

TECHNICAL MANUAL
3 DECK
REPRODUCERS

INTERNATIONAL TAPETRONICS CORPORATION

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TECHNICAL MANUAL

(890-0004-000)

3D (THREE DECK) SERIES REPRODUCERS:

MONO, SINGLE TONE 827-0001-000

STEREO, SINGLE TONE 827-0002-000

MONO, TRIPLE TONE 827-0003-000

STEREO, TRIPLE TONE 827-0004-000

TECHNICAL MANUAL

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SECTION I

INTRODUCTION

3D SERIES REPRODUCER

A. GENERAL DESCRIPTION

International Tapetronics magnetic cartridge Reproducers are designed to meet or exceed the NAB standards for cartridge tape recording and reproducing. The 3D (Three Deck) series reproducers are available in monophonic or stereophonic configurations. All reproducers are furnished with primary (1 kHz) cue capabilities while the secondary (150 Hz) and tertiary (8 kHz) cue detectors are optional.

The top two decks are designed to function as independent reproducers. The bottom deck may be used as a reproducer or, with a WRA series Recording Amplifier, as a Master Recorder/Reproducer. All decks accept the NAB type A and B cartridges.

The electronic circuits are constructed on printed circuit cards and, with the exception of the Utility card, are of plug-in design. Silicon semiconductors are used throughout. The regulated power supply is an integrated circuit in a plug-in TO-3 case. The program amplifiers have NAB equalization and transformer coupled outputs.

The cue tone detectors utilize reliable L-C networks and provide relay contact output information. Upon the conclusion of the audio, the Reproducer continues to advance the tape until a 1 kHz primary cue tone is detected, whereupon the 1 kHz cue detector stops the tape drive mechanism.

The Secondary Cue Tone (150 Hz) Detector, when the machine is so equipped, can be used for such functions as the indication of the "end-of-message." This is necessary in automated systems to start the next deck or machine and can be useful in live operations to keep the operator "on cue" for inserts, tags, or the beginning of the next material. The presence of the secondary cue tone is indicated by the brightening of the front panel and remote "Run" (Start) Lamps.

The Tertiary Cue Tone (8 kHz) Detector, also optional, can be used to supply digital information in automated systems or for auxiliary switching such as the control of slide projectors in television. Presence of the tertiary cue tone is indicated by the illumination of the front panel and remote "Ready" Lamps.

B. SPECIFICATIONS

Power:

117 volts AC, 60 Hz, 144 watts; other voltage and frequency variations are available on special order.

The full-swing pressure roller is connected to the actuating solenoid by a simple and reliable chain linkage with a clevis screw adjustment for pressure roller capstan pressure. Air damping of the solenoid is adjustable with a needle valve. The direct-capstan, 450 RPM (375 RPM in 50 Hz models), hysteresis synchronous drive motor (with an electrolyzed shaft) provides optimum tape drive.

Routine servicing requires a minimum of disassembly. Removal of the cover grille provides accessibility to both mechanics and electronics. The top two decks readily slide from the housing after the head leads and solenoid cables are unplugged. Either or both of the top two decks may be removed for service without affecting the remaining decks.

Cue and program cards are easily removed from the rear of the chassis. A single extender card, optionally available, provides a means for mounting each card for circuit analysis. Level controls are located on the circuit cards and are accessible from the rear.

Remote connections make use of latching plugs and sockets to prevent accidental loss of contact. Full remote control and audio output information are readily available on the sockets for each deck. Wiring and an interconnect socket are provided for the optional addition of the WRA Series Recording Amplifier.

The head and track configuration of the ITC Three Deck Reproducer is in accordance with the NAB Standards.

The magnetic tape head nearest the capstan shaft is head A, the reproducing head. Head B is a "dummy" which is installed to maintain constant tension on the tape and minimize wow and flutter. Head B of Deck C is a recording head when the Reproducer is connected to a WRA Series Recording Amplifier.

On mono machines, the upper track is the program channel and the lower track is the cue channel. On stereo units, the upper track is the left program channel, the center track is the right program channel, and the lower track is the cue channel. A graphic comparison of the mono and stereo track configuration is shown in Figure 5-17.

Tape Speed:	7½ inches per second; direct drive, hysteresis-synchronous, common-capstan motor with electrolyzed shaft and instrument-type, permanently lubricated ball bearings.
Wow and Flutter:	0.2% or less
Timing Accuracy:	0.1% or better
Audio Output:	+12 dBm before clipping; normally +4 dBm; 600 ohms balanced. May be strapped for 150 ohms. Independent output for each deck.
Distortion:	2% or less, record to playback at 0 VU record level, 400 Hz.
Noise:	55 dB or better below reference of 400 Hz at 3% THD, monophonic, 50 dB or better below reference of 400 Hz at 3% THD, stereophonic.
Cross Talk Between Channels:	Better than 50 dB at 1 kHz.
Frequency Response:	± 2 dB from 50 to 15,000 Hz.
Equalization:	NAB. Adjustable to compensate for head wear.
Cue Signals:	NAB primary cue, 1 kHz, standard. Secondary cue, 150 Hz, and tertiary cue, 8 kHz, optional. External information when tone is sensed furnished as relay contact closure.
Playback Time:	NAB size A and B cartridges, 2 seconds to 16 minutes, each shelf.
Start Time:	0.1 seconds, at minimum solenoid damping.
Stop Time:	0.1 seconds, at minimum solenoid damping.
Ambient Temperature:	55 degrees C, 131 degrees F, maximum.
Remote Control:	All controls and indicators.
Mounting:	Table top mounting with rack mounting adapters optional.
Dimensions:	10-1/2" high (add 5/8" for feet); 13" deep, 8-5/8" wide.
Weight:	38½ pounds.
Head Configuration:	NAB (provided with reproduce heads only; except bottom deck supplied with recording head when accompanied by WRA Series Recording Amplifier).

SECTION II

INSTALLATION AND OPERATION

3D SERIES REPRODUCER

A. UNPACKING

Remove the 3D Reproducer from the shipping carton and inspect the unit for damage. All packing material must be retained if a claim for shipping damage is to be filed; and, therefore, should be kept on hand until installation has been completed in case concealed damage is discovered. If shipping damage is found, contact ITC for assistance in the filing of claims.

B. INSTALLATION

The 3D Reproducers are supplied in cases prepared for table top mounting. Adapter angle brackets and hardware for mounting in a 19 inch equipment rack are supplied with instructions on an optional basis.

To provide adequate ventilation in rack installations, vertical spacing between Reproducers and other equipment should be from 1 $\frac{3}{4}$ " to 3 $\frac{1}{2}$ " depending on the temperature inside the closed rack.

C. EXTERNAL CONNECTIONS—AUDIO

Audio output connections are made on the six pin sockets J2A, J2B, and J2C. Mating plugs are supplied, and terminal information is as follows:

CONNECTOR J-2

Terminal	Function
1	Monophonic Shield (Ground) (left channel stereo)
3	Monophonic Audio Output (left channel stereo -)
5	Monophonic Audio Output (left channel stereo +)
2	Right Channel Stereo Shield (Ground)
4	Right Channel Stereo Audio Output (-)
6	Right Channel Stereo Audio Output (+)

Socket J2A is associated with the top "A" deck while J2B is for the center "B" deck and J2C is for the bottom "C" deck. Socket and terminal locations are shown in Figure 5-2.

The load impedance of the audio output is normally 600 ohms. A 150 ohm output can be provided by changing the transformer wires on connector J2 as noted on the schematic diagram.

In stereo systems, proper phasing of the audio connections must be observed.

D. EXTERNAL CONNECTIONS—CONTROL

Remote Control connections are provided on

the fifteen pin sockets J1A, J1B, and J1C. Mating plugs are supplied for this purpose and terminal information is as follows:

CONNECTOR J-1

Terminal	Function
1	Ground
2	Remote Start (Run Ground)—Normally Open Switch
3	Remote Start (Ready Ground)—Normally Open Switch
4	Remote Stop (Ready Ground)—Normally Open Switch
5	Remote Stop (Stop Ground)—Normally Open Switch
6	Remote Run Lamp Ground Circuit
7	Remote Ready Lamp Ground Circuit
8	+24 Volts
9-10	Secondary Cue Relay Contacts (Normally Closed)
10-11	Secondary Cue Relay Contacts (Normally Open)
12-13	Tertiary Cue Relay Contacts (Normally Open)
14-15	Cue Audio — Unbalanced Audio Output from Cue Preamplifier; High Impedance (Terminate with 10K ohms or greater)

Socket J1A is associated with the top "A" deck while J1B is for the center "B" deck and J1C is for the bottom "C" deck. Socket and terminal locations are shown in Figure 5-2.

Ground switching is employed in all remote control functions. Normally open, momentary action switches are used for both the remote START and STOP functions. A sample remote control schematic is shown in Figure 10-1.

If necessary, the normally open stop circuit can be replaced with a normally closed circuit by removing the jumper installed inside the machine between pins 3 and 4 on J1 and installing a remote, normally closed switch in its place.

E. CONTROL SWITCHES AND INDICATORS

Each of the three tape transport mechanisms (decks) has the following associated control switches and indicators.

CARTRIDGE SWITCH

A cartridge Sensing Micro Switch is located on each deck to provide a "Ready" indication to the Reproducer's control circuit and illuminate the yellow indicator lamp just

above the Stop Switch. The Cartridge Switch must be operated in order for the tape transport to be started. See Figure 5-3 for the location of this switch.

**START
SWITCH**

The Start Switch (green) is used to energize the transport's pressure roller solenoid and put the tape in motion. The indicator lamp in the Start Switch shows that the machine is in a "Run" condition. Location is shown in Figure 5-1.

**STOP
SWITCH**

The Stop Switch (red) can be used to stop the tape drive system. (Remember that unless a cartridge stops automatically, it will not be properly cued for the next play.)

**READY
LAMP**

The Ready Lamp (yellow) shows that a cartridge has been properly loaded and the machine is "Ready" to be started.

F. OPERATING PROCEDURES

To play a tape cartridge:

1. Insert a properly recorded tape cartridge into the right-hand side of any of the three cartridge slots.
2. Check to see that the Ready Lamp associated with that deck is illuminated, indicating that the cartridge has been properly inserted and that the deck is "Ready" for operation.
3. Press the Start Switch momentarily. The tape drive system will be started, and tape motion will continue until the primary (1 kHz) cue tone automatically stops the deck or until the Stop Switch for that deck is pressed.

SECTION III

PRINCIPLES OF MECHANICAL OPERATION

3D SERIES REPRODUCER

A. HEAD ASSEMBLY

The reliability and the maintenance required is improved through the use of heads with a metal face and a hyperbolic front contour. The shape and material reduce the need for cleaning and relieve the problems caused by pressure pads. The heads are of plug-in, no mount design and are readily replaced as described in Section IV (Mechanical Adjustments).

The 3D Reproducer deck assembly contains three tape guides of nonmagnetic material which are mounted on the head assembly bracket. The positioning of these tape guides is preset at the factory but may be field adjusted should it be required. The head mounting bracket is of very sturdy construction with the azimuth pivot point located directly behind the center of the heads in both a vertical and horizontal plane. This feature permits azimuth adjustment without disturbing the zenith adjustment. An integral locking screw is provided to prevent movement after adjustment.

B. CAPSTAN DRIVE

The proper drive of tape in a cartridge is much more difficult than in reel and other types of tape equipment. The 3D Reproducer is designed and constructed to overcome the difficulties of cartridge tape drive. In a cartridge, the tape pulls from the center and winds back on the outside of an endless loop of tape. Therefore, the tape must slip upon itself as the cartridge plays. This slipping action does not occur at an even rate, and the tape tends to jerk as it pulls from the center of the hub. In addition, the tape is coated with a lubricant which reduces drive friction. One means of improving the tape drive would be to use a larger diameter pressure roller, but this is not possible since there is insufficient clearance in the bottom of the cartridge for a larger roller. The

tape drive required in a cartridge machine is improved by using a 450 RPM (375 RPM in 50 Hz models), direct drive motor with an electrolyzed shaft. The hysteresis-synchronous direct drive motor has a constant speed because there are no belts or pulleys to introduce speed variables.

With a large capstan, directly driven, constant tape drive can be achieved if the tape is not permitted to slip between the pressure roller and the capstan. In the 3D Reproducer, this problem is eliminated by machining the shaft to a very high polish and then blasting it with aluminum oxide particles. This type of finish is a random rough pattern which provides the positive tape drive demanded of cartridge machines. An electrolyzing process holds the roughened pattern and reduces wear of the surface. This finish is very durable and results in a normal wear life of approximately 5 years in normal service.

C. PRESSURE ROLLER LINKAGE

The use of a mechanical chain assembly which has a design life in excess of a million operations brings the pressure roller into contact with the capstan. The pressure roller cross-shaft must exert much greater turning torque as the roller contacts the capstan. In the 3D Reproducer the required torque is achieved by using a reliable and efficient chain and sprocket. The shape of the solenoid plunger provides the required torque curve. Correct pressure roller/capstan pressure is achieved by adjusting the clevis screw which attaches the chain assembly to the solenoid plunger.

The solenoid and pressure roller action of the 3D Reproducer is extremely quiet in its operation. The speed and the resultant noise of this assembly is controlled by an adjustable damping valve at the rear of the solenoid. The design is intended to provide long life, dependable operation, and a minimum of maintenance.

SECTION IV

MECHANICAL ADJUSTMENTS

3D SERIES REPRODUCER

A. GENERAL MECHANICAL INFORMATION

Tapetronics Tape Cartridge Reproducers have been designed to provide reliable, rugged mechanics which require a minimum of simplified adjustments.

The sequence in which mechanical adjustments are completed, however, is important. Therefore, if a complete check of all mechanical adjustments is required, start at the beginning of this section and check and/or adjust the "C" (bottom) deck as instructed—from Capstan Shaft (Motor) Position to Head Azimuth Adjustment. Then repeat the entire procedure on the "B" (center) deck; and finally, repeat the procedure on the "A" (top) deck.

Head Adjustments, outlined last in this section, may be made without having completed the deck adjustments covered first in this section.

The alignment gauges mentioned in this section are optionally available from Tapetronics.

B. DECK REMOVAL

Decks "A" (top) and "B" (center) must be removed to provide access to make mechanical adjustments on the "C" (bottom) deck. When removing decks always remove source power from the equipment.

1. Remove the two top cover retaining screws from the rear chassis and lift off the cover grille.
2. Remove the two front panel 7/64" Allen-type retaining screws (see Figure 5-1), and open the front panel.
3. Unplug the solenoid and head cables from the upper two decks and slide these tape transport mechanisms forward and out of the main chassis.

The upper deck has been labeled (on its front edge) "A" while the center deck is designated "B."

C. CAPSTAN SHAFT (MOTOR) POSITION

While the adjustment procedure outlined below will normally be required only if the motor has been removed, a check for proper positioning of the capstan should be part of the regular maintenance schedule.

