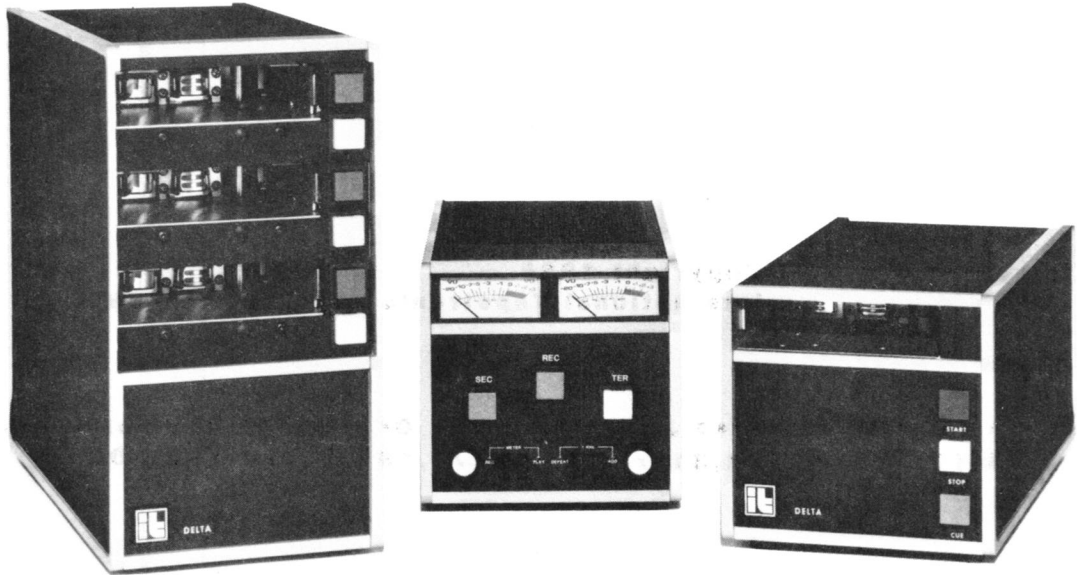


“DELTA”
TECHNICAL MANUAL
(8 9 0 - 0 0 2 8 - 0 2 0)
(R e v . 9 / 8 5)



“Today’s Most Popular Cartridge Machines”

From
“The Leader in Reliability and Service”

International Tapetronics Corporation/3M
2425 South Main Street
P.O. Box 241
Bloomington, Illinois 61702-0241

3M

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Preface

International Tapetronics Corporation/3M manuals are written with the intent of assisting the reader/user towards a better understanding of ITC equipment. Please read through this manual and familiarize yourself with the various procedures and tests necessary to keep your equipment in top operating condition. It is advisable to keep the manual in a convenient and readily accessible area near the machine.

Our test procedures are designed to allow adjustment by users for accurate and repeatable results; while yielding performance within specifications.

Should you discover any errors or omissions, or wish to comment on the manual or equipment, your input will be greatly appreciated. Forward any suggestions or recommendations to the Technical Documentation Coordinator; c/o ITC Technical Service department.

Warning: This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instructions manual, may cause interference to radio communications. It has been tested and found to comply with the limits for a Class A computing device pursuant to Subpart J of Part 15 of FCC Rules, which are designed to provide reasonable protection against such interference when operated in a commercial environment. Operation of this equipment in a residential area is likely to cause interference in which case the user at his own expense will be required to take whatever measures may be re-required to correct the interference.

Warranty

International Tapetronics Corporation/3M

Warranty Conditions: There are no warranties, expressed or implied including the warranties of merchantability and fitness for use, beyond those stated herein.

International Tapetronics Corporation/3M, hereinafter referred to as ITC, warrants its products to be free from defects in workmanship and material under normal and proper use for the periods specified below. ITC assumes no obligation to repair or replace equipment which has been subject to maltreatment, misapplication, exposure or excessive moisture, improper maintenance or installation, negligence or accident, or had its serial number or any part thereof altered, defaced or removed. These warranties apply only to the original user. No dealer or agent is authorized to make any other or additional guaranty or warranty.

The sole or exclusive liability of ITC shall be to replace or repair the product as it may designate. ITC assumes no liability for consequential damages or for any other loss, damage or expense, directly or indirectly arising from the use of its products. In order to obtain warranty service ITC may require Purchaser to deliver the item to ITC at Purchaser's expense.

NEW EQUIPMENT: Warranted to be free from defects in workmanship and material, and conform to the specifications referred to or set out herein, for a period of two (2) years from date of shipment.

REFURBISHED EQUIPMENT: Warranted to be free from defects in workmanship and material, and conform to the specifications referred to or set out herein, for a period of two (2) years from date of shipment.

REPAIRED EQUIPMENT/REPLACEMENT PARTS: Warranted to be free from defects in workmanship and material for a period of ninety (90) days from date of shipment.

USED EQUIPMENT: Warranty time-period determined at time of sale.

Equipment Return Policy

When return of ITC equipment or components is necessary, please follow the procedure outlined in this bulletin. These four easy steps will insure prompt attention for your equipment.

1. Call the ITC Technical Service Department for return authorization and assistance. We must know that your equipment is coming and what the problem is before we can help. Unexpected or unidentified equipment is subject to delays of days or weeks since only properly documented material can be processed. Also, many problems can be diagnosed and rectified without actually returning the equipment, thereby saving you the expense of shipping and downtime!

2. Let us know who you are by writing a brief note listing the problem, your name, call letters or company name, address, phone number and who you spoke with at ITC. Enclose this note with the equipment. Also, make sure that your return address is visible on the outside of the carton.

3. Package the equipment securely! ITC is not responsible for shipping damage. If possible, use the original packing material. (Replacement packing material is available from ITC.)

4. Ship the equipment, prepaid, via a traceable mode of transportation; UPS, air express or air freight. Parcel Post and Air Mail are not traceable. Do not ship collect unless prior arrangements have been made. ITC recommends that you insure your shipment. Our Technical Service or Customer Service staff can assist with declared values for insurance purposes.

We continually strive to make available the finest in technical support and service for our products. Your help in making this possible is appreciated.

Call Toll-Free 800-447-0414. From Alaska, Hawaii and Illinois, call collect 309-828-1381.

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Section I Introduction & Specifications

INTRODUCTION

This manual describes the installation, operation and maintenance of the DELTA family of audio tape cartridge machines from International Tapetronica Corporation/3M. The DELTA family consists of:

DELTA I: MONO or STEREO single-deck reproducer; plays AA size carts.

DELTA II: MONO or STEREO single-deck reproducer; plays AA, BB or CC size carts.

DELTA III: MONO or STEREO triple-deck reproducer; plays AA size carts.

DELTA IV: MONO or STEREO recording amplifier for all other DELTA units; single-deck size for rack mounting or mix & match table-top mounting.

ITC cartridge machines are designed and built for rugged use, with minimal required effort needed for normal servicing.

DELTA series units utilize a crystal-referenced, DC brushless capstan motor and bottoming solenoid for stable flutter & speed accuracy. A toroidal power transformer significantly reduces heat and minimizes radiated electromagnetic fields. Also, a patented head mounting module provides precise adjustment and alignment for tape contact.

Access for adjustments and routine servicing is made via an easily removable top cover. Subassemblies such as amplifiers, control circuitry, power supplies, front/rear panels and head assemblies are all plug or bolt in place, making service access convenient.

SPECIFICATIONS:

Power-

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

Power Consumption-

- DI/DII: 50 VA Typical; 65 VA Maximum.
- DIII: 120 VA Typical; 135 VA Maximum.
- DIV : 5 VA Typical; 10 VA Maximum.

Tape Speed-

- A. 7.5 IPS (19 cm/s) Standard
- B. 3.75 IPS (9.5 cm/s) Strappable Option
- C. 15 IPS (38 cm/s) Strappable Option

Speed Accuracy-

- Better Than +/- 0.2%

Capstan Motor-

- A. Direct Drive
- B. DC Brushless
- C. Electrolyzed, Non-Magnetic, Stainless Steel Shaft.
- D. Permanently Lubricated Ball Bearings
- E. Crystal Referenced, Phase-Locked Controller

Record/Play Flutter-

- A. Play Maximum: 0.12% DIN Weighted @ 7.5 IPS
- B. Rec/Play Maximum: 0.15% DIN Weighted @ 7.5 IPS

Audio Output Configuration-

- A. Transformer Coupled Standard
- B. Balanced Transformerless Operation
Available Via Field Conversion

Audio Output Impedances-

- A. 600 Ohm Standard Termination Impedance
(275 Ohm Source Impedance)
- B. 150 Ohm Optional Termination Impedance Via Strap Change
(50 Ohm Source Impedance)
- C. Transformerless Output: 150 Ohm Source Impedance

Audio Output Level-

- A. +18 dBm Before Clipping Into 600 Ohm Load
- B. +22 dBm Transformerless Clip Level
- C. Variable From 0 Level To +18 dBm
(Referenced To 1 kHz At 160 nWb/m).
Continuously Variable "Useable" Range Of
-18 dBm To +18 dBm.

Distortion-*

- System: 1.5% Or Less THD. (Tape Dependent)

Noise-

A.* Signal-To-Noise: No Tape Running;
ScotchCart Cartridge In Place.

MONO	STEREO
62 dB	60 dB
(Or Better)	(Or Better)

B.* Signal-To-Noise: Measured With Bias/
No Signal; Input Shorted; Virgin Cartridge.

MONO	STEREO
60 dB	58 dB
(Or Better)	(Or Better)

C. Squelch Noise-
70 dB Or Better

-Noise Measurements Are 20 Hz-20 kHz Bandlimited, Unweighted-

Crosstalk (System)-*

-50 dB Minimum Separation Between Any Two
Channels.

Frequency Response-*

Record/Playback: +/- 2.0 dB, 50 Hz - 16kHz

Equalization-

- A. 1975 NAB: Factory Standard
- B. 1964 NAB: Field Convertible, Via Jumper
- C. CCIR: Field Convertible

Adjustments: High Frequency Via Potentiometer

Head Configuration-

NAB Standard: Mono Play; Stereo Play; Mono R/P;
Stereo R/P

Cue Signals- (Conform To NAB Specification)

- A. NAB Primary Cue: 1 kHz
- B. NAB Secondary Cue: 150 Hz
- C. NAB Tertiary Cue: 8 kHz
- D. External Cue:
 - 1. Cue Record Logging Input-
Source Impedance: 10K Ohms or less
Volts In: 0.5V +/- .25V RMS
 - 2. Cue Reproduce Audio Output-
Load Impedance: 47K Ohms or greater
Volts Out: 0.5V +/- .25V RMS

Audio Input Sensitivity-

- A. Line Input: 0 dBm nominal

Input Range: -18 dBm To +18 dBm

(Strappable For -6 dBm Or +6 dBm Center Range)

Audio Input Configuration-

- A. Transformer Coupled:

- 1. 20K Ohm Bridging Standard

- 2. Strappable For 150/600 Ohms Terminating Impedance

- B. Transformerless Balanced Available

Metering-

- A. Monitors Input Level To The Recorder;

- Automatically Switches To Playback When

- Not Recording; Manually Switchable For

- Record/Play/Bias/Cue.

- B. Taut Band Movement With VU Type "A" Scale

Bias-

119.3 kHz, Crystal Referenced

Cartridge Size-

DI/DIII: NAB A & AA

DII: NAB A & AA, B & C

Start Time-

100 ms Typical. (Dependent On Solenoid Air-Damp Adjustment.)

Stop Time-

Less Than 100 ms Typical.

(Tape Travel Varies According To Type Of Cartridge And Length Of Tape)

Ambient Operating Temperature Range-

10 To 50 Degrees C. (50 To 122 Degrees F.)

Storage Temperature Range-

-40 To +85 Degrees C. (-40 To +185 Degrees F.)

Manual And Remote Controls-

- A. All Front Panel Indicators And Controls

- (Except Program Bias & Cue Track Monitoring)

- B. Play Remotes Available Via Play Remote

- Connector

- C. Record Remote Functions (Except Metering)

- Available Via Record Remote Connectors

External Connectors-

- A. XLR Audio Connectors

- B. D-Subminiature Remote Connectors

Mounting-

- A. Table-Top Standard
- B. Rack-Mount Optional With URM-0001 Rack-Mount Kit
(Three Units May Mount Side-By-Side)

Dimensions-

- A. Width: DI: 14.1 cm (5 9/16")
DII: 28.3 cm (11 1/8")
DIII: 14.1 cm (5 9/16")
DIV: 14.1 cm (5 9/16")

- B. Depth: DI: 30.5 cm (12.00")
DII: 30.5 cm (12.00")
DIII: 33 cm (13.00")
DIV: 30.5 cm (12.00")

- C. Height: DI: 13.3 cm (5 7/32")
DII: 13.3 cm (5 7/32")
DIII: 26.6 cm (10 15/32")
DIV: 13.3 cm (5 7/32")
Add 1 cm (.375") for feet.

Note: All Machines Require 8.75 cm (3 1/2")
Additional Depth At Rear For
Interconnection

Weight-(Typical)

- DI: 10.0 kg (22 lbs.)
- DII: 11.8 kg (26 lbs.)
- DIII: 16.8 kg (37 lbs.)
- DIV: 5.9 kg (13 lbs.)
- Total Shipping Weight: Less Than 22.5 kg (50 lbs)

* Note: Items Indicated (*) Are Specified Using A
ScotchCart® Broadcast Cartridge At A Reference
Level Of 1 kHz At 250 nWb/m.

International Tapetronics Corporation/3M Reserves
The Right To Change Products And Specifications
Without Notice.

Section II Installation & Operation

UNPACKING, HANDLING & PRE-INSTALLATION CHECKOUT

Fully unpack the unit, retaining all packing material. Place the unit in an area suitable for servicing. Visually inspect the chassis and covers for signs of freight damage. This inspection is necessary in order to determine if a damage claim is warranted.

Occasionally, damage is hidden and not readily apparent on external examination. The top cover should be removed by pulling back on the spring-loaded fastener located on the rear brace and sliding the cover back and off of the unit. Inspect all internal components for signs of hidden damage.

If damage is discovered--DO NOT POWER UP THE UNIT! Personal injury or further damage to the machine may occur. When a machine is damaged in shipment, please follow this procedure:

1. Call the ITC Customer Service department to inform them of the damage.

2. Describe the damage, how it was discovered and whether the delivering carrier has been informed. We can assist in determining what forms need to be submitted for a claim.

3. Do not repack the machine or dispose of any packing material until an inspection has been made by the delivering carrier or a representative.

After it is determined that the unit has not been damaged in shipment, check all internal connectors and other assemblies to make sure that nothing has been shaken loose or come unplugged. Review the following checklist to verify that your unit came with the correct connection/power parts and that they are correct for your type of installation. (Tables 2-1 & 2-2)

Table 2-1 DI/II/III

<u>Unit Type</u>	<u>Description</u>	<u>Part Number</u>
-Line Cord-		
120V	North American plug, molded, with ground lug.....	433-0004-000
240V	240V type pigtail provided for customer installed connector.....	433-0005-000

240V Color Code for Leads:		
Brown = Live Conductor		
Blue = Neutral Conductor		
Green w/Yellow Stripe = Ground		

-Fuse Carrier-		
120V	3AG size fuse carrier. (Grey).....	418-0006-000
240V	5mm x 20mm fuse carrier. (Black).....	418-0007-000
120/240V	Fuse holder, low-profile.....	418-0005-000
-Fuse-		
120V	DI/DII: 3AG, .75 A 125V, time-delay	417-0012-000
	DIII: 3AG, 800 mA 125V, time-delay.....	417-0009-000
240V	DI/DII: 5mm x 20mm, 400 mA 250V, slo-blo.....	417-0018-000
	DIII: 5mm x 20mm, 800 mA 250V, slo-blo.....	417-0014-000
-Audio Output Connectors-		
120/240V	DI/DII: 3-Pin XLR Female plug.....	378-0019-000
	MONO--Quantity 1, STEREO--Quantity 2.	
	DIII: 3-Pin XLR Female plug.....	378-0019-000
	MONO--Quantity 3, STEREO--Quantity 6.	
-Remote Connectors-		
120/240V	DI/DII: 15-Pin plug.....	378-0062-000
	Quantity 1.	
	DIII: 15-Pin plug.....	378-0062-000
	Quantity 3.	
-Miscellaneous-		
	Technical manual.....	890-0028-020

Table 2-2 DIV

<u>Unit Type</u>	<u>Description</u>	<u>Part Number</u>
	-Audio Input Connectors-	
	3-Pin XLR Male plug.....	378-0018-000
	MONO--Quantity 1, STEREO--Quantity 2.	
	-Remote Connectors-	
	15-Pin plug.....	378-0062-000
	Quantity 1.	
	-Cables-	
	Interconnect cable.....	837-0035-002

**Operational
Checkout**

Prior to actual installation, it is advisable to perform a short, operational check on the unit:

1. With the top cover removed, plug the unit in and check to make sure that the motor is running. No front panel lamps will be illuminated.
2. Insert a blank tape cartridge into the machine. The yellow (READY/STOP) lamp will be illuminated. This indicates that the power supplies and microprocessor are functional.
3. Press the green (RUN/START) button. The green lamp will come on, the yellow lamp will go out, the solenoid plunger will pull in and tape will be pulled.
4. Press the blue (CUE) button. (This button is only on DELTA I & DELTA II units.) The green lamp will go out and the blue lamp will be illuminated. Simultaneously, the motor will speed up.
5. Press the yellow button. The green lamp will go out, the solenoid plunger will release and the tape will stop. The yellow lamp will be flashing.
6. Remove the cartridge from the machine. The yellow lamp will go out. Unplug the unit.

If the motor fails to run or if any of the lamps fail to illuminate, check connections to make sure that nothing has come loose. The lamps may be checked by removing the switch lens (pull straight forward) and reseating the bulb.

Factory Setup

Factory setup procedures call for adjusting and testing this unit to prevailing industry standards. Because of this, the unit's final setup standards may be different than those already in use at your facility. Therefore, a careful check of this machine may be in order to insure that the unit conforms to your needs. We make every possible effort to insure the accuracy of our factory adjustments and presume that certain setup conditions exist at your facility. These conditions include, but are not limited to input level, output level, record fluxivity, equalization, tape type, cartridge type, etc. Please check the unit's final inspection tag and the Specifications section of this manual for setup information. Finally, make note in your company's permanent records of the date of receipt and the model/serial numbers. You may need this information for future reference.

CAUTION: For Record/Reproduce units only. DO NOT connect a record unit to a reproduce unit while power is applied. Interconnection of units should be done only when power is removed. Failure to do this may cause damage to internal logic or power supply circuits.

INSTALLATION

Machine Installation

TABLE TOP: Your DELTA cart machine was shipped from the factory as a table-top unit. The DELTA family was designed as an incremental Unit system. Up to three (3) single UNIT height machines may be mounted on top of each other. DELTA machines may be mounted to provide a compact and versatile system as illustrated by Figure 2-1. Units should not be fully enclosed unless additional ventilation is provided by external sources. (See VENTILATION) In addition, units should not be placed on top of equipment producing large amounts of heat.

