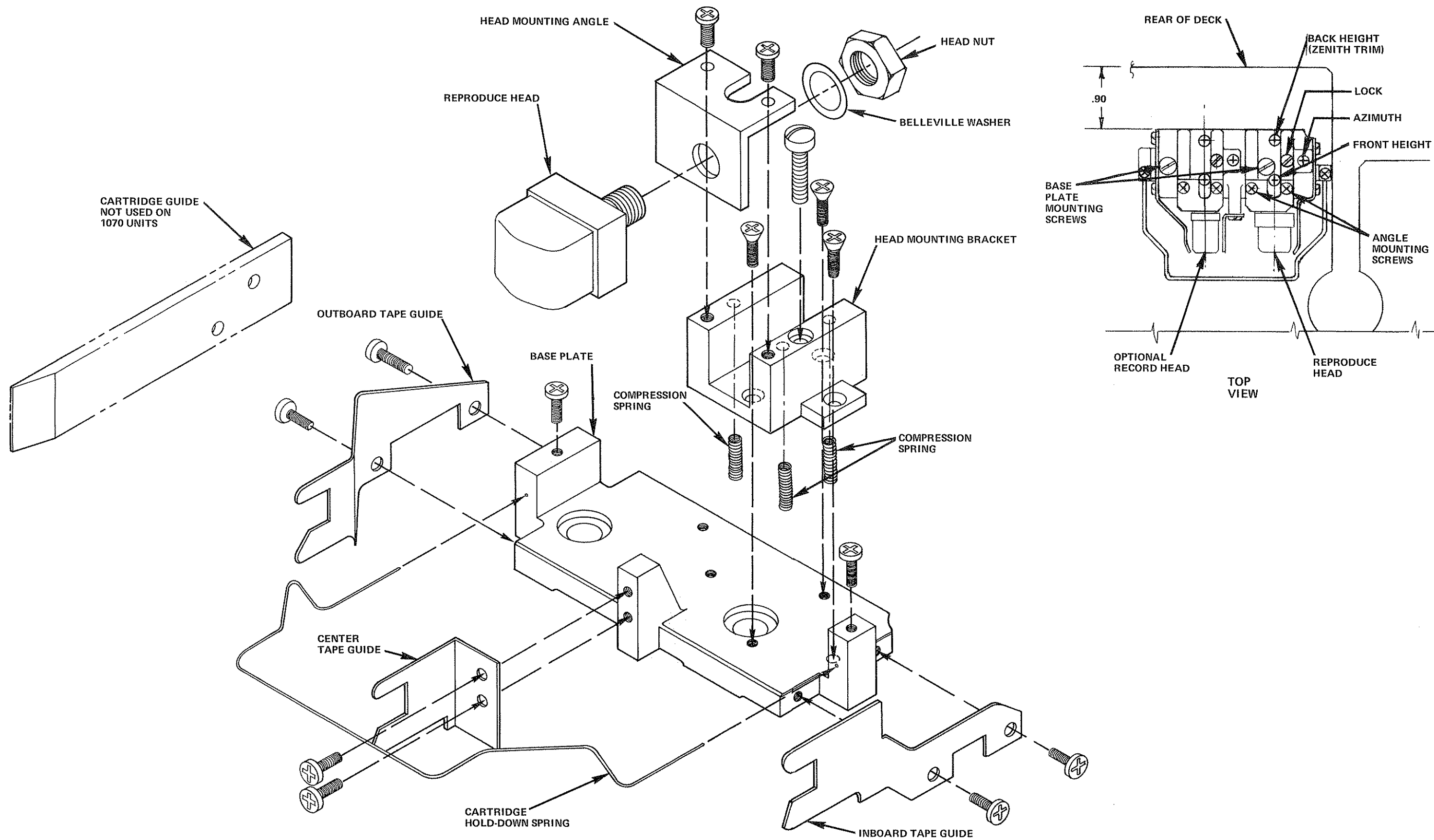
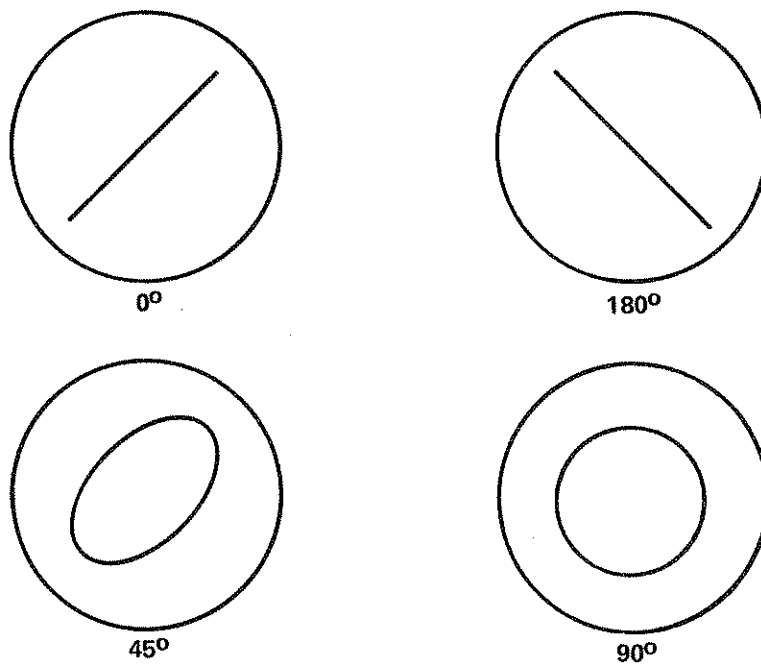
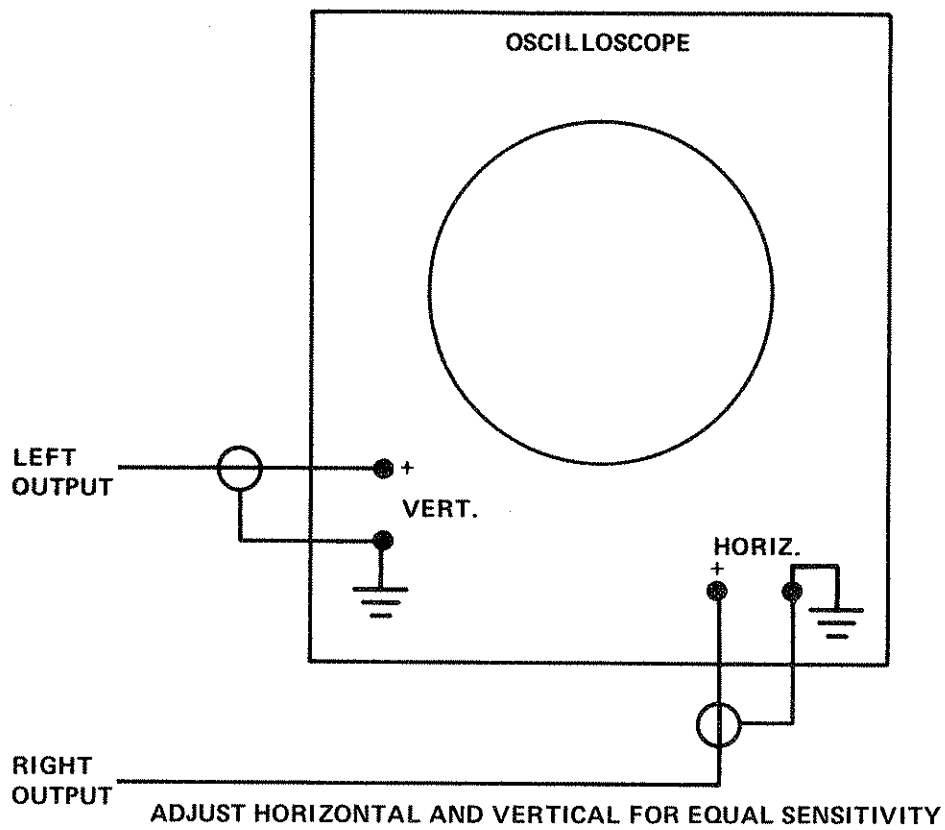