1. "C" (bottom) Deck
 - a. Remove the mounting screws from the top bearing block so that the top end of the capstan shaft is free to move.
 - b. Remove the rubber pressure roller and place the round steel Capstan Shaft Locator Gauge on the pressure roller shaft of the "C" (bottom) deck as shown in Figure 5-7.
 - c. Loosen the motor mounting screws and

manually press the steel Capstan Shaft Locator Gauge against the capstan shaft.

- d. While squeezing the steel gauge and the capstan shaft together, position the capstan shaft as shown in Figure 5-8. The steel tool must lie flat against the capstan shaft to make the pressure roller shaft parallel with the capstan shaft.

The slight offset between the two shafts allows the tape to come into contact with the capstan shaft before the pressure roller to minimize wow and flutter and to slightly "wrap" around the capstan shaft for better pull.
- e. Tighten the motor mounting screws and re-check the adjustment.
- f. Replace the rubber pressure roller on its shaft. The steel washer goes on the bottom and the nylon washer goes on the top just under the retainer clip.
- g. Replace the screws in the top bearing block and tighten. Be careful to avoid excessive flexing of the capstan shaft.
- h. Complete the subsequent mechanical adjustments outlined in Section III on the "C" (bottom) deck before starting adjustments on decks "A" and "B."
 - a. Replace the "B" deck (labeled on its front edge) in the main chassis.
 - b. Remove the rubber pressure roller and place the steel Capstan Shaft Locator Gauge on the pressure roller shaft.
 - c. Check to see that the steel tool and the capstan shaft lie flat against each other.
 - (1) If the adjustment is incorrect, first loosen the bearing block mounting screws to make sure that the capstan shaft is not flexed.
 - (2) If the adjustment is still not correct, loosen the screws in the deck stop blocks mounted on either side of the deck on the deck slides (see Figure 5-3), adjust the position of the deck so that the steel tool lies flat against the capstan shaft, and tighten the screws in the deck stop blocks.
 - d. Replace the rubber pressure roller on its shaft, and reconnect the solenoid and head cables. The locator slot in the head socket of mono units must be on the top side to prevent a reversal of the program and cue channels. See the schematic diagram for the color code of

the head lead arrangement used on stereo units.

- e. Adjust the "set" screws in the front edge of the deck so that a small amount of pressure is exerted against the front panel when it is bolted into place. The purpose of this adjustment is to prevent the deck from being pushed toward the front panel of the machine (thereby destroying the adjustments completed above) when the solenoid is energized.
 - f. Tighten the two front panel retaining screws and complete the subsequent mechanical adjustments outlined in Section IV on the "B" (center) deck before starting adjustments on deck "A."
3. "A" (top) Deck
- a. Replace the "A" deck (labeled on its front edge) in the main chassis.
 - b. Remove the rubber pressure roller and place the steel Capstan Shaft Locator Gauge on the pressure roller shaft of the "A" (top) deck.
 - c. Check to see that the steel tool and the capstan shaft lie flat against each other. If the adjustment is incorrect, loosen the screws in the deck stop blocks mounted on either side of the deck on the deck slides, adjust the position of the deck so that the steel tool lies flat against the capstan shaft, and tighten the screws in the deck stop blocks.
 - d. Replace the rubber pressure roller on its shaft and reconnect the solenoid and head cables.
 - e. Adjust the "set" screws in the front edge of the deck so that a small amount of pressure is exerted against the front panel when it is bolted into place.
 - f. Tighten the two front panel retaining screws and complete the subsequent mechanical adjustments on the "A" (top) deck.

D. PRESSURE ROLLER/CAPSTAN PRESSURE — COARSE SOLENOID ADJUSTMENT

This adjustment is made at the factory and should not normally have to be repeated unless a parts replacement (solenoid, solenoid plunger, linkage chain, clevis, or cross-shaft clamp) has been made in the solenoid linkage assembly. If there is no specific reason for making this adjustment, skip ahead to part "E" of Section IV.

The adjustment procedure outlined below is applicable to all three decks. The front panel must be bolted into its closed position when adjusting sliding decks "A" and "B."

1. Check to see that the steel roll pin protruding from the cross-shaft clamp is inserted between the eleventh and twelfth (counting from the clevis) connector pins

in the linkage chain as shown in Figure 5-9.

2. Loosen the clevis locknut and rotate the solenoid plunger and the locknut until the Pressure Roller Compression Tool will fit snugly between the shoulder of the clevis and the locknut as shown in Figure 5-10. The locknut must be finger tight against the plunger. If the tool is not available, the space between the clevis and the locknut should be .2812 (9/32) inch.
3. Remove the capstan motor plug from the socket located on the utility board (see Figure 5-4), and actuate the cartridge sensing micro switch by pushing a piece of folded cardboard or other material between the switch's actuator arm and plunger (Figure 5-3).
4. Press the front panel START switch to energize the solenoid; loosen the screws in the cross-shaft clamp (Figure 5-3). The front panel must be bolted into its closed position when adjusting sliding decks "A" and "B." Adjust the clamp screws so that the clamp is snug on the shaft but can be moved with a small amount of force.
5. Remove the rubber pressure roller and adjust the pressure roller shaft so that the Pressure Roller Compression Gauge fits snugly between the left side of the slot in the deck and the pressure roller shaft as shown in Figure 5-11.
6. Place the steel Capstan Shaft Locator Gauge on the pressure roller shaft, press it tight against the capstan shaft (see Figure 5-7), and tighten the screws in the cross-shaft clamp. If the Capstan Locator Gauge is not available, place a rubber pressure roller on the shaft, press it against the capstan until the rubber is depressed approximately 1/32 of an inch where it makes contact with the capstan shaft, and tighten the screws in the cross-shaft clamp. Pressure is applied by pushing plunger into solenoid, this will keep this linkage taut.
7. Remove the Capstan Shaft Locator Gauge and check the adjustment made in Step 5 above.
8. Replace the rubber pressure roller on its shaft. The steel washer goes on the bottom and the nylon washer goes on the top just under the retainer clip.
9. Plug motor back, check set screws on the front of deck and bolt front panel in place.

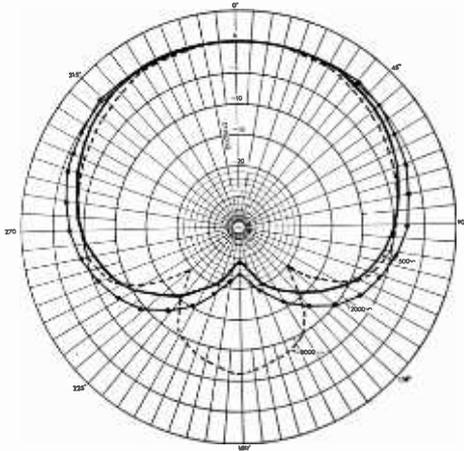
E. PRESSURE ROLLER/CAPSTAN PRESSURE — FINE SOLENOID ADJUSTMENT

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

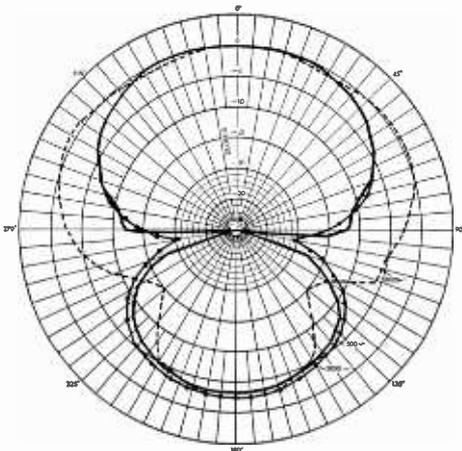
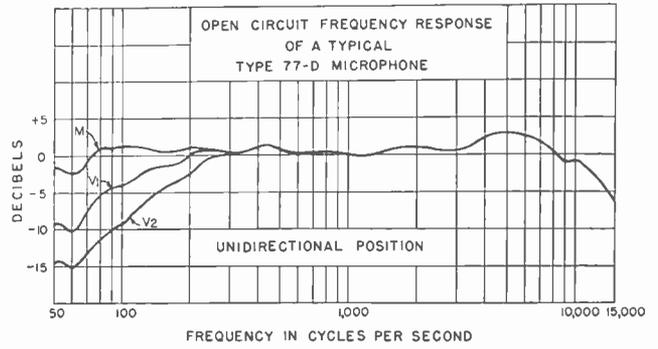
The adjustment procedure outlined below is applicable to all three decks. The front panel must

Directional Response Patterns

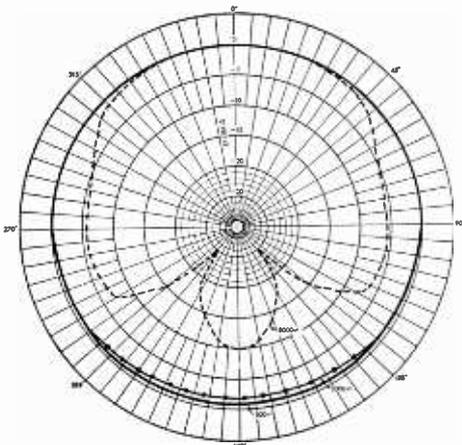
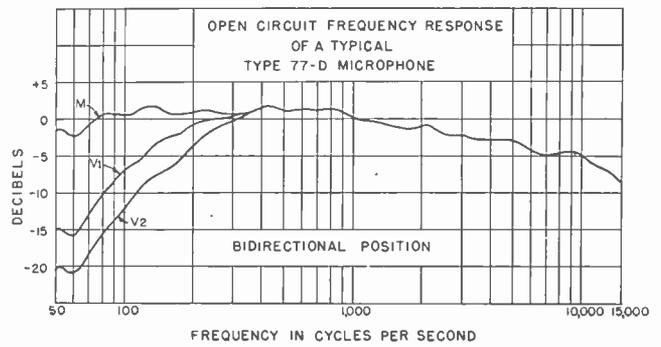
Frequency Response Curves



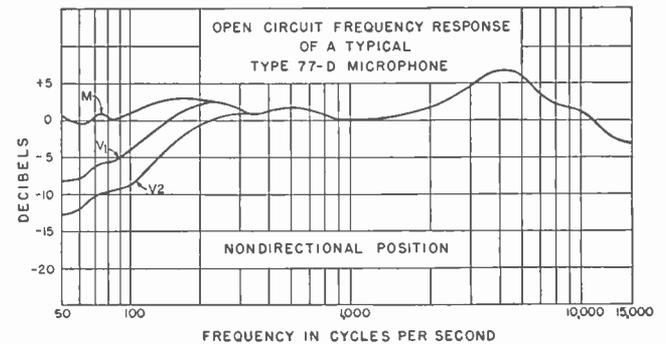
Uni-Directional Position



Bi-Directional Position



Non-Directional Position



Velocity Microphone Type 44-BX

Features

- Sensitive ribbon element for faithful reproduction.
Free from cavity or diaphragm resonance and pressure doubling.
- Uniform and smooth reproduction over the entire audio range.
- Response adjustment to provide the best possible frequency characteristics for either vocal or musical pickup.
- Bi-directional "figure eight" type pattern which allows placing of artists on both sides of the microphone and greatly reduces reflection pickup from side walls.
- Unaffected by temperature, humidity or changes in air pressure.
- Ruggedly built for hard usage.
- Shock mounted.
- Attractive in appearance.

Uses

The 44-BX is primarily intended for studio use where a microphone of the highest quality of reproduction is desired. It can be used with practically any audio facilities system and lends itself readily to unusual or difficult studio problems. The 44-BX is also well suited for high quality remote work. The 44-BX is found in almost all of the leading studios in the country and has become a recognized symbol of broadcasting.

Description

The bi-directional pattern of the Type 44-BX Microphone is of the familiar "figure eight" type. Unlike other types of microphones, it has no diaphragm—the moving element being, instead, a thin metallic ribbon so suspended as to be able to vibrate freely between the poles of a permanent magnet. Because of its lightness, the motion of this ribbon corresponds exactly to the velocity of the air particles and the voltage generated in it is, therefore, an exact reproduction of the sound waves which traverse it. Moreover, since it has no diaphragm and is open in construction so that air flows freely through it, the Type 44-BX Velocity Microphone is free from the effects of cavity resonance, diaphragm resonance and pressure doubling, which cause undesirable peaks in the response of all pressure type microphones.

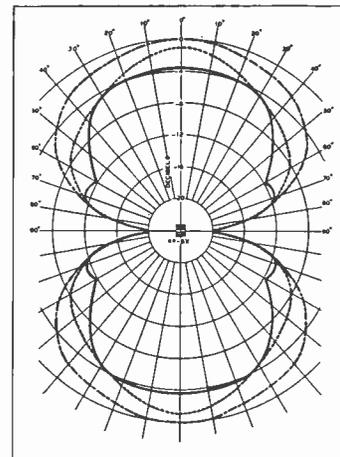
The 44-BX is attractively designed in satin chromium and umber gray to harmonize with practically any modern studio interior. The yoke mounting permits a wide range of tilting angles. The shock mounting reduces undesirable pick-up from floor vibrations, etc.

Specifications

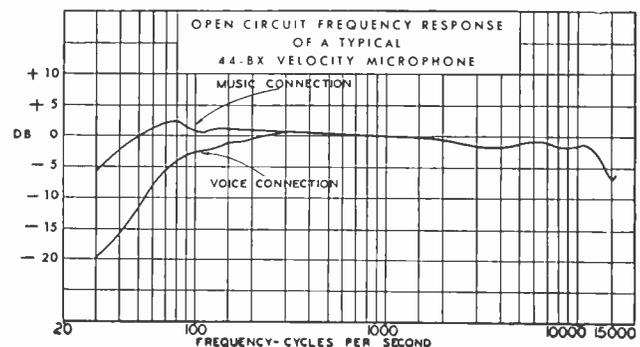
Directional Characteristic	Bi-directional
Output Impedances (tapped transformer)	50/250 ohms
Effective Output Level	-55 dbm*
Hum Pickup Level	-112 dbm**
Frequency Response (see curves)	30-15,000 cycles
Finish	Umber gray and satin chromium
Mounting	1/2" pipe thread
Dimensions, overall	
Height (including cushion mounting)	12"
Width	4 3/4"
Depth	3 3/8"
Weight (unpacked, including mountings)	8 1/2 lbs.
Cable (MI-62 2 conductor, shielded)	30' less plug
Stock Identification	MI-4027-D

* Referred to one milliwatt and a sound pressure of 10 dynes/cm².

** Level referred to a hum field of 1 x 10⁻³ gauss.



Directional characteristic of a typical 44-BX Velocity Microphone



recording head, for maximum playback output level while recording the 15 kHz tone (see Figure 5-3).

- e. Tighten lock screw L of the record head.

L. HEAD REPLACEMENT

The Tapetronics Reproducers utilize the no-mount type heads to provide quick and easy installation.

1. Loosen the two screws in the head mounting strap.
2. Remove the old head and insert a new one. (The side of the head with the printing on

it should be positioned up.)