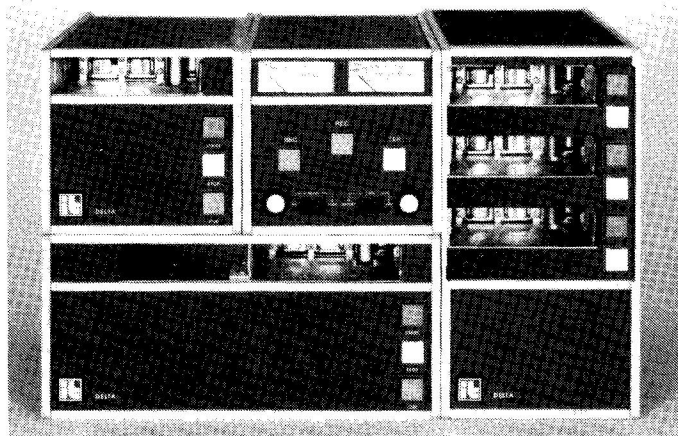


Fig. 2-1

RACK MOUNTING: DELTA cart machines may be rack mounted. Three (3) single-width units will fit side-by-side in a standard 19" rack opening. ITC makes available a universal rack mounting kit and filler panel as options. Please refer to Table 2-3 for ordering information.

Table 2-3

<u>Description</u>	<u>Part Number</u>
URM-0001 Universal Rack Mount.	878-0089-010
1/3 Rack Width Filler Panel.	878-0091-000

To prepare the unit for rack mounting, remove all four (4) feet and the top cover. Place these parts in a storage area for use if needed again.

CAUTION

Rack mounted units are installed without covers and must have their power disconnected

during removal from or installation into the rack frame.

Ventilation

The unit's top cover, and the URM-0001 (rack mount), have holes to allow normally generated heat to dissipate without allowing debris to fall into the chassis. No forced air cooling is needed (See Special Note For DELTA III Units) unless the unit is to be installed in a fully closed, unventilated housing. If a fully closed housing is used, a ventilating fan should be installed to draw heat away from the unit. Also, check air-flow from the fan and install a filter, if needed, to prevent excess dust from being drawn into the cart machine.

CAUTION

Do not block the top cover holes, or those of the URM-0001 by placing material on top the unit. Abnormal heat buildup will cause component life to be considerably shortened.

-SPECIAL NOTE ON DELTA III UNIT VENTILATION-

Because of the highly compact nature of this triple-deck unit, there is a miniature cooling fan installed inside all DELTA III units. This provides heat and dust dissipation for the densely packed componentry. The fan is mounted below and to the rear of the center panel.

The fan operates from low-voltage DC current. Fan speed is variable by turning a trimpot accessible through a small hole in the rear panel. The factory-set speed is adequate for most applications. If the unit is to be installed in a fully closed housing, more fan speed may be necessary. The unit should not be operated without the fan regardless of the type of installation. Component life will suffer greatly from abnormal heat buildup.

Typical fan noise is less than that produced by tape being pulled through a cartridge.

EXTERNAL AUDIO/REMOTE CONTROL CONNECTIONS

Inputs/Outputs

All DELTA units are shipped with standard input and output transformers installed. Inputs and outputs are made via 3-pin XLR-type connectors on the rear panel. Pin connections are "universal": Pin #1 is GROUND, Pins #2 & #3 are the balanced pair.

Should transformerless operation be desired, please refer to the Jumpers & Straps part of this section. DELTA I, II & IV units may be converted to transformerless operation by jumper strap modification on PCB's. DELTA III units require removal of the transformers and insertion of capacitors, or purchase of a properly loaded replacement PCB from ITC.

Cabling

ITC recommends that only shielded, twisted pair cable be used for input/output connections. In some remote audio output applications, unshielded cable may be tolerated if necessary, but this is not recommended.

Hookup

+(plus) and -(minus) signs on audio connections are indications of proper (stereo) phase relationship only and do not reflect DC voltage potential. It is necessary to connect the +(plus) lines of both channels to the corresponding +(plus), or equivalent terminal of the terminating equipment. This will prevent audio phase reversals (mono sum errors).

Remotes

Remote control for DELTA series machines is provided by 15-Pin D-Subminiature connectors located on the rear panel. Tables 2-4 and 2-5 outline the remote connector pin functions.

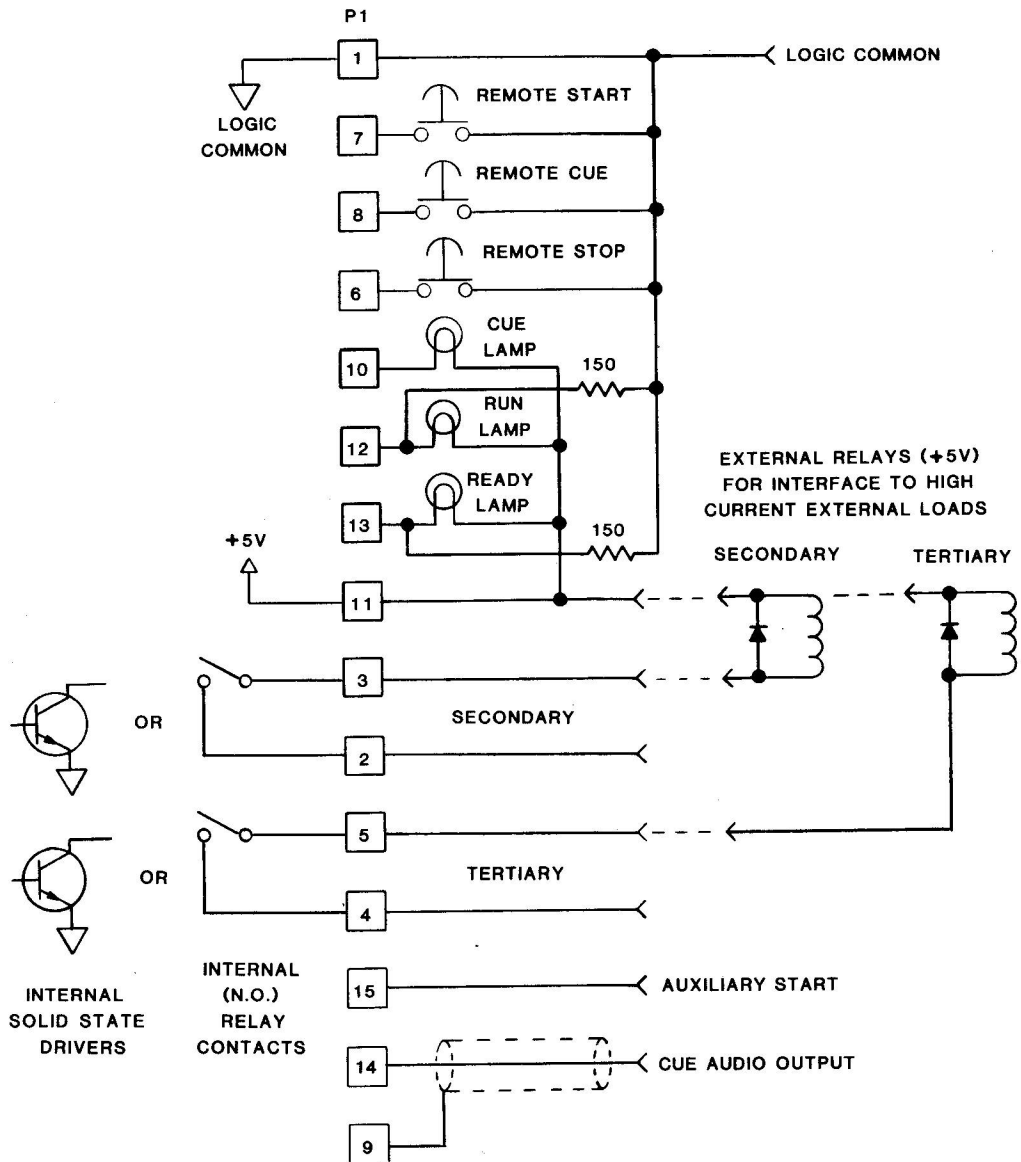
Table 2-4
 Reproducer (DI/DII/DIII) Remote Connector

Pin #	Function
1.....	Logic Common, Switch Common
2.....	Secondary Cue Relay (Normally Open)
3.....	Secondary Cue Relay (Open Collector)- 200 mA switching current (sinking) , maximum 25 VDC open circuit voltage, switches to ground upon sensing of secondary tone.
4.....	Tertiary Cue Relay (Normally Open)
5.....	Tertiary Cue Relay (Open Collector)- Switches to ground upon sensing of tertiary cue.
6.....	Remote Stop (Stop Ground)
7.....	Remote Start (Run Ground)
8.....	Remote Cue Switch
9.....	Cue Audio Ground
10.....	Remote Cue Lamp
11.....	+5 Volts

NOTE: Use of this power supply in external applications should be limited to low-current, non-inductive loads. This is the same power supply that operates machine logic, and is subject to the influence of externally connected devices.

12.....	Remote Run Lamp (Ground)
13.....	Remote Ready Lamp (Ground)- Follows ready lamp function, when lamp is at ground. When lamp is off, the open collector transistor is off. CAUTION: Ready ground follows the condition of the front panel ready lamp. If the ready lamp is strapped to flash, ready ground will change states synchronous with the front panel ready lamp. Maximum open circuit voltage is 25 VDC; Maximum current at 200 mA.

- 14.....Cue Audio Output-
(Nominal voltage is .5V RMS)
- 15.....Auxiliary Start Pulse-
Open collector momentary
(100 msec) pulse to ground
upon start of cartridge.
May be used to start an
external clock or timer.
Maximum 25 VDC open circuit
voltage at 200 mA.

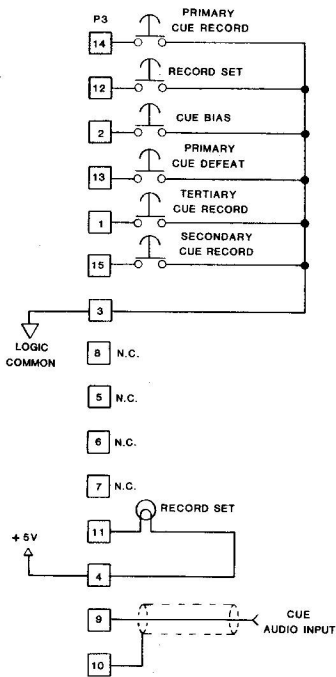


SAMPLE REMOTE CONTROL DELTA I,II,III (PER DECK) REPRODUCERS

Fig. 2-2

Table 2-5
Recorder (DIV) Remote Connector

Pin #	Function
1.....	8 kHz Cue Record Switch (Tertiary)
2.....	Cue Bias (Remote Cue Record Switch)
3.....	Logic Common
4.....	+5 Volts Regulated
NOTE: Use of this power supply in external applications should be limited to low-current, non-inductive loads. This is the same power supply that operates machine logic, and is subject to the influence of externally connected devices.	
5.....	N.C.
6.....	N.C.
7.....	N.C.
8.....	N.C.
9.....	Cue Audio Input
10.....	Cue Audio Input Common
11.....	Remote Record Set Lamp
12.....	Remote Record Set Switch
13.....	1 kHz Cue Tone Defeat (Primary)
14.....	1 kHz Cue Record Switch (Primary)
15.....	150 Hz Cue Record Switch (Secondary)



SAMPLE REMOTE CONTROL DELTA IV RECORD AMPLIFIER

Fig.2-3

Grounding & Shielding

Proper grounding and shielding techniques are important in insuring safe and noise-free operation. Fig. 2-4 illustrates a common installation technique for the prevention of audio (hum) ground loops. Notice that all third-lug connections must be made through this studio's AC power distribution system. This technique allows the mixer ground bus to become the central grounding point for all equipment in the studio.

CAUTION: The third (ground) lug should not be removed due to the increased potential for a shock hazard.

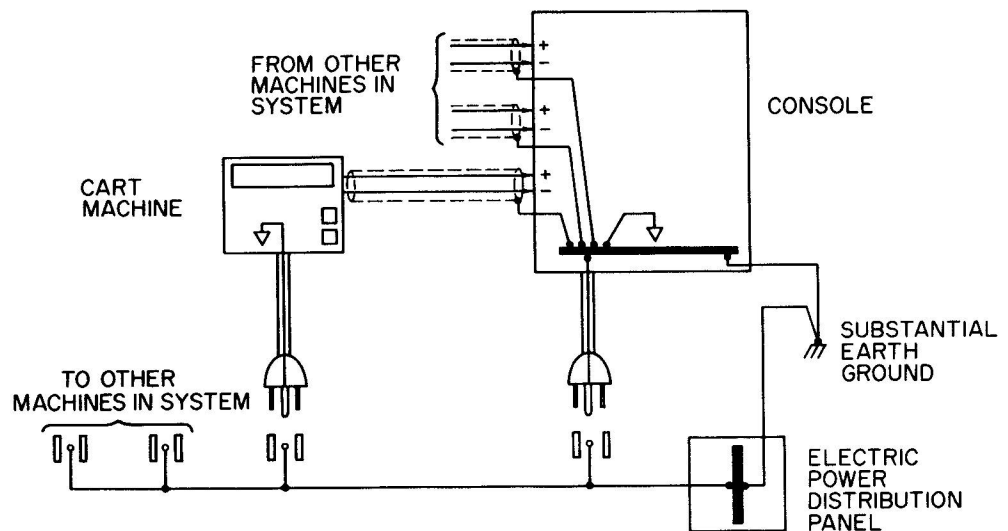
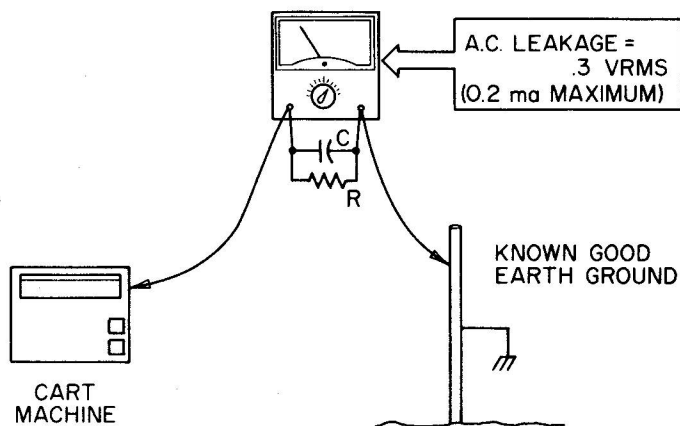


Fig. 2-4

AC Leakage Test

AC leakage currents in the system, between chassis components of properly connected and operating equipment, will be minimized. In any new equipment installation, AC leakage currents must be measured. Leakage of more than 200 microamps indicates a potentially hazardous condition that must not be left unremedied!

Use an AC voltmeter of 5000 Ohms per volt, or greater, and build a parallel circuit consisting of a 1500 Ohm, 10 Watt resistor and a .15 mfd capacitor, connected as shown in Figure 2-5.



* R = 1500 OHM, 10 WATT
 C = .15 MFD

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 SYSTEMS TECHNICIAN SAFETY GUIDELINES
 (7-84)

Sample AC Leakage Test

Fig. 2-5

Measure the voltage between a known good earth ground and an exposed metallic part on the chassis of the equipment under test. Voltage measured **must not exceed .3V RMS**, (corresponding to 0.2 mA AC). ANY value exceeding this limit must be considered a potential shock hazard and should be remedied immediately.

The studio construction technique shown in Fig. 2-4 is sometimes called "Spoke", or "Hub and Spoke" construction. In this technique, the mixer is always considered to be the electrical "Hub" of the studio, with all other equipment connected to the mixer in a "Spoke"

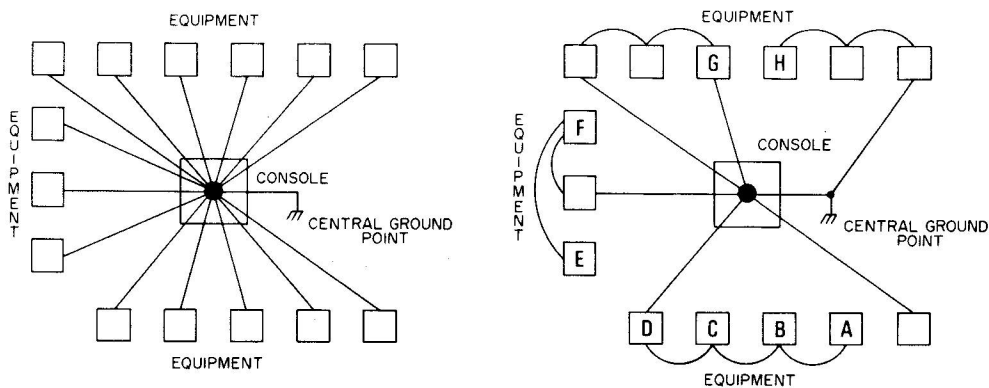


Fig. 2-6

CORRECT GROUNDING TECHNIQUE, SHOWING CONSOLE/MIXER AS THE CENTRAL GROUND POINT

INCORRECT GROUNDING TECHNIQUES, SHOWING MIXED SCHEMES, INCLUDING LOOPING AND UNSUBSTANTIATED GROUNDS. SHOCK HAZARDS AND GROUND LOOP POTENTIAL IS HIGH.

fashion. All grounding is referenced to the mixer (Console) as is power distribution. Correct and incorrect grounding techniques are illustrated in Fig. 2-6.

Leakage current measurements between machine A and the mixer will usually reveal a serious ground fault because of the long route back to the mixer. The ACTUAL route is A to B to C to D, then back to the mixer before true ground is achieved.

Similarly, leakage current between machines E and H is significant due to its equally lengthy route.

Function Modification

JUMPERS & STRAPS (Special Functions)

As noted in the Controls & Indicators section, DELTA series machines are factory configured for standard operation. All standard configuration machines also have the ability to be reconfigured via jumper and strap changes for special operation to meet the needs of your particular installation.

Reproducer Options:

Flashing Ready Lamp

1. START LOCK OUT/1 kHz FLASH (yellow lamp): Unless otherwise specified when ordered, the READY (Stop) lamp will flash slowly when a cartridge plays through to the 1 kHz cue tone and stops. If a cartridge has been stopped manually, by pressing the STOP button, the READY lamp will flash quickly. The "flashing ready" may be reset to continuous ready by momentarily pressing the STOP switch. To disable the "flashing READY" on cue up or manual stop, install jumper W206 on the Reproduce Logic PCB.

Repeat-Play Lockout

As supplied from the factory, a cartridge that has played through to the 1 kHz cue tone and stopped may be replayed by pressing the START button. To prevent accidental replay of the same cartridge, enable the repeat play lock-out by installing W207 on the reproduce PCB.

NOTE: If W206 is selected for a "No Flash" condition, W207 will NOT enable the "Start

Lock Out". Please refer to Figure 2-7 and Table 2-6 for exact interrelationship of straps.