Figure 6-6. Optional Phase-Lok Head Assembly



LISSIJOUS PATTERNS

Figure 6-7. Stereo Phasing Test

SECTION 7

TROUBLE SHOOTING GUIDE

| TROUBLE | POSSIBLE CAUSE | REMEDY |
|------------------------------------|---|--|
| Capstan not turning | Motor defective No power to motor Defective motor capacitor Motor mounting plate spring loose or off — not holding belt tight Belt off or broken | Replace Check motor plug Check fuse Replace Adjust or replace spring Replace belt if belt will not stay centered on flywheel. Check the motor pulley position on the motor shaft so that belt remains centered. |
| Cartridge won't release | AC power off Machine in play No control voltage on deck No supply voltage to release solenoid Spring in cartridge too tight Broken return spring on pivot actuator lever Release solenoid lever arm too tight or too far from solenoid Defective cartridge CR2 on MB-107 shorted R3 on MB-107 open | Check power switch Push STOP button and RDY/REL Defective B power supply LO-103 defective Broken wire in deck leads connector S1 (on deck) misadjusted Adjust Replace Re-adjust (see 6.3.2) Replace Replace Replace |
| Cartridge won't latch in place | Spring in cartridge deformed Push link assembly screw misadjusted Pressure roller latch deformed Release lift blocking pressure roller latch Release solenoid energized Play solenoid energized | Repair or replace Re-adjust (see paragraph 6.3.2) Replace Re-adjust Shorted RDY/REL switch Shorted wire in deck leads connector Push STOP button Shorted wire Defective transistor on LO-103 |
| Cartridge won't stop automatically | No stop tone on tape or stop tone level too low | Make test with a cartridge known to work |

| TROUBLE | POSSIBLE CAUSE | REMEDY |
|--|--|--|
| Cartridge won't stop automatically (continued) | Stop tone frequency off or CA-101 sensitivity set too low Defective CA-101 Defective cue PA-101 LO-103 defective Defective head Defective diode on MB-107 | Suspect cartridge can be checked in known deck, check operation with NAB tape. Repair or replace Check in program channel Repair or replace Replace Replace |
| Cartridge won't stop manually | Defective LO-103 Defective S3 (STOP) S2 (START) shorted Pressure roller too close to capstan | Repair or replace Replace Replace Re-adjust pressure roller pressure or the travel of play solenoid |
| Unit won't move tape, STOP lamp not lit | No AC power Defective LO-103 Defective B Supply Defective PS-102 in power supply | Check fuse Repair or replace Repair or replace Repair or replace |
| Unit won't move tape, STOP lamp remains lit | S1 on deck not closed (RDY/REL not lit) Defective LO-103 Defective START (S2) switch S3 (STOP) shorted S1 on deck defective | Re-adjust switch actuator Repair or replace Replace Replace Replace |
| Unit won't move tape, START lamp lights | Defective coil on play solenoid Pressure roller too far away from capstan shaft Spring in cartridge jamming pressure roller Defective C1 on MB-107 Shorted diode CR1 on MB-107 R1 on MB-107 defective Anchor block screw not tight | Replace Re-adjust play solenoid, travel and/or pressure roller pressure Adjust (see 6.3.2) Replace Replace Replace Tighten |
| Cartridge wows or drags | Improperly wound cartridge Spring in cartridge not releasing Spring in cartridge dragging on pressure roller Pressure roller dirty Capstan shaft dirty Pressure pads in cartridge pressing tape against heads too tightly | Rewind or replace Adjust or replace Adjust or replace Clean Clean Adjust or replace |