3. Align the rear edge of the head case so that it is flush with the rear edge of the head mounting strap.
4. Tighten the screws in the head mounting strap.
5. Reconnect the head cable. The locator slot in the head socket of mono units must be on the top side to prevent a reversal of the program and cue channels. See the schematic diagram for the color code of the head lead arrangement used on stereo units.
5. After head replacement it is necessary to adjust the heads as described in (J) & (K).

SECTION V

MECHANICAL DRAWINGS

3D SERIES REPRODUCER

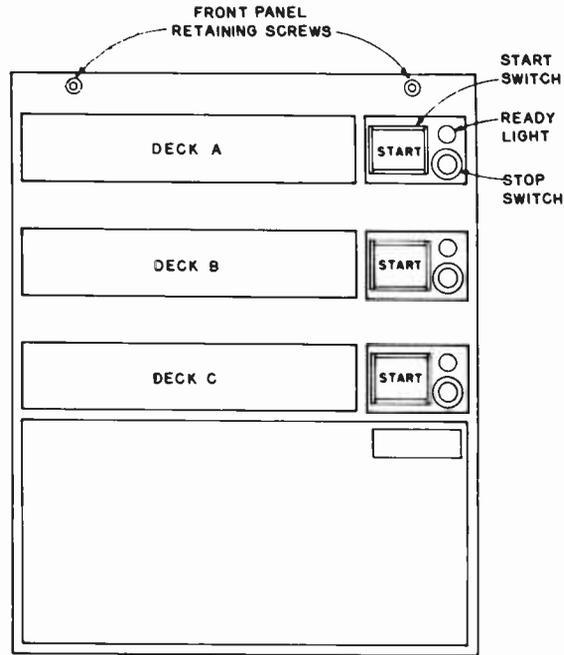


FIGURE 5-1
3D, FRONT VIEW

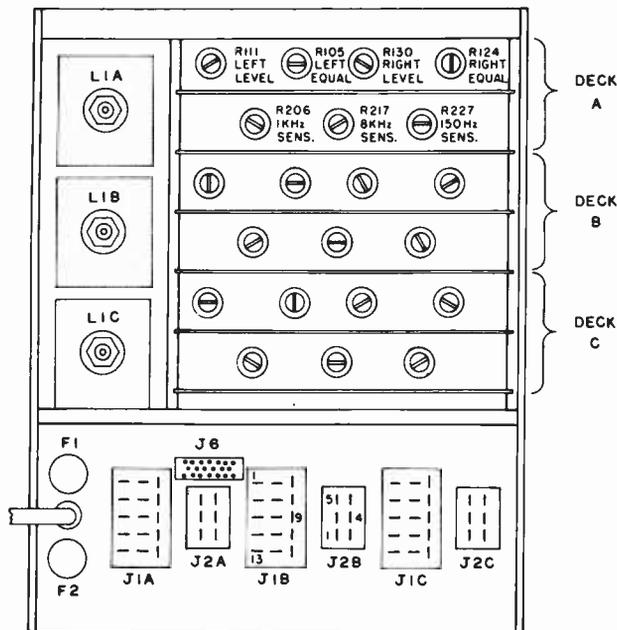


FIGURE 5-2
3D, REAR VIEW

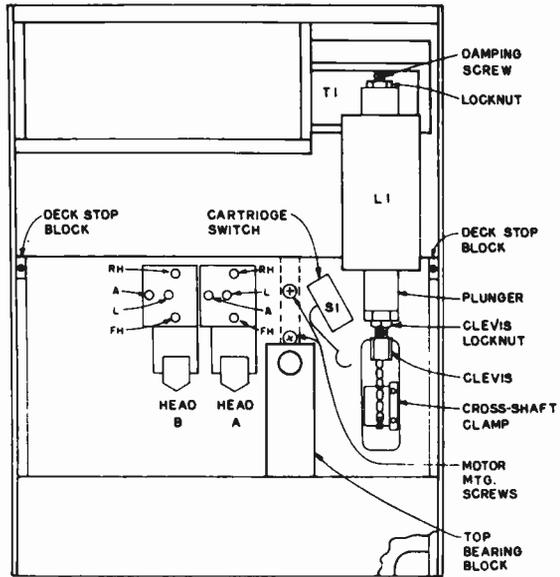


FIGURE 5-3
3D, TOP VIEW

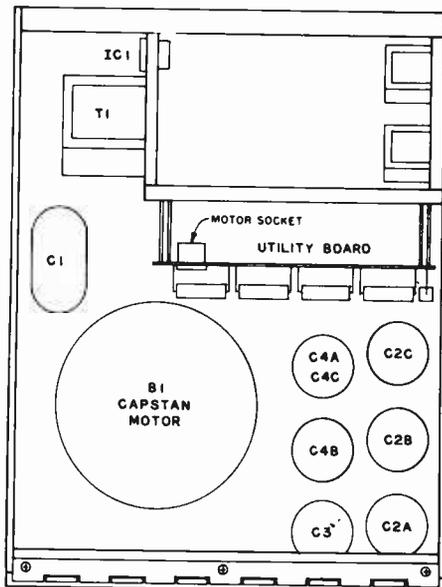


FIGURE 5-4
3D, BOTTOM VIEW

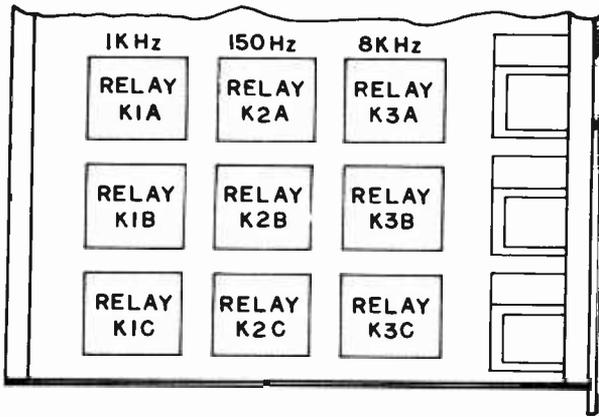


FIGURE 5-5
3D RELAY CHASSIS, REAR VIEW

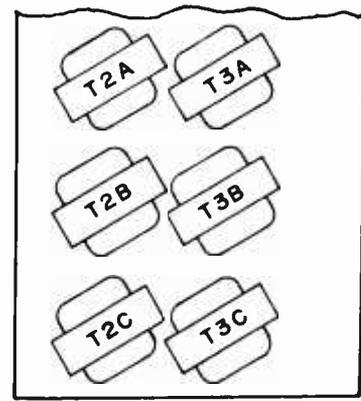


FIGURE 5-6
3D OUTPUT TRANSFORMER LAYOUT

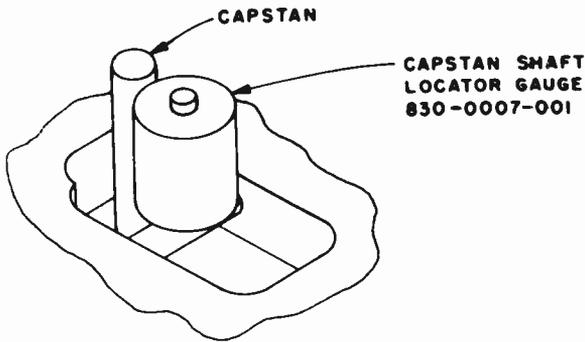


FIGURE 5-7
CAPSTAN SHAFT ALIGNMENT

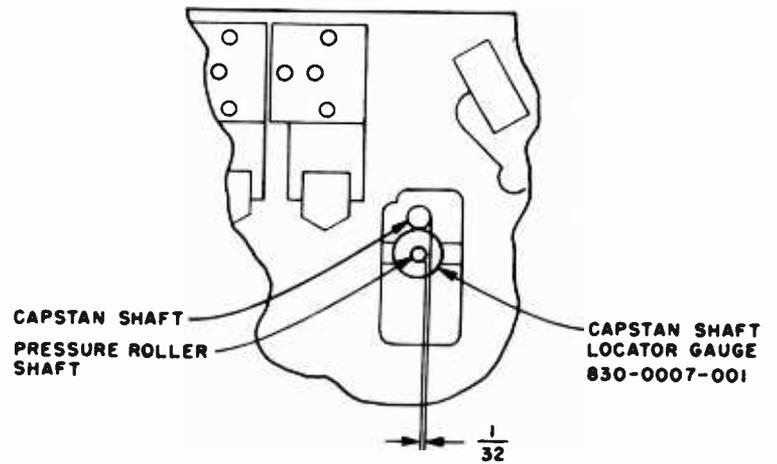


FIGURE 5-8
CAPSTAN/PRESSURE ROLLER SHAFT ALIGNMENT

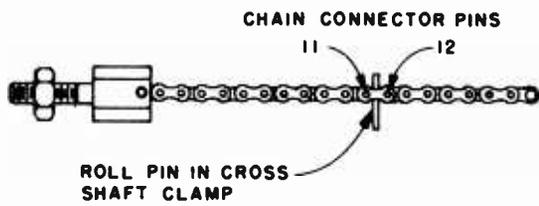


FIGURE 5-9
LINKAGE CHAIN POSITIONING

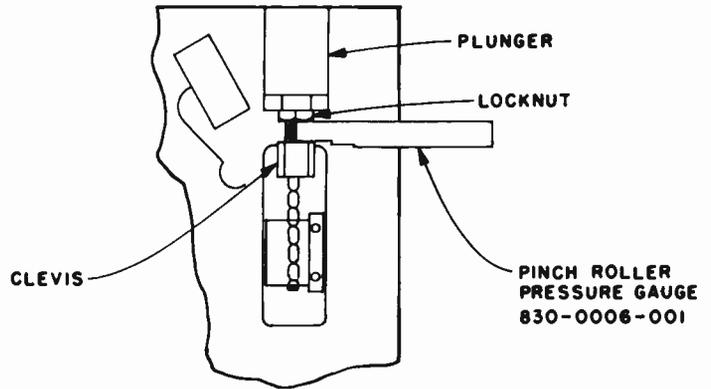


FIGURE 5-10
PRELIMINARY PLUNGER ADJUSTMENT

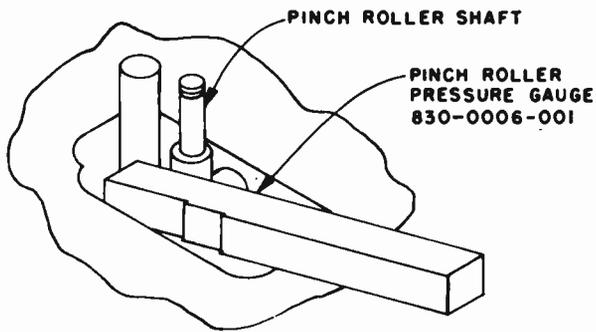


FIGURE 5-11
PRESSURE ROLLER SHAFT ALIGNMENT

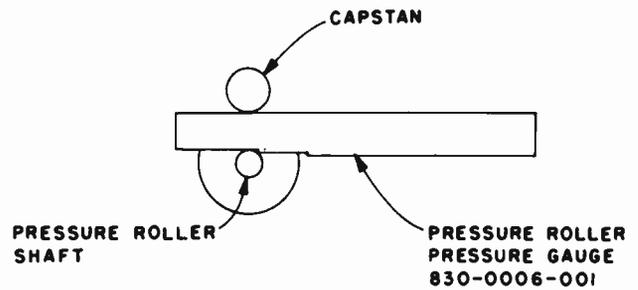


FIGURE 5-12
TEST OF PRESSURE ROLLER PRESSURE

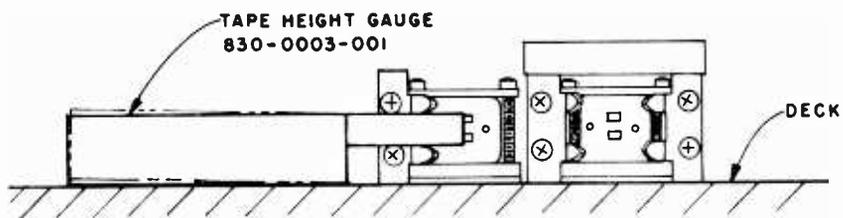


FIGURE 5-13

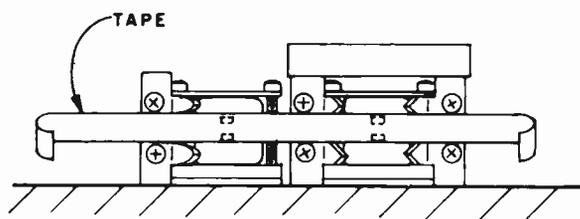


FIGURE 5-15

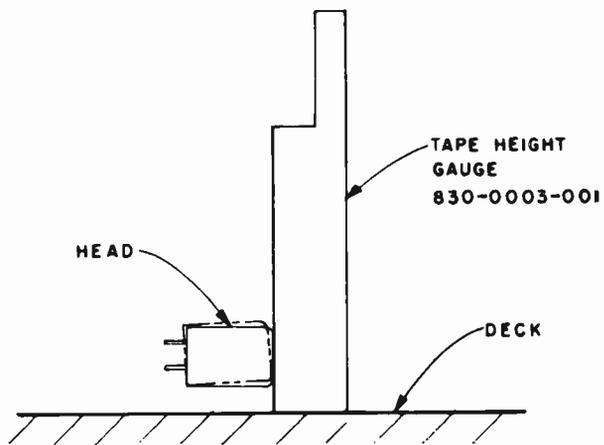


FIGURE 5-14

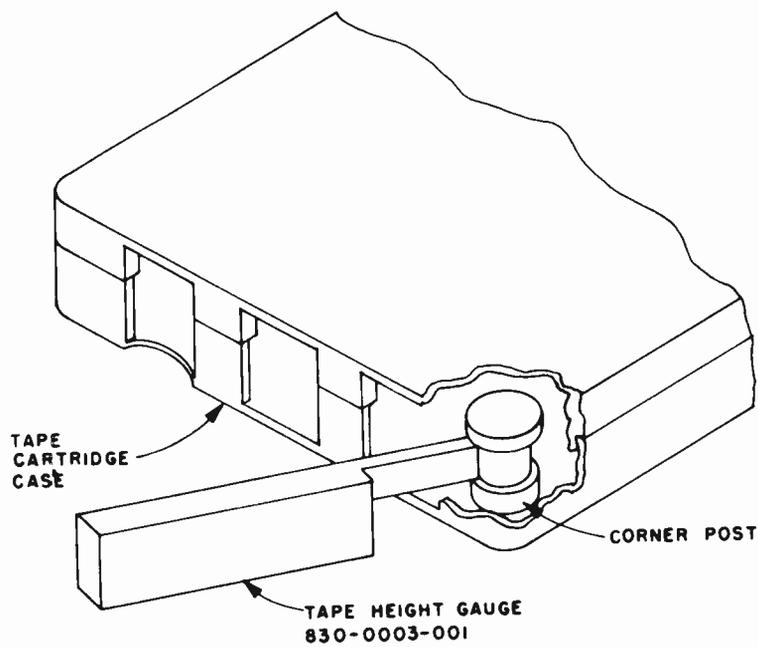


FIGURE 5-16

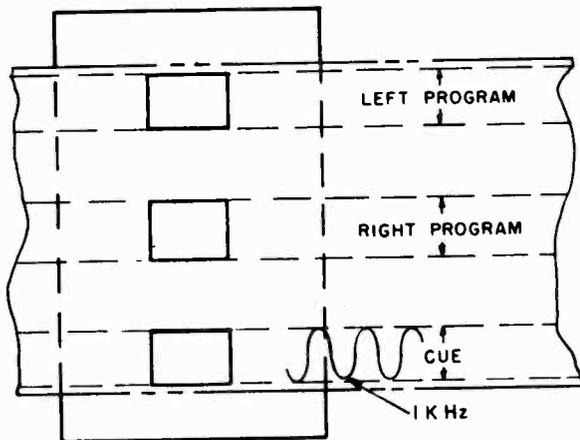
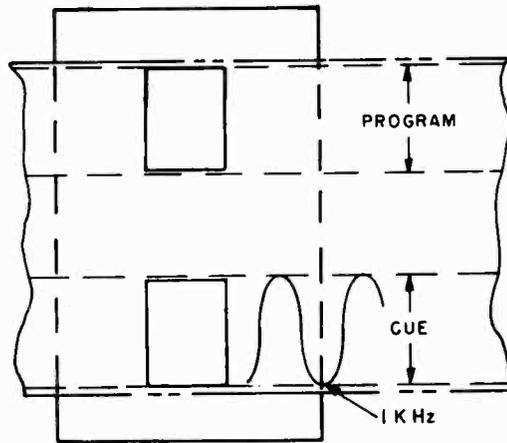