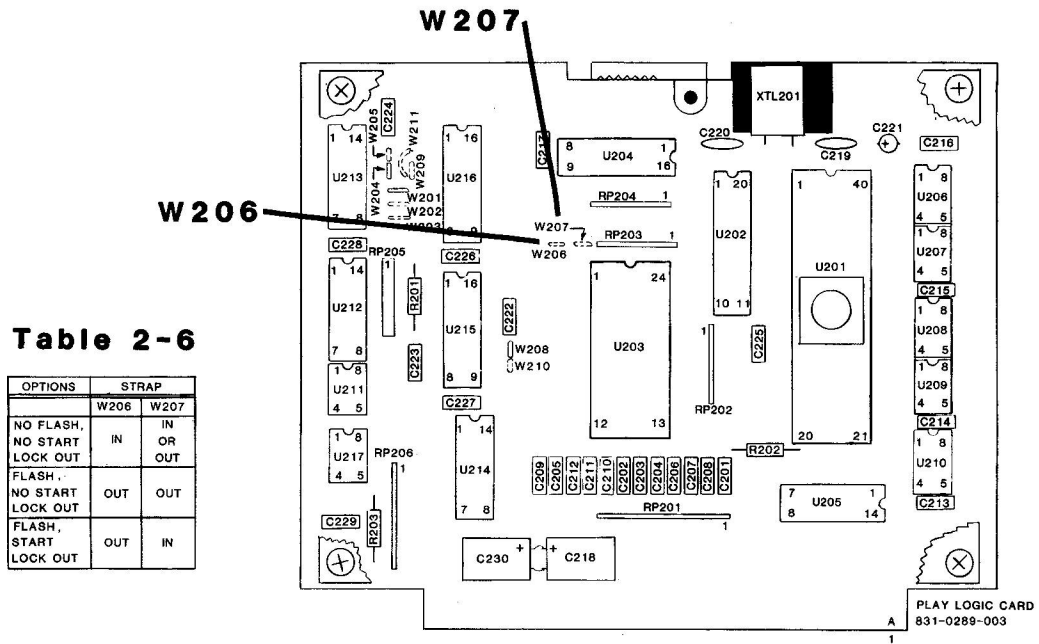


Fig. 2-7

**Secondary/
Tertiary**

2. 150 Hz/8 kHz HIGH-SPEED RECUE/AUDIO MUTE:
As supplied from the factory, a 150 Hz
Secondary cue tone will cause audio to mute at

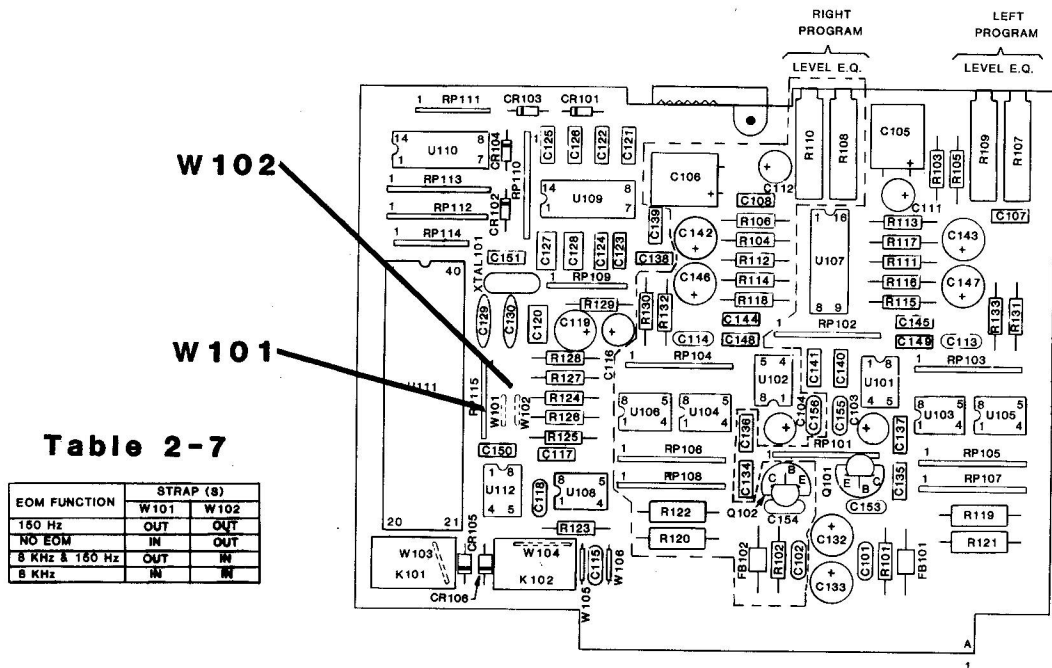


Fig. 2-8

Recue/Audio Mute

the trailing edge of the tone and the cartridge will recue at high-speed. Additionally, an 8 kHz Tertiary tone may be substituted for or used in conjunction with the 150 Hz tone to provide audio mute/high-speed recue via jumper change. Both tones may be disabled via jumper change. These jumpers are located on the Reproduce Amplifier & Cue Detect PCB. Refer to Figure 2-8 and Table 2-7 for exact jumper location and strap change instructions.

Relay/ Open Collector

3. RELAY/OPEN COLLECTOR OPERATION: Unless otherwise specified when ordered, operation of the 150 Hz or 8 kHz cue tones is controlled by internal relay contacts. Open collector operation is available via internal solid state drivers by removing relays and making strap changes. The relays and straps are located on the Reproduce Amplifier & Cue Detect PCB. Refer to Figure 2-9 and Table 2-8 for exact location and relay/jumper change instructions.

Fig. 2-9

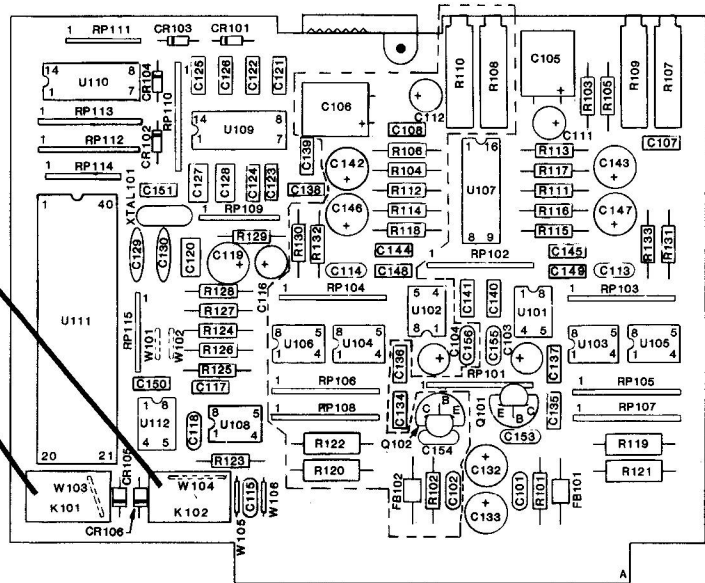


Table 2-8

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

Output Impedance

4. REPRODUCER OUTPUT IMPEDANCE: Unless otherwise specified when ordered, all DELTA series reproducers are supplied from the factory with 600 OHMS balanced, transformer coupled output. 150 OHM balanced, transformer coupled output is available by making strap changes on the DI/DII or DIII Output Transformer PCBs. Refer to Figure 2-10 (Table 2-9) or Figure 2-11 (Table 2-10) for exact location and strap change instructions.

Table 2-9
IMPEDANCE TABLE

LOAD IMPEDANCE	CHANNEL	
	LEFT	RIGHT
600 OHMS W/ TRANSFORMER (S)	W403 (XT)	W404 (XT)
	W407 (XT)	W408 (XT)
	W413 (BC)	W414 (BC)
150 OHMS W/ TRANSFORMER (S)	W403 (XT)	W404 (XT)
	W407 (XT)	W408 (XT)
	W409 (AC)	W410 (AC)
	W411 (BD)	W412 (BD)

NOTE: 1. STRAPS W403, W404, W407, W408, W413 AND W414 ARE FOILS AND MUST BE CUT AS REQUIRED.
2. IF FOIL OR WIRE STRAP IS NOT LISTED IN TABLE BLOCK, IT MUST BE REMOVED.

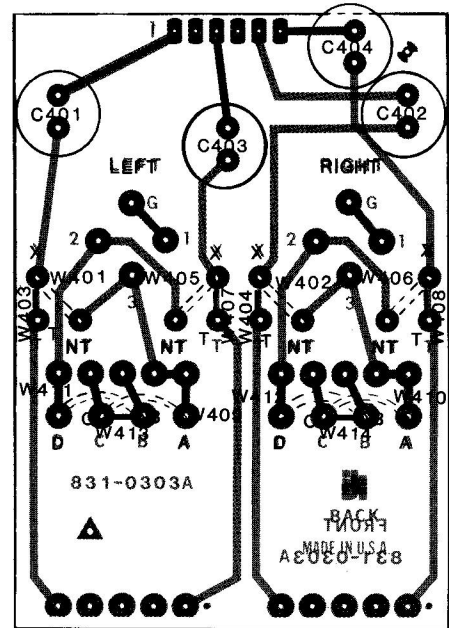
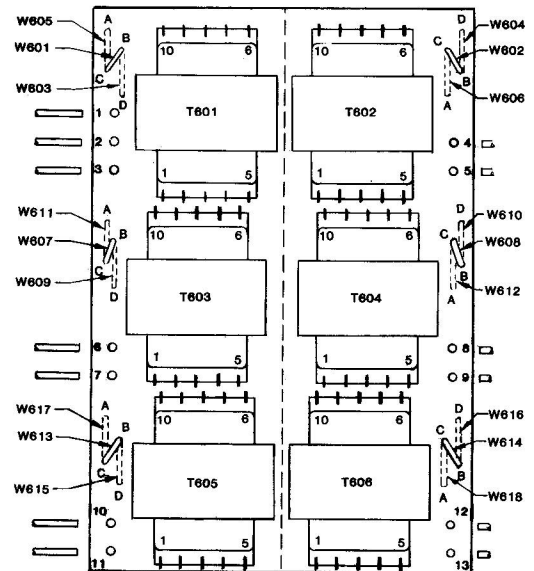


Fig. 2-10

Fig. 2-11

Table 2-10

IMPEDANCE	CHANNEL	
	LEFT	RIGHT
600 OHMS LOAD IMPEDANCE	WITH TRANSFORMER (S)	
	STRAP (S)	
	W601 (BC)	W602 (BC)
	W607 (BC)	W608 (BC)
150 OHMS LOAD IMPEDANCE	W613 (BC)	W614 (BC)
	W603 (BD)	W604 (BD)
	W605 (AC)	W606 (AC)
	W609 (BD)	W610 (BD)
	W611 (AC)	W612 (AC)
	W615 (BD)	W616 (BD)
	W617 (AC)	W618 (AC)



**Transformerless
Operation
Reproducer**

5. REPRODUCER BALANCED TRANSFORMERLESS (ACTIVE) OUTPUT: All DELTA series reproducers may be reconfigured to operate in a transformerless (active) output state. DI/DII units may be reconfigured via strap change on the Output Transformer PCB. DIII units require removal of output transformers and installation of isolation capacitors.

DI/DII Change: Refer to Figure 2-12 and Table 2-11 for exact location and strap change instructions.

Table 2-11

IMPEDANCE TABLE

LOAD IMPEDANCE	CHANNEL	
	LEFT	RIGHT
600 OHMS W/O TRANSFORMER (S) (75 OHMS DRIVING POINT IMPEDANCE)	W401 (XNT) W405 (XNT)	W402 (XNT) W406 (XNT)

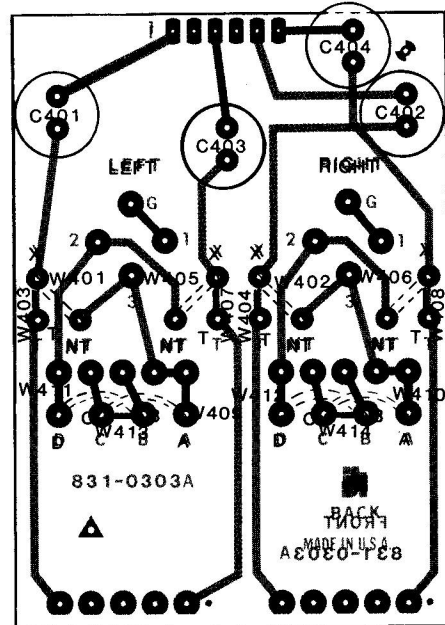


Fig. 2-12

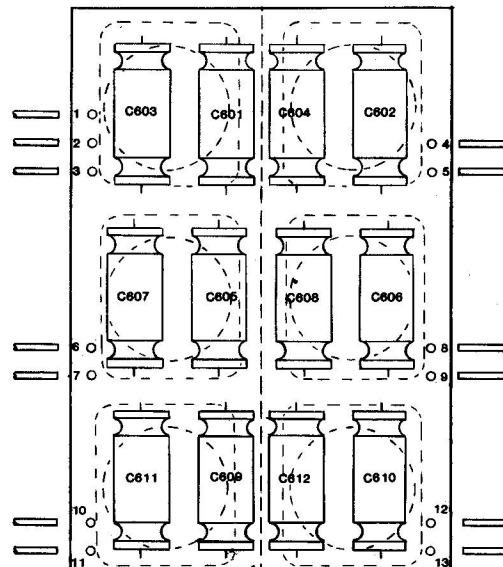
DIII Change: Output transformers must be removed from the DIII Output Transformer PCB. When output transformers are removed, DC isolation between the DIII output stage and connected equipment should be maintained. To do so, insert a 220 mfd, non-polarized capacitor in each output leg, (+) and (-). Refer to Figure 2-13 and Table 2-12 for exact location and transformer/capacitor changes.

Fig. 2-13

Table 2-12

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	W603 (BD) W605 (AC) W609 (BD)	W604 (BD) W606 (AC) W610 (BD)
	W611 (AC) W615 (BD) W617 (AC)	W612 (AC) W616 (BD) W618 (AC)
	TRANSFORMERLESS	
	CAPACITORS	
600 OHMS LOAD IMPEDANCE (75 OHMS DRIVING POINT IMPEDANCE)	C601 C603 C605 C607 C609 C611	C602 C604 C606 C608 C610 C612



NOTE: ITC provides PCB assemblies to readily convert a DIII to balanced transformerless operation. Refer to Table 2-13 for ordering information.

Table 2-13

DIII Audio Output PCBs

MONO w/Transformer.....	831-0254-003
STEREO w/Transformer.....	831-0254-013
MONO w/o Transformer.....	831-0254-023
STEREO w/o Transformer.....	831-0254-033

Motor

6. SERVO MOTOR:

A. Motor Speed: Standard motor speed is set at 7 1/2 IPS unless otherwise specified. Units may be changed to operate at 3 3/4 IPS or 15 IPS by installing jumpers located on the Reproduce Logic PCB. Refer to Figure 2-14 and Table 2-14 for exact location and jumper change instructions.

B. Capstan Shaft Diameter: Standard capstan shaft diameter is 10 mm. In cases where it becomes necessary to install a motor with an 8 mm diameter shaft, make a strap change on the Reproduce Logic PCB. Figure 2-14, Table 2-15.

Table 2-14

IPS	STRAP		
	W201	W202	W203
7 1/2	IN	OUT	OUT
3 3/4	OUT	IN	OUT
15	OUT	OUT	IN

Table 2-15

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

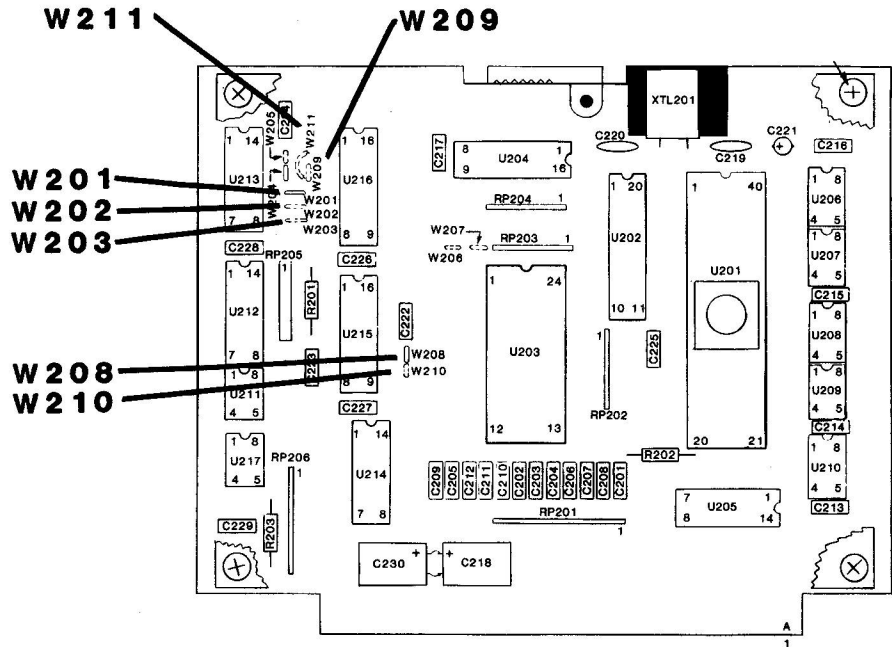


Fig. 2-14

Equalization

7. EQUALIZATION: Unless otherwise specified when ordered, DELTA machines are setup to the 1975 NAB Standard for equalization. Equalization may be changed to either 1964 NAB Standard or CCIR equalization as follows:

A. 1964 NAB Standard: Refer to Figure 2-15. Change R105 and R106 on the Reproduce Amplifier & Cue Detect PCB from 680K OHM, 1/4w carbon film resistors to 270K OHM, 1/4w carbon film resistors. Remove strap W1003 (and W1004 if the unit is STEREO) on the Record & Meter Amplifier PCB. Figure 2-16 & Table 2-17.

B. CCIR equalization: Potentiometers R107/R108 on the Reproduce Amplifier & Cue Detect PCB and R1005/R1006 on the Record & Meter Amplifier PCB control record equalization for this adjustment. Figure 2-15 & Figure 2-16.