| TROUBLE | POSSIBLE CAUSE | REMEDY |
|---|--|--|
| Cartridge wows or drags (continued) | Head bracket mounted too far forward Pressure misadjusted (Pressure roller pressure) Play solenoid travel not adjusted properly Improper voltage on play solenoid | Adjust (see paragraph 6.5) Re-adjust (if the pressure roller pressure is too great, the play solenoid may not be able to "pull in"). (see 6.3.2) Re-adjust (Should be 17 V in play) |
| No audio output | Output cable not connected Open output transformer Blank tape Dirty head Open head Defective PA-101 Defective DA-102 Level control open Defective switcher (if used) Defective power supply | Connect Replace Replace Clean Replace Repair or replace Repair or replace Replace Repair or replace Repair or replace |
| Audio output distorted, noise, high hum level | Level control not properly adjusted Audio output not properly terminated Defective PA-101 Defective DA-104 Open head Unit not properly grounded | Re-adjust (see 5.4.1 and 2) Improper output impedance or termination resistor. Check output board jumpers. Repair or replace Repair or replace Replace Check ground connections |
| Remote control failure | Shorted or open lead in remote control | Check operation of controls on unit first. Check remote control wiring. |
| Remote control spurious operation | Too great capacity between remote control leads | Cable length should not exceed 100 feet. |
| Loss of high frequency response | Tape not properly recorded Weak pressure pads in cartridge Reproduce head dirty Tape worn out Head azimuth incorrect Tape guides out of place Playback equalization incorrect | Compare performance with Acceptance Test Results for unit. Adjust or replace Clean Replace if shiny and worn Re-align head (see 6.5 and 6) Re-position Re-adjust (see 5.4.5) |

| TROUBLE | POSSIBLE CAUSE | REMEDY |
|--|--|--|
| Loss of high frequency response (continued) | Defective PA-101 Defective DA-104 Output impedance mismatched Guide post in cartridge loose | Repair or replace Repair or replace Improper output impedance or termination resistor. Check output board jumpers. Glue in place |
| Loss of channel separation (high crosstalk) | Head tracking height misadjusted Tape guides loose or deformed Defective head Tape recorded incorrectly Cartridge warped | Re-adjust Adjust or replace Replace Replace defective tape (check recording unit) Replace |
| Erratic QI, QII Operation in Reproduce (Units so equipped) | Tone burst on tape: 1. Not present 2. Incorrect level 3. Wrong frequency 4. Too short duration High noise level on tape Sensitivity on CA-201 misadjusted Defective CA-201 Defective PA-101 (in cue channel) Head height or azimuth incorrect | Check Recorder Cartridge poorly erased Re-adjust (see 5.4.8) Repair or replace Repair or replace Re-adjust (see 6.5 or 6.6) |
| Q Tone heard in program track | Q recording level too high Defective cartridge (warped) Defective head Head height misadjusted Tape guide on head bracket loose or out of position | Check recording unit Repair or replace Replace Re-adjust (see 6.5 or 6.6) Adjust (see 6.5 or 6.6) |

SECTION 8 PARTS LISTS

8.1 CONTENT

The following parts lists support both the 303C and 305C. Component parts for most printed circuit boards are included on the PC assembly (layout) drawings contained within this Manual. Component parts for the MB-125, MB-126, and EB-102 are contained in this Section as they are not shown on the drawings.

| Table 8-1 MAIN CHASSIS | | | |
|---------------------------|--------------|---|----------------|
| Qty. 303C | Qty. 305C | Description | BE Part Number |
| 2 | 2 | Front Panel Housing | 460-0001 |
| 1 | 1 | Front Panel, Top | 502-3050 |
| 1 | 1 | Toggle Switch, Miniature, SPDT (Power) | 548-7101 |
| 1 | | Front Panel, Bottom | 502-3052 |
| | 1 | Front Panel, Bottom | 502-3051 |
| 6 | 10 | Pushbutton Switches | 343-0020 |
| 6 | 10 | Lamps for above (7-7369) | 321-7369 |
| 1 | 1 | Button, Green, Marked "1" | 343-0031 |
| 1 | 1 | Button, Red, Marked "1" | 343-0026 |
| 1 | 1 | Button, Green, Marked "2" | 343-0032 |
| 1 | 1 | Button, Red, Marked "2" | 343-0027 |
| 1 | 1 | Button, Green, Marked "3" | 343-0033 |
| 1 | 1 | Button, Red, Marked "3" | 343-0028 |
| | 1 | Button, Green, Marked "4" | 343-0034 |
| | 1 | Button, Red, Marked "4" | 343-0029 |
| | 1 | Button, Green, Marked "5" | 343-0035 |
| | 1 | Button, Red, Marked "5" | 343-0030 |
| 1 | 1 | Top Chassis Assembly | 470-0480 |
| 1 | 1 | Bottom Chassis Assembly | 470-0481 |
| 1 | | Right Side Plate | 471-0038 |
| | 1 | Right Side Plate | 471-0036 |
| 1 | | Left Side Plate | 471-0039 |
| | 1 | Left Side Plate | 471-0037 |
| 1 | 1 | Top Cover | 471-0392 |
| 6 | 6 | Screws for above 6-32, Flat Head S.S., 1/4" long | -- |
| 1 | 1 | Bottom Cover | 471-0391 |
| 6 | 6 | Screws for above 6-32, Flat Head S.S., 1/4" long | -- |
| 1 | | Right Rear Cover | 471-0013 |
| | 1 | Right Rear Cover | 471-0011 |
| 3 | 4 | Screws for above 2-56, Pan Head S.S., 1/4" long | -- |
| 1 | | Left Rear Cover | 471-0014 |

