



TECHNICAL MANUAL

**750 SERIES
REEL-TO-REEL
REPRODUCER**

INTERNATIONAL TAPETRONICS CORPORATION

2425 South Main Street Bloomington, Illinois 61701 Telephone: 309-828-1381

**TECHNICAL MANUAL
(890-0015-000)**

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2425 SOUTH MAIN STREET • BLOOMINGTON, ILLINOIS 61701

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3,800,323 3,801,043 3,801,329 3,833,925 3,865,719
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THE ITC INSTRUCTION MANUAL

International Tapetronics Corporation manuals are dedicated to assisting the reader-user toward a better understanding of ITC equipment. Most instruction manuals are seldom read except in the time of crisis when equipment malfunction is suspected. When this happens the manual is usually missing, or at best, difficult to locate. So to start things off on the right foot, WHY NOT FIND A CONVENIENT SPOT TO KEEP THIS MANUAL?

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

TECHNICAL MANUAL

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832-0011-002

**ITC ADDENDA AND INSTRUCTIONS
FOR PRESSURE ROLLER REPLACEMENT
ON ITC 750 SERIES REEL-TO-REEL**

PARTS LIST

Qty.	Part Number	Description
1	832-0011-002	Pressure Roller Assembly

The pressure roller supplied with this kit is made of a polyurethane material which has been selected to provide optimum tape drive. The surface of the new pressure roller has been carefully manufactured to the proper diameter to insure proper concentricity (minimum run-out), and the permanently lubricated ball bearing allows the pressure roller to automatically align itself to the capstan shaft.

To install the new pressure roller, first remove the old pressure roller. This can be done by loosening the pressure roller shaft locking screw (Item #66 on Figure 8-2 in the 750 Instruction Book). The old pressure roller can then be removed and the new one installed. Be sure to retighten the lock screw.

IF THE MACHINE PREVIOUSLY HAD A BLUE POLYURETHANE PRESSURE ROLLER, NO FURTHER ADJUSTMENTS ARE NECESSARY. HOWEVER, IF THE MACHINE HAD A BLACK RUBBER PRESSURE ROLLER, THE FOLLOWING ADJUSTMENTS ARE NECESSARY:

Due to the improved driving characteristics of the polyurethane material, less pressure is required to provide proper tape drive.

Section C, Page 6-2, of the 750 Instruction Book shows the adjustment procedures for the pressure roller pressure. This procedure can be followed with the exception that the new pressure roller should be adjusted as follows:

For 7.5 IPS — 15 IPS machines, the pressure should be adjusted for 6 to 7 pounds.

For 3.75 IPS — 7.5 IPS machines, the pressure should be adjusted to 4½ to 5½ pounds.

If there are any questions about installation or adjustments, please call the ITC Technical Service Department collect at 309-828-1381.

INTRODUCTION

750 SERIES

A. GENERAL INFORMATION

ITC's new 750 Series has been designed and built for broadcasters and is ideally suited for use in program automation systems. The 750 Series reel-to-reel reproducer is designed to meet or exceed the NAB standards for reel-to-reel tape reproducing. These units are available in a variety of configurations which include one or two-track capabilities and tape speeds ranging from $3\frac{3}{4}$ inches per second to 15 inches per second. Also available on special order are two-speed machines which would operate at either $3\frac{3}{4}$ - $7\frac{1}{2}$ IPS or $7\frac{1}{2}$ - 15 IPS.

B. TAPE TRANSPORT

The ITC 750 reproducers are constructed on a heavy $\frac{1}{2}$ -inch thick aluminum tool-plate deck. The tool-plate deck is superior to a cast deck because it is inherently stress-relieved so that thermal changes will not cause instability. To make best use of this tool-plate deck, the brake, tape lifter, and head assemblies are all incorporated within the aluminum plate. Use of the deck plate in this manner not only eliminates extra subassemblies that would normally mount externally but also insures maximum phase alignment stability as well as optimum tape handling characteristics.

The tape drive system uses three individual, permanently lubricated ball bearing motors. The capstan motor is a hysteresis synchronous direct-drive type with a large diameter shaft. The two reel drive motors are four-pole, 1800 RPM, induction motors which develop sufficient torque to provide positive control of most standard size reels.

An air-damped solenoid is used to control the tape lifter/pressure roller assembly. The use of the air damping and Teflon covered plunger in this solenoid results in quiet operation and almost no maintenance. The brake assembly solenoids incorporate fiber liners and, therefore, never require lubrication.

C. HEAD ASSEMBLY

The ITC 750 Series machine is equipped with an unique head assembly which utilizes a high quality professional head nested in a bracket designed to provide total azimuth, height, and zenith adjustment. 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. The head assembly also includes provision for locking the head in position after adjustment, and the head mounting arrange-

ment permits rapid head replacement when required.

Incorporated into the head assembly is a tape lifter system which provides manual, as well as automatic, operation. Tape is automatically lifted away from the reproduce head during any of the fast wind modes and automatically returned to its normal wrap on the reproduce head in the PLAY or START mode. Automatic operation of the lifter assembly may be defeated in the fast mode simply by pushing the CUE lever toward the reproduce head. The lifters will now remain in this position until the START mode is entered or the CUE lever is manually returned to its "lifted" condition.

As an aid to head maintenance and tape marking/editing, the entire head assembly is housed in a "flip-top" cover. The "flip-top" cover is hinged and sprung in such a manner that it can be easily opened or closed and remain in either state.

D. ELECTRONICS

Simplieity and serviceability are the keys to the electronics incorporated into the 750 Series reel-to-reel reproducers. A mother-daughter board construction, coupled with ribbon cable connectors, virtually eliminates any bulky wiring harnesses. All assemblies, including motors, solenoids, and P.C. boards, plug in for easy serviceability and field replacement. All normal maintenance adjustments are accessible from the front panel of the 750 Series machine. Removal of the switch dress panel exposes equalization and program level calibration. Also available at the front panel are limited range level controls designed to give a 8 dB boost in gain from the calibrated position (vertical) or a 4 dB drop in audio level. A headphone jack is provided for program monitoring purposes.

All electronic logic is either transistor or simple relay type. Transistors and relays plug into sockets mounted on the printed circuit boards.

E. OPTIONS

The following are options which are available on special request.

1. Power on-off switch
2. Two-speed capstan motor — $3\frac{3}{4}$ - $7\frac{1}{2}$ IPS or $7\frac{1}{2}$ - 15 IPS
3. Motion sensing — includes an additional P.C. board circuit which automatically senses the motion of tape reels when in the fast mode of operation and prevents tape destruction due to an error on the part of the operator. A feature of this motion sense circuit is start memory which al-

lows the start circuit to be entered directly from the fast mode.

4. Audio output transformers (factory installed) — provide 600 ohm balanced output.

F. SPECIFICATIONS

Power: 105 to 125 volts AC, 60 Hz, 150 watts maximum

Wind Time: Less than 60 seconds for 2400 feet of tape
Less than 90 seconds for 3600 feet of tape

Motors: Capstan—direct-drive hysteresis synchronous with electrolyzed shaft and instrument-type permanently lubricated ball bearings
Torque—induction motors (two) with ball bearings provide 20 ounce/inches of torque

Tape Speed: 7½ IPS (other speeds available optionally)

Reel Sizes: Handles ¼ inch-tape and either NAB or EIA hubs with diameters greater than 1¾ inches. Maximum reel flange diameter 10½ inches. Selectable tape tension for small *or* large reels.

Timing Accuracy: 0.2% or better

Flutter (NAB Weighted): 0.07% (at 7½ IPS)

Audio Output: +18 dBm before clipping into 600 ohm load, unbalanced (600 ohm transformers optional)

Distortion: 0.5% maximum total RMS amplifier distortion at +16 dBm output level at 1 kHz

Signal-To-Noise: -52 dB using 400 Hz tone recorded at NAB Standard Reference Level with reproduce amplifier adjusted for +8 dBm output and measuring unweighted noise
-70 dB using 1 kHz tone recorded at 500 nWb/m (approximately 8 dB above NAB Standard Reference Level) and measuring NAB weighted noise

Crosstalk: Better than 50 dB at 1 kHz

Frequency Response: ±2 dB from 50 to 15,000 Hz

Equalization: NAB with adjustment for high frequencies

Headphone Output: 8 ohms or greater

Brakes: Mechanical brakes with stainless steel bands

Remote Control: All operating mode indicators and controls

External Connectors: Latching type, mating plugs furnished

Dimensions: 19" wide (1¼" overhand on each side with 10½" reels)
14" high (2¼" overhand on top with 10½" reels)
9" deep

Weight: 41 lbs. unpacked

SECTION II

INSTALLATION

750 SERIES

A. UNPACKING AND HANDLING

Carefully remove the ITC 750 Series reel-to-reel 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 International Tapetronics immediately for assistance in claims. It is suggested that packing material be retained for any future use.

B. INSTALLATION IN RACK

750 Series reel-to-reel machines are supplied in a 19-inch rack mounting configuration. To provide adequate ventilation, vertical spacing between reel-to-reel machines and other equipment should be from 1 1/4 to 3 1/2 inches depending on the temperature inside the closed rack. Please refer to Figure 2-1 for deck size and reel overhang dimensions. Because of the close proximity of the reels with respect to the deck plate, it may be necessary in some applications to space out the 750 Series deck in the rack installation. A simple, inexpensive 1/4-inch spacer can be made by using a 10-32 socket head screw with a 1/16-inch flat washer spaced below it. Four of these spacers may be mounted in the rack panel near the location of the four mounting slots in the 750 Series deck.

C. CONNECTING AUDIO LINES

A six pin unwired plug to be used for connecting the audio output of the 750 Series reproducer is provided with each machine. Refer to Figure 2-2 for the connecting of these audio lines. Care should be taken to insure proper phasing of each channel on stereo machines. It is recommended that two conductor shielded cables be used for output connections.

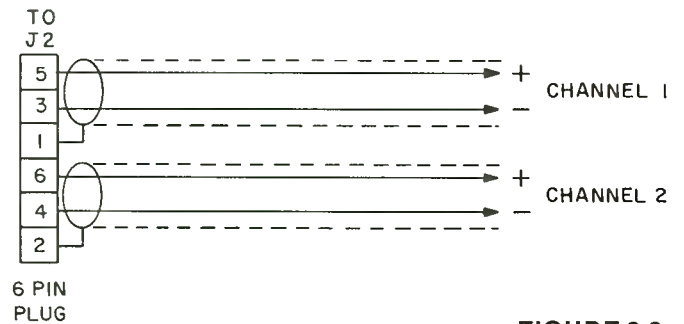


FIGURE 2-2

D. CONNECTING REMOTE CONTROLS

Remote control functions are provided through Connector J-1 for start, stop, fast rewind, fast forward, and associated lamp circuits. All switching functions require a normally open mo-

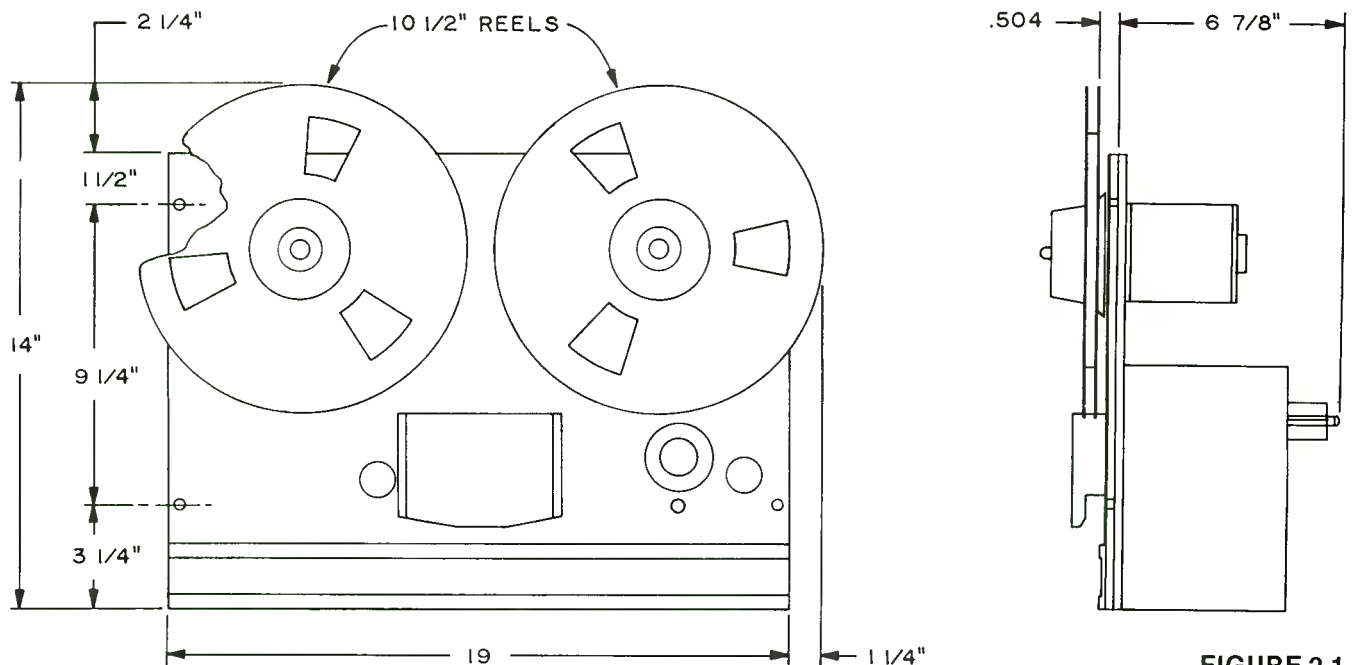


FIGURE 2-1

mentary type switch. A 15 conductor plug is supplied with the machine for wiring the remote functions. Please refer to Figure 2-3 for a sample remote control schematic.

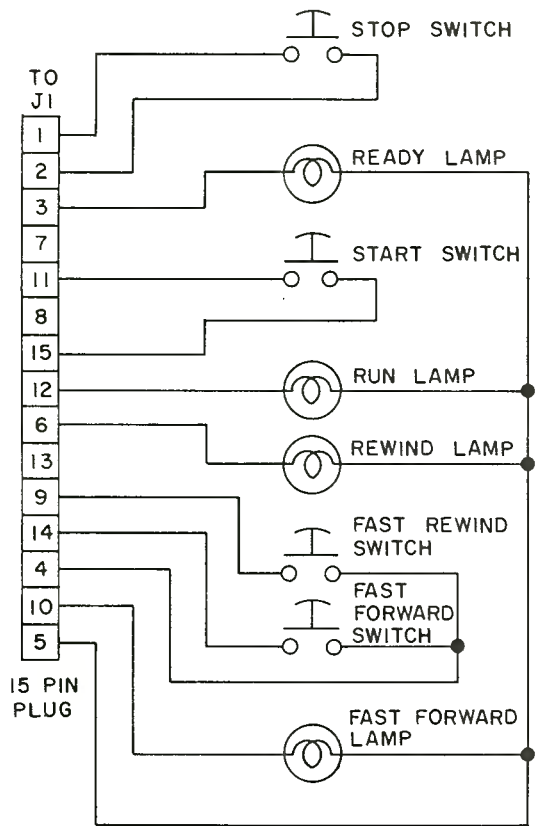


FIGURE 2-3

E. BEFORE OPERATION INITIAL TESTS

Before operating the ITC 750 Series reel-to-reel machine, determine that all motors and rotating parts are free and work easily. Check to see that P.C. cards, relays, and ribbon cable connectors are properly seated. Insure that the line frequency and voltage are correct before plugging in the AC cord. With the insertion of the AC power cord into the appropriate outlet, the capstan motor should begin turning. Proceed now to Section III, Operating Instructions.

SECTION III

OPERATING INSTRUCTIONS

750 SERIES

A. THREADING THE TAPE

The ITC 750 Series reel-to-reel reproducer is designed in such a manner that tape may be threaded without opening or closing any doors or interfering members. Please refer to Figure 3-1 for a drawing of the tape loading path. If tape has been loaded properly the ready indicator LED on the front panel will illuminate.

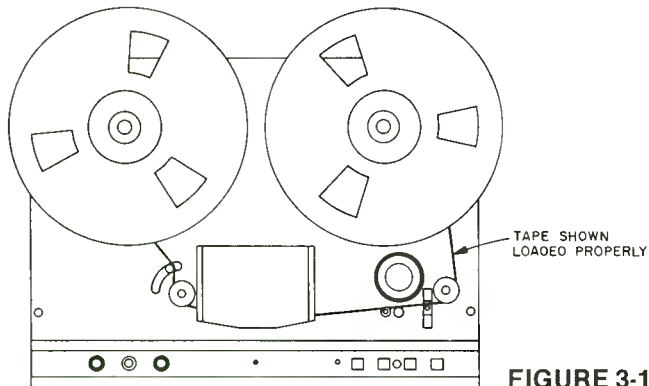
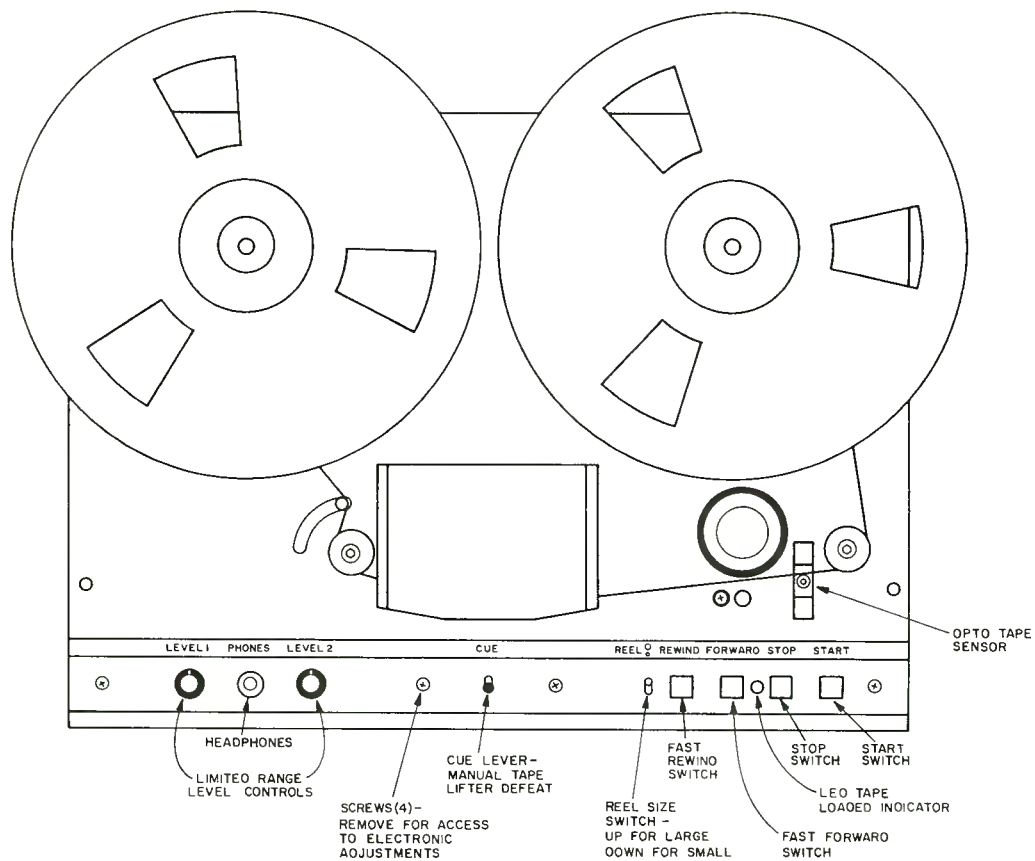


FIGURE 3-1

B. CONTROLS AND INDICATORS

Refer to Figure 3-2 for a front view of the reproducer unit, showing all the various switching functions.



NOTE:
HOLE PLUGS ARE AVAILABLE SO THAT
LEVEL KNOBS MAY BE REMOVED FOR
SCREWDRIVER ADJUSTMENT.

FIGURE 3-2

1. The START SWITCH, when pressed, will automatically cause the transport mechanism to move tape at the normal speed required for accurate reproduction of recorded material. The start switch will not function if the tape has been loaded improperly, therefore, not interrupting the LED phototransistor tape sensing switch, located directly after the capstan shaft. When the start switch is pressed, full torque is momentarily applied to the forward reel motor to cause the tape to move instantly. The duration of this "torque boost" may be adjusted on the rear of the machine. The start switch is not active when the machine is in the fast rewind or fast forward mode of operation (unless the machine is equipped with the optional motion sense circuitry). A built-in start mode delay circuit prevents entering the start mode for approximately one second after the fast forward or fast rewind modes of operations. This built-in delay is simply a reminder that the start switch is active during braking out of the fast modes. Therefore, tape could be damaged severely if start is activated.

2. The STOP SWITCH is active at all times except when no tape is loaded on the machine. Stop will override all other functions of the 750 Series reel-to-reel reproducer.
3. The FAST REWIND AND FAST FORWARD modes may be entered at all times except when the tape is loaded improperly or an overriding stop signal is present. The machine may be switched directly from the normal start mode to either fast mode.
4. The REEL SIZE SWITCH which is located on the lower right-hand side of the front panel is used for setting the different torques required for different size reel hubs. When using the large NAB type hub, the switch must be in the large reel position. When using a smaller EIA type hub size, the small reel position should be used. Intermixing of different size reels is not recommended as the 750 Series is designed to accept either large NAB hubs or small EIA hubs. *If two different size reel hubs are used simultaneously it is recommended that stopping out of either fast mode be accomplished by pressing the opposite fast mode switch until the tape motion has ceased.* The stop switch should then immediately be pressed to set the mechanical brakes.
5. The CUE LEVER simply provides a means for manual operation of the tape lifter assembly. This structure is designed in such a manner that when the cue lever is pushed toward the reproduce head, it will lock in this position. Entering the start mode automatically unlocks this condition and resets it for automatic tape lifter operation. When in a fast mode, the cue lever may be moved up or down for cueing purposes or locked in its "lifters off" position.
6. The red LED indicator on the lower right-hand corner of the 750 Series is a visual indication that tape is loaded properly and that a stop command is not present.
7. LIMITED RANGE FRONT PANEL LEVEL CONTROLS may be used to vary the program output level approximately +8 or -4 dB from the calibrated (vertical) position. To vary program level more than +8 or -4 dB, the switch dress panel must be removed and the full range level calibration controls used.

SECTION IV

DESCRIPTION OF ELECTRONIC OPERATION

750 SERIES

A. POWER SUPPLIES

Incorporated into the 750 Series reproducers are two power supply circuits. Full wave bridge rectifier CR3 rectifies line voltage and furnishes DC to the filter section made up of R3 and C3. This circuit will charge to a peak of approximately 155 volts DC. The presence of this peak voltage upon initial engagement of a solenoid causes the solenoid plunger(s) to pull in very rapidly, essentially creating a faster start for the tape motion. After this initial surge of power, the voltage will drop down to approximately 110 volts during the various operating modes.

The secondary of transformer T1 provides low voltage AC with the center tap grounded to diodes CR1 and CR2. DC is supplied from this full wave rectifier to the filter capacitor C1 and to the input of series regulator U1. This regulated 24 volts DC powers the various controls and audio functions of the 750 Series reproducer.

B. CONTROL LOGIC — TRANSPORT

All control switching in the 750 Series reproducer is a combination of transistor and relay logic.

Stop Circuitry — The stop circuitry has priority over all other control functions of the 750 Series. Therefore, if a stop command is given, no other mode of operation may be entered. Transistor Q104 is a series “ready” ground for all switching logic. This transistor is normally biased through R107 and CR103. If the stop switch S101 is pressed, base-emitter current is removed from transistor Q104 causing the collector voltage to increase to approximately 24 volts DC and canceling all previous operating modes. If tape is not loaded properly or if a reel of tape runs completely through, the tape sensor will also cause Q104 to “turn off.” Phototransistor Q101 will be biased on if it is allowed to “see” the infrared light emitted from diode CR101. This condition would exist with the absence of tape from the sensor. With Q101 biased on, it in turn biases on Q102 at which point the DC is amplified to drive Q103. The collector of Q103 then removes base drive current from Q104 as does the stop switch. Trim pot R102 is provided to adjust for optimum sensitivity of all thicknesses and varieties of magnetic tape. Capacitor C102 prevents false stops of the machine due to minor deteriorated or thin oxide conditions existing on the tape.

Rewind Circuitry — Because the rewind and forward circuits are essentially the same, only the rewind circuitry will be explained in this section.

Relay K1 is the control relay for the rewind functions. By depressing the rewind switch, S102, the rewind relay is turned on and a latch is set up through contacts 6 and 10 and back through contacts 9 and 1 of relay K2 to the ready ground circuitry. Contacts 3 and 11 of relay K1 open at this time and prevent start relay K3 from being operated. Relays K1 and K2 are essentially wired in series with each other so that energizing one relay will cause the other to drop out. This is accomplished through latching contacts 6 and 10 of K1 and 5 and 9 of K2. Diodes CR8 and CR10 are used to prevent an inadvertent dual latch of relay K1 and K2. Contacts 8 and 12 (K1) when closed switch voltage to the brake solenoids L1 and L2. Run voltage is supplied through contacts 5 and 9 to the rewind torque motor, B2. Normally closed contacts 9 and 1 set up a potential current path for a “series” switching of the forward and rewind torque motors, a condition which exists during the start mode.

Start Relay — As explained earlier in the section describing the rewind relay, K1, the start relay, K3, cannot be activated if either fast mode is in operation. Therefore, if a reel of tape is loaded properly and if a ready condition exists, a potential ground path for the start switch, S104, exists through contacts 3 and 11 of K2 and 3 and 11 of K1. Pressing the start switch, S104, causes transistor Q2 to be forward biased through R15, R16, the start switch and to ground. Pin 13 of K3 at this point also goes to ground through the start switch and causes K3 to energize and “latch on” through contacts 9 and 5.

Simultaneous with the energizing of relay K3 is the momentary pulsing of relay K4, **Torque Boost**. Transistor Q4 is momentarily forward biased while capacitor C12 is charging and, in turn, causes relay K4 to energize. Once C12 is charged, there no longer is any forward drive current for transistor Q4; thus, relay K4 will drop out. During the pulsing of relay K4, full voltage is applied to the forward torque motor through the paralleled contacts of relay K4 and, therefore, creates momentary “torque boost” which is required to overcome the inertial effects of the forward reel mass.

Paralleled contacts 10/6 and 11/7 of relay K3, when closed cause the pinch roller solenoid, L3, to energize simultaneously with the two brake solenoids, L1 and L2. A closure of contacts 12 and 8 of K3 causes both torque motors, B2 and B3, to rotate. In this condition these motors are connected “in series” with each other and, therefore, eliminate the normally required large power resistor

used to reduce voltage and dissipate power. Further reduction and adjustment of motor torque is accomplished with resistors R7 and R1.

The purpose of transistor Q1 is to provide a momentary disabling of the start relay K3 immediately following either one of the fast wind modes. This is accomplished by forward biasing transistor Q1 in either fast mode through R12 and diode CR11 or CR12. During this time, capacitor C10 discharges through R13 and diode CR11 or CR12 is removed from ground, at which time capacitor C10 begins to charge through R13, R12, and the base-emitter junction of transistor Q1. During this charging period of C10, transistor Q1 is forward biased and, therefore, disables normal forward bias current flow for transistor Q2 through R15 and R16. Transistor Q1 is also part of the motion sensing circuitry (optional) which will be described later in Part D of this section.

All control switching functions of the logic are available on the remote connector J1. In addition to these switching functions, lamp circuits are also provided on pins 6, 10, 12, and 3 of J1. In series with each one of these lamp circuits is a 100 ohm, ½ watt resistor used to limit current and protect the power supply of the 750 Series machine. It is expected that if these lamp circuits are connected, a standard 40 milliamp incandescent lamp will be used. A foil sensing circuit is also connected to the remote connector J1 on pin 7, which when used with a current amplifier can provide automatic sensing of foil on magnetic tape.

C. PROGRAM REPRODUCE AMPLIFIER

The program reproduce amplifier is located on a plug-in PC card which is inserted from the front of the 750 Series reproducer. A single card is used for either stereo or mono configurations. The circuit consists of an equalized preamplifier and a four transistor driver output section. Transistors Q201 and Q202 serve as a preamplifier which is stabilized to prevent performance variations with widely varying temperatures. This is accomplished with DC negative feedback from the emitter of Q202 to the base of Q201. Feedback equalization is used since this reduces gain variations and permits higher input impedance. The equalization components are C205, variable resistor R205, and fixed resistor R203. The output of the preamplifier is connected to a full range calibration control resistor, R210.

Transistor Q203 is a common emitter amplifier stage with biasing resistor R212 connected from base to collector for DC and temperature stability. The output is connected through coupling capacitor C210 and R218 to the front panel level control R219. This potentiometer has a limited range (approximately +8 dB -4 dB from the vertical position) so that performance of the amplifier

is not degraded. Audio signals then continue on to the base of transistor Q204 which is the driver for the output complimentary amplifiers Q205 and Q206. To provide stability, Q204, Q205, and Q206 are all direct coupled with resistor R220 providing feedback. If the 750 Series reel-to-reel unit is equipped with the optional 3¾ - 7½ IPS capstan motor, an additional equalization network is connected to the emitter of transistor Q204. This network which consists of transistor Q207 and associated resistors and capacitor provide the extra gain necessary for 3¾ operation as well as additional high frequency contouring.

D. OPTIONAL MOTION SENSOR

The optionally available motion sensor not only provides more reliable tape handling but also adds an automatic feature to the 750 Series — “start memory.” The “start memory” circuit simply allows the 750 Series to be transferred directly from a rewind or fast forward mode into the start mode. Pressing the start switch S104 will cause the reels to come to a complete stop prior to automatic transfer into the start mode of operation. Please refer to the motion sense schematic and the 750 Series control schematic for the following circuit description.

The motion sensor circuit which is located directly on the back of the rewind torque motor assembly is controlled by an opto-interrupter module ID301. A chopper disk located directly on the back of the torque motor shaft interrupts this photo module four times for each revolution of the torque motor shaft. These interruptions or pulses are amplified with transistor Q304 and converted to DC through zero bias transistor Q305 and filter capacitor C303. This DC provides forward current drive for transistor Q1, and in turn prevents Q2 from being turned on, therefore disabling relay K3. As soon as reel motion ceases, capacitor C303 discharges and forward current for Q1 is removed. “Start memory” is created by dual transistor latch Q302 and Q303. These transistors are latched on when the start switch S104 is depressed and remain latched until a stop signal is present. The collector of transistor Q303 is connected to pin 13 of relay K3 and thus provides the ground current path for this relay. As soon as motion ceases, transistor Q2 is enabled once again, and, therefore, relay K3 is energized because of the current path available through transistor Q2 and transistor Q303. In order to prevent pulsing of the motion sense circuitry from turning relay K3 off (the chopper disc continues to rotate in start; therefore, pulses occur), the disabling current path for Q2 through R15 to the collector of Q1 is bypassed through R17 and Q3 to ground. Q3 will be normally biased on whenever the start relay is activated and, therefore, will provide a continuous forward

bias for transistor Q2 through R17 until a stop signal is introduced into the circuit. Capacitor C11 is simply used to stabilize transistor Q3 and prevent any transients from activating it falsely.

It should be noted that on units equipped with motion sensing, points G and F are strapped together instead of E and G. In addition to this change, points A and B no longer have a jumper but connect directly to the emitter and collector of transistor Q301 respectively. The purpose of transistor Q301 is to cause the rewind or fast forward relays to unlatch whenever the start switch is de-

pressed. Q301 is essentially in series with the latch circuit to ground for these relays and, therefore, if not forward biased will prevent K1 or K2 from remaining energized. Forward bias for Q301 is removed through diode CR301 whenever the start switch is depressed. This causes either K1 or K2 to de-energize. With this condition existing, the mechanical brakes immediately engage and cause the reel motors to come to a complete stop at which time the machine transfers to the start mode.

SECTION V

MECHANICAL ADJUSTMENTS

750 SERIES

A. REEL TURNTABLE HEIGHT

The height of the reel turntable should be adjusted whenever the torque motor assembly is either removed or replaced. Illustrated in Figure 5-1 is the method for adjusting the turntable height using the special gauge (ITC Part Number 830-0022-001). It should be noted that the short end of the gauge is used to set the height of the turntable and that the gauge be squarely and firmly seated against the deck plate for proper adjustment. Loosen the set screw shown in Figure 5-1 and slide the turntable up or down on the torque motor shaft until the proper adjustment is achieved. Be certain that when retightening the set screw it is secured against the *flat* on the torque motor shaft.