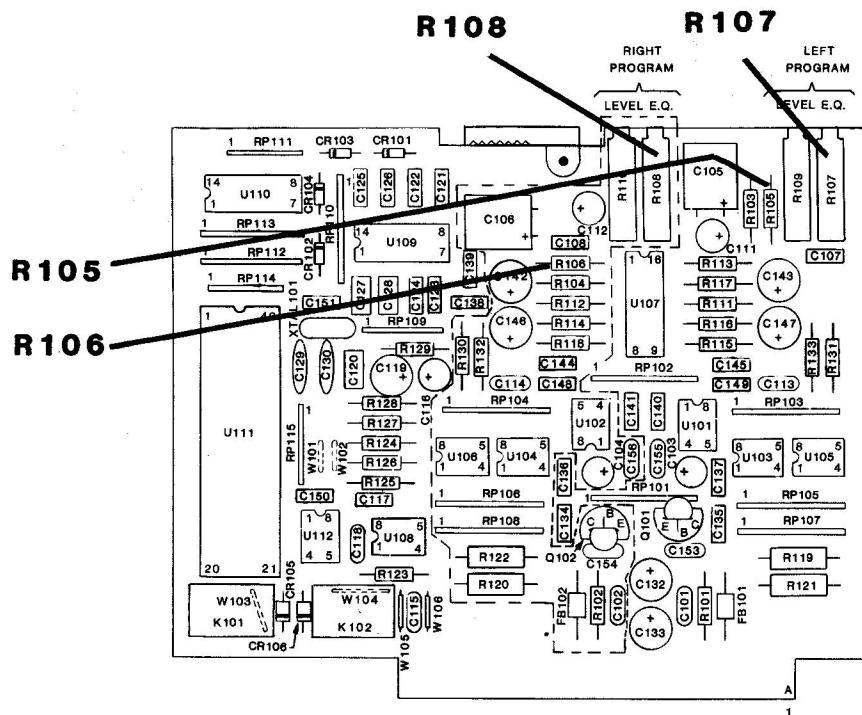


Fig. 2-15

Table 2-17

NAB EQUALIZATION TABLE

STRAP (S)	1964	1975
W1003	OUT	IN
W1004	OUT	IN

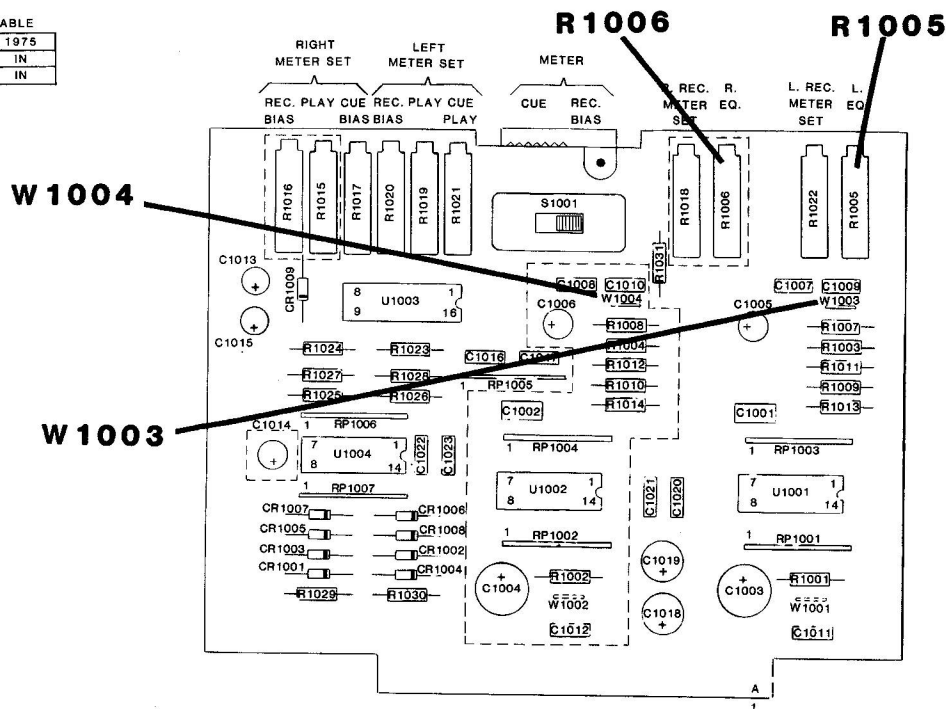


Fig. 2-16

Input Impedance

Recorder Changes:

1. RECORDER INPUT IMPEDANCE: DELTA IV recorders are shipped from the factory with 20K OHMs balanced bridging input standard. The input may be terminated with either 150 or 600 OHMs by making jumper changes on the Record Mother PCB. Refer to Figure 2-17 and Table 2-18 for exact location and jumper change instructions.

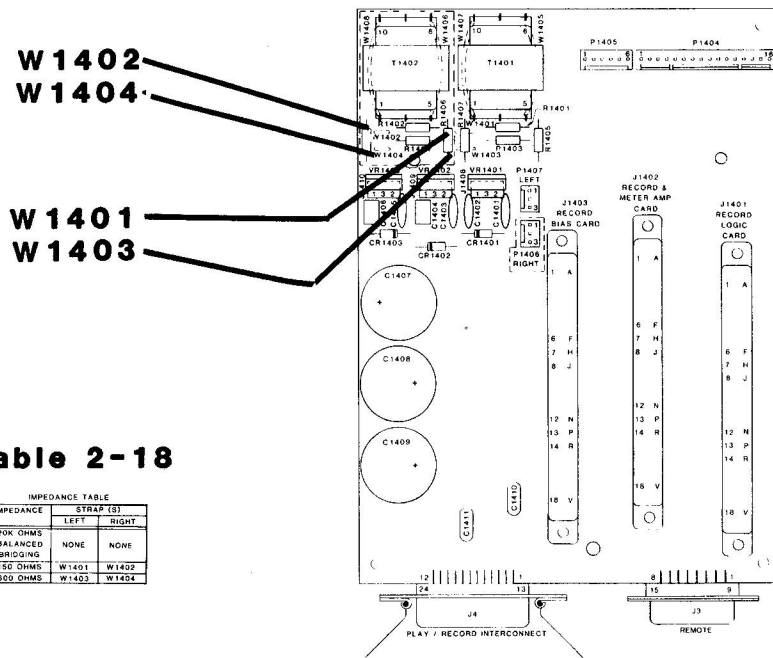


Table 2-18

IMPEDANCE	STRAP (S)	
	LEFT	RIGHT
20K OHMS BALANCED BRIDGING	NONE	NONE
150 OHMS	W1401	W1402
600 OHMS	W1403	W1404

Fig. 2-17

Transformerless Operation Recorder

2. BALANCED TRANSFORMERLESS (DIFFERENTIAL) INPUT: Input for the DELTA IV is balanced, transformer coupled as shipped from the factory. Transformerless operation may be obtained by adding straps located on the Record Mother PCB. Refer to Figure 2-18 and Table 2-19 for exact location and jumper change instructions.

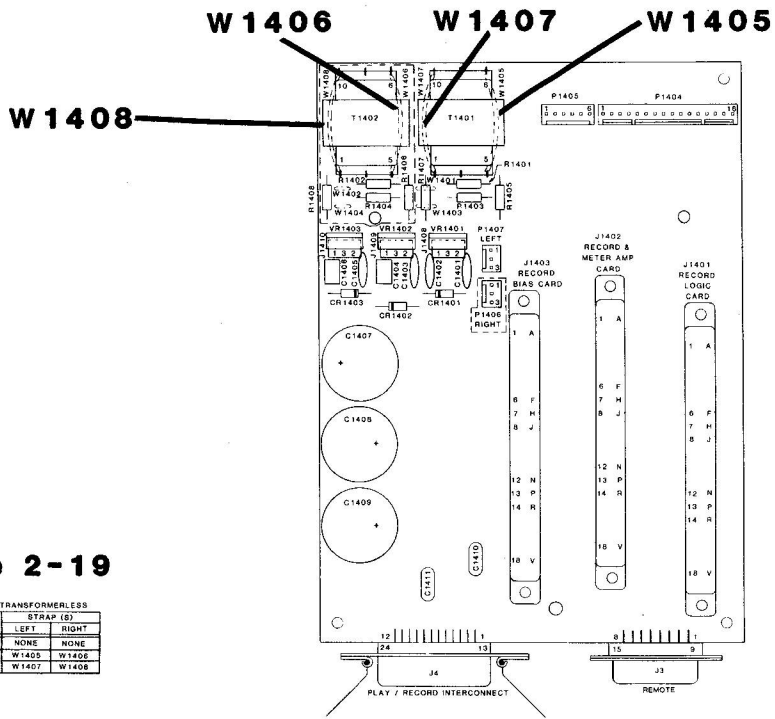


Table 2-19

TRANSFORMER / TRANSFORMERLESS	STRAP (S)	
	LEFT	RIGHT
TRANSFORMER	NONE	NONE
TRANSFORMERLESS	W1405	W1406
	W1407	W1408

Fig. 2-18

3. AUDIO INPUT LEVEL: Front panel potentiometers on the recorder are factory set so that the center of range is +6 dbm. This may be changed to -6 dbm by making a strap change on the Record & Meter Amplifier PCB. Figure 2-19 and Table 2-20. Front panel potentiometer range is 0 to at least +12 dB, referenced to each strap.

Fig. 2-19

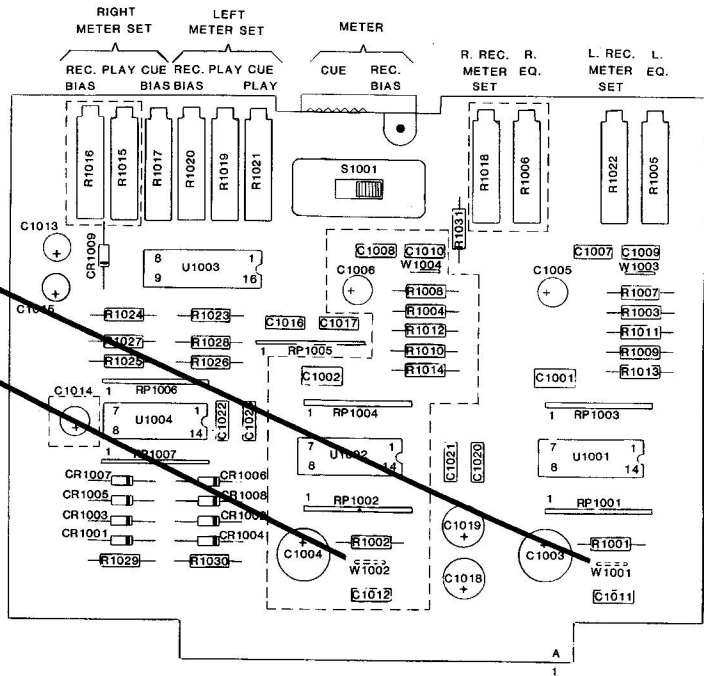


Table 2-20

INPUT LEVEL STRAPPING TABLE

STRAP (S)	-6dbm	+6dbm
W1001	IN	OUT
W1002	IN	OUT

CONTROLS & INDICATORS

Front Panel - Reproducers:

Stop/READY

1. STOP switch (READY - yellow lens): Active when a cartridge is properly loaded. Will override all other machine functions regardless of mode.

2. READY (Stop) lamp: Illuminated when a cartridge has been properly loaded. Flashes slowly after the 1 kHz Primary cue tone is detected and the cart has recued. Flashes quickly when the cart is stopped manually, indicating that the cart has not automatically recued.

Start/RUN

3. START switch (RUN - green lens): Active when the unit is in the READY mode, (yellow lamp on) or in CUE mode. Pressing the START switch will initiate the recording process when the unit is in the RECORD SET mode, (red & yellow lamps on).

4. RUN (Start) lamp: Illuminated during the RUN mode. Flashes during 150 Hz Secondary cue tone detection.

Cue

5. Cue Switch (CUE - blue lens): Used for high-speed cue and audio mute from STOP, START, or RECORD modes (Cancels RECORD SET). Pressing CUE while in high-speed mode causes audio to turn ON for the duration the switch is held. Note: Not available on DIII units.

6. Cue lamp: Illuminated when in CUE mode.

Front Panel- Recorder

Record Set

1. RECORD SET switch (REC- red lens): Active only in the READY mode, (yellow lamp on). When pressed, program audio is switched into the recording amplifier circuit. Pressing the START button will then cause the recording process to begin.

2. RECORD SET (REC) lamp: Illuminated when the machine is in the RECORD SET mode or actually in the process of recording. This lamp will flash if the 1 kHz cue tone defeat has been activated.

1 kHz Cue

3. 1 kHz Cue Record: When the machine is placed into a RECORD SET mode and then the START button is pushed, a 1 kHz (Primary) cue tone is automatically recorded. This is internally controlled by the recorder. Additionally, there are two (2) front panel switches (Black) which allow the operator to control the 1 kHz tone as follows:

A. 1 kHz Cue Record (ADD): This switch is active in either the playback or recording modes. The operator may record a 1 kHz cue tone at any time, (as in the case of editing), by momentarily depressing the 1 kHz ADD switch. The length of the tone is automatically controlled by the microprocessor. The internal 1 kHz cue tone detector is automatically momentarily defeated when the ADD button is pushed.

B. 1 kHz Cue DEFEAT: This switch is active only when the unit is in RECORD SET mode, (READY-yellow and REC-red lamps on). Pressing this switch will DEFEAT the automatic 1 kHz record function and cause the red REC lamp to flash. If recording on more than one cartridge, the 1 kHz DEFEAT must be activated for each cartridge.

150 Hz Cue

4. Secondary (150 Hz) Cue switch (SEC - blue lens): This switch is active in either the playback or recording modes. When recording, an operator may press the SEC button and record a 150 Hz Secondary cue tone. During playback, a recorded 150 Hz tone will signal the reproducer to initiate high-speed recue. This function may be defeated if desired by performing a jumper operation detailed in the Jumpers & Straps portion of this section.

8 kHz Cue

5. Tertiary (8 kHz) Cue switch (TER - white lens): This switch is active in either the playback or recording modes. When recording, an operator may press the TER button and record an 8 kHz Tertiary cue tone. Reproducers can be programmed via jumper change to initiate high-speed recue from the 8 kHz tone rather than the 150 Hz Secondary tone. Refer to the Jumpers & Straps portion of this section for details on performing the strap changes.

Meters

6. Meter Monitoring: Both meters are controlled by two (2) front panel switches (Black) labeled REC and PLAY. These switches work in conjunction with an internal slide switch located on the Record & Meter Amp PCB. Refer to Table 2-21 for switch functions.

NOTE: The internal slide switch is active ONLY when NEITHER the REC or PLAY front panel switch is depressed. The slide switch has two positions: Toward the rear panel = "Cue" position; Toward the front panel = "Rec Bias" position.

Table 2-21

Meter Switch/ Machine Status	<u>Meter Indication:</u>	
	Left Meter	Right Meter
REC depressed; machine recording tape.....	Left program input level.	Right program input level.
REC depressed; machine reproducing 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; internal slide switch in "CUE" position...	Cue Play	Cue Bias
Neither PLAY or REC depressed; internal slide switch in "REC BIAS" position.....	Left program bias	Right program bias

Section III Adjustments & Alignment

Your DELTA cartridge machine is designed and built for reliable, long-term operation. As with any electromechanical device, various factors such as severity of use, ambient temperature, vibration and normal wear contribute to diminished performance.

With proper attention paid to operating conditions, and a little routine maintenance, your machine will provide many years of trouble-free service.

The following sections describe adjustment and alignment procedures needed to assure optimum operation of mechanical and electrical assemblies. Please read through these sections carefully and familiarize yourself with the workings of the machine.

These procedures are designed to be performed using ITC gauges and fixtures. Use of gauges and fixtures other than those specified may lead to incorrect alignment or less than optimum performance.

Adjustments may be performed individually as needed, or as part of a regular service schedule.

However, due to the interrelationship of these procedures, a complete check of all assemblies requires that you follow, in order, the sequence of adjustments in this section. Failure to follow this sequence could result in misalignment and less than optimum performance!

Review the following checklist to make sure that you have the correct tools and materials to do the job.

Table 3-1 ADJUSTMENT TOOL CHECKLIST

1. Gauges:
 - A. Capstan Shaft Locator Gauge
ITC #830-0043-001 *
 - B. Pressure Roller Pressure Gauge
ITC #830-0042-011 *
 - C. Tape Guide Height Gauge
ITC #830-0041-022 *
 - D. Zenith Gauge
ITC #830-0026-022 *

2. Tools:
 - A. 5/64" Long-arm Hex Wrench
 - B. 1/8" Hex Wrench or Driver
 - C. 1/4" Open-end or Box Wrench
 - D. Phillips-head Screwdrivers:
 1. #0 bit
 2. #1 bit
 - E. Small Flat-blade Screwdriver
 - F. Needle-nose Pliers
 - G. Razor Knife, Scribe or Sharp Awl
 - H. Ruler--accurate to 1/32".

3. Test Tapes:
 - A. NAB Standard Azimuth and Spot Frequency Alignment Tape. (MONO or STEREO, dependent on unit type)
 - B. 3.5 Minute Blank Cartridge-Known To Have Good Operating Characteristics. (Use the same type as in normal daily cart library. Needed for Recorder units only.)

4. Test Equipment:
 - A. Oscilloscope
 - B. Audio Oscillator-(Capable of producing 0 dBm into a 600 Ohm termination.)
 - C. 600 Ohm Termination
 - D. RMS Voltmeter-(Capable of reading dBm.)
 - E. Clip Leads

* Available from ITC.

NOTE: Many of the following procedures require a 600 Ohm termination. A simple 600 Ohm terminating resistor may be made by paralleling two 1200 Ohm, 1/2 watt, 5% resistors.

TOP COVER REMOVAL:

The top cover is held in place by a spring loaded fastener located in the middle of the rear chassis support bar (Figure 3-1). To remove the cover, pull back on the fastener and slide the cover out and off of the unit.

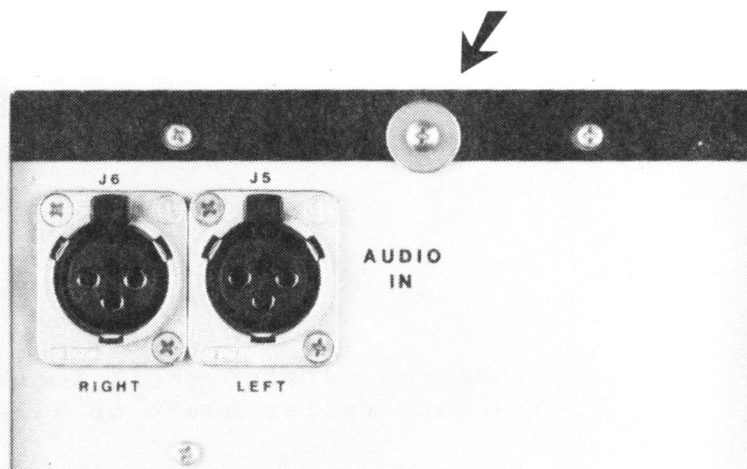


Fig. 3-1

CAUTION

CAUTION: These adjustments require contact with the capstan shaft, which can be easily damaged. DO NOT FORCE gauges into position or allow the capstan shaft to become bound by a gauge. To do so will risk both shaft finish and straightness of the shaft.

1. Motor (Capstan Shaft) Location:

(Required when a motor is removed or replaced)

The purpose of this adjustment is to insure that the pressure roller shaft and the motor shaft remain absolutely parallel to each other during operation. Shaft parallelism is a critical requirement. Its establishment insures that no tape skewing occurs.