| Table 8-1 MAIN CHASSIS (Continued) | | | |
|------------------------------------|--------------|--|----------------|
| Qty. 303C | Qty. 305C | Description | BE Part Number |
| 3 | 1 4 | Left Rear Cover Screws for above 6-32, Flat Head S.S., 1/4" long | 471-0012 -- |
| 1 | 1 | Rear Plate, Bottom | 471-0040 |
| 1 | 1 | Connector, 24-Pin Amphenol (Q-TRIPS) | 417-2440 |
| 1 | 1 | Connector, 50-Pin Amphenol (RMT) | 417-5057 |
| 1 | 1 | Fuse Holder | 415-2012 |
| 1 | 1 | Fuse, 3AG, 1 amp, (117 VAC) | 330-0100 |
| 1 | 1 | Fuse, 3AG, 1/2 amp, (220 VAC) | 330-0050 |
| 1 | 1 | Power Cord | 681-1723 |
| 1 | 1 | Strain Relief for above | 401-0006 |
| 3 | 3 | Ground Lugs | 410-1416 |
| 1 | 1 | Nut for above | -- |
| 1 | 1 | Rear Plate, Top | 471-0051 |
| 1 | | Connector Plate Assembly | 471-0008 |
| | 1 | Connector Plate Assembly | 471-0378 |
| 3 | 5 | Deck Leads Connectors (J1) | 417-1420 |
| 1 | | Card Rack Assembly | 470-0528 |
| | 1 | Card Rack Assembly | 470-0478 |
| 1 | | Cable Support | 470-0022 |
| | 1 | Cable Support | 470-0261 |
| 6 | 10 | PC Board Guides | 407-1001 |
| 3 | 6 | PC Board Connectors | 417-2200 |
| 1 | | Audio Switcher Socket (15 Pin) | |
| 3 | 5 | PC Board Connector Shield | 459-0078 |

| Table 8-2 DRIVE SYSTEM | | | |
|---------------------------|--------------|---|----------------|
| Qty. 303C | Qty. 305C | Description | BE Part Number |
| 1 | 1 | Motor, 115 VAC, 50/60 Hz | 384-1114 |
| 1 | 1 | Motor, 220 VAC, 50/60 Hz | |
| 4 | 4 | Screws for above 6-32, Pan Head, 7/16" long | -- |
| 1 | 1 | Motor Capacitor, 2 MFD (60 Hz) | |
| 1 | 1 | Motor Capacitor, (50 Hz) | |
| 2 | 2 | Screws for above 6-32, Flat Head Phillips S.S., 5/16" long with No. 6 Hex Nut | -- |
| 1 | 1 | Motor Pulley (60 Hz, 7.5 IPS) | 389-0005 |
| 1 | 1 | Motor Pulley (50 Hz, 7.5 IPS) | |
| 1 | 1 | Drive Belt (7.5 IPS) | 405-0038 |
| 1 | | Bearing Plate Assembly | 443-0010 |
| | 1 | Bearing Plate Assembly | 443-0367 |
| 1 | | Shaft and Flywheel Assembly | 440-0026 |
| | 1 | Shaft and Flywheel Assembly | 440-0359 |

Table 8-2 DRIVE SYSTEM (Continued)

| Qty. 303C | Qty. 305C | Description | BE Part Number |
|--------------|--------------|---|----------------|
| 1 | 1 | Thrust Bearing, Bottom | 453-0495 |
| 1 | 1 | Top Bearing Retainer Assembly | 442-0089 |
| 2 | 2 | Screws for above 6-32, Pan Head, 1/4" long | -- |
| 1 | 1 | Top Bearing Support Bracket | 470-0037 |
| 1 | 1 | Shaft Retaining Plate | 474-0073 |
| 2 | 2 | Screws for above 6-32 Pan Head, 1-3/8" long and No. 6 flat washers | |
| 2 | 2 | Shaft Retaining Plate Spacer | 441-0075 |
| 1 | 1 | Shaft Retaining Plate Thrust Bushing | 420-0074 |
| 1 | 1 | Nut for above 10-32, Nylon | -- |
| 1 | 1 | Motor Mounting Plate | 453-0392 |
| 3 | 3 | Screws for above 8-32, Pan Head, 3/8" long | -- |
| 3 | 3 | Motor Mounting Plate Bushing | 406-0020 |
| 1 | 1 | Air Duct | 479-0394 |
| 1 | 1 | Motor Shield | 389-9393 |
| 1 | 1 | Mu Metal Motor Shield | 389-9002 |
| 1 | 1 | Fan | 409-0470 |
| 1 | 1 | Motor Tension Spring | 432-0001 |
| 1 | 1 | Spring Mounting Stud (Motor Plate) | 420-0071 |
| 2 | 2 | Motor Shield Spring | 432-0561 |
| 1 | 1 | Motor Connector (J9) | 417-0578 |
| 1 | 1 | Motor Plug (P9) | 418-0591 |

**Table 8-3
DECK ASSEMBLY**

| Qty. | Description | BE Part Number |
|------|--------------------------------------|----------------|
| -- | Deck, less Head Bracket Assembly | 952-0300 |
| 1 | Deck Chassis | 493-0300 |
| 1 | Deck Guide, Nylon | 407-0035 |
| 1 | Deck Guide | 459-0026 |
| 1 | Anchor Block | 422-0036 |
| 1 | Anchor Block Screw | 420-0037 |
| 1 | Roll Pin (1/8" x 1/4" long) | -- |
| 1 | Connector Bracket | 470-0015 |
| 1 | Deck Heads Connector (J1) | 418-1410 |
| 1 | Cartridge Stop Pin | 420-0112 |
| 1 | Cartridge Guide Assembly | 472-0069 |
| 1 | Push Button Switch | 343-0020 |
| 1 | Button, Yellow, Marked "RDY/REL" | 343-0025 |
| 1 | Lamp, for above, No. 7-7369 | 321-7369 |
| 2 | PC Board Spacers | 441-9223 |
| 1 | MB-107 Deck Interconnection PC Board | 914-1070 |
| 1 | Solder Lug No. 6 | 410-1410 |