FIGURE 5-17

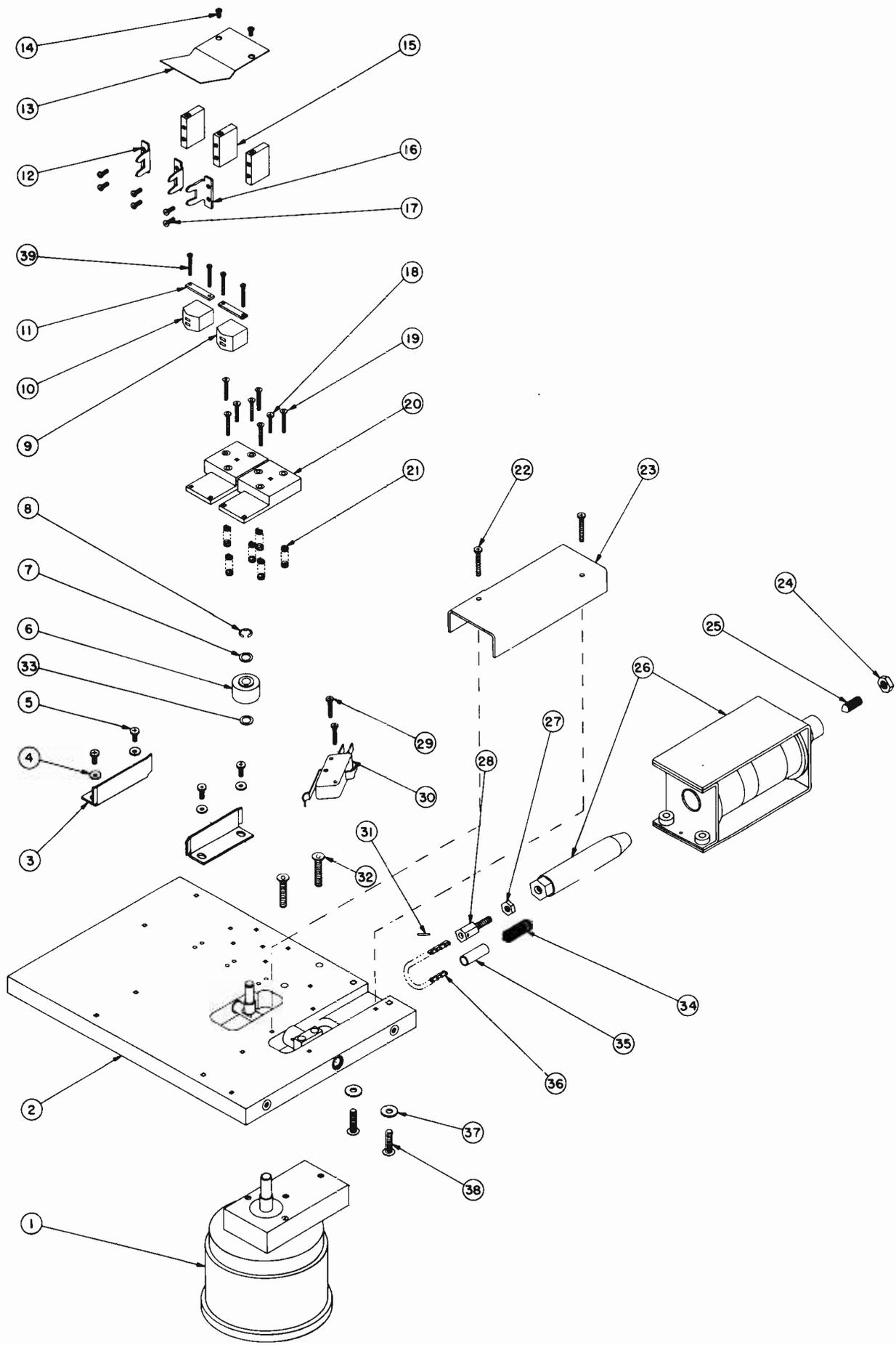


FIGURE 5-18

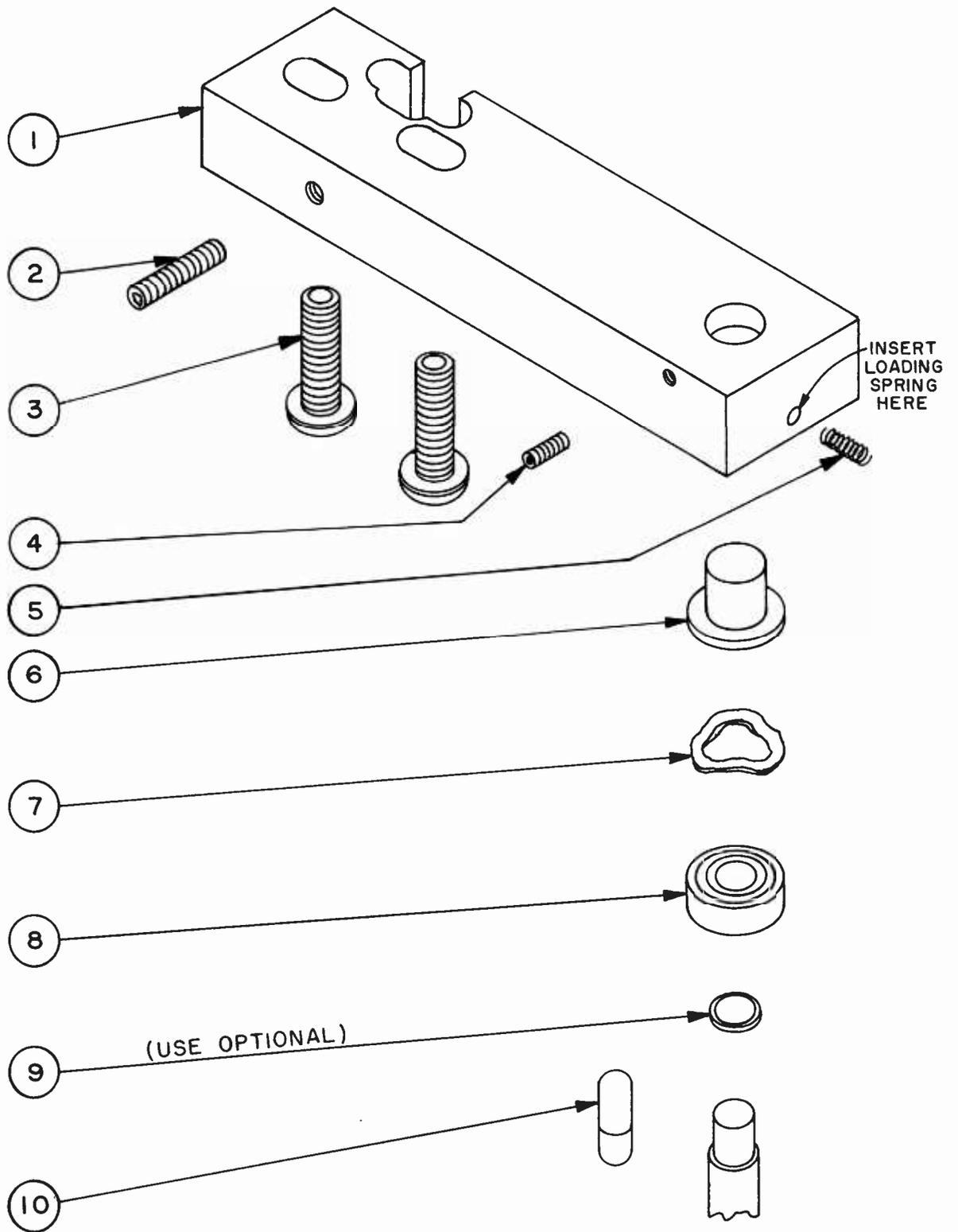


FIGURE 5-19

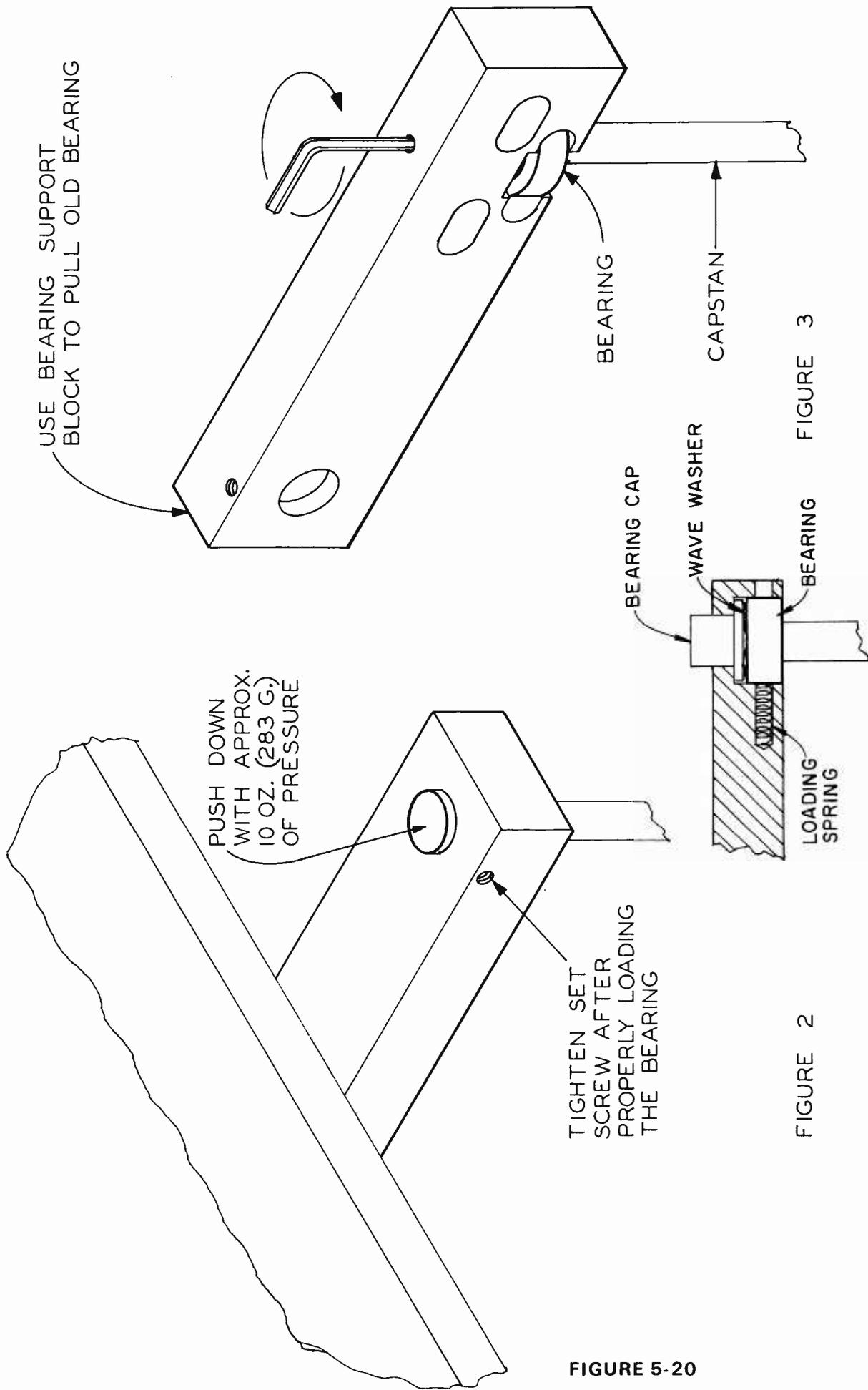


FIGURE 3

FIGURE 2

FIGURE 5-20

SECTION VI

MECHANICAL PARTS LIST

3D SERIES REPRODUCER

(See Figure 5-18)