A. DELTA I/II Motor Positioning:

With power OFF, loosen (do not remove) the two motor mounting screws (Figure 3-2). Remove the

pressure roller by gently unfastening the "E" clip, nylon washer, pressure roller and metal washer. (Figure 3-3)

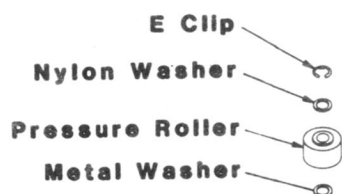


Fig. 3-3

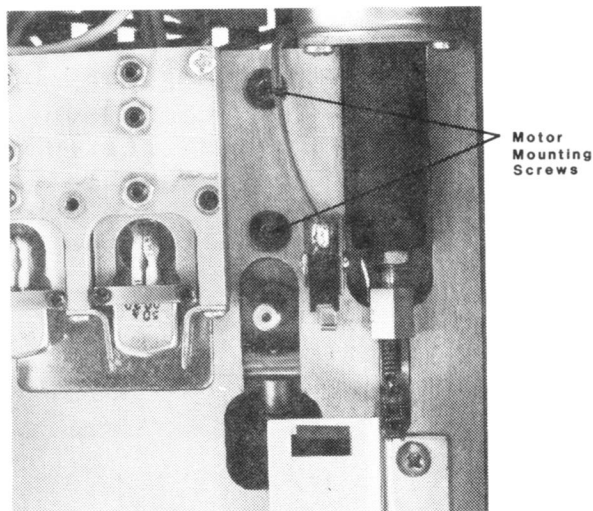


Fig. 3-2

Place the capstan shaft locator gauge over the pressure roller shaft as illustrated in Figure 3-4.

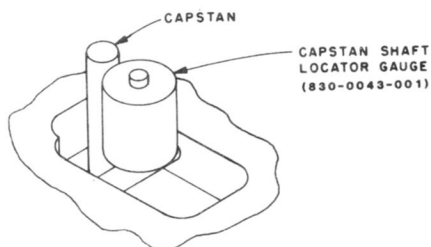


Fig. 3-4

Move the gauge up against the capstan shaft and carefully observe the gauge surface as it mates with the capstan surface. The gauge surface should lie flush against the capstan shaft. If not, gently move the motor until both surfaces are completely flush against each other. (See Figure 3-5).

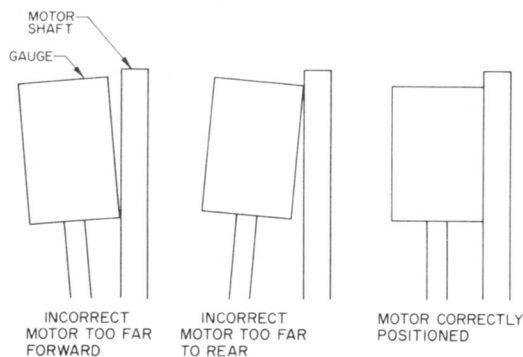


Fig. 3-5

As noted in the first paragraph, the capstan shaft (and the locator gauge) must remain parallel to the pressure roller shaft. To insure parallelism, the capstan shaft and pressure roller shaft must remain directly in line with each other. (See Figure 3-6). Also, as illustrated, the centerline of each shaft must be an equal distance from the right-hand side panel, setting up 90 degree angles at each corner.

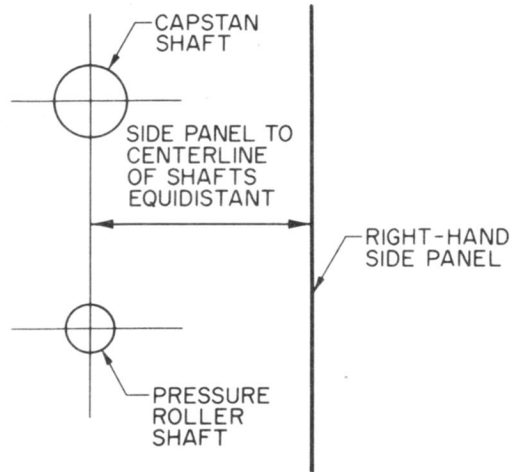


Fig. 3-6

Once the gauge and both shafts are correctly positioned, carefully tighten the motor mounting screws, making sure that neither shaft nor gauge change position. After tightening the screws, remove the gauge and reinstall the pressure roller by reversing the order of removal.

B. DELTA III Motor Positioning:

Note: Motor location in DIII models is always referenced to the center bulkhead. Motor location is relatively fixed. When adjustment is necessary, manipulation of the sliding decks is required. This procedure should only be performed when either a motor or deck is replaced. Once the procedure is completed, it should not be necessary to perform it again.

 On each deck front panel there is a plastic hole plug which covers the deck capture screw. Remove the hole plug for each deck, loosen the capture screws and remove all decks. (The capture screws are held in the deck by the front panel and cannot fall out.)

Through the open front of the unit, observe the center bulkhead and the three holes used by the deck capture screws. Immediately adjacent to each hole is a 10-32 set screw which controls penetration of the deck into the frame. These will be used later on in the procedure if adjustment is needed.

Remove the right hand side panel inlay by unscrewing the four fasteners located in each corner. The side panel itself is not to be removed. There are three holes in the side panel which allow access to the decks.

Starting with the bottom deck, remove the pressure roller and place the Capstan Shaft Locator gauge over the pressure roller shaft as previously illustrated in Figure 3-4. Reinsert the deck into the bottom slot and secure it to the bulkhead with the deck capture screw.

Using the opening in the right hand side panel, manually press in the solenoid plunger until the gauge contacts the capstan shaft. Visually check to see if the gauge surface and capstan shaft surface indicate that the two shafts are parallel. (Refer to Figure 3-5) If the two shafts are not parallel, check to see if the gap between the shafts is at the top or bottom of the gauge surface. A gap at the top indicates that the deck is too far out and needs to be moved into the mainframe, closer to the capstan shaft. Conversely, a gap at the bottom of the gauge indicates that the deck is too far inside the mainframe and needs to be moved out, away from the capstan shaft.

If adjustment is necessary, loosen the deck capture screw and remove the deck. As mentioned earlier, the 10-32 set screws mounted on the bulkhead control deck penetration. Turning the set screws CLOCKWISE will move the decks CLOSER to the capstan shaft. Turning the set screws COUNTER-CLOCKWISE will move the decks AWAY from the capstan shaft. Depending on the gauge reading observed with the deck in place, adjust the set screw for proper deck penetration until the gauge indicates that the pressure roller shaft and capstan shaft are parallel.

Repeat this procedure for the middle and top decks. Once all decks are properly adjusted,

replace the pressure rollers, reinstall the decks and secure the deck capture screws. This ends the adjustment procedure.

Note:

DELTA III motors use a unitized construction technique whereby the windings, rotor, shaft and shaft top bearing are all contained in a single-piece precision casting. This allows for precise 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 bulkhead forms a precision mounting plate for the motor from the rear, and provides a very rigid center and side brace for the mainframe.

Replacement of DELTA III motors, when necessary, will include the shaft top bearing and its support block. Since the motor has only two bearings, the shaft top bearing and the center support "gallows" are considered part of the motor.

2. Pressure Roller Pressure Adjustment:

(NOTE: Required after parts replacement, but should be performed as routine maintenance.)

DELTA units utilize a high-voltage, bottoming-plunger solenoid. This design requires that the solenoid plunger bottom against the stop seat and remain there during the entire tape driving operation. Accurate and repeatable adjustment of the pressure roller mechanism is assured because of its definite location against a rigid, fixed mechanical member. Refer to Figure 3-7 for an illustration of a properly bottomed plunger.

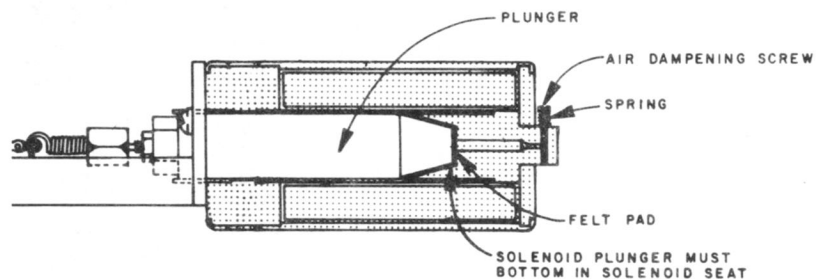


Fig. 3-7

The Pressure Roller Pressure gauge is used in the same manner as that of a "feeler" gauge or a "Go-No Go" type fixture. Refer to Figure 3-8 for gauge dimensions. Step "A" indicates OPTIMUM pressure roller pressure. Step "B" indicates LOW pressure roller pressure.

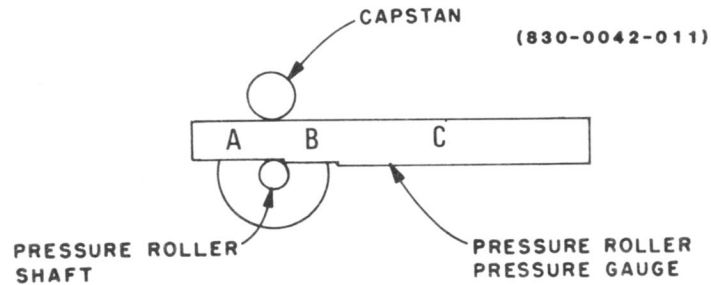


Fig. 3-8

Step "C" is simply a handle and has no measurement function. You may hold the gauge at any point on Step "C".

With power ON, hold the cartridge sensing switch closed, Figure 3-9, and press the START switch to engage the solenoid. Make sure that the solenoid plunger has bottomed and stays bottomed throughout this procedure. Use a rubber band or plastic twist-tie to hold the cartridge sensing switch closed.

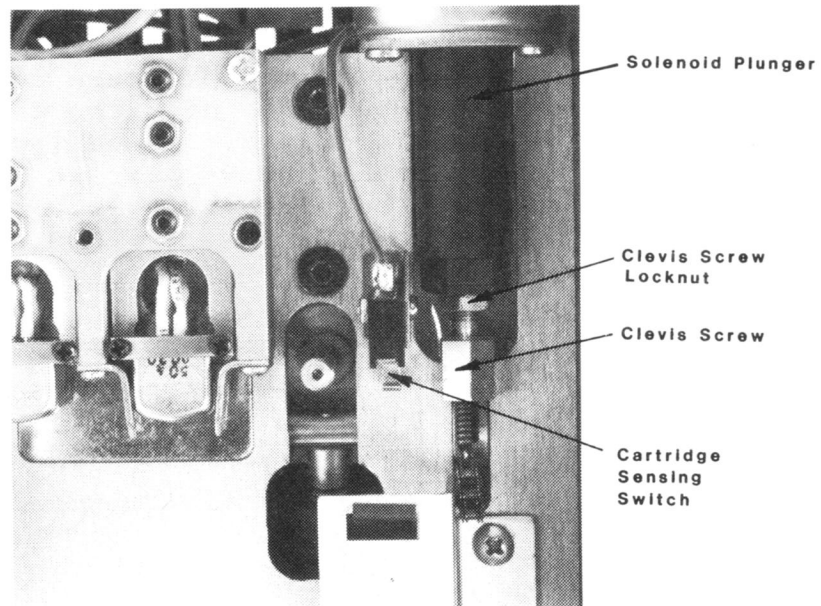


Fig. 3-9

Insert Step "A" of the gauge between the capstan shaft and the pressure roller shaft, as shown in Figure 3-8, stopping at Step "B".

(Note: In DELTA III units, remove the right hand side panel inlay and use the three side panel openings for access.)

Step "A" should slip between the shafts without being forced. If not, loosen (do not remove) the clevis screw locknut, (Figure 3-9), and rotate the solenoid plunger CLOCKWISE until Step "A" slips through. Conversely, Step "B" should not slip between the shafts. If it does, rotate the solenoid plunger COUNTERCLOCKWISE until Step "B" cannot slip through.

Once pressure roller pressure has been adjusted, tighten the clevis screw lock nut, taking care not to disturb any of your previous adjustments. Remove the gauge.

3. Solenoid Air-Damping Adjustment:

The speed and noise of solenoid operation is determined by the rate at which air flows through a small hole in the solenoid seat. Optimum adjustment of the air damp screw is achieved when a suitable balance between speed and noise is obtained.

Since speed and noise are directly related, the fastest operation of the solenoid usually results in the most noise. Therefore, this adjustment is made to provide a suitable balance between speed and noise, without compromising the operation of either.

Adjustment of airflow is accomplished by using a #0 bit Phillips screwdriver to turn the solenoid air-damp screw. Figure 3-10. The screw is turned CLOCKWISE for increased damping and COUNTER-CLOCKWISE for less.

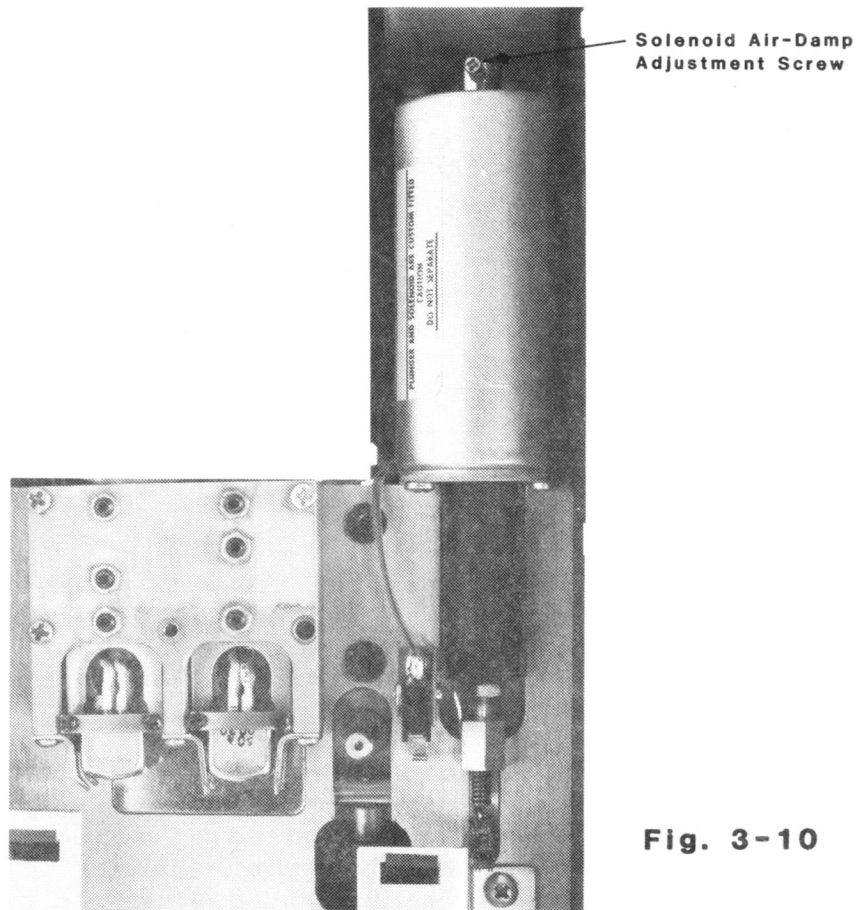


Fig. 3-10

4. Cartridge Guide Adjustment:

Optimum performance from cartridge machines and your tape cartridges can only be realized if the cartridge is positioned accurately and consistently each time it is inserted.

Figure 3-11 illustrates key indexing points by which cartridge location is measured. These markings correspond to NAB mechanical specifications for broadcast cartridge systems, and should correspond to your own system adjustments.

A mechanical reference cartridge may be constructed by using these measurements as a guide. Scribe index lines on a cartridge body, using a razor knife, awl or other sharp instrument, and an accurate measure such as a machinist's ruler.

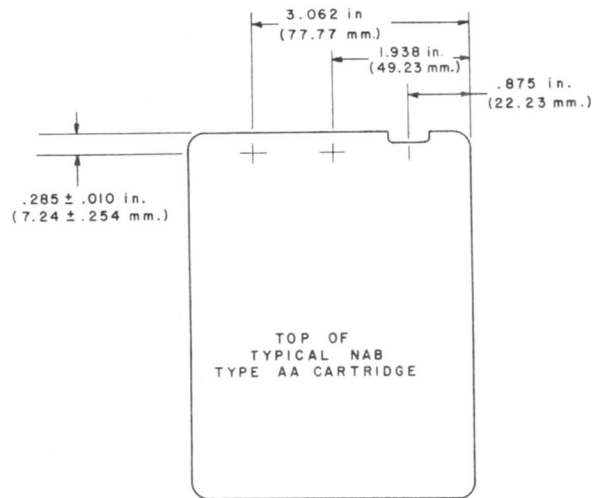


Fig. 3-11

Proper cartridge positioning is achieved when the following criteria are met:

1. The cartridge face is snugly and squarely located against the head block.

2. The heads are centered in each cartridge head opening.

3. The pressure roller shaft is centered in the cart's pressure roller keyway when the solenoid is engaged.

4. The right-hand cartridge guide is snug and square against the cartridge body right-hand side. See Figure 3-12.

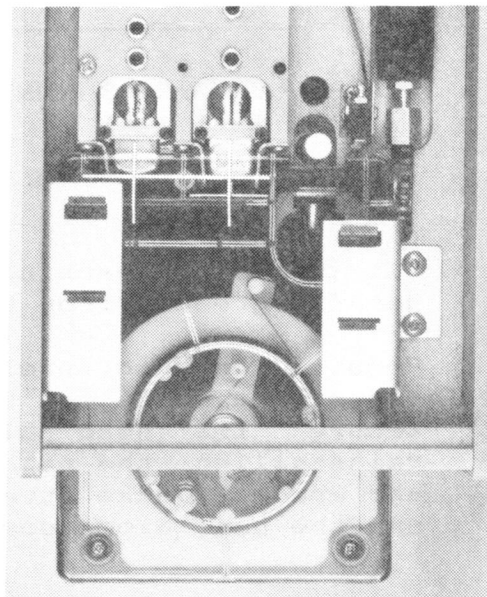


Fig. 3-12

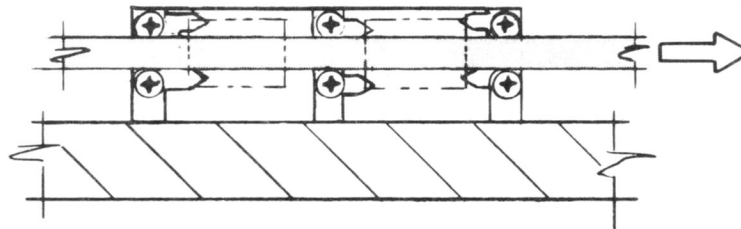
Be certain that the front edge of the cartridge seats firmly and squarely against the tape guide screws. When all four (4) of the above mentioned criteria are met, tighten down the right hand cartridge guide mounting screws, insuring that the cartridge and cartridge guide do not move or change positions.

Position the left hand cartridge guide parallel to the right hand guide and check to see that the two springs are compressed equally and that the cartridge is reasonably snug but not bound by the guides.

Remove the cartridge and reinsert it. If the cartridge does not position correctly, repeat the alignment procedure.

5. Tape Guide Adjustment:

This procedure provides precise adjustment of the tape guide "tang" and establishes a 3-point contact area between the guides and the tape. The result is a very closely controlled tape path across the heads. Figure 3-13.



TAPE PATH WITH 3 POINT CONTACT OF TAPE GUIDES

Fig. 3-13

All cartridge machines in your system would benefit greatly from this setup procedure.

Remove the head shield before beginning guide adjustment. After the shield is removed, secure the head block to the deck by reinstalling the right hand head shield screw and spacer. Make sure that the screw is tight and the head block does not move. Figure 3-14.

