

## TECHNICAL MANUAL

- DELTA SERIES -

BROADCAST CARTRIDGE  
RECORDER/REPRODUCER  
SYSTEM

**INTERNATIONAL TAPETRONICS CORPORATION**

2425 South Main Street, P.O. Box 241, Bloomington, Illinois 61701

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**3M**

TECHNICAL MANUAL  
890-0028-000

- DELTA SERIES -

BROADCAST CARTRIDGE  
RECORDER/REPRODUCER  
SYSTEM

INCLUDING:

DELTA I  
DELTA II  
DELTA III  
DELTA IV

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**3M**

## PREFACE

International Tapetronics Corporation/3M Manuals are written with the intent of assisting the reader-user toward a better understanding of ITC/3M equipment. Most instruction manuals are seldom read except at the time of crisis when equipment malfunction is suspected. When this happens, the manual is usually missing, or at best, difficult to locate. PLEASE FIND A CONVENIENT SPOT TO KEEP THIS MANUAL.

We at ITC/3M have tried to produce a useable manual. But, being human, we are subject to the frailties of behavior. Therefore, should you discover any errors or omissions, or should you wish to contribute any recommendations, please send us your comments. We will be most appreciative.

## TABLE OF CONTENTS

### INTRODUCTION/SPECIFICATIONS

- A. General Description and Features
- B. Delta Specifications

### INSTALLATION AND OPERATION

- A. Unpacking, Handling, and Pre-Installation Checkout
- B. Installation
  - 1. Special Consideration for Cooling
  - 2. Forced Air Cooling - Delta III Units
- C. External Audio Connections
- D. External Remote Control Connections
  - 1. Remote Control Specifications
- E. Control and Indicators
- F. Operational Options
  - 1. Ready Lamp Flash
  - 2. Repeat Play Lockout
  - 3. E.O.M. High Speed Recue
  - 4. Reproduce Amplifier Level
  - 5. Reproduce Output Impedance
  - 6. Balanced Transformerless Output
  - 7. Record Input Impedance
  - 8. Input Level Strapping
  - 9. Differential (Transformerless) Input
  - 10. Servo Motor Speed

### MECHANICAL ADJUSTMENTS

- A. Important Considerations
- B. Pressure Roller Shaft, Capstan Shaft Location - Procedure for Delta I and II Units
- C. Procedure for Delta III Deck Adjustment
- D. Pressure Roller Pressure, Solenoid Adjustment
- E. Solenoid Dampening Adjustment
- F. Cartridge Guidance System Alignment
- G. Tape Guide Adjustments
- H. Head Height and Zenith Adjustment
- I. Monophonic Head Azimuth Adjustment

- J. Stereo System Head Azimuth Adjustment
  - 1. Master Reproduce Head Azimuth
  - 2. Master Record Head Azimuth
  - 3. Other Reproduce Head Azimuth
- K. Head Replacement

## MECHANICAL DRAWING

## ELECTRICAL ADJUSTMENTS

- A. General
- B. Reproducer
  - 1. Servo Motor Duty Cycle
  - 2. Program Playback Amplifier
  - 3. Cue Detect Sensitivity
- C. Recorder
  - 1. Input Level Strapping
  - 2. Program Record Bias
  - 3. Program Record Equalization
  - 4. Cue Bias
  - 5. Cue Master Levels
  - 6. Meter Calibration

## PRINCIPLE OF OPERATION

- A. Power Supply Systems
  - 1. Reproducers
  - 2. Recording Amplifier
- B. Reproduce Amplifier and Audio Output
- C. Play Logic
- D. Record Logic
  - 1. General
  - 2. Bias Generation
  - 3. Cue Tone Generation
  - 4. Head Control
- E. Cue Tone Detector
- F. Motor Control and Motor
- G. Solenoid Control
- H. Record Amplifier
- I. Meter Amplifier
- J. Bias Amplifier

**ELECTRICAL DRAWINGS AND PARTS LIST**

**MAINTENANCE**

- A. General
- B. Mechanical
- C. Electrical
- D. Recommended Tools, Gauges
- E. Test Tapes

**WARRANTY**

**PARTS LISTS**

## ILLUSTRATIONS

- Front Cover      Delta I, IV, and III Grouping
- II-1      Delta Series Components
- 2      Audio Input/Output Schematic
- 3      Delta I, II Rear Panel
- 4      Delta III Rear Panel
- 5      Delta IV Rear Panel
- 6      Delta I, II, III Sample Remote Control
- 7      Delta IV Sample Remote Control
- 8      Delta IV Control Locations
- III-1      Solenoid Set-Up Gauge
- 2      Capstan Shaft Set-Up Gauge
- 3      Pressure Roller Pressure Measurement
- 4      Solenoid Air Dampening Adjustment
- 5      N.A.B. Cartridge - Head Penetration
- 6      Cartridge Insertion Measurement
- 7      Tape Guidance Window
- 8      Head Height Measurement
- 9      Tape Guide Window Adjustment
- 10      Head Height Gauge Use
- 11      Head Block Internal - Azimuth Arms
- 12      Head Block Adjustment Points
- 13      Head Block Internal - Pivots
- 14      Use of Square Gauge
- 15      Head Height Gauge
- 16      Test Equipment Connection
- 17      Oscilloscope Audio Phase Patterns
- 18      Head Mounting Block - Head Replacement
- 19      N.A.B. Cartridge Track Formats
- IV      Mechanical Drawings
- V-1      Servo Motor Duty Cycle Oscilloscope Pattern
- 2      Delta I, II Electrical Adjustment Points
- 3      Delta IV Electrical Adjustment Points
- VII-1      Reproduce Amplifier/Cue Detector Board Layout
- 2      Reproduce Amplifier/Cue Detector Board Schematic

- 3 Reproduce Logic Board Layout
- 4 Reproduce Logic Board Schematic
- 5 Servo Motor Control Board Layout
- 6 Servo Motor Control Board Schematic
- 7 Delta I, II Output Transformer Board Layout
- 8 Delta I, II Output Transformer Board Schematic
- 9 Delta III Output Transformer Board Layout
- 10 Delta III Output Transformer Board Schematic
- 11 Delta I, II Motherboard Layout
- 12 Delta I, II Motherboard Schematic
- 13 Delta III Deck Wiring Schematic
- 14 Delta III Interconnect Board Layout
- 15 Delta III Interconnect Board Schematic
- 16 Delta III Mainframe Wiring Schematic
- 17 Delta III Power Components Board Layout
- 18 Delta III Power Components Board Schematic
- 19 Delta IV Regulator Board Layout
- 20 Delta IV Regulator Board Schematic
- 21 Record and Meter Amplifier Board Layout
- 22 Record and Meter Amplifier Board Schematic
- 23 Record Logic Board Layout
- 24 Record Logic Board Schematic
- 25 Bias Board Layout
- 26 Bias Board Schematic
- 27 Delta IV Motherboard Layout
- 28 Delta IV Motherboard Schematic
- 29 Input Transformer Board Layout
- 30 Input Transformer Board Schematic
- 31 Delta III Remote Connector Card Layout
- 32 Delta III Remote Connector Card Schematic



## SECTION I - INTRODUCTION/SPECIFICATIONS

### A. GENERAL DESCRIPTION

The Delta Series cartridge equipment from International Tapetronics Corporation has been designed and built using the technology available today. Microprocessor control is the key behind the innovative standard features of the Delta Series. Low-noise and BI-FET op-amp circuits have provided the basis for an audio system which easily accommodates the best magnetic tapes of today.

One of the guidelines used during the development of the Delta Series was the December, 1975, NAB Standards for cartridge tape recordings and reproductions. Those standards have been met and in many cases improved upon.

The Delta Series is built on a modular basis in which the playback transport electronics and the recording electronics are each housed in separate units. Individually, the Delta Series consists of four separate units. These may be mixed or matched to suit individual needs: the Delta I, a single deck reproducer only, for A and AA size cartridges; the Delta II, a single deck reproducer only, for AA and B size cartridges; the Delta III, a three deck reproducer for A and AA size cartridges; and the Delta IV, a Record Amplifier that may be added to any of the other Delta components. The compact 1/3 rack width design allows the use of several Delta units side by side. This allows great flexibility in mounting the Delta Series. It also makes the addition of a recorder unit to an existing reproducer a simple task. All subassemblies such as amplifiers, control circuits, power supplies, front and rear panels, and head assemblies either plug or bolt in place. This feature makes service convenient and efficient. Sockets are also used for IC's and transistors to ease individual component replacement.

Mechanically, the Delta Series is built with the reliability of standards set by ITC. These include solid 1/2 inch thick anodized aluminum deck, full swing chain driven pressure roller assembly, heavy duty air-damped solenoid, and a precision micro-adjust head assembly. A

roller material which pulls better with less pressure is standard.

The pressure roller solenoid provides for stable tape travel path and minimal tape overshoot. The solenoid plunger is coated with a dry lubricant bonded to the metal surface, insuring years of trouble-free performance.

The entirely new true, center-pivot head module is designed with rotational axis in the exact vertical and horizontal centerline of the heads. Height, zenith and azimuth adjustments are independent and individually lock. This prevents interaction between any of the three adjustments. The unique "criss-cross" azimuth arms internal to the head block allow for very precise azimuth adjustment. Steel pivots combined with the unique "criss-cross" azimuth arms permit very fine azimuth adjustments. The entire head module can be removed without destroying previous adjustments.

Accurate tape cartridge positioning allows best performance from mechanical design improvements. ITC, therefore, has designed a cartridge positioning system which assures precise, rigid alignment of tape and head, even when cartridge insertion is hurried or somewhat careless.

Electronically, the Delta Series incorporates many standard features made possible by microprocessor technology. The cue tones are generated and detected digitally, and crystal referenced for long term frequency stability. Cue tones include Primary, Secondary, and Tertiary as standard. A two speed, standard 7.5 IPS and 22.5 IPS high speed cue, crystal locked DC brushless servo motor provides high quality flutter performance and reduces heat.

A specially designed reproduce head, coupled with a long life recording head, contribute to frequency response which equals open reel quality. High frequency bias and a unique bias and program mixing amplifier combine to reduce intermodulation distortion. Only the magnetic tape and cartridge become the limiting factors. All Delta units are shipped with

input and output transformers as standard. A unique circuit design allows for the removal of all transformers so the Delta units may be operated in a true differential input and balanced transformerless (active) output configuration.

Programmable logic allows using the secondary, tertiary, or both cue tones to send the machine into high speed recue. A flashing front panel indicator shows that a cart has played, whether it stops automatically, or is manually stopped by the operator. High speed end of message recue is standard on Delta I and Delta II. All Delta units feature user selectable input and output impedances and levels, and are easily field convertible. Reproducers may be converted to record/reproducers at any time. All units are readily convertible from stereo to mono and vice-versa.

State of the art components and design are used in the recording amplifier to improve square wave performance and transient response. Meters may be used to monitor input, output, program, cue bias and cue playback. These functions are selectable from the front panel. Input monitoring (REC) is automatically switched to output monitoring (PLAY) when the machine is not recording. The primary cue tone may be recorded at any time from the front panel 1 kHz cue control switch.

### Delta Features

#### Mechanical

- \*Compact size - 1/3 rack width, 12" deep  
(DI, II, IV)  
13" deep (D III)  
Height 5 1/2" (DI, II, IV)  
10 1/2" (D III)
- \*Modular construction
- \*Styling similar to Series 99 - neutral colors
- \*1/2" deck assembly - tool plate aluminum - anodized
- \*Extruded side, front, and rear panel

- \*New headblock - stable, compact, allows precision adjustment
- \*Improved cart guides
- \*Solenoid electronically controlled
- \*Capstan motor - D.C. Servo, brushless with ball bearings and ceramic shaft (except DIII). Crystal referenced - can be strapped for 3 3/4, 7 1/2, 15 IPS
- \*XLR connectors for inputs/outputs
- \*Vinyl clad and polycarbonate surfaces for lasting finish and ease of cleaning
- \*Universal rack mounting
- \*On DIII, all 3 decks are removable
- \*Extensive use of mumetal shielding
- \*Long life, high quality switches - bifurcated wiping contacts
- \*All front panel switches illuminated using 5 volt long life bulbs

#### Electrical

- \*Toroidal power transformer
- \*Extended life, open face cylindrical heads
- \*Common P.C. cards for D-I, II, & III
- \*Microprocessor control (8048/8748)
- \*State of the art audio using TLO Series and 5500 Series (5532, 34) opamps
- \*Electronically balanced input/output. Can be used with our without x-formers (input can be bridging)
- \*Hi-speed recue standard on D-I, II
- \*Full 3 cue tone operation standard
- \*Either 150 Hz or 8 kHz cue detectors can be strapped to initiate hi-speed cue

\*Audio muting

\*Non-repeat indicator w/start lock-out

\*Flashing record lamp for rec set w/ 1 kHz disabled

\*On D-IV - front panel access to:

1. Normal record (input)
2. Program play (output)
3. 1 kHz defeat (electronically latched)
4. 1 kHz add (timed tone)
5. Front panel actuation of test metering mode:
  - a. cue play/cue bias
  - b. program bias

\*ICs and Transistors socketed

\*Soldermask on pcbs

\*All power supplies regulated

\*Full remote controls including lamps

\*Detachable line cord

\*Strappable level ranges

\*Cart cueing standard (Cue switch mutes unless held depressed)

\*DIV is universal recording amplifier for use with DI, DII, and bottom deck of DIII

\*All playbacks are field convertible to stereo

\*Motor and control electronics (servo) are one assembly - eliminates field matching)

\*High frequency crystal referenced bias (120 kHz)

\*Auxiliary start pulse

## B. DELTA SPECIFICATIONS

### 1. Power Specification

- A. 105 to 132 VAC or 210 to 264 VAC
- B. 50/60 Hz

### C. Power Consumption

1. Delta I 50 VA Typical  
65 VA Maximum
2. Delta II 50 VA Typical  
65 VA Maximum
3. Delta III 120 VA Typical  
135 VA Maximum
4. Delta IV 5 VA Typical  
10 VA Maximum

### 2. Tape Speed

- A. 7 1/2 IPS, (19 cm/s);  
(3 3/4 IPS, 9.5 cm/s);  
(15 IPS, 38 cm/s)
- B. High speed recue - 22.5 IPS (57 cm/s), nominal

### 3. Capstan Motor

- A. Direct drive capstan  
(10.0 mm diameter capstan shaft)
- B. Brushless DC servo motor
- C. Ceramic capstan shaft - D-I and D-II electrolyzed stainless steel shaft D-III
- D. Permanently lubricated ball bearings

### 4. Record/Play Flutter

- A. Record/Play maximum  
0.15% DIN WTD at 7.5 IPS.
  - B. Play maximum  
0.12% DIN WTD at 7.5 IPS.
- Tape cartridge length 2 1/2 minutes

### 5. Speed Accuracy

- A. Better than +/- 0.2%

### 6. Audio Output Configuration and Audio Impedance

- A. Transformer coupled  
Strappable for 150 ohm or 600 ohm (load impedance) operation (source impedance is 50 ohms or 275 ohms respectively)
- B. Transformerless output

(Source impedance is 150 ohms as factory supplied; only for electronically balanced output, no transformers)

7. Audio Output Level

- A. +18 dBm (at 1 kHz) for .5% THD or less, amp distortion (W/XFMR); +22 dBm transformerless clip level
- B. Variable from 0 level to +18 dBm (Ref. 1 kHz at 160 nWb/m) (Continuously variable, "useable" range -18 dBm to +18 dBm)

8. Distortion

- A. Amplifier Distortion: Reproducer: 0.2% or less total harmonic distortion, at 0 dBm @ 1 kHz; 0.5% or less THD at +18 dBm @ 1 kHz.
- B. System Distortion: Reproducer: 1.5% or less total harmonic distortion, 0.5% or less third harmonic distortion. Specification by 1975 NAB standards.

9. Noise

- A. S/N -Measured with bias/no signal; virgin "ScotchCart" tape at 7.5 IPS.

Mono	Stereo
50 dB (or better)	48 dB (or better)

3. Hum & Noise - No tape running

Mono	Stereo
52 dB (or better)	50 dB (or better)

- C. Squelch Noise - 70 dB or better.
- D. Reference level of measurements 160 nWb/m at 1 kHz recorded signal

10. Cross Talk

Measured at 50 Hz, 1 kHz, 10 kHz (1975 NAB Standards)  
-50 dB Min. separation between program channels

11. Frequency Response

- A. +/- 2.0 dB from 50 Hz - 16 kHz
- B. R/P 0 dB reference; 160 nWb/m at 1 kHz (ScotchCart Tape)

12. Equalization

- A. 1975 NAB cartridge machine (standard - adjustable for CCIR (Pot. adjustment)
- B. Customer option/component reloading in field 7.5 IPS only - 1964 NAB equalization
- C. Fixed low frequency equalization; adjustable high frequency equalization

13. Head Configuration - NAB, Mono/Stereo

14. Cue Signals

- A. NAB primary cue 150 Hz
- B. NAB secondary cue 150 Hz
- C. NAB tertiary cue 8 kHz
- D. Open collector sinking signal (Ground switching) available upon sensing secondary or tertiary cue tones maximum volts 25V, maximum current 200 ma, saturation volts 0.7V at 200 ma
- E. Cue detect open relay contacts optionally available upon sensing secondary or tertiary cue tones.

Secondary and Tertiary cue detect normally open relay SPDT\*

\*Contact ratings - 1A at 25V DC, 0.5A at 100V AC (resistive)  
Initial contact resistance 100m ohms maximum at 6 volts, 0.5A  
Operate time 5 msec maximum (including contact bounce, at rated voltage)  
Release time 10 msec maximum (including contact bounce)  
Life expectancy- Mechanical:  $5 \times 10^6$  operations minimum  
Electrical:  $300 \times 10^3$  operations minimum  
At 25V DC, 1A resistive  
 $200 \times 10^3$  operations minimum at 100 V AC, 0.5A resistive

Not to be used with inductive loads

## 15. Logging Signals

- A. Not internal to machine
- B. Cue audio input and cue audio output available for external use.

Cue Audio Input - Source impedance:  
10K ohms or less volts in.: .5V  
+/- .25V RMS @ 2.5 kHz

Cue Audio Output - Load impedance:  
4/7K ohms or greater volts out:  
500mv +/- .25V RMS @ 1 kHz, 150  
Hz, 3.5 kHz, 8 kHz

## 16. Audio Input Level

- A. -18 dBm to +18 dBm
- B. 2 range control straps on record amp: -6 dBm/+6 dBm center-range
- C. Front panel potentiometer range  
0 to at least +12 dB - referenced to each strap

## 17. Audio Input Configuration

- A. Input XFMR is normally supplied for 20K ohm balanced bridging
- B. Strappable for 600 ohms or 150 ohms terminating
- C. Electronically balanced bridging  
20K ohms

## 18. Metering (D-IV)/Function Switches

- A. Front panel switch selection for monitoring (left to right positions on front panel)
  - 1. Meter Rec - monitor input level to recorder - switches automatically to "Meter Play" (monitor output level from playback) when machine is not set to record
  - 2. Meter Play - Monitor output level
  - 3. 1kHz Defeat - prevents the 1kHz tone from automatically being recorded on the cue track when recording. This mode is indicated when the record set lamp flashes.
  - 4. 1 kHz Add - Places a 1 kHz tone on the tape for a duration of

0.625 seconds when the playback is in the run mode. It is not necessary to hold the 1 kHz record button depressed for the duration of the tone.

- B. Internal Meter Switch - Two position slide switch on record amp/meter board - activates only when meter rec and meter play buttons are in "out" position.

- 1. Cue play/cue bias - Slide switch in the "left" position for cue functions and record bias;  
Cue Play - Left Meter  
Cue Bias - Right Meter
- 2. Record Bias - Slide switch in the "right" position for program bias functions  
Left Program Bias - Left Meter  
Right Program Bias - Right Meter

## 19. Bias Amplifier

- A. 119.3 kHz Bias Frequency, Crystal referenced

## 20. Tape Capacity

- A. NAB sizes A and AA (Delta I & Delta III)
- B. NAB sizes A, AA, B and C (Delta II)

## 21. Start Time

- A. Typically 100 milliseconds

## 22. Stop Time

- A. Audio squelch stop time typically 2 msec - Tape stop time typically less than 100 msec
- B. Tape travel varies according to:
  - 1. Type of cartridge
  - 2. Length of tape

## 23. Ambient operating temperature range

- A. 10 - 50 degrees C (50 degrees to 122 degrees F)

## 24. Manual and Remote Controls

- A. All front panel indicators and controls (except program bias and cue track metering)
- B. Play remotes available via play remote connector
- C. Record remote functions (except metering) available via record remote connector.

## 25. External Connectors

- A. XLR audio connectors
- B. Jones remote connectors
- C. Interconnect between play and recorder to carry audio and microprocessor control lines
- D. Plug-in line cord

## 26. Mounting

- A. Table top
- B. Rack mount

## 27. Dimensions

A.	Width	Depth	Height
Delta I	5.562"	12.00"	5.25"*
Delta II	11.125"	12.00"	5.25"*
Delta III	5.562"	13.00"	10.50"*
Delta IV	5.562"	12.00"	5.25"*

\*Add 0.312" for feet

All machines require 3.5" additional depth at rear for interconnection.

- B. Single height rack assembly (for use with the Delta I, II, and IV) requires 7" vertical height.
- C. Double height rack assembly (for use with all machines) requires 12 1/4" vertical height.

## 28. Weight (typical)

- A. Delta I 15 lbs; 6.75 kg
- B. Delta II 20 lbs; 9.0 kg
- C. Delta III 31 lbs; 13.95 kg
- D. Delta IV 8 lbs; 3.6 kg
- E. Total shipping weight (including connectors, instruction book, etc.) less than 50 lbs; 22.5 kg.

## SECTION II - INSTALLATION AND OPERATION

### A. UNPACKING, HANDLING, AND PRE-INSTALLATION CHECKOUT

Upon receipt, carefully inspect the carton for visible signs of freight damage. In the event of external damage to the carton, carefully make note of its nature, and ask the freight carrier to inspect the damage. Unbox the unit, noting any obvious or concealed damage. In the event that an insurance claim is filed, the freight company will want to inspect the shipping carton and the unit. All packing material should be retained until it is verified that no damage has occurred.

First, place the unit in an area suitable for maintenance. Remove the top and bottom covers and make a physical inspection of your new unit. Reproducers are shipped with a motor protection wedge around the motor rotor. Remove the packing material from around the motor. The main power fuse is attached to this packing. Install the fuse into the rear-panel fuse holder.

All units are shipped with a PC card retainer sheet. This must also be removed before placing unit into service. Unplug and reseal the printed circuit boards to insure they have not shaken loose in transit. Inspect all internal connectors to make sure they are securely fastened and properly seated. Review the final inspection tags to insure this unit meets your in-house standards for equalization, levels, and tape type. Finally, make a note in your stations' permanent records of the date of receipt, model number, and serial numbers. You may need this information in the future.

### B. INSTALLATION

The Delta Series components are designed in incremental sizes for convenient installation into existing spaces. Three basic "sizes" are designed on a UNIT size of 5 1/4" high (without feet) by 5 1/2" wide. Therefore, three single UNIT widths may be installed side by side in a standard 19" rack opening. Likewise, two single UNIT height compon-

ents may be stacked next to a double unit height component. The illustration below demonstrates the unit concept:

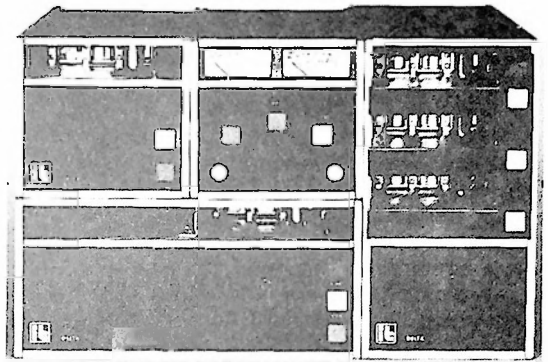


Figure 2-1

ITC Delta Series components are designed as a very flexible, high performance cartridge system. Reproducers may be interconnected to recording amplifiers with a single cable. The four components of the Delta system allow user flexibility unachievable in a cartridge system. They may be mixed or matched to perform a variety of tasks. The following table lists the four Delta system components and their primary usage.

Delta I	Single Deck Reproducer, "AA" size cartridges only;
Delta II	Single Deck Reproducer, "AA" or "BB" or "CC" sized cartridges;
Delta III	Three Deck Reproducer, "AA" size cartridge only;
Delta IV	Record Amplifier, may be used with Deltas I, II, or III.

Available as an option, the Universal Rack Mount URM-0001 allows the user to install Delta system components in any configuration for existing 19" racks.

Variations in the rack mount design are discussed in the URM-0001 instruction sheet.

#### -SPECIAL CONSIDERATION FOR COOLING-

Delta Series components are designed using state of the art microprocessor and analog technology. Due to the compactness of the units, and the high density packaging, these units generate heat that must not be allowed to accumulate. Adequate ambient air circulation is required in order to prevent premature heat related failures. As a general rule, no forced air cooling is required unless the units will be installed in a fully enclosed housing. It is normal for these units to radiate heat through the tops and this air must be allowed to escape. Likewise, ventilation holes in the tops and bottoms should not be restricted. Vertical stacking of Delta components should pose no problems so long as the ventilation holes are not blocked. Desk-mounted units should not have their feet removed for this reason. Rack-mounted units may be installed without their lids. The URM-0001 Universal Rack Mount kit provides for air circulation through the units.

#### Forced Air Cooling - Delta III Units

Delta III units incorporate very densely packed high-speed electronics on four major printed circuit boards. To provide maximum features, premium performance and compact size, the electronics were designed to be space efficient. This required close component to component and board to board spacing. This compact design required supplemental aid to convection cooling.

The Delta III utilizes an internal miniature cooling fan to augment natural convection cooling. This fan is mounted below and to the rear of the center panel. It blows air upward across the four printed circuit boards and out through the top. The fan motor operates from low voltage D.C. and is variable speed. Fan speed, and hence, air volume, is controllable by a trimpot. It is ac-

cessible through a small hole in the rear panel of the machine.

The fan type has been carefully selected to provide adequate cooling at slow rotor speeds, low noise level, and long motor life. Typical fan noise is less than the noise produced by tape being pulled through a cartridge. The slow fan speed also prevents abnormal dust or dirt buildup. Less airborne particulate matter is drawn into the unit. The purpose of the fan is to gently complement natural convection cooling in the densely packed electronics.

Fan speed is factory adjusted to provide ample cooling for most applications. Should more or less air flow be required, customers may adjust fan speed. Units mounted in enclosures, such as fabricated housings, may require increased fan speed. Units mounted above other heat-producing equipment may also require increased ventilation.

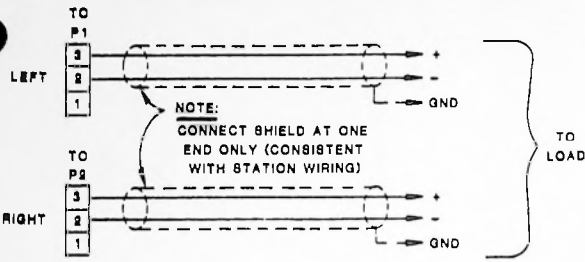
It should be noted that, should the forced air flow be reduced, internal ambient heat will rise. The Delta Series units are high quality and temperature-rated higher than the expected heat rise. Life expectancy of all components, such as electrolytic capacitors, may be shortened by reducing the forced air flow. This is true if the components are operated under higher than normal heat for extended periods of time. Therefore, if at all possible, ITC recommends the use of the Delta III internal forced air system for optimum performance and maximum longevity of components.

#### C. EXTERNAL AUDIO CONNECTIONS

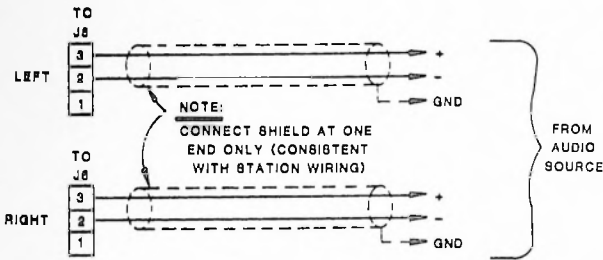
All Delta Series units are shipped with standard input and output transformers installed. Inputs and outputs are via 3-pin XLR-type connectors, on the rear panels of respective Delta components. Pin connections are "universal": Pin 1 is ground, Pins 2 and 3 are the balanced pair.

Should transformerless operation be desired, transformer PCB removal is accomplished by turning the small screw-driver slot in the center of each XLR





REPRODUCER AUDIO OUTPUT CONNECTIONS



RECORDER AUDIO INPUT CONNECTIONS

Figure 2-2

connector 1/2 turn, then removing the board from the rear of the connector. The audio leads on the PCB may be transferred directly to the XLR socket pins. All Delta Series components provide balanced active, transformerless design and may be used in this configuration as desired.

An appropriate combination of plugs and sockets is provided with each Delta Series component for connecting audio inputs and outputs. Refer to Figures 2-3, 2-4, and 2-5 for location of connectors. Inputs and outputs are balanced; it is therefore recommended that two-conductor shielded cable be used for each. Attach the shield only at either the machine end or the console to prevent any potential ground loop. Figure 2-2 shows a proper method of connection for the playback output lines.

It is important to note that the + (plus) and - (minus) signs are indications of proper phase relationships only and do not reflect DC voltage potential. It is necessary to connect the + lines of both channels to the corresponding +,

or equivalent terminal of the external source in order to prevent audio phase reversals.

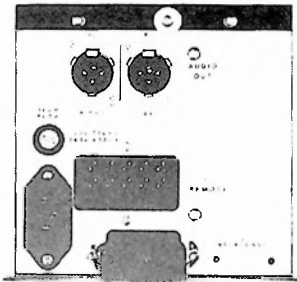


Figure 2-3: DELTA I & II REAR PANEL

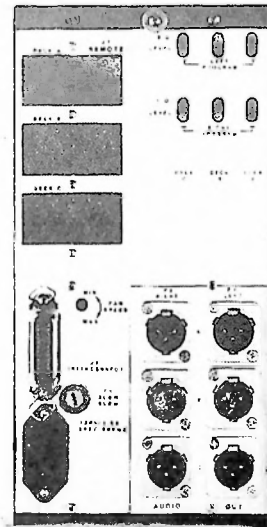


Figure 2-4: DELTA III REAR PANEL

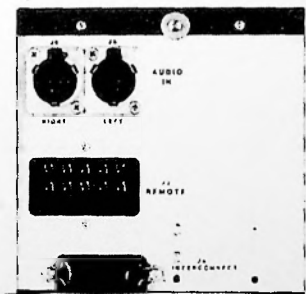


Figure 2-5: DELTA IV REAR PANEL

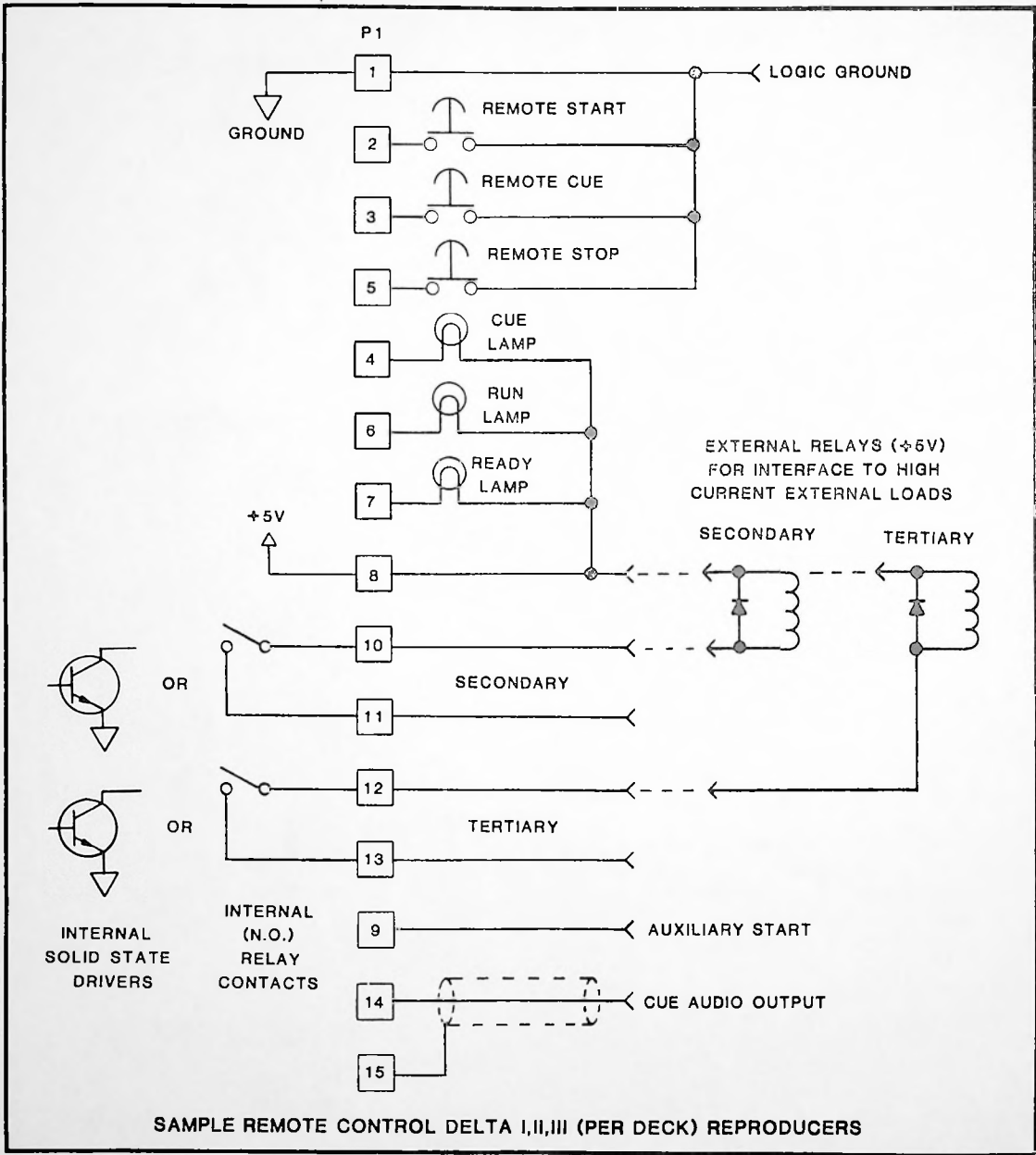


Figure 2-6

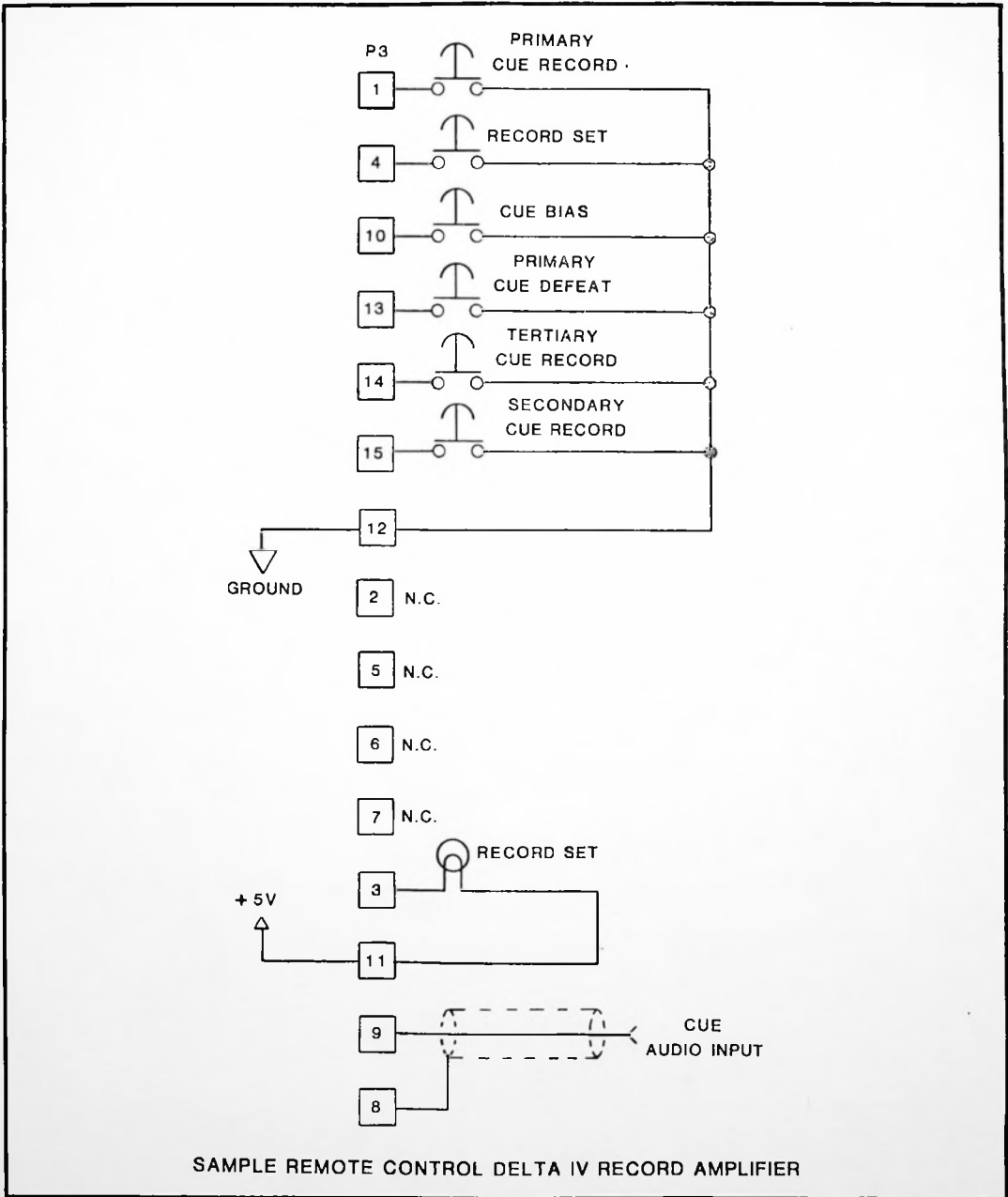


Figure 2-7

#### D. EXTERNAL REMOTE CONTROL CONNECTIONS

Remote control for the Delta Series Components is via rear panel female Jones type connectors. The pin-out connections listed below indicate typical remote control functions. Figures 2-6 and 2-7 illustrate many of the common remotes used and the proper method for making the connections.

In some cases, unshielded lines may be tolerated for remote switch functions. However, it is recommended that shielded cables be used in all installations.

All switches shown are momentary action, single pole. Typical switching current is 15 ma. at a maximum 5 VDC.

#### Delta I, II, III Reproducer Remote Connector

Pin #	Function
1	Logic Ground, Switch Common
2	Remote Start (Run Ground)
3	Remote Cue Switch
4	Remote Cue Lamp
5	Remote Stop (Stop Ground)
6	Remote Run Lamp (Ground)
7	Remote Ready Lamp (Ground)--follows ready lamp function, when lamp is at ground. When lamp is on, signal is at ground. When lamp is off, the open collector transistor is off. <b>CAUTION:</b> ready ground follows condition of front panel ready lamp. If ready lamp is strapped to flash ready ground will change states synchronous with front panel ready lamp. Maximum open circuit voltage 25 VDC, maximum current at 200 ma.
8	+5 Volts
9	Auxiliary Start Pulse - momentary (100 msec) pulse to ground upon start of cartridge -- open collector. May be used to start an external clock or timer. Maximum 25 VDC open circuit voltage, at 200 ma.
10	Secondary Cue Relay (Open Collector) - 200 ma. switching current (sinking), maximum 25 VDC open cir-

	cuit voltage, switches to ground upon sensing of secondary cue.
11	Secondary Cue Relay (Normally Open)
12	Tertiary Cue Relay (Open Collector) - switches to ground upon sensing of tertiary cue.
13	Tertiary Cue Relay (Normally Open)
14	Cue Audio Output - Nominal voltage is .5V r.m.s.
15	Cue Audio Ground

#### Delta IV Record Amplifier Remote Connector

Pin #	Function
1	Primary (1 kHz) Cue Record
2	N.C.
3	Record Set Lamp
4	Record Set Switch
5	N.C.
6	N.C.
7	N.C.
8	Cue Audio Input Common
9	Cue Audio Input
10	Cue Bias (Remote Cue Record Switch)
11	+5 V Regulated
12	Power Common
13	Primary (1kHz) Cue Tone Defeat
14	Tertiary (8 kHz) Cue Tone Record Switch
15	Secondary (150 Hz) Cue Tone Record Switch

It should be noted that, when Delta Series components are used to replace existing cartridge machines, exchange of remote lamps will be required if the Delta +5 VDC power supply is used as a source for lamp voltage. Stations using the popular T-1 3/4 based lamps in remote indicators may replace them with 5 volt versions, such as the #328, #345, #349, or similar versions. Lamps are driven in an open collector fashion and should not exceed 140 ma. at 5 volts.

Delta I  
Delta II  
Delta III  
Reproducers

Control/Remotes  
Specifications

A. Remote Switch Lines - Active Low

Logic '0' Max	Logic '1' Min	Max. Current Logic '0'
0.8V	2V	17 ma.

B. Remote Lamps

Max. Volts	Max. Current	Saturation Volts
5.0V	140ma	0.7V Max @ 240 ma.

C. Audio Lines

Load Impedance	Volts Out
-------------------	-----------

Cue Audio Output	500m V + .25 RMS @ 1 kHz, 150 Hz, 3.5 V kHz, 8 kHz
4.7k ohms or greater	

D. External Power Supply

Max. Current Draw	Volts/ Regulation
----------------------	----------------------

+5 Volts 540 ma (9 lamps)	+5V ± 5%
---------------------------	----------

E. Remote Cue Tone Switched Lines

Auxiliary Start Pulse  
Time Duration 0.1 sec. @ + 10%  
Max Volts 25V  
Max Current 200 ma  
Saturation Volts 0.7V Max @ 300ma

Cue Detect or Open Collector  
Max Volts 25 V  
Max Current 200 ma  
Saturation Volts 0.7V Max @ 300ma

Cue Detect or Normally Open Relay SPDT  
Contact Ratings - 1A at 24V DC, 0.5A at  
100V AC (Resistive)

Operate Time 5 msec Maximum (Including  
contact bounce, at rated voltage)

Release Time 10 msec Maximum (Including  
contact bounce)

Life Expectancy -  
Mechanical: 5 x 10<sup>6</sup> Operations Mini-  
mum  
Electrical: 300 x 10<sup>3</sup> Operations  
Minimum @ 24V DC, 1A Re-  
sistive  
100 x 10<sup>3</sup> Operations  
Minimum @ 100V AC, .05A  
Resistive

DO NOT USE WITH INDUCTIVE LOADS

Recorder Audio Lines

Load Impedance	Volts In
-------------------	----------

Cue Audio	.5V + .25V RMS @ 3.5 kHz
Input Remote	10K Ohms or less

Recorder External Power Supply

Max. Current Draw	Volts/ Regulation
----------------------	----------------------

+5 Volts 60ma (1 lamp)	+5V ± 5% (Regulated)
------------------------	-------------------------

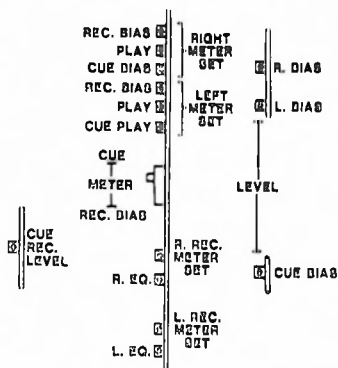
E. CONTROLS AND INDICATORS

1. Stop Switch - Active when cartridge is loaded properly. Overrides all other operations within the machine.
2. Ready Lamp - On when cartridge is loaded properly. Flashes as supplied from the factory after cartridge has played and cued. For optional operation of the Ready function, see SECTION II F. Operational Options.
3. Start Switch - Active whenever the

cartridge deck is in Ready or CUE mode.