| Table 8-3 DECK ASSEMBLY (Continued) | | |
|-------------------------------------|---|----------------|
| Qty. | Description | BE Part Number |
| 1 | Play Solenoid Bracket | 470-0013 |
| 1 | Play Solenoid Assembly | 289-0033 |
| 1 | Armature Assembly | 459-0025 |
| 1 | Armature Guide Strap | 459-0021 |
| 1 | Pivot Shaft Strap | 459-0022 |
| 1 | Pivot Shaft Strap Spring | 430-0045 |
| 1 | Socket Head Screw PRESSURE ADJUST 6-32, 7/8" long | -- |
| 1 | Armature Guide Spacer | 459-0020 |
| 1 | Armature Guide Spring | 432-0044 |
| 1 | Roller Shaft Assembly | 446-0029 |
| 1 | Pressure Roller | 404-0001 |
| 1 | Nylon Washer | -- |
| 2 | Nylatron Washer | -- |
| 2 | E Retaining Ring | 454-3318 |
| 1 | Push Link Assembly | 459-0046 |
| 1 | Pivot Actuating Lever | 459-0012 |
| 1 | Pivot Post | 449-0070 |
| 1 | E Retaining Ring | 454-3318 |
| 1 | Wire Link | 429-0016 |
| 1 | Pivot Actuator Lever Spring | 432-0045 |
| 1 | Switch Actuator | 459-0039 |
| 1 | Switch (S1) | 346-6210 |
| 1 | Switch Insulator | 407-0043 |
| 1 | Electrical Release Assembly | 950-0047 |
| 1 | Release Solenoid Assembly | 289-0007 |
| 1 | Cam Cushion | 403-0042 |
| 1 | Pressure Roller Latch | 459-0003 |
| 2 | Screw for above 4-40, Pan Head, 3/16" long | -- |
| 1 | Lift Control Spring | 430-0064 |
| 1 | Screw, NYLOK, 6-32, Phillips Head, 7/8" long, AZIMUTH ADJUST | -- |
| 1 | Shoulder Screw | 420-0065 |
| 1 | Bumper Strap | 459-0040 |
| 2 | Screw for above 6-32, Pan Head, 1/4" long | -- |
| 1 | Bumper Plug | 403-0038 |

| Table 8-4 MICRO-ADJUSTABLE HEAD BRACKET ASSEMBLY | | |
|---|-----------------------------|----------------|
| Qty. | Description | BE Part Number |
| 1 | Head Bracket | 470-0049 |
| 1 | Clamping Block | 449-0050 |
| 1 | Clamping Nut | 421-0003 |
| 1 | Conical (Belleville) Washer | 436-0052 |
| 1 | Block Spring | 430-0053 |

Table 8-4 MICRO-ADJUSTABLE HEAD BRACKET ASSEMBLY (Continued)

| Qty. | Description | BE Part Number |
|------|--|----------------|
| 1 | Cartridge Guide | 452-0074 |
| 1 | Left and Right Combined Tape Guide | 452-0103 |
| 2 | 4 - 40X 1/4 inch Allen Head Set Screws | -- |
| 1 | 4 - 40X 3/8 inch Pan Head Screw | -- |
| 1 | DMIB Reproduce Head (MONOPHONIC) | 252-0001 |
| 1 | DISA Reproduce Head (STEREOPHONIC) | 253-0002 |

**Table 8-5
OPTIONAL PHASE-LOK HEAD BRACKET**

| Qty. | Description | BE Part Number |
|------|---|----------------|
| 1 | Base Plate | 469-0051 |
| 1 | Inboard Tape Guide | 452-0047 |
| 1 | Center Tape Guide | 452-0048 |
| 1 | Outboard Guide | 452-0049 |
| 1 | Cartridge Hold-down Spring | 436-0555 |
| 1 | Head Mounting Bracket | 469-0410 |
| 1 | Head Mounting Angle | 466-0050 |
| 3 | Compression Springs | 430-0120 |
| 1 | Cartridge Guide | 452-0074 |
| 3 | 2 - 56 x 1/4 inch Flat Head Machine Screws | |
| 10 | 2 - 56 x 1/4 inch Pan Head Machine Screws | |
| 10 | No. 2 Lock Washers | |
| 10 | No. 2 Flat Washers | |
| 1 | 4 - 40 x 1/2 inch Fillister Head Machine Screws | |
| 1 | DISA Reproduce Head (STEREOPHONIC) | 253-0002 |

**Table 8-6
REAR MOUNTING PANELS**

| Qty. | Description | BE Part Number |
|------|------------------------------------|----------------|
| | 305C, MULTIPLE OUTPUT, MONO | |
| 1 | Rear Panel with Screening | 471-0386 |
| 4 | Screws for the above | -- |
| | 2-56, Pan Head S.S., 1/4" long | |
| 5 | Stereo Phone Jacks with Hardware | 417-0311 |
| 5 | Slide Switch DP3T | 345-0128 |
| 5 | Potentiometer, Locking, 10K | 191-1053B |
| 5 | Hole Plugs, 3/8 inch | 450-0652 |
| 5 | Hole Plugs, 1/4 inch | 450-0650 |

Table 8-6 REAR MOUNTING PANELS (Continued)

| Qty. | Description | BE Part Number |
|--------------------------------------|----------------------------------|----------------|
| 305C, MULTIPLE OUTPUT, STEREO | | |
| 1 | Rear Panel with Screening | 471-0388 |
| 4 | Screws for above | -- |
| | 2-56, Pan Head S.S., 1/4" long | |
| 10 | Stereo Phone Jacks with Hardware | 417-0311 |
| 5 | Slide Switch DP3T | 345-0128 |
| 10 | Potentiometer, Locking, 10K | 191-1053B |
| 305C, SINGLE OUTPUT, MONO | | |
| 1 | Rear Panel with Screening | 471-0536 |
| 4 | Screws for above | -- |
| | 2-56, Pan Head S.S., 1/4" long | |
| 1 | Stereo Phone Jack with Hardware | 417-0311 |
| 1 | Slide Switch DP3T | 345-0128 |
| 5 | Potentiometer, Locking, 10K | 191-1053B |
| 1 | Hole Plug, 3/8 inch | 450-0652 |
| 5 | Hole Plug, 1/4 inch | 450-0650 |
| 305C, SINGLE OUTPUT, STEREO | | |
| 1 | Rear Panel with Screening | 471-0537 |
| | Screws for above | -- |
| | 2-56, Pan Head S. S., 1/4" long | |
| 2 | Stereo Phone Jack with Hardware | 417-0311 |
| 1 | Slide Switch, DP3T | 345-0128 |
| 10 | Potentiometer, Locking, 10K | 191-1053B |
| 303C, MONO | | |
| 1 | Rear Panel with Screening | 471-0384 |
| 3 | Screws for above | -- |
| | 2-56, Pan Head S. S., 1/4" long | |
| 3 | Stereo Phone Jack with Hardware | 417-0311 |
| 3 | Slide Switch DP3T | 345-0128 |
| 3 | Potentiometer, Locking, 10K | 191-1053B |
| 3 | Hole Plug, 3/8 inch | 450-0652 |
| 3 | Hole Plug, 1/4 inch | 450-0650 |
| 303C, STEREO | | |
| 1 | Rear Panel with Screening | 471-0385 |
| 3 | Screws for above | -- |
| | 2-56, Pan Head S. S., 1/4" long | |
| 6 | Stereo Phone Jacks with Hardware | 417-0311 |
| 3 | Slide Switch DP3T | 345-0128 |
| 6 | Potentiometer, Locking, 10K | 191-1053B |