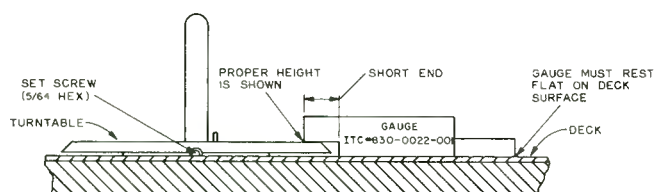


FIGURE 5-1

B. BRAKES

The mechanical brake tensions of the 750 Series are adjusted with an easily accessible thumb screw. See Figure 5-2. To increase brake tension, loosen the thumb screw and slide it away from the brake solenoid. To decrease brake tension, slide the thumb screw toward the brake solenoid and retighten. Brake tensions set at the factory are done so to provide reliable braking of similar size reels. It, therefore, should be noted that the combination of a small 7-inch reel and a large 10½-inch reel could create a potential problem in braking.

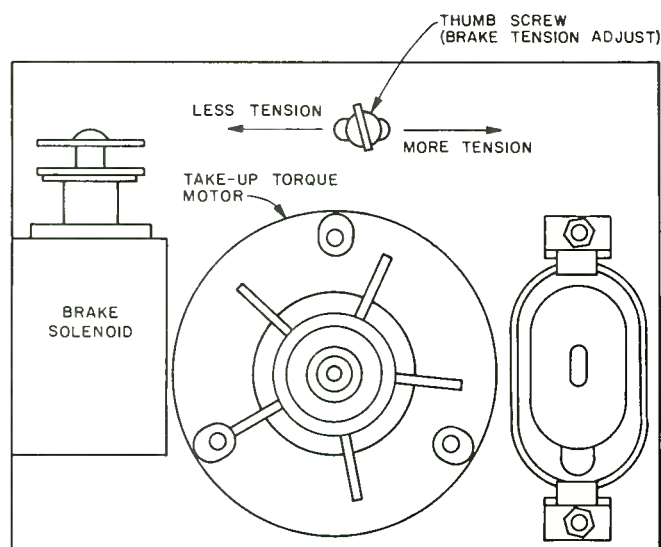


FIGURE 5-2

* BRAKE SLIP TORQUE		
BRAKE	DIRECTION	
	CW	CCW
SUPPLY		16 - 18 oz.
		450 - 500 g
TAKE-UP	16 - 18 oz.	
	450 - 500 g	

* USE 2 ¼" DIAMETER REEL HUB.

FIGURE 5-3

C. HEAD HEIGHT AND ZENITH

The head height and zenith adjustment should be made only in case of head replacement or as a matter of routine maintenance. Please refer

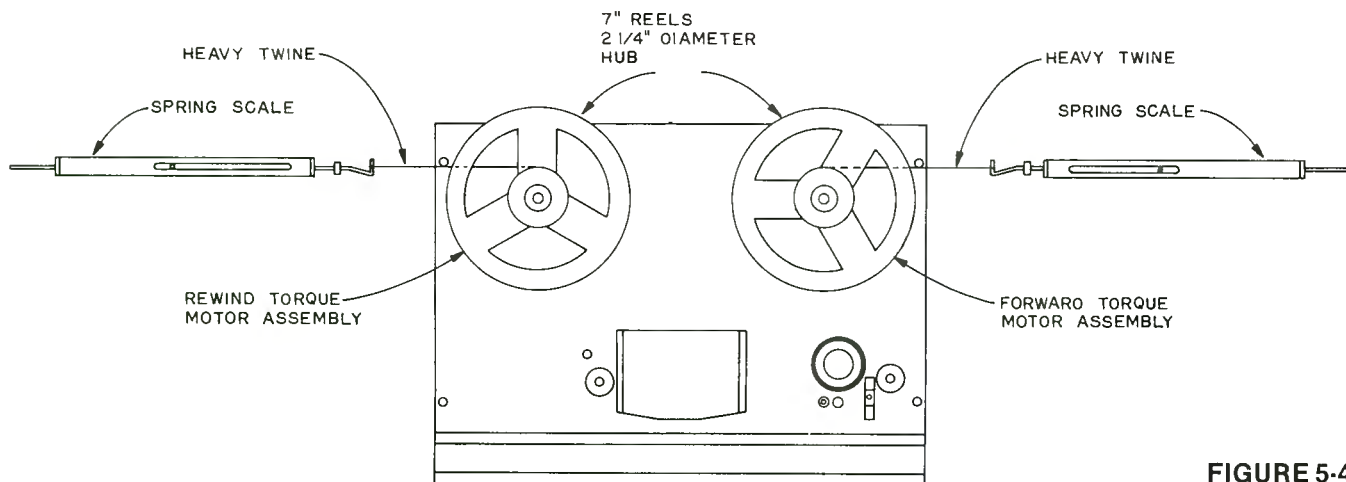


FIGURE 5-4

to Figure 5-5 for location of adjustment points outlined in this section.

1. **Head Assembly Lock Screw** — Loosen the lock screw "L" by turning it counter-clockwise about four complete turns.
2. **Coarse Height** — Adjust the front height screw FH so that the top of the upper head track (pole piece) is 9/16 of an inch above the deck plate surface. The alignment tool (part number 830-0022-001) may be used for this purpose. See Figure 5-6.
3. **Coarse Zenith** — Adjust the rear height screw RH until the face of the head is perpendicular* to the surface of the deck plate. Position any known square against the deck plate surface and move it against the face of the head (being careful not to scratch or damage the surface of the head). The square being used should be demagnetized before adjustments are made. When the face of the head is per-

- pendicular, the surface of the head and the "square" will be flush. See Figure 5-7.
4. **Fine Height and Zenith** — This final adjustment is made using a reel of tape loaded properly on the machine in combination with the square outlined in the previous step, **Coarse Zenith**.
 - a. With the reel of tape loaded properly in the machine, press the start switch and observe the tape travel path over the reproduce head. If the tape does not completely cover both pole pieces as shown in Figure 5-8, alternately and in equal amounts, adjust the forward height screw FH and the rear height screw RH to position the head properly behind the tape.
 - b. Recheck the zenith of the head as instructed in Step 3. If adjustment is necessary, height must also be rechecked and adjusted until both height and zenith are perfect.

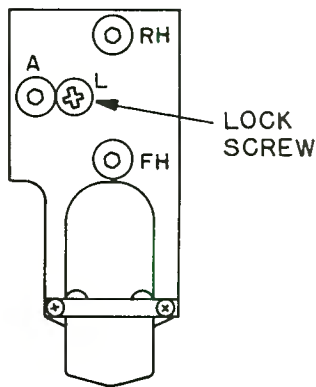


FIGURE 5-5

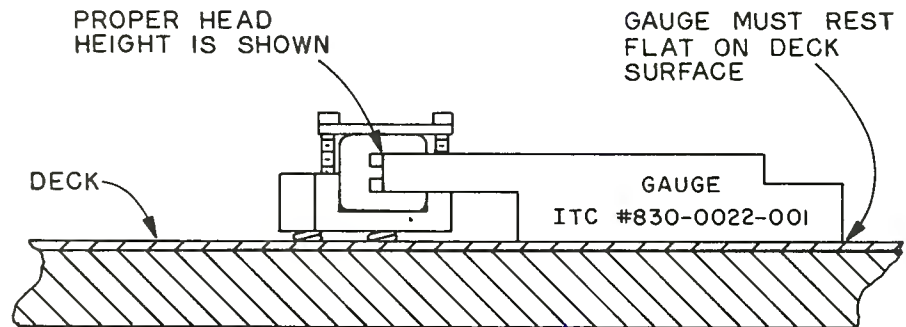


FIGURE 5-6

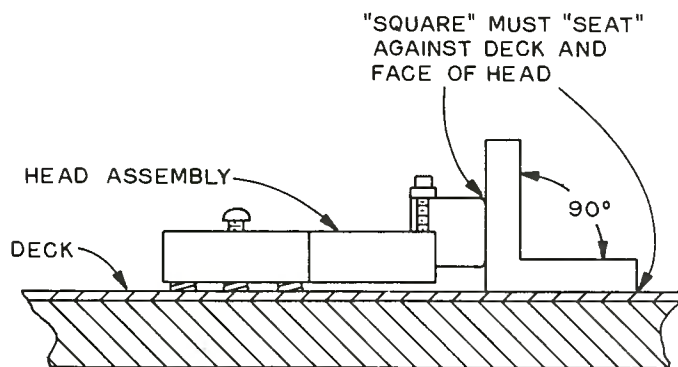


FIGURE 5-7

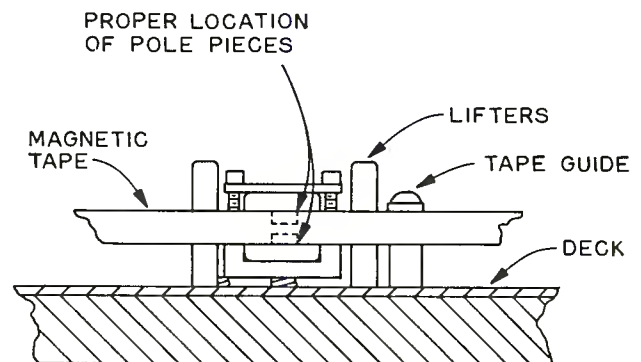


FIGURE 5-8

SECTION VI

ELECTRICAL ADJUSTMENTS—TRANSPORT

750 SERIES

A. TORQUE MOTORS

In order to adjust the reel motor torques properly, the large reel torque must be adjusted first with the reel size switch, S105, in the large reel position. Once this adjustment has been made (see Figure 6-1 for adjusting resistors), transfer the reel size switch, S105, to the small reel position and adjust the small reel torque. Please refer to Figure 6-2 for the proper torque settings. It should be noted that either torque motor may be used for setting the proper tension as these motors are connected in series during the start mode of operation, and, therefore, their torques will be essentially the same. While the torques are being measured, the reel motor not being used to set the torque should be held in place and not allowed to rotate, as this will affect the final torque setting. Power resistors used to adjust torque settings on the 750 Series are accessible by removing the stainless steel cover located directly on top of the electronics housing on the back of the 750 Series deck.

CAUTION: REMOVE POWER CORD FROM SOCKET BEFORE ADJUSTING RESISTORS.

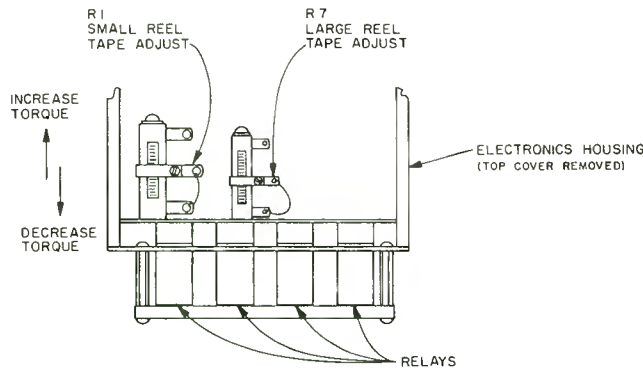


FIGURE 6-1

* MOTOR TORQUE ADJUST		
REEL SIZE SWITCH	ADJUSTING RESISTOR	TORQUE SETTING
LARGE	R 7	6.0 oz. — 170 g
SMALL	R 1	3.0 oz. — 85 g

* USE 2 1/4" DIAMETER REEL HUB.

FIGURE 6-2

B. TORQUE BOOST

The torque boost time is controlled using potentiometer R23 (screwdriver adjustment) located on the mother printed circuit board. This potentiometer is accessible from the rear panel of the electronics housing on the 750 Series deck.

For proper adjustment of the torque boost time, attach two large reels to the machine, thread them properly, and fast wind the tape so that almost the entire length of the tape is on the forward take-up reel. Make certain that the reel size switch is in the large reel position. Repeatedly start and stop the machine and adjust the torque boost time until the tape always remains properly wrapped around the reproduce head on start and does not have any tendency to jump off of the head. Refer to Figure 6-4 for location of the torque boost potentiometer.

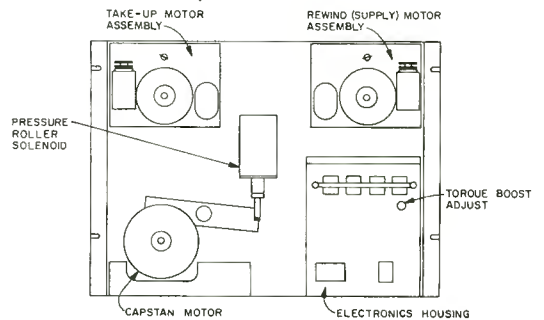


FIGURE 6-4

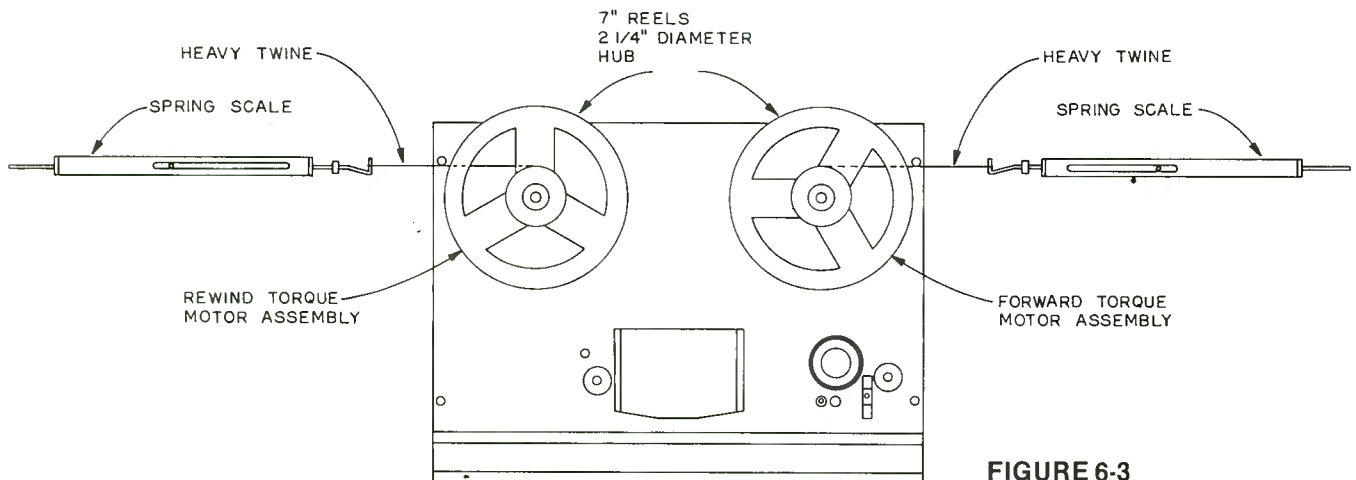


FIGURE 6-3

C. PRESSURE ROLLER PRESSURE

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

1. Attach one end of a strong piece of twine around the pressure roller shaft and the other end to a spring scale capable of measuring up to 10 pounds. See figure 6-5
2. Start the machine into the run mode and begin pulling on the spring scale directly opposite the direction the solenoid is pulling (so as to disengage the pressure roller from the capstan).
3. The instant the pressure roller leaves the capstan is the point at which the meas-

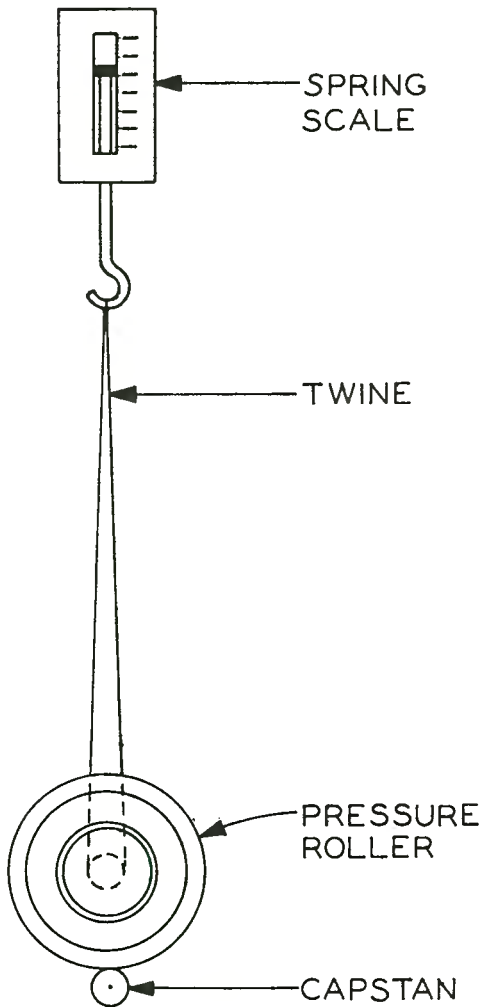


FIGURE 6-5

urement must be taken. The pulling force at this point should be between 9 and 10 pounds or 4.5 kilograms. See Figure 6-5.

4. If adjustment is required, loosen the clevis lock nut and rotate the solenoid plunger as follows. See Figure 6-6.
 - a. To increase pressure, rotate the plunger clockwise as viewed from the clevis end (plunger will penetrate deeper into the solenoid). Do not allow the plunger to "bottom out" to the seat of the solenoid.
 - b. To decrease pressure, rotate the plunger counterclockwise.
5. Once adjustment is correct, retighten the clevis lock nut.

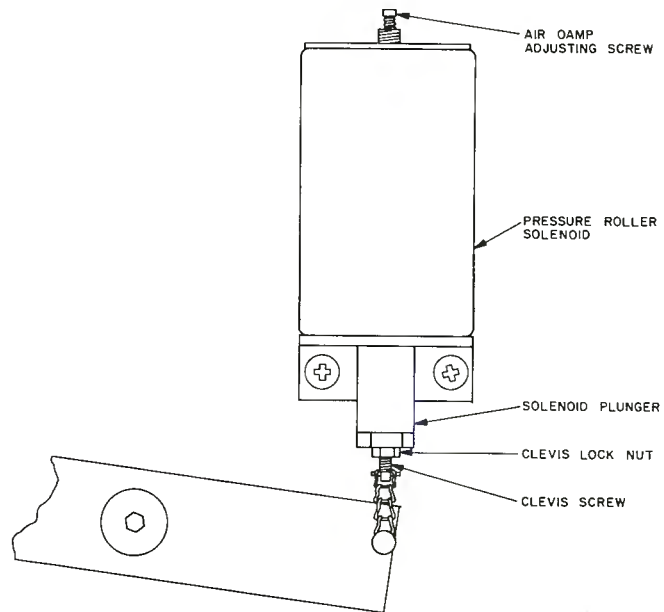


FIGURE 6-6

ELECTRONIC ADJUSTMENTS

750 SERIES

A. REPRODUCE HEAD —
AZIMUTH AND PHASING

1. Monophonic Head Azimuth Alignment — Before attempting these adjustments, insure that the head height and zenith adjustments as outlined in Section V-C are accurate.
 - a. Connect a 600 ohm load to the output terminals (3 and 5) at connector J2 and connect a high impedance volt meter across this load.
 - b. Properly thread a standard alignment tape in the machine and start the transport mechanism in motion.
 - c. When the 15 kHz azimuth tone is present, adjust the azimuth screw A (refer to Figure 7-1) of the reproduce head until a maximum audio output level is observed.
 - d. Carefully tighten lockscrew L while observing the volt meter to insure that no change in output level occurs.

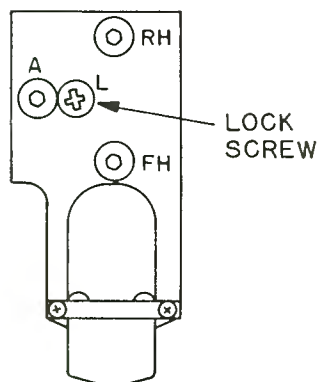


FIGURE 7-1

2. Stereo Head System Azimuth Adjustment (Phasing) — Two track stereo reproducing results are subject to several contributing mechanical inaccuracies, which can cause a shift in simultaneously monitored reproducer outputs. In stereo systems these shifts are generally not perceptible in reproduction; however, in cases where monophonic “dubbing” or channel “summing” is desired, phase shifts can result in serious amplitude variations or complete audio dropout at the higher frequencies. The most common causes of these problems are:
 - a. Improper azimuth of the head with respect to any other reproducer or recorder in a system.
 - b. Improper tape guidance (skew) within the head assembly or within the complete tape guidance system.

- a. Improper azimuth of the head with respect to any other reproducer or recorder in a system.
- b. Improper tape guidance (skew) within the head assembly or within the complete tape guidance system.

Azimuth (phasing) adjustment should be made in the following manner:

- a. Connect 600 ohm loads across both the Channel 1 and Channel 2 outputs. Connect a high impedance volt meter to the Channel 1 output and begin playing a properly threaded full track 400 Hz reference level tape. Set the Channel 1 gain control R219 for +8 dBm output. Now connect the volt meter to the Channel 2 output and adjust the Channel 2 gain control R247 for +8 dBm output.
- b. While playing the 15 kHz full track azimuth tone, carefully adjust the playback azimuth screw A (see Figure 7-1) for a maximum reading of the volt meter. Observe the mechanical position of the azimuth screw.
- c. Move the volt meter to the Channel 1 output. Now move the azimuth screw a small amount in either direction and observe the volt meter reading as an increasing or decreasing output. Continue moving the screw in the direction that causes increasing output until a maximum is obtained.
- d. Observe direction and amount the screw was turned to obtain maximum on the other channel. Set screw A to the midpoint between the settings to obtain AVERAGE azimuth for the two channels.
- e. Connect the horizontal input of any scope so equipped to the Channel 2 output. Insert a full track frequency alignment tape and start the machine. Adjust the horizontal gain provided on the scope to a suitable amplitude. Remove the horizontal input.
- f. Connect the vertical input to the same Channel 2 output; adjust the vertical gain to provide deflection equal to that of the horizontal above.

- g. Now connect the horizontal input to the Channel 1 output. Advance the tape to the 400 Hz section. A pattern as shown in Figure 7-2 should now appear. If not, reverse the two leads of the horizontal input. This pattern represents the “zero” or near “zero” phase shift pattern of the system.
- h. Allow the tape to run to the 5 kHz section and observe if phase shift has occurred. (Refer to Figures 7-2 through 7-5.) If phase shift has occurred, adjust the azimuth screw A to correct this phase shift in the exact reverse rotation to which it has occurred. This means that if the pattern was increased counterclockwise from “zero” shift as frequency increased, screw A should be turned in such a way as to cause the scope display to rotate counterclockwise back to the “zero” position.
- i. Now allow the tape to continue through the various frequencies observing the scope display to insure that no 180° reversals occur. At 15 kHz final adjustment of screw A can

be made to provide best average phase shift. It is normal for shift “jitter” of several degrees to occur at the highest frequencies so settings should be based on the best average results. It is desirable to run the tape several times observing that phase reversals do not occur at any frequencies. Tighten the lockscrew L carefully and observe that no change occurs. (Readjust if necessary.)

- j. Figures 7-2 through 7-5 show the proper phase angles which would be observed on probably the majority of oscilloscopes available today. It should be noted, however, that some oscilloscopes will produce the opposite direction of deflection when “in phase” signals are connected to the vertical and horizontal inputs. Therefore, before making any stereo phasing adjustments, determine which angle of deflection will be produced on the scope being used when “in phase” signals are connected to its horizontal and vertical inputs. (Follow step g.)

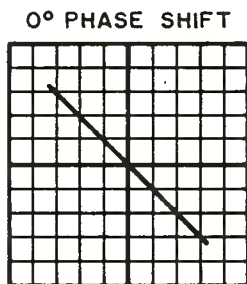


FIGURE 7-2

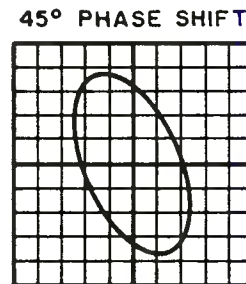


FIGURE 7-3

90° or 270° PHASE SHIFT

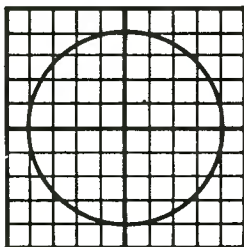


FIGURE 7-4

180° PHASE SHIFT

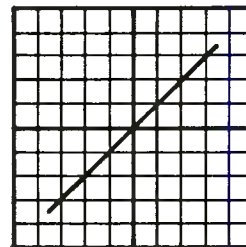


FIGURE 7-5

B. REPRODUCE AMPLIFIER EQUALIZATION

In order to adjust the reproduce amplifier equalization, the front switch dress panel must first be removed. The reproduce equalization is adjusted with variable resistor R205 (R233 on two track models) and should be done so using a reliable standard response tape. The equalization control(s) (see Figure 7-6) should be adjusted to provide the flattest response possible when using the standard frequency response tape. It is important that before making any equalization adjustments, the azimuth (phasing on stereo units) be accurately set.

C. REPRODUCE AMPLIFIER LEVEL

The output level of the reproduce amplifier is

factory adjusted for +8 dBm while playing an NAB standard reference tone. (The front panel level control must be in the "calibrated" or vertical position.) The limited range front panel level control may be used to change the gain approximately +8 dB or -4 dB. If more output level variation is necessary, the internal level control R210 (also R238 on two track models) must be used. If an output level of less than 0 dBm is required, an external loss pad should be used to maintain a maximum signal-to-noise ratio. The limited range front panel level controls are accessible without removing the switch dress panel, but in order to obtain access to the full range controls, resistors R210 and R238, the switch dress panel must first be removed. (See Figure 7-6 for location of the calibration controls.)

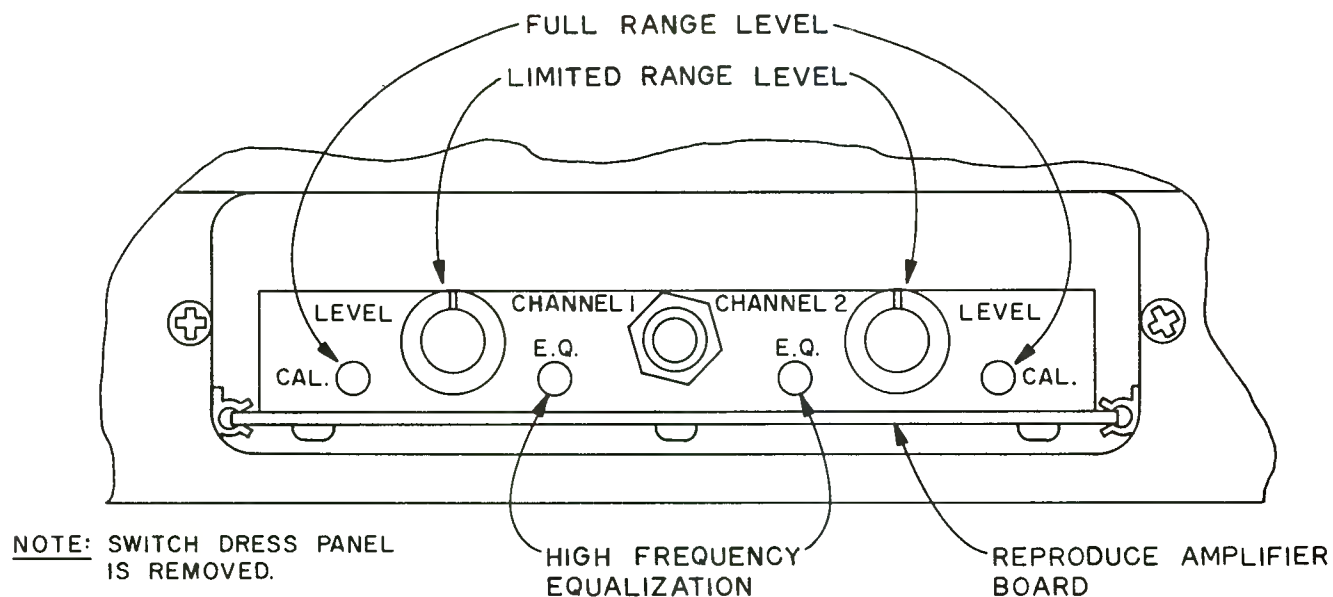


FIGURE 7-6

A. TORQUE MOTOR ASSEMBLIES

SYMBOL	PART NUMBER	DESCRIPTION
1	355-0801-000	Screw, set 8-32 x 1/4 socket
2	253-0048-001	Block, L.H. brake (rewind)
3	253-0049-001	Block, R.H. brake (take-up)
3	282-0029-000	Pin, .187 x 1 1/8
4	300-0040-000	Stand off, 1/4 x 1/2 - 6 - 32 round
5	370-0403-000	Nut, 4-40 x 1/4 Hex, KEPS
6	254-0050-001	Bracket, angle
7	350-0407-000	Screw, 4-40 x 5/16 Phillips panhead
8	360-1001-000	Washer, flat #10 x 3/8
9	370-1003-000	Nut, 10-32 x 3/8 square
10	352-0001-000	Screw, thumb 10-32 x 5/8
11	350-0811-000	Screw, 8-32 x 3/8 Phillips flathead
12	353-0004-000	Screw, 10-32 x 7/8 Button head
13	360-0604-000	Washer, .203" I.D. x 1" O.D. x 1/16" Flat
14	300-0042-000	Spacer, steel .203" I.D. x 9/32" O.D. x 1/4" long
15	359-0017-000	Washer, Urethane 3/4 x 1/2 x 1/16
16	477-0015-000	Solenoid, brake
17	282-0001-021	Pin, roll 5/16 x 1/2
18	291-0013-002	Roller, brake
19	301-0002-001	Spring, Expansion
20	370-0802-000	Nut, 8-32 x 1 1/32 Hex
21	832-0500-165	Strap, brake and lining assembly
22	350-0411-000	Screw, 4-40 x 3/8 Phillips flathead
23	350-0811-000	Screw, 8-32 x 3/8 Phillips flathead
24	350-0801-000	Screw, 8-32 x 1/4 Phillips panhead
25	283-0040-003	Plate, motor mounting L.H. (rewind)
25	283-0041-003	Plate, motor mounting R.H. (take-up)
26	683-0012-000	Capacitor 7.5 mfd. 236 VAC
27	724-0007-000	Bracket, capacitor mounting
28	451-0057-020	Motor, Torque (without plug)