4. Run Lamp - On when in a RUN mode.
5. Cue Switch - Used for high speed cue and audio mute from STOP, START, or RECORD (cancels record set) modes. Pressing CUE while in high speed mode causes audio to turn on for the duration the switch is held.
6. Cue Lamp - On when in a CUE mode.
7. Record Set Switch - Active only in the READY mode. When pressed, program audio signals are switched into the recording amplifier circuit. Pressing START causes the recording process to begin.
8. Record Set Lamp - A visual indication showing that the machine is either ready to record or in the process of recording. This lamp will flash if the 1 kHz cue record defeat has been activated.
9. 1 kHz Cue Record - Enables the operator to record a 1 kHz primary cue tone at any desired time as in the case of editing a tape. Automatic timing of the tone length is controlled by the microprocessor. The switch is active in a playback or recording mode. The 1 kHz cue detector is automatically defeated as the 1 kHz tone is being recorded.
10. 1 kHz Cue Defeat - Active only in a READY mode (no tape running - READY and RECORD lamps on). When pressed, this mode is indicated by a flashing record set lamp.
11. Secondary Cue Switch - Active in either record or playback modes. Used to record a secondary (150 Hz) cue tone on the cue track. A remote switching signal occurs in the playback unit upon sensing of the cue tone. As supplied from the factory, high speed recue is initiated at the end of secondary cue tone when the unit is in playback mode. Jumper provided on Play Card to defeat high-speed cue if desired.
12. Tertiary Cue Switch - Active in either record or playback modes. Used to record a tertiary (8 kHz) cue tone. A remote switching signal occurs in the playback unit upon sensing of the tone. Reproducer can be programmed (jumper optional) to

initiate high-speed recue at the end of tertiary tone rather than secondary tone, if desired. Jumpers located on Reproduce Amplifier/Cue Detect Card.



Figuro 2-8

13. Meter Monitoring - The two front-panel switches, REC and PLAY, are used in conjunction with the internal two-position slide switch (mounted on the top edge of the Record and Meter Amp board) in order to monitor the various machine functions. The following explanation describes the metered indication as related to switch position and Record Amplifier mode:

Meter Switch Actuated	Indicates:	
	Left Meter	Right Meter
REC Depressed Machine in "Record Set" Mode, Recording	Left Program input level	Right Program input level
REC Depressed Machine in Reproduce Mode, playing tape	Left Program output level	Right Program output level
PLAY Depressed, Machine in either Record or Reproduce Modes	Left Program output level	Right Program output level
NEITHER PLAY or REC Depressed, Slide switch in "CUE" position	Cue Play	Cue Bias
Slide switch in "REC BIAS" position	Left Program Bias	Right Program Bias

\*NOTE: When both REC and PLAY meter switches are simultaneously depressed, the metering circuits will "default", and indicate the same meter function indicated when only the REC switch is depressed.

## F. OPERATIONAL OPTIONS

Delta Series components may be operationally configured to perform various tasks depending on your specific needs. Special functions are outlined below:

1. READY LAMP FLASH - The ready lamp may be programmed to flash, giving a visual indication of a cartridge that has been stopped. A fast flash indicates a cartridge that has been stopped by the operator using the Stop switch. A slow flash indicates a cartridge has stopped by the 1 kHz cue tone. When units are programmed to flash, the flashing Ready may be "reset" to continuous Ready by momentarily pressing the Stop switch. This jumper is located on the Reproduce Logic Board.

Jumper	Flash Option
"IN" "OUT"	Not Active Active

2. REPEAT PLAY LOCKOUT - This programmable option inhibits playing the same cartridge twice in a row. In other words, once a cartridge has played and stopped, it may not be restarted until it is removed from the deck, and reinserted. This prevents replay of the same program material. This jumper is located on the Reproduce Logic Board.

Jumper	Repeat Play Lockout
"IN" "OUT"	Enabled Disabled

3. E.O.M. HIGH SPEED RECUE - May be jumpered so that neither, either, or both the secondary (150 Hz) and tertiary (8 kHz) cue tone detectors cause the end-of-message high speed recue to occur. This jumper is located on the Play Amp and Cue Detector Board.

4. REPRODUCE AMPLIFIER LEVEL - Provides output level range selection for preservation of best signal-to-noise. For location of these jumpers refer to the Reproduce Amplifier schematic and parts layout drawings.

Jumper	Output Range
"A"	+ 1 to +18 dBm
"B"	-10 to + 7 dBm

5. REPRODUCE OUTPUT IMPEDANCE - 600 ohms, balanced transformer is standard. Refer to mainframe schematics for information regarding 150 ohm balanced.
6. BALANCED TRANSFORMERLESS (ACTIVE) OUTPUT - All Delta Series components may be operated in a transformerless (active) output stage configuration for improved transient response. The high slew rate of the output stages may be utilized to provide the best possible audio response, in particular at the extreme ends of the audio band.

When output transformers are removed, D.C. isolation between the Delta output stage and connected equipment should be maintained. This is accomplished by inserting a 220 mfd non-polarized capacitor in each output leg, (+) and (-). ITC/3M provides an assembly to readily convert any Delta Series output to balanced transformerless.

#### Delta I, II Audio Output Board

831-0252-003	Mono, w/transformer
831-0252-013	Stereo, w/transformer
831-0252-023	Mono, w/o transformer
831-0252-033	Stereo, w/o transformer

#### Delta III Audio Output Board

831-0254-003	Mono, w/transformer
831-0254-013	Stereo, w/transformer
831-0254-023	Mono, w/o transformer
831-0254-033	Stereo, w/o transformer

7. RECORDER INPUT IMPEDANCE - 20 K ohms bridging is standard. The input may be terminated by a 150 ohm or 600 ohm resistor by adding a jumper to

each input channel. This is already loaded on the Delta IV mainframe. Refer to the Delta IV input transformer board drawings for exact location.

8. INPUT LEVEL STRAPPING - Input straps are provided to adjust the nominal input level range, to insure best overall signal-to-noise is preserved, and to set the nominal position of the front panel level controls. Jumpers are located in the Delta IV mainframe.
9. DIFFERENTIAL (TRANSFORMERLESS, BALANCED) INPUT - Input transformers (standard) may be removed in order to operate the Delta IV record amplifier in a true differential input configuration. High-performance op-amp record amplifier input sections permit this user option. When operating in the differential input mode, users should be cautious to insure that no D.C. potential, or A.C. ground loops exist before attempting connection. Removal of the input transformer eliminates the D.C. and A.C. protection characteristics (isolation) offered by the transformer. Once the transformers have been removed, wire jumpers W1305, W1306, W1307, and W1308 are installed providing input directly to the Record Amplifier differential input.
10. SERVO MOTOR SPEED - Delta units are shipped to operate at NAB standard speed of 7.5 IPS. Units may be field modified to run at 3.75 IPS or 15 IPS by moving the motor speed select jumper located on the Reproduce Logic PCB. Refer to the Reproduce Logic Board schematic and parts layout drawings for jumper location and use information.



## SECTION III - MECHANICAL ADJUSTMENTS

### A. IMPORTANT CONSIDERATIONS

The rugged mechanics built into Delta Series cartridge machines are designed to provide extremely reliable and long-term operation with only a minimum of simplified adjustments. The sequence in which mechanical adjustments are completed, however, is important due to the fact that many of these adjustments are inter-related. Therefore, if a complete check of all mechanical adjustments is required, start at the beginning of this section and follow the proper sequence.

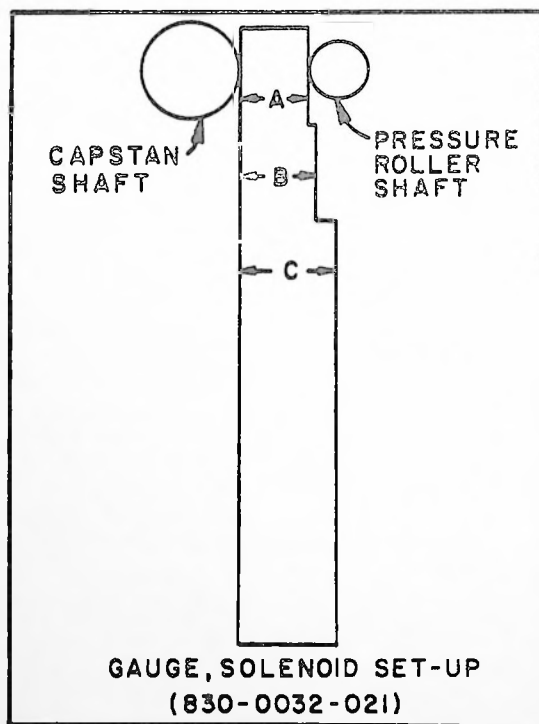


Figure 3-1

Alignment gauges to which references are made are available from ITC.

The pressure roller pressure gauge, 830-0042-011 has been designed for use in the ITC Delta Series. When utilized for either checking or adjusting pressure roller pressure, a clear understanding of its purpose will be most helpful in making an accurate and speedy set-up.

The three primary width dimensions are shown. Dimension "C" is a low-tolerance dimension, and should never be used to measure any mechanical parameter in the the Delta Series. Its prime function is as a handle and may be held at this point or at any place along its length.

Dimensions "A" and "B" are used to measure the range of pressure roller pressure. Dimension "A" measures maximum roller pressure. Dimension "B" is used to show when pressure roller pressure is too low. The pressure of the pressure roller is properly adjusted when dimension "A" slides between the capstan shaft and pressure roller shaft and dimension "B" does not.

### B. PRESSURE ROLLER SHAFT / CAPSTAN SHAFT ( MOTOR ) POSITION

The following adjustments are necessary if a motor or solenoid has been removed. The adjustment should be checked any time a new pressure roller is installed.

NOTE: The pressure roller capstan shaft locator gauge (ITC PART #830-0043-001) and the pressure roller pressure gauge (ITC part #830-0042-011) are required for the following procedure.

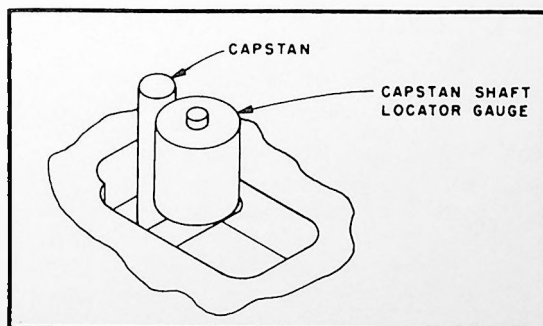


Figure 3-2

Procedure for Delta I and II Units

1. Remove the pressure roller and place the special locator gauge (830-0043-

- 001) over the pressure roller shaft as illustrated in Figure 3-2. Manually move gauge up to (against) the capstan shaft. Check to see that the gauge surface lies flat against the capstan shaft. If not, loosen the motor mounting screws, and gently move the motor until the gauge surface and the motor shaft are "flat" against each other.
2. Carefully tighten motor mounting screws while making certain that the motor locating gauge remains parallel to the capstan shaft. Also insure that the pressure roller shaft and motor shaft are directly in line with each other centering on the deck plate hole. This is the proper position of the pressure roller shaft as related to the capstan shaft.
  3. Remove the gauge from the machine and install the pressure roller. The steel washer fits over the shaft first, followed by the pressure roller, nylon washer, and the retainer clip.
- \*NOTE:** Motor locating in Delta III models is always referenced to the center bulkhead, and motor location is relatively fixed. Therefore, manipulation of the sliding deck adjustment screws is required to insure proper motor shaft-to-pressure roller shaft parallelism. The following procedure applies to Delta III units only:

#### C. PROCEDURE FOR DELTA III DECK ADJUSTMENT

This procedure should be used when a motor or new deck has been replaced.

1. Remove all decks from the mainframe.
2. Starting with the bottom deck, remove pressure roller and place the special locator gauge (830-0043-001) over the pressure roller shaft as illustrated in Figure 3-2.
3. Insert bottom deck into the bottom slot.
4. Secure the deck by tightening the capture screw which is accessible through the front trim piece center hole. Remove right-hand side panel inlay for ease of set up.

5. Using the opening in the right side panel, manually press in solenoid plunger until gauge is placed against the capstan shaft. Observe if the gauge surface indicates the two shafts to be parallel or nonparallel. If nonparallel, observe whether the gap is at the top or bottom of the gauge. A gap at the bottom of the gauge indicates the deck is too far out and needs to be moved into the mainframe, closer to the motor shaft. Likewise, a gap at the top of the gauge indicates the deck should be moved away from the motor shaft.
6. Deck penetration into the mainframe is determined by a 10-32 set screw, for each deck, located in the motor mounting plate. These screws are immediately adjacent to the tapped holed used by the deck capture screws. Decks must be removed from the frame to adjust the penetration set screws. Turning the set screw clockwise allows the deck to move closer to the motor shaft. Turning the set screw counter-clockwise moves the deck away from the motor shaft. By observing the "gap" indicated by the gauge in the previous step, an indication of deck penetration will be given. Adjust the deck penetration set screws so that the gauge indicates parallelism of the capstan shaft and pressure roller shaft of each deck. When proper deck penetration is established for all three decks, pressure rollers may be replaced, and the deck capture screws secured.

Delta III motors utilize a unitized construction technique whereby the windings, rotor, shaft, and shaft top bearing are all contained in a single-piece precision casting. This technique allows for precision alignment of the shaft to the top bearing and motor bearing. The entire assembly is bolted to the machine by screws mounting through the rear of the center bulkhead. The center bulkhead forms a precision mounting plate for the motor from the rear, as well as an extremely rigid center and side brace for the mainframe. Replacement of motors in Delta III units, when necessary, will include the "top" bearing, and its support block.

Since the Delta III motor has only two bearings, the shaft "top" bearing, its block, and the vertical support member gallows is considered part of the motor. The precision casting and subsequent machining of the gallows allows the use of a high grade motor bearing at the top of the capstan shaft.

**SPECIAL SERVICE NOTE:** Delta Series transports utilize a SPDT deck switch. The unused terminal (normally closed) may be shorted to chassis ground in order to put the deck into a powered READY condition. This facilitates pressure roller pressure adjustments, etc., to be made without having a cartridge loaded.

#### D. PRESSURE ROLLER PRESSURE / SOLENOID ADJUSTMENT

This adjustment will normally be required only after parts replacement; but for best results, a check of the pressure roller/capstan pressure should be on the routine maintenance schedule.

1. With pressure roller installed, apply power to the machine. Holding cart sensing switch closed, press start switch.
2. With the solenoid engaged place gauge 1st step - Dimension A end between the pressure roller shaft and capstan shaft. (See Figure 3-3.)

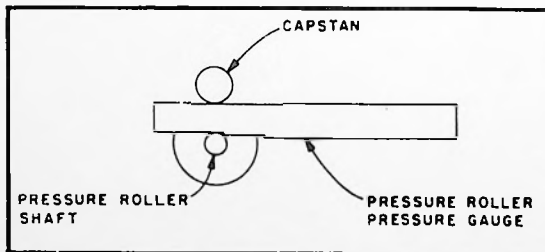


Figure 3-3

**NOTE:** On Delta III units, use the access opening in the right-hand side panel.

3. The 2nd step - (Dimension B) section (see Figure 3-1) should not slip through. If it does, loosen the clevis screw lock nut and rotate the plunger clockwise until the 2nd step -

(Dimension B) will not slip through. If the 1st step - (Dimension A) end of the gauge will not slip through, the plunger is to be rotated counterclockwise until it will slip through easily.

4. Once this setting has been obtained, tighten the 10-32 clevis lock nut.

#### E. SOLENOID DAMPENING ADJUSTMENT

Figure 3-4 illustrates the location of the screw used to adjust the air dampening of the solenoid plunger. The speed of the solenoid operation is proportional to the speed at which air is allowed to move through the small hole in the solenoid seat. The noise of the solenoid operation shares the same relationship.

Adjustment requires turning the screw clockwise for more dampening and the opposite for less. It is important to note that too much dampening will affect the start and stop time of the cartridge, therefore, the minimum dampening necessary is the most desirable.

#### F. CARTRIDGE GUIDANCE SYSTEM ALIGNMENT

Optimum performance from the Delta Series machines and the tape cartridges can only occur if the cartridge is positioned accurately and consistently in precisely the same location each time it is inserted into the machine. Cartridge guide alignment can be achieved by using a specially marked cartridge as illustrated in Figure 3-5. Use a point or scriber and mark a cartridge as shown.

Refer now to Figure 3-6 in which the cartridge is shown in its properly aligned position. If the alignment cartridge does not position as illustrated,

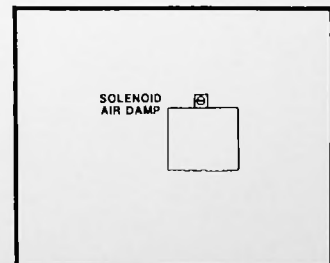


Figure 3-4

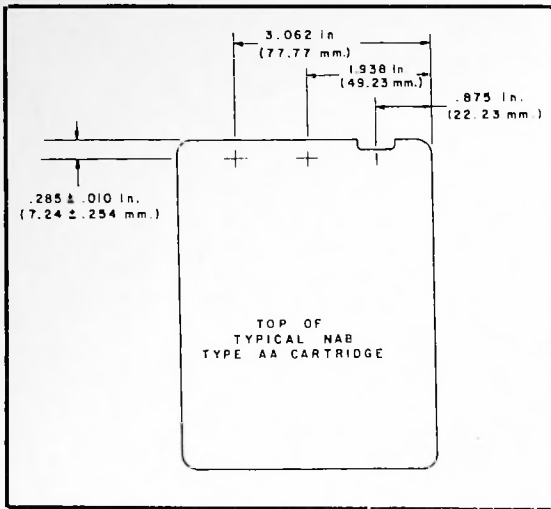


Figure 3-5

squarely against the right hand guide. Check the alignment again, if it is not exactly positioned, repeat the alignment procedure.

NOTE: It is very important that this alignment be made as accurately as possible, and that it be consistent with other cartridge machines in the system. Failure to achieve consistent alignment from machine to machine will create inconsistent tape travel path and thus phase error on stereo machines and azimuth level errors on mono machines. Check the position of the capstan shaft and pressure roller shaft. If they are not correctly positioned, repeat steps III, B and C before proceeding.

#### G. TAPE GUIDE ADJUSTMENTS

This set-up procedure provided for a very precise adjustment of the distance between the "tangs" of the tape guides. It also sets up a three-point contact area between the guides and the tape. The mechanical stress of tape edges is minimized while affording a very closely controlled tape path across the heads (Figure 3-7). ITC advises that all cartridge machines within your system would benefit from this set-up procedure, due to the increased accuracy in setting up guidance.

The precision ground set-up gauge, 830-0041-022, allows the user to set the tape guide tangs to a typical tape slit width.

1. The head shield must be removed before beginning guide adjustment. After removing the shield, reinsert the right hand flat head screw and spacer, and retighten to secure the head block to the deck.
2. With the gauge flat on the deck surface, as for height adjustment, begin adjustment of the left (entry) tape guide:
  - a) Loosen guide mounting screws.
  - b) Insert gauge straight into the guide only as far as the face of the head. Insure that the gauge remains flat against the deck.

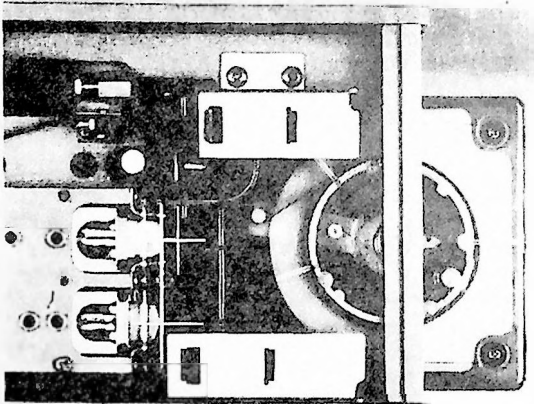


Figure 3-6

loosen (do not remove) the mounting screws on the right hand cartridge guide. Position the cartridge and right-hand cartridge guide (by holding them tightly together) to the right or left until the scribed lines are located directly over the heads as shown. Be certain that the front edge of the cartridge seats firmly and squarely against the tape guide screws. Tighten down the right hand cartridge guide mounting screws, making sure it does not move or change positions.

Remove the cartridge and reinsert it into the machine forcing it to slide

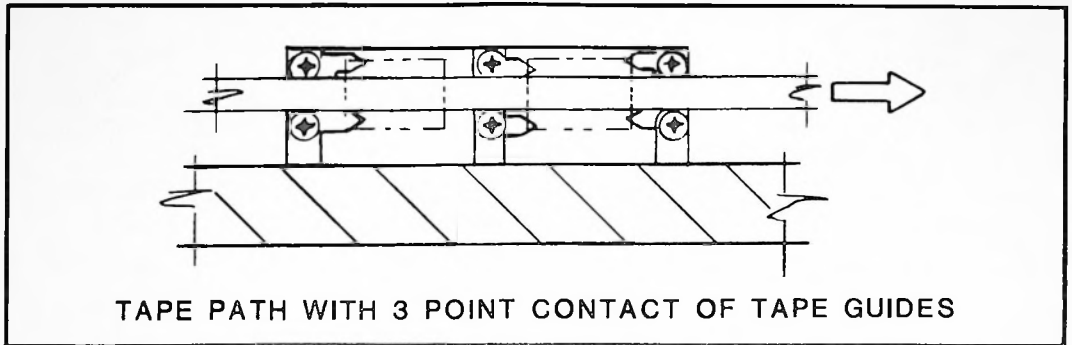


Figure 3-7

- c) Move guide upwards so that the bottom tang just touches the gauge.
  - d) Tighten the mounting screws and then recheck adjustment with the gauge.
  - e) Repeat "a" through "d" for right (exit) guide.
3. Upon completion of Step 2 (set-up for entry and exit tape guides), you are now ready to adjust the center tape guide.
- a) Loosen the center guide mounting screws.
  - b) Position the gauge into the guides with the cut-out areas toward the heads. (Figure 3-9.)
  - c) Adjust the center guide so the top tang touches the gauge, then tighten the mounting screws.
  - d) Recheck your adjustments by returning the gauge to the position for head height set-up. The gauge should not penetrate the center tape guide if it is adjusted properly.

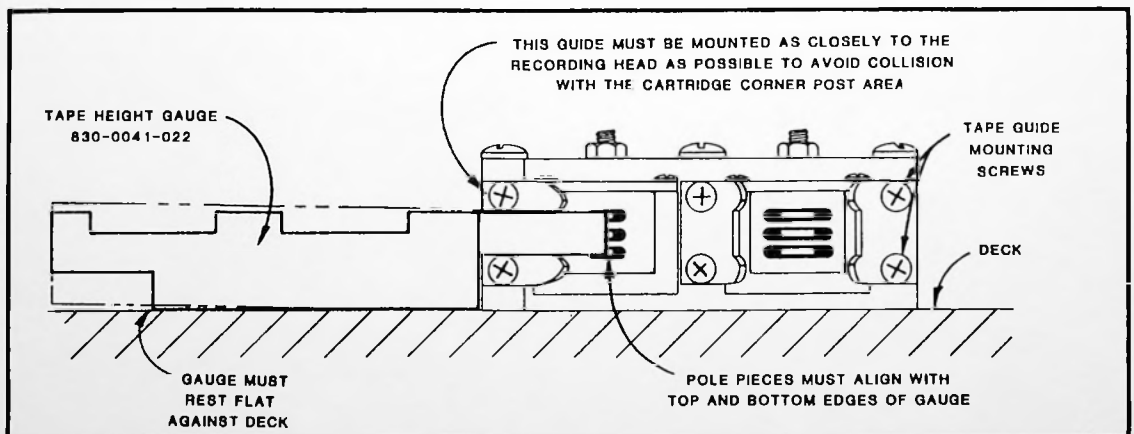


Figure 3-8

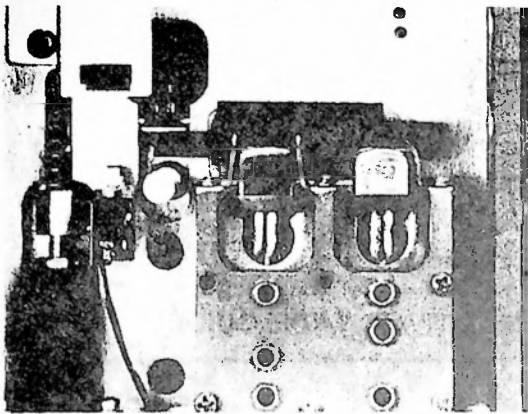


Figure 3-9

recording head except on playback only machines. A dummy head is mounted in this position on playback machines in order to maintain constant tension on the tape and thus minimize wow and flutter and improve tape guidance.

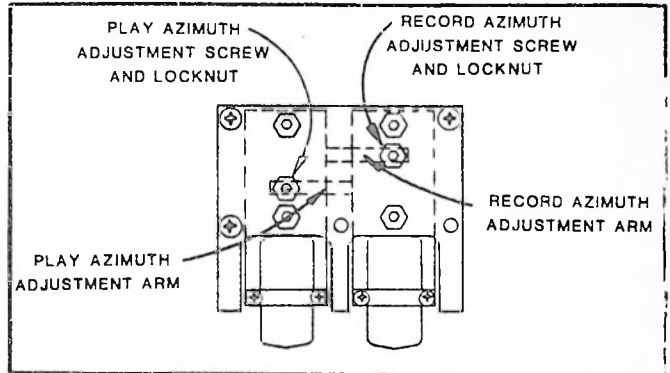


Figure 3-11

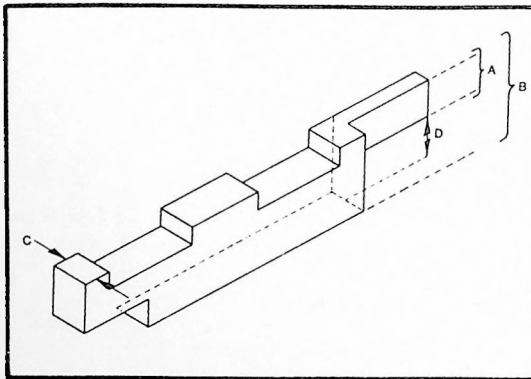


Figure 3-10

Use of the 830-0041-022 Gauge for Tape Guide and Head Height Adjustment

A = Measures tape width at the head face

B = Measures tape height at the head face

C = Nominal tape slit width

D = Height from deck plate to bottom tang inside surface of entry and exit tape guide

#### H. HEAD HEIGHT AND ZENITH ADJUSTMENT

The magnetic tape head nearest the capstan shaft is the reproducing head. The head farthest from the capstan is the

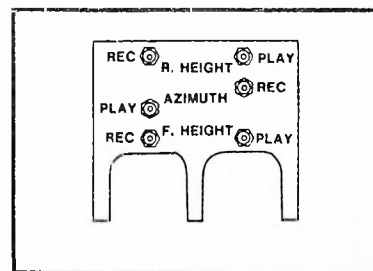


Figure 3-12

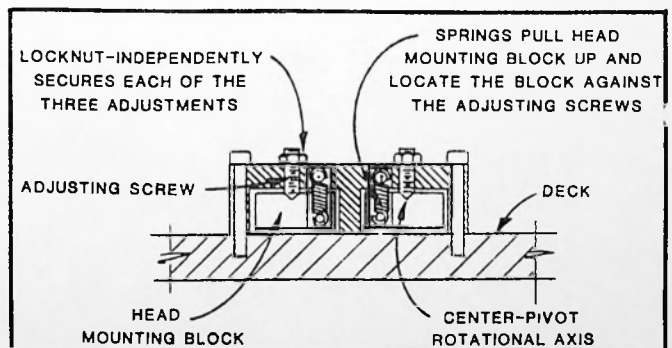


Figure 3-13

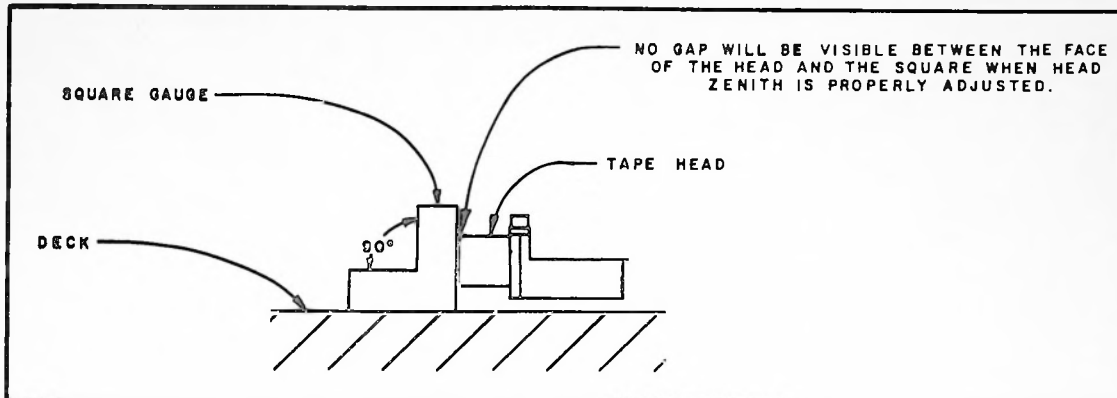


Figure 3-14

The adjustment procedure outlined below should be followed in positioning both the reproducing and recording heads. Only height and zenith adjustments are required for a "dummy" head. See Figure 3-12 for the location of the adjustment screws.

1. Loosen the lock nut by turning it counterclockwise approximately two complete turns.
2. Coarse Height: Adjust the Front Height Set Screw until the top of the upper head track (pole piece) is  $9/16$  of an inch (14.29 mm) above the deck surface.
3. Coarse Zenith: Adjust the Rear Height Set Screw until the face of the head is perpendicular with the surface of

the deck. Position the Tape Height Gauge, or any gauge known to be square, on the deck surface and move it against the face of the head as shown in Figure 3-14. The gauge must be demagnetized before making adjustments. Be careful to avoid scratching the face of the head. When the head is perpendicular, the face of the head and the "square" will be flush.

4. Fine Height and Zenith: This adjustment is made using the alignment gauge.
  - a. Position the gauge in front of the face of the head as the tape would be positioned if it were being played as shown in Figure 3-15.

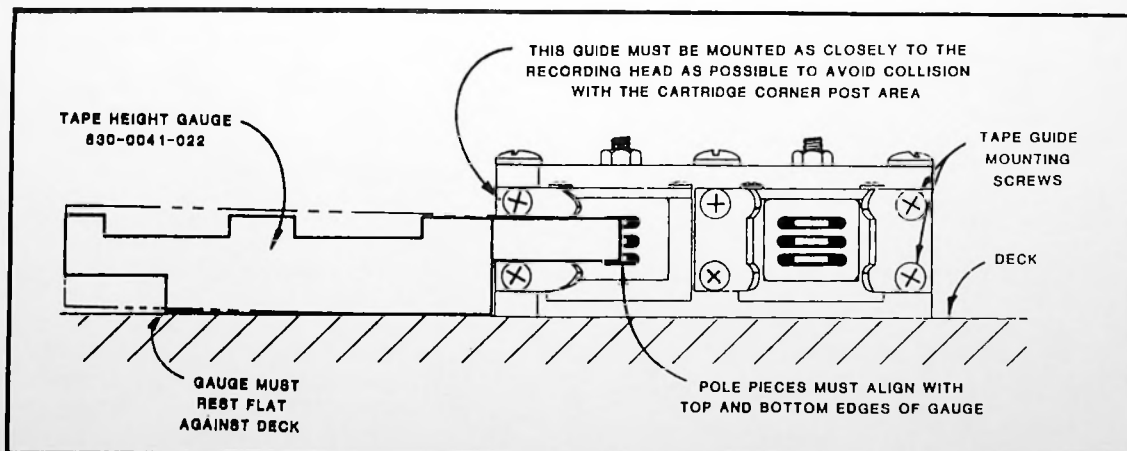


Figure 3-15

- b. Alternately adjust the Rear and Front Height Set screws to position the top of the upper head track (pole piece) so that it is even with the upper edge of the gauge. Position the bottom of the lower head track (pole piece) so that it is even with the lower edge of the gauge. The set screw should be adjusted by equal amounts in the same direction to maintain zenith.
- c. Recheck the zenith of the head as instructed in Step 3. If adjustment is necessary, height must also be rechecked and adjusted until both height and zenith are correct.
- d. Carefully tighten the Front and Rear Height Lock Nuts. Recheck the height and zenith adjustments. If a change has resulted, repeat the Fine Height and Zenith adjustment.

#### Special Note

It is important to note that the location of the Azimuth adjustment screw is offset considerably from the head it adjusts. The Record Head azimuth screw is physically located in between the two zenith screws directly to the rear of the Play head. Likewise, the Play head azimuth screw is located in between the two zenith screws located behind the Record head. The compact design of the ITC/3M Delta Series allowed the azimuth arms to be "crossed" in order to maintain the maximum length of the pivoting section to be contained in a very small area. When adjusting Record or Play head azimuth, make certain the appropriate azimuth control screw is used.

#### **I. MONOPHONIC HEAD AZIMUTH ADJUSTMENT**

Before attempting these adjustments insure the following: the mechanical adjustment of the tape guides as outlined in Section III G; and the adjustment of height and zenith of both the Record and Reproduce heads (or Reproduce and "dummy" in Reproduce only machines) as outlined in Section III H, are correct.

1. Reproduce Head Azimuth Adjustment:
  - a. Connect a 600 ohm load to the reproduce amplifier output termin-

als. Connect a high impedance voltmeter across this load.

- b. Insert a 15 kHz Standard Azimuth Alignment Tape and start the machine.
- c. Adjust the reproduce head azimuth set screw as shown in Figure 3-11 to produce maximum output level.
- d. Carefully tighten the lock nut observing the voltmeter to insure that no change in output level occurs.

#### **2. Record Head Azimuth Adjustment**

Be aware that changes in azimuth to the "Master" Record head can result in azimuth errors in all the Reproduce machines within a system unless the resultant azimuth is carefully checked against each of these Reproducers. Any change in azimuth of the record head should be attempted ONLY AFTER all mechanical adjustments are carefully checked and the "Master" Reproduce head is aligned to the 15 kHz Standard Azimuth Alignment Tape as above.

- a. Select an erased 3-1/2 minute cartridge which is known to have consistently good operating characteristics. It is suggested that this cartridge be set aside and used only for recording head adjustments. It thus will become the standard for your operation.
- b. Connect a 600 ohm load to the Reproducer output terminals. Connect a high impedance voltmeter across this load.
- c. Use a tone generator to generate 14.5 kHz and adjust the Normal Record Level to - 10 VU.
- d. Start the recorder and adjust the azimuth set screw on the record head to produce maximum output level.
- e. Carefully tighten the lock nut observing the voltmeter to insure that no change in output level occurs.

#### **J. STEREO SYSTEM HEAD AZIMUTH ADJUSTMENT**

Two track stereo recording-reproducing performance is subject to several contributing mechanical inaccuracies which can cause phase shift in simultaneously monitored reproducer outputs. In stereo systems these phase shifts are generally not perceptible in the final reproduc-



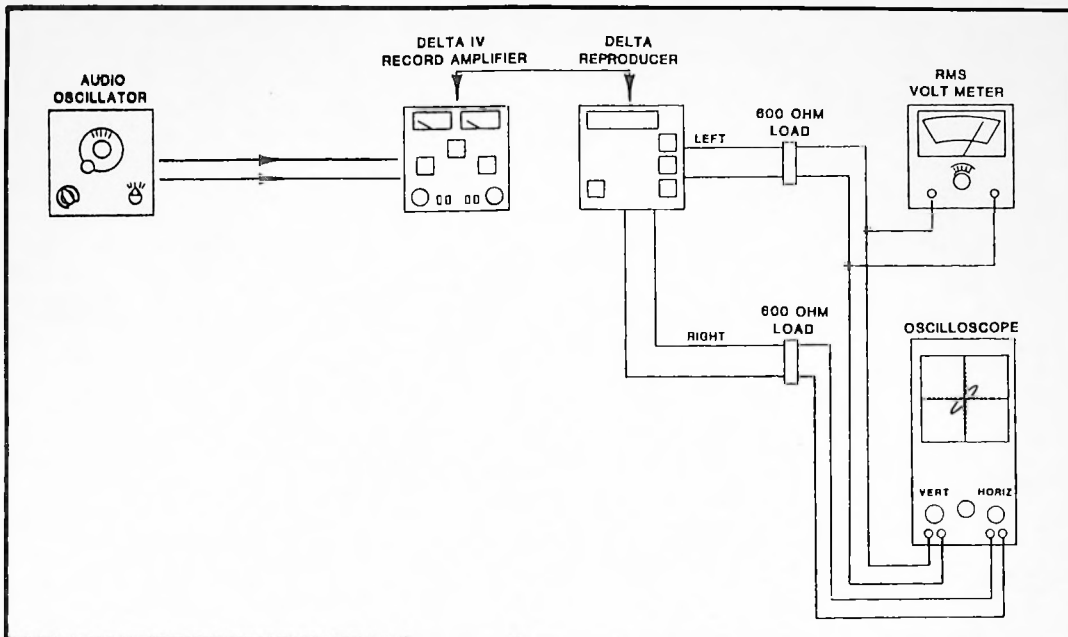


Figure 3-16

tion; however, in cases where monophonic "dubbing" or channel summing is desired, phase shifts can result in serious amplitude variations or dropouts, especially at the higher frequencies. Most common causes of these problems are:

1. Lateral displacement of the pole pieces with respect to each other within the head case.
2. Improper azimuth of the heads with respect to each other (record head to play head on any reproducer in a system).
3. Improper tape guidance (skew) either within the cartridge or through the tape guide system.

ITC/3M has provided the best features possible to assist in the proper guidance of tape outside of the cartridge. Three adjustable tape guides, heavy-duty microadjustable patented head module, and the use of "dummy" heads in Reproduce only machines, lend to consistent guidance of the tape through the head assembly. Gauges are made available for maintaining accurate adjustment and maintenance of these assemblies. These are measures taken by ITC/3M to aid the discriminating in maintaining the best

possible stereo performance from this equipment. The following tests and adjustments do not preclude the many possible techniques for measuring phase shift. They do provide the basis for satisfactory results using a minimum of equipment and skill:

1. Master Reproduce Head Azimuth - See "Special Note" in preceding section, regarding the unique location of the Azimuth adjustment screws.
  - a. Connect 600 ohm loads to both left and right channel outputs. Connect a high impedance voltmeter to the left channel output. Insert a STEREO 1 kHz reference "0" level tape and start the machine. Set left gain control R109 for 0 dBm output. Now connect the voltmeter to the right channel output and adjust right gain control R110 for 0 dBm output.
  - b. Insert a 15 kHz STEREO azimuth alignment tape and carefully adjust the playhead azimuth screw for a maximum reading on the voltmeter. Observe the mechanical position of the azimuth screw.
  - c. Move the voltmeter to the left channel output. Now, move the azi-

- turn the azimuth screw a small amount in either direction and observe the voltmeter reading as an increasing or decreasing output. Continue moving the screw in the direction that produces increasing output until a maximum reading is obtained.
- d. Observe direction and amount that the screw was turned to obtain maximum reading on the left output with respect to the previous setting for maximum on the other channel. Set the azimuth screw to the midpoint between these settings to obtain AVERAGE azimuth for the two channels.
  - e. Connect the horizontal input of a scope so equipped to the right channel output. Insert a STEREO FREQUENCY ALIGNMENT TAPE and start the machine. Adjust the horizontal gain, if provided on the scope to a suitable amplitude. Remove the horizontal input.
  - f. Connect the vertical input to the same right channel output. Adjust the vertical gain to provide a deflection equal to that of the horizontal above.
  - g. Connect the horizontal input to the left channel output. Run the tape to the 1 kHz section. A pattern such as Figure 3-17 (a) should now appear. If not, reverse the two leads of the horizontal input. This pattern represents the "0" or near "0" phase shift pattern of the system.

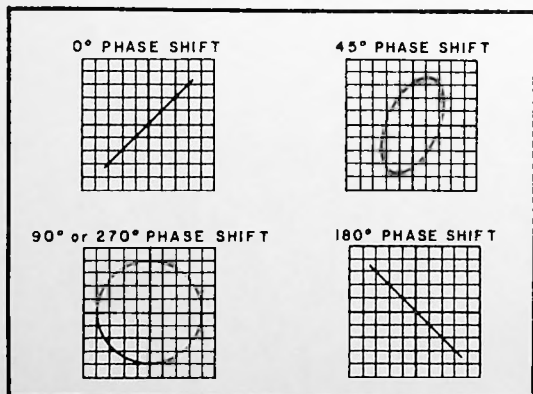


Figure 3-17

- h. Allow the tape to run to the 4 kHz section and observe if phase shift has occurred. Refer to Figures 3-17 (a) through (d). If phase shift has occurred, adjust the play head azimuth screw to correct this phase shift in the exact reverse rotation to which it has occurred. This means that if the pattern was increased clockwise from 0 shift as frequency increased, the azimuth screw should be turned in such a way to cause the scope display to rotate counterclockwise back to the "0" position.
  - i. Allow the tape to continue through the various frequencies. Observe the scope display to insure that no 180° reversals occur. At 16 kHz final adjustment of the azimuth screw can be made to provide best average phase shift. It is normal for shift "jitters" of several degrees to occur at the highest frequencies, so setting should be based on best results. It is desirable to run the tape several times, observing that phase reversals do not occur at any frequency. Tighten the lock nut and observe that no change occurs.
2. Master Record Head Azimuth
    - a. Select a 3 1/2 minute cartridge that is known to have consistently good operating characteristics.
    - b. Connect a tone generator to both inputs, and inject a 14.5 kHz tone and adjust the Normal Record level to -10 VU.
    - c. Start the recorder and adjust the recording head azimuth screw for maximum amplitude of the display on the scope. The scope gains may be adjusted in equal amounts to increase amplitude of the display if necessary.
    - d. Set the frequency of the tone generator to 50 Hz. Slowly increase the tone frequency while observing the phase rotation on the scope display.

If phase error or reversal begins to occur, slowly adjust the azimuth screw of the recording head only to retain minimum phase shift

pattern. Because the frequency continues to increase, each azimuth adjustment with succeeding tones tends to "fine-tune" the head assembly for a very accurate alignment. Repeat this procedure again and observe the results. When the 14.5 kHz tone occurs, hold the 14.5 kHz tone continuously. Tighten the azimuth lock nut while making certain that the phase does not change.

### 3. Other Reproduce Head Azimuth

It is important to realize that all reproducers within a system must be azimuth aligned to the master recorder. To implement this, it is necessary to prepare a test cartridge recorded on the master recorder each time any adjustment to this recorder is performed. This cartridge is in turn used to align EACH reproducer in the system, using the technique outlined in Section III, J-1, above.

### K. HEAD REPLACEMENT

ITC/3M cartridge machine utilize strap-mount type heads to provide quick and easy installation, Figure 3-18.

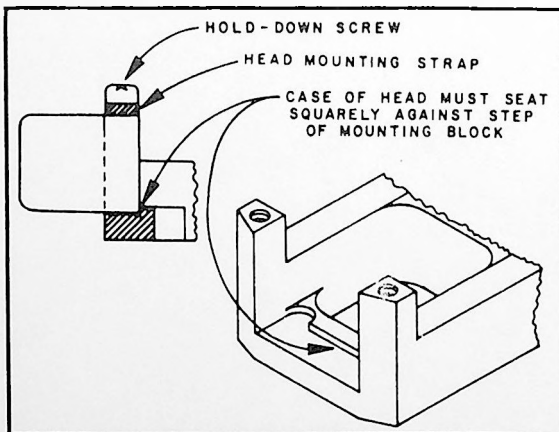


Figure 3-18

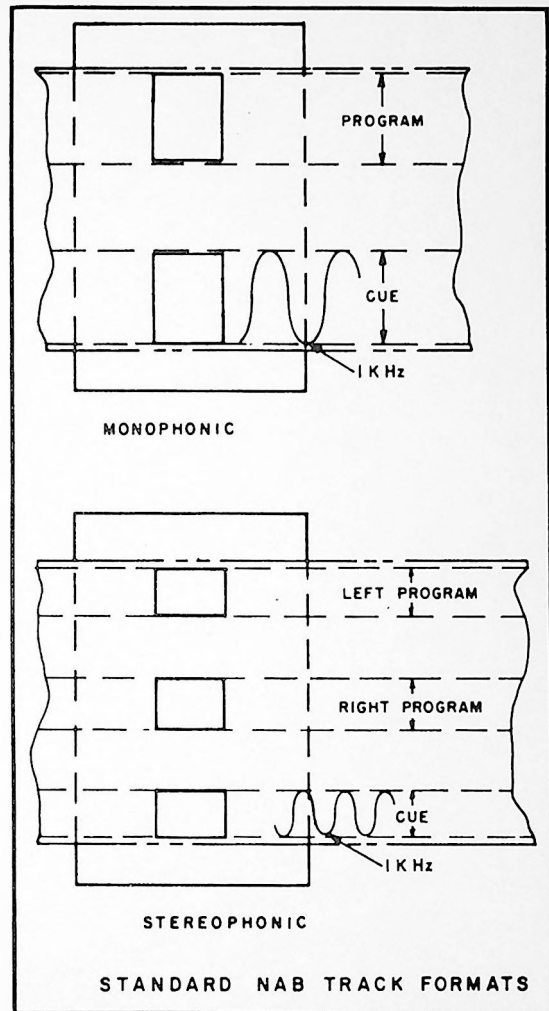


Figure 3-19

1. Loosen the two screws in the head mounting strap.
2. Remove the old head and insert a new one.
3. Reconnect the head cables. See the schematic diagram for the color code of the head lead arrangement used. **CAUTION:** Use care when reconnecting the head cables as the head pins can be broken off if excessive side pressure is exerted against them.
4. Follow the procedures outlined in this SECTION regarding height, zenith, and azimuth/phase alignment.