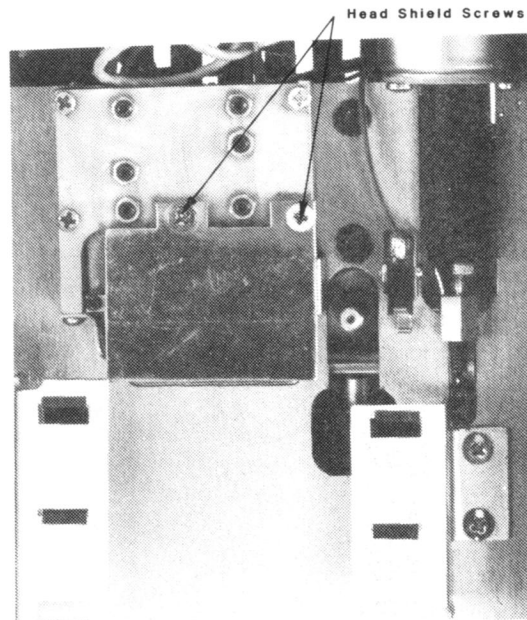


Fig. 3-14

Place the tape guide height gauge flat on the deck, as shown in Figure 3-15.

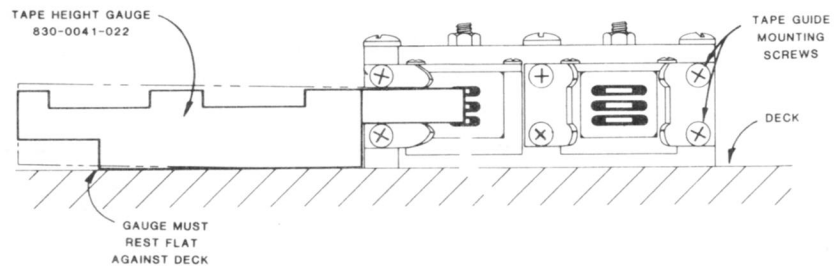


Fig. 3-15

Adjust the tape guides in the following manner:

Left (Entry) Guide: Loosen (do not remove) the guide mounting screws. Insert the gauge straight into the guide ONLY AS FAR AS THE FACE OF THE HEAD. Move the guide upward so that the bottom guide tang just touches the bottom of the gauge. Tighten the mounting screws and recheck your adjustment with the gauge.

Right (Exit) Guide: Same as the Left tape guide procedure.

Center Guide: Loosen (do not remove) the center guide mounting screws. Reposition the gauge as shown in Figure 3-16, with the cut-

out areas facing the heads. Adjust the center guide so that the top guide tang just touches the gauge, then tighten the mounting screws.

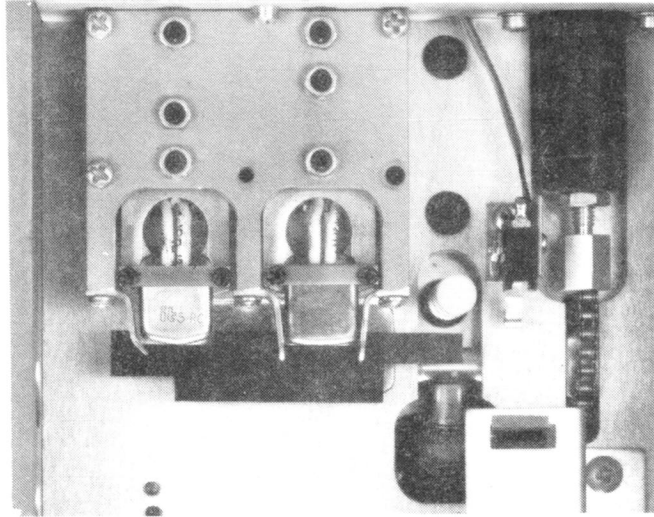


Fig. 3-16

Note: The following adjustment procedures require the use of various test equipment. Figure 3-17 illustrates a typical test equipment hookup.

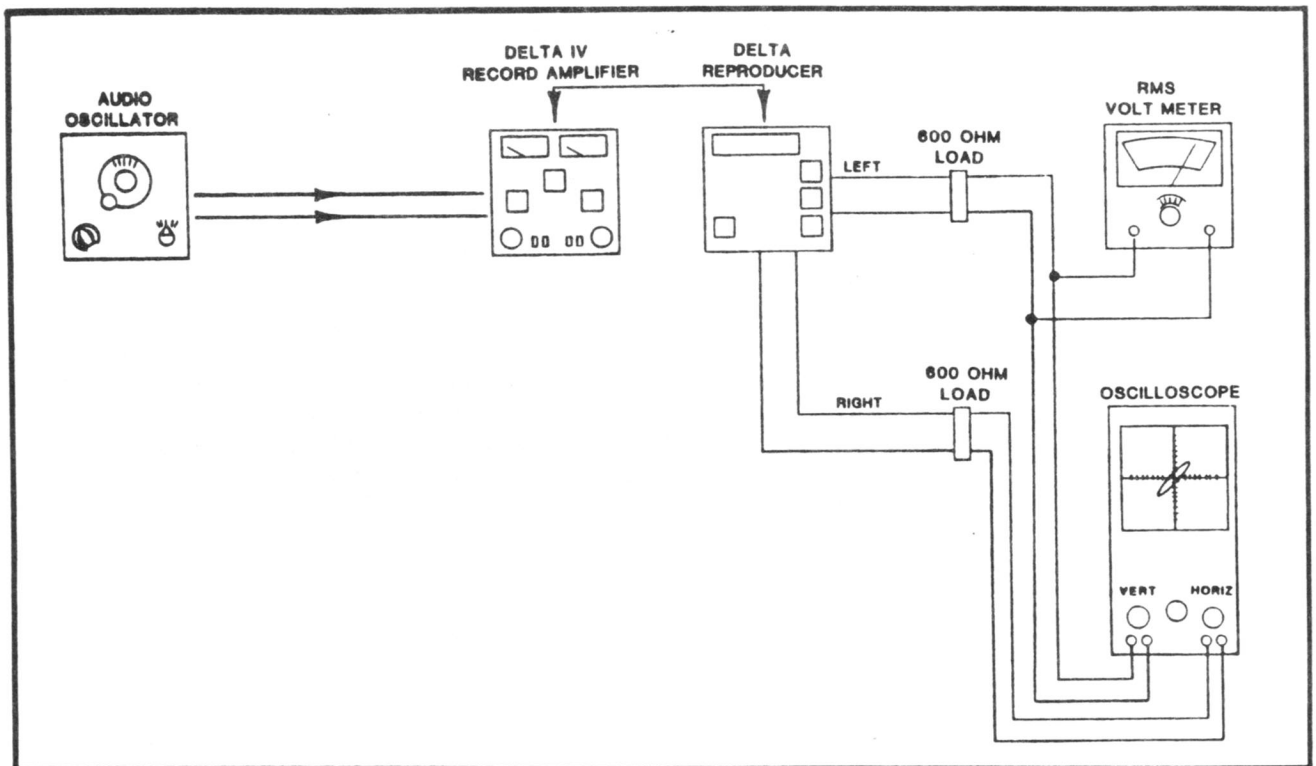


Fig. 3-17

CAUTION

6. Reproduce Head Height & Zenith Adjustment:

Caution: Demagnetize all gauges and tools BEFORE making any adjustments. Be especially careful to avoid scratching the head faces during adjustment.

Connect a 600 Ohm termination to the Left (MONO) channel reproduce output and connect the voltmeter across this termination. (For STEREO units, add the second termination to the Right channel reproduce output.)

Figure 3-18 shows the location of the heads and adjustment screws on the head mounting block. Make sure that you locate the correct screw for each adjustment.

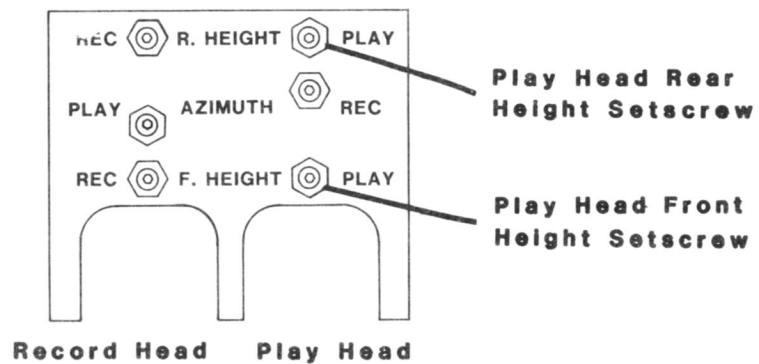


Fig. 3-18

Loosen (do not remove) the reproduce (PLAY) head Front & Rear Height setscrew locknuts. Place the Tape Height gauge on the deck and position it in front of the Play head as shown in Figure 3-19.

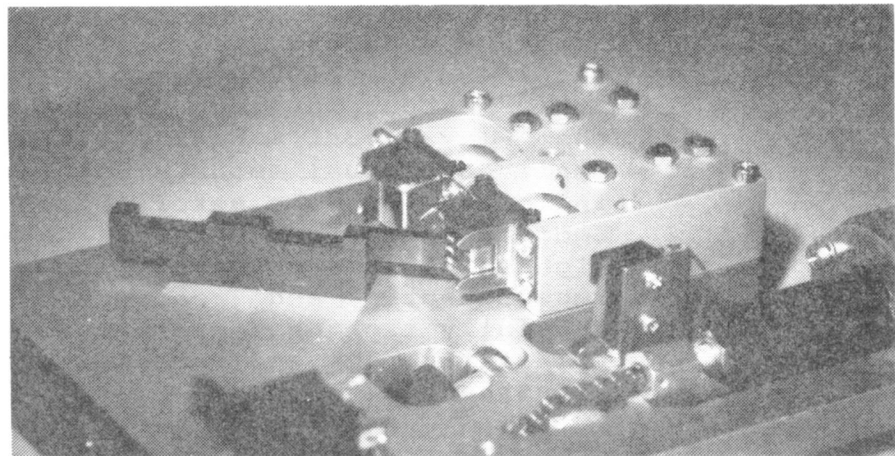


Fig. 3-19

Rough-In Head Height

Alternately adjust, in equal amounts, the Play Front & Rear Height setscrews until the nose of the gauge is approximately centered between the top of the upper head pole piece and the bottom of the lower head pole piece.

Head Zenith

Position the Zenith gauge, (or any gauge known to be completely square.), near the face of the head and alternately adjust the Play Front & Rear Height setscrews until the face of the head is parallel to the gauge and perpendicular to the deck surface. Move the Zenith gauge gently up against the face of the Play head. Be very careful to avoid any scratching. If the head is perpendicular to the deck, there will be no gap visible between the gauge and the head face. If a gap is visible, slowly adjust, independently and in equal amounts, the Play Front & Rear Height setscrews until no gap exists.

Final Height Adjustment

Final height adjustment is made by electrically measuring the machine's audio output level while playing a standard alignment tape and making fine adjustments to head height. This procedure insures that the head pole pieces are aligned with, and centered on the magnetic tracks of the tape. Adjustments are made to head height by turning the Front and Rear Height setscrews small but equal amounts in the same direction. Since adjustments to the Front or Rear Height setscrews may introduce a Zenith error, Zenith and fine Height adjustments may require repeated, alternating adjustment until no further improvements in either may be made.

At this point, demagnetize the heads and the head block assembly to avoid any stray magnetization.

Insert a standard alignment tape and start the machine in the RUN mode. While monitoring audio output level on the voltmeter, adjust the Play Front & Rear Height setscrews in small but equal amounts for maximum output as indicated on the meter. Recheck the head Zenith, and readjust if necessary, before tightening the setscrew locknuts. Once all measurements and readings are optimized, carefully tighten the setscrew locknuts. Stop the cartridge and remove it. This ends the adjustment.

7. Dummy Head Adjustment:

In reproduce only machines, a "dummy" head is installed in place of the recording head to maintain constant tension on the tape. This helps minimize wow & flutter and improves tape guidance. "Dummy" heads that have developed significant wear patterns should be replaced.

Loosen (do not remove) the "dummy" head Front & Rear Height setscrew locknuts, (Figure 3-20). Place the Tape Height gauge on the deck and position it in front of the "dummy" head as done for the reproduce head in Figure 3-19.

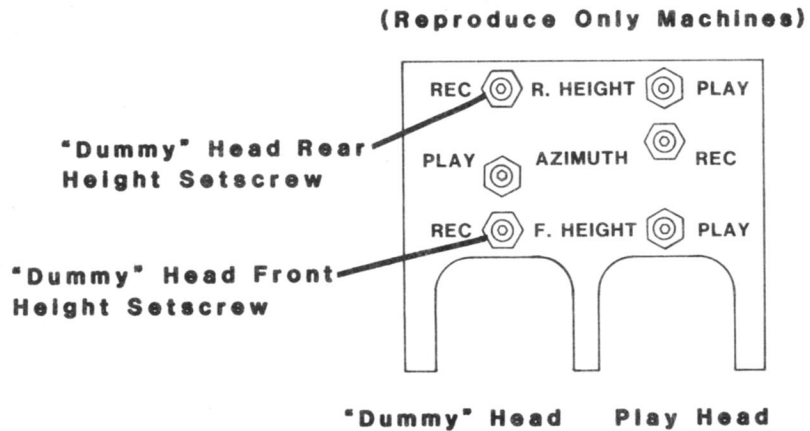


Fig. 3-20

Adjust the "dummy" head Front Height setscrew until the nose of the gauge is approximately centered between the top and bottom of the head. Position the Zenith gauge, or any gauge known to be completely square, near the face of the head and adjust the "dummy" head Rear Height setscrew until the face of the head is parallel to the gauge and perpendicular to the deck surface.

Carefully tighten the locknuts and remove the gauge. This ends the adjustment.

8. Reproduce Head Azimuth Adjustments:

NOTE: The azimuth adjustment screws are considerably offset from the heads that they adjust. Refer to Figure 3-21 for location of these screws.

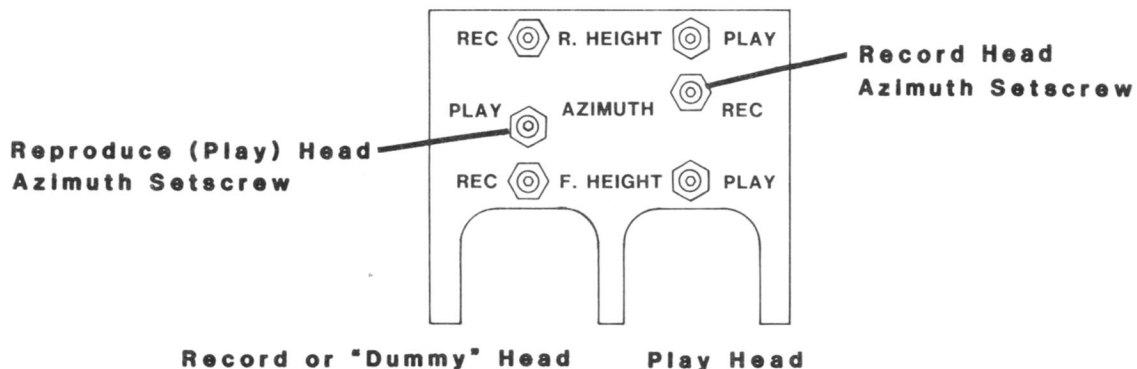


Fig. 3-21

A. Mono Azimuth:

Connect a 600 Ohm termination to the Left (MONO) reproduce amplifier output terminals. Connect the voltmeter across this termination.

Insert a standard Mono azimuth alignment tape and start the machine in the RUN mode.

Loosen (do not remove) the reproduce (Play) head azimuth setscrew locknut and adjust the setscrew for maximum output at 12.5 kHz. Hold maximum output and carefully tighten the locknut. Monitor the voltmeter to insure that no output level change occurs as the locknut is tightened.

This ends the procedure. Stop the machine and remove the cartridge. Leave all equipment connected and proceed to Step #9, Reproduce Amp Output Level Adjustment.

B. Stereo Azimuth (Phase):

SPECIAL NOTE FOR STEREO HEAD AZIMUTH

2-track stereo recording/reproducing performance is subject to several mechanical inaccuracies which contribute to phase shift in simultaneously monitored reproducer outputs. In stereo systems these phase shifts are generally not noticable in the final reproduction. However, in cases where monophonic "dubbing" or channel summing is desired, phase shifts cause serious amplitude variations or dropouts. This is especially true at higher frequencies. The most common causes of this problem 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 in any reproducer within a system)
 3. Improper tape guidance (skew) either within the cartridge or through the tape guide systems.
-

The preferred method of adjusting for STEREO azimuth (phase) utilizes an oscilloscope for accurate phase relationship measurement and alignment. This is the method recommended by ITC for best results.

Attach 600 Ohm terminations to the Left and Right channel reproduce outputs. Connect the horizontal input of an oscilloscope to the Right channel output.

Connect the vertical input of the scope to the Left (MONO) channel machine output. Adjust the scope's horizontal & vertical gain to provide an in-phase Lissajous display.

Allow the alignment tape to run to the 1 kHz frequency section. A scope pattern such as that illustrated by Figure 3-22A should appear. If a pattern such as Figure 3-22D appears, reverse the polarity of the scope horizontal input leads.

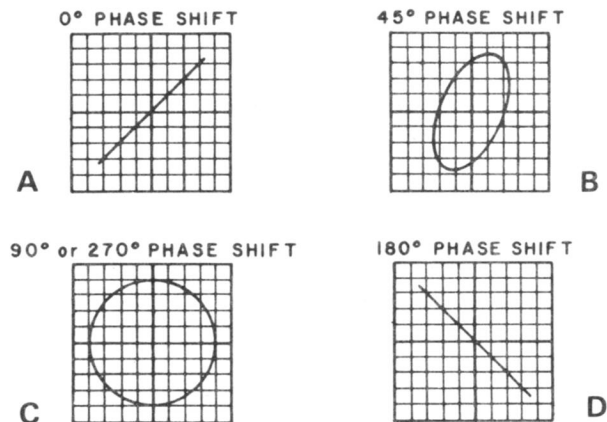


Fig. 3-22

Allow the alignment tape to run to the 8 kHz section while monitoring the scope to determine if any phase shift occurs. If phase shift is observed, loosen (do not remove) the reproduce (Play) head azimuth setscrew locknut

and adjust the setscrew in the opposite direction to that in which phase shift occurred. Do not tighten the locknut.

Continue running the tape through the various frequencies and monitor the scope to insure that minimal phase errors occur at any frequency. It is normal for small shift "jitters" to occur at the higher frequencies. Your final setting will be based on best AVERAGE results.

At 16 kHz, make a final adjustment to the setscrew for the best possible reading. Do not tighten the locknut.

Rerun the alignment tape through ALL frequencies one more time to insure that minimal errors occur at any frequency. If an error exists, repeat the entire procedure.

When the best possible results are consistently obtained, carefully tighten the locknut while monitoring the scope to make sure that best overall results in phase reading are maintained.

This ends the oscilloscope procedure. Remove the cartridge and disconnect the scope. Leave the termination resistors in place. Proceed to Step #9, Reproduce Amp Output Level Adjustment.