Table 8-7
PC BOARDS USED

| Qty. | Description | BE Part Number |
|------|-------------------------------|----------------|
| | MB-118 Reproduce Master Board | |
| 5 | 305C, Multiple Output, Mono | |
| 2 | MB-118 with plug-ins: | 914-1180 |
| 1 | PA-101 Preamplifier | 911-1010 |
| 1 | DA-104 Driver Amplifier | 910-1040 |
| 1 | CA-101 1 kHz Tone Sensor | 910-1012 |
| 4 | 305C, Single Output, Mono | |
| 2 | MB-118 with plug-ins: | 914-1180 |
| 1 | PA-101 Preamplifier | 911-1010 |
| 1 | CA-101 1 kHz Tone Sensor | 910-1072 |
| 2 | MB-118 with plug-ins: | 914-1180 |
| 1 | PA-101 Preamplifier | 911-1010 |
| 1 | DA-104 Driven Amplifier | 910-1040 |
| 1 | CA-101 1 kHz Tone Sensor | 910-1012 |
| 5 | 305C, Multiple Output, Stereo | |
| 3 | MB-118 with plug-ins: | 914-1181 |
| 2 | PA-101 Preamplifier | 911-1010 |
| 1 | DA-104 Drive Amplifier | 910-1040 |
| 1 | CA-101 1 kHz Tone Sensor | 910-1012 |
| 4 | 305C, Single Output, Stereo | |
| 3 | MB-118 with plug-ins: | 914-1181 |
| 1 | PA-101 Preamplifier | 911-1010 |
| 1 | CA-101 1 kHz Tone Sensor | 910-1012 |
| 3 | MB-118 with plug-ins: | 914-1181 |
| 2 | PA-101 Preamplifier | 911-1010 |
| 2 | DA-104 Driver Amplifier | 910-1040 |
| 1 | CA-101 1 kHz Tone Sensor | 910-1012 |
| 3 | 303C, Mono | |
| 2 | MB-118 with plug-ins: | 914-1180 |
| 1 | PA-101 Preamplifier | 911-1010 |
| 1 | DA-104 Driver Amplifier | 910-1040 |
| 1 | CA-101 1 kHz Tone Sensor | 910-1012 |
| 3 | 303C, Stereo | |
| 3 | MB-118 with plug-ins: | 914-1181 |
| 2 | PA-101 Preamplifier | 911-1010 |
| 2 | DA-104 Driver Amplifier | 910-1040 |
| 1 | CA-101 1 kHz Tone Sensor | 910-1012 |
| | MB-113 Audio Output Board | |
| 5 | 305C, Multiple Output, Mono | |
| | MB-113 | 914-1130 |
| 5 | 305C, Multiple Output, Stereo | |
| | MB-113 | 914-1131 |
| 1 | 305C, Single Output, Mono | |
| | MB-113 | 914-1130 |
| 1 | 305C, Single Output, Stereo | |
| | MB-113 | 914-1131 |

Table 8-8 MB-125 AUDIO SWITCHER OPTION (305C) (Continued)

| Sym. | Stereo | Mono | Description | BE Part Number |
|------|--------|------|---|----------------|
| -- | 14 | 14 | Push-On Connectors for Jumpers | 417-0160 |
| -- | 1 | 1 | Blank MB-125 PC Board | 514-1250 |
| -- | 6 | 6 | No. 22 Jumpers (3" long) | -- |
| -- | 1 | 1 | No. 22 Jumpers (1" long) | -- |
| -- | 1 | 1 | Screws 6-32, Pan Head Phillips, S.S., 1/4" long | -- |