**SECTION IV - MECHANICAL DRAWINGS**

## SECTION V - ELECTRICAL ADJUSTMENTS

### A. GENERAL

Before making any of the adjustments described in this section, make certain that all mechanical adjustments outlined in Section III have been properly made. Errors in mechanical adjustments cause errors in electrical adjustments. This occurs due to the interdependence of the two systems. It must also be stressed that in order for the electrical adjustments to be made properly, the sequence of adjustments outlined in this section must be followed.

### B. REPRODUCER

#### 1. Servo Motor Duty Cycle

- a. Connect an oscilloscope probe to the motor duty cycle test point, Pin 2 of P301 on the motor control board.
- b. Adjust R303 so that an approximate 75% duty cycle is observed on the scope display. This adjustment must be made with a tape cartridge running in the transport. See Figure 5-1. Slight variations in the duty cycle will be observed as the controller compensates for rotational nonlinearities of the motor.

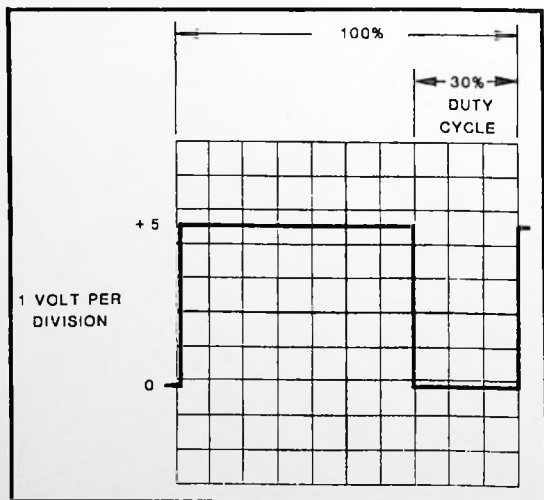


Figure 5-1

#### 2. Program Playback Amplifier

- a. Program level - The output level is factory adjusted to 0 dBm while reproducing an NAB 1 kHz reference tone (160 nW/m). R109 is the mono level control and left channel of stereo. R110 is used for right channel level control. See PC card overlay - Section VI. If an output level lower than -10 dBm is required, an external pad should be added in order to preserve the optimum signal-to-noise performance of the system. Whenever an output level adjustment is made, a corresponding Program Play meter calibration must be made, as outlined later in the Record Amplifier Meter calibration section.
- b. High Frequency Equalization - High frequency equalization controls R107 (left or mono) and R108 (right channel) are used to adjust 10 kHz so that it matches the 1 kHz level established earlier on the test tape.

#### 3. Cue Detect Sensitivity

Cue tone detection in Delta Series reproducers is performed by a digital detector. Cue tones recorded in accordance with N.A.B. standards for frequency and level tolerance will operate the Delta digital cue detector. No adjustments are required.

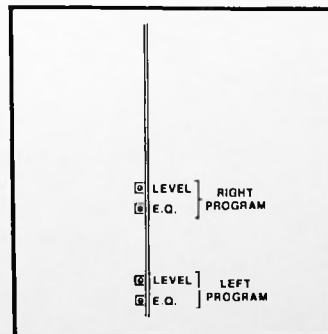


Figure 5-2

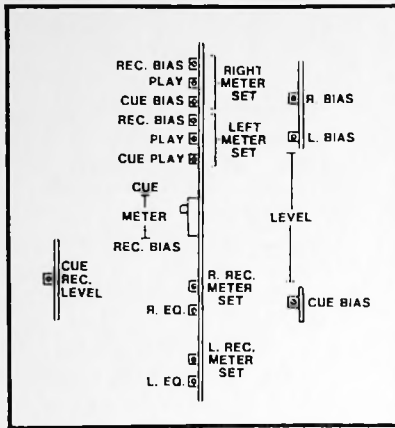


Figure 5-3

### C. RECORDER

#### 1. Input Level Strapping

- a. This "adjustment" involves only a strap position change if required. The strap positions accommodate a wide range of input reference levels to obtain optimum signal-to-noise and front panel level control positioning.
- b. Refer to the Record and Meter Amplifier card drawing found in Section VI.
- c. As shipped from ITC, the input strap is connected for a 0 dBm input level range. The "0" correspondence to a 0 VU meter reading when the level control is at its approximate mid-range position.
- d. To accommodate lower input reference levels, connect wire jumper W1001 (and W1002 for stereo) as indicated on the Record and Meter amplifier board drawing.

#### 2. Program Record Bias

NOTE: This procedure adjusts Program Recording Bias according to generally accepted practice for commonly available tape formulations. This procedure yields acceptable record performance (noise, distortion, and frequency response) on many of the tape oxide formulations available. However, this adjustment may vary slightly from one tape formulation to another, and

exact procedure should be determined by consulting the tape manufacturer.

- a. Prior to making any bias adjustments, confirm that the recording head azimuth (phase alignment) has been correctly adjusted as outlined in Section III.
  - b. While monitoring the respective playback output channel with a high impedance voltmeter, begin recording a 10 kHz tone at an indicated -10 VU level (front panel meter). Be certain the cartridge selected is typical of the type to be used in the machine; especially the type of magnetic tape.
  - c. Turn R1107 (mono or left channel) until a maximum output level of the 10 kHz tone is observed. Once this "peak" bias setting is found, continue to turn in a clockwise direction until the average level of the tone decreases 1 dB.
  - d. Repeat this procedure on the right channel, using R1108 to adjust the bias.
- #### 3. Program Record Equalization
- a. Connect the high impedance AC voltmeter to the respective playback program channel output. Be sure to properly load the output with 600 ohms.
  - b. Set the test tone generator to 1 kHz and set the front panel indicated Record level to -10 VU.
  - c. Observe the playback level on the voltmeter and adjust its range switch to a convenient reference reading.
  - d. Set the test tone generator to 10 kHz and observe the level on the external voltmeter. If the 10 kHz level differs from the 1 kHz tone, level, adjust R1005 on the Record/Meter Amp PC board until the 1 kHz and 10 kHz tones are indicated at equal levels.
  - e. Repeat this same procedure for the right channel using R1006.
- #### 4. Cue Bias
- a. Swap the left program playback head cable with the cue playback head cable.

b. While monitoring the left program playback output with a high impedance AC voltmeter, begin recording a continuous 8 kHz (tertiary) cue tone.

c. Adjust cue bias potentiometer R1131, located on the Bias Amp PC board. until a maximum output level of the 8 kHz cue tone is observed.

d. Alternately record a Primary cue tone (1 kHz cue record switch behind the front panel door) and a 9 kHz (tertiary) cue tone. The 8 kHz cue tone should be 10 dB lower in level than the 1 kHz tone. The 1975 NAB standards call for -10 dB nominal, -9 dB maximum, -13 dB minimum.

NOTE: The program playback amplifier must first be properly equalized from a calibration tape in order to make this adjustment.

#### 5. Cue Master Levels

The cue oscillator tones are generated by the microprocessor and are digitally controlled. The microprocessor determines the correct frequency and level. Therefore, there is only one control to adjust the cue oscillator circuitry. This control sets the levels of all other cue tones in proper relationship to the primary (1 kHz) tone.

a. With the head cables still connected as outlined in the previous Cue Bias procedure, record a 1 kHz Primary cue tone and observe the output level.

b. The Primary cue tone must playback at the same relative output level as the 1 kHz reference tone (160 nWb/m) used on the 1975 NAB standard alignment tape.

c. If cue level adjustment is required, turn trimmer R1228, located on the Recorder Logic Control PC Board, until the Primary cue tone is equal to the NAB standard reference tone of 1 kHz at 160 nWb/m.

#### NAB Cue Tone Level Standards (1976) Referenced to 160 nWb/m

	Nominal	Minimum	Maximum
1 kHz	0	-3	+1
150 Hz	+6	+3	+7
8 kHz	-10	-13	-9

d. Return the left program playback and cue playback head cables back to their original locations.

#### 6. Meter Calibration

The following adjustments are made with multi-turn potentiometers located on the Record/Meter Amp PC Board. Potentiometers are identified on the small sticker applied to the underside of the top cover (lid).

##### a. Program Play

-Select the PLAY meter switch position.

-Connect a 600 ohm load across the left or mono program playback output terminals.

-Insert and play an NAB standard reference level tape (1 kHz at 160 nWb/m) recorded level - 1975 standard). Adjust R1019 for a 0 VU indication.

-Repeat this procedure for the right channel if the machine is stereo. Use R1015 for calibrating the right PGM Play meter for 0 VU.

##### b. Normal Record

-Select the PGM PLAY meter switch position.

-Place the machine into the recording mode and select function #1 of the test tone generator (1 kHz at 0 VU).

-Select the REC meter switch position and observe the level(s).

-Use R1022 to obtain a 0 VU indication for the left channel (or mono).

-Use R1018 to adjust the right meter to read 0 VU.

c. Program Bias

- Select the PGM Bias meter switch.
- Insert an erased cartridge, press REC and START.
- Adjust the left channel (mono) program bias trimmer R1020 for a 0 VU reading on the left channel meter.
- Repeat this same procedure for the right channel using trimmer R1016.

d. Cue Bias\*

- Select the CUE BIAS meter switch.
- Insert an erased cartridge and press START.
- While pressing and holding the TER (tertiary) cue switch, adjust potentiometer R1017 for a 0 VU reading on the front panel meter (right meter).

e. Cue Play\*

- Select the CUE PLAY meter switch.
- Insert an erased cartridge tape and press START.
- Press the 1 kHz CUE REC switch. A meter deflection for approximately 3/4 of a second in length will be observed. The point at which the meter settles in the last 1/4 second is the point at which 0 VU should be calibrated.
- Adjust R1021 to calibrate the Cue play metering to read 0 VU.

\*Note: Since the Delta IV features combination metering of Cue Bias and Cue Play, pay particular attention to Cue Bias indication on one meter, simultaneous with Cue Reproduce levels indicated on the other. Refer to the metering chart in Section II for details.



## SECTION VI - PRINCIPLES OF OPERATION

### A. POWER SUPPLY SYSTEMS

#### 1. Reproducers

Delta Series components utilize multiple voltage power supplies to operate the solenoids, amplifiers, logic and lamps. Main A.C. power is connected to the unit via the power cord and a rear-panel instrumentation-type connector. The power is routed through a fuse holder capable of using either American 3-AG sized fuses, or 5 x 20 mm fuses commonly used in Europe. A dual primary toroidal power transformer is mounted inside the mainframe, and may be used on either 120 volt A.C., or 240 volt A.C. mains. Mains voltage selection is accomplished by wiring the primaries in parallel (120 V.A.C.) or Series (240 V.A.C.). All units may be operated on either 50 Hz or 60 Hz voltages.

Transformer secondary number 1, Orange-Black/Black-Orange, supplies low voltage A.C. to the full wave rectifier CR705, CR706, and is filtered by the input capacitor, a 15,000 mfd electrolytic. DC voltage at this point is approximately +14 V.D.C. This voltage is passed to the rear panel for further use in the Record Amplifier and to a 7805 voltage regulator. Regulator output is +5 V.D.C. regulated. It is used for operation of the logic circuits, illumination of internal lamps, and is available at the rear panel for use with external lamps as well.

Secondary number 2, Red-Yellow/Yellow-Red, runs the amplifier power supplies. Medium voltage A.C. is supplied to full wave bridge rectifier CR715, 716, 717, and 718. The bridge outputs both + and - voltages. These voltages, approximately +30 volts, are fed to two 2200 mfd filter capacitors (6800 in Delta III units) and then to two 15 volt regulators, one +15 volt 7815 and one -15 volt 7915. The regulated +15 volt supply voltages are used to run amplifiers in the reproducers.

Unregulated D.C. from the 5 volt and + 15 volt supplies are routed through

the rear panel interconnect for use in separate regulators used in the Delta IV Record Amplifier.

#### 2. Record Amplifier

Unregulated D.C. from the reproducer (+14 volts, and + 30 volts) are brought in via the interconnect cable and the rear panel connector. Record Amplifier power supplies are similar to those used in the reproducers. Unregulated DC is supplied to three I.C. voltage regulators, a 7805, 7815, and 7915, and connected to their respective loads. The +5 volt supply operates the logic and lamps, while the +15 volts supply is used in analog circuits.

It is important to remember when servicing, that failure of one supply may affect other supplies even though they have separate regulators and filters. It should also be noted that a low-voltage/high current condition will be created if the toroid transformer "top mounting plate" is electrically connected to ground. Toroid transformers are highly efficient devices, and radiate little heat or field when in operation. Irrespective of this, an appreciation of their operating characteristics will facilitate servicing.

#### TYPICAL VOLTAGE AND CURRENT REQUIREMENTS

Delta I, II	DC Current In Milliampères		
	+15V	-15 V	+5V
Motor	700		
Motor Control			60
Play Logic			500
Lamps			300
Cue Amplifiers	45	45	
Play Amplifiers	135	135	
Relays			180
Total	880	180	1040

Delta III			
Motor	700		
Motor Control			60
Play Logic			500
Lamps			300
Cue Amplifiers	135	135	
Play Amplifiers	405	405	
Relays			540
Totals	1240	540	1520

Delta IV			
Lamps			180
Record Logic			218
Amplifiers	225	225	
Total	225	225	398

Currents indicated are "typical," and will vary from machine to machine, depending on model variations, accessory loading, and external conditions.

#### B. REPRODUCE AMPLIFIER AND AUDIO OUTPUT

Reproduce Amplifier cards loaded for stereo use utilize two identical audio circuits. Therefore only one audio channel will be discussed for simplicity. Connections to the input stage are via ferrite beads and terminate into the head loading circuit R101, C101, and the base of Q101. Q101 is an input buffer stage which electrically isolates the reproduce head from U101 during power up and power down. The collector connects to -15 VDC. The emitter connects to +15 VDC via an RC decoupling (filtering) network consisting of RP101 and C103. The buffer stage prevents any DC voltage transients appearing at U101 pin 3 during power up/down from reaching and magnetizing the head.

U101 is the head preamp and high frequency equalizer. This stage has high gain and utilizes a low noise 5534AN opamp IC. High frequency gain is controlled by R107 in the feedback loop. Changing equalization standards is accomplished by changing the value of R105. Preamp output is nominally +2 dBm at 1 kHz referenced to 160 nW/m flux level. Audio output level is set by R109, at the output of this stage.

Audio is AC coupled to the analog switch, U107, via C111. U107, a 4052 BC

CMOS switch is powered by + 7.5 volts which is obtained by dividing down the on-board + 15 VDC supplies. Audio enters the switch on pin 11, and exits on pin 13 (pins 4 and 3 for the right channel). R115 and R116 resistors control the gates of U107. During "mute," U107 pin 9 is pulled low, and no audio passes. Muting logic "low" is supplied by the play microprocessor.

Audio from the analog switch is routed to half of U103 as a driver for the phase inverter half of U105. It is a combination medium-gain 23 dB buffer. Audio from U103 is phase inverted in U105 and routed to the second half (-) input of U105, while being routed directly to U103. The audio appearing on the inputs of U103 and U105 are 180° out of phase. Feedback for the output stages is cross coupled via other RP107 sections. In a transformer-coupled output, the output amplifiers are DC coupled to the transformer primary. When operating in a balanced-transformerless output configuration, output audio is AC coupled via a 220 mfd nonpolarized capacitor in each output leg. Should the output become unbalanced with one side shorted to ground, the cross-coupled feedback scheme compensates for the grounded condition. It "adjusts" the gain of the remaining functioning output section.

#### C. PLAY LOGIC

The play logic is the heart of the machine, in that all activity of the machine is monitored and controlled by the on-board microprocessor. Delta Series units utilize an 8048/8748 microprocessor. This is an 8-bit processor with 1K ROM. All machine functions are programmed into software contained in the memory. The Play Logic card contains the microprocessor clock, input multiplexers, output buffers, and divider chains for motor control. The motor circuits will be discussed in a later section.

Clock frequency for the play processor is 5.22350 MHz, and is crystal controlled. The 8048/8748 contains internal clock driver circuits and will oper-

ate from a crystal attached directly to pins 2 and 3. C219 and C220 form a portion of the oscillator circuit.

All Delta Series Play Logic cards contain hardware and software to be used in ANY Delta reproducer. A single deck Delta I play logic board may be directly replaced by a three deck Delta III board, and vice-versa. Delta I units use the input and output circuitry designated for the BOTTOM deck of a Delta III logic card. Inputs and outputs to the logic board are via the PCB edge connector. This occurs where it interfaces with the front panel switches and lamps, internal control lines to other circuits, and to the two rear panel connectors for Remote Control and interface with the add-on Delta IV Record amplifier. Due to its utility design, it is practical for a station to have a spare play logic board to be used for backing up several Delta model playback machines in service.

The Delta system uses active low logic. Ground going signals activate the various logic functions. Data inputs to the processor are via U203, a 16 bit multiplexing gate, and U204, an 8 bit multiplexing gate. Logic inputs to the multiplexers are held logic "HI" by 330 ohm pullups in RP201, 202, 203, and 204. In addition, external input lines are debounced with .1 mfd capacitors to ground. The combination of the 330 ohm "hard" pullup, and the .1 mfd debounce capacitors make the Delta logic relatively noise immune.

A "low" input from the cart switch, pin 19 of the edge connector, causes the processor to execute a software "cart loaded" sequence. Among other things, the processor outputs a "low" on pin 34, READY, which provides a low output at pin 5 of U209, a 75451 peripheral driver. This low causes the ready lamp to illuminate, giving the operator a visual indication the cart is correctly loaded and the processor is prepared for the start sequence. Pressing the START switch pulls pin 21 of U203 low, which outputs a signal to the processor via pins 11, 13, 14, and 15. Once the processor recognizes this condition, it outputs a low on pin 31, U201, to unmute

the audio; a low on pin 30 to energize the solenoid; and a low on pin 33 to turn on the RUN lamp. Likewise, the "READY" line goes high to extinguish the READY lamp. The processor also outputs a 100 millisecond low on pin 29, the AUX START pulse line. This line is a user line and may be used to remote start or reset an auxiliary piece of equipment such as a turntable or timer. All other circuits in the Delta logic work in a similar manner.

IC's on the logic board are bypassed with .1 mfd capacitors. Furthermore, an on-board 47 mfd electrolytic is used to decouple the +5 volt coming in from the power supply. At power up, the microprocessor is reset by a 1 mfd capacitor on pin 4 of U201. This pin will stay "low" for a brief time after power up until C221 charges up.

During machine operation, U201 pin 11, (ALE), outputs a pulse train that is 1/15th the master clock frequency. This pin is used as the master clock for the servo motor circuits and may be used as a convenient frequency test point.

Software contained in the U201 processor is unique. It is used in single deck reproducers, three deck reproducers and on the record logic board as well! Support hardware for the processor on the Record Logic board is significantly different than that of the Play Logic board, but the software in the microprocessor contains both the playback and recorder programs. For this reason, a single Delta microprocessor chip may be used as an emergency spare for either record or play logic boards.

Several user selectable jumpers on the play logic board enable the selection of several operational variations. Jumpers A, B, and C select "standard" motor speed. Units are shipped with B jumpered, to set normal motor/tape speed at 7.5 IPS. Jumper A selects 3.75 IPS, and Jumper C selects 15 IPS. These will be discussed in greater detail in the section for Motor and Servo Amplifier. All Delta units utilize DC servo motors which generate very little heat or electrical noise, and are designed for continuous duty. Therefore, no clear advantages are known to have the motor

run "intermittent" duty, other than a very slight improvement of control room ambient mechanical noise. Jumper F selects the flashing READY lamp provision, and Jumper G engages the repeat play lockout feature.

Since the 8048/8748 software is interchangeable between Play and Record logic boards, a system had to be devised whereby the processor "knows" which software to use. Pin 39, the T1 pin is used to electrically signal the processor which software to use. In reproducers, pin 39 is held "low" by U204 pin 6. In recorders, this pin is held "high" by a pullup to +5 volts. The processor uses this pin to recognize which software sections to use.

#### D. RECORD LOGIC

The record Logic PCB is located in the Delta IV Record Amplifier chassis, and executes and monitors all recording functions. Although it functions separately from the play processor and logic circuits, data transfer between it and the play processor is required for orderly machine functions. Serial data is transferred into the Record processor via pin 16 from the reproducer, and back out on pin 27. This allows a logical "handshake" between the two processors as they attend to their respective duties. The data they exchange is serial, digital logic level, and in a unique "language." For this reason, data exchange is ongoing during the various machine functions. Due to the complexity it will not be discussed in detail.

Logical inputs from the front panel and remote connector are inputted on pins 12 through 19 of U1201. As in the Play Logic, all digital circuits are "Active Low." Since the processor uses software programs common to the Play Logic processor, pin 39 of U1201 is pulled up to +V<sub>CC</sub> to identify to the processor that it is being used on a Record Logic board. See the discussion regarding this in the Play Logic section. Other specific functions of the Record logic will be detailed according to major circuit function.

Power-up reset is performed by C1207. Pin 4 of U1201 will be held low for a short period of time after power-up until C1207 charges up. The "low" condition on pin 4 of U1201 causes the processor to reset itself to a programmed starting point, and causes all outputs to be set to a predetermined state. This insures the processor and its software are prepared to begin operating from a known starting point.

Processor clock functions are similar to those discussed for the play processor with the exception that a crystal frequency of 3.579 MHz is used.

The processor ALE line, pin 11 of U1201, outputs a pulse train that is 1/15th the master clock frequency. This frequency is divided down and used to generate bias for the program and cue tones. The ALE frequency, 238.6 kHz, is variously divided by U1203, U1204, and U1205, then gated by U1206A, U1206B, U1206C, and U1206D to output a pulse train to the bias and cue generator circuits.

#### Bias Generation

The ALE frequency is fed into U1204 pin 1, divided by two, and output via pin 3, U1204 to the bias gate U1206A, pin 1. When the processor calls for bias, U1206A pin 2 is pulled low, and enables the output U1206A pin 3 to provide 119.3 kHz square waves to U1207A. Simultaneously, processor U1201 pin 22 goes low, enabling the bias ramp circuit U1208A. The result is a fast ramp "on" of bias occurring at the board edge connector pin 8. This square wave signal (119.3 kHz) is routed to the bias card for further signal conditioning and ultimately to the record heads.

#### Cue Tone Generation

The ALE frequency fed to U1204 pin 1 (as above) is divided by 16 and output at U1204 pin 6 at a frequency of 14,914 Hz. This is fed to U1205 Pin 4, and routed through two sequential divide-by-ten circuits. This divide-by-100 outputs a square wave on Pin 13, U1205, at a

frequency of 149.14 Hz. It is routed to U1206B pin 4. The processor logic line (low during 150 Hz tone generation) is fed to pin 5 of U1206. When the processor logic is "low" on pin 5, U1206B pin 6 outputs the 149.14 Hz square wave into U1209A. U1209A and B comprise a 4-pole low pass filter with an approximate 24 db per decade slope. This filter sharply attenuates the "harmonic" content of the square wave so that the output, pin 9 of U1209B is a virtual sine wave. This signal is AC coupled to U1208B which is a variable gain buffer/ mixer and provides "audio" to the cue circuits on the bias board.

1 kHz and 8 kHz cue tones are generated in a similar manner. The ALE signal 238.6 kHz, is routed to U1203 pin 6, a divide by 15. The output, 15,909 Hz, is routed to U1204 pin 13, which outputs a 7954.5 Hz after a divide by two, and a 994.3 Hz after a divide by 16. These, of course, become the "8 kHz," and "1 kHz" cue tones after appropriate filtering. The control of these tones is provided by processor ports on U1201, pins 36, 37, and 35 and are "gated" on or off by the processor. All three cue tones are actively mixed at the input of U1208D. R1228, located in the U1208D feedback circuit, is used to adjust the Master cue tone levels. The proper level relationship between the three cue tones is set by fixed resistors. An "extra" input to the cue audio circuit is provided via a rear-panel connector pin so that external sources, such as F.S.K. generators may be connected to the Delta IV Record Amplifier. This audio is A.C. coupled through C1223 and actively mixed with the other cue signals at the input of U1208D.

#### Head Control

The record processor executes an electronic "on" or "off" for the program and cue record heads. This is done to minimize any bias turn on or turn off transients being introduced onto tape. The logic lines are pins 23 and 24 of U1201 and they go "low" to turn on their respective heads. These logic lines are connected to the output of the bias

amplifier circuit, where the head control transistors are located.

#### **E. CUE TONE DETECTOR**

The digital cue tone detector is located on the reproduce amplifier board. The detector system consists of an equalized preamplifier, a fixed gain buffer stage, four band-pass filters, a microprocessor, logic outputs to the relay drivers, and logic outputs to the transport control microprocessor.

Audio from the play head cue track is fed into a high gain fixed equalization preamplifier, U108. It is coupled to the second half of U108, which increases signal level and drives the four band-pass filters. Three of these filters are center-tuned for the N.A.B. cue tone frequencies of 1 kHz, 150 Hz, and 8 kHz. A fourth section is band-tuned to 3 kHz and is used to detect the 1 kHz cue tone when the deck is in "High Speed." Each filter outputs one of four sections of components U110. These squaring circuits in turn are routed to separate inputs of the microprocessor. Programs in the cue detect microprocessor contain the necessary memory routines to "measure" the frequency of the incoming signals from the squaring circuits. Depending on the frequency, the cue detect microprocessor outputs logic "1" or logic "0" to the appropriate support devices.

Logic outputs from the cue detect microprocessor drive the transport logic (1 kHz and 3 kHz tones), and the output peripheral drivers (150 Hz and 8 kHz tones). U112 provides the drive for 150 Hz and 8 kHz relays. Logic (for EOM signaling) and 1 kHz "STOP" outputs directly from microprocessor U111.

A user selectable jumper enables either, neither, or both the 150 Hz and 8 kHz cue tones to engage the End of Message (EOM) sequence. This consists of: 1) muting the audio; 2) switching the motor to high speed; and 3) enabling the 3 kHz cue detector via a processor input (low) at pin 13 of the card edge connector. Jumpers are used to provide an open-collector output (to ground) upon detection of the 150 Hz or 8 kHz cue tones.

## F. MOTOR CONTROL AND MOTOR

The motor and motor control circuits comprise a highly precision crystal referenced electro-mechanical tape drive system consisting of the motor and its support circuits. The motor circuits are mounted on a small printed circuit board adjacent to the motor.

The motor is D.C. operated. It has an integral 120 pole tachometer and tachometer ring located inside the bottom of the rotor. There are 3 hall-effect sensors located mechanically 120 degrees apart. They are used for sensing the rotating position of the rotor/shaft, and a 3-phase Y connected stator. Connection to the control circuit is via a multiple conductor mass-termination type connector, which provides all operating D.C. voltages and signals.

Clock reference frequencies are determined by user-programmable dividers located on the Play Logic board. The output reference square wave frequency is divided down from the microprocessor master clock via the ALE line from the processor (1/15th the clock master frequency), U213 and U216, a pair of dividers. The output of U216, pins 3 and 12, is a square wave which serves as the motor clock reference, and drives U215, a phase comparator.

Simultaneously, the motor-mounted tachometer outputs an analog signal to U301A, a high gain "squaring circuit" and low pass filter. This signal is fed to the base of Q301, which forms an open collector type driver that outputs a square wave pulse train back to pin 1 of U215 on the play logic board.

U215 pin 9 receives the clock reference pulse train, while pin 1 receives the pulse train from the motor tachometer circuit. U215 is a dual one-shot which outputs an approximate 5 micro-second pulse on each output (pin 5 for the reference oscillator, and pin 13 for the motor tachometer). U215 is active high, and outputs pulses to U214, a bi-directional 4 bit shift register. Tach pulses from U215 pin 13 shifts a "high" in U216 from  $Q_A$  to  $Q_B$ ,  $Q_B$  to  $Q_C$ ,  $Q_C$  to  $Q_D$ . Reference clock pulses from U215 pin 5 shifts a low to  $Q_D$ ,

$Q_D$  to  $Q_C$ ,  $Q_C$  to  $Q_B$ ,  $Q_B$  to  $Q_A$ . This action produces an output from U216 that represents an "error" signal representing the difference between the reference frequency and the tachometer frequency. This output, pin 2 and 12 of U214 is "low" when the reference frequency is greater than the tach frequency. It is "high" when the tach frequency is greater than the reference frequency. When the motor (tachometer) is running at the "correct" speed, U214 pins 2 and 12 output a square wave pulse train equal in frequency to the reference frequency and at an approximate 75% duty cycle. This pulse is equal to the phase difference between the reference pulses and the tachometer pulses. This signal is outputted to the microprocessor for monitoring the motor "condition" and also outputted back to the motor control card for further conditioning.

Duty cycle pulses from the Play Logic board are routed to U301C on the motor control board, which is configured as a low pass filter (LPF). The output of the LPF is a DC voltage that is proportional to the motor's Duty Cycle.

In a similar manner, tachometer square waves from the output of U301A are filtered heavily and routed via R303 to the inverting input of U301D. DC from the LPF is routed to the non-inverting input of U301D where the two signals are combined. U301D performs multiple functions, but primarily functions as a summing amplifier for DC levels from the tachometer and duty cycle circuits. The outputs of U301D is a DC level that is the "sum" of the input voltages. It is used to set the nominal operating current of the motor stator drivers Q302, Q303, and Q304. R327 provides motor current sense feedback via the emitters of commutation transistors Q306, Q308, and Q310. This allows U301D to monitor activity in the motor windings and limit current, remove high frequency switching transients, and provide smoother commutation. The emitter of Q306, Q308, and Q310 are located .1 ohms above ground by R328. This allows accurate current flow monitoring via R327 back to U301D, and serves as a

motor "fault" detector. The fault detector shuts off the amplifier circuits should the motor stall or fail, and provides the necessary "feedback" required to start the motor at each initial power-up. Motor "fault" detector is performed by U301B.

### Operation

#### 1. Normal

Tach signal is filtered by R306, CR301 and C302. This position voltage DC level is compared to a fixed voltage set by R307 and R308 by U310B. When the motor is running, the output of U301B, is at the positive supply. This provides the duty cycle adjust potentiometer R303 with the proper voltage.

#### 2. Fault

When the tach signal is lost, U301B will swing to the negative supply rail. This action causes a negative voltage level to be fed to the negative input of U301D via R303. This forces the output of U301D to a higher positive voltage which prohibits current to the drive transistors.

#### 3. Power Up

C303 serves to disable the fault detector during power up by holding the comparator, U301B, to a positive output state.

Commutation logic is controlled by three Hall-effect devices located internal to the motor, 120 degrees of motor rotation apart. As the motor rotor rotates, the Hall-effect devices output a "low" to U302 A, B, or C, depending upon the degree of rotation. These, in turn, sequentially turn on drivers Q302, Q303, and Q304 via commutation logic U303 A, B, C, and D, and U304 A, B, C, and D.

The motor utilizes a 3 phase "Y" connected floating common stator. These are driven by commutation transistors Q305, Q306, Q307, Q308, Q309, and Q310. Each winding uses a pair of transistors, one for "positive" current flow and one for "negative" current flow. "Positive" current is defined as from the end of

the leg to the center of the "Y." Because of the three windings, and the "pair" of commutation transistors for each leg, and a total of six current paths through the windings, a total of twelve commutation "strokes" per revolution is achieved.

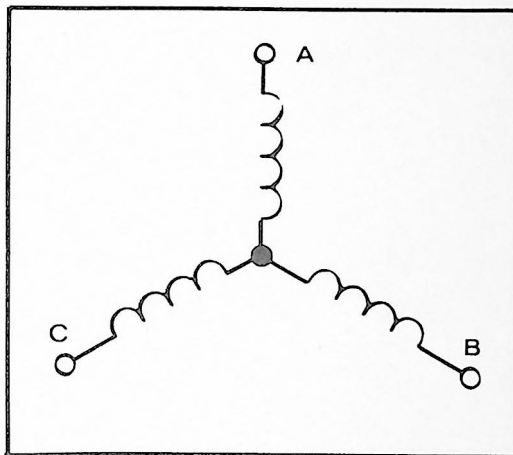


Figure 6-1

Electrical Degree	"Positive" I	"Negative" I
0° - 60°	A	B
60° - 120°	A	C
120° - 180°	B	C
180° - 240°	B	A
240° - 300°	C	A
300° - 360°	C	B

### G. SOLENOID CONTROL

Run voltage for solenoid operation is provided by rectification of the mains A.C. voltage in a full wave bridge comprised of CR701, 702, 703, and 704. High level DC is fed via R701 to the solenoid, then returns to the collectors of Q701 and Q702, configured as a Darlington pair. Solenoid control (a "low"-going signal, 5-volt logic level) is originated by the play logic board. The processor produces a logic "0" which turns off U701 through inverter U205B, allowing Q701 and Q702 to saturate, pul-

ling in the solenoid. A logic "1," inverted by U205B, saturates the Darling-  
ton in U701 shunting the base supply  
current for Q701 and Q702, causing them  
to turn off, and the solenoid to drop  
out.

#### H. RECORD AMPLIFIER

Recording amplifiers for left and  
right channels are identical, and there-  
fore only the left (mono) recording am-  
plifier will be discussed. Audio from  
the rear panel XLR connector and trans-  
former is routed to differential input  
amplifier U1001. Nominal input level is  
set to +6 dBm, but may be set to -6 dBm  
by installing W1001 wire jumper. This  
jumper changes the stage gain by adding  
a 3.3K resistor, R1001, to the circuit.  
U1001 (third section) is a summing am-  
plifier that provides differential input  
summing and acts as a buffer/driver for  
the front panel level control. Audio is  
AC coupled to the front panel level con-  
trol, and then to equalization amplifier  
U1001 (fourth section). High frequency  
equalization is done in the feedback  
circuit of this stage, and is controlled  
by R1005. C1009 is factory loaded to  
provide 1964 NAB record equalization,  
but is shorted by wire jumper W1003 for  
1976 NAB equalization. Audio output  
from this amplifier is routed to the  
Bias PC card.

#### I. METER AMPLIFIER

Metering functions internal to the  
Delta Series are monitored by an elec-  
tronically switched amplifier and recti-  
fier located on the Record Amplifier PC  
card. Monitored signals from various  
circuits are routed to an analog switch  
U1003 via calibration potentiometers  
R1015 through R1022. U1003 is a dual 4  
input CMOS analog switch that is selec-  
tively controlled by the two front panel  
meter switches and the on-board slide  
switch S1001.

The "selected" signal is output to  
the meter amplifier U1004 and then to  
the full wave meter bridge CR1001, 1003,  
1005, and 1007. The resulting signal is  
fed to the front panel meter for mechan-

ical display. The "right" channel cir-  
cuit is similar and will not be discus-  
sed.

#### J. BIAS AMPLIFIER

Program and cue record circuits uti-  
lize a common source of bias. The bias  
frequency originates as a square wave  
from the Record microprocessor clock and  
is divided down to 119.3 kHz on the Re-  
cord Logic PC board. The square waves  
require significant modification before  
they may be used as bias (sine waves) at  
the record heads. Two sections of U1101  
comprise a low pass filter which sharply  
attenuates the "harmonic" content of the  
square wave, so that the output is a low  
distortion sine wave at 119.3 kHz. The  
signal is then AC coupled to the bias  
level potentiometers R1107, R1108, and  
R1131 for use by the left, right, and  
cue head drivers.

Cue tones from the Record Logic card  
are fed to U1104 by way of C1125 and  
R1132. U1104 is the cue head driver,  
where bias and audio are summed. Summing  
of audio and bias signals at the virtual  
ground (-) input of U1104 eliminates the  
need for an audio bias trap. The output  
of U1104 is bias-plus-audio. Q1103  
which controls head "turn-on." Cue head  
enable logic originates at the Record  
microprocessor, and a "low" at the PCB  
edge connector pin V initials the se-  
quence.

One section of U1101 is an integrator,  
which ramps the head switch slowly on  
and off. The RC combination C1102 and  
R1102 determine the head on/off tran-  
sition time, and CR1102 provides the  
necessary steering for the gate of  
Q1103. Another section of U1101 is the  
program head integrator, and functions  
in a like manner.

Program audio is routed to the head  
driver U1102 from the program recording  
amplifier. Its operation is very sim-  
ilar to that of U1104 (cue), except for  
an additional circuit function. C1107  
and R1113 provide phase shift at audio  
frequencies, a form of group delay com-  
pensation. U1104 is unity gain at all  
frequencies. However, as input frequen-  
cies increase, the output signal leads  
the input signal in phase. This group



delay is used to compensate for a lagging phase shift which occurs in the playback system. It is caused by the combined effects of the reproduce head, equalizers, and others. The net result is that complex high speed signals may

be more accurately recorded and reproduced. The right program channel is identical, and it will not be discussed.

Record heads are parallel resonated via C1115, C1116, and C1130.

DELTA REPRODUCE AMPLIFIER & CUE DETECT BOARD 831-0286 PARTS LIST

STEREO, 1975 EQ.  
RELAY OUTPUTS WITH 150 HZ EOM VERSION

CAPACITORS

C101	1	677-0001-000	CAPACITOR, SILVER MICA, 100 PFD, 300 V
C102	1	677-0001-000	CAPACITOR, SILVER MICA, 100 PFD, 300 V
C103	1	695-1335-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 10 UFD., 35 V
C104	1	695-1335-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 10 UFD., 35 V
C105	1	695-1106-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 220 UFD., 6.3 V
C106	1	695-1106-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 220 UFD., 6.3 V
C107	1	695-1106-013	CAPACITOR, POLYESTER FILM, .0068 UFD., 100 V, 5%
C108	1	680-1101-033	CAPACITOR, POLYPROPYLENE, .0068 UFD., 100 V, 5%
C109	1	678-0763-033	CAPACITOR, POLYPROPYLENE, 680 PFD, 63V, 5%
C110	1	695-1335-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 10 UFD., 35 V
C111	1	695-1335-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 10 UFD., 35 V
C112	1	695-1335-013	CAPACITOR, SILVER MICA, 47 PFD., 300V
C113	1	677-0005-000	CAPACITOR, SILVER MICA, 47 PFD., 300V
C114	1	677-0014-000	CAPACITOR, SILVER MICA, 68 PFD., 300V
C115	1	695-1335-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 10 UFD., 35 V
C116	1	695-1335-013	CAPACITOR, POLYESTER FILM, .015 UFD., 63V, 5%
C117	1	680-1563-033	CAPACITOR, SILVER MICA, 22 PFD., 300V
C118	1	677-0008-000	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C119	1	695-1716-013	CAPACITOR, POLYPROPYLENE, 220 PFD., 63V, 5%
C120	1	678-0163-033	CAPACITOR, POLYESTER FILM, .022 UFD., 63V, 5%
C121	1	680-1763-033	CAPACITOR, POLYESTER FILM, .022 UFD., 63V, 5%
C122	1	680-1763-033	CAPACITOR, POLYESTER FILM, .0033 UFD., 100V, 5%
C123	1	680-0701-033	CAPACITOR, POLYESTER FILM, .0033 UFD., 100V, 5%
C124	1	680-0701-033	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%
C125	1	680-0101-033	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%
C126	1	680-0101-033	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%
C127	1	678-0363-033	CAPACITOR, POLYPROPYLENE, 330 PFD., 63V, 5%
C128	1	678-0363-033	CAPACITOR, POLYPROPYLENE, 470 PFD., 63V, 5%
C129	1	686-0011-000	CAPACITOR, CERAMIC, 15 PFD., 1000 WDC, 20%
C130	1	694-0005-000	CAPACITOR, TANTALUM, 1 UFD., 35 V, 20%, RADIAL
C131	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C132	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C133	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C134	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C135	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C136	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C137	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C138	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C139	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C140	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C141	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C142	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C143	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C144	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C145	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C146	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C147	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C148	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C149	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C150	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C151	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%

RESISTOR NETWORKS

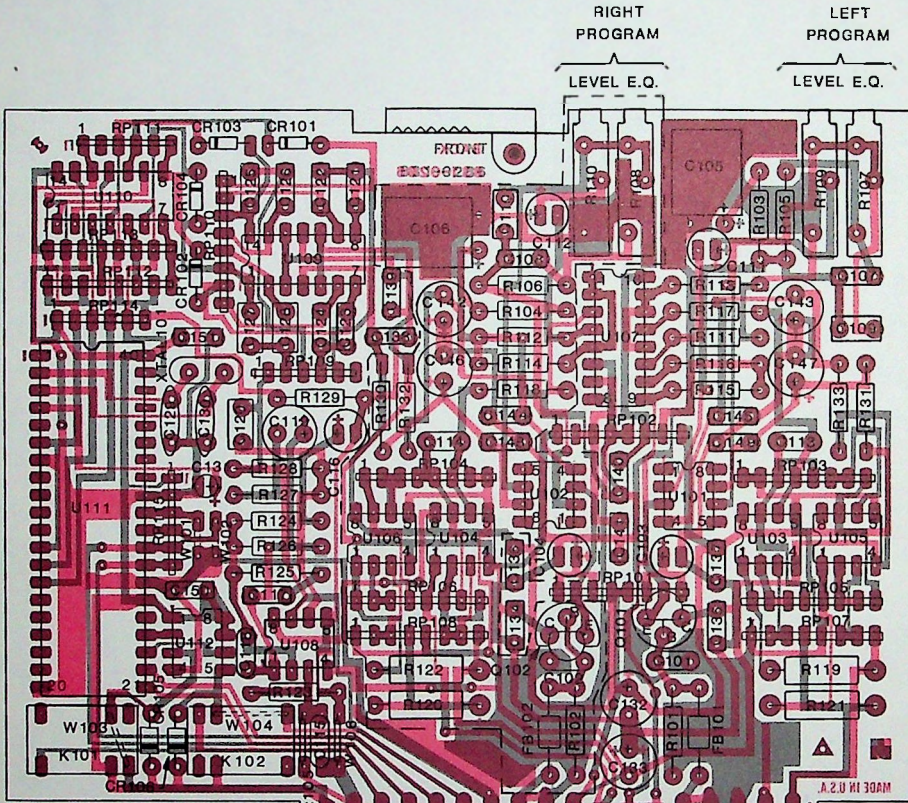
RP101	1	631-0032-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 47K, 2%
RP102	1	631-0030-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP103	1	631-0032-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 47K, 2%
RP104	1	631-0032-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 47K, 2%
RP105	1	631-0030-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP106	1	631-0030-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP107	1	631-0036-001	RESISTOR, NETWORK, SEP. SIP, CUSTOM, 4.7K/5.6K/4.
RP108	1	631-0036-001	RESISTOR, NETWORK, SEP. SIP, CUSTOM, 4.7K/5.6K/4.
RP109	1	631-0039-000	RESISTOR, ARRAY, COMMON SIP, 5R, 4.7K, 2%
RP110	1	631-0040-000	RESISTOR, ARRAY, COMMON SIP, 5R, 4.7K, 2%
RP111	1	631-0039-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 470K, 2%
RP112	1	631-0032-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 47K, 2%
RP113	1	631-0032-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 47K, 2%
RP114	1	631-0039-000	RESISTOR, ARRAY, COMMON SIP, 5R, 4.7K, 2%
RP115	1	631-0039-000	RESISTOR, ARRAY, COMMON SIP, 5R, 4.7K, 2%

RESISTORS

R101	1	630-0115-000	RESISTOR, CARBON FILM, 150K OHM, 1/4 W, 5%
R102	1	630-0115-000	RESISTOR, CARBON FILM, 150K OHM, 1/4 W, 5%
R103	1	630-0033-000	RESISTOR, CARBON FILM, 56 OHM, 1/4 W, 5%
R104	1	630-0033-000	RESISTOR, CARBON FILM, 56 OHM, 1/4 W, 5%
R105	1	630-0129-000	RESISTOR, CARBON FILM, 560K OHM, 1/4 W, 5%
R106	1	630-0129-000	RESISTOR, CARBON FILM, 560K OHM, 1/4 W, 5%
R107	1	636-0031-000	POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R108	1	636-0031-000	POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R109	1	636-0031-000	POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R110	1	636-0031-000	POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R111	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%
R112	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%
R113	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%
R114	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%
R115	1	630-0079-000	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
R116	1	630-0079-000	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
R117	1	630-0075-000	RESISTOR, CARBON FILM, 3.3K OHM, 1/4W, 5%
R118	1	630-0075-000	RESISTOR, CARBON FILM, 3.3K OHM, 1/4W, 5%
R119	1	630-0075-000	RESISTOR, CARBON FILM, 7% OHM, 1/2 W, 5%
R120	1	630-0238-000	RESISTOR, CARBON FILM, 7% OHM, 1/2 W, 5%
R121	1	630-0238-000	RESISTOR, CARBON FILM, 7% OHM, 1/2 W, 5%
R122	1	630-0238-000	RESISTOR, CARBON FILM, 7% OHM, 1/2 W, 5%
R123	1	630-0238-000	RESISTOR, CARBON FILM, 7% OHM, 1/2 W, 5%
R124	1	630-0115-000	RESISTOR, CARBON FILM, 150K OHM, 1/4 W, 5%
R125	1	630-0093-000	RESISTOR, CARBON FILM, 18K OHM, 1/4 W, 5%
R126	1	630-0115-000	RESISTOR, CARBON FILM, 150K OHM, 1/4 W, 5%
R127	1	630-0093-000	RESISTOR, CARBON FILM, 18K OHM, 1/4 W, 5%
R128	1	630-0079-000	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
R129	1	630-0079-000	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
R130	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%
R131	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%
R132	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%
R133	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%
R134	1	629-0001-000	RESISTOR, ZERO OHM, 1/4 W

## SOCKETS

Q101	1	613-0004-001	PAD, TRANSISTOR, #7717-137N
Q102	1	613-0004-001	PAD, TRANSISTOR, #7717-137N
U101	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
U102	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
U103	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
U104	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
U105	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
U106	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
U107	1	613-0009-000	SOCKET, IC, 16 PIN, DIP
U108	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
U109	1	613-0008-000	SOCKET, IC, 14 PIN, DIP
U110	1	613-0008-000	SOCKET, IC, 14 PIN, DIP
U111	1	613-0017-000	SOCKET, IC, 40 PIN, DIP
U112	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
SEMI-CONDUCTORS			
Q101	1	590-0031-000	TRANSISTOR, 2N5087 PNP, LOW NOISE
Q102	1	590-0031-000	TRANSISTOR, 2N5087 PNP, LOW NOISE
U101	1	608-0024-000	IC, NE534AN, LOW NOISE, SINGLE AUDIO OP AMP
U102	1	608-0024-000	IC, NE534AN, LOW NOISE, SINGLE AUDIO OP AMP
U103	1	608-0021-000	IC, NE532N, DUAL AUDIO OP AMP
U104	1	608-0021-000	IC, NE532N, DUAL AUDIO OP AMP
U105	1	608-0021-000	IC, NE532N, DUAL AUDIO OP AMP
U106	1	608-0021-000	IC, NE532N, DUAL AUDIO OP AMP
U107	1	608-0004-000	IC, MC14052BC, CMOS DUAL 4-1 MULTIPLEX W/DECODE
U108	1	608-0014-000	IC, TL072CP, DUAL BI-FET OP AMP
U109	1	608-0015-000	IC, TL084CP, QUAD BI-FET OP AMP
U110	1	609-0002-000	IC, LM339N, QUAD VOLTAGE COMPARATOR
U111	1	610-0006-000	IC, 8748, MICRO-PROCESSOR, EPROM, ERASED
U112	1	607-0009-000	IC, 75451, DUAL PERIPHERAL AND DRIVER
CR101	1	575-0031-000	DIODE, SMALL SIGNAL IN4448
CR102	1	575-0031-000	DIODE, SMALL SIGNAL IN4448
CR103	1	575-0031-000	DIODE, SMALL SIGNAL IN4448
CR104	1	575-0031-000	DIODE, SMALL SIGNAL IN4448
CR105	1	575-0007-000	DIODE, LM4005
CR106	1	575-0007-000	DIODE, IN4005
MISCELLANEOUS			
FB101	1	516-0001-000	BEAD, FERRITE, W/LEADS 57-3425
FB102	1	516-0001-000	BEAD, FERRITE, W/LEADS 57-3425
K101	1	480-0011-000	RELAY, 5 VOLT
K102	1	480-0011-000	RELAY, 5 VOLT
W101			NOT USED
W102			NOT USED
W103			NOT USED
W104			NOT USED
XTAL101	1	325-0286-003	CARD, REPRODUCE AND CUE AMPLIFIER
	1	323-0003-001	CARD FULL, DELTAS
	1	282-0046-000	PIN, ROLL, 1/16 X 3/16
	1	448-0009-000	CRYSTAL, 3.579 MHZ.