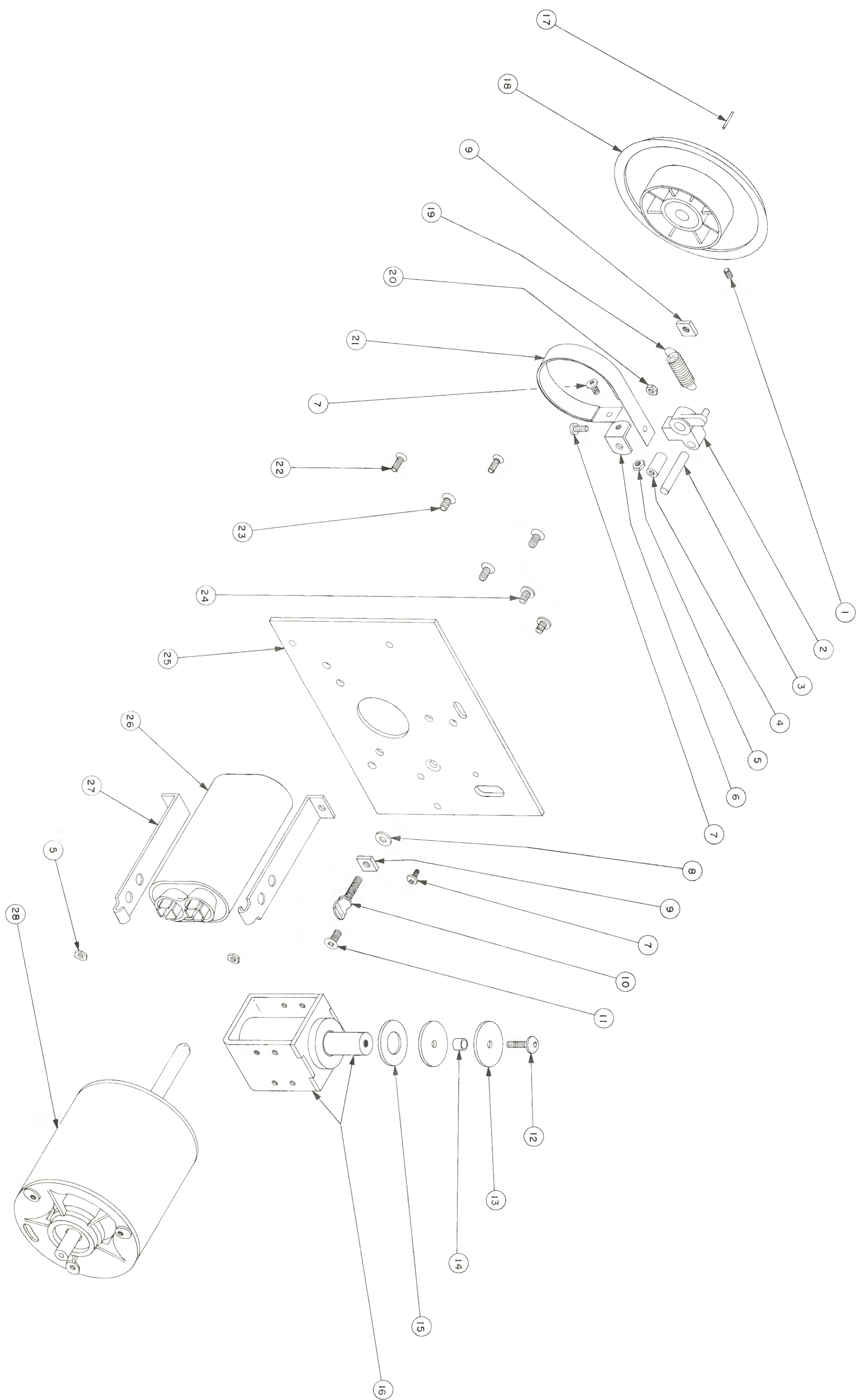


FIGURE 8-1

B. TRANSPORT CHASSIS ASSEMBLY

SYMBOL	PART NUMBER	DESCRIPTION
1	267-0018-004	Deck
2	283-0042-004	Plate, Dress
3	350-0609-000	Screw, 6-32 x 3/8" black
4	359-0015-000	Washer, #6 fiber 1/4 O.D.
5	268-0013-003	Escutcheon, 750
6	300-0038-000	Standoff, 6-32 x 1/4 Hex
7	300-0009-000	Standoff, 1/4 x 1 1/4 x 6-32
8	265-0034-002	Cover, Switch
9	350-0607-000	Screw, 6-32 x 5/16 Phillips
10	353-0022-000	Panhead
11	832-0500-230	Screw, 6-32 x 5/8 Flat Socket Head
12	350-1019-000	Tape Sensor Assembly
13	300-0036-001	Screw, 10-24 x 7/8 FH Socket
14	251-5019-000	Cap, Bearing
15	334-0003-001	Bearing, Ball
16	350-0428-000	Standoff, bearing
17	360-0402-000	Screw, 4-40 x 3/4 Phillips
18	272-0014-001	Panhead
19	433-0001-000	Washer #4 x 5/16 Flat
20	418-0001-000	Guide, Capstan Tape
21	417-0007-000	Line Cord
22	350-0626-000	Fuseholder
23	---	Fuse, 2 Amp, Slo Blo
24	477-0006-002	Screw, 6-32 x 3/4 Phillips Panhead
25	277-0002-021	Electronics Assembly
26	526-0003-000	Solenoid & Plunger Assembly
27	350-1002-000	Chain, Ladder (6 links)
28	370-1001-000	Transformer NT 1228
29	264-0002-001	Screw, 10-24 x 3/8 Phillips
30	282-0001-021	Nut, 10-32 x 3/8 Hex
31	355-0808-000	Screw, Clevis
32	253-0002-000	Pin, Roll, 1/16 x 1/2
33	282-0010-011	Screw, Set 6-32 x 1/8
34	233-0002-000	Rubber, Bumper tip
35	441-0001-000	Pin, Dowel 1/8 x 5/8
36	282-0031-000	Urethane Stock, 1 inch wide
37	301-0030-000	Tubing, shrink
38	350-0809-000	Pin, Roll 1/8 x 1
39	282-0028-000	Spring, Tape Lifter Return
40	253-0050-001	Screw, 8-32 x 1 Phillips Panhead
41	353-0025-000	Pin, Dowel 3/16 x 1 1/4
42	250-0009-001	Block, Tape lifter
43	282-0032-001	Screw, 1/4-20 x 1/2 FH Socket
44	300-0041-001	Arm, Rear Lifter
45	250-0010-001	Pin, Foil Sensing
46	282-0017-001	Spacer, Foil Sensing
47	301-0031-000	Arm, Tension
48	359-0010-001	Pin, Dowel 1/8 x 3/4
49	349-0001-001	Spring, Tension Arm Compression
50	350-1021-000	Washer, Nylon 1/4 x 1/2
51	312-0001-001	Screw, 6-32 x 2 Slotted PHD
52	301-0005-000	Cable and Clip, Tension Arm
53	251-0013-000	Spring, Expansion
54	360-1003-000	Bearing, Ball
55	350-1007-000	Washer, #10 x 1/2 Flat
56	322-0001-000	Screw, 10-24 x 5/8 Phillips
57	301-0003-001	Panhead
58	832-0500-160	Ball, Steel 1/4" diameter
59	832-0500-140	Spring, Compression 1/4 x 5/8
60	284-0003-001	Take Up Torque Motor Assembly
61	301-0014-000	Supply Torque Motor Assembly
62	289-0010-000	Dress Cap
63	359-0007-000	Spring, Dress Cap Retainer
64	291-0010-001	Pressure Roller
65	296-0019-001	Washer, Felt
66	350-0611-000	Shaft, Pressure Roller
67	250-0008-002	Pressure Roller
68	251-0001-041	Arm, Pressure Lever
69	349-0003-001	Bearing, Oilite 1/2 x 5/8 x 1
70	353-0004-000	Screw, Shoulder 1/2 x 1
71	832-0500-350	Screw, 10-32 x 7/8 Button Head
72	350-1002-000	Socket
73	316-0002-000	Motor, Capstan 60 Hz 7 1/2 IPS
74	441-023-000	Pinhead
		Capacitor Insulator
		Tubing, 1/4 inch clear

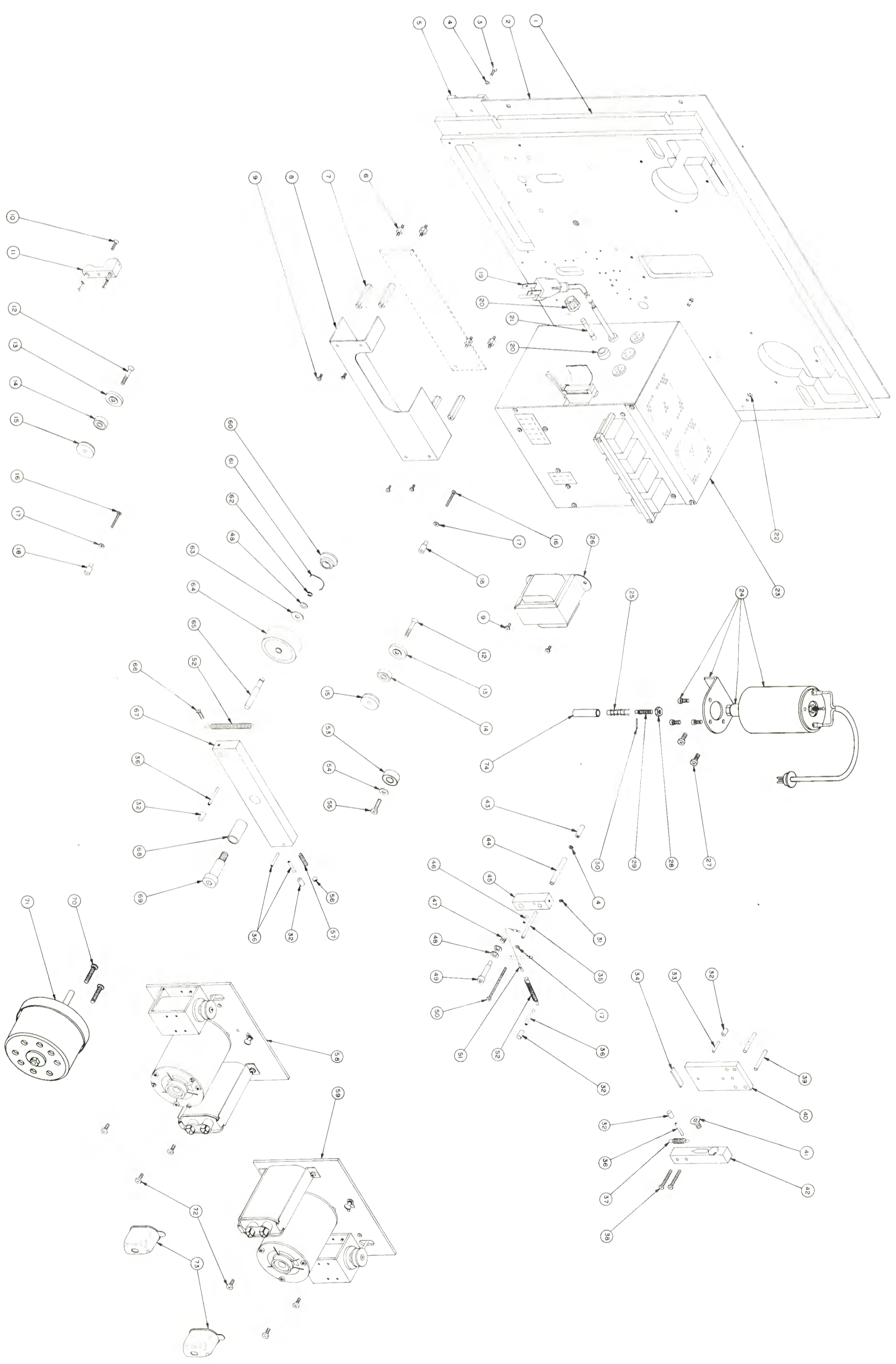


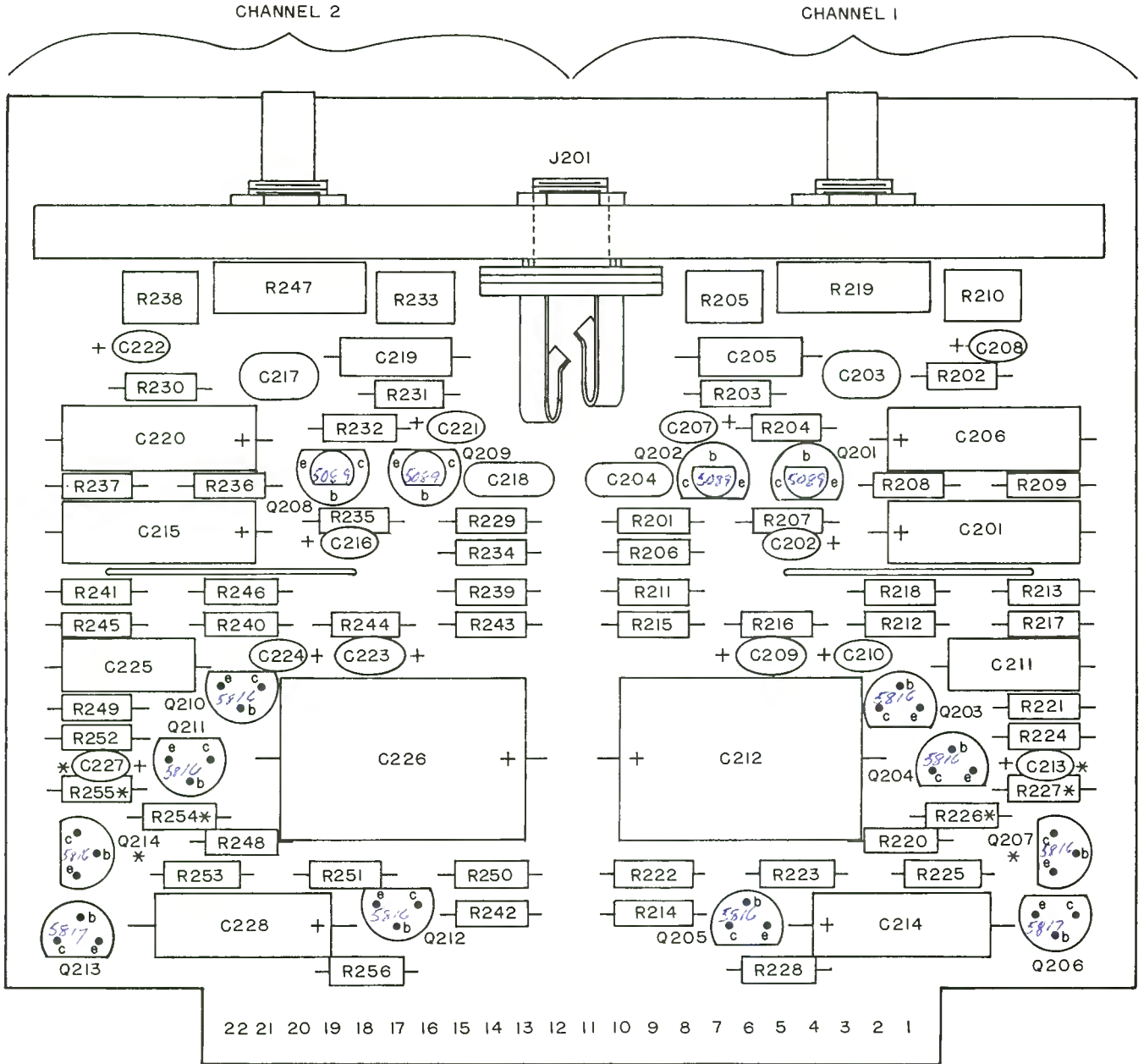
FIGURE 8-2

SECTION IX

ELECTRICAL DRAWINGS AND PARTS LISTS

750 SERIES

A. Printed Circuit Boards



NOTES:

1. * USED ON 2 SPEED 3 3/4 - 7 1/2 IPS MODELS ONLY.

**MONO REPRODUCE AMPLIFIER
831-0089-003**

**STEREO REPRODUCE AMPLIFIER
831-0089-013**

FIGURE 9-1

1. Reproduce Amplifier

SYMBOL	PART NUMBER	DESCRIPTION
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CAPACITORS

C201	696-0078-000	100 mfd 12 v, electrolytic
C202	694-0003-000	4.7 mfd. 35 v, tantalum
C203	677-0001-000	100 pfd. 300 v, silver mica

C204	677-0003-000	300 pfd. 300 v, silver mica
C205	681-0046-000	.01 mfd. 200 v, paper
C206	696-0078-000	100 mfd. 12 v, electrolytic
C207	694-0003-000	4.7 mfd. 35 v, tantalum
C208	694-0003-000	4.7 mfd. 35 v, tantalum
C209	694-0007-000	47 mfd. 20 v, tantalum
C210	694-0003-000	4.7 mfd. 35 v, tantalum
C211	681-0050-000	.022 mfd. 200 v, paper
C212	687-0007-000	470 mfd. 25 v, electrolytic
C213	694-0005-000	1 mfd. 35 v, tantalum
C214	696-0122-000	50 mfd. 25 v, electrolytic

C215	696-0078-000	100 mfd. 12 v, electrolytic
C216	694-0003-000	4.7 mfd. 35 v, tantalum
C217	677-0001-000	100 pfd. 300 v, silver mica
C218	677-0003-000	300 pfd. 300 v, silver mica
C219	681-0046-000	.01 mfd. 200 v, paper
C220	696-0078-000	100 mfd. 12 v, electrolytic
C221	694-0003-000	4.7 mfd. 35 v, tantalum
C222	694-0003-000	4.7 mfd. 35 v, tantalum
C223	694-0007-000	47 mfd. 20 v, tantalum
C224	694-0003-000	4.7 mfd. 35 v, tantalum
C225	681-0050-000	.022 mfd. 200 v, paper
C226	687-0007-000	470 mfd. 25 v, electrolytic
C227	694-0005-000	1 mfd. 35 v, tantalum
C228	696-0122-000	50 mfd. 25 v, electrolytic

PHONE JACK

J201	380-0035-000	Phone Jack
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TRANSISTORS

Q201	590-0013-000	2N5089, NPN
Q202	590-0013-000	2N5089, NPN
Q203	590-0017-000	2N5816, NPN
Q204	590-0017-000	2N5816, NPN
Q205	590-0017-000	2N5816, NPN
Q206	590-0018-000	2N5817, PNP
Q207	590-0017-000	2N5816, NPN
Q208	590-0013-000	2N5089, NPN
Q209	590-0013-000	2N5089, NPN
Q210	590-0017-000	2N5816, NPN
Q211	590-0017-000	2N5816, NPN
Q212	590-0017-000	2N5816, NPN
Q213	590-0018-000	2N5817, PNP
Q214	590-0017-000	2N5816, NPN

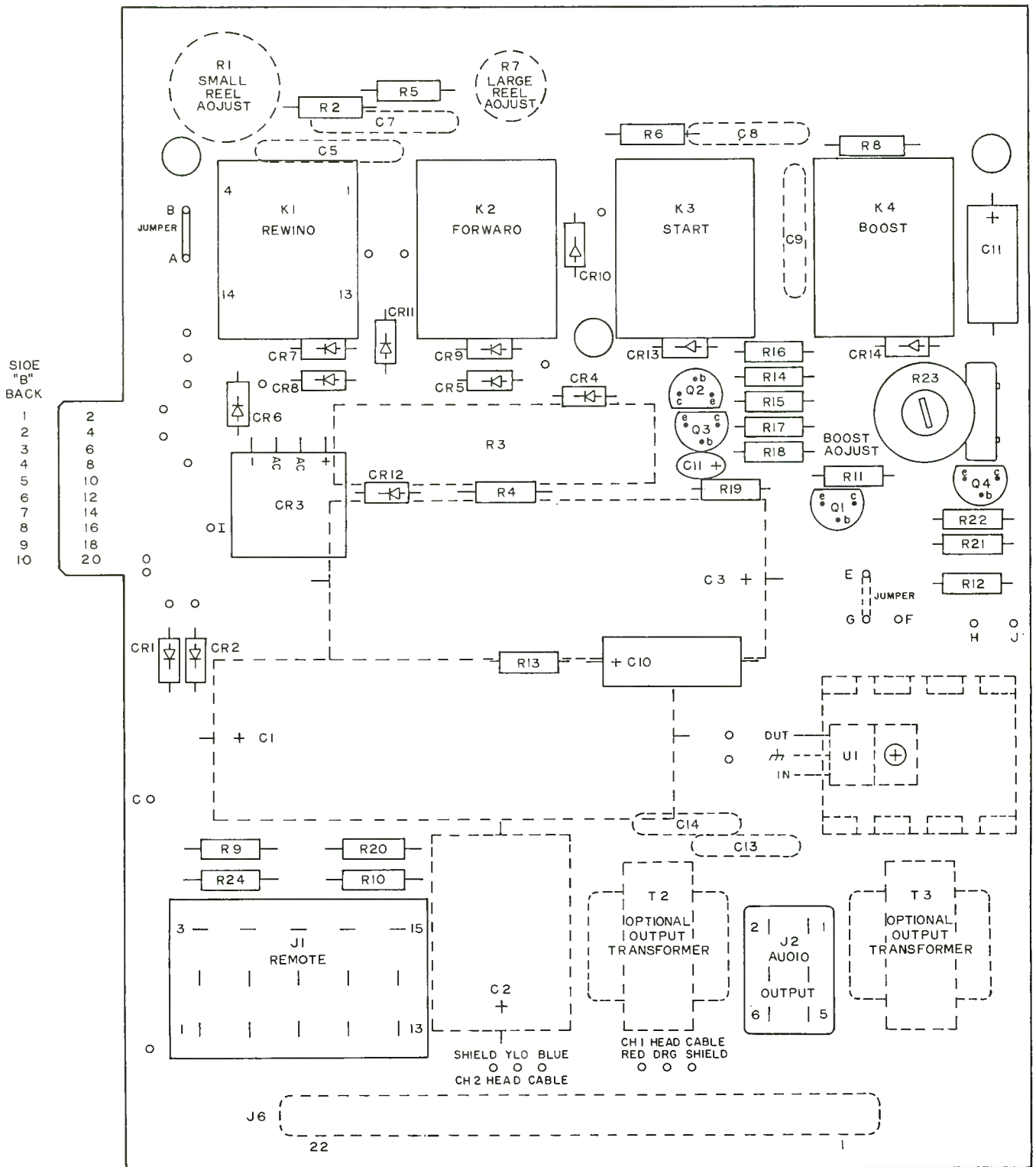
RESISTORS

(All 1/4 watt, carbon film, 5% tolerance unless otherwise noted)

R201	630-0103-000	47k ohms
R202	630-0051-000	330 ohms
R203	630-0075-000	3.3k ohms
R204	630-0111-000	100k ohms
R205	636-0010-000	10k ohms, potentiometer
R206	630-0071-000	2.2k ohms
R207	630-0047-000	220 ohms
R208	630-0067-000	1.5k ohms

R209	630-0055-000	470 ohms
R210	636-0010-000	10k ohms, potentiometer
R211	630-0085-000	8.2k ohms
R212	630-0107-000	68k ohms
R213	630-0087-000	10k ohms
R214	630-0031-000	47 ohms
R215	630-0063-000	1k ohm
R216	630-0071-000	2.2k ohms
R217	630-0051-000	330 ohms
R218	630-0071-000	2.2k ohms
R219	636-0011-000	25k ohms, potentiometer
R220	630-0115-000	150k ohms
R221	630-0095-000	22k ohms
R222	630-0071-000	2.2k ohms
R223	630-0047-000	220 ohms
R224	630-0039-000	100 ohms
R225	630-0023-000	22 ohms
R226	630-0091-000	15k ohms
R227	630-0079-000	4.7k ohms
R228	630-0039-000	100 ohms
R229	630-0103-000	47k ohms
R230	630-0051-000	330 ohms
R231	630-0075-000	3.3k ohms
R232	630-0111-000	100k ohms
R233	636-0010-000	10k ohms, potentiometer
R234	630-0071-000	2.2k ohms
R235	630-0047-000	220 ohms
R236	630-0067-000	1.5k ohms
R237	630-0055-000	470 ohms
R238	636-0010-000	10k ohms, potentiometer
R239	630-0085-000	8.2k ohms
R240	630-0107-000	68k ohms
R241	630-0087-000	10k ohms
R242	630-0031-000	47 ohms
R243	630-0063-000	1k ohm
R244	630-0071-000	2.2k ohms
R245	630-0051-000	330 ohms
R246	630-0071-000	2.2k ohms
R247	636-0011-000	25k ohms, potentiometer
R248	630-0115-000	150k ohms
R249	630-0095-000	22k ohms
R250	630-0071-000	2.2k ohms
R251	630-0047-000	220 ohms
R252	630-0039-000	100 ohms
R253	630-0023-000	22 ohms
R254	630-0091-000	15k ohms
R255	630-0079-000	4.7k ohms
R256	630-0039-000	100 ohms

2. Mother Board



NOTES:

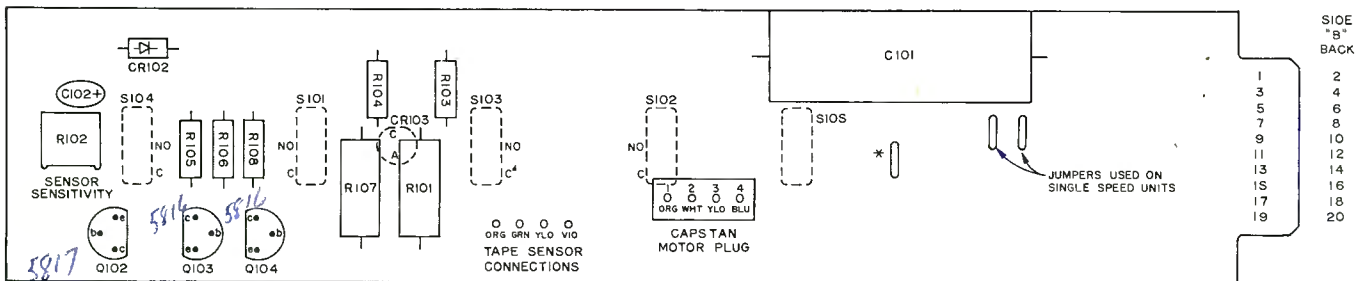
1. LETTERS "I" DESIGNATE CONNECTIONS FROM MOTION SENSE BOARD IF SO EQUIPPED.
2. JUMPER TOGETHER 'G' AND 'F'. REMOVE JUMPER BETWEEN 'E' AND 'G'. REMOVE JUMPER BETWEEN 'A' AND 'B' AND REMOVE JUMPER BETWEEN 'H' AND 'J' IF EQUIPPED WITH MOTION SENSE.
3. DASHED LINES INDICATE COMPONENTS MOUNTED ON SIDE "B".

MOTHER PC BOARD
831-0101-003

FIGURE 9-2

SYMBOL	PART NUMBER	DESCRIPTION	TRANSISTORS	
CAPACITORS			Q1	590-0018-000 2N5817
C1	696-0028-000	1100 mfd. 50 v, electrolytic	Q2	590-0018-000 2N5817
C2	696-0165-000	500 mfd. 25 v, electrolytic	Q3	590-0017-000 2N5816
C3	696-0207-000	200 mfd. 250 v, electrolytic	Q4	590-0018-000 2N5817
C5	686-0001-000	.1 mfd. 500 v, ceramic disc	RESISTORS	
C7	686-0001-000	.1 mfd. 500 v, ceramic disc	(All 5% tolerance unless noted)	
C8	686-0001-000	.1 mfd. 500 v, ceramic disc	R1	638-0002-000 250 ohms, 25 watts, adjustable
C9	686-0001-000	.1 mfd. 500 v, ceramic disc	R2	626-0231-000 47 ohms, 1/2 watt, carbon comp.
C10	696-0122-000	50 mfd. 25 v, electrolytic	R3	628-0179-000 50 ohms, 20 watts, wire wound
C11	694-0002-000	10 mfd. 20 v, tantalum	R4	630-0107-000 68k ohms, 1/2 watt, carbon film
C12	696-0117-000	10 mfd. 25 v, electrolytic	R5	626-0231-000 47 ohms, 1/2 watt, carbon comp.
C13	686-0003-000	.05 mfd. ceramic disc	R6	626-0231-000 47 ohms, 1/2 watt, carbon comp.
C14	686-0003-000	.05 mfd. ceramic disc	R7	638-0005-000 150 ohms, 12 watts, adjustable
DIODES			R8	626-0231-000 47 ohms, 1/2 watt, carbon comp.
CR1	575-0007-000	1N4005	R9	630-0239-000 100 ohms, 1/2 watt, carbon film
CR2	575-0007-000	1N4005	R10	630-0239-000 100 ohms, 1/2 watt, carbon film
CR3	575-0011-000	75KBP04 Bridge Rectifier	R11	630-0091-000 15k ohms, 1/4 watt, carbon film
CR4	575-0007-000	1N4005	R12	630-0079-000 4.7k ohms, 1/4 watt, carbon film
CR5	575-0007-000	1N4005	R13	630-0055-000 470 ohms, 1/4 watt, carbon film
CR6	575-0007-000	1N4005	R14	630-0079-000 4.7k ohms, 1/4 watt, carbon film
CR7	575-0007-000	1N4005	R15	630-0079-000 4.7k ohms, 1/4 watt, carbon film
CR8	575-0007-000	1N4005	R16	630-0079-000 4.7k ohms, 1/4 watt, carbon film
CR9	575-0007-000	1N4005	R17	630-0087-000 10k ohms, 1/4 watt, carbon film
CR10	575-0007-000	1N4005	R18	630-0107-000 68k ohms, 1/4 watt, carbon film
CR11	575-0007-000	1N4005	R19	630-0091-000 15k ohms, 1/4 watt, carbon film
CR11	575-0007-000	1N4005	R20	630-0239-000 100 ohms, 1/2 watt, carbon film
CR12	575-0007-000	1N4005	R21	630-0087-000 10k ohms, 1/4 watt, carbon film
CR13	575-0007-000	1N4005	R22	636-0055-000 470 ohms, 1/4 watt, carbon film
CR14	575-0007-000	1N4005	R23	636-0004-000 10k ohms, potentiometer
CONNECTORS			R24	630-0239-000 100 ohms, 1/2 watt, carbon film
J1	380-0045-000	15 pin socket, PC	TRANSFORMERS	
J2	380-0044-000	6 pin socket, PC	T2	532-0001-020 Audio output, PC mount, NT1277
J6	380-0038-000	22 pin card edge connector	T3	532-0001-020 Audio output, PC mount, NT1277
RELAYS			INTEGRATED CIRCUIT	
K1, K2			U1	605-0004-000 24 v series regulator—7824
K3, K4	480-0001-000	4 PDT (24 v)		
	487-0003-000	Socket, relay (PC mount)		

3. Control Switch Assembly



NOTES:
 1. * JUMPER MAY BE REPLACED WITH POWER-ON-OFF SWITCH.
 2. DASHED LINES INDICATE COMPONENTS MOUNTED ON SIDE "B".