Item	Part Number	Description	Item	Part Number	Description
1	451-0003-010	Motor, Capstan, 450 RPM, 110 V., 60 Hz, 6 inch shaft	25	355-1102-000	Screw, Set, Solenoid Damping
	451-0008-010	Motor, Capstan, 500 RPM, 110 V., 50 Hz, 6 inch shaft	26	477-0003-002	Solenoid Coil and Plunger
2	267-0003-012	Deck, Fixed, 3D Series	27	370-1001-000	Nut, Lock, Clevis Screw
	267-0002-013	Deck, Movable, 3D Series	28	264-0001-001	Clevis, Screw (Solenoid Linkage)
3	272-0001-001	Guides, Cartridge (two)	29	350-0420-000	Screws, Micro Switch Mtg., (two)
4	360-0601-000	Washers (four)	30	392-0001-000	Switch, Micro
5	350-0604-000	Screws, Cartridge Guide Mtg. (four)	31	282-0001-001	Pin, Roll
	360-1005-000	Washer, steel	32	353-0004-000	Screws, Motor Mounting
6	291-0003-001	Pressure Roller	34	301-0002-000	Spring, Expansion, Solenoid Linkage Return
7	359-0006-000	Washer, mylar	35	441-0004-010	Tubing
8	289-0002-000	Clip, retainer	36	277-0001-000	Chain, Solenoid Linkage
9	504-0002-000	Head, Mono Reproduce, Nortronics, PB2H7KNO	37	360-1003-000	Washers, (two)
	504-0004-000	Head, Stereo Reproduce, Nortronics, PB3Q7KNO	38	353-0003-000	Screws, Solenoid Mounting (two) (See Figure 5-19)
10	504-0001-000	Head, Dummy, Nortronics B12NO	1	284-0001-000	Cap, Bearing Block (hole plug)
	504-0003-000	Head, Mono Record, Nortronics PB2H4RNO (on "C" Deck only when used with recording amp)	2	253-0008-001	Block, Top Bearing
	504-0005-000	Head, Stereo Record, Nortronics PB3Q4RNO (on "C" Deck only when used with recording amp)	3		Screws, Bearing Block Mtg.
11	303-0001-001	Straps, Head Mounting (two)	4	361-0001-000	Washer, Wave
12	350-0307-000	Screws, Head Mtg. (four)	5	311-0011-000	Boot, Bearing
13	301-0001-000	Spring, Cartridge Hold-Down	6	251-0003-000	Bearing, Top
14	350-0402-000	Screws, Cartridge Spring Mtg (two)	7	311-0012-000	Ring, "O"
15	304-0001-001	Supports, Tape Guide (three)	8	359-0003-000	Washers, Shim, mylar, .265 1D, 7/16 OD
	272-0003-001	Guide, Tape, Left (one)			
16	272-0002-002	Guides, Tape, Center and Right (two)			
17	350-0403-000	Screws, Tape Guide Mtg., (six)			
18	350-0415-000	Screws, Head Block Locking, (two)			
19	353-0001-000	Screws, Head Block Azimuth and Height (six)			
20	253-0001-002	Blocks, Head Mounting (two)			
21	301-0003-000	Springs, Compression, Head Block Support (six)			
22	350-0422-000	Screws, Solenoid Plunger Cover Mtg., (two)			
23	265-0009-011	Cover, Solenoid Plunger			
24	372-1101-000	Nut, Lock			

MISCELLANEOUS MECHANICAL PARTS

290-0001-000	Slides, Deck
253-0007-001	Blocks, Deck Stop (four)
250-0624-000	Screws, (for above)
355-0601-000	Screws, set (In front of sliding decks)
293-0002-013	Grille, bottom
293-0003-014	Grille, top
311-0010-000	Foot, plastic
830-0003-001	Gauge, Tape Height
830-0006-001	Gauge, Pressure Roller Pressure
830-0007-000	Gauge, Capstan Shaft Locator

SECTION VII

PRINCIPLES OF ELECTRICAL OPERATION

3D SERIES REPRODUCER

A. GENERAL INFORMATION

This section of the manual describes the electronic circuitry and the way in which it works. The symbol designations referred to are used on the schematic diagram for the 3D Series Reproducer. (The schematics are located in Section XIV.)

B. SOLENOID POWER SUPPLIES

Diodes CR1, CR2, CR3, and CR4 are a full wave bridge rectifier which furnishes 110 volts DC to the solenoid power supply filter. The dual section filter consists of R1, R9, and the two sections of C2. The diodes and resistors are located on the Utility Power Supply board (see Figure 5-4 for the board location) while the filter capacitors are mounted on the under side of Deck C, the bottom deck (see Figure 5-4). The output of 110 volts DC (under load) is switched by the parallel contacts 7 and 11 / 8 and 12 of control relay K1. A network consisting of C13 and R17 is across the coil of each solenoid L1 for transient protection when power is removed.

C. LOW VOLTAGE POWER SUPPLY

Transformer T1 provides low voltage AC (with the center tap grounded) to diodes CR6 and CR7, a full wave rectifier that supplies the input to the regulated power supply. Capacitor C3 acts as an input filter. The diodes and resistors of this power supply are mounted on the Utility Power Supply board (see Figure 5-4 for the board location) while the filter capacitors are located on the under side of the deck (see Figure 5-4).

IC1 is the regulated power supply. (See Figure 5-4 for location.) The output of this power supply is +24 volts. The regulated power supply is protected by F1, a fast acting fuse. The output of the regulated power supply is represented on the schematic diagram by a triangle which is common to all other points on the schematic shown with a like symbol. R3 and C4 provide decoupling and additional filtering for the program amplifier card.

The case of IC1 is insulated from the chassis by a mica washer to prevent hum loops. To provide maximum heat dissipation, the mica washer is coated on both sides with thermal conductive agent and IC1 is held firmly in place with two mounting screws.

D. CONTROL CIRCUITRY

The chassis control circuitry is furnished with power by the low voltage DC power supply and utilizes ground switching. At all times other than when a primary (1 kHz) cue tone is being detected, positive voltage is routed from the low voltage DC power supply through R215 and CR205 on the cue card to control relay, K1. When a cartridge has been properly inserted in the deck, the cartridge sensing micro switch S1 closes furnishing ground information through contacts 2 and 10 on relay K1 and pin 2 on J5 to the stop cue tone protection circuit on the cue card, the action of which is described under Cue Circuitry. This same "ready" ground is furnished through CR8 and R4 to illuminate I3, the "ready" lamp, and through R5 to a remote "ready" lamp.

The ground furnished through S1 is routed to S3, the Stop Switch, through pin 4 on J1 to a remote stop switch, through the jumper installed between pins 3 and 4 on J1 to S2, the Start Switch, and through pin 3 on J1 to a remote start switch. On the bottom deck the ground arriving at the Start Switch is also made available to a recording amplifier through pin 18 on J6 and through contacts 9 and 1 on K1 and pin 15 on J6.

With conditions described above, pressing the Start Switch presents a ground to pin 13, the coil of K1, the control relay, which energizes and holds itself energized by closing contacts 5 and 9. Contacts 1 and 9 open removing the "ready" ground from the recording amplifier. Contacts 2 and 10 open removing the "ready" ground from the stop tone cue protection circuit and the Ready lamps. Contacts 6 and 10 close providing a ground through R6 to a remote run lamp and to the audio squelch to turn on the audio. Parallel contacts 7 and 11 / 8 and 12 close completing the circuit to energize the solenoid.

When a primary (1 kHz) cue tone is detected, transistor Q203 turns on and takes the junction of R215 and CR205 to ground, removing the positive holding voltage from K1.

Pressing S3, the Stop Switch, accomplishes the same thing with a normally open, momentary action switch which eliminates the disadvantages of a series stop circuit. If for any reason a series remote stop circuit is required, the normally open stop circuit can be replaced with a normally closed circuit by removing the jumper installed inside the machine between pins 3 and 4 on J1

and installing a remote, normally closed switch in its place.

When a secondary (150 Hz) cue tone is sensed, relay K2 is energized. A contact closure is then provided on pins 10 and 11 of J1 by parallel contacts 5 and 9 / 6 and 10. The closure of contacts 8 and 12 shorts out dropping resistor R7 providing a brighter illumination of the Run Lamp as an indication of 150 Hz cue tone detection. Contacts 7 and 11 short out R6 in the remote run lamp circuit.

Relay K3 is energized when an 8 kHz tone is detected. A contact closure is provided on pins 12 and 13 of J1 by parallel contacts 5 and 9 / 6 and 10. The closure of contacts 8 and 12 provides an indication of the 8 kHz cue tone detection by returning the ground to the Ready Lamp circuit. Diode CR8 functions as a blocking diode and prevents this ground from being presented to the stop cue tone protection circuit.

E. CUE CIRCUITRY

The plug-in Cue Detector card is located at the rear of the deck assembly. The 1 kHz Primary Cue detector and the optional 150 Hz and 8 kHz detectors when so equipped are designed to operate from tones as specified in the NAB Standards.

Transistors Q210 and Q211 are the equalized preamplifier stages which provide essentially equal voltage for each of the normal level cue tones to the common signal bus of the three detectors (when so equipped).

Diodes CR201 and CR202 act as a signal limiter to prevent the signal bus from exceeding the detector input maximum level of approximately .5 volts. This bus is also supplied to the remote socket J1 (Pin 15) and to the recorder meter circuits via J6 (Pin 2) of WP Series Reproducers.

The 1 kHz Primary Cue section contains a stop cue tone protection circuit which prevents the machine from being stopped by a 1 kHz tone for approximately two seconds after the unit is started. While the reproducer is sitting idle with a cartridge inserted (cartridge sensing micro switch S1 closed), capacitor C206 is discharged through R204, CR203, contacts 2 and 10 of relay K1, and S1 to ground. When the reproducer is started, the discharge path is opened by relay K1, and C206 begins to be charged by the 24 volt DC power supply through resistor R203. While C206 is charging, the base of Q201 is clamped sufficiently close to ground to prevent operation of the 1 kHz detector. When C206 is charged to approximately 11 volts, diode CR204 is reverse biased and the clamp is removed.

In the 1 kHz Primary Cue Section, a series resonant circuit consisting of L201, C208 and C209 provides a low impedance regenerative cir-

cuit for Q201 at 1 kHz, while attenuating frequencies more than a few percent above or below 1 kHz. Transistor Q202 is a zero bias signal rectifier which amplifies positive current pulses present at its base. R212, R213 and C210 act as the rectifier load and coupling network to switching transistor Q203. This configuration also acts to filter out any transients that may be present on incoming signals. Q203 diverts current flow from relay coil K1 during the cue tone and causes it to de-energize and stop the tape drive.

The operation of the 150 Hz Secondary and 8 kHz Tertiary Cue sections is, in principle, the same — except that the tuned circuit is designed for the respective frequency. Since no tone protection is provided in these circuits, the 150 Hz and 8 kHz detectors are free to operate at any time. Switching transistors Q209 and Q206, when conducting, operate relays K2 and K3 respectively.

NOTE: The NAB standards specify that the Primary Cue tone oscillator generate a tone of 925 Hz to 1075 Hz. Many older cartridge recorders produce a stop cue tone that is well outside these tolerances.

A broad-band cue detector is supplied in ITC single cue tone machines. This broad-band cue detector will pass a wide range of frequencies which permits proper cueing of cartridges recorded on older machines. The broad-band characteristics will cause no problem as long as only single cue tone operation is used. Components C220 and C221 provide the broad-band operation.

The broad-band detector can be changed to the narrow band mode (1 kHz \pm 75 Hz) by removing the white wire strap that is on top of the detector PC card. In addition, it may be necessary to increase the gain of the detector by turning the sensitivity control clockwise. (The detector has about 10 dB less gain in the narrow band mode.)

F. PROGRAM PLAY CIRCUITRY

The program play amplifier is located on the plug-in PC Card immediately to the rear of the deck assembly. Single monophonic or dual stereophonic amplifiers of identical design are on the same card, depending upon machine design.

Transistors Q101 and Q102 are the high stability equalized pre-amplifier stages. Adjustable AC feedback equalization is employed to improve input impedance. These components are C104, R104 and R105 in the L. Channel amplifier. Out-

put from these stages is coupled through the electronic attenuator IC101 to the gain control R111. Audio is muted by IC101 in all but the run mode. Transistors Q103 and Q104 are conventional voltage amplifiers, each with local AC feedback employed. The output is connected via edge pin 1 to the balanced output transformer T2. Output impedance is normally 600 ohms but may be changed to 150 ohms by re-connection of the secondary wires. Refer to the schematic notes.

A. CONTROLS

The various electrical controls listed below are adjusted at the factory to provide optimum operation of the ITC Reproducer. At the time of installation, the only control which may require adjustment is Program Level.

A good maintenance schedule will include periodic checks (weekly or monthly—depending upon operational requirements) of the machine's electronics, but always remember to check the adjustment of and demagnetize heads first. Small adjustments of the electronic controls may be required to compensate for normal head wear, but large adjustments may indicate the need for head replacement or further testing.

See Figure 5-2 for the location of the electronic controls, and notice that all controls, both program and cue, are duplicated for each deck.

1. **Program Level:** The output level of the program amplifier(s) is factory adjusted for 0 dBm when reproducing a "standard level" tone. R111 is the control for mono reproducers and the left channel of stereo units. R130 controls the right channel of stereo machines. If the output level must be reduced below -10 dBm, an external pad should be installed to maintain the best possible signal to noise ratio.
2. **Program Equalization:** Equalization of the program amplifier(s) is factory adjusted to

conform with NAB equalization curve. The equalization control(s) may be used to compensate for head wear and for small variations in heads when replacement is required. The equalization control for mono and the left channel of stereo units is R105 while R124 is the control for the right channel of stereo reproducers. The equalization control(s) should be adjusted to provide the smoothest possible response during the reproduction of a frequency response test cartridge.

3. **Primary (1 kHz) Cue Sensitivity:** The sensitivity of the 1 kHz Primary Cue Detector is increased by turning R206 clockwise. This control is normally set to respond to a 1 kHz tone 8 dB below the NAB level for this tone.
4. **Secondary (150 Hz) Cue Sensitivity:** Turning R227 clockwise increases the sensitivity of the Secondary (150 Hz) Cue Detector and is normally adjusted to respond to a 150 Hz tone 10 dB below the NAB level for this tone.
5. **Tertiary (8 kHz) Cue Sensitivity:** To increase the sensitivity of the Tertiary (8 kHz) Cue Detector, turn R217 clockwise. Normal adjustment will allow the 8 kHz Detector to respond to a tone 10 dB below the NAB level for this tone.

TEST CARTRIDGES

A. PREVENTIVE MAINTENANCE

Preventive maintenance of the electrical adjustments should be done on monthly schedule. Each installation should be equipped with a primary test cartridge such as the NAB Standard Test Tape.

Should a primary test cartridge be used to test several tape transports on a monthly basis, the short wave length sensitivity will be degraded by repeated playing. The proper handling and storing of the Primary Test Cartridge, and proper cleaning of heads and tape guides will minimize signal loss. The best method to preserve a primary test cartridge is to record your own test cartridges as outlined below and compare them with the primary test cartridge every six months. It is important that all test cartridges contain the same type of tape that is used for normal recording.

B. TEST CARTRIDGES

1. **Test Cartridge No. 1:** Carefully align the reproducer to the Primary Test Cartridge for azimuth and level. Verify the proper adjustment of the recorder electronics and the recording head azimuth. Select a properly erased cartridge of known good guidance. Record a 15 kHz azimuth tone at -10 dB level for 30 seconds. Follow this tone with 400 Hz, 10 kHz, 5 kHz, 2500 Hz, 1 kHz, 250 Hz, 100 Hz and 50 Hz tones at -10 dB level and 5 seconds duration. The last tone should be 400 Hz at 0 dB level of 20 seconds duration. This tape can now be used for day to day response tests as a second generation standard.
2. **Test Cartridge No. 2:** (Refer to the recorder instructions for adjusting the level of the tone oscillators.) Temporarily connect the cue head to the properly calibrated program amplifier input. With an erased tape, adjust these tone oscillator levels to 8 dB below normal. The program amplifier will play at -7.6 dB for 1 kHz, -1.9 dB for 150 Hz and -17.4 dB for 8 kHz. Record each tone at an interval of approximately 5 seconds at this level. Set this tape aside. With another tape, return the tone oscillators to their proper settings (+0.4 dB for 1 kHz, +6.1 dB for 150 Hz, and -9.4 dB for 8 kHz). The -8 dB tone tape may now be used as required to adjust the tone detector levels to just reliably operate at the -8 dB from normal tone level setting.
3. **Test Cartridge No. 3:** Using a long car-

3D SERIES REPRODUCER

tridge, record a single 1 kHz cue tone on the cue track. Accurately time this cartridge in several machines. Average the playing time and mark the exact time on the rear of this cartridge.