820-0286-003  
COMPONENTS WITHIN DASHED LINED  
AREA NOT USED IN MONO MACHINES

2828583  
PLAY AMP & CUE DETECTOR CARD  
1 831-0286-003 MONO  
831-0286-013 STEREO

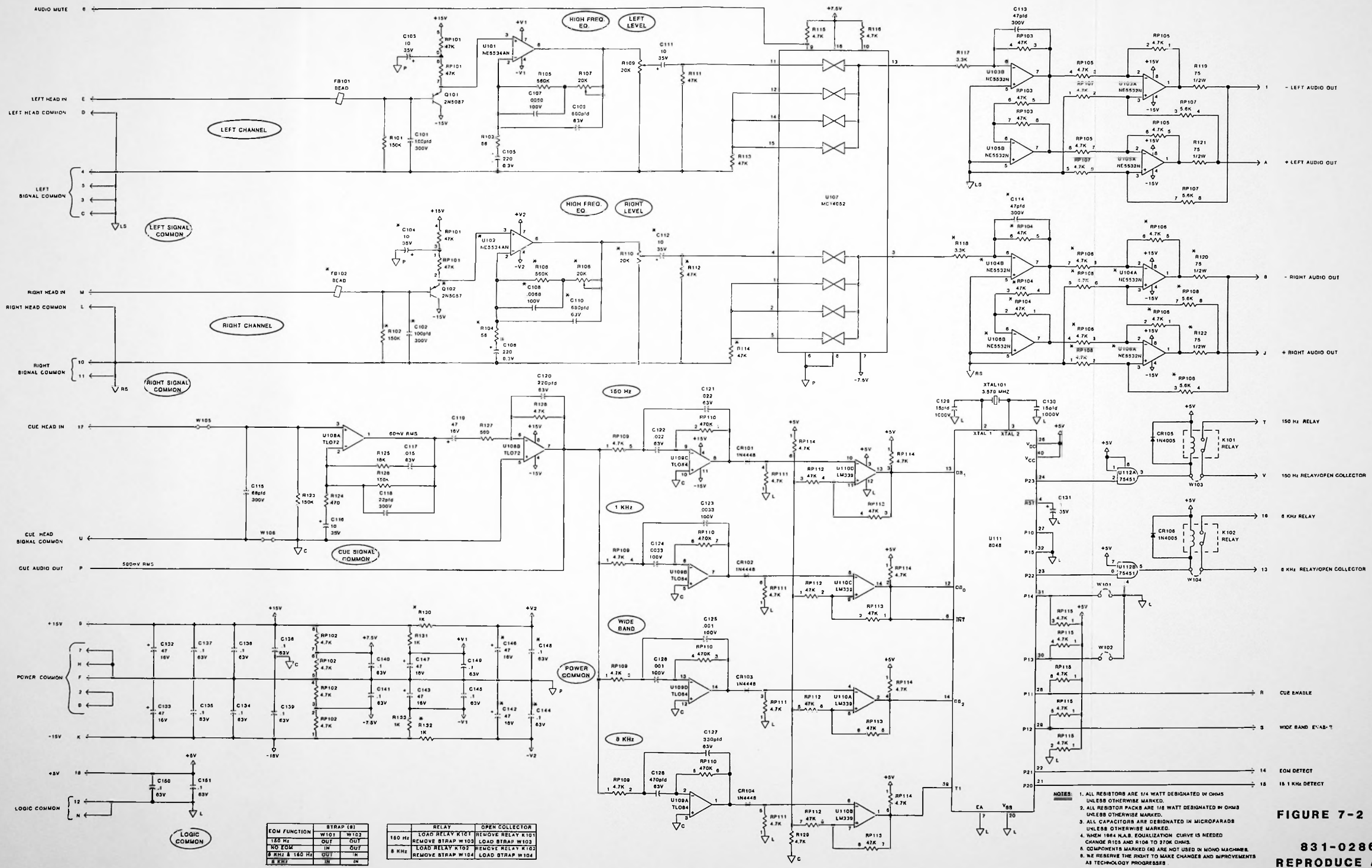
WHEN 1964 N.A.B. EQUALIZATION CURVE IS NEEDED  
CHANGE R105 AND R106 TO 270K OHMS.

EOM FUNCTION	STRAP (S)	
	W101	W102
150 Hz	OUT	OUT
NO EOM	IN	OUT
8 KHz & 150 Hz	OUT	IN
8 KHz	IN	IN

	RELAY	OPEN COLLECTOR
	150 Hz	LOAD RELAY K101 REMOVE STRAP W103
8 KHz	LOAD RELAY K102 REMOVE STRAP W104	REMOVE RELAY K102 LOAD STRAP W104

FIGURE 7-1

831-0286-014  
REPRODUCE AMPLIFIER  
AND  
CUE DETECT BOARD LAYOUT



EDM FUNCTION	STRAP (S)		RELAY	OPEN COLLECTOR
150 Hz	W101	W102	LOAD RELAY K101	REMOVE RELAY K101
1 KHz	OUT	OUT	REMOVE STRAP W103	LOAD STRAP W103
8 KHz	IN	OUT	LOAD RELAY K102	REMOVE RELAY K102
8 KHz & 150 Hz	OUT	IN	REMOVE STRAP W104	LOAD STRAP W104
8 KHz	IN	IN		

- NOTES:
1. ALL RESISTORS ARE 1/4 WATT DESIGNATED BY OHMS UNLESS OTHERWISE MARKED.
  2. ALL RESISTOR PACKS ARE 1/8 WATT DESIGNATED BY OHMS UNLESS OTHERWISE MARKED.
  3. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
  4. WHEN 18K H.Z. EQUALIZATION CURVE IS NEEDED CHANGE R105 AND R106 TO 370K OHMS.
  5. COMPONENTS MARKED (R) ARE NOT USED IN MONO MACHINE.
  6. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

**FIGURE 7-2**  
**831-0286-014**  
**REPRODUCE AMPLIFIER**  
**AND**  
**CUE DETECT SCHEMATIC**

REPRODUCE LOGIC BOARD 831-0248 PARTS LIST

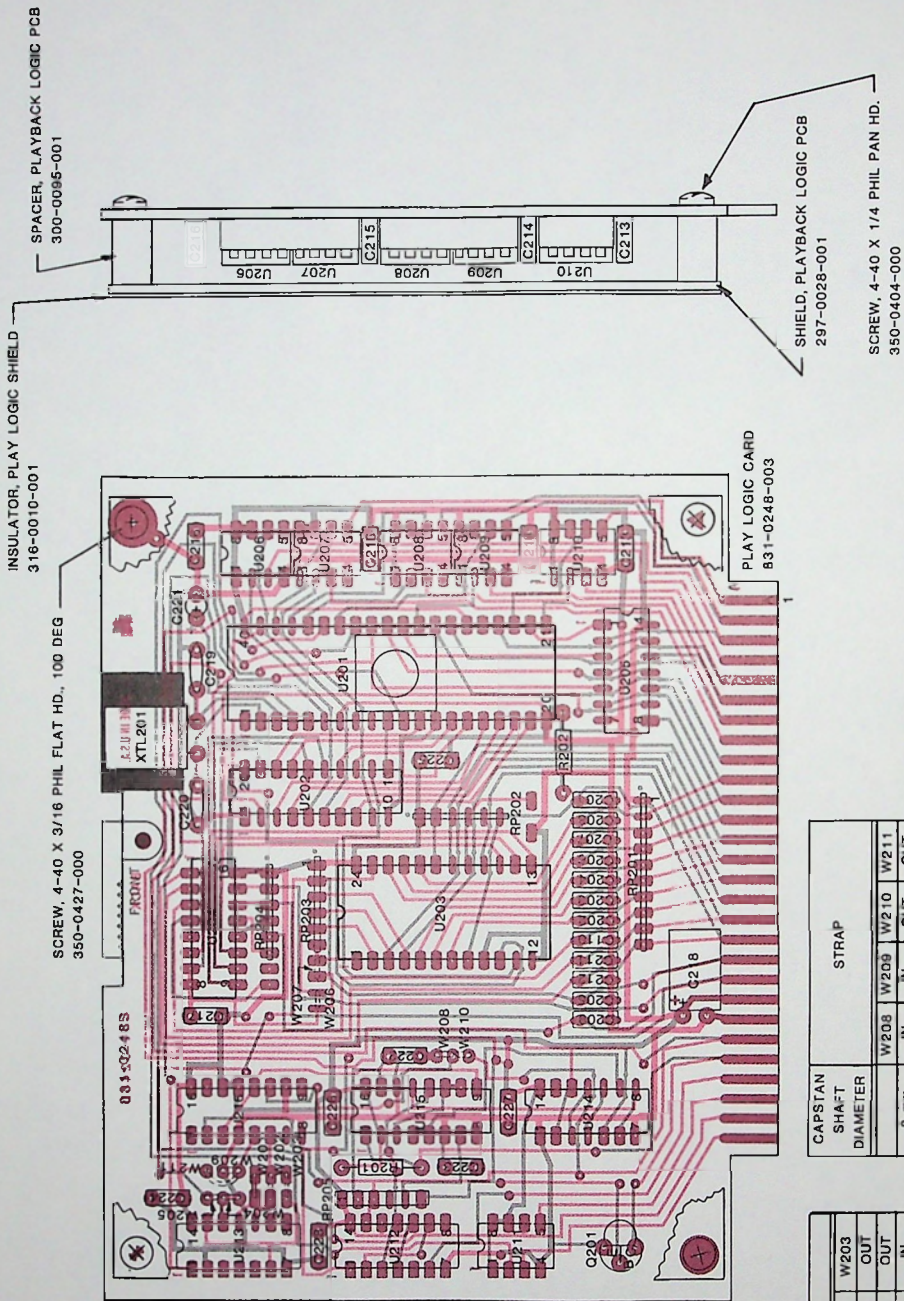
# 10mm SHAFT MOTOR  
# FLASHING READY WITHOUT START LOCKOUT  
# 7.5 IPS TAPE SPEED, CONTINUOUS RUN VERSION

C201	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
C202	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0007-000	SOCKET, IC, 8 PIN, DIP
C203	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0008-000	SOCKET, IC, 14 PIN, DIP
C204	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0008-000	SOCKET, IC, 14 PIN, DIP
C205	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0008-000	SOCKET, IC, 14 PIN, DIP
C206	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0009-000	SOCKET, IC, 16 PIN, DIP
C207	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0009-000	SOCKET, IC, 16 PIN, DIP
C208	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0009-000	SOCKET, IC, 16 PIN, DIP
C209	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	613-0004-001	PAD, TRANSISTOR, #7717-137N
C210	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C211	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C212	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C213	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C214	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C215	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C216	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C217	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C218	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V			
C219	1	686-0011-000	CAPACITOR, CERAMIC, 15 PFD., 1000 WDC, 20%			
C220	1	694-0005-000	CAPACITOR, TANTALUM, 1 UFD., 35 V, 20%, RADIAL			
C221	1	680-0101-033	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%			
C222	1	680-0101-033	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%			
C223	1	680-0101-033	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%			
C224	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C225	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C226	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C227	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C228	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
R201	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%			
R202	1	630-0079-000	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%			
RP201	1	631-0007-000	RESISTOR, ARRAY, COMMON SIP, 8R, 330 OHM, 2%			
RP202	1	631-0025-000	RESISTOR, ARRAY, COMMON SIP, 5R, 1K, 2%			
RP203	1	631-0025-000	RESISTOR, ARRAY, COMMON SIP, 5R, 1K, 2%			
RP204	1	631-0025-000	RESISTOR, ARRAY, COMMON SIP, 5R, 1K, 2%			
RP205	1	631-0023-000	RESISTOR, ARRAY, COMMON SIP, 5R, 10K, 2%			
SOCKETS						
U201	1	613-0017-000	SOCKET, IC, 40 PIN, DIP			
U202	1	613-0020-000	SOCKET, IC, 20 PIN, DIP			
U203	1	613-0019-000	SOCKET, IC, 24 PIN, DIP			
U204	1	613-0019-000	SOCKET, IC, 16 PIN, DIP			
U205	1	613-0008-000	SOCKET, IC, 14 PIN, DIP			
U206	1	613-0009-000	SOCKET, IC, 16 PIN, DIP			
U208,7	1	613-0009-000	SOCKET, IC, 16 PIN, DIP			
U208,9	1	613-0009-000	SOCKET, IC, 16 PIN, DIP			
U210	1	613-0007-000	SOCKET, IC, 8 PIN, DIP			
U211	1	613-0007-000	SOCKET, IC, 8 PIN, DIP			
U212	1	613-0008-000	SOCKET, IC, 14 PIN, DIP			
U213	1	613-0008-000	SOCKET, IC, 14 PIN, DIP			
U214	1	613-0008-000	SOCKET, IC, 14 PIN, DIP			
U215	1	613-0009-000	SOCKET, IC, 16 PIN, DIP			
U216	1	613-0009-000	SOCKET, IC, 16 PIN, DIP			
Q201	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q202	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q203	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q204	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q205	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q206	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q207	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q208	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q209	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q210	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q211	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q212	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q213	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q214	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q215	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q216	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q217	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q218	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q219	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q220	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q221	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q222	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q223	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q224	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q225	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q226	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q227	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q228	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
STRAPPING						
W201	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W202	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W203	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W204	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W205	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W206	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W207	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W208	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W209	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W210	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
W211	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)			
MISCELLANEOUS						
XTL201	1	151-0002-000	CRYSTAL, 5.22350 MHZ.			
	1	151-0002-000	TAPE, ELECTRICAL (APPROX 3/4 X 3/4)			
	1	325-0248-003	CARD, PLAYBACK LOGIC			
	1	323-0003-001	CARD FULL, DELTAS			
	1	282-0046-000	PIN, ROLL, 1/16 X 3/16			
	1	297-0028-001	SHIELD, PLAYBACK LOGIC PCB DI, DIII			
	4	300-0095-001	SPACER, PLAYBACK LOGIC PCB, TAPPED 4-40 X .250			
	4	350-0427-000	SCREW, 4-40 X 3/16 PHIL FLAT HD., 100 DEG., 2P			
	4	350-0404-000	SCREW, 4-40 X 1/4 PHIL PAN 2P			
	1	316-0010-001	INSULATOR, PLAY LOGIC SHIELD			
	14.05	999-0001-000	LABOR ..... DELTAS			

DEMOTES A STRAP LOADED WHEN A TRACE HAS BEEN CUT  
\* DEMOTES A STRAP THAT HAS NO EFFECT ON THE OPERATION

FIGURE 7-3

831-0248-003  
DELTA REPRODUCE  
LOGIC BOARD LAYOUT



MOTOR CONTROL	STRAP	
	W204	W205
CONT.	IN	OUT
CART. SW. ON/OFF	OUT	IN

OPTIONS	STRAP	
	W206	W207
NO FLASH, NO START LOCK OUT	IN	OR OUT
FLASH, NO START LOCK OUT	OUT	OUT
FLASH, START LOCK OUT	OUT	IN

IPS	STRAP	
	W201	W202
7 1/2	IN	OUT
3 3/4	OUT	IN
15	OUT	OUT
	IN	IN

CAPSTAN SHAFT DIAMETER	STRAP			
	W208	W209	W210	W211
8 mm	IN	IN	OUT	OUT
10 mm	OUT	OUT	IN	IN

INSULATOR, PLAY LOGIC SHIELD  
316-0010-001

SCREW, 4-40 X 3/16 PHIL FLAT HD, 100 DEG  
350-0427-000

SPACER, PLAYBACK LOGIC PCB  
300-0085-001

PLAY LOGIC CARD  
831-0248-003

SHIELD, PLAYBACK LOGIC PCB  
297-0028-001

SCREW, 4-40 X 1/4 PHIL PAN HD.  
350-0404-000

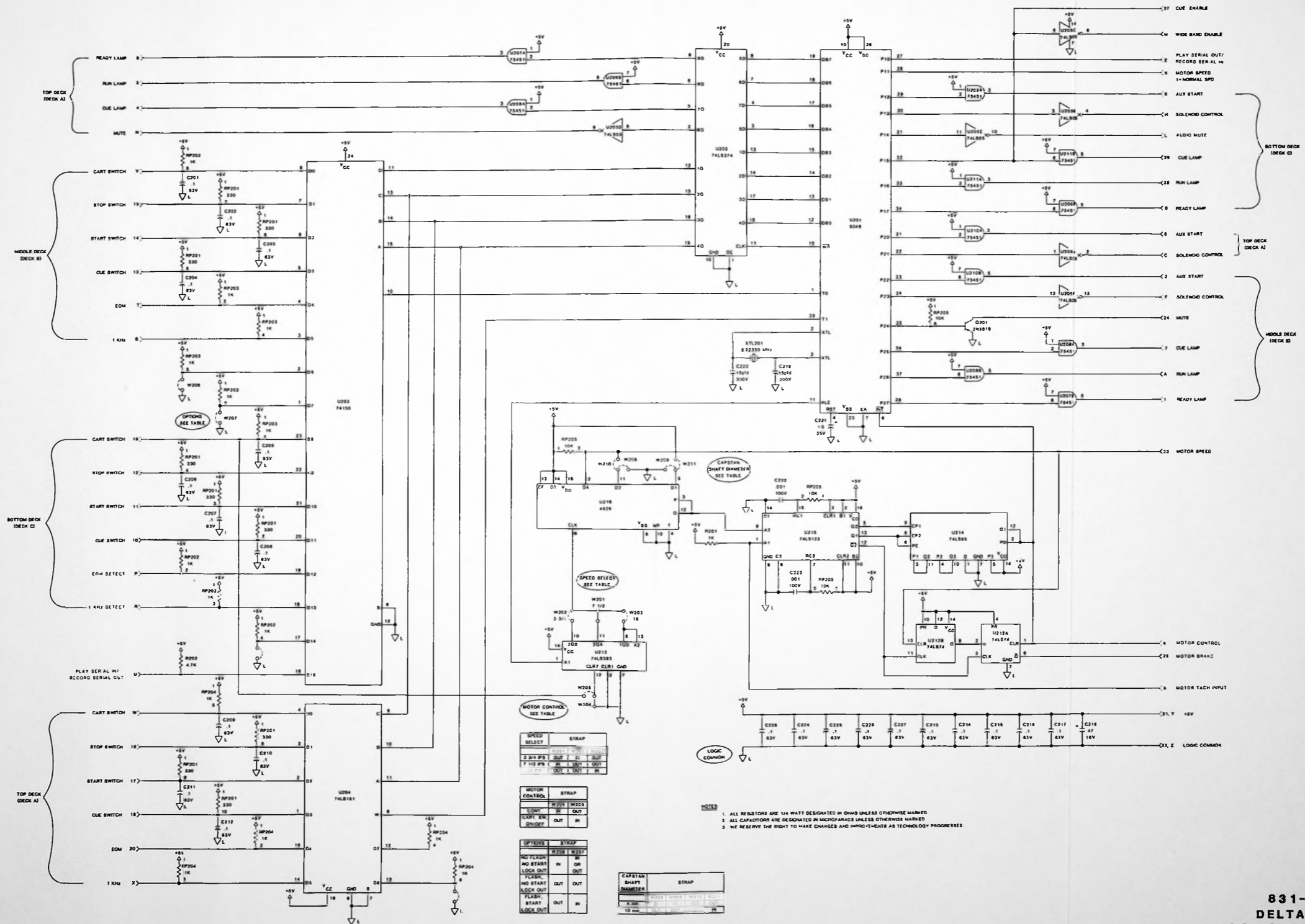


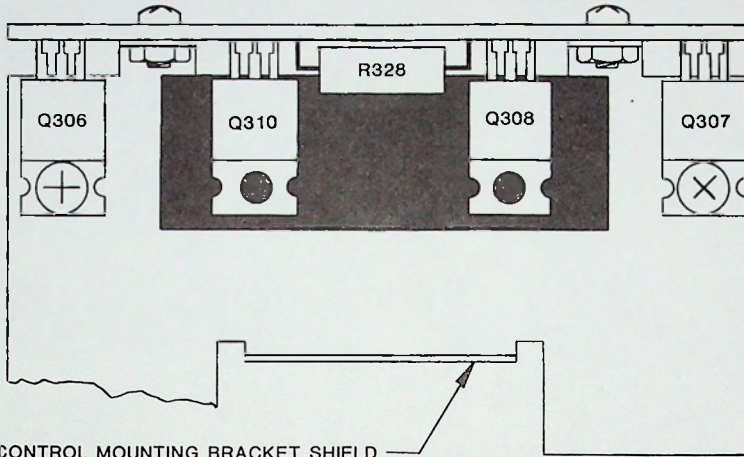
FIGURE 7-4

831-0248-003  
DELTA REPRODUCE  
LOGIC BOARD SCHEMATIC

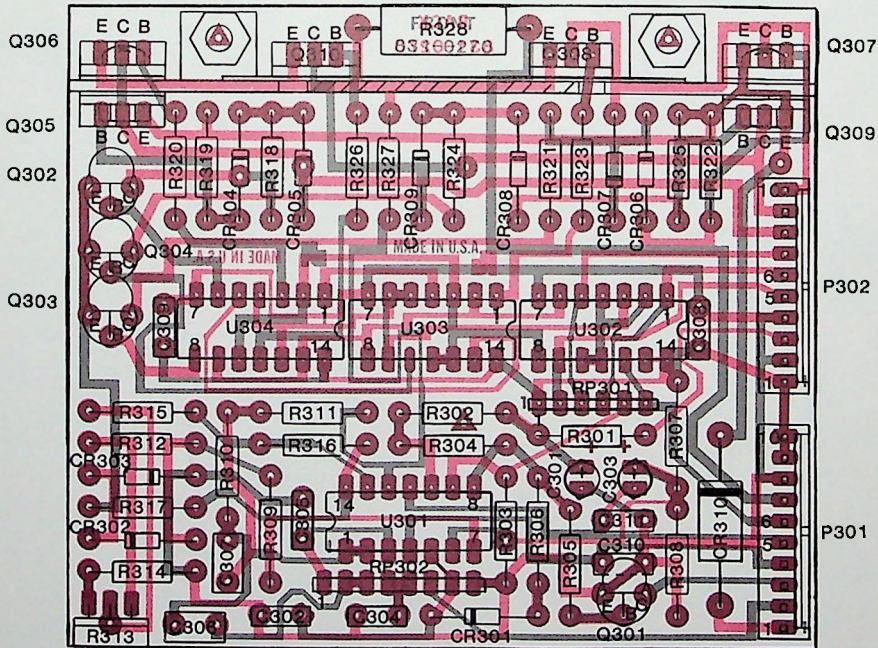


**SERVO MOTOR CONTROL BOARD 831-0270 PARTS LIST**

<b>CAPACITORS</b>						
C301	1	694-0005-000	CAPACITOR, TANTALUM, 1 UFD., 35 V, 20%, RADIAL			
C302	1	680-2963-033	CAPACITOR, POLYESTER FILM, .22 UFD, 63 V, 5%			
C303	1	694-0005-000	CAPACITOR, TANTALUM, 1 UFD., 35 V, 20%, RADIAL			
C304	1	680-2963-033	CAPACITOR, POLYESTER FILM, .22 UFD, 63 V, 5%			
C305	1	680-1363-033	CAPACITOR, POLYESTER FILM, .01 UFD., 63V, 5%			
C306	1	680-3363-033	CAPACITOR, POLYESTER FILM, .47 UFD., 63V, 5%			
C307	1	680-3363-033	CAPACITOR, POLYESTER FILM, .47 UFD., 63V, 5%			
C308	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C309	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C310	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
C311	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%			
<b>RESISTORS NETWORKS</b>						
RP301	1	631-0023-000	RESISTOR, ARRAY, COMMON SIP, 5R, 1K, 2%			
RP302	1	631-0033-000	RESISTOR, ARRAY, SEPARATE SIP, 4R, 22K, 2%			
<b>RESISTORS</b>						
R301	1	630-0039-000	RESISTOR, CARBON FILM, 100 OHM, 1/4W, 5%			
R302	1	630-0039-000	RESISTOR, CARBON FILM, 100 OHM, 1/4W, 5%			
R303	1	630-0001-000	RESISTOR, CARBON FILM, 2.7 OHM, 1/4W, 5%			
R304	1	630-0135-000	RESISTOR, CARBON FILM, 1M OHM, 1/4 W, 5%			
R305	1	630-0087-000	RESISTOR, CARBON FILM, 10K OHM, 1/4 W, 5%			
R306	1	630-0093-000	RESISTOR, CARBON FILM, 18K OHM, 1/4 W, 5%			
R307	1	630-0135-000	RESISTOR, CARBON FILM, 1M OHM, 1/4 W, 5%			
R308	1	630-0123-000	RESISTOR, CARBON FILM, 330K OHM, 1/4W, 5%			
R309	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%			
R310	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%			
R311	1	630-0079-000	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%			
R312	1	630-0079-000	POTENTIOMETER, 10K OHM, SINGLE TURN, STAND UP			
R313	1	636-0034-000	RESISTOR, CARBON FILM, 2.2K OHM, 1/4 W, 5%			
R314	1	630-0071-000	RESISTOR, CARBON FILM, 10K OHM, 1/4 W, 5%			
R315	1	630-0087-000	RESISTOR, CARBON FILM, 330K OHM, 1/4W, 5%			
R316	1	630-0123-000	RESISTOR, CARBON FILM, 2.2K OHM, 1/4 W, 5%			
R317	1	630-0071-000	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%			
R318	1	630-0067-000	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%			
R319	1	630-0067-000	RESISTOR, CARBON FILM, 100 OHM, 1/4W, 5%			
R320	1	630-0039-000	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%			
R321	1	630-0067-000	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%			
R322	1	630-0039-000	RESISTOR, CARBON FILM, 100 OHM, 1/4W, 5%			
R323	1	630-0067-000	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%			
R324	1	630-0067-000	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%			
R325	1	630-0067-000	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%			
R326	1	630-0039-000	RESISTOR, CARBON FILM, 100 OHM, 1/4W, 5%			
R327	1	630-0087-000	RESISTOR, CARBON FILM, 10K OHM, 1/4 W, 5%			
R328	1	628-0001-000	RESISTOR, WIRE WOUND, 0.1 OHM, 2 W, 5%; 8W			
<b>TRANSISTORS</b>						
Q301	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q302	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q303	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q304	1	590-0017-000	TRANSISTOR, 2N5816, NPN			
Q305	1	590-0035-000	TRANSISTOR, TIPL25, PNP, DARLINGTON, POWER			
Q306	1	590-0034-000	TRANSISTOR, TIPL20, NPN, DARLINGTON, POWER			
Q307	1	590-0035-000	TRANSISTOR, TIPL25, PNP, DARLINGTON, POWER			
Q308	1	590-0034-000	TRANSISTOR, TIPL20, NPN, DARLINGTON, POWER			
Q309	1	590-0035-000	TRANSISTOR, TIPL25, PNP, DARLINGTON, POWER			
Q310	1	590-0034-000	TRANSISTOR, TIPL20, NPN, DARLINGTON, POWER			
<b>DIODES</b>						
CR301	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR302	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR303	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR304	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR305	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR306	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR307	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR308	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR309	1	575-0031-000	DIODE, SMALL SIGNAL			1N4448
CR310	1	575-0032-000	DIODE, POWER 3A, 200 VOLT MR 502			
<b>INTEGRATED CIRCUITS</b>						
U301	1	606-0016-000	IC, TL074CP, QUAD BT-FET OP AMP			
U302	1	607-0063-000	IC, 74LS96, QUAD 2 INPUT EXCLUSIVE OR			
U303	1	607-0036-000	IC, 74LS02, QUAD 2 INPUT NOR			
U404	1	607-0030-000	IC, 74LS08, QUAD 2 INPUT AND			
<b>MISCELLANEOUS</b>						
Q301-4	4	613-0004-001	PAD, TRANSISTOR, #7717-137N			
U301-4	4	613-0008-000	SOCKET, IC, 14 PIN, DIP			
U301-4	4	613-0014-000	INSULATOR, TO-220			
	2	352-0004-000	SCREW, 6-32 X 1/4, NYLON, SLOTTED, R. HD.			
	2	370-0601-000	NUT, HEX, 6-32 X 1/4, 2P			
	2	350-0404-000	SCREW, 4-40 X 1/4 PHIL PAN 2P			
	1	151-0002-000	NUT, 4-40X1/4, KEPS HEX, STEEL, NP			
	1	297-0035-003	TAPE, ELECTRICAL (APPROX 3/4 X 3/4)			
	1	325-0270-003	SHIELD, MOTOR CONTROL MTC. BRACKET BOARD, MOTOR CONTROL			
	1	376-0047-000	WAFER, 10 POS., LOCKING, KK100, #22-27-2101			
	1	376-0047-000	WAFER, 10 POS., LOCKING, KK100, #22-27-2101			



MOTOR CONTROL MOUNTING BRACKET SHIELD  
297-0035-003



DUTY CYCLE  
ADJUST

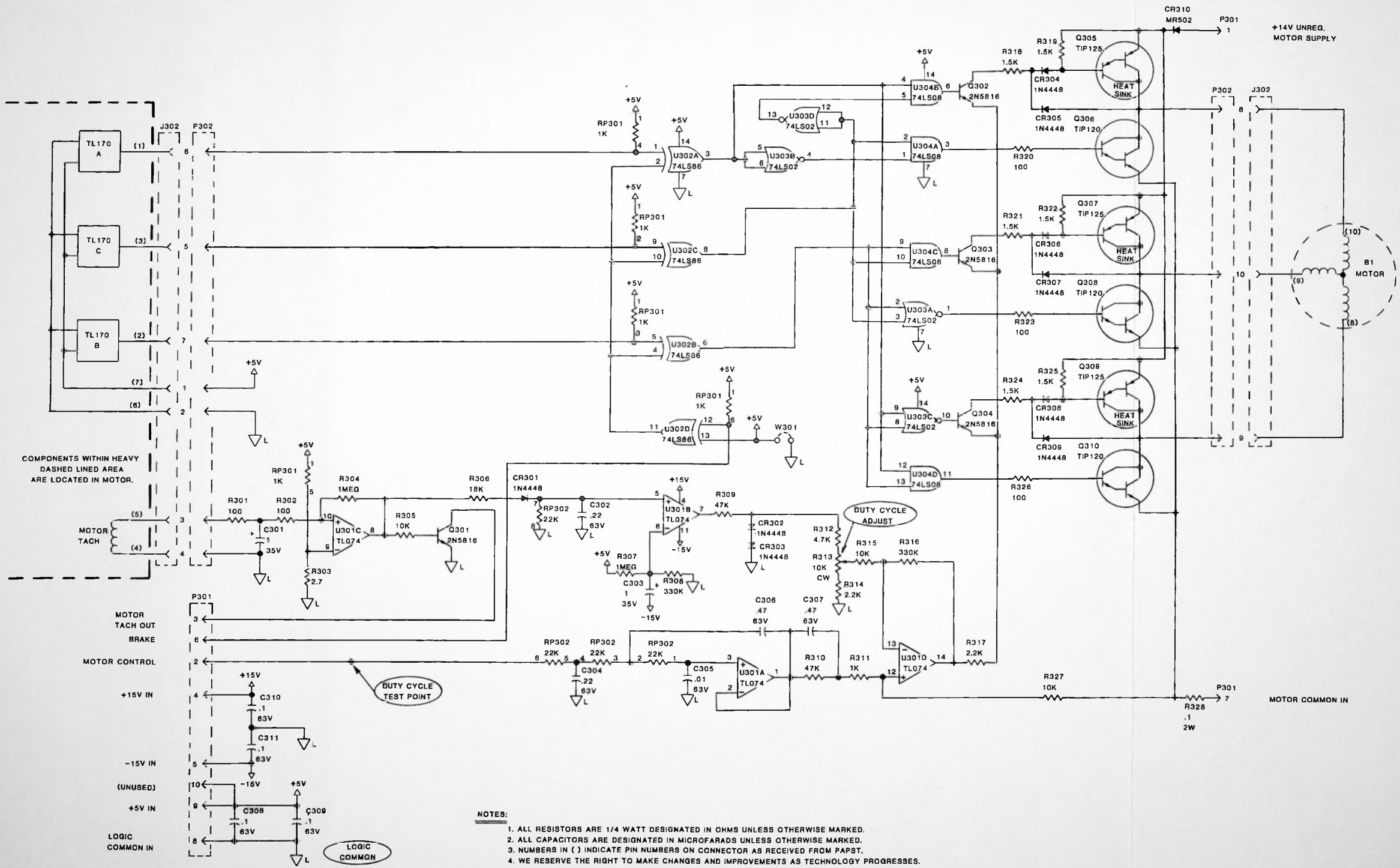
830-0270-003

S8-AS-e

MOTOR CONTROL BOARD  
831-0270-003

FIGURE 7-5

830-0270-003  
DELTA MOTOR CONTROL BOARD  
LAYOUT



- NOTES:
1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
  2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
  3. NUMBERS IN ( ) INDICATE PIN NUMBERS ON CONNECTOR AS RECEIVED FROM PAPST.
  4. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

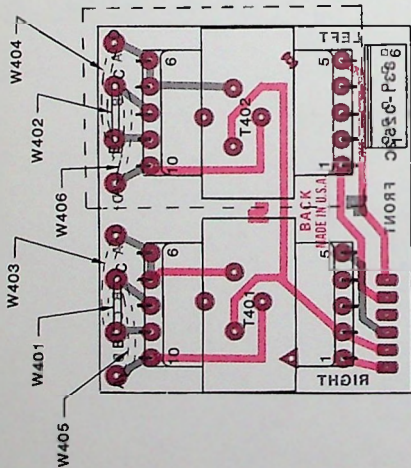
FIGURE 7-8  
831-0270-003  
DELTA MOTOR CONTROL BOARD SCHEMATIC

**DELTA I,II OUTPUT TRANSFORMER BOARD PARTS LIST 831-0252**

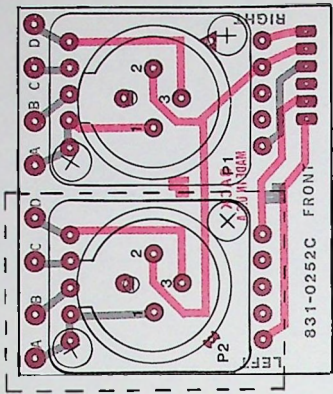
	1	325-0252-003	BOARD, AUDIO OUTPUT TRANSFORMER DI
	1	376-0058-000	WAFER, 6 POS., LOCKING, #22-27-2061
TRANSFORMERS			
T401	1	532-0011-000	TRANSFORMER, AUDIO OUTPUT AM-9724
T402	1	532-0011-000	TRANSFORMER, AUDIO OUTPUT AM-9724
OUTPUT STRAPPING			
W401	2	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W402	2	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W403			NOT USED
W404			NOT USED
W405			NOT USED
W406			NOT USED
W401			NOT USED
W402			NOT USED
W403	3	428-0015-000	WIRE, SOLID, #22 AWG, INSULATED (QUANTITY IN 1/2
W404	3	428-0015-000	WIRE, SOLID, #22 AWG, INSULATED (QUANTITY IN 1/2
W405	3	428-0015-000	WIRE, SOLID, #22 AWG, INSULATED (QUANTITY IN 1/2
W406	3	428-0015-000	WIRE, SOLID, #22 AWG, INSULATED (QUANTITY IN 1/2
CONNECTORS			
P1	1	378-0057-000	CONNECTOR, XLR 3 PIN (MALE) NC3ND5
P2	1	378-0057-000	CONNECTOR, XLR 3 PIN (MALE) NC3ND5

FIGURE 7-7

831-0252  
 DELTA I, II OUTPUT TRANSFORMER  
 BOARD LAYOUT



COMPONENTS WITHIN DASHED LINED AREAS  
 NOT USED IN MONO MACHINES

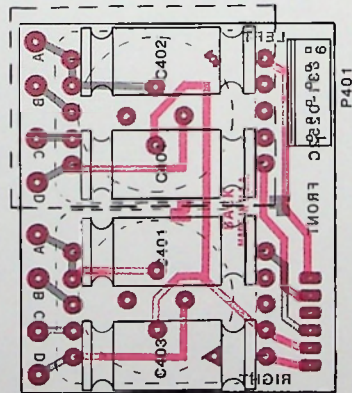


REAR PANEL  
 281-0097-023

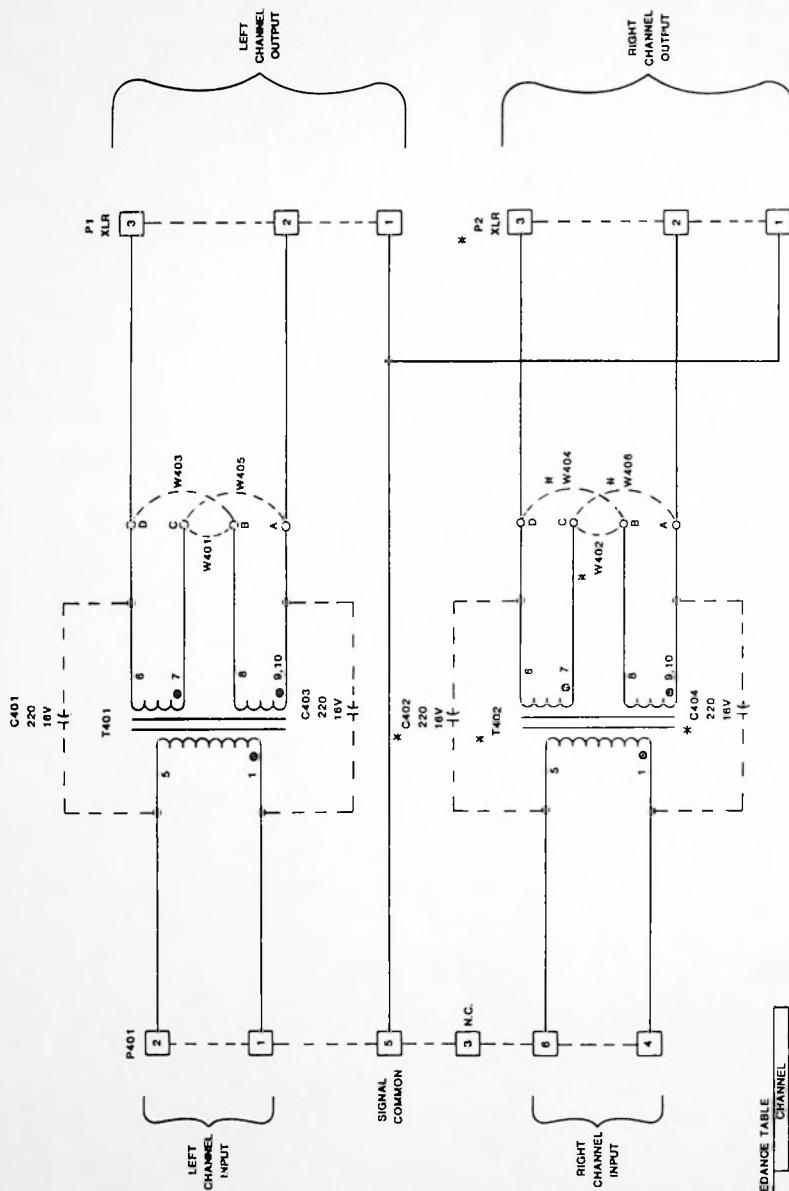
P. C. BOARD  
 831-0252

IMPEDANCE TABLE

IMPEDANCE	CHANNEL	
	LEFT	RIGHT
600 OHMS LOAD WITH TRANSFORMER (S) STRAP (S)	W401 (BC)	W402 (BC)
150 OHMS LOAD	W403 (BD) & W404 (BD) & W405 (AC)	W406 (AC)
600 OHMS LOAD IMPEDANCE (75 OHMS DRIVING POINT IMPEDANCE)	TRANSFORMERLESS CAPACITORS	
	C401	C402
	C403	C404