SWITCH PC BOARD ASSEMBLY
 831-0100-003

FIGURE 9-3

SYMBOL	PART NUMBER	DESCRIPTION	DIODES	
CAPACITORS			CR101	575-0013-000 T1L32 — LED (infra-red)
C101	685-0011-000	1.2 mfd. 400 vdc	CR102	575-0007-000 1N4005
C102	694-0002-000	10 mfd. 20 v, tantalum	CR103	575-0012-000 MV5054-1 Red LED

TRANSISTORS

Q101	590-0021-000	T1L78, Photo, NPN
Q102	590-0018-000	2N5817, PNP
Q103	590-0017-000	2N5816, NPN
Q104	590-0017-000	2N5816, NPN

RESISTORS

(All 5% tolerance unless noted)

R101	626-0463-000	1k ohm, 1 watt, carbon comp.
R102	636-0013-000	100k ohms, potentiometer
R103	630-0115-000	150k ohms, 1/4 watt, carbon film
R104	630-0103-000	47k ohms, 1/4 watt, carbon film
R105	630-0095-000	22k ohms, 1/4 watt, carbon film
R106	630-0095-000	22k ohms, 1/4 watt, carbon film
R107	626-0463-000	1k ohm, 1 watt, carbon comp.
R108	630-0063-000	1k ohm, 1/4 watt, carbon film

SWITCHES

S101	391-0013-000	Pushbutton, SPDT momentary
S102	391-0013-000	Pushbutton, SPDT momentary
S103	391-0013-000	Pushbutton, SPDT momentary
S104	391-0013-000	Pushbutton, SPDT momentary
S105	390-0004-000	Toggle, SPDT, optional power switch
	404-0021-000	Lens, white
	404-0022-000	Lens, yellow
	404-0023-000	Lens, green
	404-0024-000	Lens, blue

4. Motion Sensor

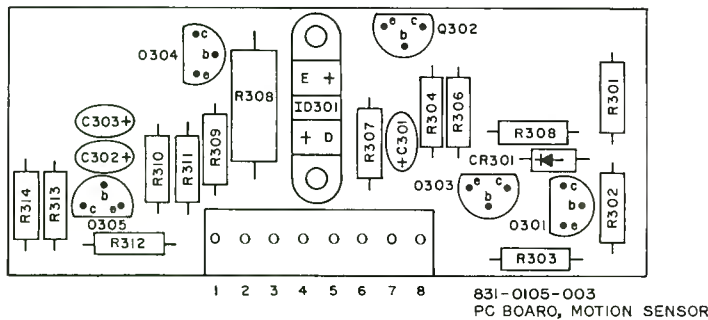


FIGURE 9-4

SYMBOL PART NUMBER DESCRIPTION

CAPACITORS

C301	694-0002-000	10 mfd. 20 v, tantalum
C302	694-0005-000	1 mfd. 35 v, tantalum
C303	694-0002-000	10 mfd. 20 v, tantalum

DIODE

CR301	575-0007-000	1N4005
-------	--------------	--------

PHOTO INTERRUPTER

ID301	652-0001-000	H13A1
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TRANSISTORS

Q301	590-0017-000	2N5816, NPN
Q302	590-0018-000	2N5817, PNP
Q303	590-0017-000	2N5816, NPN
Q304	590-0017-000	2N5816, NPN
Q305	590-0017-000	2N5816, NPN

RESISTORS

(All 1/4 watt, 5% carbon film unless otherwise noted)

R301	630-0083-000	6.8k ohms
R302	630-0075-000	3.3k ohms
R303	630-0079-000	4.7k ohms
R304	630-0071-000	2.2k ohms
R305	630-0099-000	33k ohms
R306	630-0079-000	4.7k ohms
R307	630-0079-000	4.7k ohms
R308	626-0463-000	1k ohm, 1 watt, carbon comp.
R309	630-0107-000	68k ohms
R310	630-0087-000	10k ohms
R311	630-0099-000	33k ohms
R312	630-0095-000	22k ohms
R313	630-0087-000	10k ohms
R314	630-0055-000	470 ohms

B. Miscellaneous Electronic Parts

SYMBOL PART NUMBER DESCRIPTION

MOTORS

B1	451-0053-020	Motor, capstan, 450 RPM, 117 VAC, 7 1/2 IPS
B2	451-0057-020	Motor, torque, 1800 RPM, 117 VAC
B3	451-0057-020	Motor, torque, 1800 RPM, 117 VAC

CAPACITORS

C4	683-0012-000	7.5 mfd. 236 VAC, oil filled
C6	683-0012-000	7.5 mfd. 236 VAC, oil filled

CONNECTORS

J3	380-0007-000	6 pin socket
J4	380-0001-000	3 pin socket
J5	380-0007-000	6 pin plug
	380-0046-000	20 pin ribbon card edge connector

TRANSFORMER

T1	526-0005-000	Power, NT1228
----	--------------	---------------

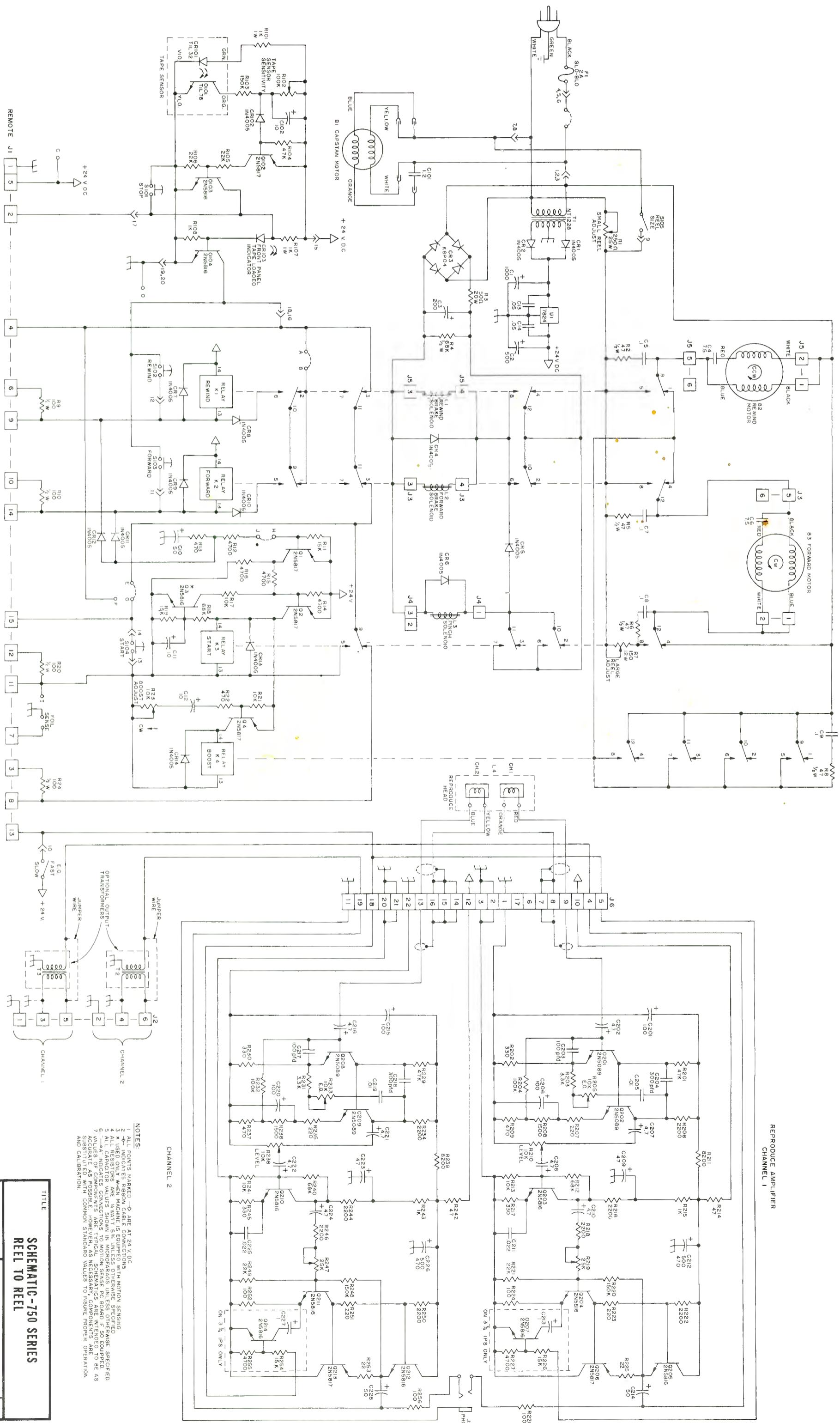
SOLENOIDS

L1	477-0015-003	Brake, 117 VDC
L2	477-0015-003	Brake, 117 VDC
L3	477-0006-002	Pressure roller, 117 VDC, front mount

TAPE SENSOR

CR101 & Q101	832-0500-250	Sensor assembly—complete
--------------	--------------	--------------------------

FIGURE 9-5



- NOTES:
1. ALL POINTS MARKED -D ARE AT 24 V D.C.
 2. -W- INDICATES WIRE CONNECTIONS FROM ANTON SENSORS.
 3. ALL USED OVER WIRE CONNECTIONS FROM ANTON SENSORS.
 4. ALL CAPACITOR VALUES SHOWN IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
 5. ALL CAPACITOR VALUES SHOWN IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
 6. ALL CAPACITOR VALUES SHOWN IN MICROFARADS UNLESS OTHERWISE SPECIFIED.
 7. VALUES OF COMPONENTS ARE TYPICAL. SCHEMATICS ARE INTENDED TO BE AS ACCURATE AS POSSIBLE, HOWEVER, AS NECESSARY, COMPONENTS ARE IDENTIFIED TO BE AS NEAR AS POSSIBLE TO THE MANUFACTURER'S SPECIFICATIONS.

IF

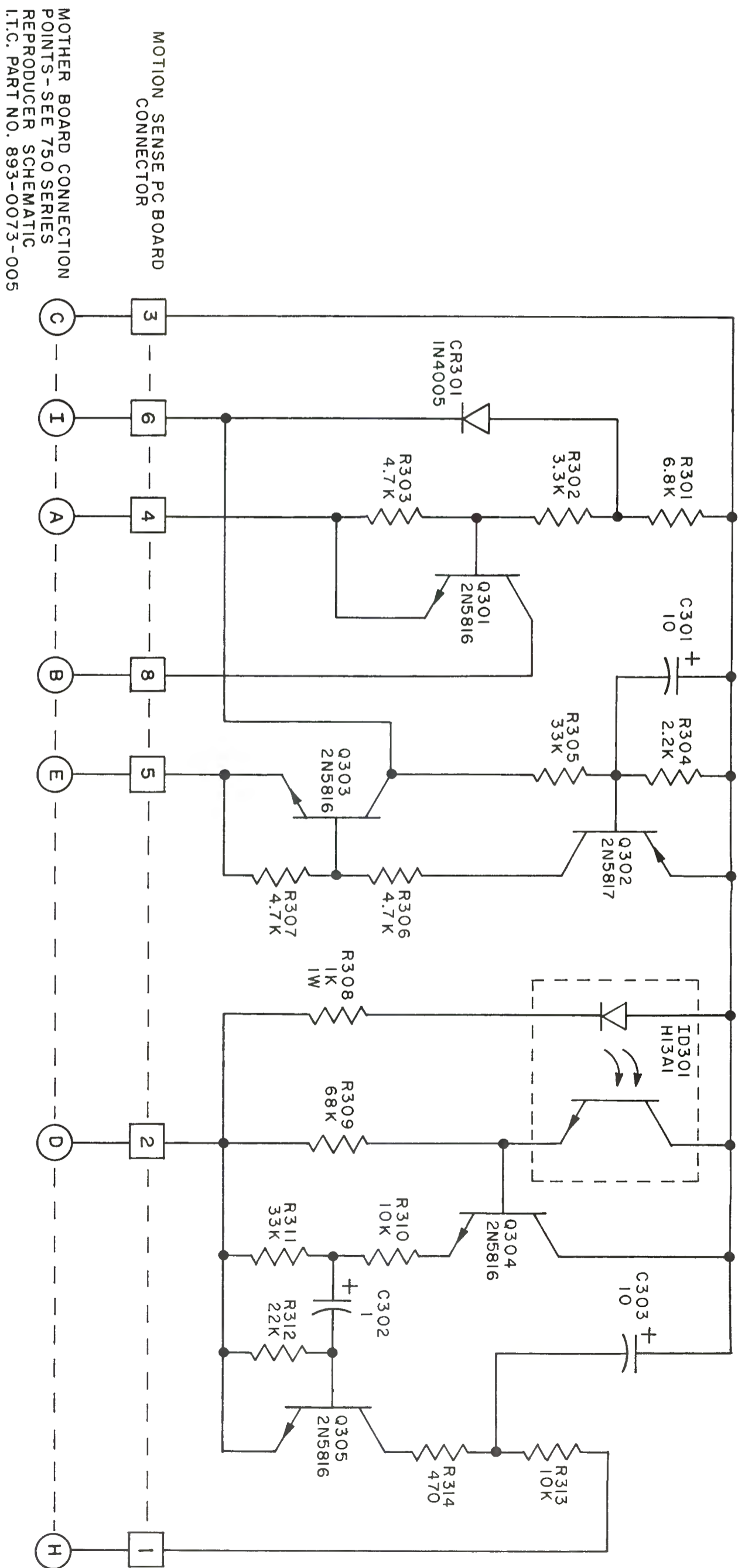
SCHEMATIC-750 SERIES

REEL TO REEL

893-0073-005

DRAWING NUMBER

REV.



- NOTES:
1. ALL RESISTORS ARE 1/4 WATT UNLESS OTHERWISE NOTED.
 2. ALL CAPACITOR VALUES ARE IN MICROFARADS UNLESS OTHERWISE NOTED.

TITLE	
SCHEMATIC - MOTION SENSE	
PC BOARD - 750 SERIES	
893-0074-002	PART NUMBER
REV.	REV.

FIGURE 9-6

SECTION X

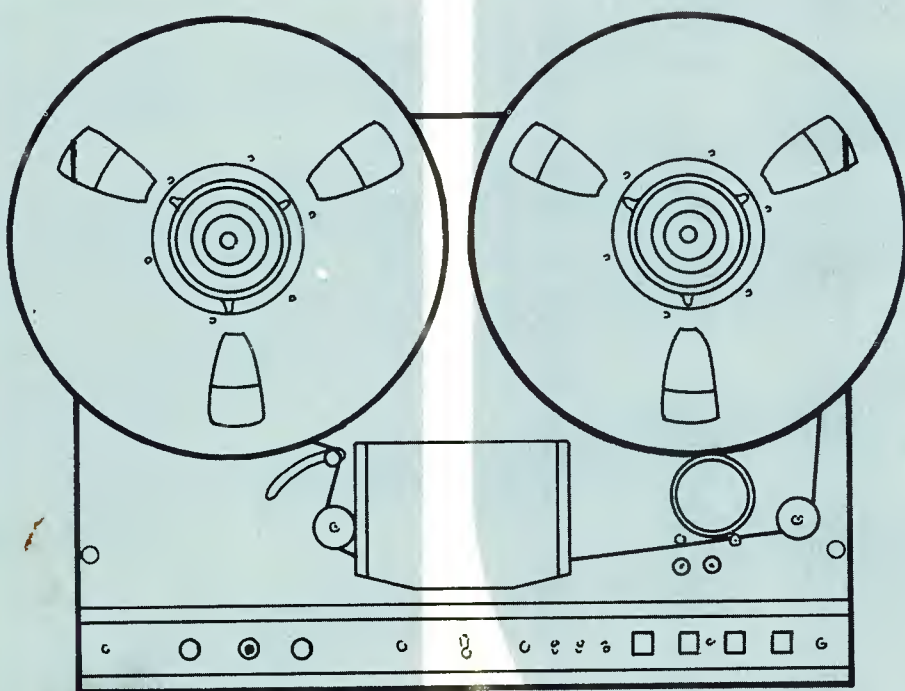
WARRANTY

750 SERIES

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 one year on labor, magnetic head and pressure roller; and for a period of two years on all other parts. 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. 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.



TECHNICAL MANUAL
770 SERIES
REEL-TO-REEL
REPRODUCER / 25 HZ DETECTOR

INTERNATIONAL TAPETRONICS CORPORATION

2425 South Main Street

Bloomington, Illinois 61701

TECHNICAL MANUAL
(890-0024-000)

770 SERIES
REEL-TO-REEL
REPRODUCER/
25 Hz DETECTOR



INTERNATIONAL TAPETRONICS CORPORATION

2425 SOUTH MAIN STREET • BLOOMINGTON, ILLINOIS 61701

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Made under one or more of the following patents:
3,800,323 3,801,043 3,801,329 3,833,925 3,865,719
other patents pending

PREFACE

THE ITC INSTRUCTION MANUAL

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

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

ITC's 770 SERIES REEL-TO-REEL REPRODUCER has been designed for broadcasters. It is ideally suited for use in program automation systems. The 770 SERIES is:

- designed to meet or exceed the NAB (National Association of Broadcasters) standards for reel-to-reel tape reproducers;
- available in a variety of configurations including,
... one or two track, mono or stereo capabilities
and
... tape speeds of 3-3/4, 7-1/2, and 15 IPS;
- constructed with a heavy 1/2 inch (12.7mm) thick aluminum tool plate deck for stability;
- equipped with a unique, high quality, professional head assembly;
- utilizing two induction torque motors for supply and take up reel handling and a D.C. servo capstan motor for tape drive; and
- designed for simplicity and serviceability of mechanical and electronic components.

The 770 Series reproducer is designed for long life, durability, and ease of service

- low maintenance, positive action differential disc brakes design;
- strong, cast stainless steel turntable;
- long life control switches and an ingenious switch support;
- multispeed D.C. servo capstan motor;
- automatic cue lever and tape lifter;
and
- unique magnetic playback head.

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SECTION I — INTRODUCTION

A. TAPE TRANSPORT

The ITC 770 reproducer is constructed of heavy 1/2 inch (12.7mm) thick aluminum tool plate. The tool plate is stress-relieved, and is resistant to thermal variations. The precision milled tool plate aluminum deck provides a stable reference for each critical assembly, resulting in improved tape handling and phase stability.

Individual motors are used in the tape drive system. A DC Servo motor is used for capstan drive. This direct drive system, along with its electronic control system provides accurate speed control with minimum wow and flutter. Heat generation is substantially lower than hysteresis synchronous motors. The two reel drive motors are four pole, 1800 RPM, induction motors. These motors have permanently lubricated ball bearings, and develop adequate torque to provide positive control of the tape reels.

An air damped solenoid operates the tape lifters and pressure roller assembly. The use of air damping, and a TEFLON® covered plunger in this solenoid result in quiet operation and minimum maintenance.

The transport incorporates a tape lifter system operated by the pressure roller solenoid which allows both manual and automatic operation. The tape is automatically lifted away from the head(s) during either fast wind mode. To monitor recorded information while in the fast wind modes, the automatic positioning of the lifters may be overridden by pushing the CUE lever toward the heads. The lifters will remain in this position until the START/PLAY mode is entered, or the CUE lever is manually returned to its original position.

Disc type brakes with a one-way clutch provide a differential between the take up and supply reels. Differential action is essential to provide smooth and even braking action. The disc brakes are designed for minimum maintenance. However, if a touch-up is necessary, the adjustment is simple to make and easily accessible.

B. HEAD ASSEMBLY

The ITC 770 SERIES reproducer is equipped with a unique, high quality professional head assembly. The head is mounted in a machined aluminum bracket designed to provide simple and highly accurate azimuth, height, and zenith adjustments.

The azimuth pivot point is located directly behind the center of the head in both the vertical and horizontal plane. This feature permits azimuth adjustment without disturbing the zenith or height adjustments, and can be locked into position after adjustment. The head mounting arrangement permits convenient head replacement when it is required.

As an aid to head maintenance and tape marking/editing, the entire head assembly is housed beneath a hinged, spring loaded "flip-top" cover. The design of this

cover allows it to be easily opened or closed and remain in either position.

C. ELECTRONICS

The electronics of the 770 Series reel-to-reel reproducer provide simplicity and serviceability. Bulky wiring is eliminated by the mother-daughter board construction with modular cables and connectors.

All assemblies, including motors, brakes, solenoids, and P.C. boards, plug in for easy serviceability and replacement in the field. All normal maintenance adjustments are accessible from the front panel. The equalization and program level calibrations are exposed by removal of the switch dress panel. Limited range level controls, designed to give an 8dB boost or a 4dB cut in audio level, are located on the front panel. A headphone jack is provided for program monitoring purposes.

All electronic logic is either I.C., transistor, or simple relay type. Active components and relays are socket-mounted on the printed circuit boards.

D. SPECIFICATIONS

1. Power:

105 to 130 volts AC, 60 Hz, 160 watts maximum

2. Wind Time:

Less than 60 seconds for 2500 feet of tape.

Less than 90 seconds for 3600 feet of tape.

3. Motors:

Capstan - Direct drive DC servo control with electrolyzed shaft. Reels - Two capacitor-start induction torque motors.

4. Tape Speeds

7-1/2 and 15 ips (19 and 38 cm/sec) or

3-3/4 and 7-1/2 ips (9.5 and 19 cm/sec)

Speed accuracy $\pm 0.2\%$ or less measured with 1.5 mil (0.038 mm) tape.

5. Tape Width and Tracks:

1/4 inch (6.3 mm) tape, 1.0 mil (0.025 mm) base minimum.

Full Track - mono

1/2 track - mono or stereo

1/4 track - stereo

6. Reel Sizes:

NAB or EIA with a hub diameter of 1.75 inch (44.45 mm) or greater. Maximum reel flange diameter of 10.5 inches (266.7 mm). Selectable tape tension for small or large reels. Reels of dissimilar sizes, i.e. 7 inches (177.8 mm) and 10.5 inches (266.7 mm), should not be used together.

7. Flutter (NAB Weighted):

3-3/4 ips 0.10% or less

7-1/2 ips 0.07% or less

15 ips 0.05% or less

8. Audio Output:

With transformer(s) . . . +24dBm before clipping into 600 ohm load, balanced.

Without transformer(s) . . . +18dBm before clipping into 600 ohm load, unbalanced.

9. Distortion (Amplifier):

0.5% rms total harmonic distortion, maximum at +18dBm output level at 1 kHz with output transformer(s). +16dBm without output transformer(s).

10. Signal-To-Noise Ratio:

52dB measured from a 700 Hz tone, recorded at 185 nWb/m, with reproduce amplifier adjusted for +8dBm output, to tape recorded with bias but no signal. Measurement is unweighted noise with a bandwidth of 20 to 20,000 Hz.

11. Crosstalk:

55dB or better with a 185nWb/m 1 kHz tone on adjacent track.

12. Equalization:

NAB with high frequency adjustment for 3-3/4, 7-1/2 and 15 ips. Automatically switched with speed switch between low and high speed equalizers.

13. Frequency Response:

3-3/4 ips (+2dB -3.5dB) 25 to 35 Hz; ±2dB 35 to 8,000 Hz.

7-1/2 ips (+2dB -3dB) 25 to 35 Hz; ±2dB 35 to 15,000 Hz.

15 ips (+2dB -3.5dB) 25 to 35 Hz; ±2dB 35 to 18,000 Hz.

14. Headphone Output:

24 mV into 8 ohms (with AT-0001 output transformers)

58 mV into 8 ohms (without AT-0001 output transformers)

15. Ambient Operating Temperature:

40° to 130°F (5° to 55°C)

16. Remote Control:

Start, Stop, Rewind, Forward, Speed Select, Foil Sense and Mode Indicators.

17. Brakes:

Mechanical disc with one-way clutch.
10-1/2 inch (266.7 mm) metal reels stop time adjustable from 2-1/2 seconds to 10 seconds.

18. External Connectors:

Latching type Beau Series 3300, mating plugs furnished.

19. Dimensions:

19 inches (482.6 mm) wide 1-1/4 inch (31.75 mm) overhang on each side with 10-1/2 inch (266.7 mm) reels.

14 inches (355.6 mm) high, 2-1/4 inches (57.15 mm) overhang on top with 10-1/2 inch (266.7 mm) reels.

7-7/8" (197.6 mm) deep, including mating plugs.

20. Weight:

Unpacked - 44 pounds (19.96 kg)

E. 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 mal-treatment, 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 separately 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.

F. OPTIONS AND ACCESSORIES

833-0018-200	25 Hz DETECTOR
864-0016-000	REMOTE CONTROL FOR REPRODUCERS
864-0017-000	REMOTE CONTROL FOR RECORDER/REPRODUCERS
864-0014-010	CONSOLE CABINET
864-0015-000	ADD-ON STACKING KIT (USE WITH CONSOLE CABINET)
281-0014-012	FILLER PANEL, 1-3/4" (44.45 mm) USE WITH CONSOLE CABINET
830-0022-021	HEAD & TURNTABLE HEIGHT GAUGE
830-0036-001	DISC BRAKE ADJUSTMENT GAUGE
831-0075-003	REPRODUCER TEST EXTENDER
831-0119-003	RECORDER TEST EXTENDER

These items are available for your ITC Model 770 unit. Please call for complete information.

SECTION II — INSTALLATION

A. UNPACKING AND HANDLING

Carefully remove the ITC 770 Series reel-to-reel 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.

If shipping damage is found, contact International Tapetronics immediately for assistance in filing a claim. It is suggested that packing material be retained for any further shipment of the unit.

B. INSTALLATION IN RACK

770 Series reel-to-reel machines are supplied in a 19 inch (482.6 mm) mounting configuration. Adequate ventilation is essential. Vertical spacing between reel-to-reel machines and other equipment should be from 1-3/4 inch (44.45 mm) to 3-1/2 inches (88.9 mm). The spacing depends on the temperature inside the closed rack.

Please refer to Figure 2-1 for deck size and reel overhang dimensions.

The reel is in close proximity to the deck plate. For this reason it may be necessary, in some applications, to space out the 770 Series deck in the rack installation. A simple inexpensive 1/4 inch (6.35 mm) spacer can be made by using a 10-32 socket head screw and a 1/16 inch (1.58 mm) flat washer. Four of these spacers may be mounted in the rack panel near the location of the four mounting slots.

C. OPTIONAL CONSOLE HOUSING

The optional console housing for the 770 Series is shipped separately, and requires minor assembly upon receipt.

After removing the console from the packing material, install the four casters in the bottom of the console legs. Set the console upright, and rotate the transport deck table to its vertical position by pressing the release button located on the front upper right hand side of the console cabinet. This will allow the table to rotate and lock in various planes. With the aid of another person, carefully slide the transport mechanism into the mounting area.

NOTE: When handling the transport, be careful not to damage delicate items such as motors and brakes.

After the transport is properly located, carefully rotate the table back to its horizontal position. Secure the assembly with the enclosed rack mounting screws and washers.

Included with the console is a 1-3/4" (44.45 mm) filler panel. This panel should be mounted toward the top end of the transport deck assembly in order to fill the vacant space.

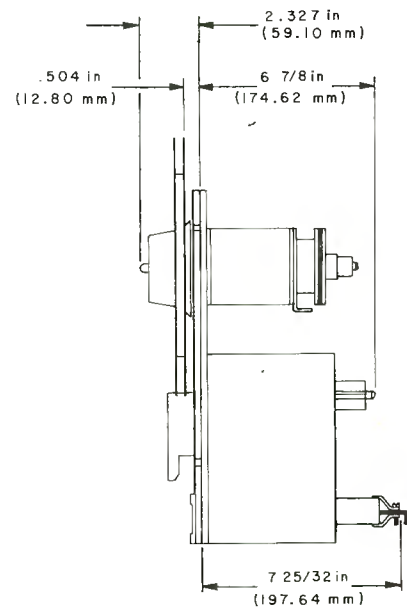
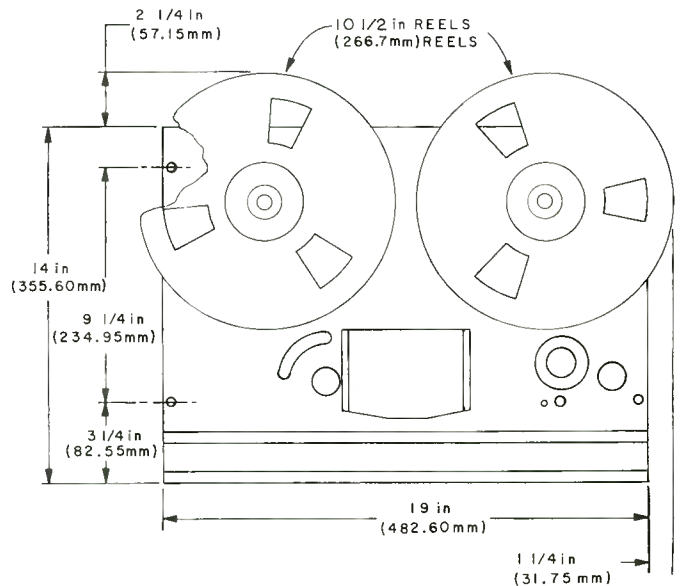


Figure 2-1

D. CONNECTING AUDIO LINES

A six pin unwired plug is provided with each 770 Series reproducer. This is used to connect the audio output. Refer to Figure 2-2 for proper connection of the audio lines. Care should be taken to insure proper connections of each channel on stereo machines. It is recommended that two conductor shielded cables be used for output connections.

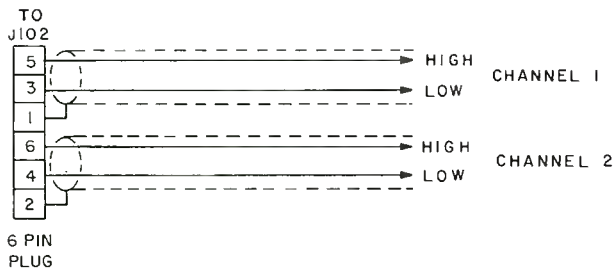


Figure 2-2

E. CONNECTING REMOTE CONTROLS

Remote control functions are provided through connector J101 for START, STOP, REWIND, FORWARD, and associated lamp circuits (24 volt, 40 ma.). All switching functions require a single pole, normally open, momentary contact switch.

A 15 conductor plug is supplied with the machine for wiring the remote functions. Figure 2-3 shows a sample remote control schematic.

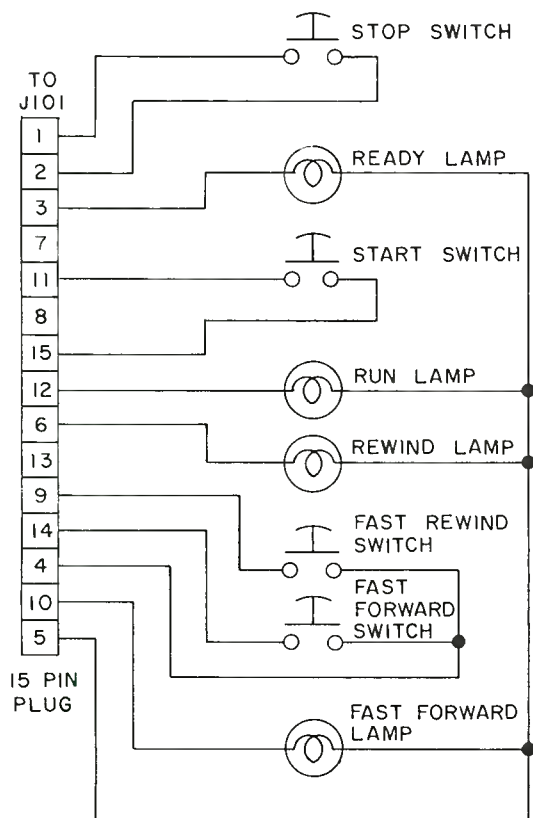


Figure 2-3

F. INITIAL CHECKS BEFORE OPERATION

Check all motors and rotating parts before operating the 770 Series machine. The capstan motor and pressure roller should rotate freely. The two reel turntables should rotate with some resistance due to the action of the brakes being engaged. Be certain that P.C. cards, relays, and ribbon cable connectors are properly seated. Insure that the line frequency and voltage are correct, 117 volts $\pm 10\%$, 60 Hz, before plugging in the power cord.

G. FUNCTIONAL CHECKOUT

1. Plug the unit in and turn the ON/OFF switch to the ON position. The capstan motor should rotate clockwise as viewed from the front.
2. Push REWIND, FORWARD, STOP, and RUN. Nothing should happen.
3. Block the light path in the tape sensor with the reel size switch in the large reel position. All operations are to be viewed from the front of the deck.
 - a) Push FORWARD (blue) - The take-up motor should run at full speed counterclockwise. The supply motor should run slowly clockwise. Both brake solenoids should activate and release the brakes.
 - b) Push REWIND (white) - The supply motor should run at full speed clockwise. The take-up motor should run slowly counterclockwise. Both brake solenoids should activate and release the brakes.
 - c) Push STOP (yellow) - Reel motors should stop. Brake solenoids should deactivate and apply the brakes.
 - d) Push RUN (green) - Pressure roller should engage. Take-up motor should turn counterclockwise. Rewind motor should turn clockwise after the boost interval. Brake solenoids should activate and release the brakes.
 - e) From the rewind or forward modes, push STOP. There should be approximately 1-1/2 second delay before the run mode can be entered. NOTE: If motion sense has been installed, the run mode can be entered at any time from a fast mode.

SECTION III. OPERATING INSTRUCTIONS

A. THREADING THE TAPE

The ITC 770 Series reel-to-reel reproducer is designed to allow tape threading without opening or closing any doors or interfering components. Please refer to Figure 3-1 for a diagram of the tape loading path. If the tape has been loaded correctly the ready indicator LED on the front panel will illuminate.

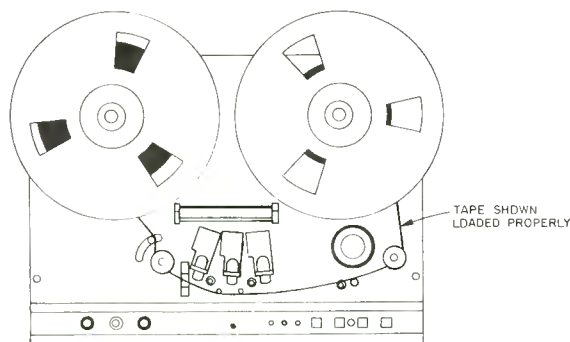


Figure 3-1

B. CONTROLS AND INDICATORS

Refer to Figure 3-2 for a front view of the reproducer. All of the various switching functions are shown.

1. The START SWITCH - The start switch will not function if the tape has not been loaded properly, i.e. across the tape sensing LED photo-transistor located to the left of the magnetic heads.

Activating the START SWITCH puts the transport in the run mode at the selected speed. When the start switch is pressed, full torque is momentarily applied to the forward reel motor causing the tape to move instantly. The duration of this "torque boost" may be adjusted at the rear of the machine. See Figure 3-3.

Normally, the start switch cannot be activated when the machine is in the fast forward or rewind mode of operation. An optional motion sense circuitry is available to allow for this type of switching. A built-in start mode delay circuit prevents entering the start mode for approximately one second after coming out of the fast forward or fast rewind mode of operation.