IMPORTANT

Substitute Method For STEREO Azimuth

This procedure is to be used ONLY when an oscilloscope is not available. Satisfactory results may be obtained using this method, but without the accuracy in phase alignment provided by a scope.

Attach 600 Ohm terminations to the Left (MONO) and Right channel outputs. Connect the voltmeter across the Left channel termination.

Insert the alignment tape, (1 kHz reference "0" level), and start the machine in the RUN mode. Locate the Left (MONO) channel level control potentiometer (R109) on the Reproduce Amplifier & Cue Detect PCB and adjust it for 0 dBm output. Figure 3-23.

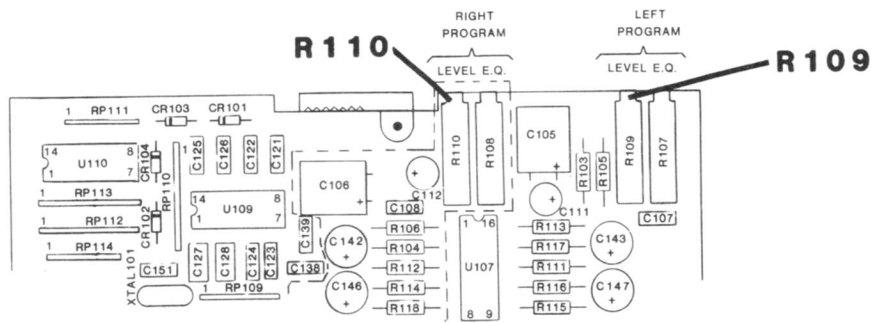


Fig. 3-23

Move the voltmeter leads to the Right channel output. Adjust the Right channel level control potentiometer (R110) for 0 dBm output. Move the voltmeter leads back to the Left (MONO) channel output. Loosen (do not remove) the reproduce (Play) head azimuth setscrew locknut.

Adjust the setscrew for a maximum output reading on the voltmeter at 12.5 kHz. Using the hex wrench handle as a guide, note the physical position of the setscrew. (A small piece of tape will suffice for marking the position.) Leave the wrench in place.

Move the voltmeter leads to the Right channel output and slowly adjust the setscrew to determine which direction INCREASES output. Continue adjusting the setscrew for increasing output until a maximum reading is obtained.

Once again, note the position of the setscrew by using the hex wrench handle as a guide. Mark the position. Compare this position with that of the Left channel adjustment and slowly readjust the setscrew to the midpoint between the two marks. This setting will provide AVERAGE azimuth for both channels.

This ends the procedure. Remove the cartridge. Leave all equipment connected.

9. Reproduce Amp Output Level Adjustment:

Standard output level is factory set to 0 dBm while reproducing a 1 kHz reference tone at 250 nWb/m. On the Reproduce Amplifier & Cue Detect PCB, potentiometer R109 controls Left (MONO) channel level and R110 controls Right channel level. Figure 3-24.

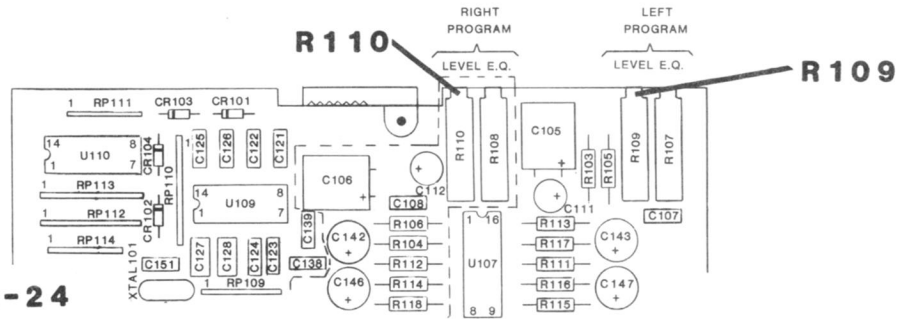


Fig. 3-24

Note: Whenever a reproduce output level adjustment is made, a corresponding adjustment to the Program Play meter calibration must be made. See Recorder Adjustments, Step #7 for this adjustment. Also, if a reproduce output level lower than -10 dBm is required, an external pad should be added in order to maintain optimum signal-to-noise performance.

Connect a 600 Ohm termination to the Left (MONO) channel reproduce output. (For STEREO units, add the second 600 Ohm termination to the Right channel output.) Connect the voltmeter across this termination.

Insert a reproduce alignment tape and start the machine in the RUN mode. Adjust R109 for 0 dBm output at 1 kHz. If this is a STEREO unit, move the voltmeter leads to the Right channel and repeat the procedure, using R110.

This ends the procedure. Stop the alignment tape and remove it. Leave all equipment connected.

10. Reproduce Amp Equalization Adjustment:

Connect a 600 Ohm termination to the Left (MONO) reproduce output. (For STEREO units, add a second termination to the Right channel output. Connect a voltmeter across this termination.

Potentiometers R107 & R108 control high frequency equalization for the Left (MONO) and Right channels respectively. Figure 3-25.

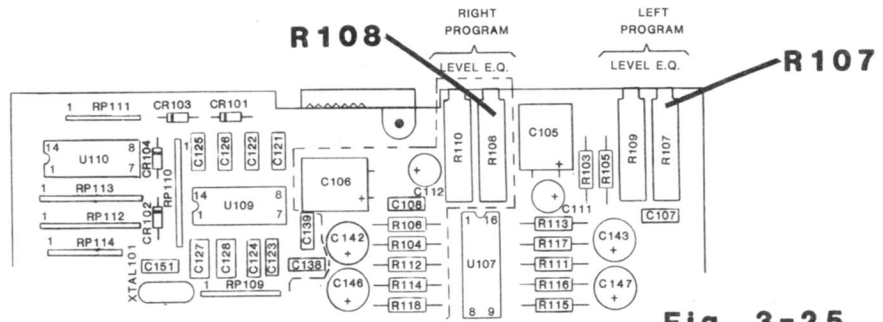


Fig. 3-25

Insert the reproduce alignment tape and start the machine in the RUN mode. Adjust R107 for 0 dBm (+/-2dBm) output at 12.5 kHz and 16 kHz. For STEREO units, move the voltmeter leads to the Right channel output and repeat the procedure, using R108.

This ends the procedure.

Since reproduce amplifier adjustments are, to a degree interrelated, the equalizer adjustments will usually require that a small readjustment be made for the reproducer output levels. At this point, repeat the Reproduce Amp Output Level Adjustment procedure. (Step #9).

11. Servo Motor Duty Cycle:

Refer to Figure 3-26. Pin 9 of P301 is the duty cycle test point and R313 controls the duty cycle.

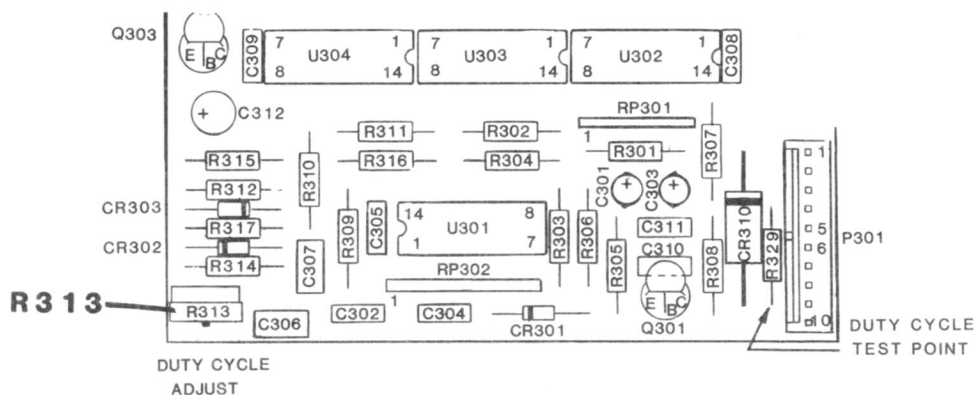


Fig. 3-26

Attach an oscilloscope test probe to Pin 9 of P301. Insert a blank cartridge into the machine and press the RUN switch. Observe the scope display. The servo motor duty cycle should appear as a 70% cycle, as illustrated by Figure 3-27. If adjustment is needed, turn R313 until the scope display equals Figure 3-27. This ends the procedure.

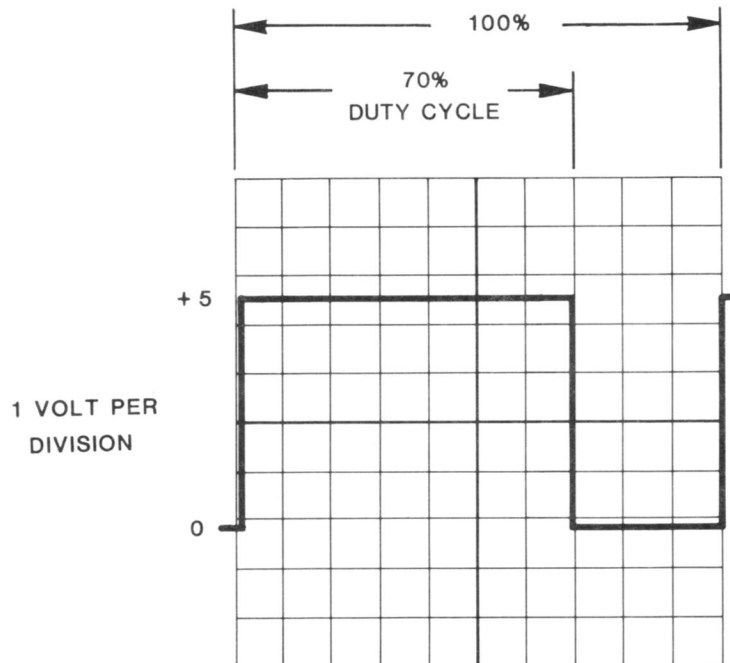


Fig. 3-27

12. Reproduce Cue Detect Sensitivity:

Cue detection is digitally controlled and will operate from cue tones recorded in accordance with NAB standards for frequency and level tolerance. Cue detector sensitivity is designed around "standard" parameters of 1 kHz cue tones at 160 nWb/m, using NAB format head tracks. Cue tones recorded outside of NAB level limits may cause improper cue detector operation. Resistor R127 on the Reproduce Amplifier & Cue Detect PCB may require changing, depending on your master cue record level. Refer to Figure 3-28 and Table 3-2 for exact location and component loading information.

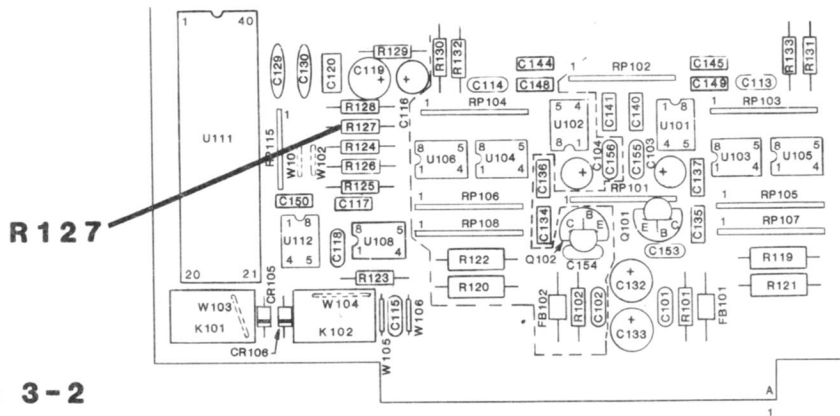


Table 3-2

R127 LOADING	
STEREO	560
MONO	820

Fig. 3-28

RECORDER ADJUSTMENTS

Adjustments to the recorder section should only be performed AFTER all reproducer adjustments have been completed. Failure to complete the reproducer section first may result in recorder misalignment. Recorder adjustments may be made individually as needed, or as part of a regular maintenance schedule.

CAUTION

1. Record Head Height & Zenith Adjustment:

Caution: Demagnetize all gauges and tools BEFORE making any adjustments. Be especially careful to avoid scratching the head face during adjustment.

Connect a 600 Ohm termination to the Left (MONO) channel reproduce output and connect the voltmeter across this termination. Connect an appropriate termination to the recorder Line input and connect an audio oscillator across this termination.

Figure 3-29 shows the location of the heads and adjustment screws on the head mounting block.

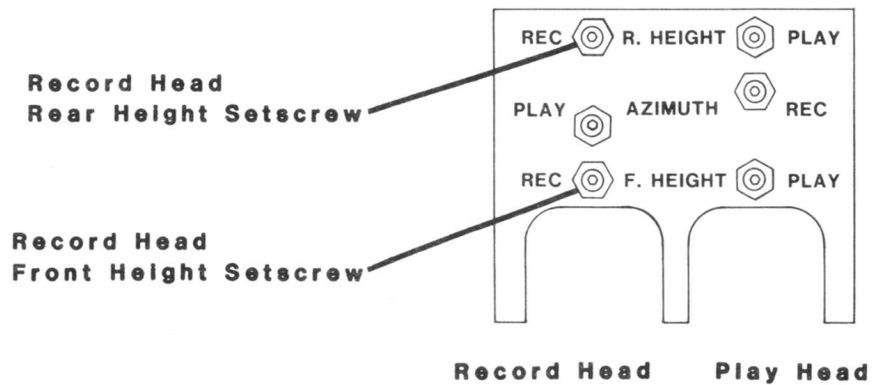


Fig. 3-29

Loosen (do not remove) the record (Rec) Front and Rear Height setscrew locknuts. Place the Tape Guide Height gauge on the deck and position it in the record head tape guide as shown in Figure 3-30.

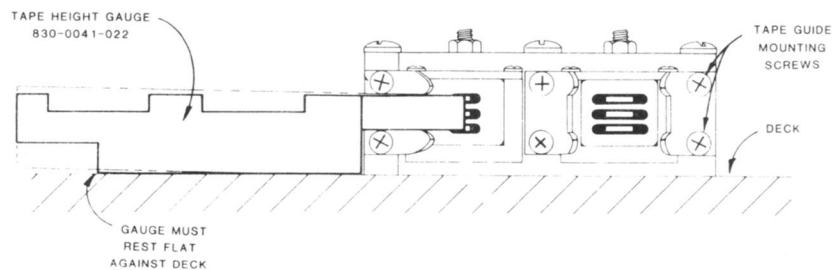


Fig. 3-30

**Rough-In
Head Height**

Alternately adjust, in equal amounts, the record Front & Rear Height setscrews until the nose of the gauge is approximately centered between the top of the upper head pole piece and the bottom of the lower head pole piece.

Head Zenith

Position the Zenith gauge, (or any gauge known to be completely square.), near the face of the head and alternately adjust the record Front & Rear Height setscrews until the face of the head is parallel to the gauge and perpendicular to the deck surface. Move the Zenith gauge gently up against the face of the record head. Be very careful to avoid any scratching. If the head is perpendicular to the deck, there will be no gap visible between the gauge and the head face. If a gap is visible, slowly adjust, independently and in equal amounts, the record Front & Rear Height setscrews until no gap exists.

Final Height Adjustment

Final height adjustment is made by electrically measuring the machine's audio output level while recording a reference tone and making fine adjustments to record head height. This procedure depends on accurately adjusted PLAY head height, which was done in an earlier procedure. Adjustments are made to head height by turning the Front and Rear Height setscrews small but equal amounts in the same direction. Since adjustments to the Front or Rear Height setscrews may introduce a Zenith error, Zenith and fine Height adjustments may require repeated, alternating adjustment until no further improvements in either may be made.

At this point, demagnetize the heads and the head block assembly to avoid any stray magnetization.

Set the audio oscillator to 1 kHz, insert a blank 3.5 minute cartridge and start the machine in the RECORD mode. While monitoring the audio output level on the voltmeter, adjust the Record Front & Rear Height setscrews in small but equal amounts for maximum output as indicated on the meter. Recheck the head Zenith, and readjust if necessary, before tightening the setscrew locknuts. Once all measurements and readings are optimized, carefully tighten the setscrew locknuts. Stop the cartridge and remove it. This ends the adjustment.

2. Record Head Azimuth Adjustment:

IMPORTANT

Note: Changes in azimuth for the record head can result in apparent errors in all reproducers within a given system. Any change in azimuth of the record head should be done ONLY AFTER all adjustments are carefully checked and the reproduce head is correctly azimuth aligned.

Attach 600 Ohm terminations to the reproduce Left (MONO) and Right channel outputs and connect an oscilloscope across the terminations. Attach 600 Ohm terminations to both recorder inputs and connect an audio oscillator across the terminations.

Set the oscillator output to -10 dBm. Insert a blank 3.5 minute cartridge, place the unit into RECORD SET mode, and adjust the front panel record Level knob for a VU meter reading of -10 dB. Start the machine in the RECORD mode.

Loosen (do not remove) the record head Azimuth setscrew locknut (Figure 3-31) and adjust the setscrew for a maximum amplitude reading on the scope display. The scope gains may be adjusted in equal amounts to increase amplitude of the display if necessary.

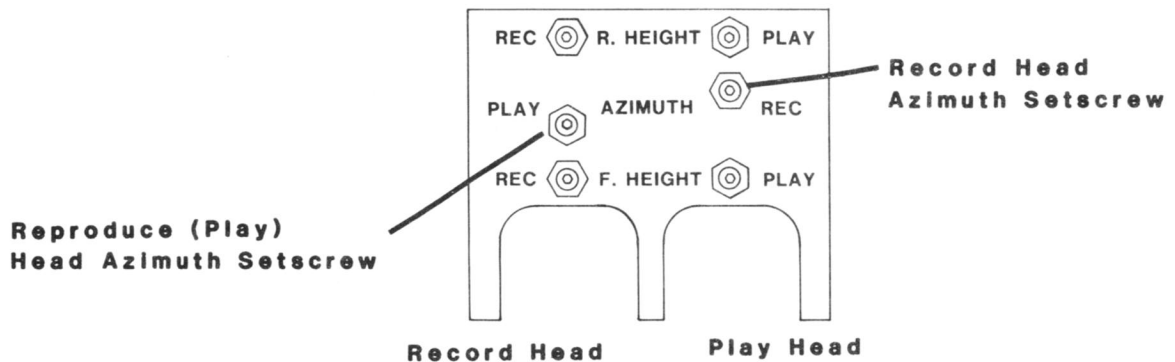


Fig. 3-31

Set the frequency of the audio oscillator to 50 Hz. Slowly increase tone frequency while observing the scope display to determine if any phase shift occurs. If phase shift does occur, adjust the setscrew in the opposite direction to that in which phase shift occurred.

As the frequencies continue to increase, each subsequent azimuth adjustment will "fine-tune" the head assembly for accurate alignment and best overall results. At 16 kHz make a final adjustment for the best possible reading. Do not tighten the setscrew locknut yet.

Repeat the procedure again and observe the scope pattern at all frequencies to determine if any phase shifting occurs. Once best overall results are consistently obtained, carefully tighten the setscrew locknut while monitoring the scope to insure that no change occurs.

This ends the procedure. Stop the cartridge and remove it. Leave all test equipment connected.