- DELTA I OUTPUT TRANSFORMER BOARD
- 831-0252-003 MONO WITH TRANSFORMER
- 831-0252-013 STEREO WITH TRANSFORMERS
- 831-0252-023 MONO WITHOUT TRANSFORMER
- 831-0252-033 STEREO WITHOUT TRANSFORMERS



IMPEDANCE	CHANNEL	
	LEFT	RIGHT
800 OHMS LOAD	W401 (BC)   W402 (BC)	W403 (BD)   W404 (BD)   W405 (AC)   W406 (AC)
150 OHMS LOAD	W401 (BC)   W402 (BC)	W403 (BD)   W404 (BD)   W405 (AC)   W406 (AC)
800 OHMS LOAD	W401 (BC)   W402 (BC)	W403 (BD)   W404 (BD)   W405 (AC)   W406 (AC)
(75 OHMS DRIVING POINT IMPEDANCE)	W401 (BC)   W402 (BC)	W403 (BD)   W404 (BD)   W405 (AC)   W406 (AC)

NOTES

1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED
2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED
3. COMPONENTS MARKED (H) ARE NOT USED IN MONO MACHINES
4. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES

FIGURE 7-8

831-0252  
 DELTA I, II OUTPUT  
 TRANSFORMER BOARD  
 SCHEMATIC

## DELTA III OUTPUT TRANSFORMER BOARD 831-0254 PARTS LIST

TRANSFORMERS			
T601	1	532-0011-000	TRANSFORMER, AUDIO OUTPUT AM-9724
T602	1	532-0011-000	TRANSFORMER, AUDIO OUTPUT AM-9724
T603	1	532-0011-000	TRANSFORMER, AUDIO OUTPUT AM-9724
T604	1	532-0011-000	TRANSFORMER, AUDIO OUTPUT AM-9724
T605	1	532-0011-000	TRANSFORMER, AUDIO OUTPUT AM-9724
T606	1	532-0011-000	TRANSFORMER, AUDIO OUTPUT AM-9724

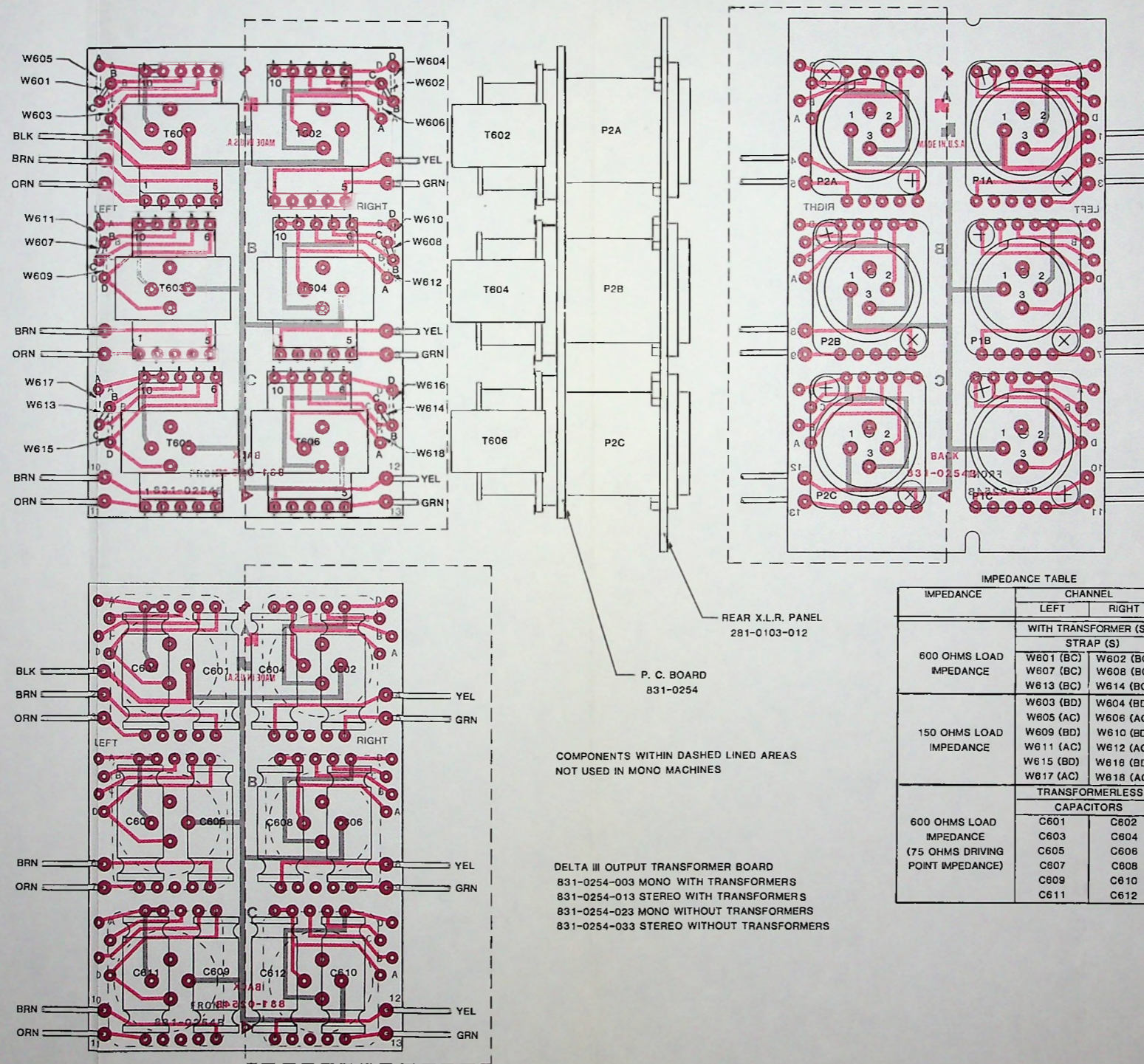
CONNECTORS			
P1A	1	378-0057-000	CONNECTOR, XLR 3 PIN (MALE) NC3ND5
P2A	1	378-0057-000	CONNECTOR, XLR 3 PIN (MALE) NC3ND5
P1B	1	378-0057-000	CONNECTOR, XLR 3 PIN (MALE) NC3ND5
P2B	1	378-0057-000	CONNECTOR, XLR 3 PIN (MALE) NC3ND5
P1C	1	378-0057-000	CONNECTOR, XLR 3 PIN (MALE) NC3ND5
P2C	1	378-0057-000	CONNECTOR, XLR 3 PIN (MALE) NC3ND5

OUTPUT STRAPPING			
W601	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W602	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W603			NOT USED
W604			NOT USED
W605			NOT USED
W606			NOT USED
W607	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W608	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W609			NOT USED
W610			NOT USED
W611			NOT USED
W612			NOT USED
W613	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W614	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W615			NOT USED
W616			NOT USED
W617			NOT USED
W618			NOT USED

MISCELLANEOUS			
	1	325-0254-003 A	BOARD, AUDIO OUTPUT TRANSFORMER DIII
	13	382-0019-000	PIN, MALE, PCB, #R62-3



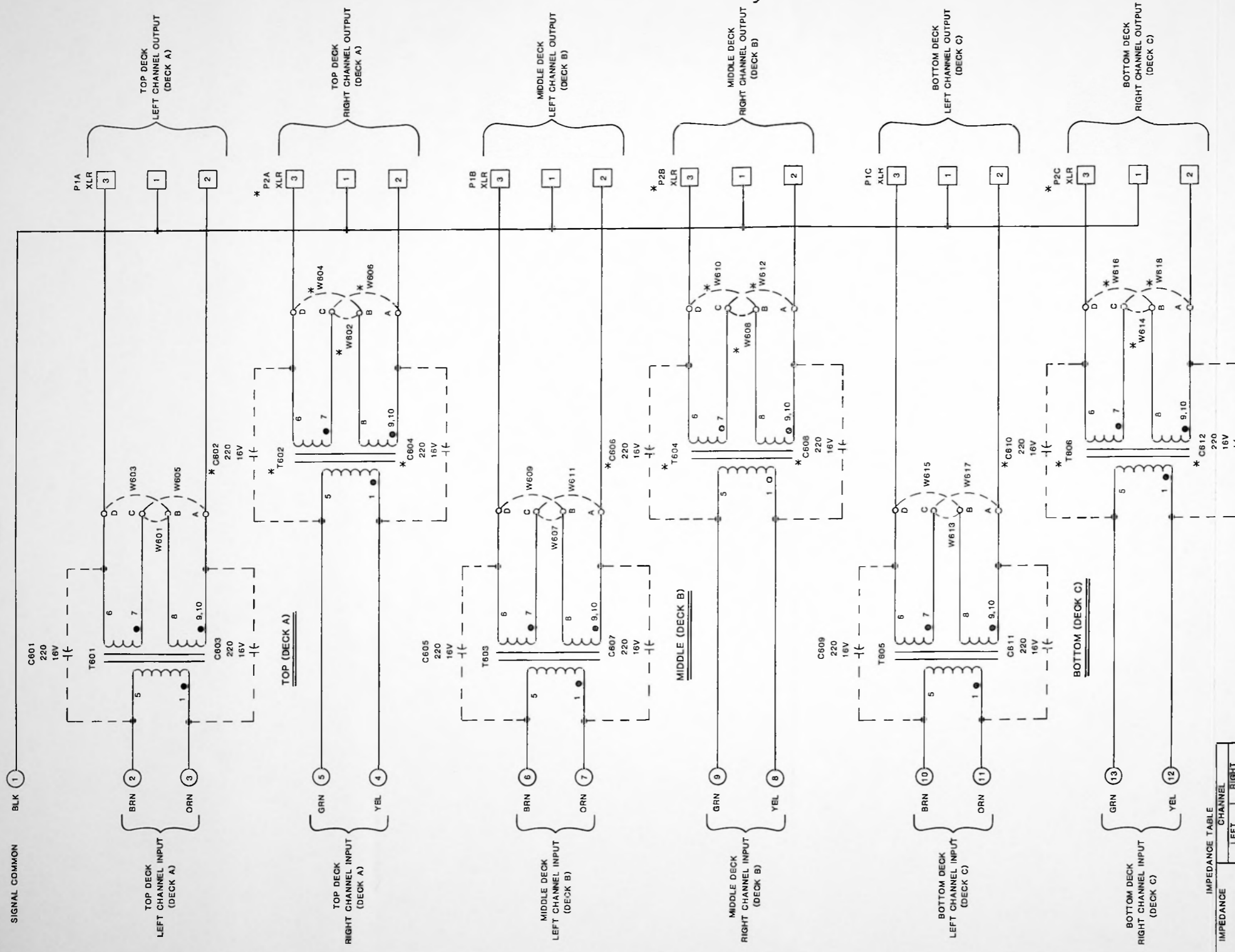
IMPEDANCE TABLE

IMPEDANCE	CHANNEL	
	LEFT	RIGHT
600 OHMS LOAD IMPEDANCE	WITH TRANSFORMER (S)	
	STRAP (S)	
	W601 (BC) W607 (BC) W613 (BC)	W602 (BC) W608 (BC) W614 (BC)
150 OHMS LOAD IMPEDANCE	WITH TRANSFORMER (S)	
	STRAP (S)	
	W603 (BD) W605 (AC) W609 (BD) W611 (AC) W615 (BD) W617 (AC)	W604 (BD) W606 (AC) W610 (BD) W612 (AC) W616 (BD) W618 (AC)
600 OHMS LOAD IMPEDANCE (75 OHMS DRIVING POINT IMPEDANCE)	TRANSFORMERLESS	
	CAPACITORS	
	C601 C603 C605 C607 C609 C611	C602 C604 C606 C608 C610 C612

FIGURE 7-9

831-0254  
DELTA III OUTPUT  
TRANSFORMER BOARD  
LAYOUT





IMPEDANCE TABLE

IMPEDANCE	CHANNEL	
	LEFT	RIGHT
800 OHMS LOAD IMPEDANCE	WITH TRANSFORMER (S)	
	STRAP (S)	
	W601 (BC)	W602 (BC)
	W607 (BC)	W608 (BC)
150 OHMS LOAD IMPEDANCE	TRANSFORMERLESS	
	CAPACITORS	
	C601	C602
	C603	C604
800 OHMS LOAD IMPEDANCE (75 OHMS DRIVING POINT IMPEDANCE)	TRANSFORMERLESS	
	CAPACITORS	
	C605	C606
	C607	C608
	C609	C610
	C611	C612

- NOTES:
1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
  2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
  3. COMPONENTS MARKED (\*) ARE NOT USED IN MONO MACHINES.
  4. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

FIGURE 7-10

831-0254  
DELTA III OUTPUT TRANSFORMER  
BOARD SCHEMATIC

DELTA I, II MOTHERBOARD

PARTS LIST

831-0274

STEREO, 120 VOLT VERSION

Part No.	Description	QTY	Part No.	Description	QTY	Part No.	Description	QTY	Part No.	Description	QTY
<b>CAPACITORS</b>											
C501	680-1163-033 A	1	680-1163-033 A	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5A	1	J2	380-0145-000	1	CONNECTOR, 24 PIN, W/LOCKING BAIL	1	
C502	680-1163-033 A	1	680-1163-033 A	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5A	1	J515	380-0062-000	1	SOCKET, 3 PIN, 10-18-2031	1	
C503	680-1163-033 A	1	680-1163-033 A	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5A	1	J516	380-0062-000	1	SOCKET, 3 PIN, 10-18-2031	1	
C504	680-1163-033 A	1	680-1163-033 A	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5A	1	J517	380-0062-000	1	SOCKET, 3 PIN, 10-18-2031	1	
C505	680-1163-033 A	1	680-1163-033 A	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5A	1	J518	380-0143-000	1	CONNECTOR, PC CARD EDGE, DUAL 18, 0.156, SOLDER T	1	
C506	680-1163-033 A	1	680-1163-033 A	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5A	1	J519	380-0144-000	1	CONNECTOR, PC CARD EDGE, DUAL 28, 0.125, SOLDER T	1	
<b>DIODES</b>											
CR501	575-0007-000	1	IN4005	DIODE, IN4005	1	P501	376-0059-000	1	WAFER, NON-LOCKING, 16 POS., RIGHT ANGLE	1	
CR502	575-0007-000	1	IN4005	DIODE, IN4005	1	P502	376-0059-000	1	WAFER, NON-LOCKING, 16 POS., RIGHT ANGLE	1	
CR503	575-0007-000	1	IN4005	DIODE, IN4005	1	P503	376-0061-000	1	WAFER, 3 POS, LOCKING, KK156	1	
CR504	575-0007-000	1	IN4005	DIODE, IN4005	1	P504	376-0061-000	1	WAFER, 3 POS, LOCKING, KK156	1	
CR505	575-0007-000	1	IN4005	DIODE, IN4005	1	P505	376-0061-000	1	WAFER, 3 POS, LOCKING, KK156	1	
CR506	575-0007-000	1	IN4005	DIODE, IN4005	1	P506	376-0064-000	1	WAFER, 10 POS., .156	1	
CR507	575-0007-000	1	IN4005	DIODE, IN4005	1	P507	376-0033-000	1	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031	1	
CR508	575-0007-000	1	IN4005	DIODE, IN4005	1	P508	376-0033-000	1	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031	1	
CR509	575-0007-000	1	IN4005	DIODE, IN4005	1	P509	376-0033-000	1	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031	1	
CR510	575-0007-000	1	IN4005	DIODE, IN4005	1	P510	376-0033-000	1	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031	1	
CR511	575-0007-000	1	IN4005	DIODE, IN4005	1	P511	376-0033-000	1	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031	1	
CR512	575-0032-000	1	DIODE, IN4005	DIODE, IN4005	1	P512	376-0033-000	1	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031	1	
CR513	575-0032-000	1	DIODE, IN4005	DIODE, IN4005	1	P513	376-0047-000	1	WAFER, 10 POS., LOCKING, KK100, #22-27-2101	1	
CR514	575-0007-000	1	DIODE, IN4005	DIODE, IN4005	1	P514	376-0047-000	1	WAFER, 10 POS., LOCKING, KK100, #22-27-2101	1	
CR515	575-0007-000	1	DIODE, IN4005	DIODE, IN4005	1						
CR516	575-0007-000	1	DIODE, IN4005	DIODE, IN4005	1						
<b>RESISTORS</b>											
R501	628-0191-000	1	RESISTOR, WM, 100 OHM, 5-1/4 W, 2870	1	W502	325-0274-003	1	BOARD, MOTHER, DELTA I	1		
R502	427-0002-000	1	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)	1		427-0002-000	1	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)	1		
R503	628-0192-000	1	RESISTOR, WM, 13K OHM, 5-1/4 W, 2921	1		350-0604-000	1	SCREW, 6-32 X 1/4, PHILL, PAN, HD., ZP	1		
R504	630-0043-000	1	RESISTOR, CARBON FILM, 150 OHM, 1/4 W, 5A	1				RUT, HEX, 6-32 X 1/4, ZP	1		
R505	630-0063-000	1	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5A	1							
<b>INTEGRATED CIRCUITS &amp; TRANSISTORS</b>											
U501	595-0008-000	1	OPTO-ISOLATER, PHOTO DARLINGTON, HILBI	1							
U502	607-0009-000	1	IC, 75451, DUAL PERIPHERAL AND DRIVER	1							
U503	607-0009-000	1	IC, 75451, DUAL PERIPHERAL AND DRIVER	1							
Q501	590-0033-000	1	TRANSISTOR, TIP50, NPN, POWER	1							
Q502	590-0033-000	1	TRANSISTOR, TIP50, NPN, POWER	1							
VR501	605-0012-000	1	VOLTAGE REGULATOR, MC7805CT, +5V, TO220 PLASTIC	1							
VR502	605-0010-000	1	VOLTAGE REGULATOR, MC7815CT, +15V, TO220 PLASTIC	1							
VR503	605-0011-000	1	VOLTAGE REGULATOR, MC7915CT, -15V, TO220 PLASTIC	1							
<b>SOCKETS</b>											
U501	613-0007-000	1	SOCKET, IC, 8 PIN, DIP	1							
U502	613-0007-000	1	SOCKET, IC, 8 PIN, DIP	1							
U503	613-0007-000	1	SOCKET, IC, 8 PIN, DIP	1							

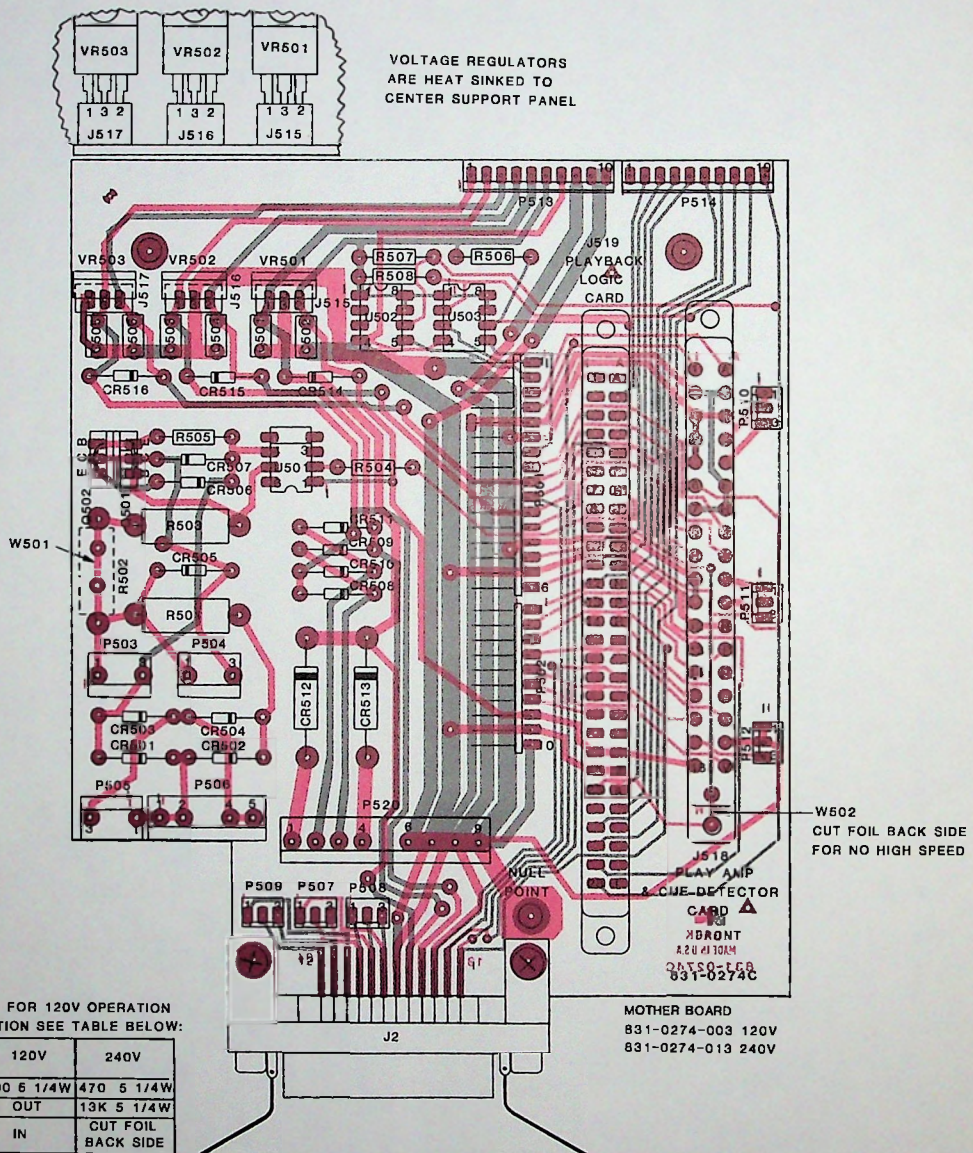


FIGURE 7-11

**831-0274-003**  
**DELTA I,II MOTHERBOARD**  
**LAYOUT**

PLAY BACK LOGIC CARD  
831-0248

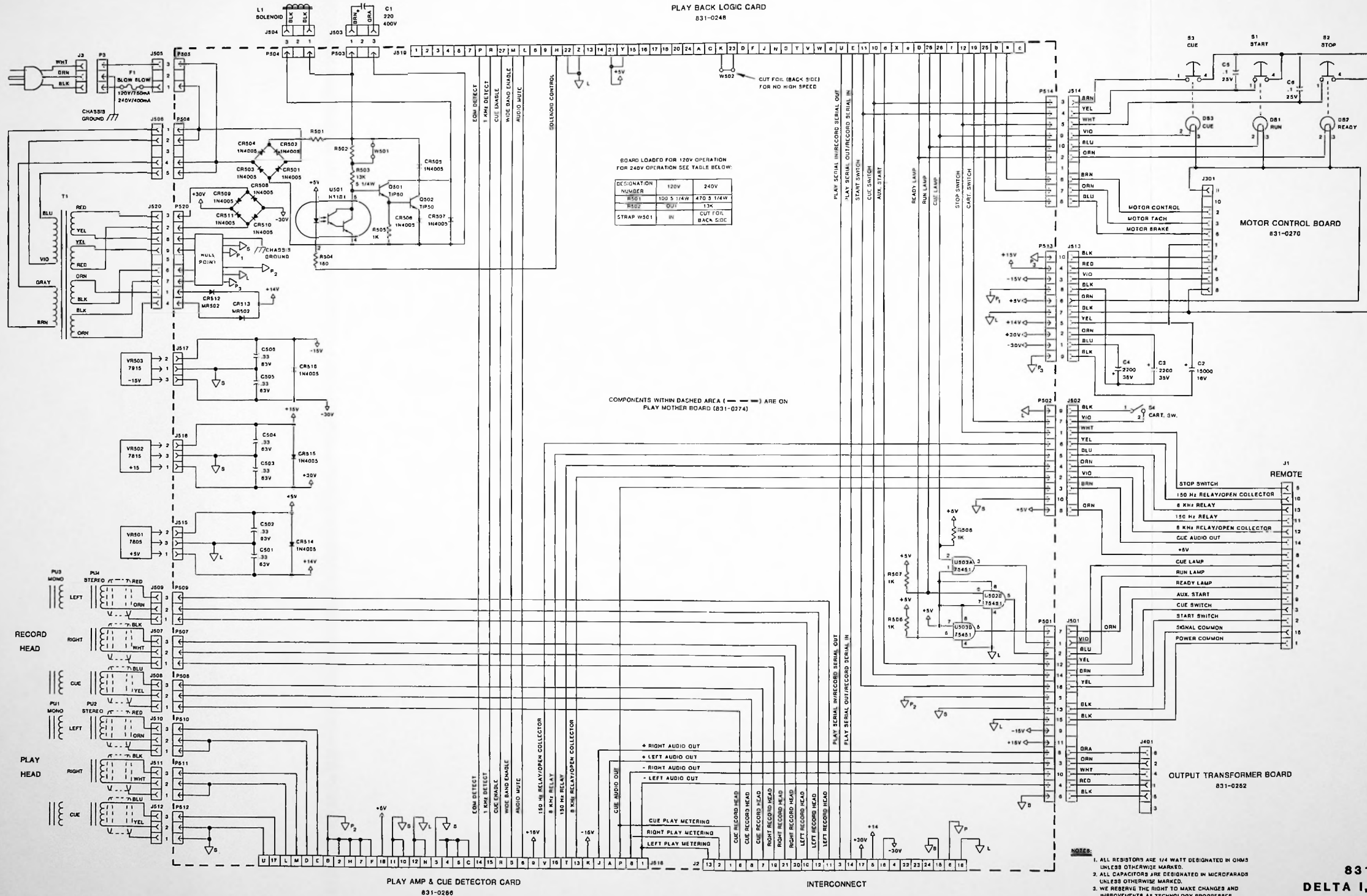
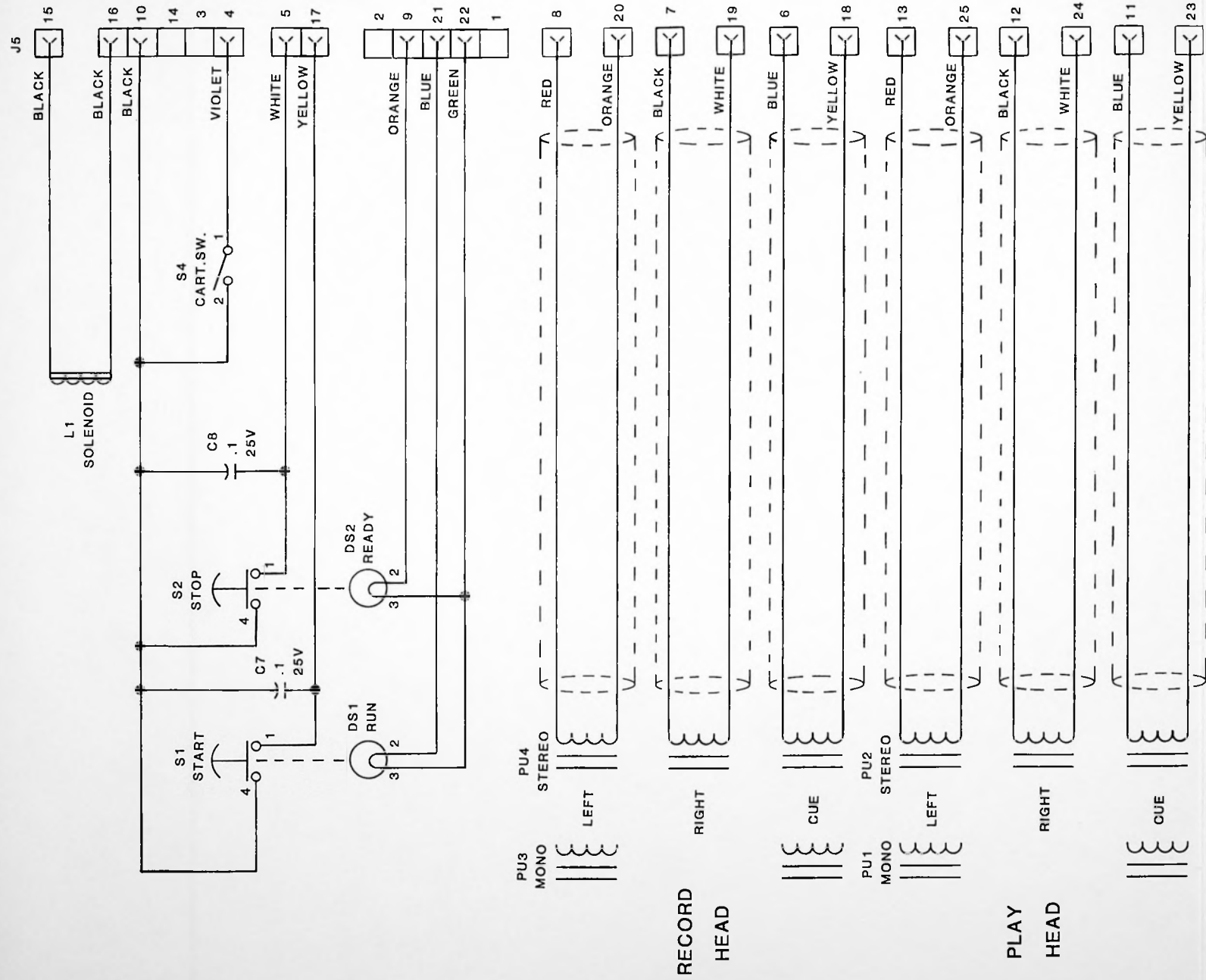


FIGURE 7-12

831-0274-003  
DELTA I, II MOTHERBOARD  
SCHEMATIC AND INTERCONNECT  
DIAGRAM



**NOTES:**

1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
3. THE RECORD HEAD PU3 OR PU4 IS ON THE BOTTOM DECK AND USED ONLY IN DELTA III RECORD VERSION MACHINES.
4. S3 INSTALLED ONLY ON DELTA I & DELTA II MACHINES. CUE PROVISION ON DELTA III ONLY AVAILABLE AT THE REMOTE CONTROL CONNECTOR J1.
5. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

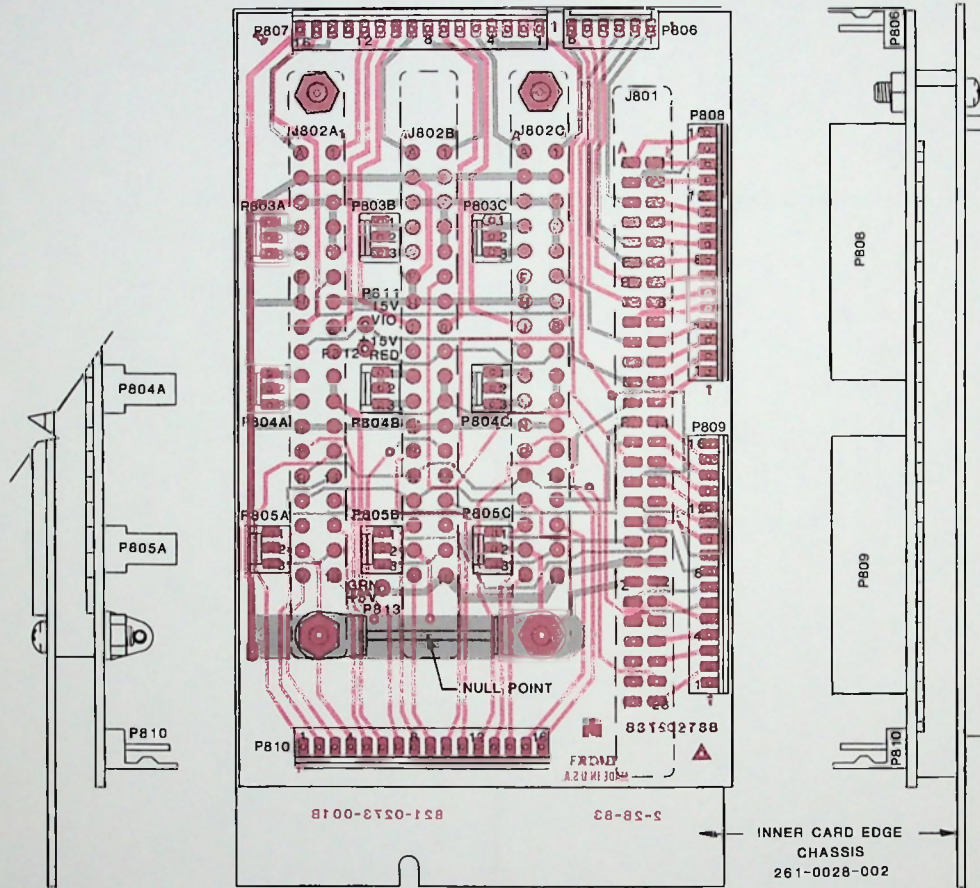
**FIGURE 7-13**  
**DELTA III DECK WIRING**  
**SCHEMATIC**

DELTA III INTERCONNECT BOARD PARTS LIST 831-0273-003

CONNECTORS			
J801	1	380-0144-000	CONNECTOR, PC CARD EDGE, DUAL 28, 0.125, SOLDER T
J802A	1	380-0143-000	CONNECTOR, PC CARD EDGE, DUAL 18, 0.156, SOLDER T
J802B	1	380-0143-000	CONNECTOR, PC CARD EDGE, DUAL 18, 0.156, SOLDER T
J802C	1	380-0143-000	CONNECTOR, PC CARD EDGE, DUAL 18, 0.156, SOLDER T
P803A,B,	3	376-0033-000	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031
P804A,B,	3	376-0033-000	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031
P805A,B,	3	376-0033-000	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031
P806	1	376-0058-000	WAFER, 6 POS., LOCKING, #22-27-2061
P807	1	376-0057-000	WAFER, 16 POS., LOCKING, #22-27-2161
P808	1	376-0057-000	WAFER, 16 POS., LOCKING, #22-27-2161
P809	1	376-0057-000	WAFER, 16 POS., LOCKING, #22-27-2161
P810	1	376-0057-000	WAFER, 16 POS., LOCKING, #22-27-2161
P811-13	3	382-0019-000	PIN, MALE, PCB, #R62-3

MISCELLANEOUS

1	325-0273-003	BOARD, INTERCONNECT DIII
2	300-0030-001	SPACER, NO. 4 X 3/16
6	350-0413-000	SCREW, 4-40 X 7/16, PHILL., PAN, HD.
2	350-0419-000	SCREW, 4-40 X 3/4, PHIL, PAN, STEEL, ZP
6	370-0403-000	NUT, 4-40X1/4, KEPS HEX, STEEL, NP
2	370-0402-000	NUT, 4-40X1/4, HEX, CAD. PLTD.
2	375-0003-000	TERMINAL, # 4, BENT, LOCKING



DELTA III INTERCONNECT BOARD  
831-0273-003

FIGURE 7-14

831-0273-003  
DELTA III INTERCONNECT BOARD  
LAYOUT

PLAY BACK LOGIC CARD  
831-0248

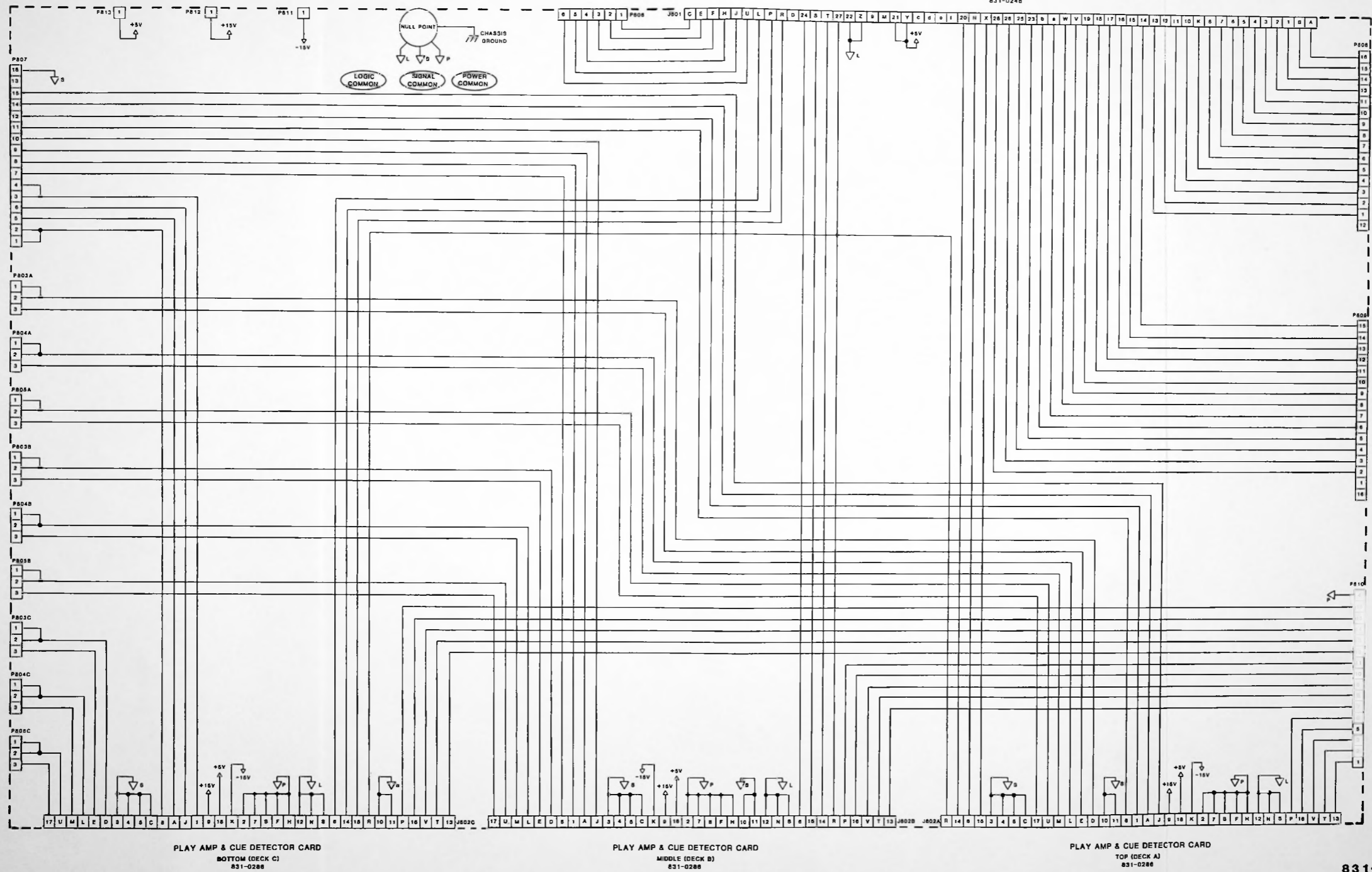
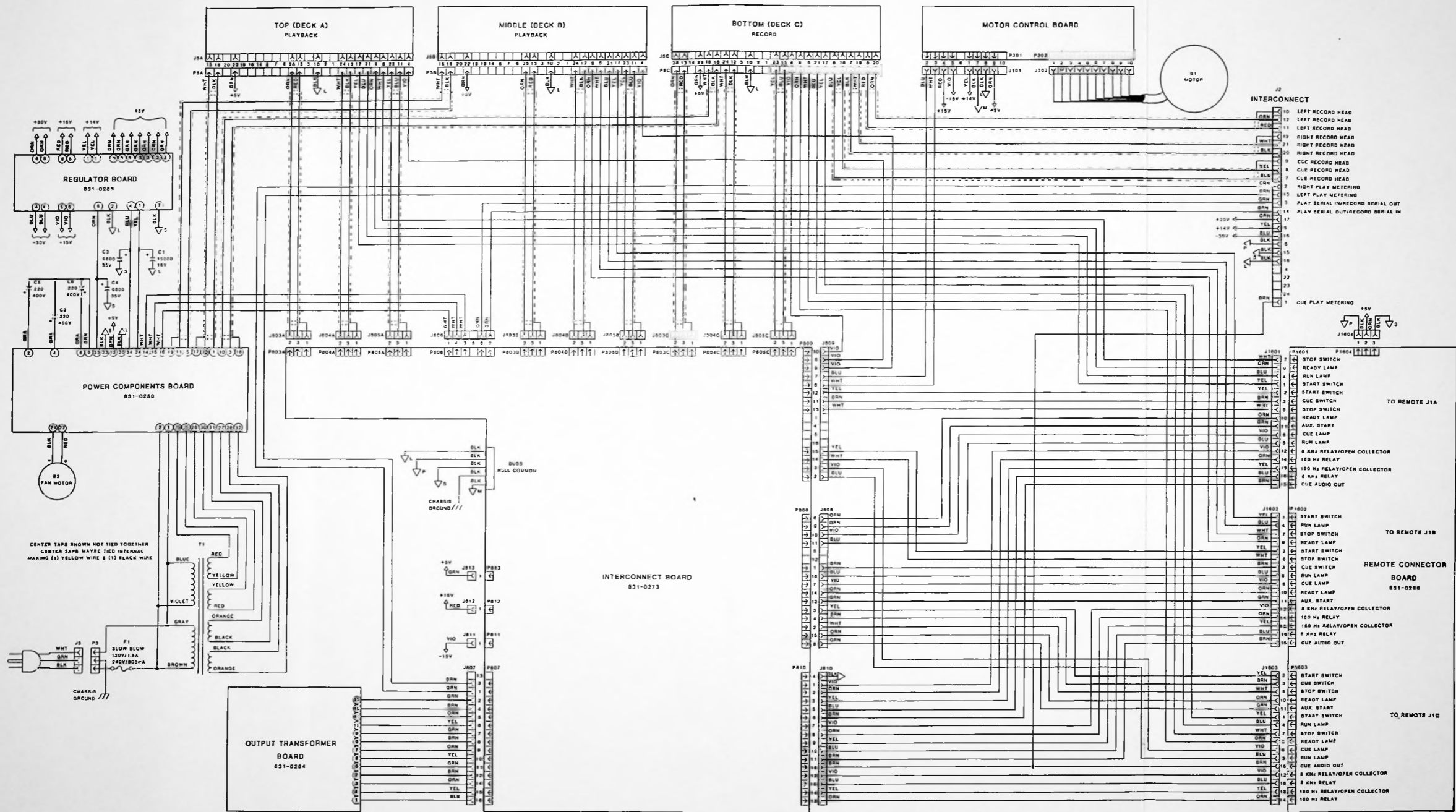


FIGURE 7-15

831-0273-003  
DELTA III INTERCONNECT BOARD  
SCHEMATIC





**NOTES:**  
 1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.  
 2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.  
 3. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

FIGURE 7-16

DELTA III MAINFRAME WIRING SCHEMATIC

## DELTA III POWER COMPONENTS BOARD

## PARTS LIST

831-0250-003

## 120 VOLT VERSION

## RESISTORS

R701	1	628-0191-000	RESISTOR, WW, 100 OHM, 5-1/4 W, 2870
R702	1	628-0192-000	RESISTOR, WW, 13K OHM, 5-1/4 W, 2921
W701	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
R703			NOT USED
R704	1	630-0043-000	RESISTOR, CARBON FILM, 150 OHM, 1/4 W, 54
R705	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 54
R706	1	628-0191-000	RESISTOR, WW, 100 OHM, 5-1/4 W, 2870
R707	1	628-0192-000	RESISTOR, WW, 13K OHM, 5-1/4 W, 2921
W702	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
R708			NOT USED
R709	1	630-0043-000	RESISTOR, CARBON FILM, 150 OHM, 1/4 W, 54
R710	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 54
R711	1	628-0191-000	RESISTOR, WW, 100 OHM, 5-1/4 W, 2870
R712	1	628-0192-000	RESISTOR, WW, 13K OHM, 5-1/4 W, 2921
W703	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
R713			NOT USED
R714	1	630-0043-000	RESISTOR, CARBON FILM, 150 OHM, 1/4 W, 54
R715	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 54
R716	1	630-0047-000	RESISTOR, CARBON FILM, 220 OHM, 1/4 W, 54
R717	1	636-0001-000	POTENTIOMETER, 1K, 1/2 W, CARBON, LAYDOWN