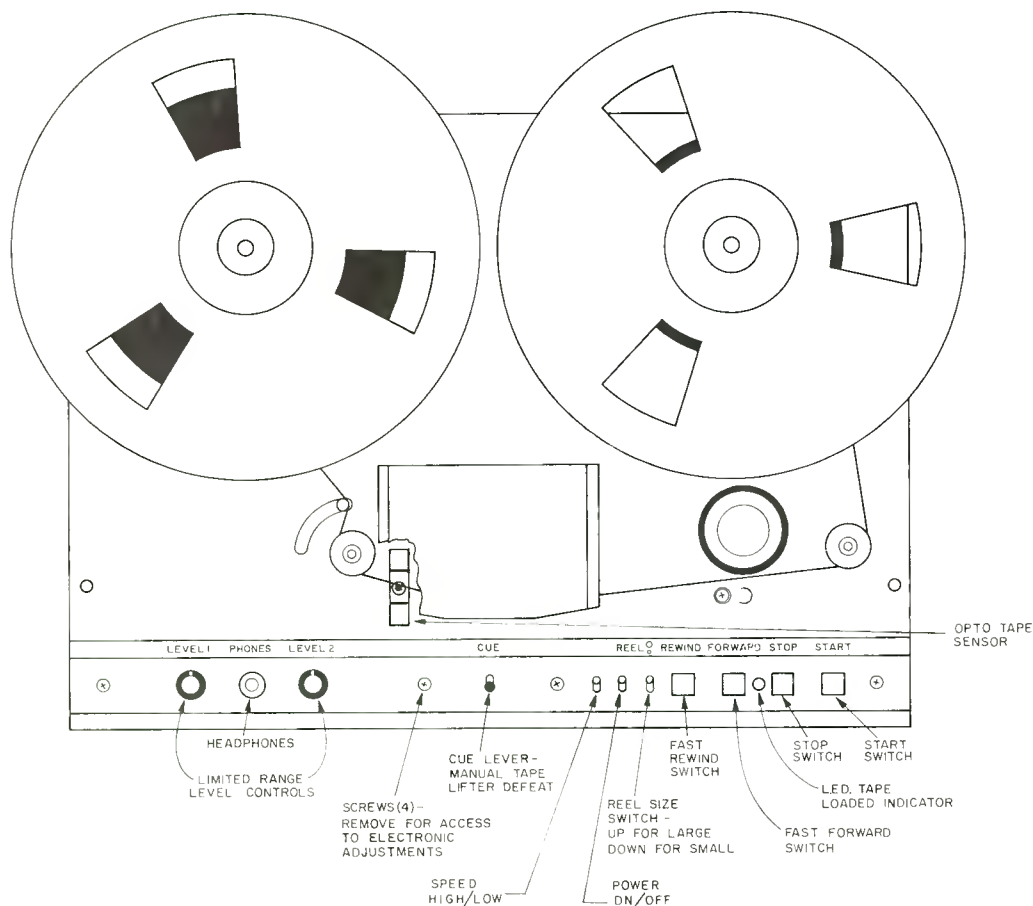


Figure 3-2

- The STOP SWITCH can be activated whenever tape is loaded on the machines. Stop will terminate all other operating modes of the machine.
- The FAST REWIND and FAST FORWARD modes may be entered from any other operating mode except when a stop signal is present.

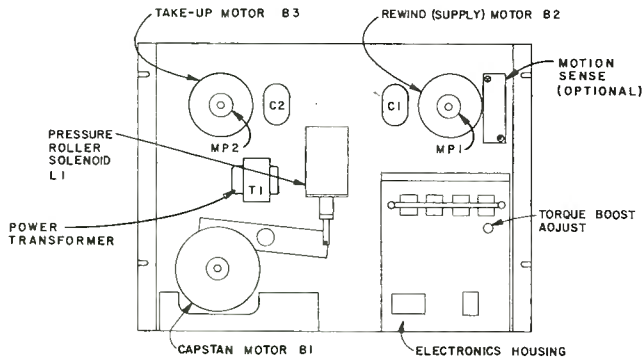


Figure 3-3

- The REEL SIZE SWITCH is used to select the tape tension for different size reel hubs. When using the 4-1/2 inch (114.3 mm) NAB hub the switch must be in the large reel position. When using the 2-1/2 inch (63.5 mm) EIA hub the switch should be in the small reel position. For best tape handling, intermixing of different reel sizes is not recommended.

If two different size reel hubs have to be used simultaneously, the following procedures should be used to minimize tape handling damage:

- To stop out of either fast wind mode activate the opposite fast wind mode switch until the tape motion has ceased, and then activate the stop switch immediately to set the mechanical brakes.

- The POWER switch either applies or removes power to the machine.
- The SPEED switch controls the speed of the capstan motor and provides any necessary equalization switching, High and Low positions are provided for 3-3/4 - 7-1/2 IPS, or 7-1/2 - 15 IPS operation.
- The CUE LEVER provides a means for manual control of the tape lifters. Normally, the tape lifters are engaged in the stop mode and the high speed mode. Pushing the cue lever upward in these modes disengages the tape lifters and permits tape cueing. Pushing the cue lever downward re-engages the tape lifters. Entering the start mode always disengages the tape lifters and returns them to the automatic mode of operation.
- A red LED indicator is found on the lower right-hand corner of the 770 Series. It is a visual indicator that the tape is loaded properly and that a stop command is not present.
- Limited range front panel level controls may be used to vary the program output level approximately +8 or -4dB from the calibrated (vertical) position.

SECTION IV. SETUP, ALIGNMENT, AND CALIBRATION

A. MECHANICAL ADJUSTMENT-TRANSPORT

1. REEL MOTORS TORQUE ADJUSTMENT

Reel motor torque in the 770 may be measured by using a small spring scale capable of measuring up to one pound or 250 grams. Use an empty 7" (177.8 mm) reel with 2 1/4" (57.15 mm) hub, and tightly tie a 4 foot (121.92 cm) section of twine around the center hub of the reel. Loop several turns of twine around the reel hub and connect the free end of the twine to your spring scale. See Figure 4-1.

It should be noted that either torque motor may be used for setting the proper tension. These motors are connected in series during the run mode of operation. Therefore, their torques will be essentially the same.

Power resistors used to adjust torque settings on the 770 Series are accessible by removing the stainless steel cover located directly on top of the electronics housing on the back of the 770 Series deck. CAUTION: REMOVE POWER CORD FROM SOCKET BEFORE ADJUSTING RESISTORS.

While the torques are being measured, the reel motor not being used should be held stationary and not allowed to rotate. If rotation is permitted the final torque setting will be affected.

To adjust the reel motors torque properly, first adjust the large reel torque with the reel size switch, S105 in the large reel position. Once this adjustment has been made transfer the reel size switch, S105, to the small reel position and adjust the small reel torque. See Figure 4-2. Refer to Figure 4-3 for the proper torque settings.

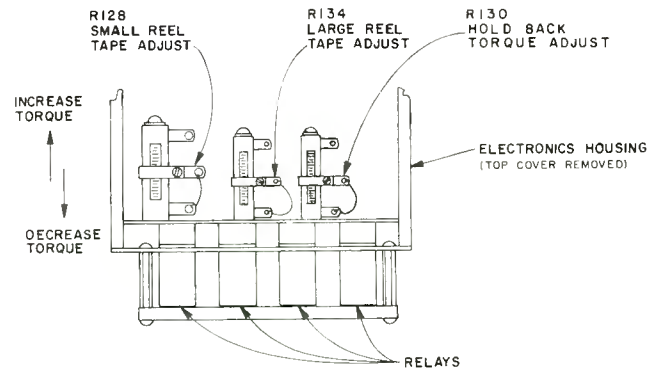


Figure 4-2

* MOTOR TORQUE ADJUST		
REEL SIZE SWITCH	ADJUSTING RESISTOR	TORQUE SETTING
LARGE	R134	6.0 oz. - 170 g
SMALL	R128	3.0 oz. - 85 g
LARGE	R130	1.0 oz. - 28 g

* USE 2 1/4" DIAMETER REEL HUB.

Figure 4-3

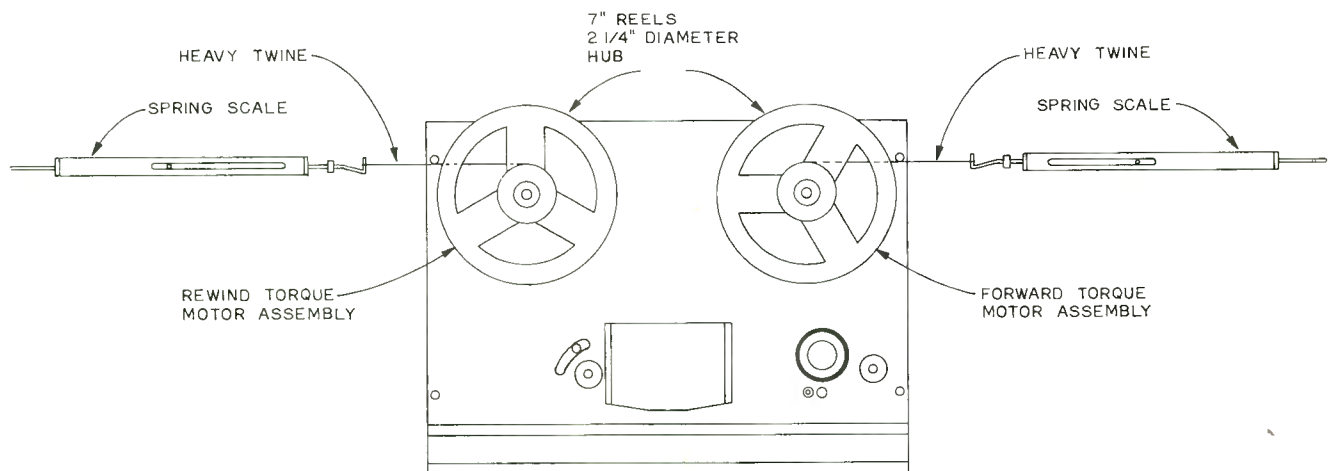


Figure 4-1

2. TORQUE BOOST ADJUSTMENT

The torque boost time is controlled by potentiometer R119, and is located on the mother board. This potentiometer is accessible from the rear panel of the electronics housing on the 770 Series deck. See Figure 4.4. Adjustment is made with a flat blade screwdriver. First attach two large reels to the machine and thread them properly. Make certain the reel size switch is in the large reel position. Then, fast wind the tape until almost the entire length is on the forward take-up reel. Next, repeatedly start and stop the machine. Adjust R119 (torque boost adjustment) so that tape maintains proper wrap on the head and exhibits minimum bounce. Several adjustments may be necessary to obtain optimum performance.

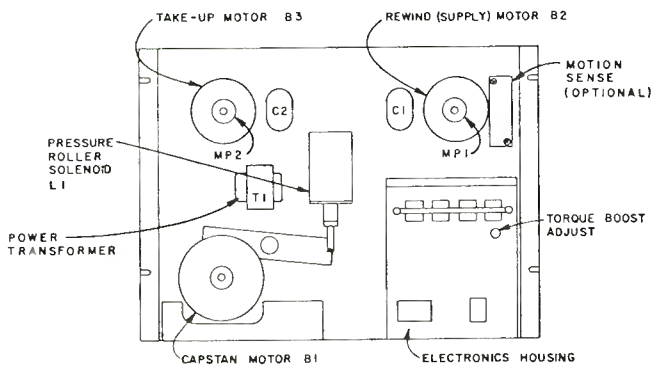


Figure 4-4

3. SUPPLY TENSION ARM DAMPING ADJUSTMENT

- With an insulated flat blade screwdriver, adjust the supply tension arm airpot (See Figure 4-17) so that the tension arm exhibits a smooth, gentle return to the upward most position. Roughly speaking, it should take approximately one second for the arm to return when pulled down to its lowermost position. After pulling the arm down, allow a moment for the airpot to stabilize before releasing the tension arm.
- With almost the entire length of tape wrapped on the forward take-up reel, repeatedly start and stop the machine and observe the amount of tape "bounce" present.
- Adjust the airpot until the tape does not lose contact with the heads. Please note that the airpot has an effective range of approximately one quarter of a turn. Therefore, make this adjustment cautiously as a small adjustment change can have major impact in controlling the tape "bounce".

4. PRESSURE ROLLER PRESSURE ADJUSTMENT

This adjustment will normally be required only after pressure roller replacement, but for optimum azimuth and phase stability, and tape drive ability, pressure roller pressure should be checked periodically.

- Attach a strong piece of twine around the roller shaft and the other end to a spring scale capable of measuring up to 10 pounds (4.536 kg). See Figure 4-5.

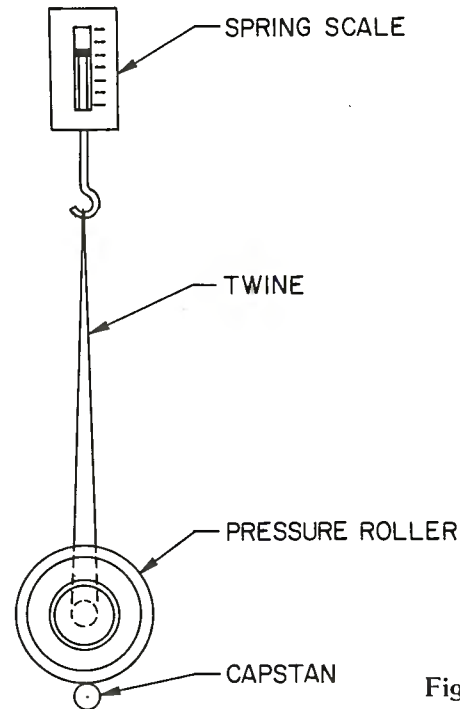


Figure 4-5

- Block the opto-sensor with a piece of non-transparent adhesive tape such as masking tape and place the machine into the RUN mode. Begin pulling on the spring scale handle in the opposite direction the solenoid is pulling until the pressure roller is disengaged from the capstan.
- The instant the pressure roller leaves the capstan is the point at which the measurement must be taken. The pulling force at this point should be between 6 and 7 pounds.
- If adjustment is required, loosen the clevis lock nut and rotate the solenoid plunger as follows: (See Figure 4-6).
 - To increase pressure, rotate the plunger to penetrate deeper into the solenoid. Do not allow the plunger to "bottom out" to the seat of the solenoid.
 - To decrease pressure, rotate the plunger for less penetration into the solenoid.

NOTE: If the above procedures do not appear to work, back the plunger 7 turns out of the solenoid and repeat Step d .

- e) Once adjustment is correct, retighten the clevis locknut.

5. SOLENOID AIR DAMPING

It is desirable to have the pressure roller descend as quickly as possible to help control tape bounce, and facilitate rapid starts. At the same time, some damping action must be maintained to minimize the mechanical noise level of the pressure roller assembly.

The pressure roller damping is adjusted by means of an air release valve on the rear of the pressure roller/tape lifter solenoid, Figure 4-6. To make this adjustment, repeatedly start and stop the machine while rotating the air release valve counterclockwise until the pressure roller assembly begins to make a “slapping” noise. At that point, slowly rotate the valve clockwise until the “slapping” noise disappears. Leave the solenoid air release valve at this setting.

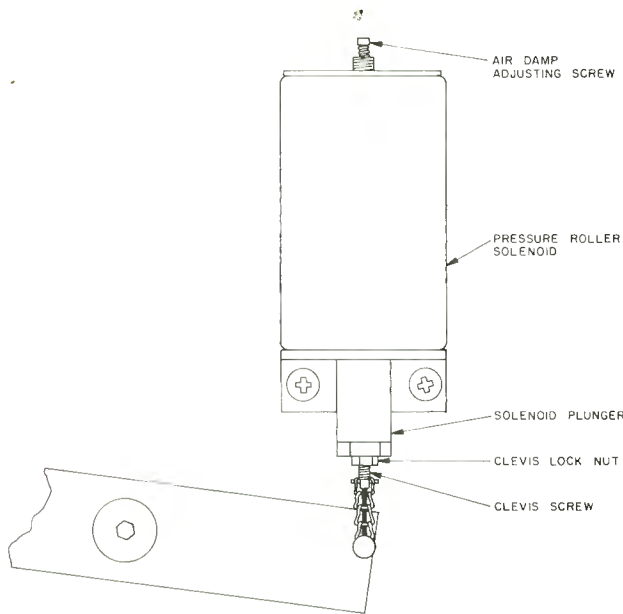


Figure 4-6

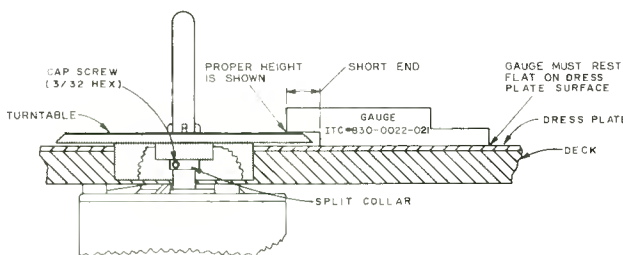


Figure 4-7

At this point verify the Torque Boost Adjustment, “Item IV-2” and, if necessary, fine-tune the Supply Tension Arm Damping Adjustment “Item IV-3.” Proper operation can be verified by repeatedly stopping and starting the machine with varying amounts of tape loaded on the forward take-up reel.

6. REEL TURNTABLE HEIGHT

Reel turntable heights should rarely require adjustment. However, adjustments will be required when torque motor maintenance is performed, and other parts have been replaced or adjusted. Turntable height adjustment may also be required to adjust the machines’ ability to wind tape in the center of the reel during normal run modes.

a) MEASURING TURNTABLE HEIGHTS

Use the short end of ITC gauge 830-0022-021 to measure the proper height of the reel turntable. Refer to Figure 4-7.

NOTE: ITC gauge 830-0022-021 is a dual-purpose fixture, used to measure head height on one end, and used to measure the 770 reel turntable height on the other end. Be sure to use the “short” end of the gauge when measuring 770 reel turntable height. Figure 4-7 illustrates the correct positioning of this gauge.

b) ADJUSTING TURNTABLE HEIGHT

Turntable height may be adjusted with the motor unit either on or off the deck assembly, but requires the turntable to be removed from the motor shaft. Remove the turntable from the motor shaft by removing the two cap screws near the motor shaft, and gently sliding the turntable off the motor shaft. Insert the split collar gauge 830-0036-001 shown in Figure 4-8 between the split collar and the motor housing, as illustrated in Figure 4-9. Reposition the split collar as necessary, by loosening the set screw and sliding the split collar along the motor shaft until proper location is indicated by the gauge. Firmly tighten the split collar set screw once the proper position is found. The turntable may now be replaced. Repeat steps 1 and 2 as necessary.



TURNTABLE HEIGHT AND BRAKE GAUGE (830-0036-001)

Figure 4-8

7. BRAKE TENSION ADJUSTMENT

The 770 utilizes disc brakes attached to unidirectional bearings and fiber brake pads which allow brake tension adjustments to be made in a highly accurate and repeatable manner. Figure 4-10 shows the brake assembly and the adjustment points. Familiarize yourself with these points and the adjustment procedures before attempting adjustments.

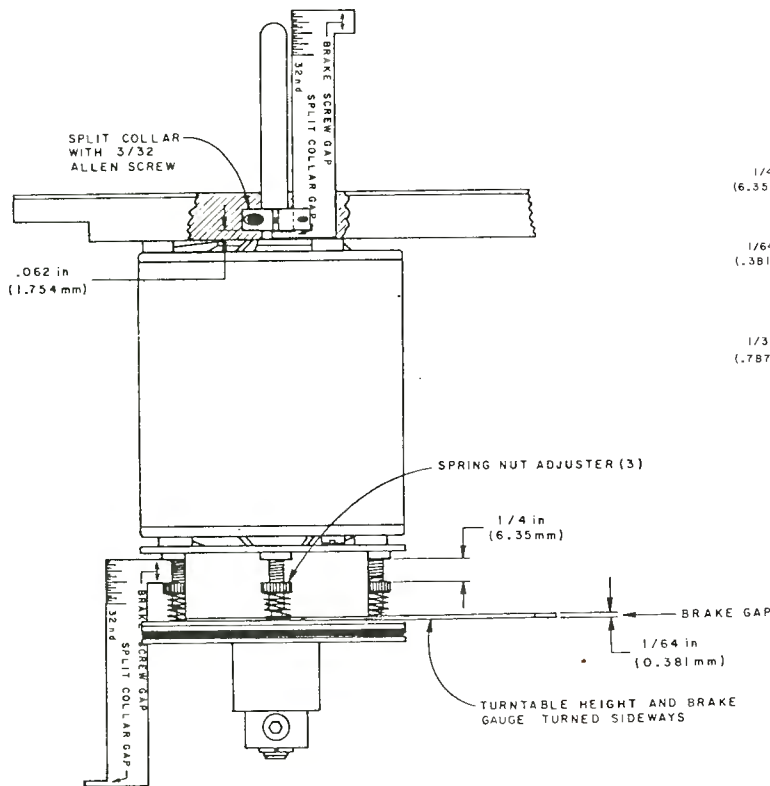


Figure 4-9

a) INITIAL BRAKE ADJUSTMENT

- (1) Turn the three spring nut adjusters on the brake solenoid housing all the way toward the torque motor (least spring tension).
- (2) Insert a 1/64" (0.4mm) thick piece of cardboard (about the thickness of a matchbook cover) or ITC brake gauge 830-0036-001 between the brake coil and the inner disc, or solenoid armature, Figure 4-9.
- (3) With the gauge in place, loosen the hex screw in the collar at the rear of the motor shaft and gently move the collar toward the motor until the thickness gauge is snug between the coil and inner disc. Tighten the hex screw and remove the gauge.

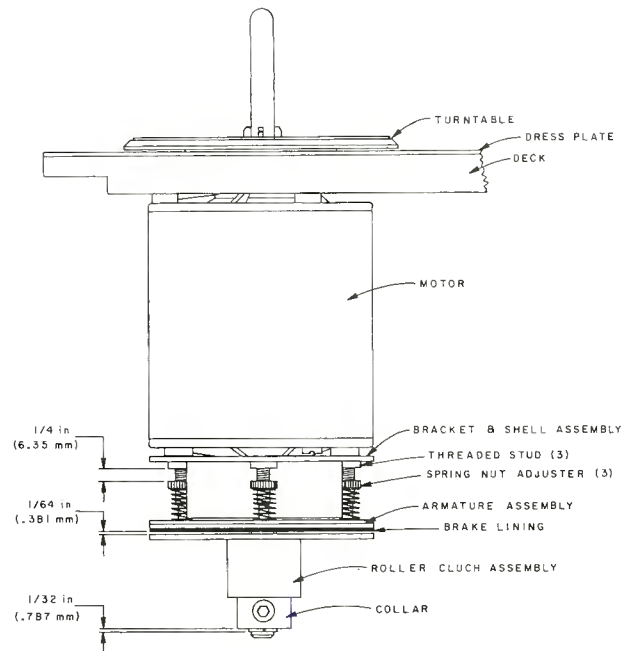


Figure 4-10

- (4) Adjust the knurled nuts on the solenoid armature to tighten the springs. Set the gap between the knurled nuts and the base of the three studs so that 1/4" (6.4mm) of threads remains. This is a "rough-in" adjustment, and final adjustment will occur in a later step.
- (5) Repeat steps (1) through (4) for the other brake.

b) FINAL BRAKE ADJUSTMENT

- (1) Use an empty 7" (17.78 cm) reel with a 2-1/4" (5.72 cm) diameter hub, and thread a length of twine around the hub as in Section IV-A-1, "Torque Motor Adjustment".
- (2) Mount the reel onto either turntable spindle as shown in Figure 4-11. Very gently pull the spring scale away from the spindle and observe the point at which slippage occurs. Figure 4-12 indicates the proper slip torque.
- (3) Should adjustment be required, Figure 4-10 shows the adjustment points. To "tighten" the brakes (increase the slip torque), turn all three knurled nuts away from the motor an equal amount. To loosen the brakes, turn all three knurled nuts toward the motor an equal amount.
- (4) Steps number 2 and 3 should be repeated for the other torque motor.

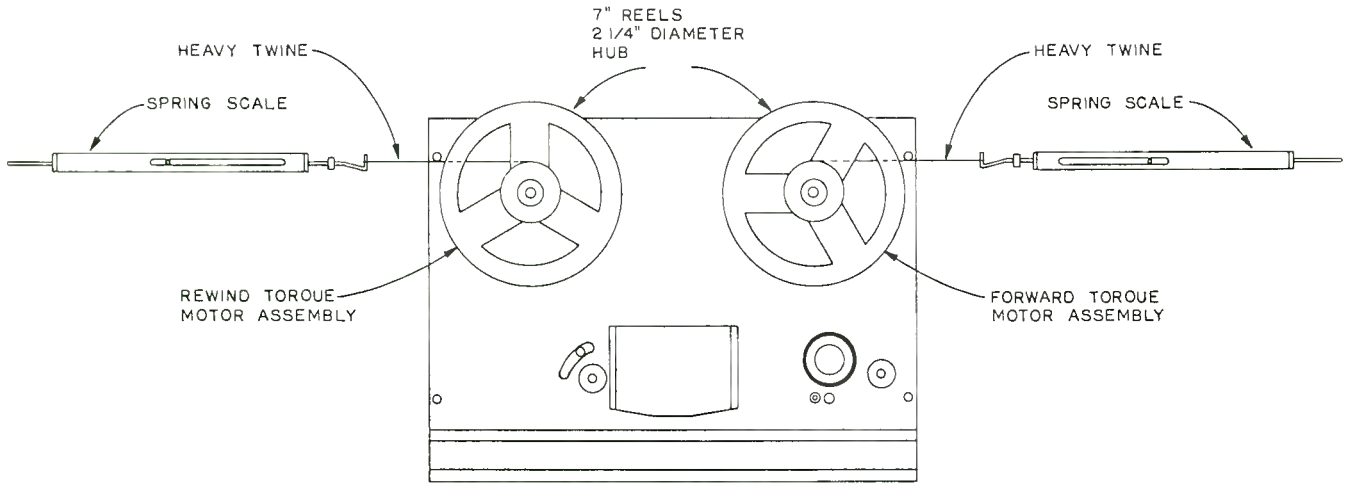


Figure 4-11

* BRAKE SLIP TORQUE		
BRAKE	DIRECTION	
	CW	CCW
SUPPLY		6 1/2 oz.
TAKE-UP	6 1/2 oz.	

* USE 2 1/4" DIAMETER REEL HUB.

Figure 4-12

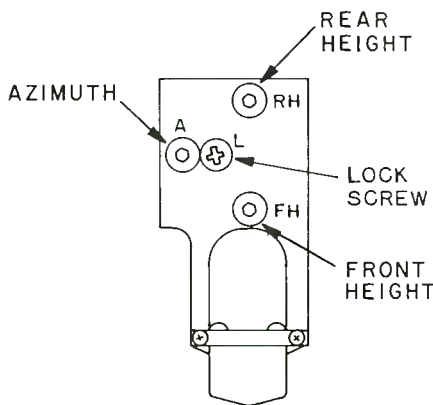


Figure 4-13

8. HEAD HEIGHT AND ZENITH

Adjustment of head height and zenith should be made during head replacement or during routine maintenance. Refer to Figure 4-13 for the location of adjustment points that are outlined in this section.

- Head Assembly Lock Screw - Loosen the lock screw "L" by turning it counterclockwise about four complete turns.

- Coarse Height - Adjust the front height screw FH to position the upper head track or pole piece 9/16 of an inch (14.29 mm) above the deck plate surface. The alignment tool (Part Number 830-0022-021) may be used for this adjustment. See Figure 4-14.
- Coarse Zenith - Adjust the rear height screw RH until the face of the head is perpendicular to the surface of the deck plate. To determine this 90° angle, place a square on the deck plate and slide it up to just touch the face of the head. Continue adjustment until the face is flush with the perpendicular surface of the square. See Figure 4-15. CAUTION: The square must be demagnetized before adjustments are made. Also, do not slide the square across the head and cause damage to its face.
- Fine Height and Zenith - Load the machine with a full reel of tape.
 - Press the start switch and observe the tape travel path over the reproducer head. The tape should completely cover both pole pieces as shown in Figure 4-16. If it does not, adjust the forward height screw (FH) and the rear height screw (RH) to position and head properly behind the tape.

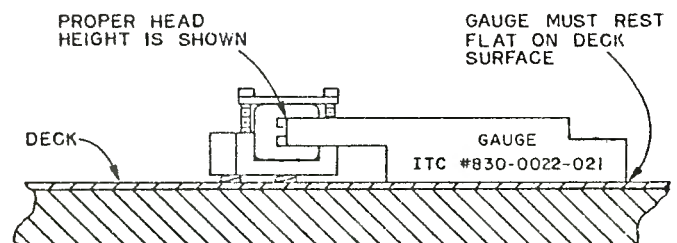


Figure 4-14

- (2) Recheck the zenith of the head as instructed in Step C. If further adjustment is required, it is also necessary to recheck the height as outlined in Step B. Continue adjustment until both height and zenith are in perfect alignment.

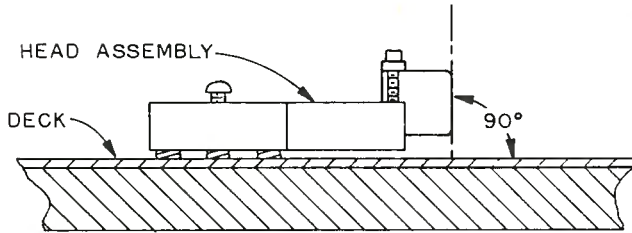


Figure 4-15

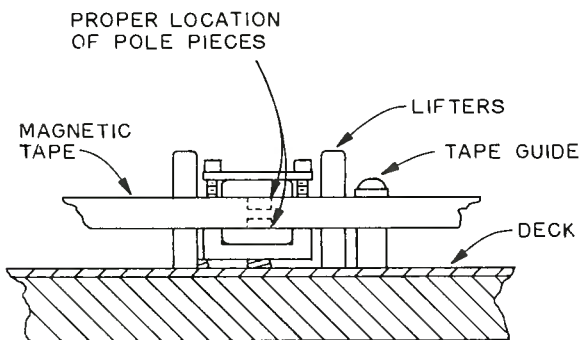


Figure 4-16

9. CAPSTAN MOTOR SPEED MEASUREMENT AND ADJUSTMENT

The Capstan Motor in your 770 is a D.C. Servo motor, which is electronically controlled by a tachometer and amplifier servo system mounted on a separate PC Board. The tachometer, mounted on the rear of the motor, provides motor speed information in the form of a pulse train to the servo amplifier card. The servo amplifier measures the rotational speed of the capstan motor, compares the actual speed to a predetermined reference, and then makes adjustments as they become necessary. This type of motor control system insures highly accurate speed control over a wide range of tape loads, drag coefficients, and power line voltage fluctuations.

Motor speed adjustment points are located on the side of the power supply cage. Speed adjustment is most accurately performed with a frequency counter. When playing the 3000 Hz flutter tape, adjust the appropriate (3-3/4, 7-1/2, or 15 ips) speed trimmer for proper readings on the frequency counter. The capstan motor speed adjustment procedure follows. Figure 4-17 illustrates the adjustment points for each tape speed.

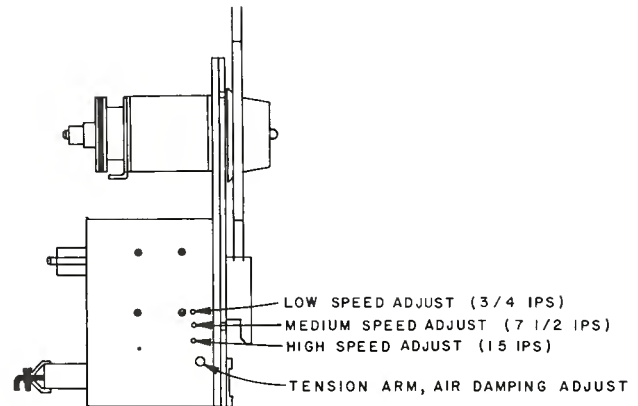


Figure 4-17

CAPSTAN MOTOR SPEED ADJUST

NOTE: All adjustments are to be made using an insulated or nonmetallic screwdriver.