If a frequency counter is available, record a 12 kHz tone on the program track at -10 dB. Play this cartridge in two or more tape transports and measure the frequency of the tone. Average the measurements and mark the frequency on the rear of the cartridge.

4. **Test Cartridge No. 4:** This cartridge is to be used for the height adjustment of the heads during the run mode. The cartridge has the pressure pads removed and the top section is cut out to allow observation of the tape travel across the heads. Since the pressure pads are removed, the tape travel across the cartridge face must be checked to be sure it is parallel with the base of the case.

C. USE OF TEST CARTRIDGES

1. **Mechanical Head Adjustment:** Place test cartridge No. 4 in the tape transport and check the tape travel across the tape heads. (Refer to Figure 5-15.) If the tape travel is incorrect, perform adjustment in accordance with Section 4.
2. **Program Playback Level:** The output level of the program amplifier is factory adjusted for 0 dBm when reproducing the NAB Standard Reference Level Tape, 400 Hz. Test cartridge No. 1 may be used to adjust this level as required. Refer to Section 8-1 for these adjustments.
3. **Program Playback Equalization:** Equalization of the program amplifier(s) is adjusted for flattest response. Test cartridge No. 1 may be used to adjust this response when necessary. It is cautioned not to attempt this adjustment until reproduce head azimuth adjustment of Section 4 are performed.
4. **Cue Detector(s) Sensitivity:** Test cartridge No. 2 is used to make adjustments as required. Refer to Section 8-3, 4, and 5 for these adjustments.
5. **Machine Speed Tests:** Test cartridge No. 3 is used for the periodic speed test. Insert this cartridge in the machine and measure the running time. If the running time is outside the 0.1% specification, refer to the mechanical adjustments in Section 4 and perform these as necessary to restore proper timing.

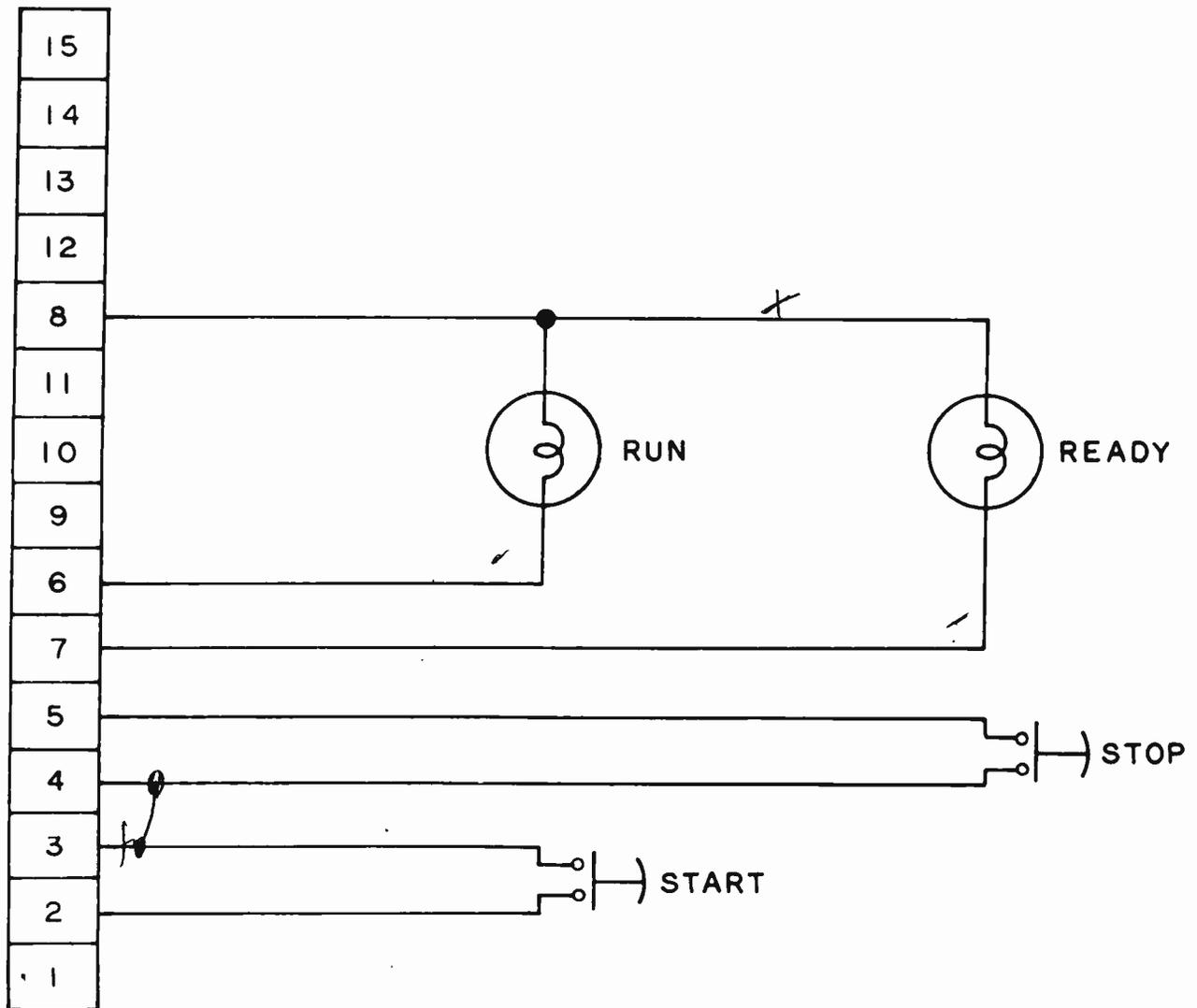
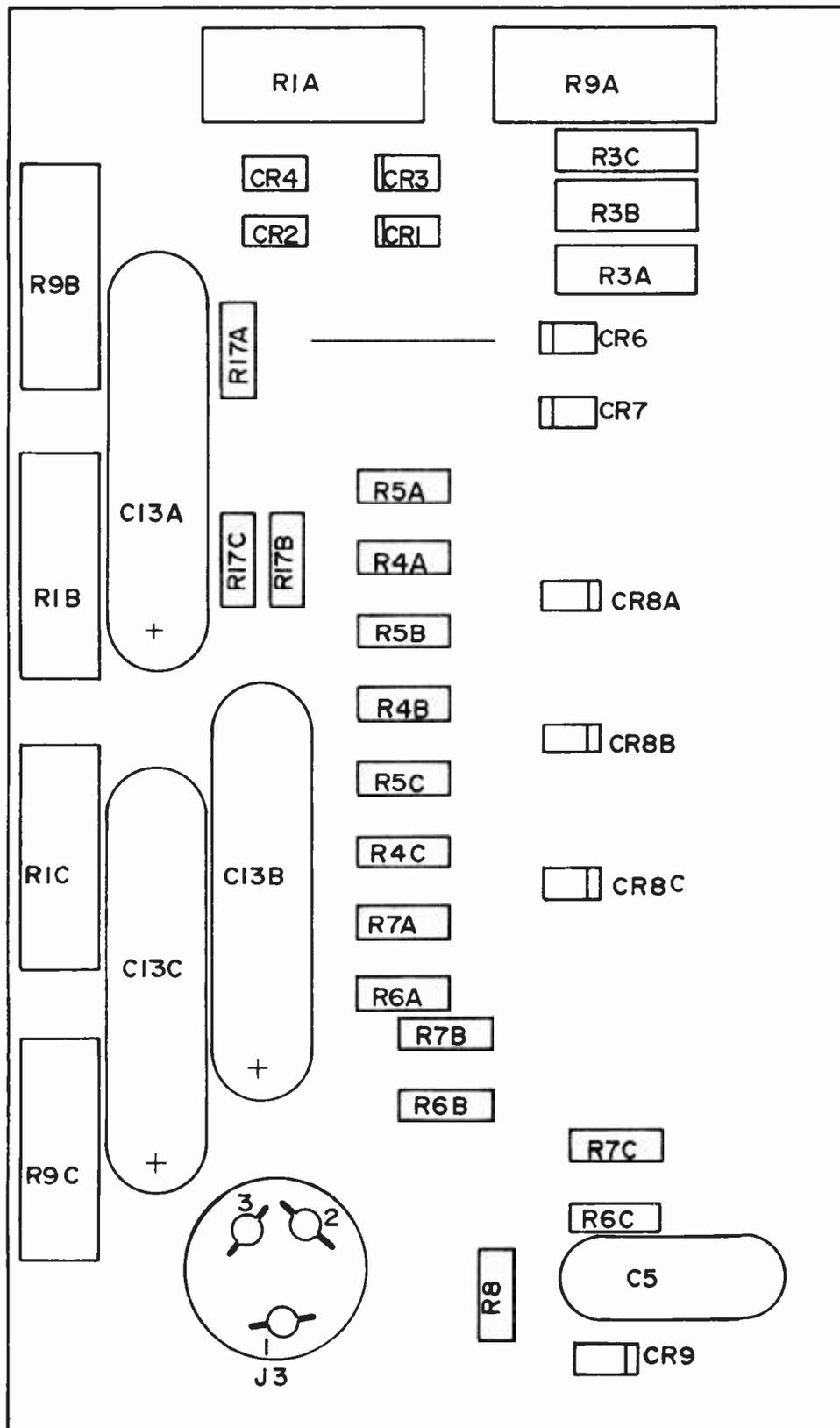


FIGURE 10-1
SAMPLE REMOTE CONTROL SCHEMATIC



831-0030-003
UTILITY CARD

CUE DETECTOR CARD

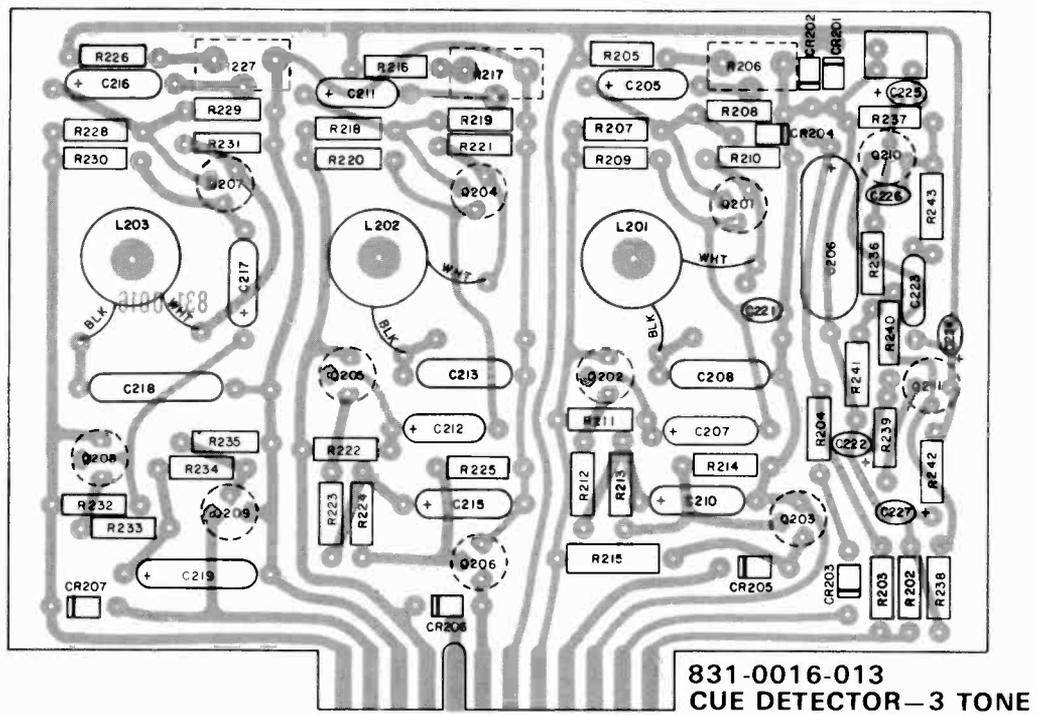
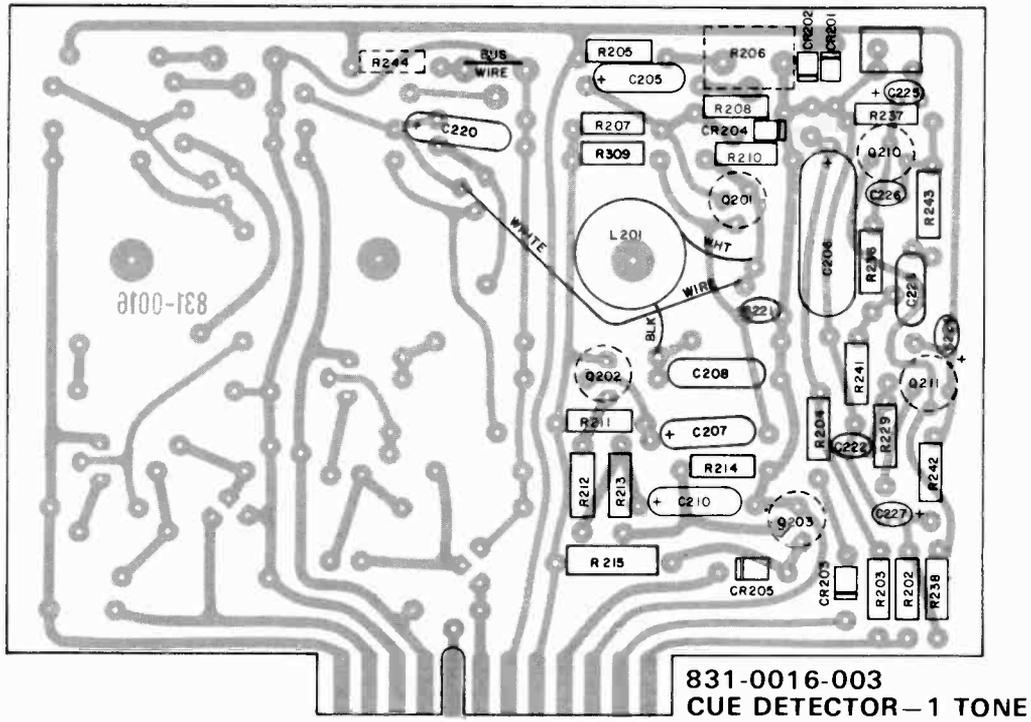