## DIODES

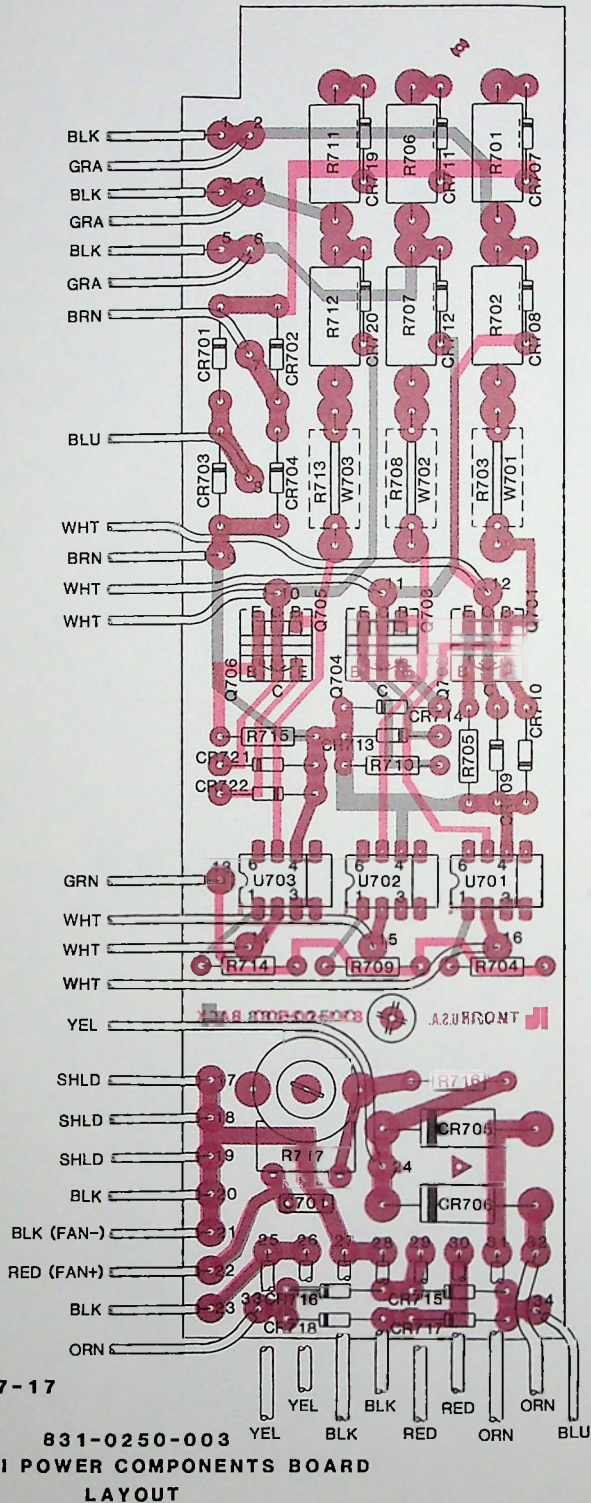
CR701	1	575-0007-000	DIODE, 1N4005
CR702	1	575-0007-000	DIODE, 1N4005
CR703	1	575-0007-000	DIODE, 1N4005
CR704	1	575-0007-000	DIODE, 1N4005
CR705	1	575-0032-000	DIODE, POWER 3A, 200 VOLT MR 502
CR706	1	575-0032-000	DIODE, POWER 3A, 200 VOLT MR 502
CR707	1	575-0007-000	DIODE, 1N4005
CR708	1	575-0007-000	DIODE, 1N4005
CR709	1	575-0007-000	DIODE, 1N4005
CR710	1	575-0007-000	DIODE, 1N4005
CR711	1	575-0007-000	DIODE, 1N4005
CR712	1	575-0007-000	DIODE, 1N4005
CR713	1	575-0007-000	DIODE, 1N4005
CR714	1	575-0007-000	DIODE, 1N4005
CR715	1	575-0007-000	DIODE, 1N4005
CR716	1	575-0007-000	DIODE, 1N4005
CR717	1	575-0007-000	DIODE, 1N4005
CR718	1	575-0007-000	DIODE, 1N4005
CR719	1	575-0007-000	DIODE, 1N4005
CR720	1	575-0007-000	DIODE, 1N4005
CR721	1	575-0007-000	DIODE, 1N4005
CR722	1	575-0007-000	DIODE, 1N4005

## TRANSISTORS

U701	1	585-0008-000	OPTO-ISOLATER, PHOTO DARLINGTON, H11B1
U702	1	585-0008-000	OPTO-ISOLATER, PHOTO DARLINGTON, H11B1
U703	1	585-0008-000	OPTO-ISOLATER, PHOTO DARLINGTON, H11B1
Q701	1	590-0033-000	TRANSISTOR, TIP50, NPN, POWER
Q702	1	590-0033-000	TRANSISTOR, TIP50, NPN, POWER
Q703	1	590-0033-000	TRANSISTOR, TIP50, NPN, POWER
Q704	1	590-0033-000	TRANSISTOR, TIP50, NPN, POWER
Q705	1	590-0033-000	TRANSISTOR, TIP50, NPN, POWER
Q706	1	590-0033-000	TRANSISTOR, TIP50, NPN, POWER

## MISCELLANEOUS

C701	1	680-2563-033 A	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 54
	1	325-0250-003 B	BOARD, POWER COMPONENTS DIII
U701-3	3	613-0007-000	SOCKET, IC, 8 PIN, DIP
	3	350-0604-000	SCREW, 6-32 X 1/4, PHILL, PAN, HD., ZP
	3	370-0601-000	NUT, HEX, 6-32 X 1/4, ZP



BOARD LOADED FOR 120V OPERATION  
 FOR 240V OPERATION SEE TABLE BELOW:

DESIGNATION NUMBER	120V	240V
R703	OUT	13K
R708	OUT	13K
R713	OUT	13K
R701	100	470
R706	100	470
R711	100	470
STRAP W701	IN	OUT
STRAP W702	IN	OUT
STRAP W703	IN	OUT

DELTA III POWER COMPONENTS BOARD  
 831-0250-003 DOMESTIC 120V  
 831-0250-013 EXPORT 240V

FIGURE 7-17

831-0250-003

DELTA III POWER COMPONENTS BOARD  
 LAYOUT

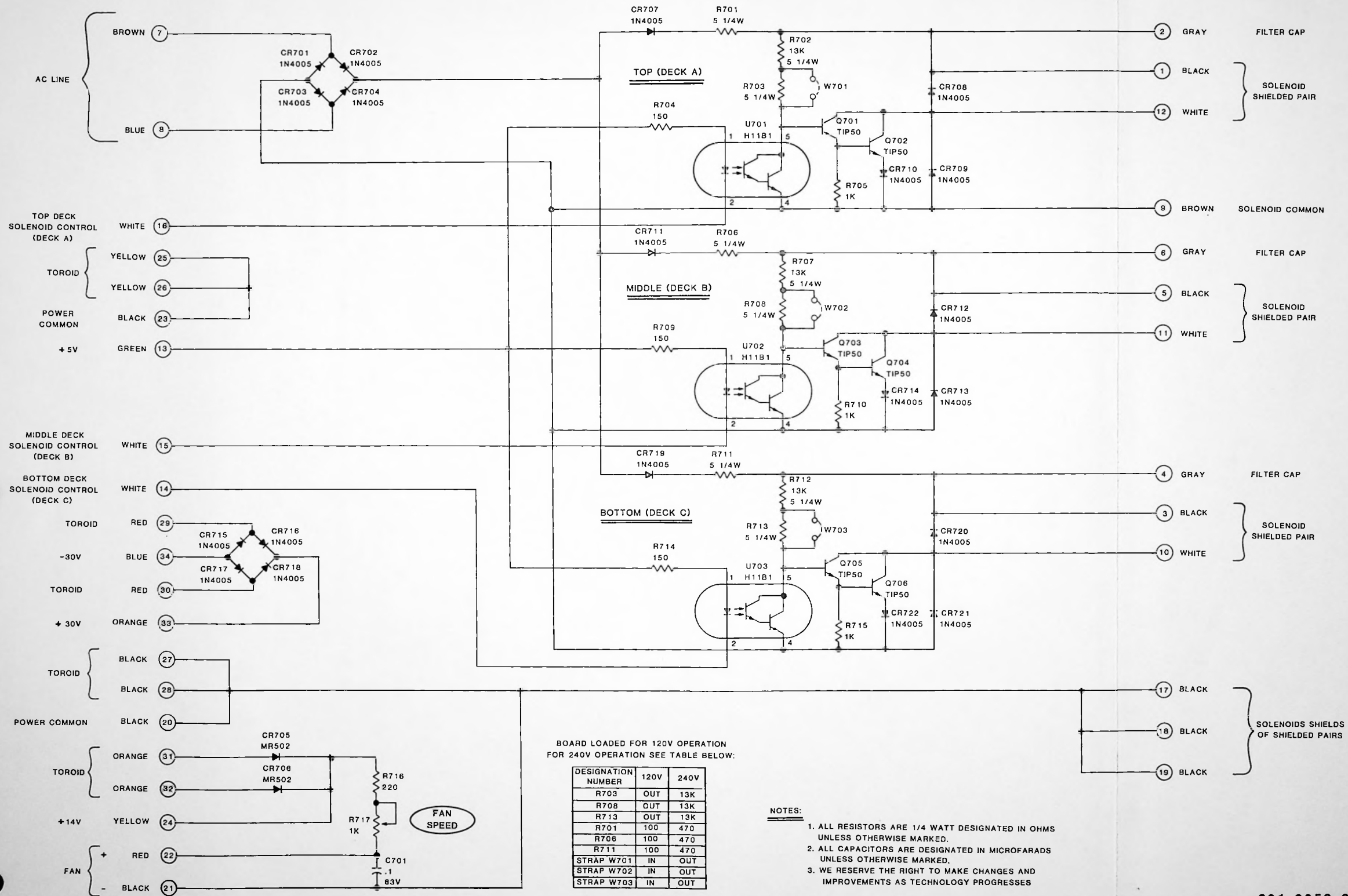


FIGURE 7-18

831-0250-003  
DELTA III POWER COMPONENTS BOARD  
SCHEMATIC

**DELTA III REGULATOR BOARD 831-0283-003 PARTS LIST**

**DIODES**

CR1	1	575-0007-000	DIODE, 1N4005
CR2	1	575-0007-000	DIODE, 1N4005
CR3	1	575-0007-000	DIODE, 1N4005

**CAPACITORS**

C7	1	680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C8	1	680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C9	1	680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C10	1	680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C11	1	680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C12	1	680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%

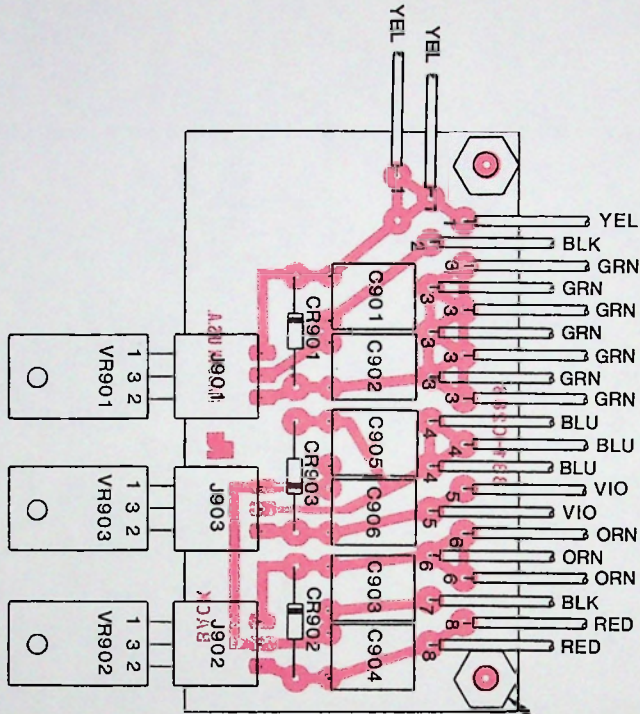
**VOLTAGE REGULATORS @ MOUNTING HARDWARE**

VR1	1	605-0010-000	VOLTAGE REGULATOR, MC7815CT, +15V, TO220 PLASTIC
VR2	1	605-0011-000	VOLTAGE REGULATOR, MC7915CT, -15V, TO220 PLASTIC
VR3	1	605-0012-000	VOLTAGE REGULATOR, MC7805CT, +5V, TO220 PLASTIC
	3	380-0062-000	SOCKET, 3 PIN, 10-18-2031
	3	613-0014-000	INSULATOR, TO-220
	3	352-0004-000	SCREW, 6-32 X 1/4, NYLON, SLOTTED, R. HD.

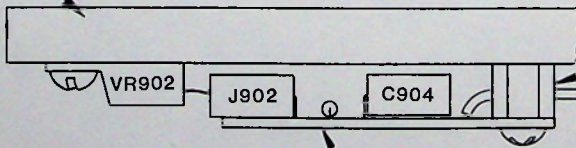
**MISCELLANEOUS**

	1	325-0283-003	BOARD, REGULATOR DIII
	2	300-0099-000	SPACER, 6-32 X 1/4 X 1/4 LONG, HEX, MALE/FEMALE,
	2	350-0604-000	SCREW, 6-32 X 1/4, PHILL, PAN, HD., ZP

SPACER, 6-32 X 1/4 X 1/4 LONG, HEX, MALE/FEMALE  
 300-0039-000



CENTER MOUNTING PLATE  
 283-0085-013

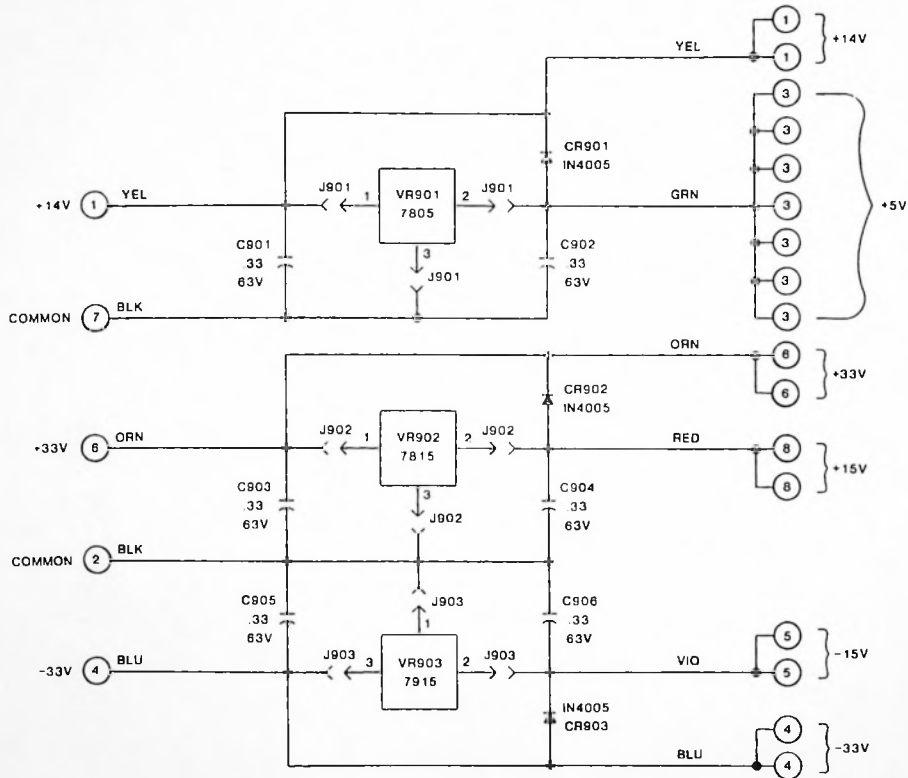


P.C. BOARD  
 831-0283

DELTA III REGULATOR BOARD  
 831-0283-003

FIGURE 7-19

831-0283-003  
 DELTA III REGULATOR BOARD  
 LAYOUT



**NOTES**

1. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
2. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES

**FIGURE 7-20**

**831-0283-003  
DELTA III REGULATOR BOARD  
SCHEMATIC**

DELTA IV RECORD AND METER AMPLIFIER BOARD PARTS LIST 831-0251

CAPACITORS

- C1001 1 678-0163-033 CAPACITOR, POLYPROPYLENE, 220 PFD., 63V, 5%
C1002 1 678-0163-033 CAPACITOR, POLYPROPYLENE, 220 PFD., 63V, 5%
C1003 1 695-1925-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 100 UFD., 25V
C1004 1 695-1925-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 100 UFD., 25V
C1005 1 695-1135-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 4.7 UFD., 35V
C1006 1 695-1135-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 4.7 UFD., 35V
C1007 1 690-1563-033 CAPACITOR, POLYESTER FILM, .015 UFD., 63V, 5%
C1008 1 690-1563-033 CAPACITOR, POLYESTER FILM, .015 UFD., 63V, 5%
C1009 1 690-2393-033 CAPACITOR, POLYESTER FILM, .068 UFD., 63V, 5%
C1010 1 690-2393-033 CAPACITOR, POLYESTER FILM, .068 UFD., 63V, 5%
C1011 1 690-2563-033 CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1012 1 690-2563-033 CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1013 1 695-1135-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 4.7 UFD., 35V
C1014 1 695-1135-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 4.7 UFD., 35V
C1015 1 695-1135-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 4.7 UFD., 35V
C1016 1 690-2563-033 CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1017 1 690-2563-033 CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1018 1 695-1716-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C1019 1 695-1716-013 CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C1020 1 690-2563-033 CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1021 1 690-2563-033 CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1022 1 690-2563-033 CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1023 1 690-2563-033 CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%

RESISTORS

- R1001 1 630-0075-000 RESISTOR, CARBON FILM, 3.3K OHM, 1/4W, 5%
R1002 1 630-0075-000 RESISTOR, CARBON FILM, 3.3K OHM, 1/4W, 5%
R1003 1 630-0101-000 RESISTOR, CARBON FILM, 39K OHM, 1/4W, 5%
R1004 1 630-0101-000 RESISTOR, CARBON FILM, 39K OHM, 1/4W, 5%
R1005 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1006 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1007 1 630-0055-000 RESISTOR, CARBON FILM, 470 OHM, 1/4W, 5%
R1008 1 630-0055-000 RESISTOR, CARBON FILM, 470 OHM, 1/4W, 5%
R1009 1 630-0093-000 RESISTOR, CARBON FILM, 18K OHM, 1/4 W, 5%
R1010 1 630-0093-000 RESISTOR, CARBON FILM, 18K OHM, 1/4 W, 5%
R1011 1 630-0119-000 RESISTOR, CARBON FILM, 220K OHM, 1/4W, 5%
R1012 1 630-0119-000 RESISTOR, CARBON FILM, 220K OHM, 1/4W, 5%
R1013 1 630-0047-000 RESISTOR, CARBON FILM, 220 OHM, 1/4 W, 5%
R1014 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1015 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1016 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1017 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1018 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1019 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1020 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1021 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1022 1 636-0031-000 POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1023 1 630-0119-000 RESISTOR, CARBON FILM, 220K OHM, 1/4 W, 5%
R1024 1 630-0119-000 RESISTOR, CARBON FILM, 220K OHM, 1/4 W, 5%
R1025 1 630-0111-000 RESISTOR, CARBON FILM, 100K OHM, 1/4 W, 5%
R1026 1 630-0111-000 RESISTOR, CARBON FILM, 100K OHM, 1/4 W, 5%
R1027 1 630-0111-000 RESISTOR, CARBON FILM, 100K OHM, 1/4 W, 5%
R1028 1 630-0091-000 RESISTOR, CARBON FILM, 15K OHM, 1/4 W, 5%
R1029 1 630-0091-000 RESISTOR, CARBON FILM, 15K OHM, 1/4 W, 5%
R1030 1 630-0091-000 RESISTOR, CARBON FILM, 15K OHM, 1/4 W, 5%
R1031 1 630-0127-000 RESISTOR, CARBON FILM, 470K OHM, 1/4 W, 5%

RESISTOR NETWORKS

- RP1001 1 631-0030-000 RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP1002 1 631-0030-000 RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP1003 1 631-0030-000 RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP1004 1 631-0030-000 RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP1005 1 631-0030-000 RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP1006 1 631-0030-000 RESISTOR, ARRAY, SEPARATE SIP, 4R, 4.7K, 2%
RP1007 1 631-0033-000 RESISTOR, ARRAY, SEPARATE SIP, 4R, 22K, 2%

SEMICONDUCTORS

- U1001 1 606-0016-000 IC, TLO74CP, QUAD BI-FET OP AMP
U1002 1 606-0016-000 IC, TLO74CP, QUAD BI-FET OP AMP
U1003 1 608-0004-000 IC, MCL14052DC, CHOS DUAL 4-1 MULTIPLEX W/DECODE
U1004 1 606-0015-000 IC, TLO84CP, QUAD BI-FET OP AMP
CR1001 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448
CR1002 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448
CR1003 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448
CR1004 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448
CR1005 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448
CR1006 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448
CR1007 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448
CR1008 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448
CR1009 1 575-0031-000 DIODE, SMALL SIGNAL, IN4448

SOCKETS

- U1001 1 613-0008-000 SOCKET, IC, 14 PIN, DIP
U1002 1 613-0008-000 SOCKET, IC, 14 PIN, DIP
U1003 1 613-0009-000 SOCKET, IC, 16 PIN, DIP
U1004 1 613-0008-000 SOCKET, IC, 14 PIN, DIP

MISCELLANEOUS

- W1001 NOT USED
W1002 NOT USED
W1003 BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W1004 SWITCH, MINATURE SLIDE, #22 AWG (QUANTITY IN 1/2 INCH)
S1001 CARD, RECORD AND METER AMP
1 323-0003-001 CARD PULL, DELTAS
1 282-0046-000 PIN, ROLL, 1/16 X 3/16



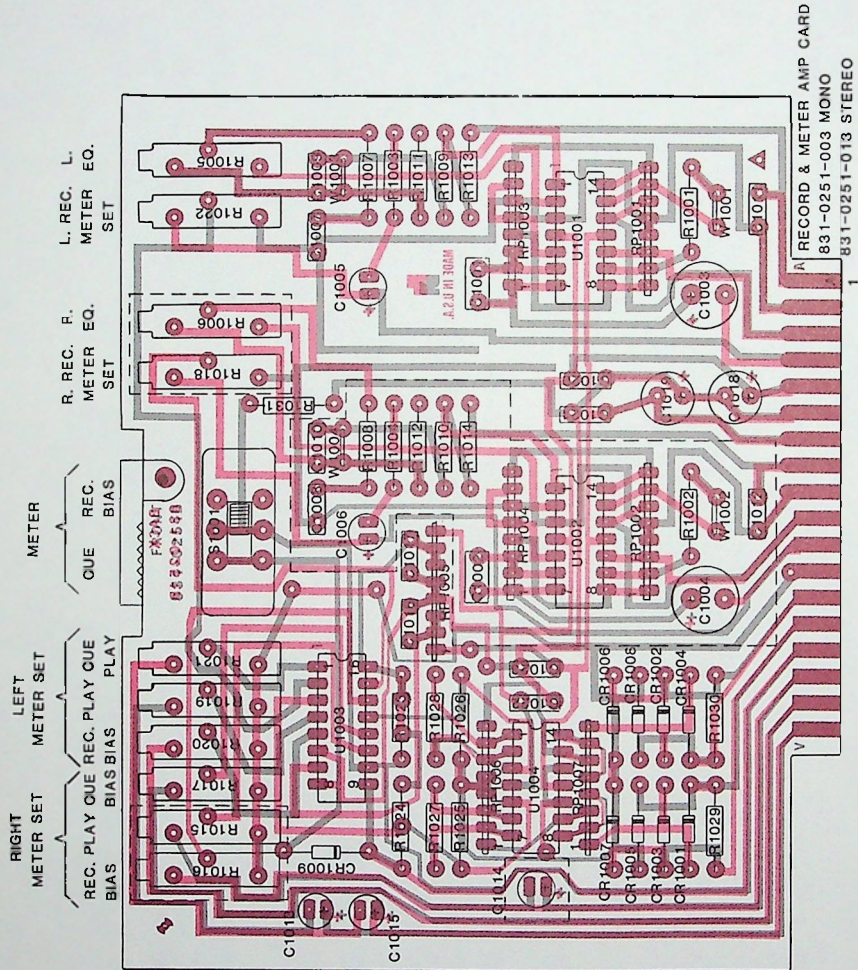
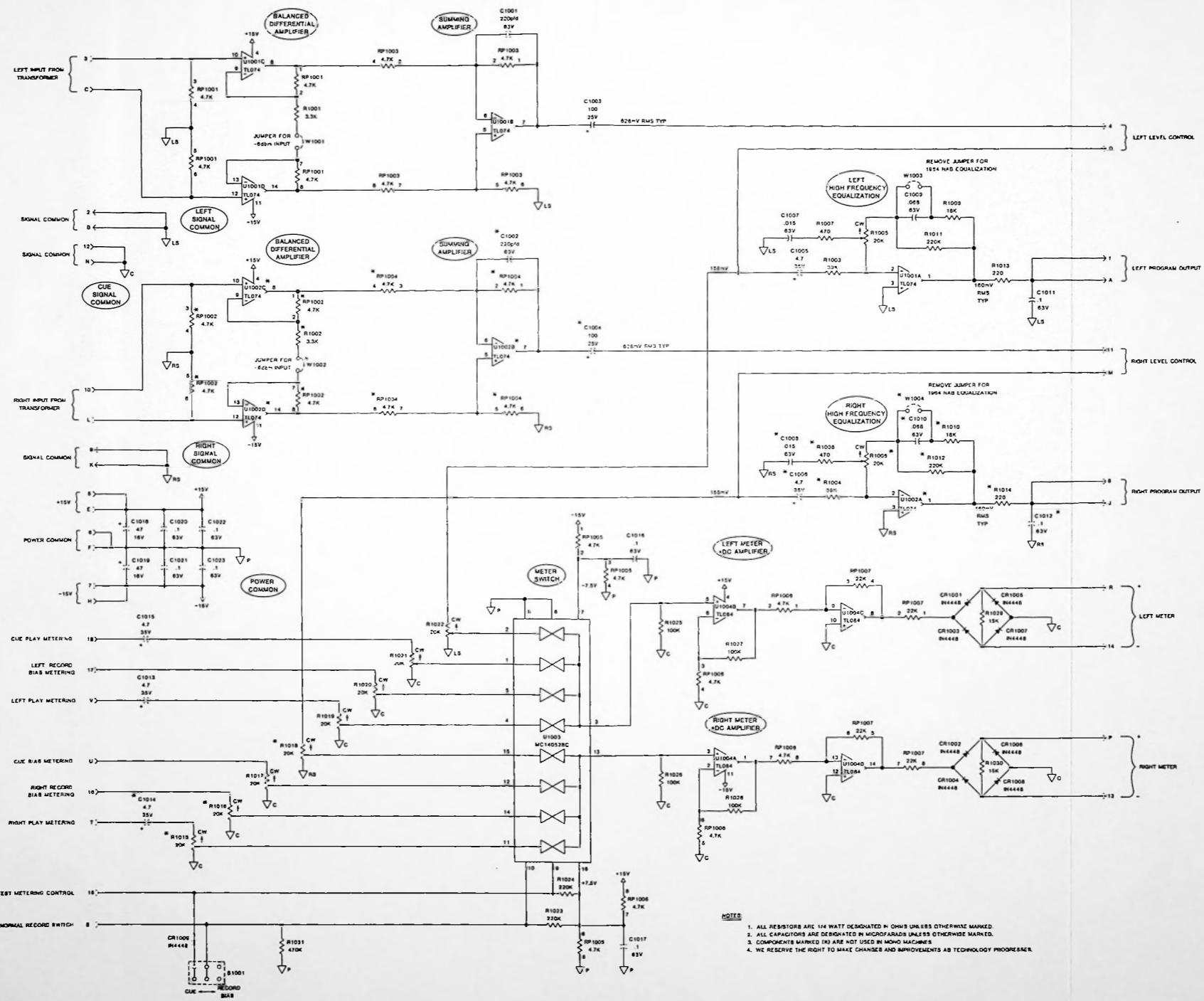


FIGURE 7-21

831-0251  
 DELTA IV RECORD AND METER  
 AMPLIFIER BOARD LAYOUT



- NOTES**
1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
  2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
  3. COMPONENTS MARKED (N) ARE NOT USED IN MONO MACHINES.
  4. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

FIGURE 7-22

831-0251  
**DELTA IV RECORD AND METER  
 AMPLIFIER BOARD SCHEMATIC**

DELTA IV RECORD LOGIC & CUE TONE GENERATOR BOARD

PARTS LIST

831-0271-003

CAPACITORS

C1201	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1202	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1203	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1204	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1205	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1206	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1207	1	594-0005-000	CAPACITOR, TANTALUM, 1 UFD., 35 V, 20%, RADIAL
C1208	1	686-0011-000	CAPACITOR, CERAMIC, 15 UFD., 1000 WDC, 20%
C1209	1	686-0011-000	CAPACITOR, CERAMIC, 15 UFD., 1000 WDC, 20%
C1210	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1211	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1212	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1213	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1214	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1215	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1216	1	680-0501-033	CAPACITOR, POLYESTER FILM, .0022 UFD., 100V, 5%
C1217	1	680-0501-033	CAPACITOR, POLYESTER FILM, .0022 UFD., 100V, 5%
C1218	1	680-1963-033	CAPACITOR, POLYESTER FILM, .033 UFD., 63 V, 5%
C1219	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1220	1	680-0501-033	CAPACITOR, POLYESTER FILM, .0022 UFD., 100V, 5%
C1221	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1222	1	680-1963-033	CAPACITOR, POLYESTER FILM, .033 UFD., 63 V, 5%
C1223	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1224	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1225	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1226	1	680-2563-033	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C1227	1	595-1716-013	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1228	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1229	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1230	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1231	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C1232	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%
C1233	1	695-1716-013	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V
C1234	1	680-2563-033	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%

RESISTOR NETWORKS

RP1201	1	631-0007-000	RESISTOR, ARRAY, COMMON SIP, 9R, 330 OHM, 2%
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RESISTORS

R1201	1	630-0079-000	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
R1202	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%
R1203	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%
R1204	1	630-0091-000	RESISTOR, CARBON FILM, 15K OHM, 1/4 W, 5%
R1205	1	630-0079-000	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
R1206	1	630-0119-000	RESISTOR, CARBON FILM, 220K OHM, 1/4W, 5%
R1207	1	630-0119-000	RESISTOR, CARBON FILM, 220K OHM, 1/4W, 5%
R1208	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%
R1209	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%
R1210	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%
R1211	1	630-0107-000	RESISTOR, CARBON FILM, 68K OHM, 1/4/W, 5%
R1212	1	630-0095-000	RESISTOR, CARBON FILM, 22K OHM, 1/4 W, 5%
R1213	1	630-0095-000	RESISTOR, CARBON FILM, 22K OHM, 1/4 W, 5%
R1214	1	630-0095-000	RESISTOR, CARBON FILM, 22K OHM, 1/4 W, 5%

R1215	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%
R1216	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%
R1217	1	630-0065-000	RESISTOR, CARBON FILM, 1.2K OHM, 1/4 W, 5%
R1218	1	630-0053-000	RESISTOR, CARBON FILM, 390 OHM, 1/4 W, 5%
R1219	1	630-0053-000	RESISTOR, CARBON FILM, 390 OHM, 1/4 W, 5%
R1220	1	630-0053-000	RESISTOR, CARBON FILM, 390 OHM, 1/4 W, 5%
R1221	1	630-0062-000	RESISTOR, CARBON FILM, 5.2K OHM, 1/4 W, 5%
R1222	1	630-0083-000	RESISTOR, CARBON FILM, 6.8K OHM, 1/4 W, 5%
R1223	1	630-0087-000	RESISTOR, CARBON FILM, 10K OHM, 1/4 W, 5%
R1224	1	630-0075-000	RESISTOR, CARBON FILM, 3.3K OHM, 1/4W, 5%
R1225	1	630-0075-000	RESISTOR, CARBON FILM, 3.3K OHM, 1/4W, 5%
R1226	1	630-0111-000	RESISTOR, CARBON FILM, 3.3K OHM, 1/4W, 5%
R1227	1	630-0111-000	RESISTOR, CARBON FILM, 3.3K OHM, 1/4W, 5%
R1228	1	630-0103-000	RESISTOR, CARBON FILM, 47K OHM, 1/4W, 5%
R1229	1	630-0119-000	RESISTOR, CARBON FILM, 220K OHM, 1/4 W, 5%
R1230	1	630-0111-000	RESISTOR, CARBON FILM, 220K OHM, 1/4 W, 5%
R1231	1	636-0031-000	POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
R1232	1	630-0063-000	RESISTOR, CARBON FILM, 1K OHM, 1/4 W, 5%

SOCKETS

Q1201	1	613-0004-001	PAD, TRANSISTOR, #7717-137N
U1201	1	613-0017-000	SOCKET, IC, 40 PIN, DIP
U1202	1	613-0009-000	SOCKET, IC, 16 PIN, DIP
U1203	1	613-0009-000	SOCKET, IC, 16 PIN, DIP
U1204	1	613-0008-000	SOCKET, IC, 14 PIN, DIP
U1205	1	613-0009-000	SOCKET, IC, 16 PIN, DIP
U1206	1	613-0008-000	SOCKET, IC, 16 PIN, DIP
U1207	1	613-0008-000	SOCKET, IC, 14 PIN, DIP
U1208	1	613-0008-000	SOCKET, IC, 14 PIN, DIP
U1209	1	613-0008-000	SOCKET, IC, 14 PIN, DIP

SEMI-CONDUCTORS

Q1201	1	596-0004-000	TRANSISTOR, MPF 4391, J-FET, N-CANNEL
U1201	1	610-0006-000	IC, 8748, MICRO-PROCESSOR, EPROM, CRASED
U1202	1	607-0003-000	IC, 75431, DUAL PERIPHERAL AND DRIVER
U1203	1	608-0033-000	IC, MC145268, PROGRAMMABLE BINARY DIVIDE-BY-N COU
U1204	1	607-0045-000	IC, 74LS393, DUAL 4 BIT BINARY COUNTER
U1205	1	607-0079-000	IC, 74LS390, DUAL DECADE COUNTER
U1206	1	607-0054-000	IC, 74LS32, QUAD 2 INPUT OR
U1207	1	607-0009-000	IC, 75451, DUAL PERIPHERAL AND DRIVER
U1208	1	606-0016-000	IC, TL074CP, QUAD BI-FET OP AMP
U1209	1	606-0016-000	IC, TL074CP, QUAD BI-FET OP AMP
CR1201	1	575-0031-000	DIODE, SMALL SIGNAL 1N4448

MISCELLANEOUS

1	323-0071-003 B	CARD, RECORD LOGIC & CUE TONE GENERATION
1	323-0003-001	CARD PULL, DELTAS
1	282-0046-000	PIN, ROLL, 1/16 X 3/16
1	448-0009-000	CRYSTAL, 3.579 MHZ.

XTL1201

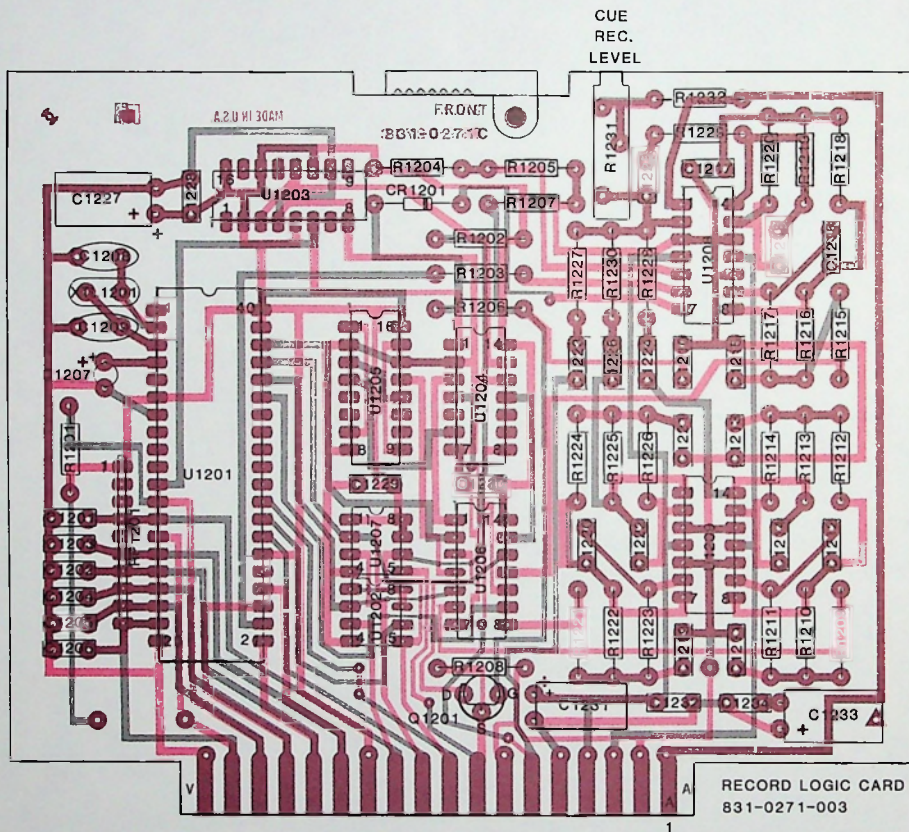


FIGURE 7-23

831-0271-003  
DELTA IV RECORD LOGIC BOARD  
LAYOUT

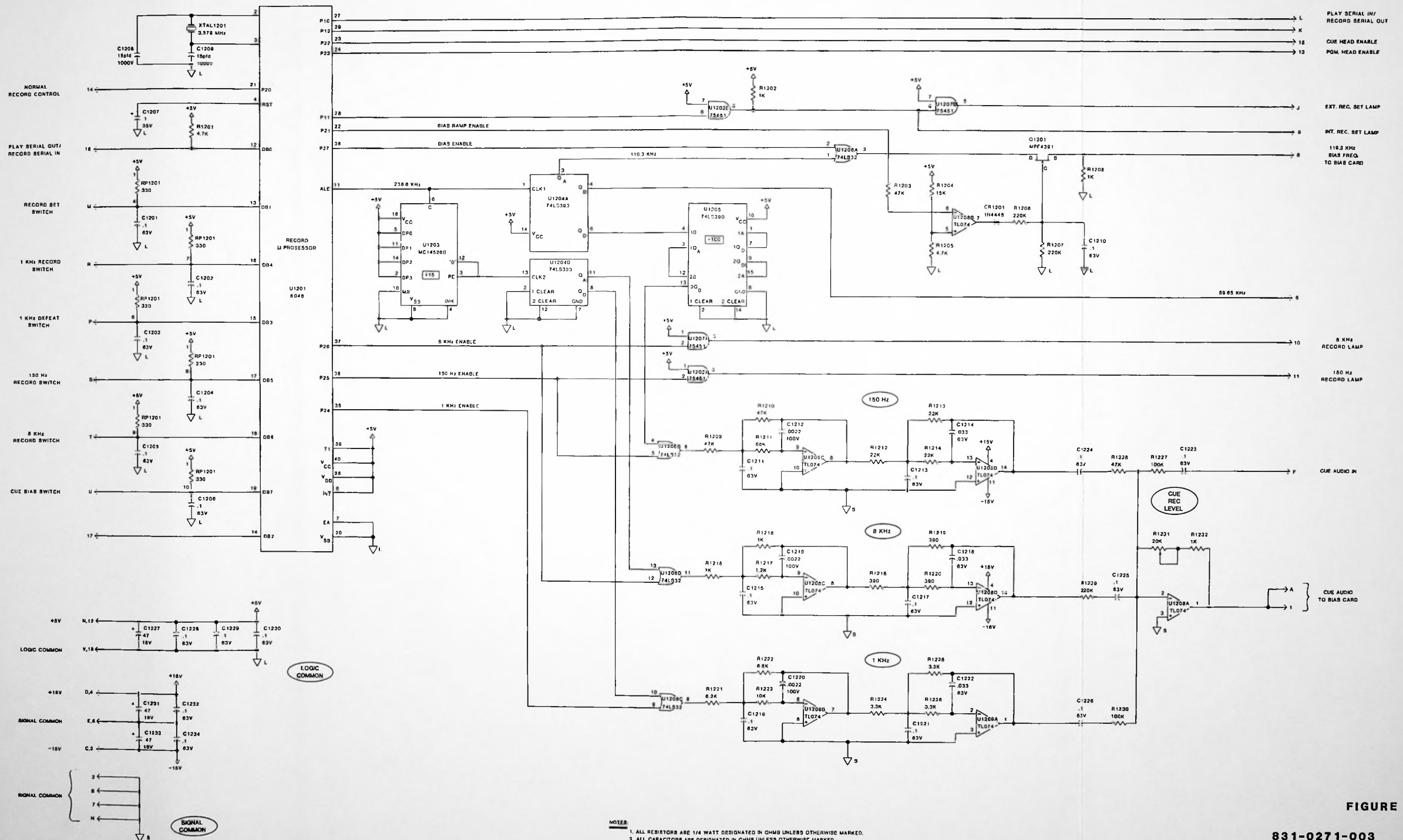


FIGURE 7-24

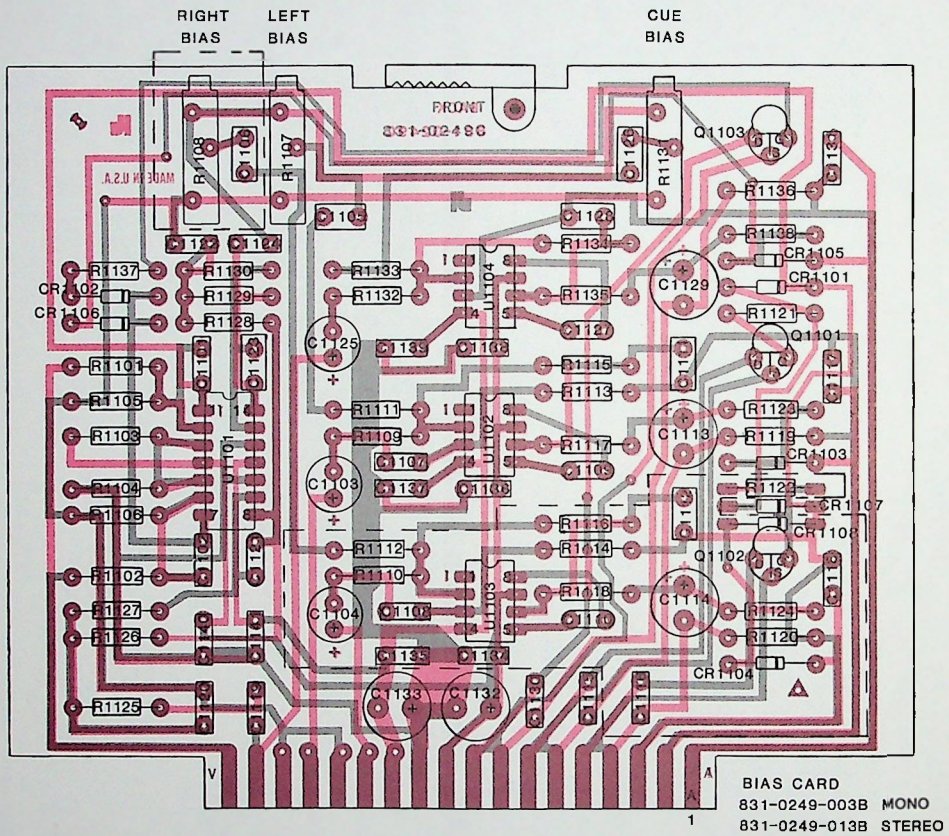
831-0271-003  
 DELTA IV RECORD LOGIC BOARD  
 SCHEMATIC