- a) 3.75 ips
 - (1) Load a 3000 Hz 3.75 ips flutter tape on the machine.
 - (2) Adjust the top potentiometer for 3000 Hz ± 6 Hz as indicated on a frequency counter. Turn the potentiometer clockwise to increase the speed and counterclockwise to decrease speed.
- b) 7.5 ips
 - (1) Load a 3000 Hz 7.5 ips flutter tape on the machine.
 - (2) Adjust the middle potentiometer for 3000 Hz ± 6 Hz as indicated on a frequency counter.
- c) 15 ips
 - (1) Load a 3000 Hz 15 ips flutter tape on the machine.
 - (2) Adjust the bottom potentiometer for 3000 Hz ± 6 Hz as indicated on a frequency counter.

B. ELECTRICAL

1. Reproduce Head Azimuth and Phasing

Stereo Head System Azimuth Adjustment (Phasing) - Two track stereo reproducing may be affected by several mechanical inaccuracies. These may cause a shift in simultaneously monitored reproducer outputs. These shifts are not generally perceptible in reproduction on stereo systems. Where monophonic "dubbing" or channel "summing" is done, phase shift can result in serious amplitude variations and audio dropouts at the higher frequencies. The most common causes of these problems are:

- Improper azimuth of the head with respect to any other reproducer or recorder in a system.
- Improper tape guidance or skew within the head assembly or within the complete tape guidance system.

Azimuth (phasing) adjustment should be made in the following manner:

- a) Connect 600 ohm loads across the Channel 1 and Channel 2 outputs. Connect a high impedance voltmeter to the Channel 1 output. Begin playing a properly threaded full track 400 Hz reference level tape. Set the Channel 1 gain control R219 for 0 dBm output. Move the voltmeter to the Channel 2 output and adjust the Channel 2 gain control R247 for 0 dBm output.
- b) While playing a 15 kHz full track azimuth tape, carefully adjust the playback azimuth screw (A) for maximum reading on the voltmeter. Note the mechanical position of the azimuth screw.
- c) Move the voltmeter to the Channel 1 output, and turn the azimuth screw a small distance in either direction, while observing increases and decreases in output level. Continue turning slowly until a maximum output is reached.
- d) Observe the direction and distance the screw was turned to obtain maximum output on the channel. Set azimuth screw "A" to the mid-point between the first and second settings to obtain AVERAGE azimuth for the two channels.
- e) Connect the horizontal input of a scope to the Channel 2 output. Load a full track frequency alignment tape and start the machine. Adjust the horizontal gain of the scope to a suitable amplitude. Remove the horizontal input.
- f) Connect the vertical input of the scope to the Channel 2 output. Adjust the vertical gain to provide deflection equal to that of the horizontal described in Step "e" above.
- g) Now connect the horizontal input to the Channel 1 output. Advance the tape to the 400 Hz section. The pattern shown in Figure 4-18 should appear. If it does not, reverse the two leads of the horizontal input. This pattern represents the "ZERO" or near "ZERO" phase shift pattern of the system.
- h) Allow the tape to run to the 5 kHz section and observe if phase shift has occurred. Use Figures 4-18, 4-19, 4-20, and 4-21 as references. If phase shift has occurred, adjust the azimuth screw "A" to correct this phase shift. For example: If the pattern increases counterclockwise from "ZERO" screw "A" should be turned to cause the scope display to rotate clockwise back to the "ZERO" position.
- i) Allow the tape to continue through the various frequencies. Observe the scope display to insure that no 180° reversals occur.

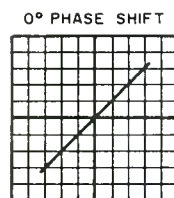


Figure 4-18

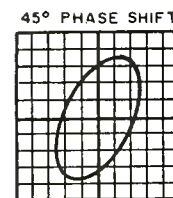


Figure 4-19

90° or 270° PHASE SHIFT

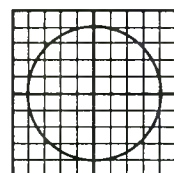


Figure 4-20

180° PHASE SHIFT

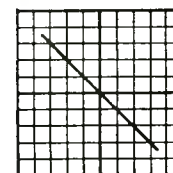


Figure 4-21

NOTE: It is normal for shift "jitters" of several degrees to occur at the highest frequencies. Therefore, settings should be based on the best average results. It is desirable to run the tapes several times. Make careful observations to be certain phase reversals do not occur at any frequencies.

Proper phase angles are shown in Figures 4-18, 4-19, 4-20, and 4-21. These angles are observed on a majority of the oscilloscopes now available. It should be noted, however, that some oscilloscopes produce the opposite direction deflection when "in phase" signals are connected to the vertical and horizontal inputs. Therefore, before making any stereo phasing adjustments, determine which angle of deflection will be produced on the oscilloscope. This should be determined when the "in phase" signals are connected to the horizontal and vertical inputs of the scope.

- j) Tighten the lock screw "L" carefully while avoiding any phase reversal.

2. REPRODUCE AMPLIFIER EQUALIZATION

The front switch dress panel must be removed to adjust the reproduce amplifier equalization. The adjustment is made with variable resistor R205 and R233 on two track models. This should be accomplished while using a standard response tape. The equalization control(s) should be adjusted to provide the flattest possible response. See Figure 4-22. *It is important the azimuth (phasing on stereo units) be accurately set before making any equalization adjustments.*

3. REPRODUCE AMPLIFIER LEVEL

The output level of the reproduce amplifier is factory adjusted for 0 dBm while playing an NAB standard reference tone (700 Hz, 185nW/m).

NOTE: *The front panel level control must be in the "calibrated" or vertical position.* The limited range, front panel level control may be used to change the gain approximately +8dB or -4dB. If more output level variation is necessary, the internal level control R210 (also R238 on two track models) must be used. If an output level of less than -10 dBm is required, an external fixed resistive pad should be used to maintain maximum signal-to-noise ratio. The limited range front panel level controls are accessible without removing the switch dress panel. It is necessary to remove the switch dress panel to have access to the full range controls resistors R210 and R238. See Figure 4-22 for location of the calibration controls.

4. INFRARED TAPE SENSOR

The infrared tape sensor is located under the head cover, and consists of an infrared light source and detector. When tape is properly threaded, the infrared light beam between the source and detector is interrupted and tape presence is indicated to the transport logic by the switchcard.

A threshold adjustment for the optical tape sensor is located on the switchcard between the STOP and START switches. It is accessible by removing the front switch dress panel.

Should adjustment of this control be necessary, remove the switch dress panel by removing the four Phillips head screws holding it in place. Thread a reel of tape onto the transport, typical of the tape type normally used. NOTE: The front panel L.E.D. should illuminate at this time. If the L.E.D. does not come on, variable resistor R302 should be slowly adjusted clockwise until the L.E.D. turns on. At this point, remove the tape from between the opto-sensor and check for tape "absence" indication, the L.E.D. should go off. Repeat the adjustment if necessary, until tape absence turns the L.E.D. off.

NOTE: *In certain ambient light situations, this adjustment will be critical. If, for example, your 770 is located near an outside window, sunlight may affect the "off" state of the optical device since sunlight contains infrared. Because of this special situation, particular attention should be paid so that ambient or reflected sunlight does not cause the infrared detector to indicate the "artificial" absence of tape.*

5. CAPSTAN MOTOR SPEED CHANGE

All 770 Series units may be used at any two-speed combination chosen from 3-3/4, 7-1/2, or 15 IPS. A user selectable jumper on the mother board allows any two-speed combination to be used, and is accessible to the facility's technical staff. To obtain 7-1/2 - 15 IPS operation, jumper "H" to "H",

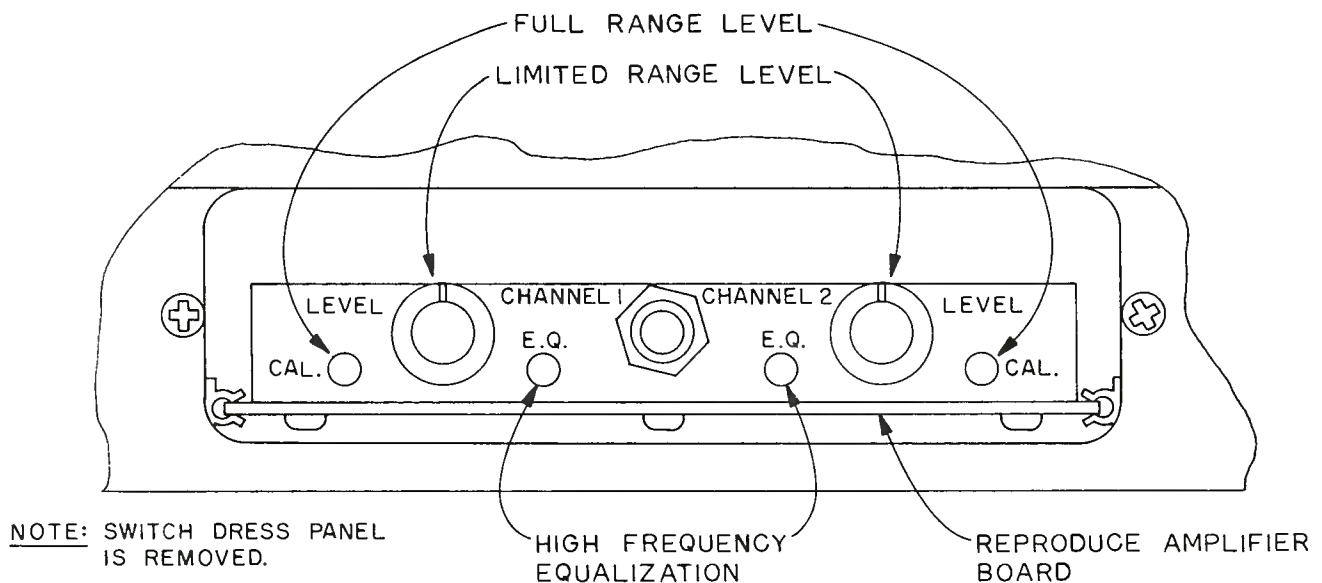


Figure 4-22

and "L" to "M" on the mother board. To obtain 3-3/4 - 7-1/2 IPS operation, use jumpers "H" to "M" and "L" to "L". (Refer to the mother board PCB drawing for the location of these jumpers.)

On machines operating at 3-3/4 IPS, an additional equalization circuit is utilized in order to prevent excessive high frequency response loss. All reproduce amplifier PCB's contain the 3-3/4 IPS equalizer, and may be made operational by installing a GES 5816 transistor in the Q207 and Q214 positions of the reproduce amplifier. This transistor switches in the 3-3/4 IPS equalization circuit when the front panel switch is in the low or downward direction. Refer to the Reproduce Amplifier PCB drawing for the location of this transistor.

NOTE: *If your unit is a recorder/reproducer, a corresponding Recording Amplifier component arrangement is utilized. Refer to the component table on the 770 Recording Amplifier schematic for component loading information.*

After changing 770 operating speeds, a complete electrical setup and calibration is recommended. Refer to Chapter IV, Mechanical and Electrical adjustments for reproducer alignment procedures. (Corresponding adjustments must be made to the Recording Amplifier if applicable.)

NOTE: *ITC does not recommend the use of the 3-3/4 - 15 IPS speed combination, due to mechanical performance limitations, and equalization considerations. Optimum performance is obtained when using either the 3-3/4 - 7-1/2 IPS, or 7-1/2 - 15 IPS speed combinations.*

SECTION V. ROUTINE MAINTENANCE

A. GENERAL

International Tapetronics Corporation has designed the 770 Series Reel-to-Reel for high reliability and maximum length of service before routine scheduled service.

The DC Servo Capstan motor utilizes both a permanently lubricated ball bearing and an OILLITE® bearing. Under continuous use the OILLITE® bearing should be periodically oiled, which will be detailed later.

The solenoid plunger is TEFLON® coated and operates within a brass tube. This combination eliminates the need for any lubrication, as wear is negligible.

Brake discs and pads are a high strength metal alloy and will endure 250,000 operations or more before maintenance is required.

Torque motor bearings are permanently sealed and never requires oiling.

Daily inspection of the heads is recommended. More frequent inspection is desirable if the unit is in heavy or continuous use. Head cleaning should be performed on a frequent and regular basis to insure optimum performance. Use a clean cotton swab dipped in isopropyl alcohol for this procedure. All metal components in the tape path including capstan, tape guides, idler arm, and guide posts should also be frequently cleaned. The 770 pressure roller should also be kept clean in order to maintain the best tape pulling characteristics. During cleaning, insure that all traces of oxide and lubricant are removed from mechanical components in the tape path. Allow all cleaning fluid to dry before rethreading tape onto the machine, to reduce the possibility of damage to the tape.

Do not allow cleaning fluid to enter the bearings in the pressure roller and the guide posts. Cleaning fluids may deteriorate the lubricant in these bearings and cause premature failure.

Front panel overlays and switch dress plate may be brushed periodically with a soft camel's hair or synthetic bristle paint brush to remove dust and oxide buildups. Should thorough cleaning be required, use a soft rag and a mild household cleaner such as "409"® or FANTASTIK®. Be sure to use cleaners sparingly and wipe dry with a soft cloth to eliminate residue and smudges.

The Servo Capstan motor requires periodic oiling. Once every 6 months apply two drops of MOBIL DTE OILLITE® OIL to the lubrication point indicated in Figure 5-1. Oil should be applied to the shaft where it penetrates the felt collar.

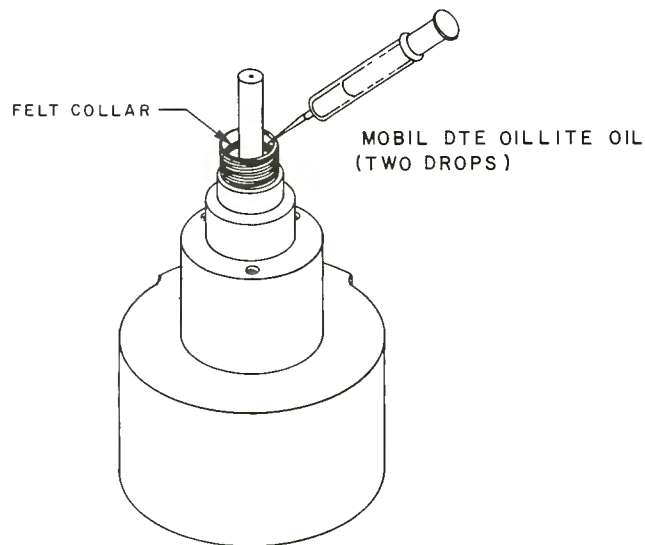


Figure 5-1

B. MAINTENANCE TOOLS AND AIDS

NEEDLE-NOSED PLIERS
STANDARD SLOT SCREWDRIVER, 6" SHAFT, 1/4" BLADE
1/8" HEX WRENCH
3/64" HEX WRENCH
MINIATURE SLOT SCREWDRIVER, 3" SHAFT, 1/8" BLADE
MINIATURE PHILLIPS SCREWDRIVER, 3" SHAFT, #0 BIT
SPRING SCALE, 10 POUNDS
SPRING SCALE, 2 POUND
10-1/2" NAB HUB EMPTY TAPE REEL
3 FT LACING CORD, OR HEAVY TWINE
ITC TAPE HEIGHT GAUGE, PART NO. 830-0022-021
ITC BRAKE GAP GAUGE, PART NO. 830-0036-001
TAPE HEAD DEGAUSSER
NAB ALIGNMENT TAPE*
FREQUENCY COUNTER
V.O.M., V.T.V.M., OR F.E.T.V.O.M.
OSCILLOSCOPE
INSULATED OR NON-METALLIC SLOT SCREW DRIVER, 6" SHAFT, 1/4" BLADE
FLUTTER TAPE*

*one tape needed for each speed of operation.

Figure 5-2

C. MAINTENANCE SCHEDULE

	DAILY	WEEKLY	MONTHLY	6 MONTHS
CLEAN HEADS, PRESSURE ROLLER, TAPE GUIDES, TAPE GUIDE POSTS, AND IDLER ARM	●			
CLEAN FRONT PANEL OVERLAY, HEAD COVER, AND DRESS PLATE		●		
DEGAUSS ALL HEADS AND TAPE GUIDES			●	
CHECK HEAD AZIMUTH, ZENITH, HEIGHT			●	
CHECK FREQUENCY RESPONSE — EQUALIZATION			●	
CHECK BRAKE SLIP TORQUE				
CHECK REEL MOTOR TORQUE				●
CHECK CAPSTAN MOTOR SPEED (HIGH AND LOW SPEED)				
CHECK PRESSURE ROLLER PRESSURE				
LUBRICATE CAPSTAN MOTOR				●
CHECK RECORDER BIAS AND EQUALIZATION*			●	
CHECK RECORDER METER CALIBRATION*				●
CHECK 25Hz TONE DETECTOR SENSITIVITY**				●
CHECK INPUT, OUTPUT LEVEL CALIBRATION**				●

* RECORD/PLAY UNITS ONLY

** AS APPLICABLE

Figure 5-3

If your unit is in daily use, follow the maintenance schedule outlined above. The schedule may be varied depending on your particular machine duty cycle. The intent is to develop a schedule to allow maximum use

with minimum maintenance time. In most cases, this maintenance schedule will enable you to pinpoint potential trouble areas before they become problems that may potentially remove the machine from service.

D. SPARE PARTS

Your new 770 Series Reel-to-Reel unit was shipped with a Maintenance Parts Price List enclosed in the front of this Technical Manual. We sincerely hope you never have to replace parts on your unit. But being a mechanical device, we recognize that components wear out after a time and must be replaced. Should parts replacement become necessary, ITC will supply those parts to you, and at no charge if within the warranty period. (See Warranty, in the front of the Technical Manual.)

If you desire a quantity of spare parts in case of breakdowns, please review the Maintenance Parts Price List. This list does not contain every part in the 770, but is a list of the most frequently requested parts, and are readily available from inventory. If you have questions regarding spares, or items not listed, call ITC Technical Service for assistance.

E. PARTS/EQUIPMENT RETURN POLICY

ITC's objective is to offer the best possible service to our customers. This objective carries through to any equipment that is returned for service — whether it's under warranty or being charged to the customer. Occasionally, however, we've found that our ability to provide this high caliber of service is hampered by our receipt of assemblies and machines without the customer's prior contact with ITC. Special procedures have been developed to allow expedient repair of customer returned items. However, our system only works when we have been notified by the customer that an item will be returned.

Here's how you can help:

1. If a problem is encountered with an ITC machine, call our Technical Service Department collect. Most often, the problem can be diagnosed over the telephone and the necessary replacement part(s) can be shipped . . . often the same day. In most cases, this is the fastest and least expensive method of making the repair for both the customer and ITC.
2. If the problem can't be remedied via telephone conversations, ITC will gladly repair the defective item and return it to you. All we require is notification from you that the item will be returned.

3. When returning an item or machine for repair, please take a moment to:
 - A. Write a note and describe the problem as fully as possible.
 - B. Be sure to include on the list your name, call letters or company name, and phone number.
4. Package the item **securely!** Often we receive items that have sustained shipping damage. Occasionally, the damage is sufficiently extensive as to prohibit repair. ITC is not liable for shipping damage. Also, we strongly recommend that complete machines be returned in their original packing material. If you don't have the proper shipping materials, ITC can supply them. It takes longer but it is better to be safe than sorry. Remember — you are responsible for shipping damage.
5. Return the machine with prepaid shipping via your choice of transportation. If necessary, ITC will offer suggestions on methods of shipment.
6. It is an excellent idea to insure the parcel. Declared value can be obtained from the appropriate ITC price list.

It is our sincere hope that you will assist us in this matter. When an item is returned without our prior knowledge, every customer suffers.

SECTION VI. THEORY OF OPERATION

A. POWER SUPPLIES

The 770 Series Reproducer has three power supply circuits.

1. Solenoid and Brake:

The full wave bridge rectifier CR103 rectifies line voltage and furnishes DC power to the filter section composed of R103 and C104. This circuit will charge to a peak of 165 volts DC. Voltage will drop to about 110 volts when the machine is in the play mode.

When the 770 Series reproducer is in either fast forward or rewind, resistor R131 is added in series with R103 to drop the voltage on the brakes to about 110 volts. Thus, there will be approximately 110 volts on both the solenoid and the brakes during fast forward, rewind and run modes.

2. 24 Volt DC Supply:

The 24 volt DC supply consists of: transformer T1, full wave bridge rectifier CR101, capacitors C101, C102, and C103 and voltage regulator VR1. This regulated 24 volt DC supply powers the various transport control circuits, supplies voltage to the audio amplifiers, and supplies power for the DC Servo Motor and its associated control circuits.

3. 5 Volt DC Supply:

The 5 volt DC supply consists of resistor R101 and voltage regulator VR101. The 5 volt supply is used for the logic on the motor control card.

B. TRANSPORT LOGIC CONTROL

All control switching in the 770 Series Reproducer is a combination of transistor and relay logic.

1. Stop Circuitry:

The stop circuitry has priority over all other control functions of the 770 Series. When a stop command is given, no other mode of operation can be entered.

Transistor Q301 is a series "ready" ground for all switching logic. This transistor is normally biased through U301 and R308. When STOP Switch S304 is pressed, base-emitter current is removed from transistor Q301. This causes the collector voltage to go to 24 volts DC thus canceling all previous operation modes.

The tape sensor will also cause Q301 to "turn off" if the tape is not loaded properly or if a reel of tape runs completely through. When tape is absent from the sensor the phototransistor will be biased on by the infrared light from the LED. With the phototransistor biased on, the voltage at R302 exceeds 14.5V, and pin 1 of U301A goes to 24V. This charges C301 through R306. When pin 6 of U301B exceeds 14.5V, pin 7 goes low and Q301 will

turn off. Trim pot R302 is used to adjust for optimum photo sensor sensitivity with various thickness and varieties of tape and leader.

Capacitor C301 and resistor R306 form an R/C time delay network to prevent false stops due to minor tape deterioration or thin oxide. The delay is approximately equal to one R.C. time-constant of C301 and R306, and can be changed by varying the values of either C301 or R306.

2. Fastwind Circuitry:

Rewind and forward circuits are essentially the same. Only the rewind circuitry will be explained in this section.

Relay K101 is the control relay for the rewind function. Pressing REWIND switch S302 causes relay K101 to energize. Once energized, it is latched through contacts 7 and 11 of K101, and contacts 1 and 9 of K102 to the ready ground circuit. Contacts 4 and 12 of K101 open at this time and prevent K102 from energizing. Relays K101 and K102 are essentially wired in series with each other; energizing one relay will cause the other to drop out. This is accomplished through latching contacts 7 and 11 of K101, and 5 and 9 of K102. Diodes CR108 and CR111 are used to prevent accidental dual latch of relays K101 and K102. Voltage is switched to the brake solenoids L1 and L2 when contacts 6 and 10 of K101 are closed. Run voltage is supplied through contacts 5 and 9 to the rewind torque motor B2.

3. Start Circuitry:

START switch S305 is grounded through contacts 4 and 12 of K101, and 10 and 12 of K102. Pressing the START switch forward biases transistor Q102 through R110, R111 and the START switch to ground, applying 24 volts to pin 14 of K103. Pin 13 of K103 also goes to ground through the start button. This causes K103 to energize and latch through contacts 9 and 15.

The momentary pulsing of relay K104, *torque boost*, occurs simultaneously with the actuation of relay K103. Transistor Q103 is forward biased while capacitor C103 is charging, causing K104 to energize. Once C103 is charged, forward drive for Q103 is lost, and K104 is de-energized. During the pulsing of relay K104, full voltage is applied to the forward torque motor. This occurs through paralleled contacts 4 and 8 and 11 and 7 of K104. A momentary "torque boost" is created to overcome the inertial effects of the forward reels mass.

When paralleled contacts 10 and 6, and 11 and 7 of relay K103 are closed, pressure roller solenoid L3, and brake solenoids L1 and L2 are energized. Simultaneously, contacts 12 and 8 of K103 provide

voltage to both reel motors, B2 and B3. In this condition the two reel motors are connected in series. Adjustment of motor torque is accomplished with resistors R128 and R134.

Transistor Q101 provides momentary disabling of the start relay K103 immediately following either one of the fast wind modes. This is accomplished by forward biasing transistor Q101 in either fast mode through R115 and diode CR114 or CR115 to ground. When ground is removed, capacitor C107 begins to charge through R116, R115 and the base-emitter junction of transistor Q101. During the charging time period of C107, transistor Q101 is forward biased, inhibiting normal forward bias of transistor Q102 through R110 and R111. Transistor Q101 is also part of the optional motion sensing circuitry which will be described later in this section.

4. External Connections

All control switching functions of the logic are available on the remote connector J101. In addition to these switching functions, lamp circuits are also provided on pins 6, 10, 12, and 3 of J101. A 100 ohm, 1/2 watt resistor is used in series with each of the lamp circuits as a current limiting device to protect the power supply. Should remote lamp indicators be used, individual lamp current should not exceed 40 ma. End-of-tape foil sensing is brought out to pin 7 of J101. Tapes utilizing conductive sensing foil will cause pin 7 of J101 to go ground when the foil passes across the 770 idler arm/foil sense post. (Pin 7 is a user-optional connection, and may be used for a variety of functions, such as automatic STOP, automatic REWIND, or external alarms).

C. PROGRAM REPRODUCE AMPLIFIER

The program reproduce amplifier is located on a plug-in PC card which is inserted from the front of the 770 Series reproducer. A single card is used for either stereo or mono configuration. The circuit consists of an equalized preamplifier and a four transistor driver output section. Transistors Q201 and Q202 serve as a preamplifier, and are stabilized to prevent performance variations with widely varying temperatures. This is accomplished with negative feedback from the emitter of Q202 to the base of Q201. Feedback equalization is used since this reduces gain variations and permits higher input impedance. The equalization components are C205, variable resistor R205, and fixed resistor R203. The output of the preamplifier is connected to a full range calibration control resistor R210.

Transistor Q203 is a common emitter amplifier stage with biasing resistor R212 connected from base to collector for DC and temperature stability. The output is connected through coupling capacitor C210 and R218 to the

front panel level control R219. This potentiometer has a limited range of approximately +8 dB -4 dB from the vertical position. Because of this, audio performance of the amplifier is uniform. Audio is coupled to the base of transistor Q204 which is the driver for the output complementary amplifiers Q205 and Q206. To provide stability, Q204, Q205, and Q206 are all direct coupled with resistor R220 providing feedback. If the 770 Series reel-to-reel reproducer is run at 3-3/4 IPS an additional equalization network is connected to the emitter of transistor Q204. This network consists of transistor Q207 and its associated resistors and capacitors. This additional circuit provides the extra gain necessary for 3-3/4 operation as well as additional high frequency contouring.

D. OPTIONAL MOTION SENSE/START MEMORY

When equipped with motion sense/start memory, the 770 Series reproducer can be changed from a rewind or fast forward mode directly into the start mode by pressing start switch S305. This causes the reel to come to a complete stop prior to automatically transferring into the start mode. Refer to the motion sense schematic and the transport interconnect schematic for the following circuit description.

The motion sense circuit is located on the rear of the deck next to the rewind torque motor. It is controlled by a reflective object sensor U402. A reflective array, with six black and six reflective sections, is located on the rear, or deck side of the rewind turntable. The sensor sends out six pulses per revolution as the turntable rotates. These pulses are amplified by differential amplifier U401A and U401D, and coupled to voltage comparator U401B. Next, the pulses are rectified by CR401 and filtered by C403. This DC trips comparator U401C which, in turn, provides forward current drive for transistor Q401. This transistor provides forward current drive for Q101 which prevents Q102 from being turned on, and thereby disables relay K103. When reel motion stops sensor output pulses cease, capacitor C403 discharges and forward current for Q401 and Q101 is removed.

The start memory portion of the Motion Sense circuit is located on the mother board. Start memory is created by dual transistor latch Q105 and Q106. These transistors are latched on when the start switch is pressed. They remain latched until a stop signal is present. The collector of transistor Q106 is connected to pin 13 of relay K103 and provides a ground current path for this relay. As soon as motion ceases, transistor Q102 applies 24 volts to pin 14 of relay K103 causing it to energize. To prevent pulsing of the motion sense circuitry from turning relay K103 off, the disabling current path for Q102 through R110 to the collector of Q101 is bypassed through R112 and Q104 to ground. Transistor Q104 will be normally biased on whenever the start relay is activated. It, therefore, will provide a continuous forward

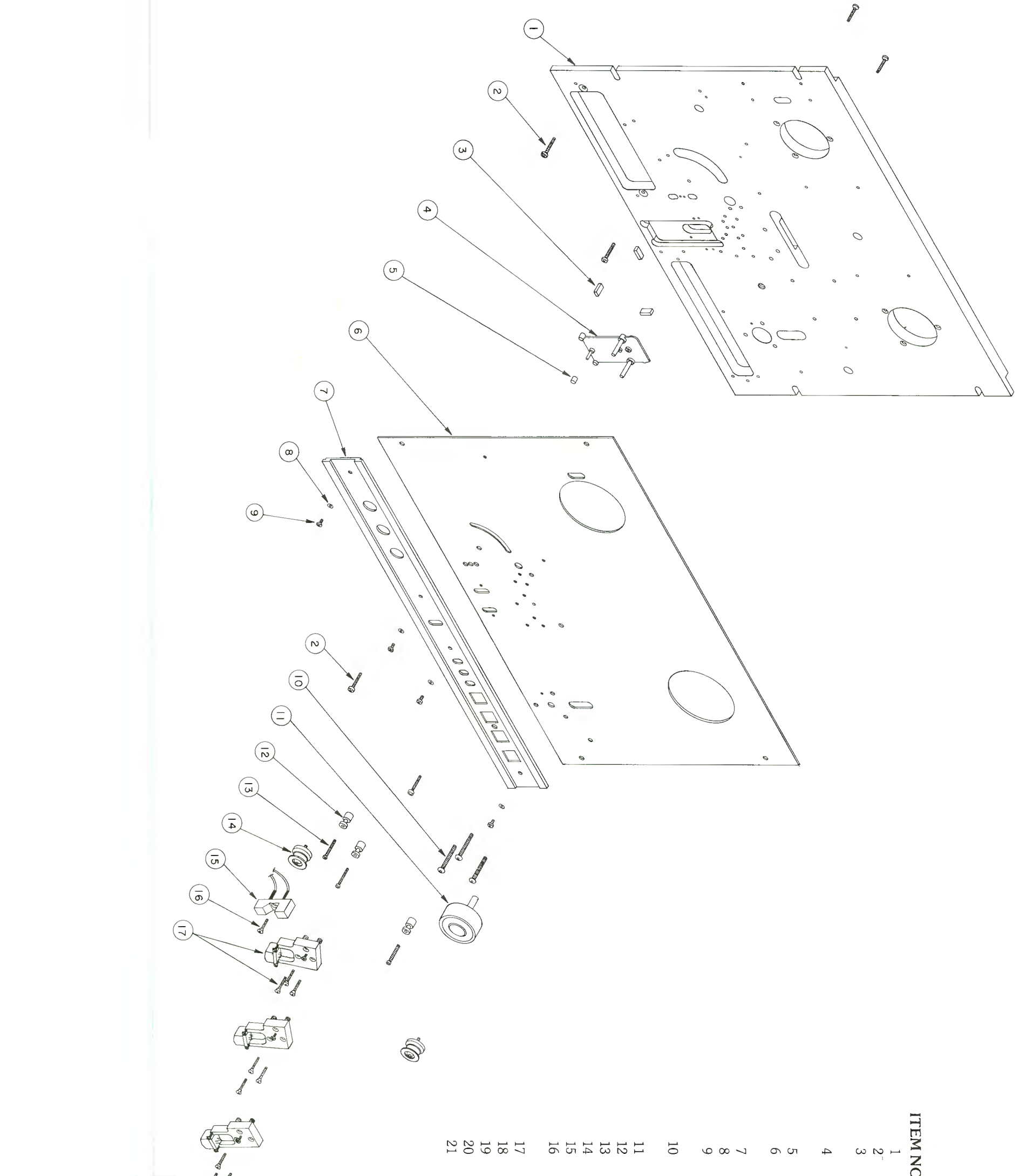
bias for transistor Q102 through R112 until a stop signal is present. Capacitor C109 is used to stabilize transistor Q104 and prevent any transients from falsely activating it.