**Table 8-9
MB-126 AUDIO SWITCHER (303C)**

| Sym. | Qty. Stereo | Qty. Mono | Description | BE Part Number |
|------|----------------|--------------|---|----------------|
| | 0 | 1 | Complete Monophonic Assembly | 914-1260 |
| | 1 | 0 | Complete Stereophonic Assembly | 914-1261 |
| R1 | 3 | 3 | 4.7K ohm, 1/4 Watt, 10% Resistor | 100-4743 |
| R2 | 3 | 0 | 4.7K ohm, 1/4 Watt, 10 % Resistor | 100-4743 |
| R3 | 3 | 3 | 1K ohm, 1/2 Watt, 10% Resistor | 110-1043 |
| R4 | 3 | 3 | 33K ohm, 1/4 Watt, 10% Resistor | 100-3353 |
| R5 | 3 | 3 | 10K ohm, 1/4 Watt, 10% Resistor | 100-1053 |
| R6 | 3 | 3 | 560 ohm, 1/4 Watt, 10% Resistor | 100-5633 |
| R7 | 3 | 3 | 3.3K ohm, 1/4 Watt, 10% Resistor | 100-3343 |
| R8 | 1 | 1 | 33K ohm, 1/4 Watt, 10% Resistor | 100-3353 |
| R9 | 1 | 1 | 10K ohm, 1/4 Watt, 10% Resistor | 100-1053 |
| R10 | 1 | 1 | 100K ohm, 1/4 Watt, 10% Resistor | 100-1063 |
| R11 | 1 | 1 | 39K ohm, 1/4 Watt, 10% Resistor | 100-3953 |
| R12 | 1 | 1 | 10K ohm, 1/4 Watt, 10% Resistor | 100-1053 |
| R13 | 1 | 1 | 10K ohm, 1/4 Watt, 10% Resistor | 100-1053 |
| R14 | 1 | 1 | 4.7K ohm, 1/4 Watt, 10% Resistor | 100-4743 |
| R15 | 1 | 1 | 4.7K ohm, 1/4 Watt, 10% Resistor | 100-4743 |
| R16 | 1 | 1 | 2.7K ohm, 1/4 Watt, 10% Resistor | 100-2743 |
| R17 | 1 | 1 | 10K ohm, 1/10 Watt, Potentiometer (HORIZ) | 170-1053A |
| R21 | 1 | 0 | 39K ohm, 1/4 Watt, 10% Resistor | 100-3953 |
| R22 | 1 | 0 | 10K ohm, 1/4 Watt, 10% Resistor | 100-1053 |
| R23 | 1 | 0 | 10K ohm, 1/4 Watt, 10% Resistor | 100-1053 |
| R24 | 1 | 0 | 4.7K ohm, 1/4 Watt, 10% Resistor | 100-4743 |
| R25 | 1 | 0 | 4.7K ohm, 1/4 Watt, 10% Resistor | 100-4743 |
| R26 | 1 | 0 | 2.7K ohm, 1/4 Watt, 10% Resistor | 100-2743 |
| R27 | 1 | 0 | 10K ohm, 1/10 Watt, Potentiometer (HORIZ) | 170-1053A |
| C1 | 3 | 3 | 1 MFD, 35 V, 10% Tantalum Capacitor | 064-1063 |
| C2 | 3 | 3 | .01 MFD, 100 V, 10%, Film Capacitor | 030-1043 |
| C3 | 3 | 3 | 33 MFD, 35 V, 10%, Tantalum Capacitor | 064-3373 |
| C4 | 3 | 3 | .047 MFD, 100 V, 10%, Film Capacitor | 030-4743A |
| C11 | 1 | 1 | 100 MFD, 20 V, 10%, Tantalum Capacitor | 063-1083 |
| C12 | 1 | 1 | 4.7 MFD, 35 V, 10%, Tantalum Capacitor | 064-4763 |
| C13 | 1 | 1 | 33 MFD, 35 V, 10%, Tantalum Capacitor | 064-3373 |
| C14 | 1 | 1 | 33 MFD, 35 V, 10%, Tantalum Capacitor | 064-3373 |
| C21 | 1 | 0 | 100 MFD, 20 V, 10%, Tantalum Capacitor | 063-1083 |
| C22 | 1 | 0 | 4.7 MFD, 35 V, 10%, Tantalum Capacitor | 064-4763 |

Table 8-9 MB-126 AUDIO SWITCHER (303C) (Continued)

| Sym. | Qty. Stereo | Qty. Mono | Description | BE Part Number |
|------|----------------|--------------|---|----------------|
| C23 | 1 | 0 | 33 MFD, 35 V, 10%, Tantalum Capacitor | 064-3373 |
| C24 | 1 | 0 | 33 MFD, 35 V, 10%, Tantalum Capacitor | 064-3373 |
| Q1 | 3 | 3 | 2N3644 Transistor | 210-3644 |
| Q2 | 3 | 3 | C6A SCR | 237-0006 |
| Q3 | 1 | 1 | 2N3644 Transistor | 210-3644 |
| Q4 | 1 | 1 | 2N3053 Transistor | 211-3053 |
| Q5 | 1 | 1 | MPS 6566 Transistor | 211-6566 |
| Q6 | 1 | 1 | MPS 6566 Transistor | 211-6566 |
| Q7 | 1 | 0 | MPS 6566 Transistor | 211-6566 |
| Q8 | 1 | 0 | MPS 6566 Transistor | 211-6566 |
| LDR1 | 3 | 3 | CK 2021 Raysistor | 274-2021 |
| CR1 | 3 | 3 | 1N4005 Diode | 203-4005 |
| CR2 | 3 | 3 | 1N4005 Diode | 203-4005 |
| -- | 12 | 10 | Transistor Sockets | 417-0333 |
| -- | 10 | 10 | Quick Disconnect Terminals | 418-0161 |
| -- | 10 | 10 | Push-On Connectors for Jumpers | 417-0160 |
| -- | 1 | 1 | Blank MB-126 PC Board | 514-1260 |
| -- | 4 | 4 | No. 22 Jumpers (3" long) | -- |
| -- | 1 | 1 | No. 22 Jumpers (1" long) | -- |
| -- | 1 | 1 | Screws 6-32, Pan Head Phillips, S.S., 1/4" long | -- |

**Table 8-10
EB-102 MINI-SERIES EXTENDER PC BOARD**

| Qty. | Description | BE Part Number |
|------|----------------------------|----------------|
| 1 | 22 Pin Connector | 417-2200 |
| 1 | Connector Mounting Bracket | 453-0751 |
| 2 | Extender Support Ear | 453-0759 |
| 1 | EB-102 Blank PC Board | 519-1020 |
| -- | Complete EB-102 | 919-1020 |

**Table 8-11
RA-35 RACK ADAPTER FOR 305C**

| Qty. | Description | BE Part Number |
|------|----------------------|----------------|
| 1 | Chassis Base Plate | 470-0025 |
| 1 | Right Side Plate | 470-0016 |
| 1 | Left Side Plate | 470-0017 |
| 1 | Front Panel | 501-0305 |
| 1 | Left Hand Separator | 470-0026 |
| 1 | Right Hand Separator | 470-0027 |
| 3 | Stop | 407-0045 |