## DELTA IV BIAS AMPLIFIER BOARD

## PARTS LIST

831-0249

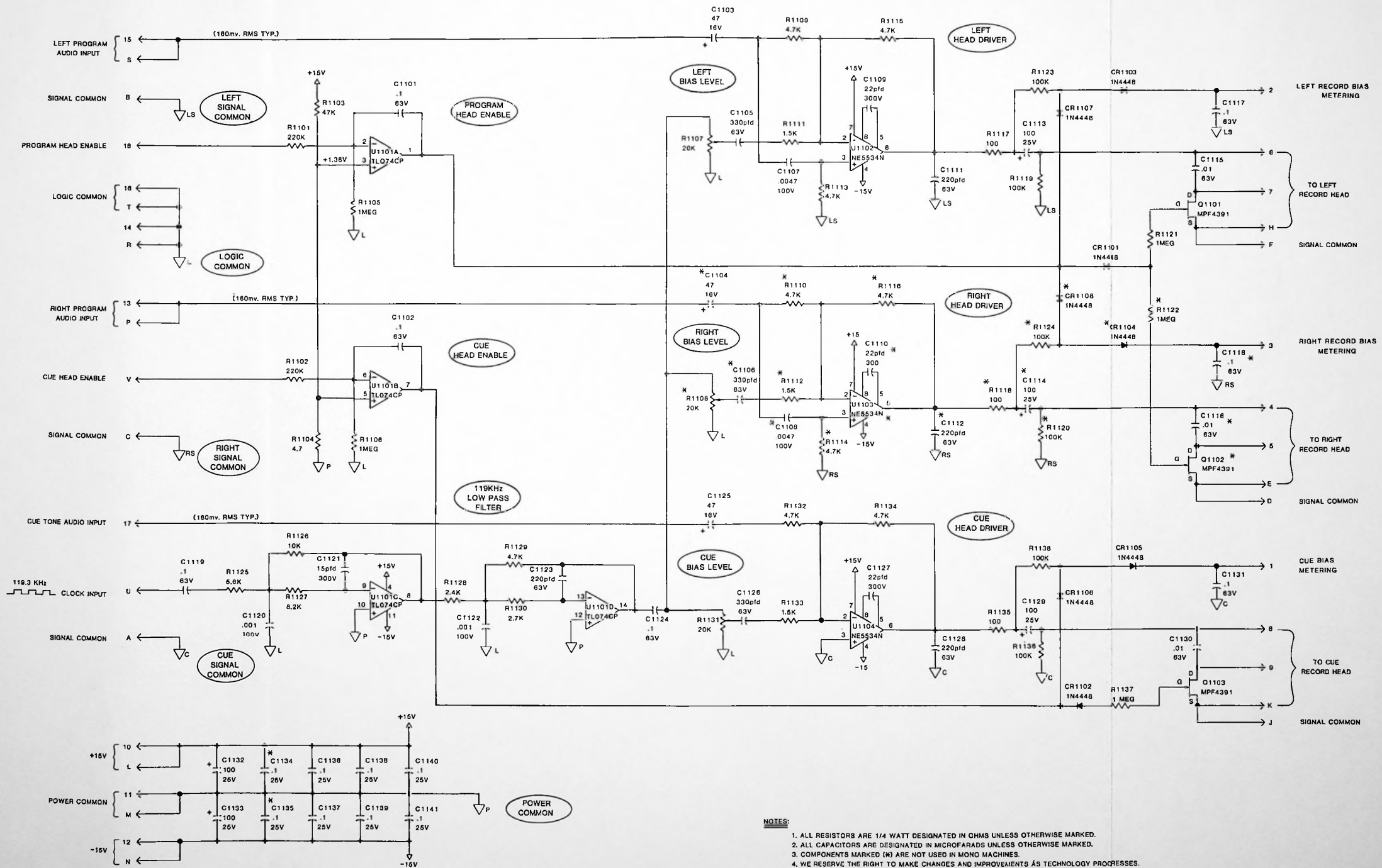
QTY	DESCRIPTION	QTY	DESCRIPTION	QTY	DESCRIPTION	QTY	DESCRIPTION
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	630-0067-000	1	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
1	695-1716-013	1	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V	1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
1	695-1716-013	1	CAPACITOR, ALUMINUM ELECTROLYTIC, 47 UFD., 16V	1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
1	678-0363-033	1	CAPACITOR, POLYPROPYLENE, 330 PFD., 63V, 5%	1	630-0039-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	678-0363-033	1	CAPACITOR, POLYPROPYLENE, 330 PFD., 63V, 5%	1	630-0039-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	680-0901-033	1	CAPACITOR, POLYESTER FILM, .0047 UFD., 100V, 5%	1	630-0111-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	680-0901-033	1	CAPACITOR, POLYESTER FILM, .0047 UFD., 100V, 5%	1	630-0111-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	677-0008-000	1	CAPACITOR, SILVER MICA, 22 PFD., 300V	1	630-0135-000	1	RESISTOR, CARBON FILM, 1M OHM, 1/4 W, 5%
1	677-0008-000	1	CAPACITOR, SILVER MICA, 22 PFD., 300V	1	630-0135-000	1	RESISTOR, CARBON FILM, 1M OHM, 1/4 W, 5%
1	678-0163-033	1	CAPACITOR, POLYPROPYLENE, 220 PFD., 63V, 5%	1	630-0111-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	678-0163-033	1	CAPACITOR, POLYPROPYLENE, 220 PFD., 63V, 5%	1	630-0111-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	695-1925-013	1	CAPACITOR, ALUMINUM ELECTROLYTIC, 100 UFD., 25V	1	630-0081-000	1	RESISTOR, CARBON FILM, 5.6K OHM, 1/4 W, 5%
1	695-1925-013	1	CAPACITOR, ALUMINUM ELECTROLYTIC, 100 UFD., 25V	1	630-0087-000	1	RESISTOR, CARBON FILM, 10K OHM, 1/4 W, 5%
1	680-1363-033	1	CAPACITOR, POLYESTER FILM, .01 UFD., 63V, 5%	1	630-0087-000	1	RESISTOR, CARBON FILM, 10K OHM, 1/4 W, 5%
1	680-1363-033	1	CAPACITOR, POLYESTER FILM, .01 UFD., 63V, 5%	1	630-0079-000	1	RESISTOR, CARBON FILM, 8.2K OHM, 1/4 W, 5%
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	630-0072-000	1	RESISTOR, CARBON FILM, 2.4K OHM, 1/4 W, 5%
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	630-0072-000	1	RESISTOR, CARBON FILM, 2.4K OHM, 1/4 W, 5%
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
1	680-0101-033	1	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%	1	630-0031-000	1	POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203
1	677-0013-000	1	CAPACITOR, SILVER MICA, 15 PFD, 300V	1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
1	680-0101-033	1	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%	1	630-0067-000	1	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%
1	680-0101-033	1	CAPACITOR, POLYESTER FILM, .001 UFD., 100V, 5%	1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
1	680-2563-033	1	CAPACITOR, POLYPROPYLENE, 220 PFD., 63V, 5%	1	630-0039-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%
1	680-2563-033	1	CAPACITOR, POLYPROPYLENE, 220 PFD., 63V, 5%	1	630-0111-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	678-0363-033	1	CAPACITOR, POLYPROPYLENE, 330 PFD., 63V, 5%	1	630-0135-000	1	RESISTOR, CARBON FILM, 1M OHM, 1/4 W, 5%
1	678-0363-033	1	CAPACITOR, POLYPROPYLENE, 330 PFD., 63V, 5%	1	630-0111-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	677-0008-000	1	CAPACITOR, SILVER MICA, 22 PFD., 300V	1	630-0111-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	677-0008-000	1	CAPACITOR, SILVER MICA, 22 PFD., 300V	1	630-0111-000	1	RESISTOR, CARBON FILM, 100 OHM, 1/4 W, 5%
1	695-1925-013	1	CAPACITOR, ALUMINUM ELECTROLYTIC, 100 UFD., 25V	1	630-0031-000	1	DIODE, SMALL SIGNAL
1	695-1925-013	1	CAPACITOR, ALUMINUM ELECTROLYTIC, 100 UFD., 25V	1	630-0031-000	1	DIODE, SMALL SIGNAL
1	680-1363-033	1	CAPACITOR, POLYESTER FILM, .01 UFD., 63V, 5%	1	630-0031-000	1	DIODE, SMALL SIGNAL
1	680-1363-033	1	CAPACITOR, POLYESTER FILM, .01 UFD., 63V, 5%	1	630-0031-000	1	DIODE, SMALL SIGNAL
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	575-0031-000	1	TRANSISTOR, MEF 4391, J-FET, N-CHANNEL
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	575-0031-000	1	TRANSISTOR, MEF 4391, J-FET, N-CHANNEL
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	596-0004-000	1	IC, TL074CP, QUAD BI-FET OP AMP
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	596-0004-000	1	IC, NE5534N, SINGLE AUDIO OP AMP
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	606-0023-000	1	IC, NE5534N, SINGLE AUDIO OP AMP
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	606-0023-000	1	IC, NE5534N, SINGLE AUDIO OP AMP
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	606-0023-000	1	IC, NE5534N, SINGLE AUDIO OP AMP
1	680-2563-033	1	CAPACITOR, POLYESTER FILM, .10 UFD., 63V, 5%	1	606-0023-000	1	IC, NE5534N, SINGLE AUDIO OP AMP
1	630-0119-000	1	RESISTOR, CARBON FILM, 220K OHM, 1/4W, 5%	1	613-0004-001	1	PAD, TRANSISTOR, #7717-137N
1	630-0119-000	1	RESISTOR, CARBON FILM, 220K OHM, 1/4W, 5%	1	613-0004-001	1	PAD, TRANSISTOR, #7717-137N
1	630-0103-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%	1	613-0008-000	1	SOCKET, IC, 14 PIN, DIP
1	630-0103-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%	1	613-0007-000	1	SOCKET, IC, 8 PIN, DIP
1	630-0135-000	1	RESISTOR, CARBON FILM, 1M OHM, 1/4 W, 5%	1	613-0007-000	1	SOCKET, IC, 8 PIN, DIP
1	630-0135-000	1	RESISTOR, CARBON FILM, 1M OHM, 1/4 W, 5%	1	613-0007-000	1	SOCKET, IC, 8 PIN, DIP
1	636-0031-000	1	POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203	1	613-0007-000	1	SOCKET, IC, 8 PIN, DIP
1	636-0031-000	1	POTENTIOMETER, 20K OHM, MULTI-TURN, 3006P-1-203	1	613-0007-000	1	SOCKET, IC, 8 PIN, DIP
1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%	1	325-0249-003 B	1	CARD, BIAS
1	630-0079-000	1	RESISTOR, CARBON FILM, 4.7K OHM, 1/4 W, 5%	1	323-0003-001	1	CARD, FULL, DELTAS
1	630-0067-000	1	RESISTOR, CARBON FILM, 1.5K OHM, 1/4 W, 5%	1	282-0046-000	1	PIN, ROLL, 1/16 X 3/15



COMPONENTS WITHIN DASHED LINED AREAS  
NOT USED IN MONO MACHINES.

FIGURE 7-25

831-0249  
DELTA IV BIAS AMPLIFIER BOARD  
LAYOUT



- NOTES:**
1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
  2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
  3. COMPONENTS MARKED (\*) ARE NOT USED IN MONO MACHINES.
  4. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

FIGURE 7-26

831-0249  
 DELTA IV BIAS AMPLIFIER BOARD  
 SCHEMATIC



**DELTA IV MOTHERBOARD 831-0282-003 PARTS LIST**

1	325-0282-002 A	BOARD, MOTHER DIV
WIRING		
1	507-0006-000	CABLE, SHIELDED, RED-ORANGE
1	507-0007-000	CABLE, SHIELDED, WHITE-BLACK
1	507-0008-000	CABLE, SHIELDED, YELLOW-BLUE
CONNECTORS		
J4	1 380-0145-000	CONNECTOR, 24 PIN, W/LOCKING BAIL
	2 350-0415-000	SCREW, 4-40 X 1/2, PHIL., PAN HD., NP
	2 370-0403-000	NUT, 4-40X1/4, KEPS HEX, STEEL, NP
J1408	1 380-0062-000	SOCKET, 3 PIN, 10-18-2031
J1409	1 380-0062-000	SOCKET, 3 PIN, 10-18-2031
J1410	1 380-0062-000	SOCKET, 3 PIN, 10-18-2031
J1411	1 380-0143-000	CONNECTOR, PC CARD EDGE, DUAL 18, 0.156, SOLDER T
J1412	1 380-0143-000	CONNECTOR, PC CARD EDGE, DUAL 18, 0.156, SOLDER T
J1413	1 380-0143-000	CONNECTOR, PC CARD EDGE, DUAL 18, 0.156, SOLDER T
P1401	1 376-0047-000	WAFER, 10 POS., LOCKING, KK100, #22-27-2101
P1402	1 376-0047-000	WAFER, 10 POS., LOCKING, KK100, #22-27-2101
P1403	1 376-0058-000	WAFER, 6 POS., LOCKING, #22-27-2061
P1404	1 376-0057-000	WAFER, 16 POS., LOCKING, #22-27-2161
P1405	1 376-0033-000	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031
P1406	1 376-0033-000	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031
P1407	1 376-0033-000	WAFER, 3 POS., LOCKING, GOLD, #22-29-2031
VOLTAGE REGULATORS		
VR1401	1 605-0012-000	VOLTAGE REGULATOR, MC7805CT, +5V, TO220 PLASTIC
VR1402	1 605-0010-000	VOLTAGE REGULATOR, MC7815CT, +15V, TO220 PLASTIC
VR1403	1 605-0011-000	VOLTAGE REGULATOR, MC7915CT, -15V, TO220 PLASTIC
	3 613-0014-000	INSULATOR, TO-220
	3 352-0004-000	SCREW, 6-32 X 1/4, NYLON, SLOTTED, R. HD.
CAPACITORS		
C1401	1 680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C1402	1 680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C1403	1 680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C1404	1 680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C1405	1 680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
C1406	1 680-3163-033	CAPACITOR, POLYESTER FILM, .33 UFD., 63V, 5%
DIODES		
CR1401	1 575-0007-000	DIODE, 1N4005
CR1402	1 575-0007-000	DIODE, 1N4005
CR1403	1 575-0007-000	DIODE, 1N4005

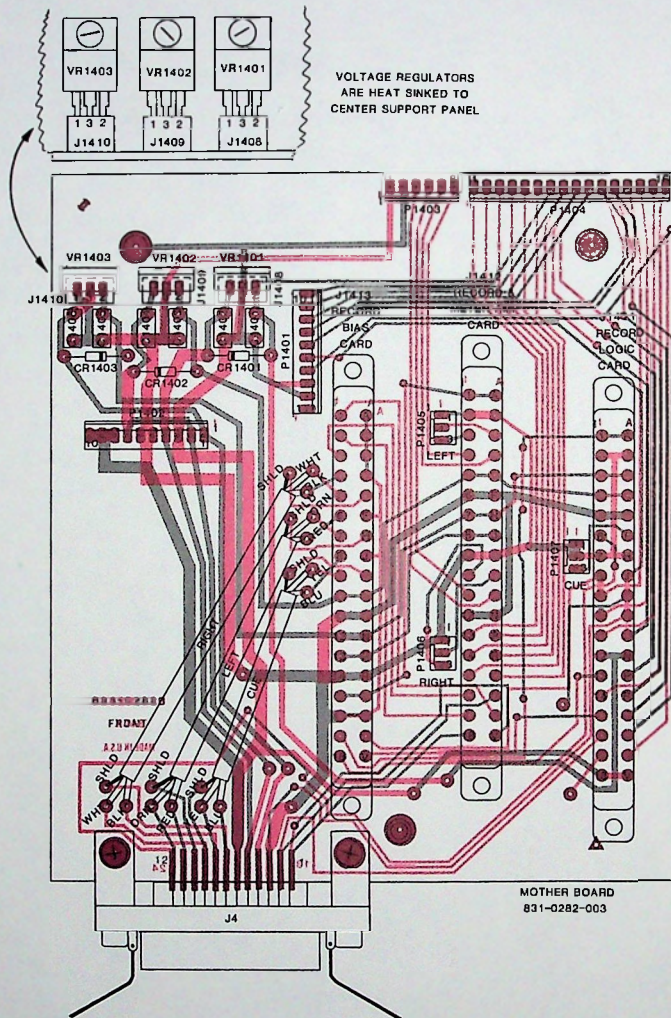
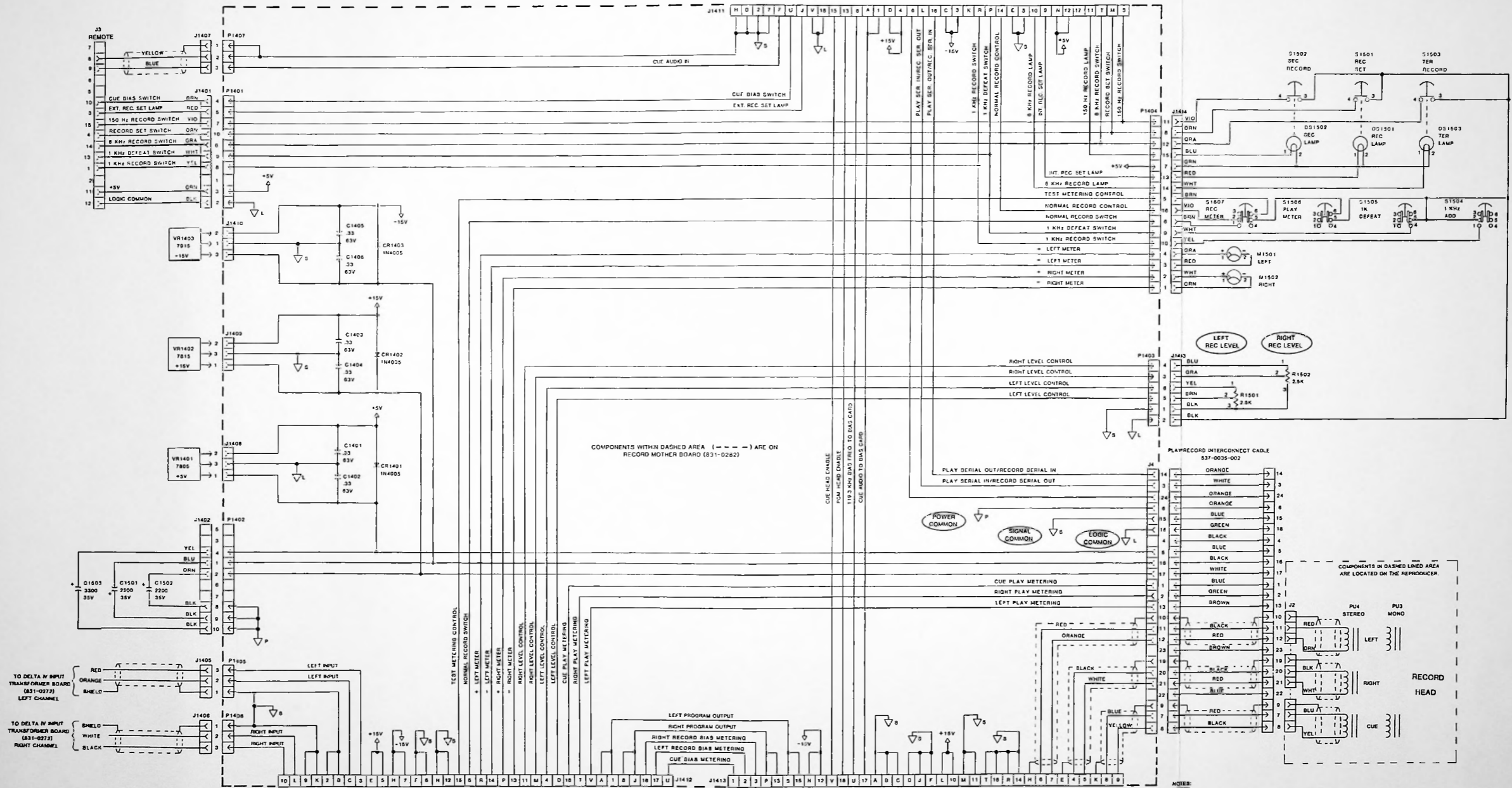


FIGURE 7-27

831-0282-003  
 DELTA IV MOTHERBOARD  
 LAYOUT

RECORD LOGIC CARD  
831-0271



RECORD & METER AMP CARD  
831-0261

RECORD BIAS CARD  
831-0249

- NOTES:
1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
  2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
  3. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

FIGURE 7-28

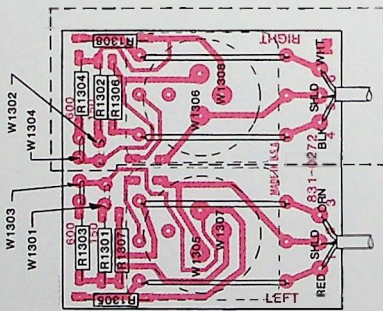
831-0282-003  
DELTA IV MOTHERBOARD  
SCHEMATIC

**DELTA IV INPUT TRANSFORMER BOARD 831-0272 PARTS LIST**

RESISTORS			
R1301	1	630-0043-000	RESISTOR, CARBON FILM, 150 OHM, 1/4 W, 5%
R1302	1	630-0043-000	RESISTOR, CARBON FILM, 150 OHM, 1/4 W, 5%
R1303	1	630-0058-000	RESISTOR, CARBON FILM, 620 OHM, 1/4W, 5%
R1304	1	630-0058-000	RESISTOR, CARBON FILM, 620 OHM, 1/4W, 5%
R1305	1	630-0080-000	RESISTOR, CARBON FILM, 5.1K OHM, 1/4 W, 5%
R1306	1	630-0080-000	RESISTOR, CARBON FILM, 5.1K OHM, 1/4 W, 5%
R1307	1	630-0080-000	RESISTOR, CARBON FILM, 5.1K OHM, 1/4 W, 5%
R1308	1	630-0080-000	RESISTOR, CARBON FILM, 5.1K OHM, 1/4 W, 5%
TRANSFORMERS			
T1301	1	532-0010-000	TRANSFORMER, AUDIO INPUT +28 DBM AM 10226
T1302	1	532-0010-000	TRANSFORMER, AUDIO INPUT +28 DBM AM 10226
CONNECTORS			
J5	1	380-0140-000	SOCKET, XLR, P.C. MOUNT (FEMALE) NC3FD-V
J6	1	380-0140-000	SOCKET, XLR, P.C. MOUNT (FEMALE) NC3FD-V
	1	507-0006-000	CABLE, SHIELDED, RED-ORANGE
	3	382-0045-000	TERMINAL, CRIMP, FOR KK100 W/GOLD
J1405	1	380-0070-000	HOUSING, 3 POS/LOCKING, 22-01-2035
	1	441-0010-010	TUBING, TEFLON, #16, EXTRA THIN
	2	441-0002-000	
	1	507-0007-000	CABLE, SHIELDED, WHITE-BLACK
	3	382-0045-000	TERMINAL, CRIMP, FOR KK100 W/GOLD
J1406	1	380-0070-000	HOUSING, 3 POS/LOCKING, 22-01-2035
	1	441-0010-010	TUBING, TEFLON, #16, EXTRA THIN
	2	441-0003-000	
STRAPPING			
W1301			NOT USED
W1302			NOT USED
W1303	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W1304	1	427-0002-000	BUS WIRE, SOLID, #22 AWG (QUANTITY IN 1/2 INCH)
W1305			NOT USED
W1306			NOT USED
W1307			NOT USED
W1308			NOT USED
MISCELLANEOUS			
	1	325-0272-003 A	BOARD, AUDIO INPUT TRANSFORMER DIV

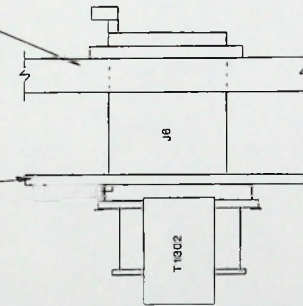
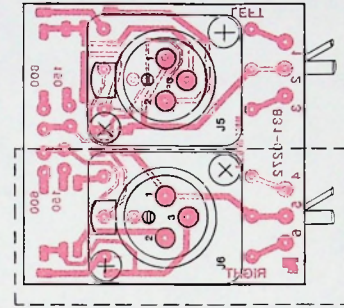
CONDITION	STRAP (S)	
	LEFT	RIGHT
TRANSFORMER	NONE	NONE
TRANSFORMERLESS	W1306	W1306
	W1307	W1308

IMPEDANCE	STRAP (S)	
	LEFT	RIGHT
20K OHMS	NONE	NONE
BALANCED	NONE	NONE
BRIDGING	W1301	W1302
150 OHMS	W1301	W1302
800 OHMS	W1304	W1304

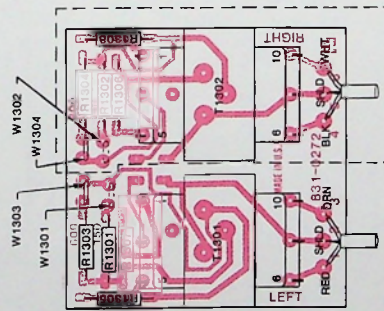


REAR PANEL  
281-0098-023

P C BOARD  
831-0272



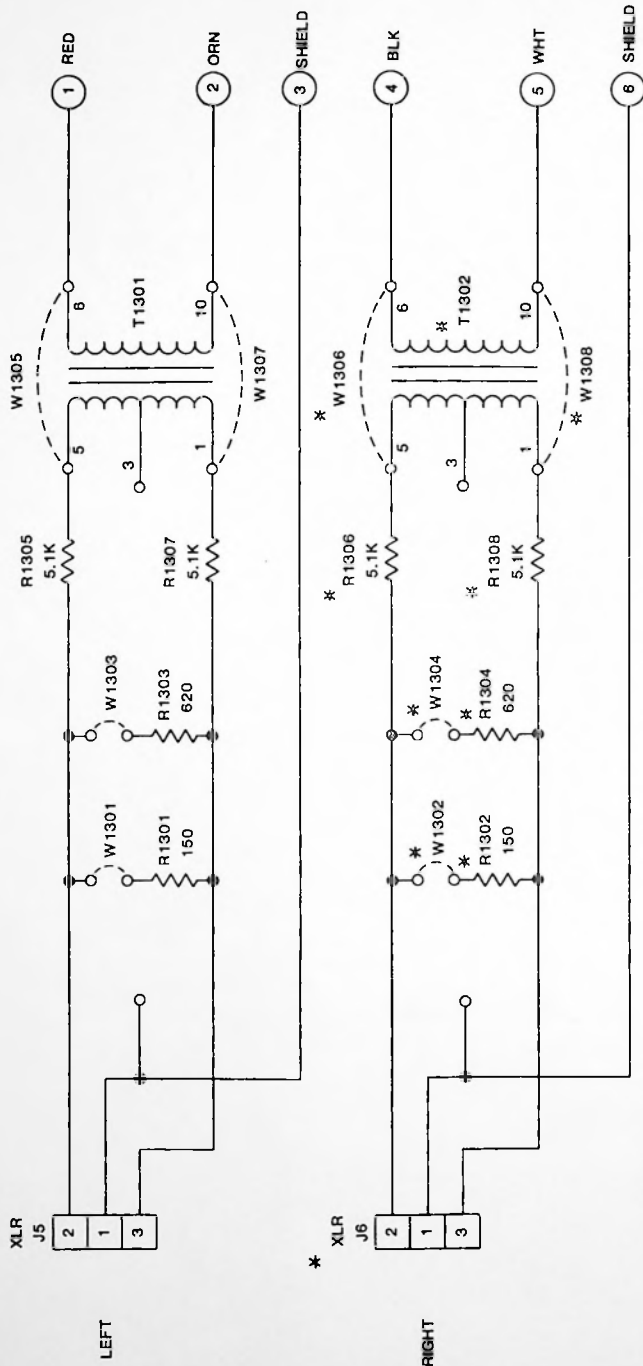
COMPONENTS WITHIN DASHED LINED AREAS  
NOT USED IN MONO MACHINES



INPUT TRANSFORMER BOARD  
831-0272-003 MONO WITH TRANSFORMER  
831-0272 STEREO WITH TRANSFORMERS  
831-0272-023 MONO WITHOUT TRANSFORMER  
831-0272-033 STEREO WITHOUT TRANSFORMERS

FIGURE 7-29

831-0272  
DELTA IV INPUT TRANSFORMER BOARD  
LAYOUT



TRANSFORMER / TRANSFORMERLESS

CONDITION	STRAP (S)	
	LEFT	RIGHT
TRANSFORMER	NONE	NONE
TRANSFORMERLESS	W1305	W1306
	W1307	W1308

IMPEDANCE TABLE

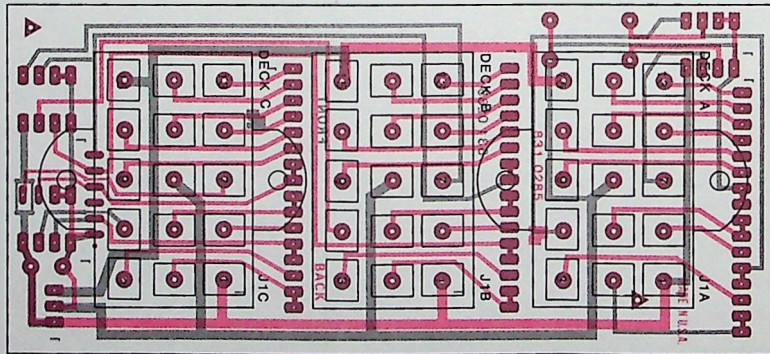
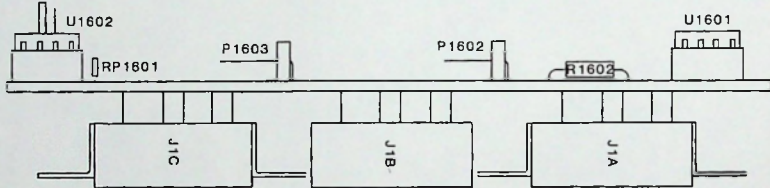
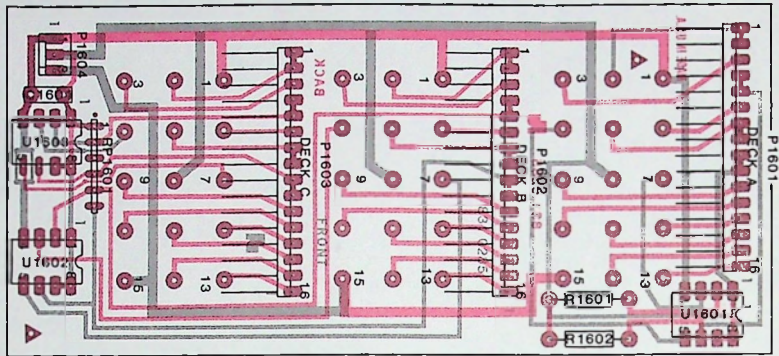
IMPEDANCE	STRAP (S)	
	LEFT	RIGHT
20K OHMS	NONE	NONE
BALANCED BRIDGING	W1301	W1302
150 OHMS	W1303	W1304
800 OHMS	W1305	W1306

NOTES:

1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
3. COMPONENTS MARKED (\*) ARE NOT USED IN MONO MACHINES.
4. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

FIGURE 7-30

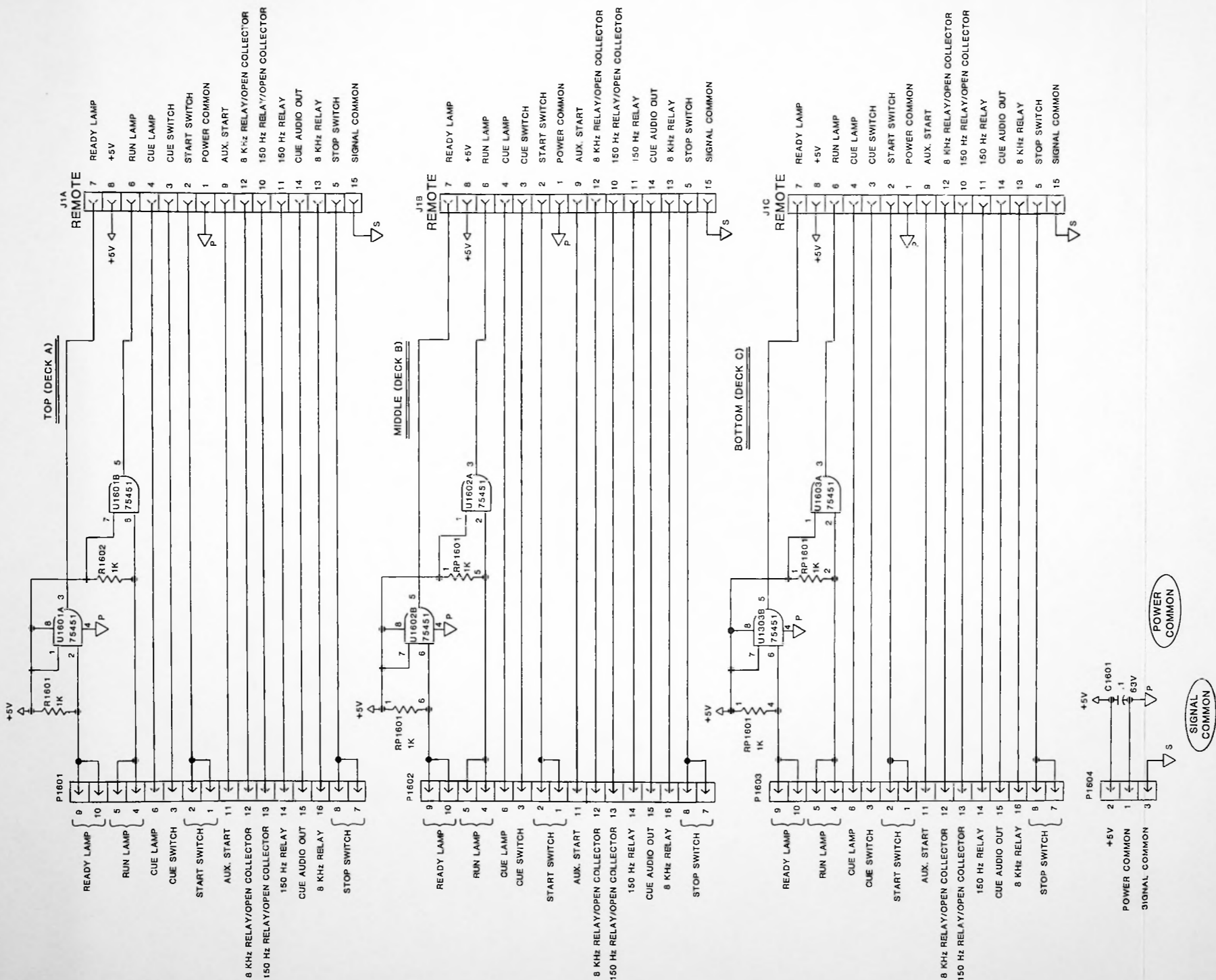
831-0272  
 DELTA IV INPUT TRANSFORMER BOARD  
 SCHEMATIC



DELTA III REMOTE CONNECTOR BOARD  
831-0285-003

FIGURE 7-31

831-0285-003  
DELTA III REMOTE CONNECTOR  
BOARD LAYOUT



- NOTES:
1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
  2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
  3. WE RESERVE THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.

FIGURE 7-32  
831-0285-003  
DELTA III REMOTE CONNECTOR  
BOARD SCHEMATIC



## SECTION VIII - MAINTENANCE

### A. GENERAL

International Tapetronics Corporation/3M has designed the Delta Series cartridge machine with high reliability and minimum required maintenance as primary design goals. A minimum amount of mechanical and electrical maintenance, when performed on a regular basis, will allow the user to realize optimum performance and trouble free operation.

Permanently lubricated and sealed ball bearings used in the DC servo motor require no lubrication. Any attempts to oil bearing may cause premature failure due to migration of oil into the copper windings and ultimate breakdown of the insulation material.

Sintered bronze bearings used in the cross shaft assembly, are also permanently lubricated and therefore require no maintenance. A specially designed TEFLON® coated solenoid plunger eliminates the need for any lubrication. As in the case of the motor bearings, any attempt to oil or lubricate this assembly will ultimately cause damage and poor operation.

### B. MECHANICAL

#### 1. Daily

-ITC recommends daily inspection and cleaning, if necessary, of the heads when the machines are used in heavy production. Use a cotton swab dipped in isopropyl alcohol. Weekly cleaning will suffice under less rigorous use.

#### 2. Weekly

-Capstan Shaft and pressure roller  
-Clean with a cloth dipped in isopropyl alcohol for maximum pulling characteristics, lowest flutter and overall best speed accuracy. Remove all traces of tape lubricant and tape oxide.

#### 3. Monthly

-Pressure roller pressure solenoid adjustment, see Section III.  
-Check playback and recording head azimuth as outlined in Section III.

#### 4. Every Six Months

-Inspect internal electronics and mechanics for dirt or dust build up. As necessary, use an air gun or dry paint brush to clean the units' interior. CLEAN MACHINES LAST LONGER.

### C. ELECTRICAL

#### 1. Monthly

-De-gauss all heads and tape guides carefully following instructions included in the degausser used.

#### 2. Every Six Months

-Check and adjust playback high frequency equalization.  
-Check and adjust program recording bias and program bias meter calibration.  
-Check and adjust high frequency equalization.  
-Cue recording bias and cue bias meter calibration.  
-Cue master level control.

### D. RECOMMENDED TOOLS, GAUGES, AND TESTS

#### 1. Hand Tools-

An assortment of hand tools common to an electrical shop including a temperature-regulated soldering station. A 3/8" and 9/16" open-end wrench are required for solenoid adjustments. A 1/16" Allen hex wrench is required for head adjustments.

2. Test Equipment
  - Oscilloscope, with 10:1 test probes;
  - High impedance voltmeter;
  - Audio oscillator;
  - Flutter meter capable of measuring DIN WTD flutter;
  - Frequency meter; and
  - Logic probe.
3. Gauges-
  - These may be ordered from ITC:
  - ITC gauge 830-0043-001, a capstan shaft locator gauge;
  - ITC gauge 830-0042-011, a pressure roller pressure gauge; and
  - ITC gauge 830-0041-022, a head height and tape guide gap adjustment gauge.
4. Miscellaneous -
  - Set of test extender PC boards
  - 831-0276-003 18 pin double-sided for Delta IV
  - 831-0277-003 18 pin double-sided for Record Logic Cards
  - 831-0278-003 18 pin double-sided for Record and Meter Amp Cards
  - 831-0279-003 18 pin double-sided for Play/Cue cards
  - 831-0280-003 28 pin double-sided for Play Logic cards

ments and frequency response from machine to machine.

3. Use the same test tape to perform head alignment and frequency response. If one cartridge is used for head phasing (azimuth) and a different cartridge is used for frequency response adjustments, errors will result.
4. Store tapes in a cool, dry, non-magnetic environment.
5. Discard a test tape when it begins to show signs of high frequency deterioration, instability, or non-repeatable performance.

#### E. TEST TAPES

Test tapes should be carefully chosen to suit your particular needs. ITC/3M cautions that the use of a particular test tape may indicate performance slightly different from that of the factory setup. ITC uses commonly available test tapes in an effort to adjust each machine to a known in-field standard.

We will be glad to discuss test tape requirements. Should you have questions or need assistance in choosing the correct format, call ITC Technical Service.

1. Purchase tapes loaded into a cartridge "shell" of the same type you normally use in your machine.
2. Use only ONE test tape throughout your cartridge system. This insures accurate and repeatable head adjust-

## SECTION IX - WARRANTY

International Tapetronics Corporation/3M warrants to Purchaser that the equipment sold is free of defects of workmanship or material and conforms to the specifications referred to or set out herein. This warranty, applying only to the user, extends from date of shipment for a period of two years. In the case of equipment leased from ITC, this warranty is extended to the full three year term of the lease. No claim shall be maintained hereunder unless written notice is received by Seller within thirty days after the discovery of the facts giving rise to the claim. The sole or exclusive liability of Seller for breach of warranty shall be to refund the purchase price of the item sold, or at its option, to replace or repair the item or part concerned FOB its factory, or such other place as it may designate. ITC's liability shall arise only if Purchaser causes the defective part or item to be delivered to ITC for inspection upon ITC's request at Purchaser's expense. This warranty shall not be effective if the alleged defect is due to maltreatment, exposure, excessive moisture or any other use of the equipment other than the use for which the manufacturer prescribed.

No warranties expressed or implied shall be applicable to any equipment sold hereunder, and the foregoing shall constitute the Buyer's sole right and remedy under the agreements in this paragraph contained. In no event shall International Tapetronics Corporation/3M have any liability for consequential damages, or for loss, damage, or expense directly or indirectly arising from the use of the products, or any inability to use them either separate or in combination with other equipment or materials, or from any other cause.

ITC's warranty is given solely to the original user and only to the extent above described. No dealer or agent is authorized to make any other or additional guaranty or warranty.

**SECTION X - PARTS LISTS**

## DELTA I, II MECHANICAL PARTS LIST - BY ASSEMBLY

## LEFT SIDE PANEL

1 281-0106-013  
5 353-0603-000  
1 328-0015-002

## LEFT CARTRIDGE HOLD DOWN

1 272-0034-012  
2 350-0427-000  
2 301-0050-001

## RIGHT SIDE PANEL

1 281-0105-013  
5 353-0603-000  
1 328-0015-002

## ADD POWER TRANSFORMER

1 526-0020-003  
1 283-0084-013  
1 350-1037-000  
1 370-1001-000  
1 297-0036-002  
2 150-0624-000  
1 300-0099-000

## WIRE HARNESS . . . . DELTA I

J301 1 380-0151-000  
J401 1 380-0150-000  
J501 1 380-0148-000  
J502 1 380-0148-000  
J503 1 380-0152-000  
J504 1 380-0154-000  
J505 1 380-0152-000  
J506A 1 380-0153-000  
J506B 1 380-0155-000  
J511 1 380-0151-000  
J514 1 380-0151-000

## CENTER SUPPORT

1 283-0081-813  
2 300-0099-000  
2 350-0433-000

## ADD SOLENOID / CLEVIS ASSY

L1 1 477-0020-001  
2 350-0624-000  
2 285-0601-000  
1 284-0001-001  
1 370-1001-000  
1 277-0001-041  
1 301-0005-001  
1 282-0001-001

## ATTACH VOLTAGE REGULATORS

3 613-0014-000  
3 352-0004-000

PANEL, SIDE, LEFT HAND-SAND BLASTED DI  
SCREW, 6-32 X 1/4, SOCKET, BUTTON HD., BLACK  
INLAY, RIGHT & LEFT SIDE PANEL, POLYCARBONATE

GUIDE, CARTRIDGE HOLD-DOWN, LEFT-CLEAR ANODIZE  
SCREW, 4-40 X 3/16 PHIL FLAT HD., 100 DEG., ZP  
SPRING, CART GUIDE

PANEL, SIDE, RIGHT HAND-SAND BLASTED DI  
SCREW, 6-32 X 1/4, SOCKET, BUTTON HD., BLACK  
INLAY, RIGHT & LEFT SIDE PANEL, POLYCARBONATE

TRANSFORMER, TOROID POWER DI  
PLATE, TOROID MOUNTING-SAND BLASTED  
SCREW, 10-32 X 1-3/4, BINDING HD., SLOTTED BRASS  
NUT, 10-32 X 3/8, HEX, ZP  
SHIELD, TOROID, DI, II  
SPACER, 6-32 X 5/16, PHIL., FILL., HD.  
SPACER, 6-32 X 1/4 X 1/4 LONG, HEX, MALE/FEMALE,  
12/28/8Z

. . . . HOUSING, 10 POS, MTA-100, 26 AMG, 1-640442-0  
HOUSING, 6 POS, MTA-100, 26 AMG, 640442-6  
HOUSING, 16 POS, MTA-100, 26 AMG, 1-640442-6  
HOUSING, 16 POS, MTA-156, 26 AMG, 1-640442-6  
HOUSING, 3 POS, MTA-156, 26 AMG, 1-640442-6  
HOUSING, 3 POS, MTA-156, 24 AMG  
HOUSING, 3 POS, MTA-156, 26 AMG  
HOUSING, 4 POS, MTA-156, 26 AMG  
HOUSING, 4 POS, MTA-156, 24 AMG  
HOUSING, 10 POS, MTA-100, 26 AMG, 1-640442-0  
HOUSING, 10 POS, MTA-100, 26 AMG, 1-640442-0

PLATE, CENTER SUPPORT-SAND BLASTED DI  
SPACER, 6-32 X 1/4 X 1/4 LONG, HEX, MALE/FEMALE,  
SCREW, 4-40 X 5/16, PHIL., FILL., HD.