Transistor Q107 replaces jumper A-B when start memory is used. This transistor causes the rewind or fast forward relays to unlatch whenever the start switch is pressed. Q107 is in series with the latch circuit to ground for these relays. If not forward biased it will prevent K101

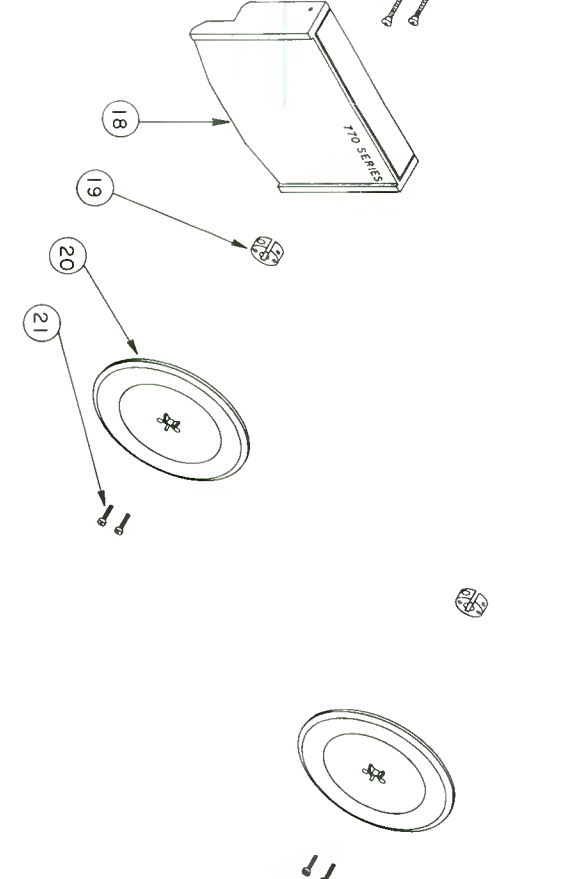
and K102 from remaining energized. Forward bias for Q107 is removed through diode CR107 whenever the start switch is pressed, causing either K101 or K102 to de-energize. With this condition the mechanical brakes will immediately engage, causing the reel motors to come to a stop and transferring the machine to the start mode.

When equipped with Motion Sense, jumpers C and D on the Mother Board are used. Reproduce only units, built without Motion Sense use Mother Board jumpers E and D.

FRONT DECK

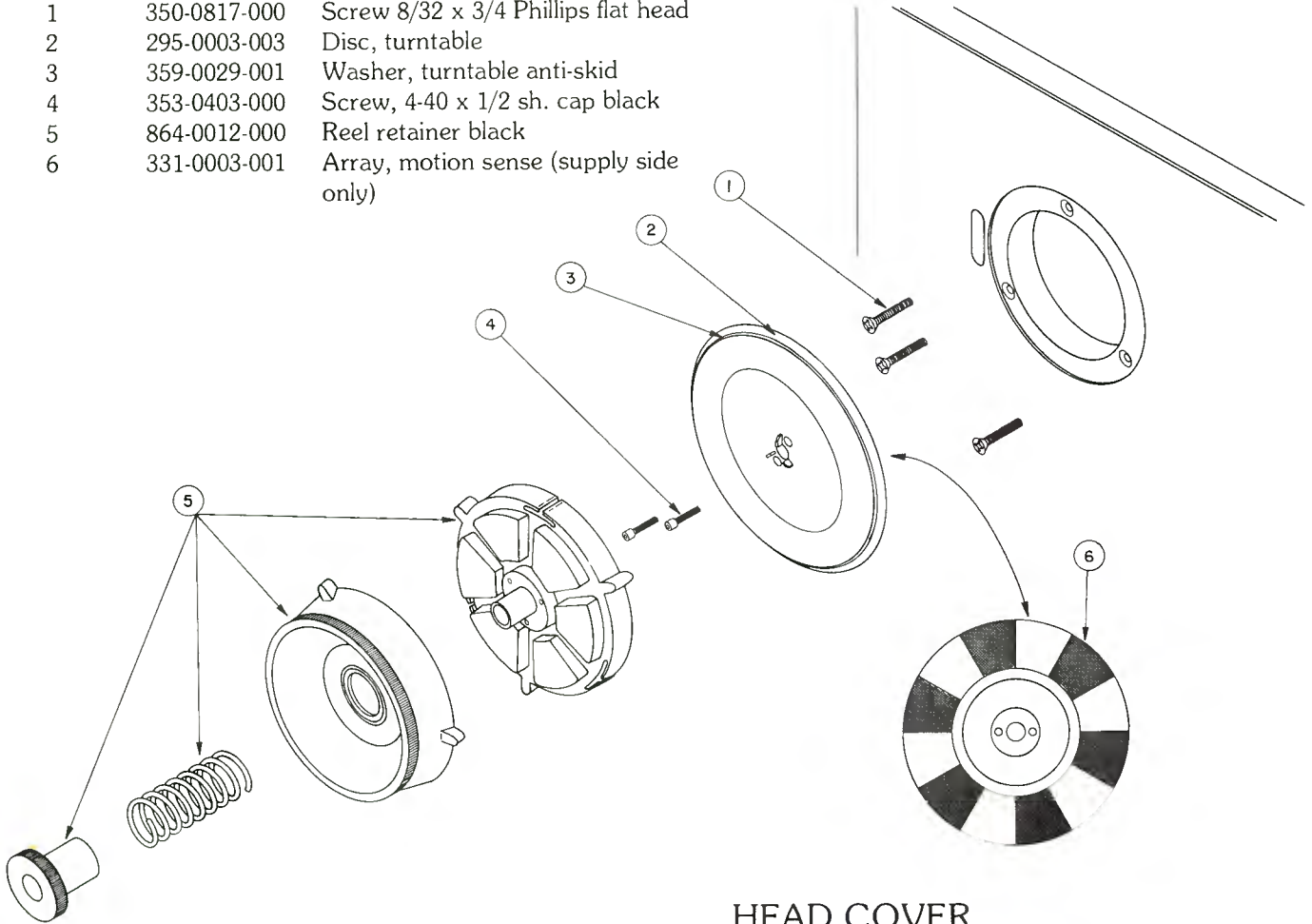


ITEM NO.	PART NO.	DESCRIPTION
1	267-0023-005	Deck
2	350-0626-000	Screw 6-32 x 3/4 Phillips pan hd.
3	311-0035-021	Sponge rubber with adhesive 3/16" x 1/2" x 1/4"
4	253-0050-001	Block, tape lifter play only
5	253-0055-001	Block, tape lifter Record/Play
6	255-0002-000	Rubber, bumper tip
7	283-0073-004	Plate, dress Play only
8	283-0074-004	Plate, dress Play/Record
9	268-0020-013	Escutcheon 770
10	359-0015-000	Washer #6 fiber 1/4 O.D.
11	350-1020-000	Screw 6-32 x 5/16 Phillips pan black
12	350-1034-000	Screw 10-32 x 1-1/2" button head socket cap black
13	837-0008-002	Pressure Roller assembly
14	272-0022-001	Guide tape
15	350-0428-000	Screw 4-40 x 1 Phillips pan black
16	832-0725-000	Tape guide assembly
17	832-0500-250	Tape sensor assembly
18	353-0607-000	Screw, 6-32 x 5/8 F.H. socket black
19	832-0785-000	Head assembly
20	313-0011-011	Head cover assembly
21	353-0403-000	Collar, split Turntable assembly



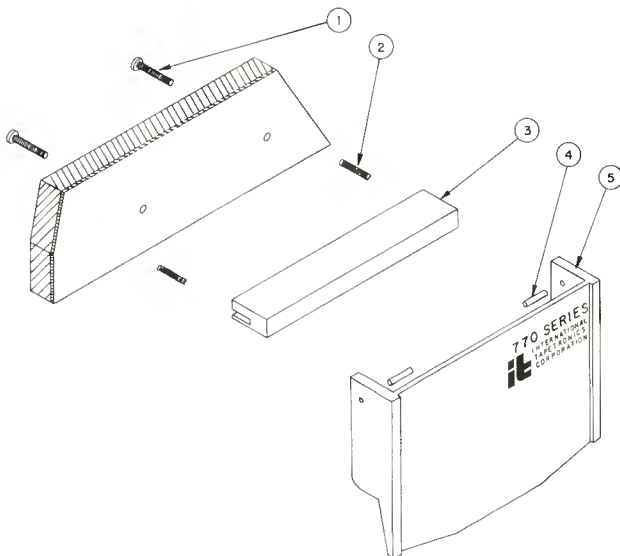
REEL TURNTABLE AND RETAINER

ITEM NO.	PART NO.	DESCRIPTION
1	350-0817-000	Screw 8/32 x 3/4 Phillips flat head
2	295-0003-003	Disc, turntable
3	359-0029-001	Washer, turntable anti-skid
4	353-0403-000	Screw, 4-40 x 1/2 sh. cap black
5	864-0012-000	Reel retainer black
6	331-0003-001	Array, motion sense (supply side only)

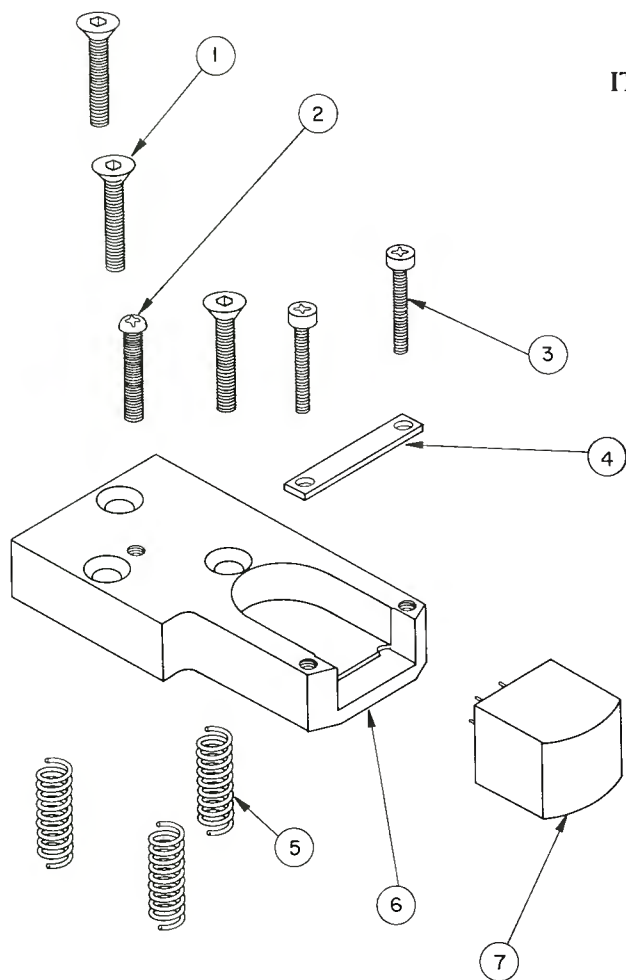


HEAD COVER

ITEM NO.	PART NO.	DESCRIPTION
1	350-0626-000	Screw 6-32 x 3/4 Phillips pan head
2	301-0027-000	Spring flip top head cover comp 1/8" x 5/8"
3	314-0006-002	Hinge bar 770 black
4	282-0010-001	Pin dowel 1/8 x 1/2
5	265-0055-012	Cover head 770 black



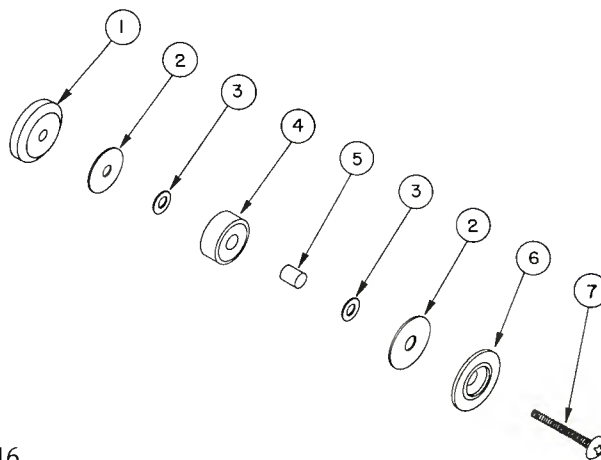
HEAD MOUNTING BLOCK

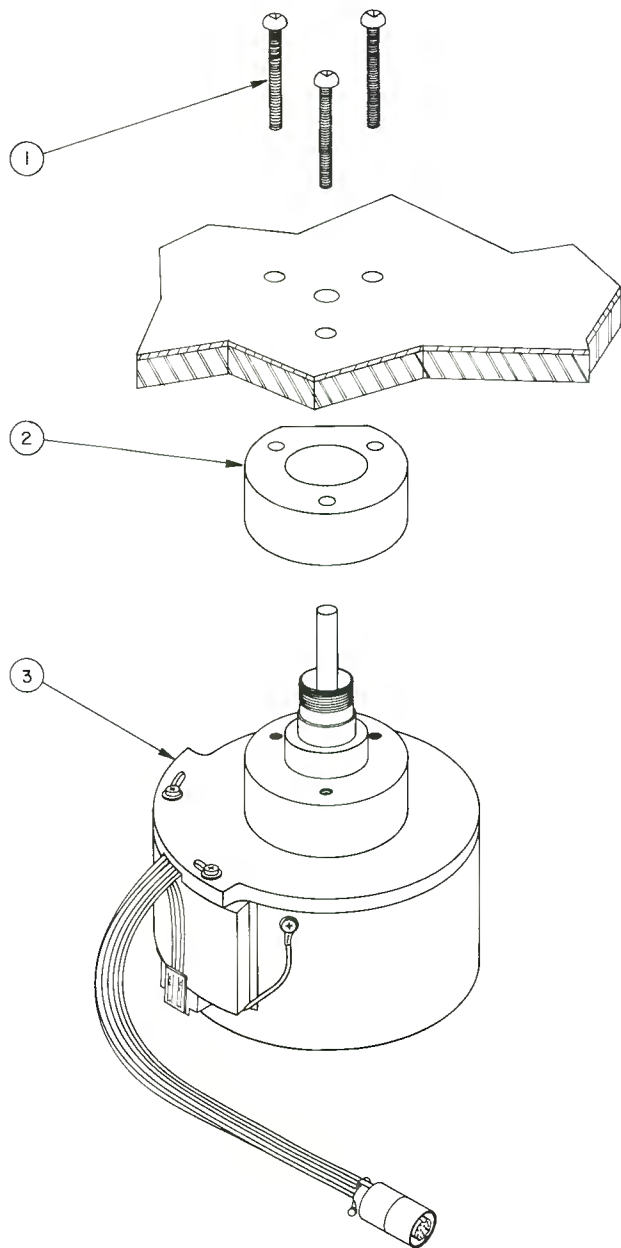


ITEM NO.	PART NO.	DESCRIPTION
1	353-0401-000	Screw 4-40 x 3/4 F.H. socket black
2	350-0417-000	Screw 4-40 x 5/8 Phillips pan head
3	350-0307-000	Screw 3-48 x 5/8 Phillips fil
4	303-0001-001	Strap head mounting
5	301-0003-001	Spring 1/4 x 5/8 compression head assembly
6	253-0035-002	Block head mounting
7	504-0013-000	Erase head half track
	504-0003-000	Record head half track
	504-0038-000	Play head half track
	504-0014-000	Erase head full track
	504-0018-000	Record head full track
	504-0015-000	Play head full track
	504-0029-000	Erase head quarter track
	504-0028-000	Record head quarter track
	504-0027-000	Play head quarter track

TAPE GUIDE

ITEM NO.	PART NO.	DESCRIPTION
1	300-0036-001	Standoff bearing
2	360-1011-000	Washer .812 O.D. x .193 I.D. x .021 thick
3	360-1012-000	Washer .437 O.D. x .193 I.D. x .007 thick
4	251-0019-000	Bearing, ball (tape guides) SKF 626Z
5	441-0022-011	Tubing plastic clear 1/4 dia. x 3/16
6	334-0003-001	Cap bearing black
7	353-1009-000	Screw 10-24 x 7/8 B.H. socket cap black





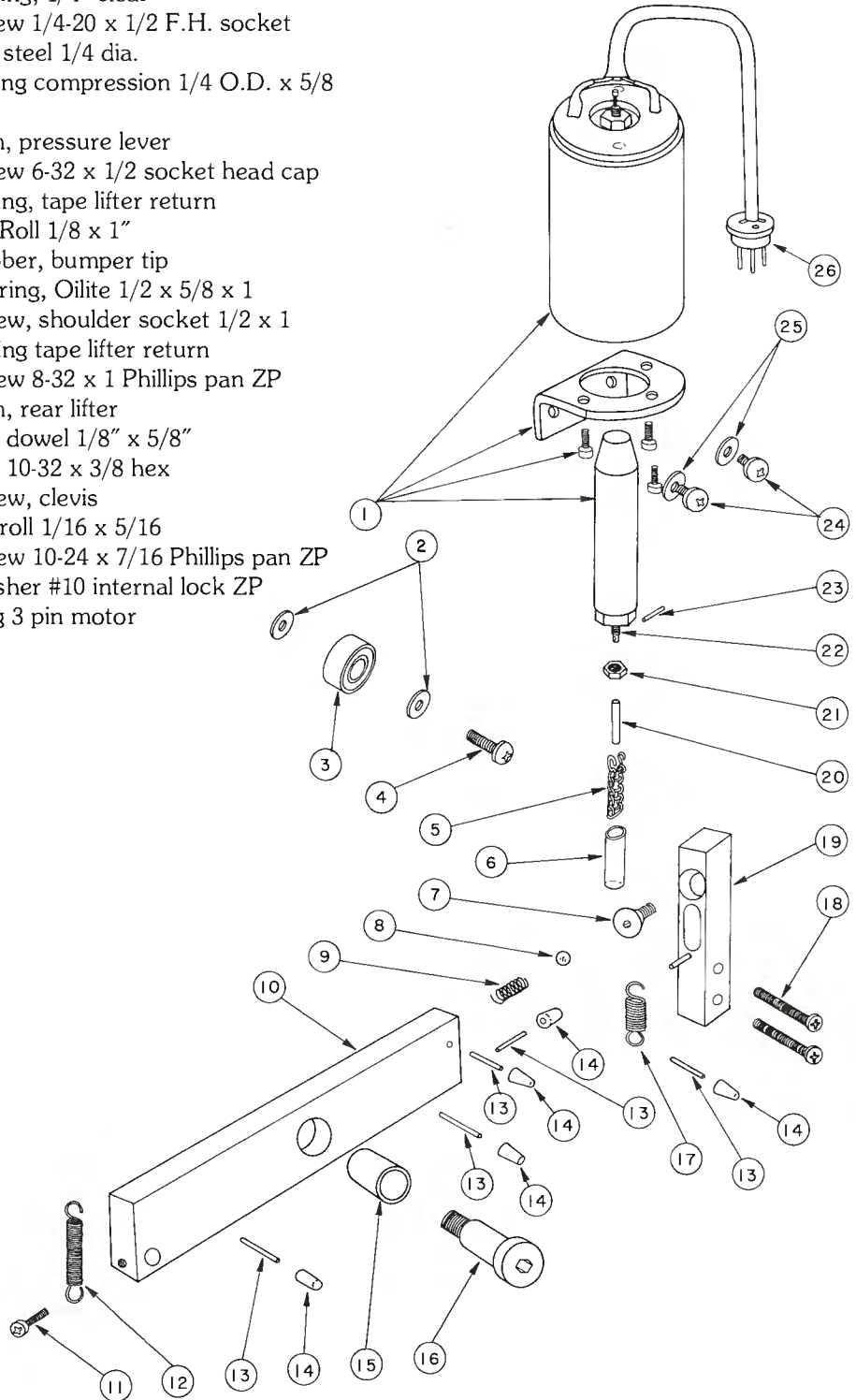
CAPSTAN MOTOR

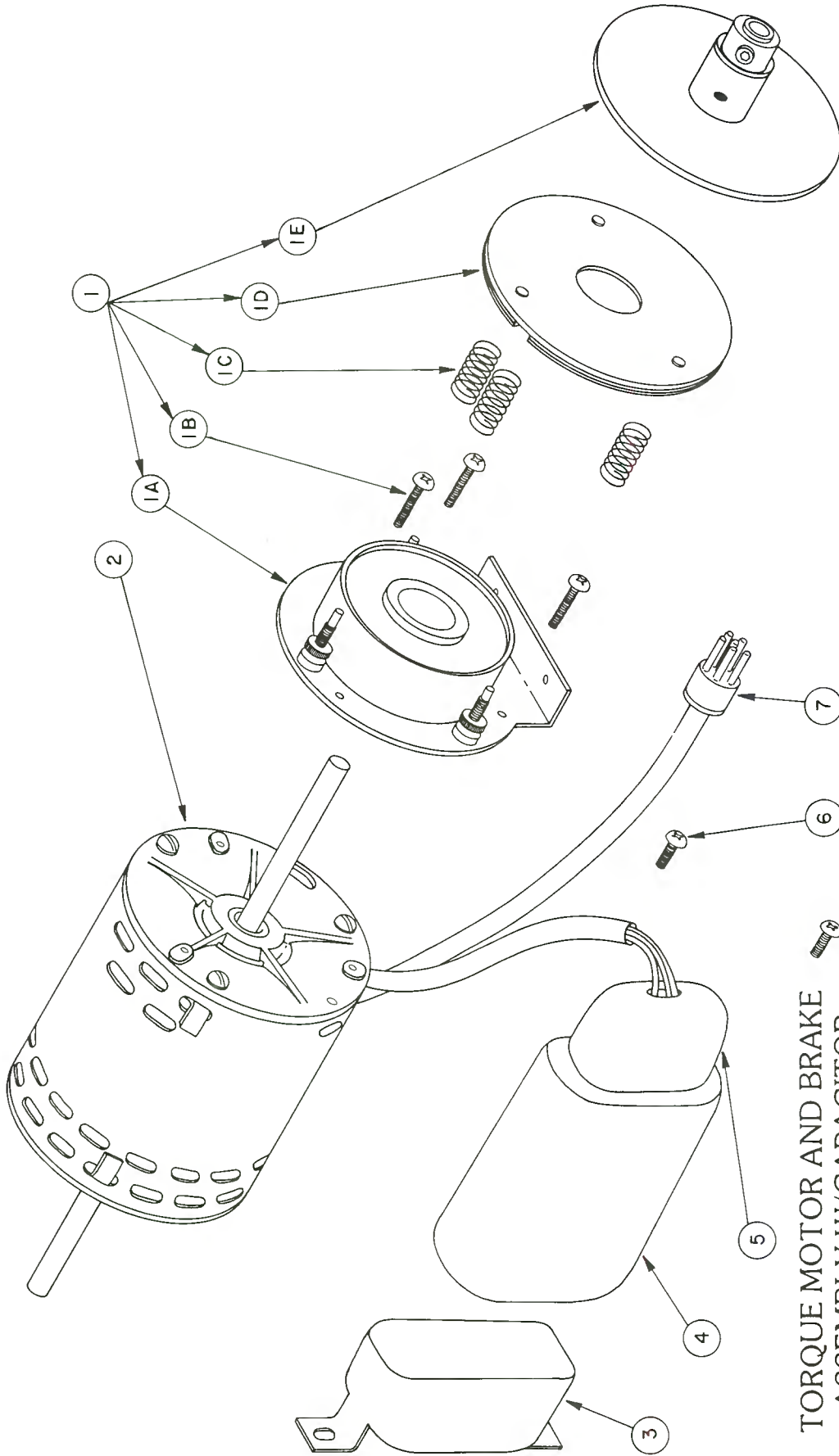
ITEM NO.	PART NO.	DESCRIPTION
1	350-1034-000	Screw, 10-32 x 1-1/2 button head socket cap black
2	313-010-001	Collar motor mounting
3	455-0003-003	Motor Nidec DCB

PRESSURE ROLLER SOLENOID ACTUATOR MECHANISM

ITEM NO.	PART NO.	DESCRIPTION
1	477-0006-002	Solenoid assembly with plunger & front mount bracket
2	360-1003-000	Washer #10 x 1/2 flat ZP
3	251-0013-000	Bearing ball
4	350-1007-000	Screw, 10-24 x 5/8 Phillips pan head ZP
5	277-0002-021	Chain ladder (5 links)
6	441-0023-000	Tubing, 1/4" clear
7	353-1102-000	Screw 1/4-20 x 1/2 F.H. socket
8	322-0001-000	Ball steel 1/4 dia.
9	301-0003-000	Spring compression 1/4 O.D. x 5/8

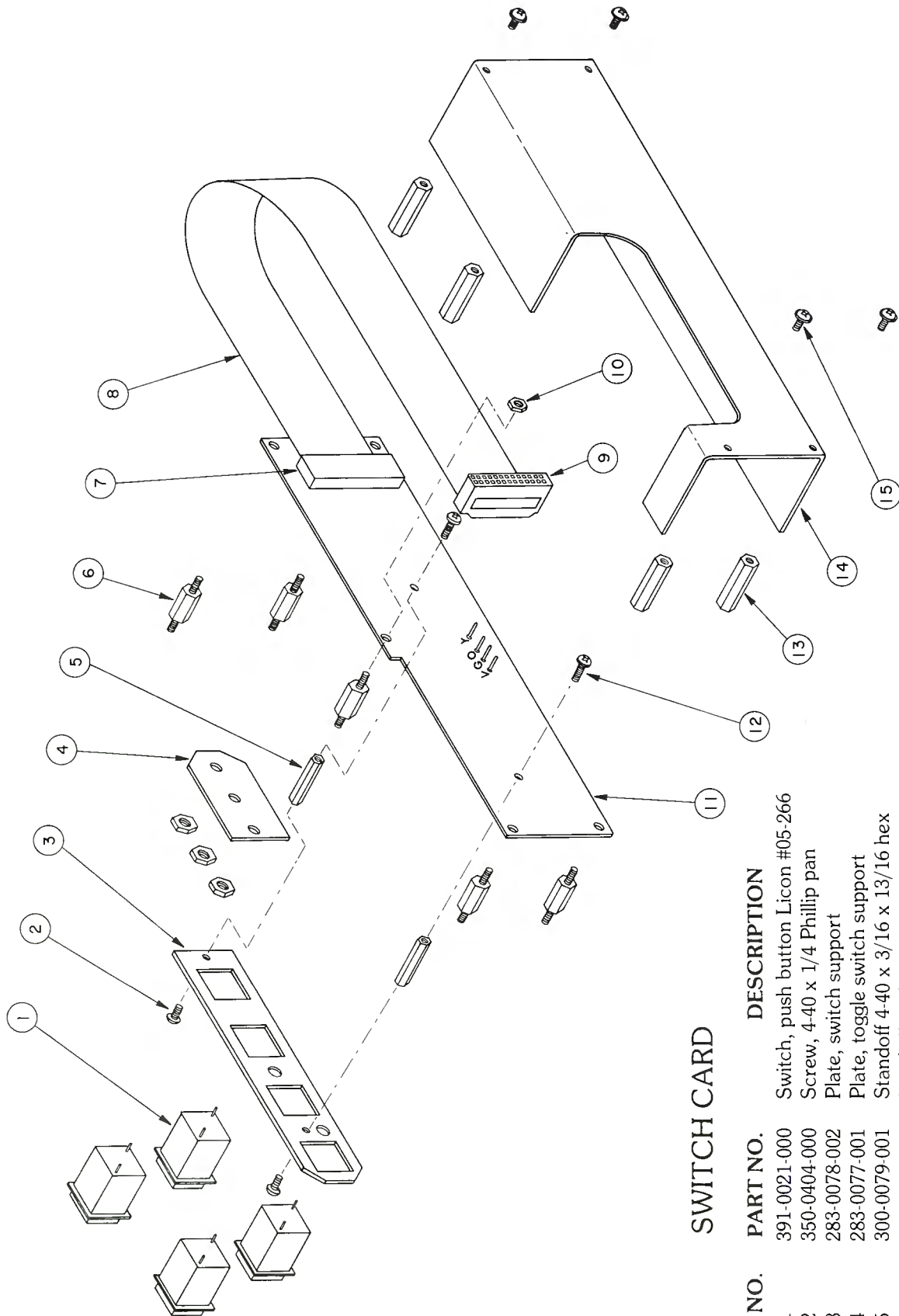
10	250-0008-002	Arm, pressure lever
11	353-0601-000	Screw 6-32 x 1/2 socket head cap
12	301-0030-000	Spring, tape lifter return
13	282-0031-000	Pin Roll 1/8 x 1"
14	255-0002-000	Rubber, bumper tip
15	251-0001-041	Bearing, Oilite 1/2 x 5/8 x 1
16	349-0002-011	Screw, shoulder socket 1/2 x 1
17	301-0030-000	Spring tape lifter return
18	350-0809-000	Screw 8-32 x 1 Phillips pan ZP
19	250-0009-001	Arm, rear lifter
20	282-0010-011	Pin, dowel 1/8" x 5/8"
21	370-1001-000	Nut 10-32 x 3/8 hex
22	264-0002-001	Screw, clevis
23	282-0001-001	Pin roll 1/16 x 5/16
24	350-1003-000	Screw 10-24 x 7/16 Phillips pan ZP
25	365-1001-000	Washer #10 internal lock ZP
26	378-0001-000	Plug 3 pin motor





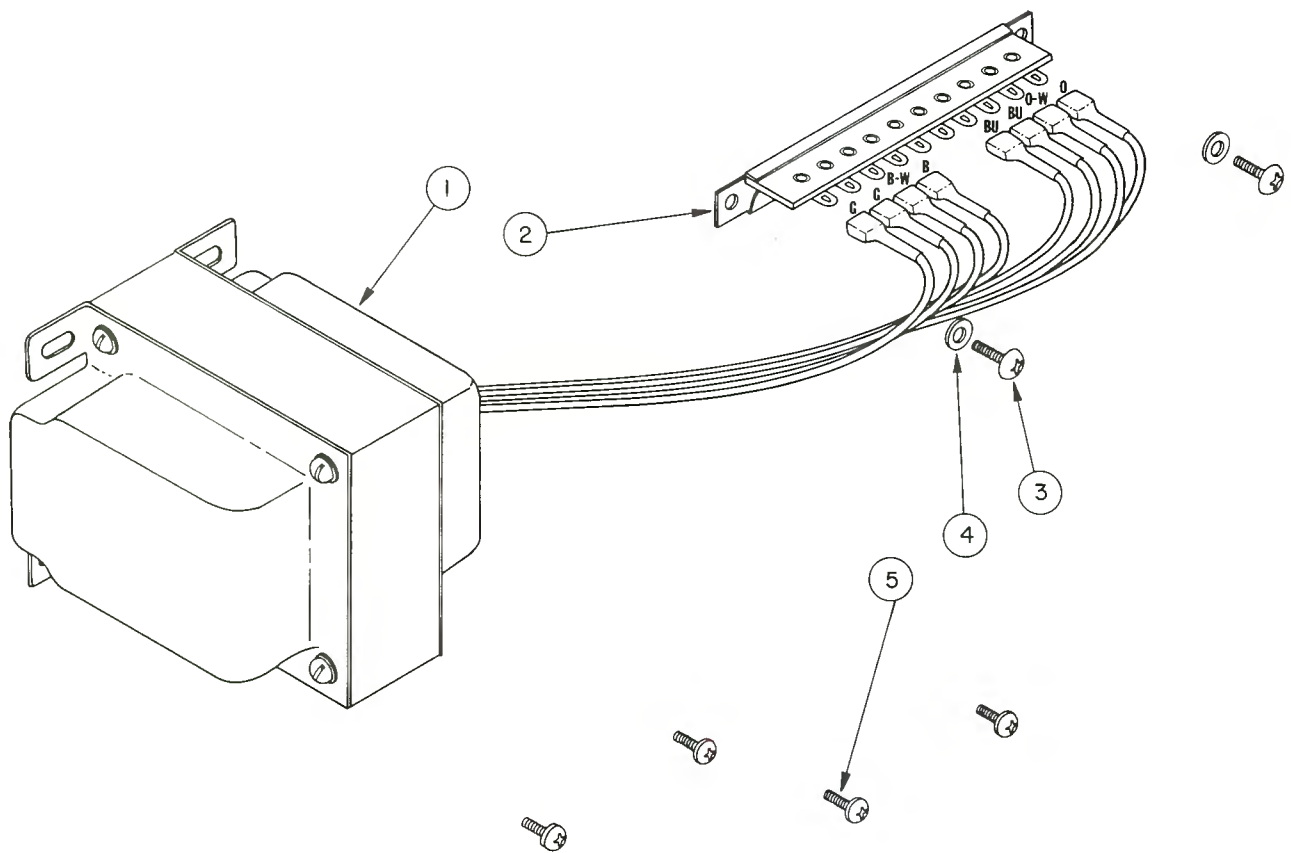
TORQUE MOTOR AND BRAKE ASSEMBLY W/CAPACITOR

ITEM NO.	PART NO.	DESCRIPTION
1	338-0001-000	Brake, disc assembly right hand (supply)
	338-0002-000	Brake, disc assembly left hand (take-up)
1A	837-0017-000	Shell & bracket assembly
1B	350-0810-000	Screw 8-32 x 5/8 Phillips pan
1C	301-0051-000	Spring, compression
1D	837-0018-000	Armature assembly
1E	837-0019-000	Roller clutch assy. R.H. (supply) with red dot
	837-0020-000	Roller clutch assy. L.H. (take-up) with green dot
2	451-0065-003	Motor, torque Howard
3	724-0002-000	Ring cap mtg. oval
4	683-0012-000	Capacitor 7.5 ufd. 236Vac
5	316-0002-000	Capacitor insulator
6	350-0801-000	Screw, 8-32 x 1/4 Phillips pan
7	378-0005-000	Plug, six pin - motor



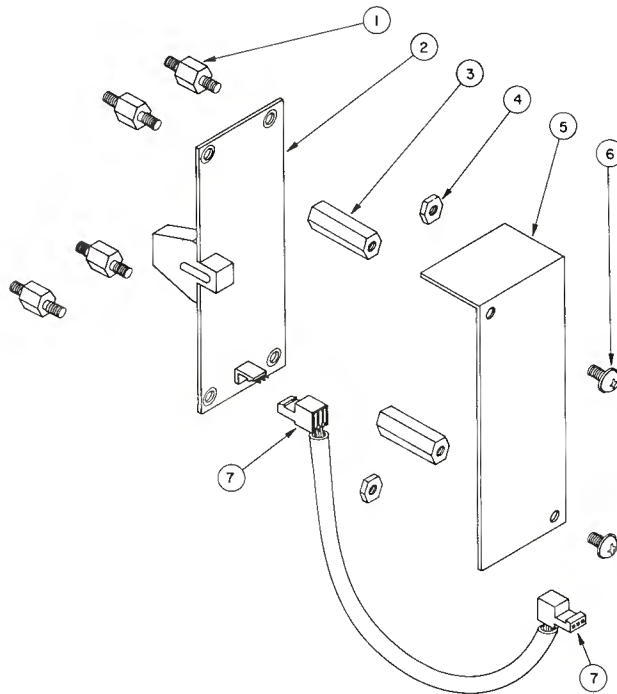
SWITCH CARD

ITEM NO.	PART NO.	DESCRIPTION
1	391-0021-000	Switch, push button Licon #05-266
2	350-0404-000	Screw, 4-40 x 1/4 Phillip pan
3	283-0078-002	Plate, switch support
4	283-0077-001	Plate, toggle switch support
5	300-0079-001	Standoff 4-40 x 3/16 x 13/16 hex female/female
6	300-0080-001	Standoff, 6/32 x 1/4 hex x 1/2 male/male
7	384-0003-000	Header, solder 26 wire flat cable
8	431-0010-000	Cable, ribbon 26 C scotch 3302/26
9	384-0004-000	Plug, header 26 pin scotch flex
10	370-0602-000	Nut 6-32 x 1/4 keps ZP
11	831-0210-003	Switch card P.C. board
12	350-0410-000	Screw, 4-40 x 3/8 Phillips pan head
13	300-0008-000	Spacer 6-32 x 7/8 x 1/4 hex threaded Smith
14	265-0046-002	Cover, switch card
15	350-0605-000	Screw 6-32 x 1/4 Phillips pan int. sems.