3. Program Record Bias Adjustment:

IMPORTANT

Note: This procedure will adjust program recording bias according to generally accepted standards for commonly available tape formulations. The object is acceptable recording performance, (ie; noise, distortion and frequency response), from many of the tape oxide formulations in current use. However, due to the wide variety of tape formulations available, recommended bias setting may differ from one tape formulation to the next. For more exact recording bias adjustment, consult the specifications provided by the tape manufacturer.

Attach a 600 Ohm termination to the reproduce Left (MONO) channel output and connect the voltmeter across this termination. Attach an appropriate termination to the recorder LINE input and connect an audio oscillator across this termination.

Insert a blank 3.5 minute cartridge and start the machine in the RECORD mode. Adjust the audio oscillator output to 10 kHz at -10 dBm as indicated on the front panel meter.

Locate R1107 on the Bias Amplifier PCB, Figure 3-32, and adjust it for a maximum (peak) output reading on the external voltmeter.

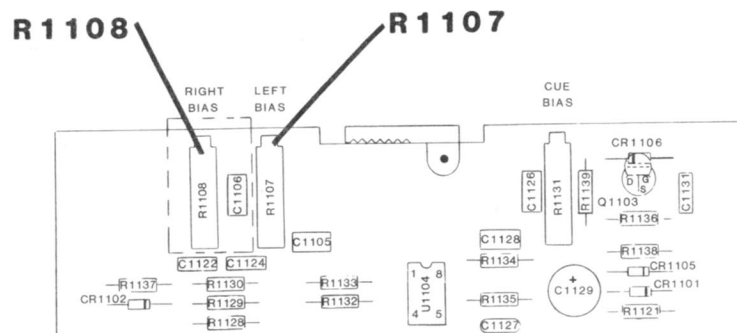


Fig. 3-32

Continue to adjust R1107 clockwise until the voltmeter indicates 2 dB below the peak reading. Repeat this procedure for the Right channel, using R1108.

This ends the procedure.

4. Cue Record Bias Adjustment:

Note: This procedure adjusts Cue Bias according to generally accepted practice for commonly available tape formulations, and yields acceptable performance. However, this adjustment may vary slightly from one tape formulation to another.

Connect a 600 Ohm termination to the Left (MONO) channel output and attach a voltmeter across this termination. Exchange the cue play and the Left (MONO) program play head leads so that the cue track audio information may be reproduced through the normal program amplifier as follows:

On the reproduce Mother PCB disconnect the Left (MONO) channel input (J510). Move the cue reproduce head lead connector (J512) to the Left (MONO) channel input connector (P510).

Insert a blank 3.5 minute cartridge and start the machine in the RECORD mode. Press the Tertiary (8 kHz) cue switch and record a continuous 8 kHz tone. Locate R1131 which controls cue bias on the Bias Amp PCB. Figure 3-33.

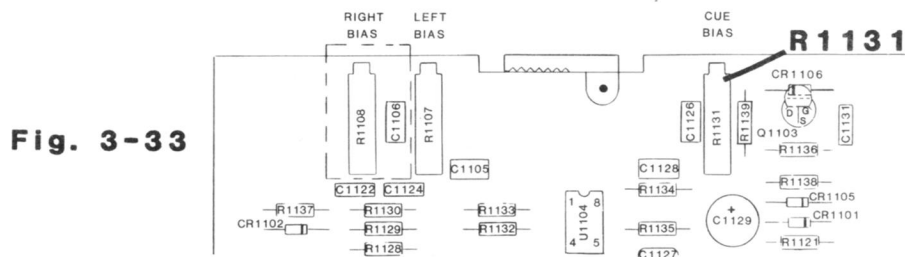


Fig. 3-33

Using the voltmeter to monitor the audio being recorded on the cue track through the Left (MONO) channel reproduce amplifier, adjust R1131 for a maximum (peak) output reading. Continue adjusting R1131 clockwise, (beyond peak reading), until the voltmeter reads -1 dB.

Now, alternately record a Primary (1 kHz) and Tertiary (8 kHz) cue tone. The 8 kHz 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. Adjust R1131 until this level relationship is achieved.

This ends the procedure.

If you are continuing to the Cue Master Level adjustment, leave the head leads in their present position. Otherwise, return the leads to their ORIGINAL position.

5. Cue Record Master Level Adjustment:

The cue oscillator tones are generated by the microprocessor and are digitally controlled. The microprocessor determines the correct frequency. 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.

DELTA cue detect circuits are designed to detect NAB cue tones recorded at 160 nWb/m. If your machine is setup for program record levels other than 160 nWb/m, it is imperative that you understand the level differences between your normal program tracks and the standard fluxivity of the cue track. Since this adjustment procedure utilizes conventional program amplifiers to measure cue track fluxivity, you must calculate any differences that exist in dB, and compensate accordingly.

If your program track is setup to produce 0 dBm output at 160 nWb/m, proper cue track adjustment will also produce 0 dBm output. If your program track is setup to produce 0 dBm output at 250 nWb/m, proper cue track adjustment will produce -4 dBm output. If your program track is setup to produce 0 dBm output at 185 nWb/m, proper cue track adjustment will produce -.5 dBm output.

Table 3-3
Level Relationship Table

<u>Program Track Calibration</u>	<u>Correct Cue Track Calibration</u>
0 dBm Output At:	
250 nWb/m.....	equals.....-4 dBm Output at 160 nWb/m
0 dBm Output At:	
185 nWb/m.....	equals.....-.5 dBm Output at 160 nWb/m

It is critical that the cue record track level adjustment be carefully made to 160 nWb/m. Otherwise improper cue detector operation may result.

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.

Connect the voltmeter to the cue audio output (J1, Pins 9 & 14). Use the 1 kHz cue record function on the DELTA IV front panel to record short 1 kHz tone bursts. These tone bursts will be indicated on the voltmeter. Adjust R1231, located on the Recorder Logic PCB-Figure 3-34, for a 500 mV RMS reading on the voltmeter.

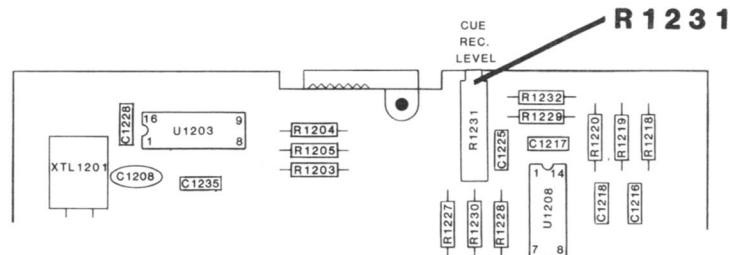


Fig. 3-34

Verify that your adjustment is correct by alternately recording 150 Hz and 8 kHz cue tones. All three cue tones should provide approximately equal readings on the voltmeter. Note that minor variations in the 8 kHz reading may be adjusted by "tweaking" the cue bias control for "flattest" performance as indicated on the voltmeter.

This ends the procedure.

Note: An alternate method of setting the cue record master level would be to swap the Left (MONO) program reproduce head leads with the cue track head leads and use the program record and reproduce amplifiers to record and monitor the cue tones. This method allows continuous recording and reproducing of tones without interaction from the cue detect circuitry. When the reproduce amplifier is adjusted to produce 0 dBm output at 160 nWb/m, a properly adjusted cue record circuit will also produce 0 dBm output at 1 kHz.

6. Program Record Equalization:

Connect a 600 Ohm termination to the Left (MONO) channel reproduce output and attach a voltmeter across this termination. Connect a second 600 Ohm termination to the recorder LINE input and attach an audio oscillator across this termination.

Adjust the audio oscillator for an output of 1 kHz at -10 dBm. Insert a blank 3.5 minute cartridge into the machine and press RECORD and START in order. Adjust the audio oscillator output level for a -10 dBm indication on the machine's output, as measured by the voltmeter. Locate potentiometer R1005, which controls Left (MONO) channel record equalization on the Record & Meter Amp PCB. Figure 3-35.

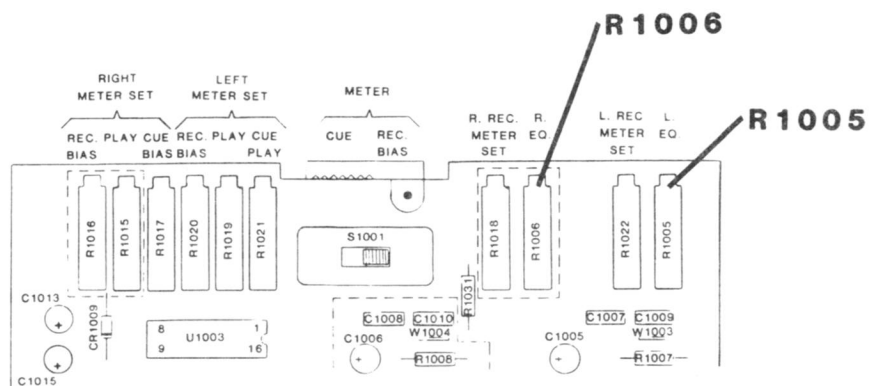


Fig. 3-35

Switch the audio oscillator output to 10 kHz and adjust R1005 for a -10dBm indication on the voltmeter. Compare the 1 kHz and 10 kHz voltmeter readings by switching the audio oscillator frequency back and forth. If necessary, readjust R1005 to produce a -10 dBm output level at 1 kHz and 10 kHz as measured on the voltmeter.

Slowly move the audio oscillator frequency upward to 15 kHz and evaluate the voltmeter readings. If a difference of more than +/- 2 dB in response occurs, it may indicate that a readjustment in bias is necessary. Excessive bias (overbias) causes losses at high frequencies. Likewise, underbias causes peaked response at high frequencies.

Adjustments should be made for flattest overall response from 1 kHz to 16 kHz. Repeat this procedure for the Right channel, using R1006.

This ends the procedure.

7. Meter Calibration:

The following adjustments will be made using the two (2) recorder front panel meter switches (Black) marked REC and PLAY, in conjunction with an internal slide switch located on the Record & Meter Amplifier PCB. Adjustment potentiometers are also located on the Record & Meter Amp PCB. All adjustments should be performed in the order shown.

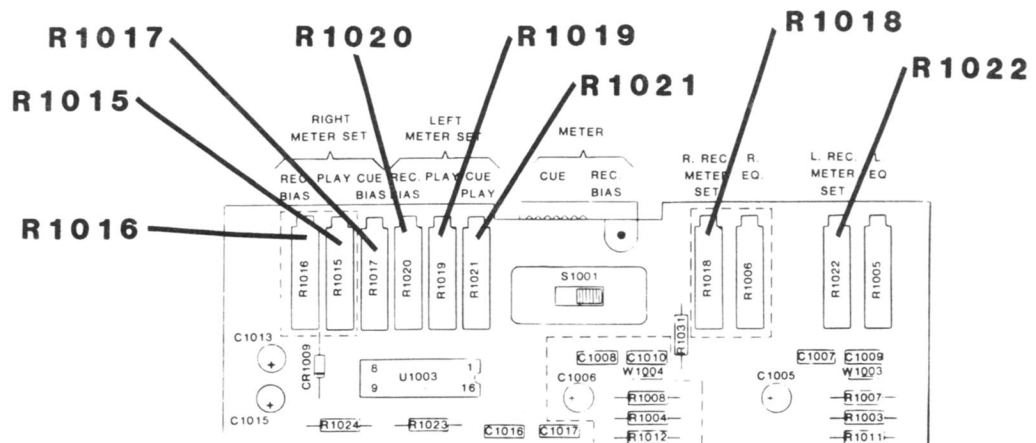


Fig. 3-36

A. Program Play:

Depress the front panel PLAY meter switch. Connect a 600 ohm termination across both program playback output terminals.

Insert a 0 reference level tape (1 kHz, recorded on your master recorder) and press the START button. Adjust R1019 (Figure 3-36) for 0 VU indication.

If the unit is STEREO, repeat this procedure using R1015 for calibrating the Right program meter for 0 VU.

B. Normal Record:

Depress the PLAY meter switch. Insert a blank cartridge and place the machine into the record mode while recording a 1 kHz tone.

Adjust the front panel level controls for a 0 VU indication on the (Play) meters.

Depress the REC meter switch and adjust R1022 to obtain a 0 VU indication for the Left (MONO) channel meter. Repeat the procedure using R1018 for the Right channel meter.

C. Program Bias:

Configure the meters for reading Program Bias by having NEITHER front panel meter switch depressed, and moving the internal slide switch to the Rec. Bias (forward) position. Figure 3-36.

Insert a blank cartridge, press the RECORD SET (red) and START (green) buttons. Adjust the Left (MONO) program bias trimmer R1020 for a 0 VU reading on the Left channel meter.

Repeat this procedure for the Right channel, using trimmer R1016.

D. Cue Bias:

Configure the meters for reading Cue Bias by having NEITHER front panel meter switch depressed, and moving the internal slide switch to the CUE position.

Insert a blank cartridge and press the START (green) button.

Press the TER (tertiary-white) cue switch and adjust trimmer R1017 for a 0 VU reading on the Right front panel meter.

E. Cue Play:

Leave the metering switches configured as for CUE BIAS meter calibration.

Insert a blank cartridge and press the START (green) button.

Press the 1 kHz cue record (Black-ADD) switch and observe meter deflection on the Left front panel meter. A meter deflection of approximately 3/4 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 trimmer R1021 to calibrate CUE PLAY metering to 0 VU.

HEAD REPLACEMENT

CAUTION

CAUTION: Demagnetize all tools and fixtures BEFORE beginning any work on or near the heads.

ITC Cartridge machines use strap-mount type heads, facilitating quick and easy replacement.

Remove the head shield by unscrewing the two shield screws and spacers. Figure 3-37. Secure the head block by reinstalling the right hand shield screw and spacer.

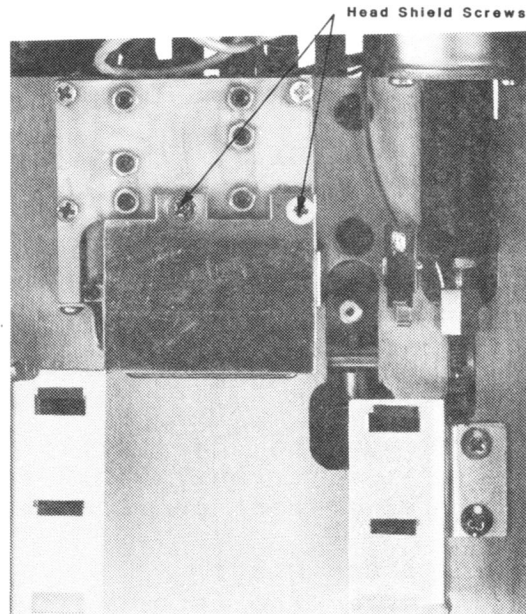


Fig. 3-37

Remove the two screws holding the head strap in place. Figure 3-38.

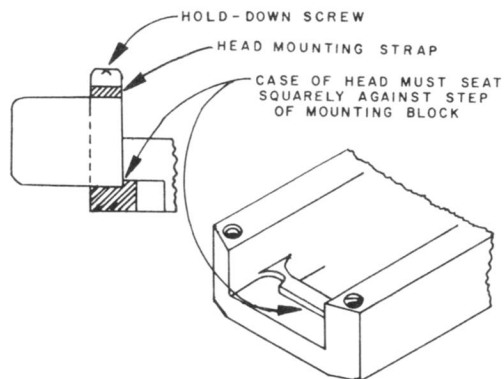


Fig. 3-38

CAUTION

CAUTION: Use extreme care when disconnecting and reconnecting head cables. The head pins can be broken off and the pin sockets on the head cable can be bent if excessive side pressure is exerted.

Disconnect and remove the old head. Install the new head and reconnect the cables. (See Figure 3-39 for the cable lead color arrangement.)

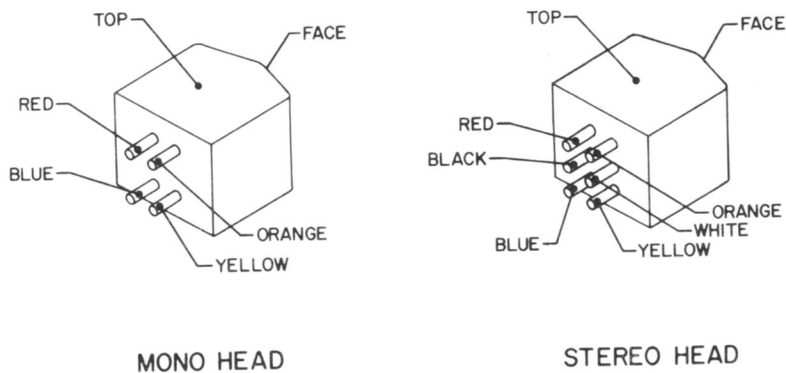


Fig. 3-39

Remount and fasten the head strap. Remove the right hand head shield screw and spacer from the head block, remount the head shield and reinstall both screws and spacers.

This ends the procedure.

Note: A COMPLETE check of alignment IS necessary after a head is disconnected and/or replaced.

Section IV Routine Maintenance

In addition to performing adjustments and alignments described in Section III, a regular maintenance program will aid overall machine operation and help prevent potential problems. We recommend that you make the following information part of your complete maintenance schedule.

Motor Lubrication

The motor contains permanently lubricated ball bearings which require NO further lubrication. Any attempt to oil these bearings may cause premature motor failure due to migration of oil into the windings and ultimately, breakdown of the insulation material.

The cross shaft assembly contains permanently lubricated, sintered bronze bearings. The solenoid plunger is coated with a friction-reducing, self-lubricating material. As with the motor bearings, any attempt to oil these parts will cause damage, poor performance and possibly complete failure.

Head Cleaners

ITC recommends using ONLY isopropyl alcohol for head cleaning. After cleaning, all surfaces should be dried thoroughly before machine operation is begun again. The use of cleaners containing organic-based solvents such as acetone or ketone can severely damage or destroy rubber or plastic parts and other components.

The use of aerosol propellants for head cleaning is discouraged. This is due to the high likelihood of the cleaner being blown into motor bearing assemblies and degrading or destroying bearing lubricants.

1. Mechanical Maintenance Schedule:

Daily-

-Inspect and, if necessary, clean the heads with a cotton swab dipped in isopropyl alcohol.

-Clean the capstan shaft and pressure roller with a clean cloth dipped in isopropyl alcohol. (Be careful not to allow any alcohol

to drip down into the motor.) Remove all traces of tape lubricant and tape oxide.

Weekly or Monthly-

(Dependent on machine usage)

-Check pressure roller pressure/solenoid adjustment. (See Section III)

-Check reproduce and record head azimuth. (See Section III)

Biannually-

-Inspect all internal assemblies for dirt or dust buildup. If cleaning is needed, use a soft, dry brush to remove the buildup. Note: In some cases an air-gun or blower may be used for cleaning, but care should be exercised so that no debris is forced into adjacent parts.

2. Electrical Maintenance Schedule:

Daily or Weekly-

(Dependent on machine usage)

-Degauss all heads and tape guides, carefully following the instructions for degausser use.

Biannually-

-Check and adjust reproduce and record high frequency equalization.

-Check and adjust program recording bias and program bias meter calibration.

-Check and adjust record bias and cue bias calibration.

(All adjustments in Section III)