FIGURE 10-3

PROGRAM AMPLIFIER CARD

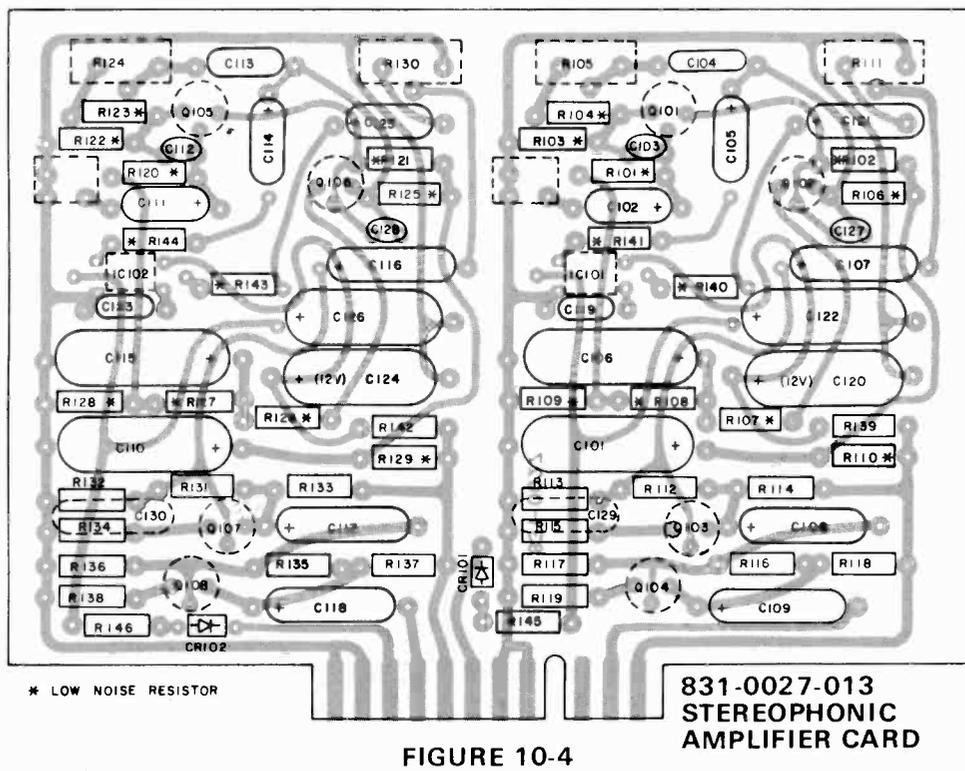
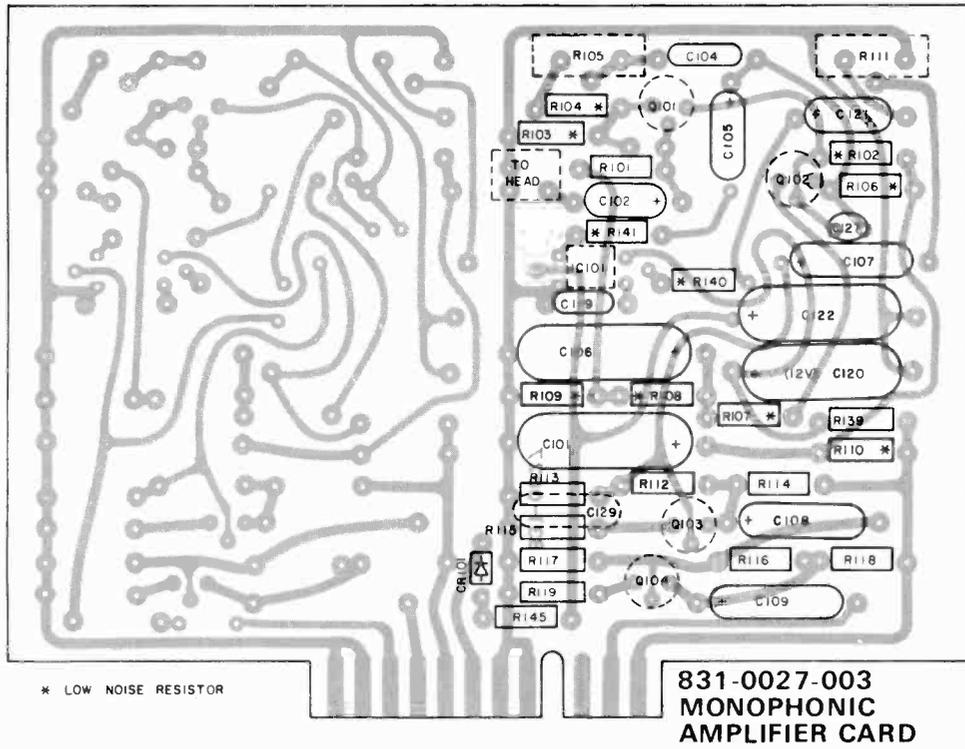


FIGURE 10-4

SECTION XI

ELECTRICAL PARTS LIST

3D SERIES REPRODUCER

A. CHASSIS

Symbol	Part Number	Description
FUSES		
F1	417-0006-000	¾ ampere, 3AG
F2	417-0002-000	1 ampere, slow-blow, 3AG
LAMPS		
I2 A,B,C	415-0001-000	# 327, 28 V
I3 A,B,C	415-0003-000	Cartridge, 28 V, yellow, Dialco 507-3918-1476-600
	263-0001-000	Clip, Retaining, for above lamp
INTEGRATED CIRCUIT		
IC1	605-0007-000	Series Regulated Power Supply, 25 VDC, 1 amp, Fairchild 7824 KC
SOCKETS		
J1 A,B,C	380-0004-000	15 pin (Control)
J2 A,B,C	380-0003-000	6 pin (Audio)
J4 A,B,C	380-0002-000	12 pin Card Edge (Program)
J5 A,B,C	280-0002-000	12 pin Card Edge (Cue)
J6	380-0011-000	20 pin (Interconnect to Recording Amp)
RELAYS		
K1 A,B,C	480-0001-000	4 PDT, 24 V (1 kHz, Control)
K2 A,B,C	480-0001-000	4 PDT, 24 V (150 Hz)
K3 A,B,C	480-0001-000	4 PDT, 24 V (8 kHz)
INDUCTIVE DEVICES		
L1 A,B,C	477-0006-002	Solenoid, 110 Volt DC
L2 A,B,C	504-0002-000	Head, Mono Reproduce, Nortronics PB2H7KNO
	504-0004-000	Head, Stereo Reproduce, Nortronics PB3Q7KNO
L3 A,B,C	504-0001-000	Head, Dummy, Nortronics H801016
	504-0003-000	Head, Mono Record, Nortronics PB2H4RNO (on "C" Deck only when used with a WRA Series Re- cording Amplifier)
	504-0005-000	Head, Stereo Record, Nortronics PB3Q4RNO (on "C" Deck only when used with a WRA Series Re- cording Amplifier)
PLUGS		
P1 A,B,C	378-0003-000	15 pin (Control)
P2 A,B,C	378-0002-000	6 pin (Audio)
P3	378-0001-000	3 pin (Motor)
SWITCHES		
S1 A,B,C	392-0001-000	Micro (Cartridge Sensing)
S2 A,B,C	391-0002-000	Push-Button (start) Dialco 513-0101-604
	404-0007-010	Lens for above, green, Dialco 303-3472, Engraved "START"
S3 A,B,C	391-0004-000	Switch, Push-Button (stop) Switchcraft 913
TRANSFORMERS		
T1	526-0002-000	Power (NT 1117)
T2 A,B,C	532-0001-010	Audio (NT 712)
T3 A,B,C	532-0001-010	Audio (NT712) (Stereo Only)
CAPACITORS		
C1	683-0001-000	1.5 mfd, 370 V, (for 60 Hz motor)
	683-0003-000	2.0 mfd, 370 V, (for 50 Hz motor)
C2 A,B,C	698-0003-000	100/ 100 mfd, 250 V

Symbol	Part Number	Description
C3	689-0001-000	1000 mfd, 50 V
C4 A	698-0001-000	1000 mfd, 50 V
C4 B,C	698-0004-000	1000/ 1000 mfd, 50 V
MISCELLANEOUS		
	507-0001-010	Head Lead Assembly, mono play
	507-0002-030	Head Lead Assembly, stereo play left
	507-0003-030	Head Lead Assembly, stereo play cue
	507-0004-030	Head Lead Assembly, stereo play right
	507-0001-000	Head Lead Assembly, mono record
	507-0002-030	Head Lead Assembly, stereo record left
	507-0003-030	Head Lead Assembly, stereo record cue
	507-0004-030	Head Lead Assembly, stereo record right
	433-0001-000	Cord, AC Power
	418-0001-000	Holder, Fuse
	487-0001-000	Sockets, relay
	613-0002-000	Socket, TO-3 Transistor (for IC1)
	831-0012-002	PC Card, Test Extender, 12 Conductor

B. UTILITY CARD (831-0030-003)

Symbol	Part Number	Description
CAPACITORS		
C5	696-0078-000	100 mf, 12 V
C13 A,B,C	696-0164-000	20 mf, 150 V
RESISTORS		
R1 A,B,C	628-0116-000	75 ohms, 5 watts, 5%
R3 A,B,C	626-0439-000	100 ohms, 1 watt, 10%
R4 A,B,C	626-0251-000	330 ohms, ½ watt, 5%
R5 A,B,C	630-0239-000	100 ohms, ½ watt, 5%
R6 A,B,C	630-0239-000	100 ohms, ½ watt, 5%
R7 A,B,C	626-0239-000	100 ohms, ½ watt, 5%
R8	626-0231-000	47 ohms, ½ watt, 5%
R9 A,B,C	628-0116-000	75 ohms, 5 watt, 5%
R17 A,B,C	626-0231-000	47 ohms, ½ watt, 5%
DIODES		
CR1	575-0007-000	IN4005
CR2	575-0007-000	IN4005
CR3	575-0007-000	IN4005
CR4	575-0007-000	IN4005
CR6	575-0007-000	IN4005
CR7	575-0007-000	IN4005
CR8 A,B,C	575-0007-000	IN4005
CR9	575-0007-000	IN4005
MISCELLANEOUS		
J3	380-0001-000	3 Pin motor socket, w/ clip

C. PROGRAM REPRODUCE AMPLIFIER CARD

MONO	831-0027-003
STEREO	831-0027-013

Symbol	Part Number	Description
CAPACITORS		
C101	696-0124-000	100 mfd, 25 V.
C102	696-0114-000	5 mfd, 25 V.
C103	677-0001-000	100 pfd, 300 V.
C104	681-0046-000	.01 mfd, 200 V.
C105	696-0114-000	5 mfd, 25 V.
C106	696-0124-000	100 mfd, 25 V.
C107	696-0117-000	10 mfd, 25 V.

Symbol	Part Number	Description	Symbol	Part Number	Description
C108	696-0117-000	10 mfd, 25 V.	R127	630-0283-000	6800 ohms, 1/2 watt, 5%, Lo Noise
C109	696-0117-000	10 mfd, 25 V.	R128	630-0269-000	1800 ohms, 1/2 watt, 5%, Lo Noise
C119	681-0032-000	.00068 mfd, 200 V.	R129	630-0293-000	18 K ohms, 1/2 watt, 5%, Lo Noise
C120	696-0202-000	450 mfd, 12 V.	R130	636-0002-000	Variable, 10 K ohms, 1/4 watt, (Right Level)
C121	696-0114-000	5 mfd, 25 V.	R131	626-0307-000	68 K ohms, 1/2 watt, 5%
C122	696-0122-000	50 mfd, 25 V.	R132	626-0287-000	10 K ohms, 1/2 watt, 5%
C127	677-0001-000	100 pfd, 300 V.	R133	626-0271-000	2.2 K ohms, 1/2 watt, 5%
C129	681-0050-000	.022 mfd, 200 V.	R134	626-0251-000	330 ohms, 1/2 watt, 5%

CAPACITORS (STEREO ONLY)

C110	696-0124-000	100 mfd, 25 V.
C111	696-0114-000	5 mfd, 25 V.
C112	677-0001-000	100 pfd, 300 V.
C113	681-0046-000	.01 mfd, 200 V.
C114	696-0114-000	5 mfd, 25 V.
C115	696-0124-000	100 mfd, 25 V.
C116	696-0117-000	10 mfd, 25 V.
C117	696-0117-000	10 mfd, 25 V.
C118	696-0117-000	10 mfd, 25 V.
C123	681-0032-000	.00068 mfd, 200 V.
C124	696-0202-000	450 mfd, 12 V.
C125	696-0114-000	5 mfd, 25 V.
C126	696-0122-000	50 mfd, 25 V.
C128	677-0001-000	100 pfd, 300 V.
C130	681-0050-000	.022 mfd, 200 V.

TRANSISTORS

Q101	590-0013-000	2N5089
Q102	590-0013-000	2N5089
Q103	590-0017-000	2N5816
Q104	590-0017-000	2N5816

TRANSISTORS (STEREO ONLY)

Q105	590-0013-000	2N5089
Q106	590-0013-000	2N5089
Q107	590-0017-000	2N5816
Q108	590-0017-000	2N5816

RESISTORS

R101	626-0311-000	100 K ohms, 1/2 watt, 5%
R102	630-0311-000	100 K ohms, 1/2 watt, 5%, Lo Noise
R103	630-0249-000	100 ohms, 1/2 watt, 5%, Lo Noise
R104	626-0275-000	3.3 K ohms, 1/2 watt, 5%
R105	636-0002-000	Variable, 10 K ohms, 1/4 watt, (L. Equalization)
R106	630-0287-000	10 K ohms, 1/2 watt, 5%, Lo Noise
R107	630-0259-000	680 ohms, 1/2 watt, 5%, Lo Noise
R108	630-0283-000	680 ohms, 1/2 watt, 5%, Lo Noise
R109	630-0267-000	1500 ohms, 1/2 watt, 5%, Lo Noise
R110	630-0295-000	22 K ohms, 1/2 watt, 5%, Lo Noise
	630-0293-000	18 K ohms, 1/2 watt, 5%, Lo Noise
		(STEREO ONLY)
R111	636-0002-000	Variable, 10 K ohms, 1/4 watt, (L. Level)
R112	626-0307-000	68 K ohms, 1/2 watt, 5%
R113	626-0287-000	10 K ohms, 1/2 watt, 5%
R114	626-0271-000	2.2 K ohms, 1/2 watt, 5%
R115	626-0251-000	330 ohms, 1/2 watt, 5%
R116	626-0295-000	22 K ohms, 1/2 watt, 5%
R117	626-0279-000	4700 ohms, 1/2 watt, 5%
R118	626-0259-000	680 ohms, 1/2 watt, 5%
R119	626-0231-000	47 ohms, 1/2 watt, 5%
R139	626-0263-000	1 K ohms, 1/2 watt, 5%
R140	626-0271-000	2.2 K ohms, 1/2 watt, 5%
R141	626-0303-000	47 K ohms, 1/2 watt, 5%
R145	626-0267-000	1500 ohms, 1/2 watt, 5%

RESISTORS (STEREO ONLY)

R120	626-0311-000	100 K ohms, 1/2 watt, 5%
R121	630-0311-000	100 K ohms, 1/2 watt, 5%, Lo Noise
R122	630-0249-000	100 ohms, 1/2 watt, 5%, Lo Noise
R123	626-0275-000	3.3 K ohms, 1/2 watt, 5%
R124	636-0002-000	Variable, 10 K ohms, 1/4 watt, (Right Equal)
R125	630-0287-000	10 K ohms, 1/2 watt, 5%, Lo Noise
R126	630-0259-000	680 ohms, 1/2 watt, 5%, Lo Noise

MISCELLANEOUS

IC101	606-0003-000	MFC 6040
IC102	606-0003-000	MFC 6040 (Stereo Only)
CR101	575-0007-000	IN4005
CR102	575-0007-000	IN4005 (Stereo Only)

D. CUE TONE DETECTOR CARD

1 TONE 831-0016-003
3 TONE 831-0016-013

CAPACITORS

C205	696-0114-000	5 mfd, 25 V.
C206	696-0124-000	100 mfd, 25 V.
C207	696-0114-000	5 mfd, 25 V.
C208	681-0054-000	.047 mfd, 200 V.
C209		Selected to tune the detector to 1 kHz.
C210	696-0114-000	5 mfd, 25 V.
C211	696-0114-000	5 mfd, 25 V. (8 kHz)
C212	696-0114-000	5 mfd, 25 V. (8 kHz)
C213	681-0081-000	.015 mfd, 200 V. (8 kHz)
C214		Selected to tune the detector to 8 kHz.
C215	696-0110-000	1 mfd, 25 V. (8 kHz)
C216	696-0114-000	5 mfd, 25 V. (150 Hz)
C217	696-0114-000	5 mfd, 25 V. (150 Hz)
C218	685-0003-000	2.2 mfd, 250 V. (150 Hz)
C219	696-0117-000	10 mfd, 25 V. (150 Hz)
C220	696-0114-000	5 mfd, 25 V. (1 kHz only) Single Tone
C221	686-0002-000	.025 mfd, 100 V.
C222	694-0002-000	10 mfd, 20 V.
C223	681-0046-000	.01 mfd, 200 V.
C224	694-0003-000	4.7 mfd, 35 V.
C225	694-0004-000	.47 mfd, 35 V.
C226	677-0001-000	100 pfd, 300 V.
C227	694-0002-000	10 mfd, 20 V.