Table 8-11 RA-35 RACK ADAPTER FOR 305C (Continued)

| Qty. | Description | BE Part Number |
|------|-------------------|----------------|
| 1 | Left Hand Gusset | 470-0028 |
| 1 | Right Hand Gusset | 470-0029 |
| 1 | Top Support | 470-0023 |
| 3 | Bottom Supports | 470-0024 |
| 3 | Panel Fastener | 488-6513 |

**Table 8-12
RA-33 RACK ADAPTER FOR 303C**

| Qty. | Description | BE Part Number |
|------|----------------------|----------------|
| 1 | Chassis Base Plate | 470-0025 |
| 1 | Right Side Plate | 470-0060 |
| 1 | Left Side Plate | 470-0061 |
| 1 | Front Panel | 501-0303 |
| 1 | Left Hand Separator | 470-0063 |
| 1 | Right Hand Separator | 470-0062 |
| 3 | Stop | 407-0045 |
| 1 | Left Hand Gusset | 470-0028 |
| 1 | Right Hand Gusset | 470-0029 |
| 1 | Top Support | 470-0023 |
| 3 | Bottom Support | 470-0024 |
| 3 | Panel Fastener | 488-6513 |

**TABLE 8-13
303C WALNUT ENCLOSURE**

| Qty. | Description | BE Part Number |
|------|--|----------------|
| 1 | Left Side Panel | 529-3031 |
| 1 | Right Side Panel | 529-3032 |
| 1 | Bottom Cover Plate | 471-0718 |
| 1 | Top Cover Plate | 471-0719 |
| 4 | Foot | 403-0004 |
| 12 | Screws 6-32 Pan Head, 1 inch long, Steel, Black Cad. Plated | |
| 4 | Screws 4-40, Round Head, 3/8 inch long, Stainless Steel | |
| 4 | Washers, Lock, No. 4 | |
| 4 | Washers, Flat, No. 4 | |

TABLE 8-14
305C WALNUT ENCLOSURE

| Qty | Description | BE Part Number |
|-----|---|----------------|
| 1 | Left Side Panel | 529-3051 |
| 1 | Right Side Panel | 529-3052 |
| 1 | Bottom Cover Plate | 471-0718 |
| 1 | Top Cover Plate | 471-0719 |
| 4 | Foot | 403-0004 |
| 12 | Screws, 6-32 Pan Head, 1 inch long, Steel, Black Cad. Plated | |
| 4 | Screws, 4-40 Round Head, 3/8 inch long, Stainless Steel | |
| 4 | Washers, Lock, No. 4 | |
| 4 | Washers, Flat, No. 4 | |

MINI-SERIES ACCESSORY ITEMS

When ordering accessories use the Broadcast Electronics stock number indicated.

Rack Adapters:

- RA-33 for up to three 303C units (921-0033)
- RA-35 mounts up to three 305C units (921-0035)

Q-Trips Options:

- MB-122 Q-Trip Master PC Board for 305C (914-1220)
- MB-122 Q-Trip Master PC Board for 303C (914-1221)
- QI (150 Hz) Cue Sensor (910-2-10)
- QII (8 KHz) Cue Sensor (910-2011)

Mini-Series Remote Control Units

Audio Switchers:

- MB-125 Audio Switcher for 305C monophonic units (914-1250)
- MB-125 Audio Switcher for 305C stereophonic units (914-1251)
- MB-126 Audio Switcher for 303C monophonic units (914-1260)
- MB-126 Audio Switcher for 303C stereophonic units (914-1261)

ESD-15 Pre-select Sequencer for 15 Decks

PHASE-LOK Stereo Head Bracket

EB-102 Printed Circuit Board Test extender (919-1020)

Connector Kits consisting of phone plugs for output jacks (supplied with units):

- 305C, monophonic, multiple output units (830-3051)
- 305C, stereophonic, multiple output units (830-3053)
- 303C, monophonic, multiple output units (830-3030)
- 303C, stereophonic, multiple output units (830-3031)
- 305C or 303C, monophonic, single output units (830-3050)
- 305C or 303C, stereophonic, single output units (830-3052)

Mating plug for Remote Control Jack (50 pin) (418-5057)

Mating plug for Q-Trip Jack (24 pin) (418-2430)

TP-18 Tapewinder with Tape Timer (904-0002)

NAB Monophonic Head Alignment Test Cartridge (808-0003)

SPOTMASTER Monophonic Azimuth Test Cartridge (808-0001)

SPOTMASTER Stereophonic Azimuth Test Cartridge (808-0002)

200C Hand-held Cartridge Eraser (820-0200)

300C Table Model Cartridge Eraser (820-0300)

Head Degausser (820-0040)

Allen Wrench for Deck Adjustments (836-0003)

Allen Wrench for Standard Head Bracket Adjustments (836-0002)

Broadcast Electronics also carries SCOTCH and AUDIOTAPE cartridge tape, FIDELIPAC and AUDIOPAK cartridges, cartridge spare parts, cartridge labels, and cartridge storage racks.



Broadcast Electronics, Inc.

No effort has been spared in the manufacture of SPOTMASTER equipment to assure long and reliable service. This unit has been thoroughly tested and inspected, and carefully packed to assure its safe arrival at the destination. The following guarantee applies.

Broadcast Electronics, Inc., hereinafter referred to as Seller, agrees to repair or replace, without charge, any equipment which is defective as to design, workmanship or material, and which is returned to Seller at its factory, transportation prepaid, provided

- (a) Notice of the claimed defect is given Seller within one (1) year from date of delivery and goods are returned in accordance with Seller's instructions.
- (b) Parts not manufactured by Seller or from Seller's design are subject to only such adjustments as Seller may obtain from the supplier thereof.
- (c) Equipment shall not be deemed to be defective if, due to misuse, exposure or excessive impurities or moisture in the atmosphere it shall fail to operate in a normal or proper manner.

The guarantee of these paragraphs is void if equipment is altered by others than Seller or its authorized service center.

No other warranties, expressed or implied, shall be applicable.

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