SOLENOID, 110 V, 1.5" DIA., 3827  
SCREW, 6-32 X 5/16, PHIL., FILL., HD.  
WASHER, #6, INTERNAL LOCK, ZP

CLEVIS SCREW

NUT, 10-32 X 3/8, HEX, ZP

CHAIN, SPROCKET, 21 LINKS

SPRING, .207 DIA. (HW) X 1-9/16 (INSIDE HR) X .13

PIN, ROLL, 1/16 X 5/16

## ADD GROUNDING LUG

1 350-1038-000  
1 370-1001-000  
5 375-0008-000

## MOUNT CENTER SUPPORT TO DECK

1 350-0624-000 SCREW, 6-32 X 5/16, PHIL., FILL., HD.

## DECK W/CROSS SHAFT &amp; CLAMP

1 267-0025-024 DECK-BRUSHED & CLEAR ANODIZED DI  
2 251-0001-051 BEARING, SLEEVE .3135 ID. X .377 OD. X 1/4 LENGTH  
1 296-0046-001 SHAFT, CROSS, DECK  
1 297-0009-001 SHIELD, LOWER HEAD  
1 262-0023-012 CLAMP, CROSS SHAFT-VIBRA BOWL  
1 282-0041-000 PIN, ROLL, 1/16 X 3/8  
1 296-0004-001 SHAFT, PRESSURE ROLLER

## ADD PRESSURE ROLLER

1 291-0018-001 ROLLER, PRESSURE, 5344V, 60  
1 359-0025-000 WASHER, NYLON, 5/16 ID. X 1/2 OD. X .003  
1 359-0026-000 WASHER, NYLON, 5/16 ID. X 1/2 OD. X .004  
1 359-0027-000 WASHER, NYLON, 5/16 ID. X 1/2 OD. X .005  
1 359-0028-000 WASHER, NYLON, 5/16 ID. X 1/2 OD. X .007  
1 289-0002-000 RING, RETAINING, PRESSURE ROLLER SHAFT  
1 360-1005-010 WASHER, 13/64 ID. X 7/16 OD. X .015 THICK, NP  
1 359-0006-001 WASHER, NYLON, .010 X .480 OD X .193 ID

## RIGHT CARTRIDGE HOLD DOWN

1 272-0033-012 GUIDE, CARTRIDGE HOLD-DOWN, RIGHT-CLEAR ANODIZE  
1 301-0050-001 SPRING, CART GUIDE  
2 350-0620-000 SCREW, 6-32 X 1/4, PHIL, TRUSS HD.

## CART SWITCH MOUNTING

1 254-0057-001 BRACKET, MICRO SWITCH MOUNTING  
2 150-0604-000 SCREW, 6-32 X 1/4, PHILL, PAN, HD., ZP  
2 150-0205-000 SCREW, 2-56 X 3/8, PHILL., PAN, HD.  
2 370-0201-000 NUT, HEX, 2-56 X 3/16  
1 392-0009-000 SWITCH, SNAP ACTION E63-00R, SIMULATED ROLLER

S4

## HEAD ASSEMBLY HO/HEADS &amp; CABLES

1 270-0010-813 FRAME, HEAD BLOCK SUPPORT-SAND BLASTED  
4 301-0034-000 SPRING, .041 WIRE, .439 LONG, 14LBS @ .572 EXTENS  
4 292-0045-000 PIN, ROLL, 5/64 DIA. X 1 3/8 LONG BLK  
1 272-0038-012 GUIDE, TAPE, LEFT HAND-VIBRA BOWL  
2 272-0039-012 GUIDE, TAPE, CENTER & RIGHT HAND-VIBRA BOWL  
6 350-0403-000 SCREW, 4-40 X 3/16, PHIL PAN ZP  
2 303-0001-001 STRAP, HEAD MOUNTING  
4 355-0307-000 SCREW, 3-48 X 5/8, PHILL., FILL., HD.  
4 350-0813-000 SCREW, 8-32 X 1/2, SOCKET, SET, CONE POINT  
2 355-0814-000 SCREW, 8-32 X 1/2, SOCKET, SET, OVAL POINT  
6 370-0801-000 HEX NUT, 8-32 X 1/4 X 3/32 THICK  
1 350-0606-000 SCREW, 6-32 X 5/8, PHIL., FLAT HD., 100 DEG  
1 350-0649-000 SCREW, 6-32 X 1/8, PHIL., FLAT HD., 100 DEG  
3 300-0644-000 SCREW, 6-32 X 1, PHIL., FILL., HD.  
1 297-0034-001 SHIELD, UPPER HEAD DI, II, III

1 253-0088-013  
1 253-0089-013  
2 282-0031-000

ADD HEADS  
FUZ 1 504-0041-002  
FUZ 1 504-0037-002

ADD PLAY HEAD CABLES  
1 507-0006-000  
2 382-0018-000  
2 441-0029-020  
1 441-0002-010  
3 382-0045-000  
1 380-0070-000  
1 507-0007-000  
2 382-0018-000  
2 441-0029-020  
1 441-0003-010  
3 382-0045-000  
1 380-0070-000  
1 507-0008-000  
2 382-0018-000  
2 441-0029-020  
1 441-0040-010  
1 441-0040-010  
3 382-0045-000  
1 380-0070-000

ADD CAN CAPACITORS & MOTOR  
1 297-0032-003  
C1 1 698-0014-000  
C2 1 698-0015-000  
C3 1 698-0013-000  
C4 1 698-0013-000  
6 350-0624-000

ADD MOTOR + CONTROL CARD  
2 350-0407-000  
B1 1 455-0004-003 C  
1 380-0124-000  
10 382-0044-000  
2 353-1018-000

FRONT PANEL  
1 281-0099-014  
2 353-0603-000  
1 280-0044-002  
1 282-0010-011  
1 364-0092-001  
1 368-0017-001  
1 368-0016-001  
1 391-0023-000  
1 391-0023-000  
1 391-0023-000

BLACK, RIGHT HEAD MOUNTING-VIBRA-BOWL  
BLOCK, LEFT HEAD MOUNTING-VIBRA BOWL  
PIN, ROLL, 1/8 DIA., X 1 LONG

HEAD, MCL, STEREO PLAY, MODEL S-PL  
HEAD, RECORD, 3-CT, 100 UR

CABLE, SHIELDED, RED-ORANGE  
CLIP, HEAD LEAD  
TUBING, SHRINK, 3/32 X 7/16 LONG, WHITE  
TUBING, SHRINK, 1/8", RED  
TERMINAL, CRIMP, FOR KK100 W/GOLD  
HOUSING, 3 POS/LOCKING, 22-01-2035  
CABLE, SHIELDED, WHITE-BLACK  
CLIP, HEAD LEAD  
TUBING, SHRINK, 3/32 X 7/16 LONG, WHITE  
TERMINAL, CRIMP, FOR KK100 W/GOLD  
HOUSING, 3 POS/LOCKING, 22-01-2035  
CABLE, SHIELDED, YELLOW-BLUE  
CLIP, HEAD LEAD  
TUBING, SHRINK, 3/32 X 7/16 LONG, WHITE  
TUBING, SHRINK, 1/8", BLUE  
TERMINAL, CRIMP, FOR KK100 W/GOLD  
HOUSING, 3 POS/LOCKING, 22-01-2035

SHIELD  
CAPACITOR, ELECTROLYTIC, 220 UFD, 400 V (CAN)  
CAPACITOR, ELECTROLYTIC, 15000 UFD, 16 V (CAN)  
CAPACITOR, ELECTROLYTIC, 2200 UFD, 35 V (CAN)  
CAPACITOR, ELECTROLYTIC, 2200 UFD, 35 V (CAN)  
SCREW, 6-32 X 5/16, PHIL., FILL. HD.

SCREW, 4-40 X 5/16 PHIL PAN ZP  
MOTOR, SERVO, PAPST (SP)  
HOUSING, 10 POS., W/LOCKING RAMP, KK100, #22-01-2  
TERMINAL, CRIMP, 08-50-0114  
SCREW, 10-32 X 3/4, BH, SOCKET CAP, BLACK

PANEL, FRONT-SAND BLASTED DI  
SCREW, 6-32 X 1/4, SOCKET, BUTTON HD., BLACK  
NAMEPLATE, STUDDIED ITC LOGO, BLACK PLASTIC  
PIN, PANEL, 1/8 DIA. X 5/8 LONG  
RETAINER, .187 STUD, .50 LONG X .38 WIDE X .017 T  
INLAY, TOP FRONT PANEL, POLYCARBONATE DI, I/I  
INLAY, BOTTOM FRONT PANEL, POLYCARBONATE DI  
SWITCH, PUSH, 05-62125  
SWITCH, PUSH, 05-62125  
SWITCH, PUSH, 05-62125

1 404-0059-000  
1 404-0060-000  
1 404-0062-000  
1 415-0013-000  
1 415-0013-000  
1 415-0013-000

DS1  
DS2  
DS3

REAR PANEL  
1 281-0097-013  
ATTACH TOROID MOUNTING PLATE  
2 350-0612-000

ADD AC RECEPTACLE  
1 380-0072-000  
1 350-0433-000  
1 375-0003-000  
1 370-0402-000  
1 350-0415-000

P3  
RECEPTACLE, LINE CORD 17252  
SCREW, 4-40 X 5/16, PHIL., FILL. HD.  
TERMINAL, # 4, BERT, LOCKING  
NUT, 4-40X1/4, HEX, CAD. PLTD.  
SCREW, 4-40 X 1/2, PHIL., PAN HD., NP

ADD RECORD HEAD CABLES  
1 507-0006-000  
2 382-0018-000  
2 441-0029-020  
1 441-0002-010  
3 382-0045-000  
1 380-0070-000  
1 507-0007-000  
2 382-0018-000  
2 441-0029-020  
1 441-0003-010  
3 382-0045-000  
1 380-0070-000  
1 507-0008-000  
2 382-0018-000  
2 441-0029-020  
1 441-0040-010  
3 382-0045-000  
1 380-0070-000

ADD REMOTE CONNECTOR  
J1 1 380-0004-000  
2 350-0433-000  
2 370-0403-000

ADD FUSE HOLDER  
F1 1 418-0005-000  
1 418-0006-000

ADD COVER LATCH .AND. GUIDES  
1 350-0419-000  
1 360-8404-000  
1 370-0402-000  
1 301-0055-000  
1 441-0034-011  
2 350-0433-000

LENS, YELLOW, FOR 05-62125 80-050606  
LENS, GREEN, FOR 05-62125 80-050604  
LENS, BLUE, FOR 05-62125  
LAMP, MINIATURE 5 VOLT 3150  
LAMP, MINIATURE 5 VOLT 3150  
LAMP, MINIATURE 5 VOLT 3150

PANEL, REAR-SAND BLASTED DI

SCREW, 6-32 X 7/16, PHIL., PAN, ZP

RECEPTACLE, LINE CORD 17252  
SCREW, 4-40 X 5/16, PHIL., FILL. HD.  
TERMINAL, # 4, BERT, LOCKING  
NUT, 4-40X1/4, HEX, CAD. PLTD.  
SCREW, 4-40 X 1/2, PHIL., PAN HD., NP

CABLE, SHIELDED, RED-ORANGE  
CLIP, HEAD LEAD  
TUBING, SHRINK, 3/32 X 7/16 LONG, WHITE  
TUBING, SHRINK, 1/8", RED  
TERMINAL, CRIMP, FOR KK100 W/GOLD  
HOUSING, 3 POS/LOCKING, 22-01-2035  
CABLE, SHIELDED, WHITE-BLACK  
CLIP, HEAD LEAD  
TUBING, SHRINK, 3/32 X 7/16 LONG, WHITE  
TUBING, SHRINK, 1/8", WHITE  
TERMINAL, CRIMP, FOR KK100 W/GOLD  
HOUSING, 3 POS/LOCKING, 22-01-2035  
CABLE, SHIELDED, YELLOW-BLUE  
CLIP, HEAD LEAD  
TUBING, SHRINK, 3/32 X 7/16 LONG, WHITE  
TUBING, SHRINK, 1/8", BLUE  
TERMINAL, CRIMP, FOR KK100 W/GOLD  
HOUSING, 3 POS/LOCKING, 22-01-2035

SCREW, 15 PIN, CHASSIS MOUNT, S-3315AB  
SCREW, 4-40 X 5/16, PHIL., FILL. HD.  
NUT, 4-40X1/4, KEPS HEX, STEEL, NP

FUSE HOLDER, LOW PROFILE, FEU 031.1673  
FUSE CARRIER, JAG, GREY, 031.1666

SCREW, 4-40 X 3/4, PHIL, PAN, STEEL, ZP  
WASHER, FLAT, #4 X 1/2 OD. X .032 THICK, STEEL  
NUT, 4-40X1/4, HEX, CAD. PLTD.  
SPRING, COMP., .180 OD. X 1/2 LONG X .022 MUSIC  
TUBING, TEFLON, #10 X 27/32, TWIN WALL  
SCREW, 4-40 X 5/16, PHIL., FILL. HD.

ADD BAIL HARDWARE

1 382-0039-000 BAIL LOCK FOR CHAMP SERIES, 1552562-1  
2 350-0413-000 SCREW, 4-40 X 7/16, PHILL., PAN, HD.  
2 370-0403-000 NUT, 4-40X1/4, KEPS HEX, STEEL, NP  
1 417-0012-000 FUSE, CARTRIDGE (3AG) .75 AMP, 125V, TIME DELAY  
1 433-0004-000 LINE CORD, 17250, 117V

FINAL DRESS ... COVERS & LABELS

1 265-0062-002 COVER, TOP, DI, IV  
1 280-0045-003 LABEL, POTENTIOMETER & READ DI  
1 046-0014-000 LABEL, TRANSFORMER WIRE CONNECTION  
1 280-0022-001 LABEL, LINE VOLTAGE  
1 280-0002-000 LABEL, SERIAL NUMBER  
1 280-0011-001 LABEL, PART NUMBER  
1 280-0056-000 LABEL, PRE-INSTALLATION WARNING

BOTTOM COVER W/FEET

1 265-0061-003 COVER, BOTTOM, DI, IV  
3 350-0427-000 SCREW, 4-40 X 3/16 PHIL FLAT HD., 100 DEG., ZP  
4 350-0628-000 SCREW, 6-32 X 3/8, PHIL FLAT HD., 100 DEG.  
4 370-0602-000 NUT, KEPS, 6-32 X 1/4, ZP  
4 311-0039-000 FEET, RUBBER, P68 (MEDIUM), BLACK  
1 046-0012-000 INSTRUCTION BOOK  
2 378-0019-000 PLUG, 3-PIN, STRAIGHT, FEMALE XLR  
1 378-0003-000 PLUG, 15 PIN, CABLE CLAMP & LATCH, P-3315-CCT-L

# DELTA III MECHANICAL PARTS LIST - BY ASSEMBLY

## LEFT SIDE PANEL

1 281-0108-014  
 13 353-0603-000  
 1 328-0020-003

PANEL, SIDE, LEFT HAND-SAND BLASTED DIII  
 SCREW, 6-32 X 1/4, SOCKET, BUTTON HD., BLACK  
 INLAY, RIGHT & LEFT SIDE PANEL, POLYCARBONATE D

## LEFT CARTRIDGE HOLD DOWN

3 272-0034-812  
 6 350-0422-000  
 6 301-0050-001

GUIDE, CARTRIDGE HOLD-DOWN, LEFT-CLEAR ANODIZE  
 SCREW, 4-40 X 3/16 PHIL FLAT HD., 100 DEG., ZP  
 SPRING, CART GUIDE

## RIGHT SIDE PANEL

1 281-0109-014  
 12 353-0603-000  
 1 328-0020-003  
 1 283-0085-813

PANEL, SIDE, RIGHT HAND-SAND BLASTED DIII  
 SCREW, 6-32 X 1/4, SOCKET, BUTTON HD., BLACK  
 INLAY, RIGHT & LEFT SIDE PANEL, POLYCARBONATE D  
 PLATE, CENTER MOUNTING-SAND BLASTED DIII

## ADD DECK CONNECTORS

J5A 1 378-0059-000  
 2 350-0205-000  
 1 378-0059-000  
 2 350-0205-000  
 J5B 1 378-0059-000  
 2 350-0205-000  
 J5C 1 378-0059-000  
 2 350-0205-000

PLUG, SUBMINITURE D, 25 POS, MALE, FLOAT MOUNT  
 SCREW, 2-56 X 3/8, PHILL., PAN, HD. FLOAT MOUNT  
 PLUG, SUBMINITURE D, 25 POS, MALE, FLOAT MOUNT  
 SCREW, 2-56 X 3/8, PHILL., PAN, HD. FLOAT MOUNT  
 PLUG, SUBMINITURE D, 25 POS, MALE, FLOAT MOUNT  
 SCREW, 2-56 X 3/8, PHILL., PAN, HD. FLOAT MOUNT

## ADD CAPACITORS (WITH BRACKETS)

C1 1 698-0011-000  
 C2 1 698-0011-000  
 C3 1 698-0015-000  
 C4 1 698-0014-000  
 C5 1 698-0014-000  
 C6 1 698-0014-000  
 10 350-0624-000

CAPACITOR, ELECTROLYTIC, 6800 UFD, 35 V (CAN) LKD  
 CAPACITOR, ELECTROLYTIC, 6800 UFD, 35 V (CAN) LKD  
 CAPACITOR, ELECTROLYTIC, 15000 UFD, 16 V (CAN) LK  
 CAPACITOR, ELECTROLYTIC, 220 UFD, 400 V (CAN) LKD  
 CAPACITOR, ELECTROLYTIC, 220 UFD, 400 V (CAN) LKD  
 CAPACITOR, ELECTROLYTIC, 220 UFD, 400 V (CAN) LKD  
 SCREW, 6-32 X 3/16, PHILL., FILL. HD.

## ADD DECK SET SCREWS

3 355-1008-000

SCREW, 10-32 X 1/2, SOCKET SET CUP POINT WITH NYL

## DECK W/CROSS SHAFT, CLAMP

1 267-0026-024  
 2 251-0001-051  
 1 296-0046-001  
 1 297-0029-001  
 1 262-0023-012  
 1 282-0041-000  
 1 296-0004-001

DECK-BRUSHED & CLEAR ANODIZED DIII  
 BEARING, SLEEVE .3135 ID. X .377 OD. X 1/4 LENGTH  
 SHAFT, CROSS, DECK DIII  
 SHIELD, LOWER HEAD DIII  
 CLAMP, CROSS SHAFT-VIBRA BOWL  
 PIN ROLL, 1/16 X 3/8  
 SHAFT, PRESSURE ROLLER

## DECK ADDITIONS

2 350-0404-000  
 1 380-0137-000  
 1 350-0819-000  
 1 254-0099-011  
 2 350-0610-000

SCREW, 4-40 X 1/4 PHIL PAN ZP  
 SOCKET, SUBMINITURE D, 25 POS., FEMALE, STANDARD  
 SCREW, 8-32 X 6", SLOTTED ROUND HD., (1-1/2)" OF T  
 BRACKET, SOLENOID MOUNTING-CLEAR CHROMATE  
 SCREW, 6-32 X 3/8, PHIL, FH, ZP, 82 DEG.

## ADD PRESSURE ROLLER

1 291-0018-001  
 1 359-0023-000  
 1 359-0028-000  
 1 359-0027-000  
 1 359-0028-000  
 1 289-0002-000  
 1 360-1005-010  
 1 359-0006-001

ROLLER, PRESSURE, 53JAV, 60  
 WASHER, NYLON, 5/16 ID. X 1/2 OD. X .003  
 WASHER, NYLON, 5/16 ID. X 1/2 OD. X .004  
 WASHER, NYLON, 5/16 ID. X 1/2 OD. X .005  
 WASHER, NYLON, 5/16 ID. X 1/2 OD. X .007  
 RING, RETAINING, PRESSURE ROLLER SHAFT  
 WASHER, 13/64 ID. X 7/16 OD. X .015 THICK, NP  
 WASHER, NYLON, .010 X .480 OD X .193 ID

## ADD SOLENOID/CLEVIS ASSY

2 350-0624-000  
 2 365-0601-000  
 1 477-0020-001  
 1 264-0001-001  
 1 370-1001-000  
 1 277-0001-041  
 1 301-0005-001  
 1 282-0001-001

SOLENOID/CLAVIS ASSY  
 WASHER, 16, INTERNAL LOCK, ZP  
 SOLENOID, 110 V, 1.5" DIA. 3827  
 CLEVIS SCREW  
 NUT, 10-32 X 3/8, HEX, ZP  
 CHAIN, SPROCKET, 21 LINKS  
 SPRING, .207 DIA. (MM) X 1-9/16 (INSIDE HK) X .30  
 PIN, ROLL, 1/16 X 5/16

## RIGHT CARTRIDGE HOLD DOWN

1 272-0033-012  
 1 301-0050-001  
 1 350-0620-000

GUIDE, CARTRIDGE HOLD-DOWN, RIGHT-CLEAR ANODIZE  
 SPRING, CART GUIDE  
 SCREW, 6-32 X 1/4, PHIL, TRUSS HD.

## CART SWITCH MOUNTING

1 254-0097-001  
 2 350-0604-000  
 2 350-0205-000  
 2 370-0201-000  
 1 392-0009-000

BRACKET, MICRO SWITCH MOUNTING  
 SCREW, 6-32 X 1/4, PHILL, PAN, HD., ZP  
 SCREW, 2-56 X 3/8, PHILL., PAN, HD.  
 NUT, HEX, 2-56 X 3/16  
 SWITCH, SNAP ACTION B63-00R, SIMULATED ROLLER

## HEAD ASSEMBLY W/O HEADS & CABLES

1 270-0010-813  
 4 281-0054-000  
 4 282-0045-000  
 1 272-0038-012  
 2 272-0039-012  
 6 500-0403-000  
 2 303-0001-001  
 4 350-0307-000  
 2 355-0813-000  
 2 355-0814-000  
 6 370-0801-000  
 1 350-0606-000  
 2 350-0644-000  
 1 350-0649-000  
 2 300-0098-001  
 2 297-0034-001  
 1 253-0088-013  
 1 253-0089-013  
 2 282-0031-000

FRAME, HEAD BLOCK SUPPORT-SAND BLASTED  
 SPRING, .041 WIRE, .439 LONG, 1/8 X 3/8 LONG BLK  
 PIN, ROLL, 5/64 DIA. X 1 3/8, 1/8 X 3/8  
 GUIDE, TAPE, LEFT HAND-VIBRA BOWL  
 GUIDE, TAPE, CENTER & RIGHT HAND-VIBRA BOWL  
 SCREW, 4-40 X 3/16, PHIL PAN ZP  
 STRAP, HEAD MOUNTING  
 SCREW, 3-48 X 5/8, PHILL., FILL., HD.  
 SCREW, 8-32 X 1/2, SOCKET, SET, CONE POINT  
 SCREW, 8-32 X 1/2, SOCKET, SET, OVAL POINT  
 HEX NUT, 8-32 X 1/4 X 3/32 THICK  
 SCREW, 6-32 X 5/8, PHIL., FLAT HD., 100 DEG  
 SCREW, 6-32 X 1, PHIL., FILL. HD.  
 SCREW, 6-32 X 7/8, PHIL., FILLISTER HD.  
 SCREW, 6-32 X 1 1/8, PHIL., FLAT HD., 100 DEG  
 SPACER, HEAD SHIELD  
 SHIELD, UPPER HEAD DI, III  
 BLOCK, RIGHT HEAD MOUNTING-VIBRA-BOWL  
 BLOCK, LEFT HEAD MOUNTING-VIBRA BOWL  
 PIN, ROLL, 1/8 DIA., X 1 LONG



ADD HEADS  
 PUZ 1 504-0043-002 HEAD, MCL, STEREO PLAY, MODEL S-PL  
 PU4 1 504-0037-000 HEAD, RECORD, 3-OT, 100 UH

ADD PLAY HEAD CABLES  
 1 507-0006-000 CABLE, SHIELDED, RED-ORANGE  
 2 382-0018-000 CLIP, HEAD LEAD  
 2 441-0029-010 1 441-0002-000  
 1 441-0002-000 CABLE, SHIELDED, WHITE-BLACK  
 1 507-0007-000 CLIP, HEAD LEAD  
 2 382-0018-000 2 441-0029-010  
 2 441-0003-000 CABLE, SHIELDED, YELLOW-BLUE  
 1 441-0003-000 CLIP, HEAD LEAD  
 1 507-0008-000 CABLE, SHIELDED, RED-ORANGE  
 2 382-0018-000 CLIP, HEAD LEAD  
 2 441-0029-010 2 441-0040-000  
 1 441-0040-000

ADD RECORD HEAD CABLES  
 1 507-0006-000 CABLE, SHIELDED, RED-ORANGE  
 2 382-0018-000 CLIP, HEAD LEAD  
 2 441-0029-010 1 441-0002-000  
 1 441-0002-000 CABLE, SHIELDED, WHITE-BLACK  
 1 507-0007-000 CLIP, HEAD LEAD  
 2 382-0018-000 2 441-0029-010  
 2 441-0003-000 CABLE, SHIELDED, YELLOW-BLUE  
 1 441-0003-000 CLIP, HEAD LEAD  
 1 507-0008-000 CABLE, SHIELDED, RED-ORANGE  
 2 382-0018-000 CLIP, HEAD LEAD  
 2 441-0029-010 2 441-0040-000  
 1 441-0040-000

ADD FRONT PANEL WITH CONTROLS  
 1 281-0107-023 PANEL, FRONT DECK-BLACK ANODIZED  
 2 333-0603-000 SCREW, 6-32 X 1/4, SOCKET, BUTTON HD., BLACK  
 1 284-0018-000 SWITCH, PUSH, 05-62125  
 2 391-0023-000 LENS, YELLOW, FOR 05-62125 80-050606  
 1 404-0059-000 LENS, GREEN, FOR 05-62125 80-050604  
 1 404-0060-000 LAMP, MINITURE 5 VOLT 3150  
 2 415-0013-000

LOWER PANEL  
 1 281-0101-012 PANEL, FRONT-SAND BLASTED DIII  
 1 328-0018-000 INLAY, FRONT PANEL, POLYCARBONATE DIII  
 1 280-0044-002 NAMEPLATE, STUDDDED, ITC LOGO, BLACK PLASTIC  
 1 364-0002-000 RETAINER, .187 STUD, .50 LONG X .38 WIDE X .017 T

UPPER BRACE  
 1 304-0021-012 SUPPORT, FRONT TOP-SANDBLASTED DIII  
 1 328-0019-001 INLAY, FRONT TOP SUPPORT.POLYCARBONATE DIII

P.C. CARD GUIDES  
 1 272-0035-013 GUIDE, TOP P.C. CARD-SAND BLASTED DIII  
 1 350-0419-000 SCREW, 4-40 X 3/4, PHIL., PAN, STEEL, ZP  
 1 360-0404-000 WASHER, FLAT, #4 X 1/2 OD. X .032 THICK, STEEL ZP  
 1 370-0402-000 NUT, 4-40X1/4, HEX, CAD. PLTD.  
 1 301-0055-000 SPRING, COMP., .180 OD. X 1/2 LONG X .022 MUSIC W  
 1 441-0034-011 TUBING, TEFLON, #10 X 27/32, THIN WALL  
 1 272-0036-013 GUIDE, MIDDLE P.C. CARD-SAND BLASTED DIII  
 1 463-0005-000 FAN, MINIATURE DC, V46JM, LZV DIII  
 4 344-0301-000 SCREW, 3mm X 1.0mm LONG, SLOTTED PAN HEAD

P.C. CARD CHASSIS  
 1 261-0028-002 CHASSIS, INNER DIII  
 2 350-0433-000 SCREW, 4-40 X 5/16, PHIL., FILL. HD.

BOTTOM GUIDE  
 1 272-0037-013 GUIDE, P.C. CARD, BOTTOM DIII -SAND BLASTED  
 1 526-0021-003 TRANSFORMER, TOROID POWER DIII  
 1 350-1037-000 SCREW, 10-32 X 1-3/4, BINDING HD., SLOTTED BRASS

ADD MOTOR  
 1 455-0005-004 MOTOR, SERVO, PAPST (3D)  
 1 380-0124-000 HOUSING, 10 POS., W/LOCKING RAMP, RK100, #22-01-2  
 10 382-0044-000 TERMINAL, CRIMP, 08-50-0114  
 1 297-0030-002 SHIELD, MOTOR DIII  
 2 353-1018-000 SCREW, 10-32 X 3/4, BR, SOCKET CAP, BLACK  
 2 350-0404-000 SCREW, 4-40 X 1/4 PHIL. PAN ZP  
 2 350-0404-000 SCREW, 4-40 X 1/4 PHIL. PAN ZP

AUDIO OUTPUT PANEL  
 1 281-0103-002 PANEL, REAR, XLR DIII  
 12 350-0411-000 SCREW, 4-40 X 3/8, PF HD. 82 DEG., ZP  
 12 370-0403-000 NUT, 4-40X1/4, KEPS HEX, STEEL, NP  
 2 350-0433-000 SCREW, 4-40 X 5/16, PHIL., FILL. HD.  
 1 281-0102-813 PANEL, REAR-SILKSCREENED DIII

ATTACH REMOTE CONNECTOR PCB  
 4 350-0604-000 SCREW, 6-32 X 1/4, PHIL., PAN, HD., ZP  
 3 350-0433-000 SCREW, 4-40 X 5/16, PHIL., FILL. HD.

ADD AC RECEPTACLE  
 1 380-0072-000 RECEPTACLE, LINE CORD I7252  
 2 350-0433-000 SCREW, 4-40 X 5/16, PHIL., FILL. HD.  
 2 370-0403-000 NUT, 4-40X1/4, KEPS HEX, STEEL, NP

ADD FUSE HOLDER  
 1 418-0005-000 FUSE HOLDER, LOW PROFILE, FEU 031.1673  
 1 418-0006-000 FUSE CARRIER, JAG. GREY. 031.1666  
 1 284-0018-000 PLUG, 1/4" HOLE, BLACK, DP-250

ADD RECORDER INTERFACE CONNECTOR  
 1 380-0134-000 CONNECTOR, 24 PIN W/LOCKING BAIL (FEMALE) 57-4024  
 2 350-0205-000 SCREW, 2-56 X 3/8, PHILL., PAN, HD.  
 2 370-0201-000 NUT, HEX, 2-56 X 3/16

## DELTA IV MECHANICAL PARTS LIST - BY ASSEMBLY

ADD RECORD HEAD CABLES				
3 507-0006-000	CABLE, SHIELDED, RED-ORANGE			
3 507-0007-000	CABLE, SHIELDED, WHITE-BLACK			
3 507-0008-000	CABLE, SHIELDED, YELLOW-BLUE			
ADD PLAY HEAD CABLES				
1 507-0006-000	CABLE, SHIELDED, RED-ORANGE			
3 382-0045-000	TERMINAL, CRIMP, FOR K1100 W/GOLD			
1 380-0070-000	HOUSING, 3 POS./LOCKING, 22-01-2035			
J803A	CABLE, SHIELDED, RED-ORANGE			
1 507-0007-000	CABLE, SHIELDED, RED-ORANGE			
3 382-0045-000	TERMINAL, CRIMP, FOR K1100 W/GOLD			
J803B	HOUSING, 3 POS./LOCKING, 22-01-2035			
1 380-0070-000	CABLE, SHIELDED, RED-ORANGE			
1 507-0008-000	TERMINAL, CRIMP, FOR K1100 W/GOLD			
3 382-0045-000	HOUSING, 3 POS./LOCKING, 22-01-2035			
J803C	CABLE, SHIELDED, WHITE-BLACK			
1 507-0007-000	TERMINAL, CRIMP, FOR K1100 W/GOLD			
3 382-0045-000	HOUSING, 3 POS./LOCKING, 22-01-2035			
J804A	CABLE, SHIELDED, WHITE-BLACK			
1 507-0007-000	CABLE, SHIELDED, WHITE-BLACK			
3 382-0045-000	TERMINAL, CRIMP, FOR K1100 W/GOLD			
J804B	HOUSING, 3 POS./LOCKING, 22-01-2035			
1 507-0007-000	CABLE, SHIELDED, WHITE-BLACK			
3 382-0045-000	TERMINAL, CRIMP, FOR K1100 W/GOLD			
J804C	HOUSING, 3 POS./LOCKING, 22-01-2035			
1 507-0008-000	CABLE, SHIELDED, YELLOW-BLUE			
3 382-0045-000	TERMINAL, CRIMP, FOR K1100 W/GOLD			
J805A	HOUSING, 3 POS./LOCKING, 22-01-2035			
1 507-0008-000	CABLE, SHIELDED, YELLOW-BLUE			
J805B	TERMINAL, CRIMP, FOR K1100 W/GOLD			
1 380-0070-000	HOUSING, 3 POS./LOCKING, 22-01-2035			
1 507-0008-000	CABLE, SHIELDED, YELLOW-BLUE			
3 382-0045-000	TERMINAL, CRIMP, FOR K1100 W/GOLD			
J805C	HOUSING, 3 POS./LOCKING, 22-01-2035			
1 380-0070-000	HOUSING, 6 POS, MTA-100, 26 ANG, 640442-6			
J806	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J807	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J808	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J809	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J810	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J801	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J811	HOUSING, 10 POS, MTA-100, 26 ANG, 1-640442-6			
J812	PIN, FEMALE			
1 382-0011-000	PIN, FEMALE			
J813	PIN, FEMALE			
13 382-0011-000	PIN, FEMALE			
J601	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J1601	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J1602	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J1603	HOUSING, 16 POS, MTA-100, 26 ANG, 1-640442-6			
J1604	FUSE CARTRIDGE (3AG) 1.5 AMP, 125V TIME DELAY			
1 417-0009-000	LINE CORD, 17250, 117V			
1 433-0004-000	LINE CORD, 17250, 117V			
FINAL DRESS				
1 265-0059-812	COVER, P.C. CARD-SILK SCREENED	DI11		
1 280-0046-003	LABEL, HEAD & SOLENOID	DI11		
1 350-0433-000	SCREEN, 4-40 X 5/16, PHIL., FILL. HD.			
1 265-0063-002	COVER, TOP	DI11		
1 046-0014-000	LABEL, TRANSFORMER WIRE CONNECTION			
1 280-0022-001	LABEL, LINE VOLTAGE			
1 280-0002-000	LABEL, SERIAL NUMBER			
1 280-0011-001	LABEL, PATENT NUMBER			
1 280-0048-001	LABEL, AMPLIFIER TO DECK IDENTIFICATION (A TOP)			
1 280-0049-001	LABEL, AMPLIFIER TO DECK IDENTIFICATION (B MID)			
1 280-0050-001	LABEL, AMPLIFIER TO DECK IDENTIFICATION (C BOT)			
3 280-0051-002	LABEL, DECK IDENTIFICATION			
1 280-0056-000	LABEL, PRE-INSTALLATION WARNING			
BOTTOM W/FEET				
1 265-0064-003	COVER, BOTTOM	DI11		
3 350-0427-000	SCREEN, 4-40 X 3/16 PHIL FLAT HD., 100 DEG., 2P			
1 350-0628-000	SCREEN, 6-32 X 3/8, PHIL FLAT HD., 100 DEG.			
4 370-0602-000	NUT, KEPS, 6-32 X 1/4, 2P			
4 311-0039-000	FEET, RUBBER, F68 (MEDIUM), BLACK			
PACK				
1 049-0006-000	INSTRUCTION BOOK	DI11		
6 378-0019-000	PLUG, 3-PIN, STRAIGHT, FEMALE XLR			
3 378-0003-000	PLUG, 15 PIN, CABLE CLAMP & LATCH, P-3315-CCT-L			

LEFT SIDE PANEL

- 1 281-0106-013 PANEL, SIDE, LEFT HAND-SAND BLASTED DI
- 5 353-0603-000 SCREW, 6-32 X 1/4, SOCKET, BUTTON HD., BLACK
- 1 328-0015-002 INLAY, RIGHT & LEFT SIDE PANEL, POLYCARBONATE D

RIGHT SIDE PANEL

- 1 281-0105-013 PANEL, SIDE, RIGHT HAND-SAND BLASTED DI
- 5 353-0603-000 SCREW, 6-32 X 1/4, SOCKET, BUTTON HD., BLACK
- 1 328-0015-002 INLAY, RIGHT & LEFT SIDE PANEL, POLYCARBONATE D
- 1 389-0151-000 HOUSING, 10 POS, MTA-100, 26 ANG, 1-640442-0
- 1 380-0151-000 HOUSING, 10 POS, MTA-100, 26 ANG, 1-640442-0
- 1 380-0150-000 HOUSING, 6 POS, MTA-100, 26 ANG, 640442-6
- 1 380-0148-000 HOUSING, 16 POS, MTA-100, 25 ANG, 1-640442-6

ADD CUE INPUT CABLE

- 1 507-0008-000 CABLE, SHIELDED, YELLOW-BLUE
- 3 382-0045-000 TERMINAL, CRIMP, FOR KR100 W/GOLD
- 1 380-0070-000 HOUSING, 3 POS/LOCKING, 22-01-2035
- 2 441-0040-000 PART NOT IN LIBRARY !!!!
- 1 441-0010-010 TUBING, TEFLON, #16, EXTRA THIN
- 1 283-0082-013 PLATE, CENTER SUPPORT-SAND BLASTED DIV

ADD CAPACITORS (WITH BRACKETS)

- 1 698-0013-000 CAPACITOR, ELECTROLYTIC, 2200 UFD. 35 V (CAN) LKD
- 1 698-0013-000 CAPACITOR, ELECTROLYTIC, 2200 UFD. 35 V (CAN) LKD
- 1 698-0012-000 CAPACITOR, ELECTROLYTIC, 3300 UFD. 35 V (CAN) LKD
- 4 350-0624-000 SCREW, 6-32 X 5/16, PHIL., FILL. HD.
- 2 350-0433-000 SCREW, 4-40 X 5/16, PHIL., FILL. HD.
- 1 281-0100-034 PANEL, FRONT-SAND BLASTED DIV
- 2 282-0010-011 PIN, DOWEL, 1/8 DIA. X 5/8 LONG

MOUNT LEVEL CONTROLS

- 1 636-0044-000 POTENTIOMETER, 2.5K OHM, SINGLE TURN, SOLDER, #72
- 1 636-0044-000 POTENTIOMETER, 2.5K OHM, SINGLE TURN, SOLDER, #72
- 2 254-0101-011 BRACKET, POT MOUNTING-VIBRA BOWL DIV
- 2 350-0428-000 SCREW, 4-40 X 5/16, INT. SENS., PHIL., PAN, 2P

MOUNT METER SWITCHES

- 1 391-0025-000 SWITCH ASSEMBLY
- 2 350-0205-000 SCREW, 2-56 X 3/8, PHILL., PAN, HD.
- 2 370-0201-000 NUT, HEX, 2-56 X 3/16

ADD METER MOUNT SCREW & INLAY (WITH LETTERING)

- 1 350-0418-000 SCREW, 4-40 X 5/8, PHIL., FLAT HD. 82 DEG
- 1 328-0021-002 INLAY, FRONT PANEL, POLYCARBONATE DIV
- 1 328-0022-001 INLAY, TOP FRONT PANEL, POLYCARBONATE DIV

ADD METERS

- M1501 1 554-0002-000 METER, VU
- 2 375-0008-000 TERMINAL, #10, BENT, LOCKING
- 2 370-1001-000 NUT, 10-32 X 3/8, HEX, 2P
- M1502 1 554-0002-000 METER, VU
- 2 375-0008-000 TERMINAL, #10, BENT, LOCKING
- 2 370-1001-000 NUT, 10-32 X 3/8, HEX, 2P
- 1 254-0103-011 BRACKET, METER MOUNTING-VIBRA BOWL DIV
- 1 370-0403-000 NUT, 4-40X1/4, KEPS HEX, STEEL, NP

ADD CONTROL SWITCHES

- S1501 1 391-0023-000 SWITCH, PUSH, 05-62125
- 1 404-0062-000 LENS, BLUE, FOR 05-62125
- 1 415-0013-000 LAMP, MINATURE 5 VOLT 3150
- S1502 1 391-0023-000 SWITCH, PUSH, 05-62125
- 1 404-0061-000 LENS, RED, FOR 05-62125 80-050603
- 1 415-0013-000 LAMP, MINATURE 5 VOLT 3150
- S1503 1 391-0023-000 SWITCH, PUSH, 05-62125
- 1 404-0063-000 LENS, WHITE, FOR 05-62125 80-050602
- 1 415-0013-000 LAMP, MINATURE 5 VOLT 3150
- 1 281-0098-013 PANEL, REAR-SAND BLASTED DIV
- 2 350-0433-000 SCREW, 4-40 X 5/16, PHIL., FILL. HD.

ADD REMOTE CONNECTOR

- J5 1 380-0004-000 SOCKET, 15 PIN, CHASSIS MOUNT, S-3115AB
- 2 350-0431-000 SCREW, 4-40 X 5/16, PHIL., FILL. HD.
- 2 370-0403-000 NUT, 4-40X1/4, KEPS HEX, STEEL, NP

ADD COVER LATCH AND GUIDES

- 1 350-0419-000 SCREW, 4-40 X 3/4, PHIL, PAN, STEEL, 2P
- 1 360-0404-000 WASHER, FLAT, 84 X 1/2 OD. X .032 THICK, STEEL 2P
- 1 370-0402-000 NUT, 4-40X1/4, HEX, CAD. PLTD.
- 1 301-0055-000 SPRING, COMP., 160 OD. X 1/2 LONG X .022 MUSIC W
- 1 441-0034-011 TUBING, TEFLON #10 X 37/32 THIN WALL
- 2 350-0433-000 SCREW, 4-40 X 5/16, PHIL., FILL. HD.

ADD MOTHER BOARD SUPPORT

- 1 304-0026-011 SUPPORT, MOTHER BOARD, VIBRA BOWL DIV
- 2 350-0413-000 SCREW, 4-40 X 7/16, PHILL., PAN, HD.
- 2 300-0099-000 SPACER, 6-32 X 1/4 X 1/4 LONG, HEX, MALE/FEMALE,
- 1 350-0403-000 SCREW, 4-40 X 3/16, PHIL PAN 2P

ADD BAIL BARRAGE

- 1 362-0039-000 BAIL LOCK FOR CRAMP SERIES, #52563-1
- 2 350-0413-000 SCREW, 4-40 X 7/16, PHILL., PAN, HD.
- 2 370-0403-000 NUT, 4-40X1/4, KEPS HEX, STEEL, NP

ADD AUDIO INPUT ASSEMBLY

- 4 350-0411-000 RECORDER-PLAYBACK INTERFACE BARRAGE
- 1 837-0015-002 CONNECTOR, 24 PIN, W/HOUSING, MALE, 57-30240
- 2 378-0058-000

FINNL DRESS

1	265-0062-002	COVER, TOP, DI, IV	
1	280-0047-003	LABEL, POTENTIOMETER	DIV
1	280-0002-000	LABEL, SERIAL NUMBER	
1	280-0011-001	LABEL, PATENT NUMBER	
1	280-0055-001	LABEL, IB REFERENCE	

BOTTOM W/FEET

1	265-0061-003	COVER, BOTTOM, DI, IV	
3	350-0427-000	SCREW, 4-40 X 3/16 PHIL FLAT HD., 100 DEG., ZP	
4	350-0628-000	SCREW, 6-32 X 3/8, PHIL FLAT HD., 100 DEG.	
4	370-0602-000	NUT, KEPS, 6-32 X 1/4, ZP	
4	311-0039-000	FEET, RUESSER, F68 (MEDIUM), BLACK	

ADD LEVEL CONTROL KNOBS

1	315-0018-002	KNOB, LEVEL CONTROL,	DIV
1	315-0018-002	KNOB, LEVEL CONTROL,	DIV

PACK

1	380-0041-000	SOCKET, 3 PIN, FLANGE, FEMALE, D3F	
1	380-0041-000	SOCKET, 3 PIN, FLANGE, FEMALE, D3F	
1	378-0003-000	PLUG, 15 PIN, CABLE CLAMP & LATCH, P-3315-CCT-L	