DIODES

CR201	575-0002-000	IN462
CR202	575-0002-000	IN462
CR203	575-0007-000	IN4005
CR204	575-0007-000	IN4005
CR205	575-0007-000	IN4005
CR206	575-0007-000	IN4005 (Three Tone Only)
CR207	575-0007-000	IN4005 (Three Tone Only)

INDUCTORS

L201	511-0002-000	Toroid, 500 mh
L202	511-0005-000	Toroid, 20 mh (8 kHz)
L203	511-0002-000	Toroid, 500 mh (150 Hz)

TRANSISTORS

Q201	590-0001-000	2N3053
Q202	590-0014-000	2N2905
Q203	590-0001-000	2N3053
Q204	590-0001-000	2N3053 (8 kHz)
Q205	590-0014-000	2N2905
Q206	590-0001-000	2N3053 (8 kHz)

Symbol	Part Number	Description
Q207	590-0001-000	2N3053 (150 Hz)
Q208	590-0014-000	2N2905 (150 Hz)
Q209	590-0001-000	2N3053 (150 Hz)
Q210	590-0011-000	2N930
Q211	590-0011-000	2N930

RESISTORS

R202	626-0255-000	470 ohms, 1/2 watt, 5%
R203	626-0283-000	68 K ohms, 1/2 watt, 5%
R204	626-0239-000	100 ohms, 1/2 watt, 5%
R205	626-0263-000	1 K ohms, 1/2 watt, 5%
R206	636-0002-000	Variable, 10 K ohms, 1/4 watt (1 kHz sensitivity)
R207	626-0291-000	15 K ohms, 1/2 watt, 5%
R208	626-0291-000	15 K ohms, 1/2 watt, 5%
R209	626-0275-000	3.3 K ohms, 1/2 watt, 5%
R210	626-0279-000	4.7 K ohms, 1/2 watt, 5%
R211	626-0271-000	2.2 K ohms, 1/2 watt, 5%
R212	626-0263-000	1 K ohms, 1/2 watt, 5%
R213	626-0279-000	4.7 K ohms, 1/2 watt, 5%
R214	626-0279-000	4.7 K ohms, 1/2 watt, 5%
R215	626-0448-000	240 ohms, 1 watt, 10%
R216	626-0291-000	15 K ohms, 1/2 watt, 5%
R217	636-0002-000	Variable, 10 K ohms, 1/4 watt (8 kHz sensitivity)
R218	626-0291-000	15 K ohms, 1/2 watt, 5% (8 kHz)
R219	626-0291-000	15 K ohms, 1/2 watt, 5% (8 kHz)
R220	626-0275-000	3.3 K ohms, 1/2 watt, 5% (8 kHz)
R221	626-0279-000	4.7 K ohms, 1/2 watt, 5% (8 kHz)
R222	626-0271-000	2.2 K ohms, 1/2 watt, 5% (8 kHz)
R223	626-0263-000	1 K ohms, 1/2 watt, 5% (8 kHz)
R224	626-0279-000	4.7 ohms, 1/2 watt, 5% (8 kHz)
R225	626-0279-000	4.7 K ohms, 1/2 watt, 5% (8 kHz)
R226	626-0239-000	100 ohms, 1/2 watt, 5% (150 Hz)
R227	636-0002-000	Variable, 10 K ohms, 1/4 watt (150 Hz sensitivity)
R228	626-0291-000	15 K ohms, 1/2 watt, 5% (150 Hz)
R229	626-0291-000	15 K ohms, 1/2 watt, 5% (150 Hz)
R230	626-0275-000	3.3 K ohms, 1/2 watt, 5% (150 Hz)
R231	626-0279-000	4.7 K ohms, 1/2 watt, 5% (150 Hz)
R232	626-0271-000	2.2 K ohms, 1/2 watt, 5% (150 Hz)
R233	626-0263-000	1 K ohms, 1/2 watt, 5% (150 Hz)
R234	626-0279-000	4.7 K ohms, 1/2 watt, 5% (150 Hz)
R235	626-0279-000	4.7 K ohms, 1/2 watt, 5% (150 Hz)
R236	626-0311-000	100 K ohms, 1/2 watt, 5%
R237	626-0235-000	68 ohms, 1/2 watt, 5%
R238	626-0287-000	10 K ohms, 1/2 watt, 5%
R239	626-0239-000	100 ohms, 1/2 watt, 5%
R240	626-0271-000	2.2 K ohms, 1/2 watt, 5%
R241	626-0259-000	680 ohms, 1/2 watt, 5%
R242	626-0271-000	2.2 K ohms, 1/2 watt, 5%
R243	626-0303-000	47 K ohms, 1/2 watt, 5%
R244	626-0287-000	10 K ohms, 1/2 watt, 5% (single tone only)

SECTION XII

MAINTENANCE SCHEDULE

3D SERIES REPRODUCER

A. GENERAL

International Tapetronics has designed the 3D Series Reproducer with reliability and minimum maintenance as primary design goals. Simplicity and mechanical strength is an important factor in reducing mechanical maintenance. Electronic dependability is provided through the use of negative feedback and other techniques which stabilize circuits which are subjected to widely varying ambient conditions.

B. MECHANICAL MAINTENANCE

1. Weekly Maintenance:
 - a. Clean the capstan and pressure roller with a cloth dipped in alcohol. Remove all traces of lubricant and oxide from both the capstan and pressure roller.
 - b. Clean the head with a cotton swab dipped in a head cleaning solution.
2. Monthly Maintenance:
 - a. Check speed of unit. Since the capstan motor is a 450 RPM, direct drive, hysteresis synchronous device, there are no belts, pulleys, or flywheel assembly to cause speed variables. The bearings in this motor are permanently sealed ball bearings which need no lubrication.

Any effort to lubricate the motor bearings will result in oil seeping into the motor windings.

To check the speed of the unit, play test cartridge No. 4 (see Section IX). The playing time should not vary more than .4 seconds in 3½ minutes. If a frequency counter is available, the 12 kHz tone should not vary more than 24 Hz.

- b. Check the pressure roller using an ITC pressure roller gauge 830-0006-001.
- c. Check head alignment.
- d. The 3D Reproducer requires no lubrication.

C. ELECTRICAL MAINTENANCE

The electrical maintenance is recommended monthly and includes measuring electrical parameters and making corrective adjustments if required.

Using the test cartridges and procedures outlined in Section IX, check the cue sensitivity, program play level and equalization. Should the 3-D be used in conjunction with a WRA recording amplifier, refer to the WRA instruction manual for electrical recording maintenance.

SECTION XIII

WARRANTY

3D-SERIES REPRODUCER

Seller warrants to Purchaser that the equipment sold is free of defects of workmanship or material and conforms to the specifications referred to or set out herein. This warranty extending only to the original user is for a period of one year from date of shipment and no claim shall be maintained hereunder unless written notice is received by Seller within thirty days after discovery of the facts giving rise to the claim. The sole or exclusive liability of seller for breach of warranty shall be to refund the purchase price of the item sold, or at its option, to replace or repair the item or part concerned FOB its factory, or such other place as it may designate. Seller's liability shall arise only if Purchaser causes the defective part or item to be delivered to Seller for inspection upon Seller's request at Purchaser's expense. Items manufactured by persons other than Seller shall bear the warranty given by such other persons and no other warranty. This warranty shall not be

effective if the alleged defect is due to maltreatment, exposure, excessive moisture or any other use of the equipment other than the use for which the manufacturer prescribed.

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

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

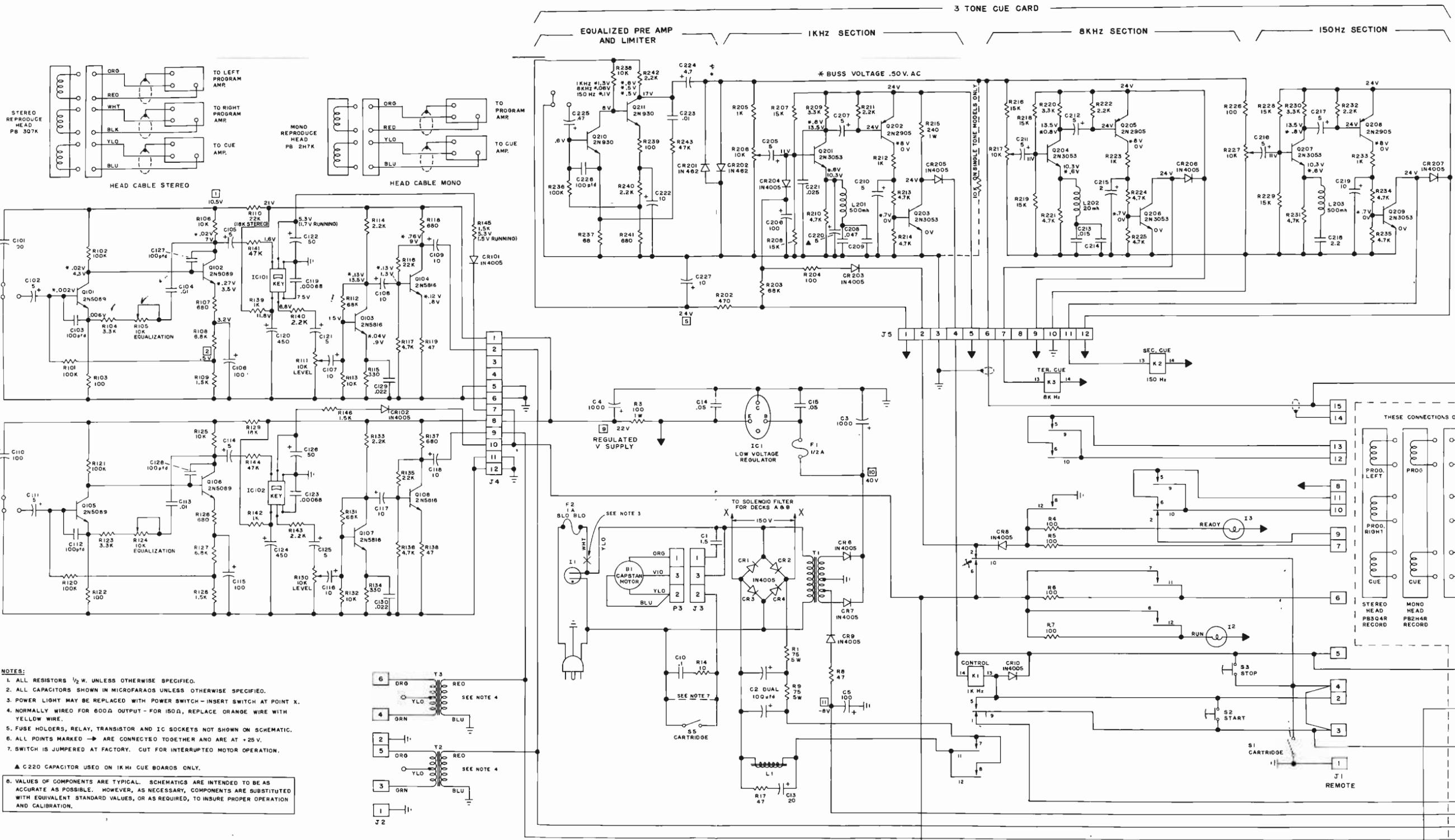
SECTION XIII

WARRANTY

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

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

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



- NOTES:**
1. ALL RESISTORS 1/2 W. UNLESS OTHERWISE SPECIFIED.
 2. ALL CAPACITORS SHOWN IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
 3. POWER LIGHT MAY BE REPLACED WITH POWER SWITCH - INSERT SWITCH AT POINT X.
 4. NORMALLY WIRED FOR 600Ω OUTPUT - FOR 150Ω, REPLACE ORANGE WIRE WITH YELLOW WIRE.
 5. FUSE HOLDERS, RELAY, TRANSISTOR AND IC SOCKETS NOT SHOWN ON SCHEMATIC.
 6. ALL POINTS MARKED → ARE CONNECTED TOGETHER AND ARE AT +25V.
 7. SWITCH IS JUMPED AT FACTORY. CUT FOR INTERRUPTED MOTOR OPERATION.
- ▲ C220 CAPACITOR USED ON 1KHz CUE BOARDS ONLY.
6. VALUES OF COMPONENTS ARE TYPICAL. SCHEMATICS ARE INTENDED TO BE AS ACCURATE AS POSSIBLE. HOWEVER, AS NECESSARY, COMPONENTS ARE SUBSTITUTED WITH EQUIVALENT STANDARD VALUES, OR AS REQUIRED, TO INSURE PROPER OPERATION AND CALIBRATION.

TITLE	
SCHEMATIC, 3D SERIES LOWER DECK (C)	
INTERNATIONAL TAPETRONICS CORPORATION	893-0062-005
BLOOMINGTON, ILLINOIS 61701	DRAWING NUMBER REV

INTERCONNECTS W. H. RECORDER P302