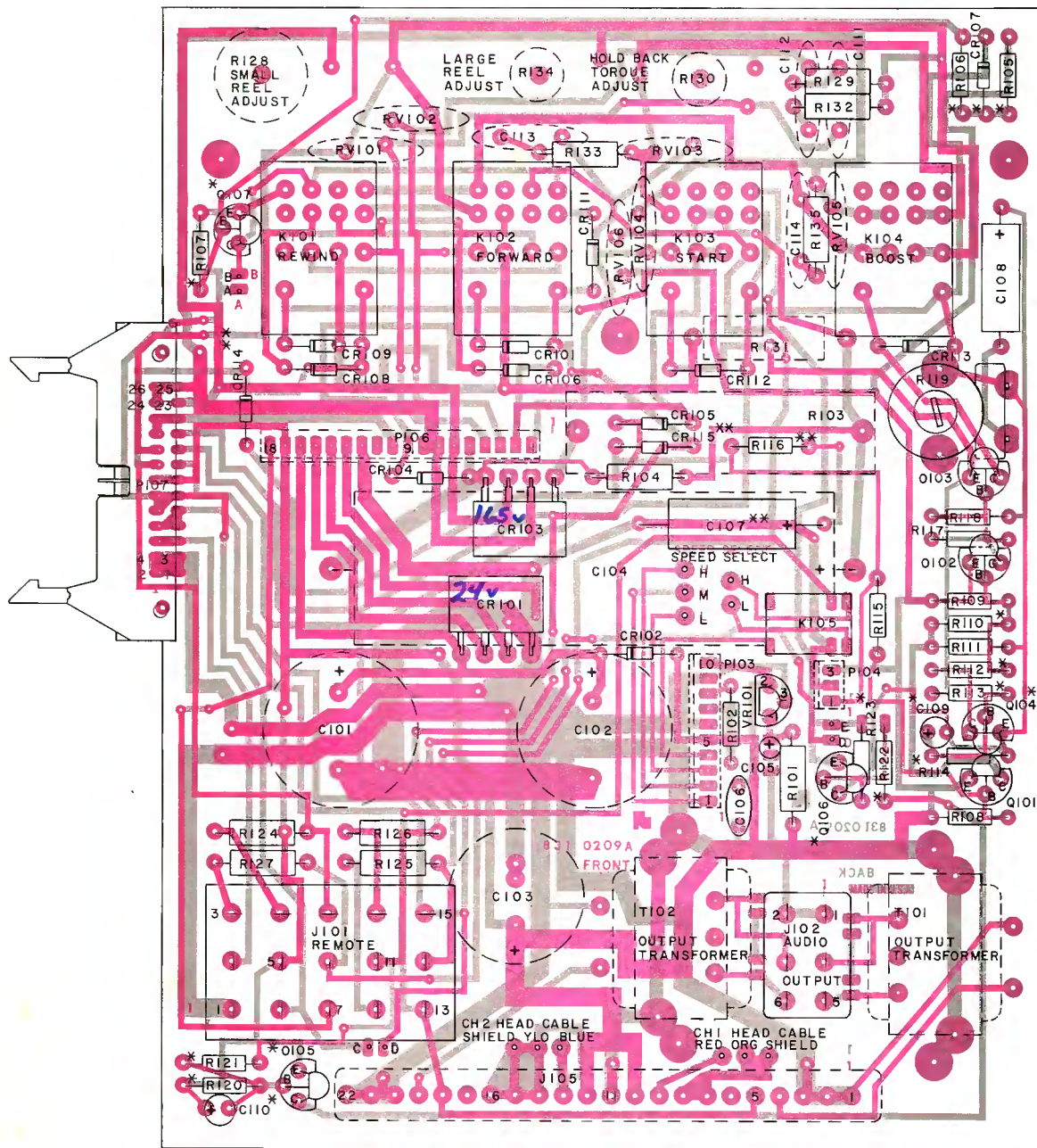
POWER TRANSFORMER

ITEM NO.	PART NO.	DESCRIPTION
1	526-0015-000	Transformer
2	376-0039-000	Terminal strip Smith 3010
3	350-0410-000	Screw 4-40 x 3/8 Phillips pan head
4	365-0401-000	Washer #4 int. lock ZP
5	350-0804-000	Screw, 8-32 x 3/8 Phillips pan head



MOTION SENSE

ITEM NO.	PART NO.	DESCRIPTION
1	300-0038-000	Standoff 6-32 x 1/4 x 1/4 male- /male
2	831-0229-002	Motion sense P.C. board
3	300-0085-000	Standoff 6-32 x 3/4 x 1/4 hex fe- male/female
4	370-0601-000	Nut 6-32 x 1/4 hex ZP
5	297-0021-001	Shield, motion sense
6	350-0605-000	Screw, 6-32 x 1/4 Phillips pan int. sems
7	380-0127-000	Housing, Amp 640440-3



NOTES:

1. DASHED LINES INDICATE COMPONENTS MOUNTED ON "BACK" SIDE .
2. * COMPONENTS USED WITH MOTION SENSE.
3. ** COMPONENTS USED WITHOUT MOTION SENSE.
4. 15 IPS - 7 1/2 IPS USE JUMPERS H TO H AND L TO M.
7 1/2 IPS - 3 3/4 IPS USE JUMPERS H TO M AND L TO L.
5. WITHOUT MOTION SENSE USE JUMPERS A TO B AND E TO D.
WITH MOTION SENSE USE JUMPER C TO D.

MOTHER PC BOARD
 B31-0209-003 WITHOUT MOTION SENSE
 831-0209-013 WITH MOTION SENSE

**MOTHER BOARD COMPONENT
 LOADING AND OVERLAY**

MOTHER BOARD PARTS LIST

770 PLAYBACK

Symbol	Part Number	Description
Capacitors		
C101	687-0010-000	3300 uFd. 50v, electrolytic
C102	687-0010-000	3300 uFd. 50v, electrolytic
C103	687-0009-000	2200 uFd. 50v, electrolytic
C104	696-0207-000	200 uFd. 250v, electrolytic
C105	694-0004-000	.47 uFd. 35v, tantalum
C106	686-0009-000	.1 uFd. 25v, ceramic disc
C107	696-0122-000	50 uFd. 25v, electrolytic
C108	696-0117-000	10 uFd. 25v, electrolytic
C109	694-0002-000	10 uFd. 20v, tantalum
C110	694-0002-000	10 uFd. 20v, tantalum
C111	686-0001-000	.1 uFd. 500v, ceramic disc
C112	686-0001-000	.1 uFd. 500v, ceramic disc
C113	686-0001-000	.1 uFd. 500v, ceramic disc
C114	686-0001-000	.1 uFd. 500v, ceramic disc

Diodes

CR101	575-0022-000	MDA 206, bridge rectifier
CR102	575-0007-000	1N 4005
CR103	575-0022-000	MDA 206, bridge rectifier
CR104	575-0007-000	1N 4005
CR105	575-0007-000	1N 4005
CR106	575-0007-000	1N 4005
CR107	575-0007-000	1N 4005
CR108	575-0007-000	1N 4005
CR109	575-0007-000	1N 4005
CR110	575-0007-000	1N 4005
CR111	575-0007-000	1N 4005
CR112	575-0007-000	1N 4005
CR113	575-0007-000	1N 4005
CR114	575-0007-000	1N 4005
CR115	575-0007-000	1N 4005

Connectors

J101	380-0045-000	15 pin socket, PC
J102	380-0044-000	6 pin socket, PC
J103	380-0130-000	22 pin card edge connector
J105	376-0051-000	18 pin post header, polarized
P106	380-0066-000	26 pin header
P107	376-0050-000	10 pin post header, polarized
P103	376-0049-000	3 pin post header, locking
P104	376-0051-000	18 pin housing
J106	380-0128-000	10 pin housing
J104	380-0127-000	3 pin housing
	380-0132-000	Socket, Spring

MISCELLANEOUS ELECTRONIC PARTS

Symbol	Part Number	Description
Motors		
B1	455-0003-003	Motor, capstan DCB
	831-0236-000	Motor control for B1
B2	451-0065-003C	Motor, torque, 1800 RPM 117VAC
B3	451-0065-003C	Motor, torque, 1800 RPM 117VAC

Capacitors

C1	683-0012-000	7.5 uFd. 236VAC, oil filled
C2	683-0012-000	7.5 uFd. 236VAC, oil filled
C3	686-0003-000	.05 uFd. 500v, ceramic disc
C4	686-0003-000	.05 uFd. 500v, ceramic disc

Connectors

J2	380-0007-000	6 pin socket
J3	380-0001-000	3 pin socket
J4	380-0007-000	6 pin socket
	613-0002-000	TO-3 socket for VR1
J5	380-0125-000	11 pin socket
P2 & P4	378-0005-000	6 pin plug
P3	378-0001-000	3 pin plug

Solenoids and Brakes

MP1	338-0001-000	Brake 110VDC, disc
MP2	338-0002-000	Brake, disc 110VDC
L1	477-0006-002	Pressure roller, 110VDC

Heads

PU1	504-0038-000	Head Play, 2-HT
	504-0015-000	Head Play, 1-FT
	504-0027-000	Head Play, 1/4-T

Transformer

T1	526-0015-000	Power AM 8845
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Integrated Circuit

VR1	605-0007-000	24V series regulator -7824KC
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Terminal Strips

TB1	376-0039-000	10 position terminal strip
TB2	376-0003-000	5 position terminal strip

MOTHER BOARD

Symbol Part Number Description

Relays		
K101	480-0009-000	4PDT 24v
K102	480-0009-000	4PDT 24v
K103	480-0009-000	4PDT 24v
K104	480-0007-000	4PDT 24v
K105	487-0003-000	SPDT 24v
	487-0003-000	Socket, relay PC mount (4)

Transistors

Q101	590-0018-000	GES 5817, PNP
Q102	590-0018-000	GES 5817, PNP
Q103	590-0018-000	GES 5817, PNP
Q104	590-0017-000	GES 5816, PNP
Q105	590-0018-000	GES 5817, PNP
Q106	590-0017-000	GES 5816, PNP
Q107	590-0017-000	GES 5816, PNP

Resistors (5% Tolerance Unless Noted)

R101	630-0252-000	360 ohm 1/2 watt, carbon film
R102	630-0047-000	220 ohm 1/4 watt, carbon film
R103	628-0179-000	50 ohm 20 watt, wire wound
R104	630-0307-000	68K ohm 1/4 watt, carbon film
R105	630-0083-000	6.8K ohm 1/4 watt, carbon film
R106	630-0075-000	3.3K ohm 1/4 watt, carbon film
R107	630-0079-000	4.7K ohm 1/4 watt, carbon film
R108	630-0091-000	15K ohm 1/4 watt, carbon film
R109	630-0079-000	4.7K ohm 1/4 watt, carbon film
R110	630-0079-000	4.7K ohm 1/4 watt, carbon film
R111	630-0079-000	4.7K ohm 1/4 watt, carbon film
R112	630-0075-000	3.3K ohm 1/4 watt, carbon film
R113	630-0099-000	33K ohm 1/4 watt, carbon film
R114	630-0091-000	15K ohm 1/4 watt, carbon film
R115	630-0079-000	4.7K ohm 1/4 watt, carbon film
R116	630-0055-000	470 ohm 1/4 watt, carbon film

Symbol	Part Number	Description
R117	630-0087-000	10K ohm 1/4 watt, carbon film
R118	630-0055-000	470 ohm 1/4 watt, carbon film
R119	636-0004-000	10K ohm, potentiometer
R120	630-0071-000	2.2K ohm 1/4 watt, carbon film
R121	630-0099-000	33K ohm 1/4 watt, carbon film
R122	630-0079-000	4.7K ohm 1/4 watt, carbon film
R123	630-0079-000	4.7K ohm 1/4 watt, carbon film
R124	630-0239-000	100 ohm 1/2 watt, carbon film
R125	630-0239-000	100 ohm 1/2 watt, carbon film
R126	630-0239-000	100 ohm 1/2 watt, carbon film
R127	630-0239-000	100 ohm 1/2 watt, carbon film
R128	638-0002-000	250 ohm 25 watt, adjustable
R129	626-0231-000	47 ohm 1/2 watt, carbon comp.
R130	638-0007-000	1K ohm 12 watt, adjustable
R131	628-0189-000	75 ohm 8 watt, wire wound
R132	626-0231-000	47 ohm 1/2 watt, carbon comp.
R133	626-0231-000	47 ohm 1/2 watt, carbon comp.
R134	638-0005-000	150 ohm 12 watt, adjustable
R135	626-0231-000	47 ohm 1/2 watt, carbon comp.

Varistor

RV101	648-0001-000	V150LA20A
RV102	648-0001-000	V150LA20A
RV103	648-0001-000	V150LA20A
RV104	648-0001-000	V150LA20A
RV105	648-0001-000	V150LA20A
RV106	648-0001-000	V150LA20A

Transformers

T101	532-0009-000	Audio output, PC mount AM9064
T102	532-0009-000	Audio output, PC mount AM9064

Integrated Circuit

VR101	605-0015-000	5V series regulator 78L05 ACP
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REPRODUCE AMPLIFIER

Symbol Part Number Description Capacitors

C201	696-0078-000	100 uFd. 12v, electrolytic
C202	694-003-000	4.7 uFd. 35v, tantalum
C203	677-0003-000	300 pFd. 300v, silver mica
C204	677-0003-000	300 pFd. 300v, silver mica
C205	681-0046-000	.01 uFd. 200v, pacer
C206	696-0078-000	100 uFd. 12 v, electrolytic
C207	694-0003-000	4.7 uFd. 35v, tantalum
C208	694-0003-000	4.7 uFd. 35v, tantalum
C209	694-0007-000	47 uFd. 20v, tantalum
C210	694-0003-000	4.7 uFd. 35v, tantalum
C211	681-0039-000	.0027 uFd. 200v pacer
C212	687-0007-000	470 uFd. 25v, electrolytic
C213	694-0005-000	1 uFd. 35v, tantalum
C214	687-0006-000	220 uFd. 25v, electrolytic
C215	696-0078-000	100 uFd. 12v, electrolytic
C216	694-0003-000	4.7 uFd. 35v. tantalum
C217	677-0003-000	300 pFd. 300v, silver mica
C218	677-0003-000	300 pFd. 300v, silver mica
C219	681-0046-000	.01 uFd. 200v, pacer
C220	696-0078-000	100 uFd. 12v, electrolytic
C221	694-0003-000	4.7 uFd. 35v, tantalum
C222	694-0003-000	4.7 uFd. 35v, tantalum
C223	694-0007-000	47 uFd. 20v, tantalum
C224	694-0003-000	4.7 uFd. 35v, tantalum
C225	681-0039-000	.0027 uFd. 200v pacer
C226	687-0007-000	470 uFd. 25v, electrolytic
C227	694-0005-000	1 uFd. 35v, tantalum
C228	687-0006-000	220 uFd. 25v, electrolytic
C229	681-0035-000	.0012 uFd. 200v, pacer
C230	677-0005-000	47 pFd. 300v, silver mica
C231	681-0035-000	.0012 uFd. 200v, pacer
C232	677-0005-000	47 pFd. 300v, silver mica

Symbol Part Number Description Phone Jack

J201	380-0035-000	Phone Jack, 1/4 stereo
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Transistor

Q201	590-0013-000	2N5089, NPN
Q202	590-0013-000	2N5089, NPN
Q203	590-0017-000	GES 5816, NPN
Q204	590-0017-000	GES 5816, NPN
Q205	590-0017-000	GES 5816, NPN
Q206	590-0018-000	GES 5817, PNP
Q207	590-0017-000	GES 5816, NPN
Q208	590-0013-000	2N5089, NPN
Q209	590-0013-000	2N5089, NPN
Q210	590-0017-000	GES 5816, NPN
Q211	590-0017-000	GES 5816, NPN
Q212	590-0017-000	GES 5816, NPN
Q213	590-0018-000	GES 5817, PNP
Q214	590-0017-000	GES 5816, NPN

Miscellaneous Parts

Part Number Description

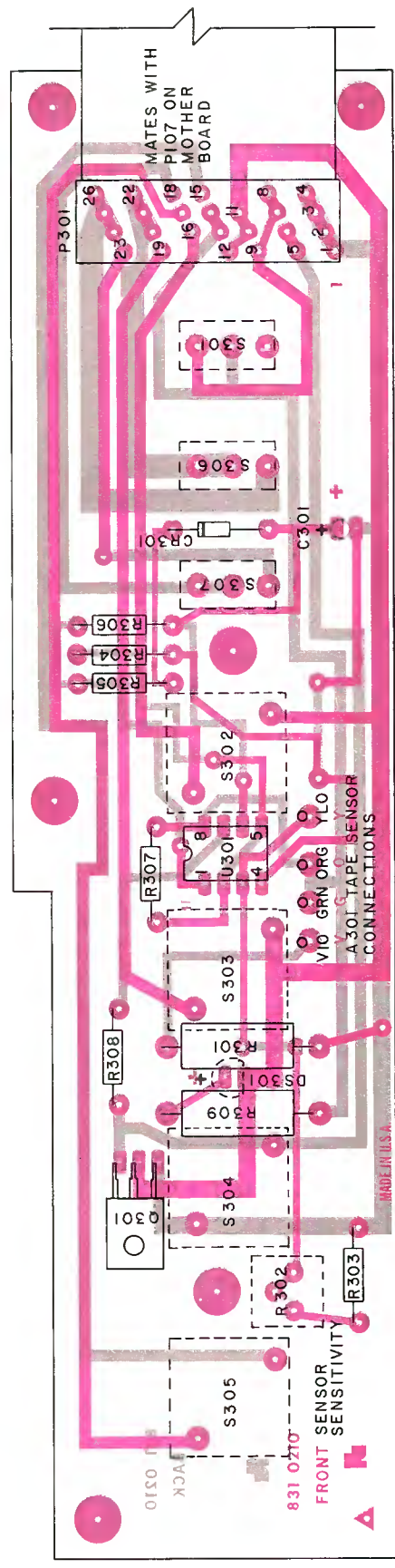
832-0765-021	Head Cable, Channel 1
832-0765-022	Head Cable, Channel 2
325-0230-003	PCB, PROGRAM AMP
297-0022-012	SHIELD, PROGRAM AMP
315-0013-000	Knob, Level Control

Symbol Part Number Description
Resistors (5% Tolerance Unless Noted)

Resistors

R201	630-0103-000	47K ohm 1/4 watt, carbon film	R230	630-0051-000	330K ohm 1/4 watt, carbon film
R202	630-0051-000	330 ohm 1/4 watt, carbon film	R231	630-0067-000	1.5K ohm 1/4 watt, carbon film
R203	630-0067-000	1.5K ohm 1/4 watt, carbon film	R232	630-0111-000	100K ohm 1/4 watt, carbon film
R204	630-0111-000	100K ohm 1/4 watt, carbon film	R233	636-0010-000	10K ohm, potentiometer
R205	636-0010-000	10K ohm, potentiometer	R234	630-0071-000	2.2K ohm 1/4 watt, carbon film
R206	630-0071-000	2.2K ohm 1/4 watt, carbon film	R235	630-0043-000	150 ohm 1/4 watt, carbon film
R207	630-0043-000	150 ohm 1/4 watt, carbon film	R236	630-0067-000	1.5K ohm 1/4 watt, carbon film
R208	630-0067-000	1.5 ohm 1/4 watt, carbon film	R237	630-0055-000	470K ohm 1/4 watt, carbon film
R209	630-0055-000	470 ohm 1/4 watt, carbon film	R238	636-0010-000	10 ohm 1/4 watt, carbon film
R210	636-0010-000	10K ohm, potentiometer	R239	630-0085-000	8.2K ohm 1/4 watt, carbon film
R211	630-0085-000	8.2K ohm 1/4 watt, carbon film	R240	630-0107-000	68K ohm 1/4 watt, carbon film
R212	630-0107-000	68K ohm 1/4 watt, carbon film	R241	630-0087-000	10K ohm 1/4 watt, carbon film
R213	630-0087-000	10K ohm 1/4 watt, carbon film	R242	630-0031-000	47 ohm 1/4 watt, carbon film
R214	630-0031-000	47 ohm 1/4 watt, carbon film	R243	630-0063-000	1K ohm 1/4 watt, carbon film
R215	630-0063-000	1K ohm 1/4 watt, carbon film	R244	630-0071-000	2.2K ohm 1/4 watt, carbon film
R216	630-0071-000	2.2K ohm 1/4 watt, carbon film	R245	630-0043-000	150 ohm 1/4 watt, carbon film
R217	630-0043-000	150 ohm 1/4 watt, carbon film	R246	630-0071-000	2.2K ohm 1/4 watt, carbon film
R218	630-0071-000	2.2K ohm 1/4 watt, carbon film	R247	636-0011-000	25K ohm 1/4 watt, carbon film
R219	636-0011-000	25K ohm, potentiometer	R248	630-0115-000	150K ohm 1/4 watt, carbon film
R220	630-0115-000	150K ohm 1/4 watt, carbon film	R249	630-0095-000	22K ohm 1/4 watt, carbon film
R221	630-0095-000	22K ohm 1/4 watt, carbon film	R250	630-0069-000	1.8K ohm 1/4 watt, carbon film
R222	630-0069-000	1.8K ohm 1/4 watt, carbon film	R251	630-0051-000	330 ohm 1/4 watt, carbon film
R223	630-0051-000	330 ohm 1/4 watt, carbon film	R252	630-0039-000	100 ohm 1/4 watt, carbon film
R224	630-0039-000	100K ohm 1/4 watt, carbon film	R253	630-0023-000	22 ohm 1/4 watt, carbon film
R225	630-0023-000	22K ohm 1/4 watt, carbon film	R254	630-0091-000	15K ohm 1/4 watt, carbon film
R226	630-0091-000	15K ohm 1/4 watt, carbon film	R255	630-0079-000	4.7K ohm 1/4 watt, carbon film
R227	630-0079-000	4.7K ohm 1/4 watt, carbon film	R256	630-0039-000	100 ohm 1/4 watt, carbon film
R228	630-0039-000	100K ohm 1/4 watt, carbon film	R257	630-0081-000	5.6K ohm 1/4 watt, carbon film
R229	630-0103-000	47K ohm 1/4 watt, carbon film	R258	630-0081-000	5.6K ohm 1/4 watt, carbon film

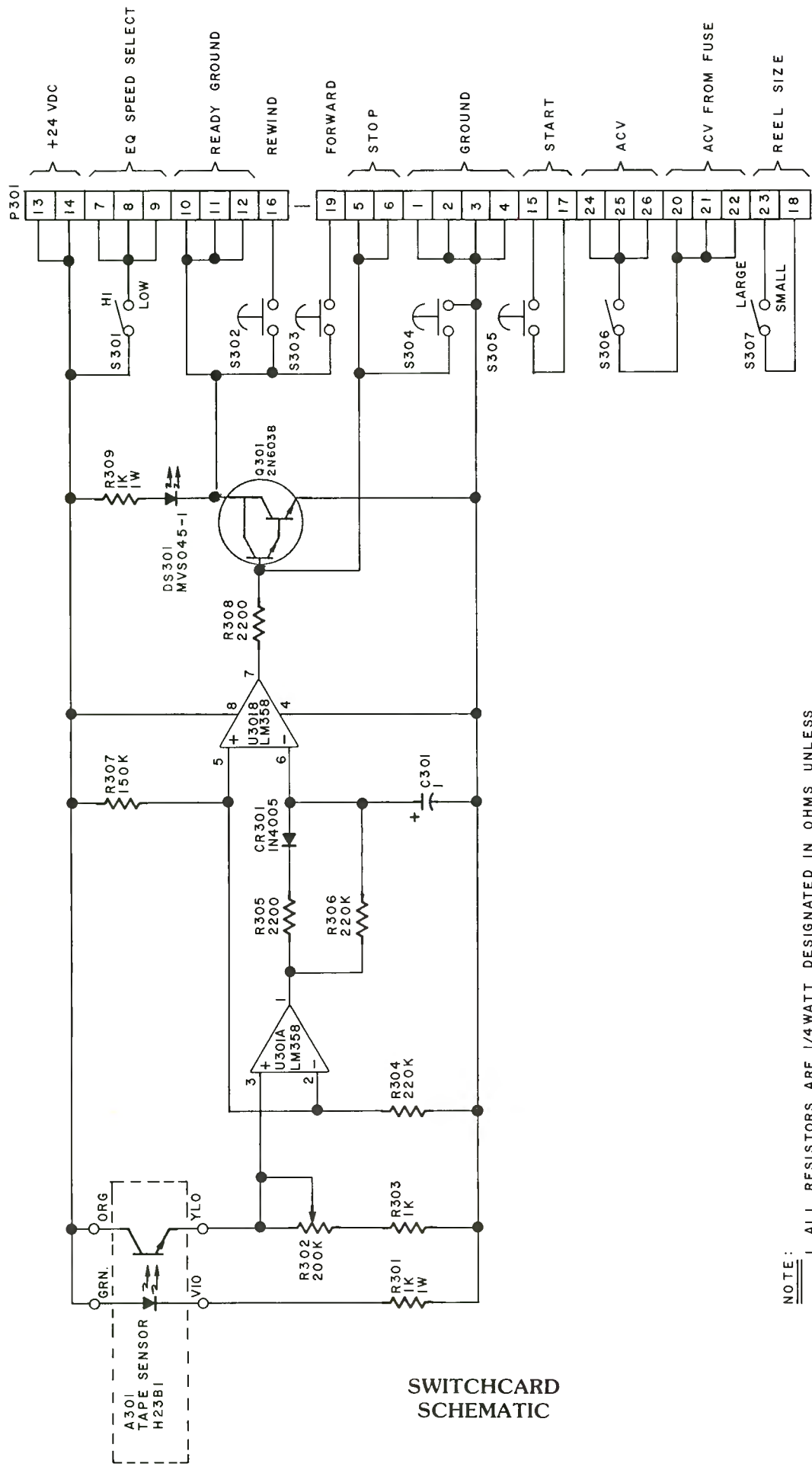
*LED SENSITON REGULATES SA SENSITIVITY SETTING
 ETHERC SHORT YEL/ORA TAPE SENSOR OF BAO LM35E*



SWITCH PC BOARD
 831-0210-003

NOTES:
 I. DASHED LINES INDICATE COMPONENTS MOUNTED ON "BACK" SIDE

SWITCHCARD COMPONENT
 LOADING AND OVERLAY

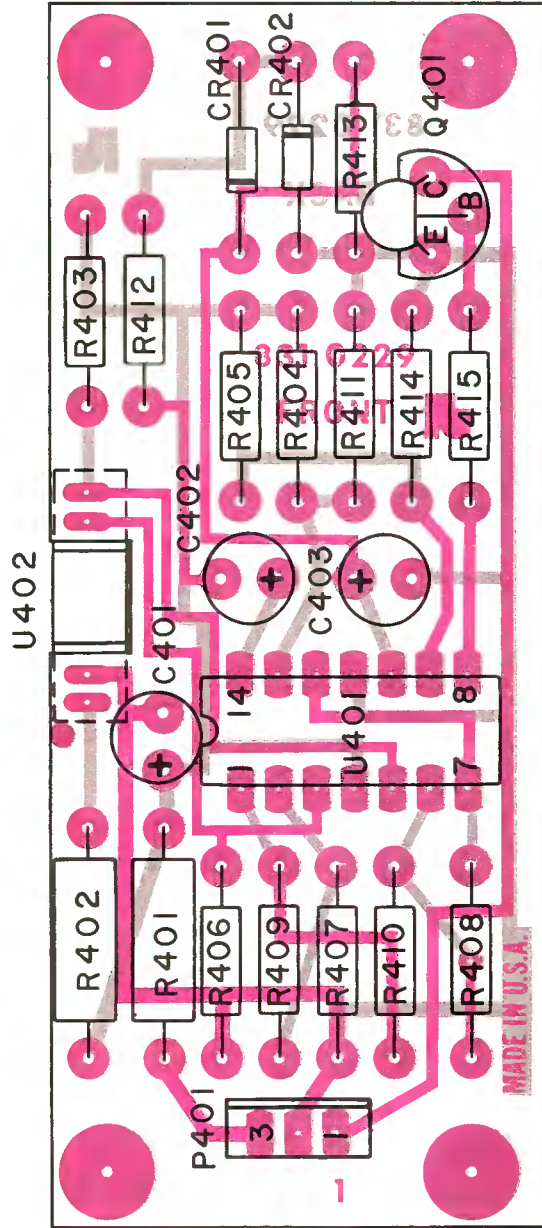


SWITCHCARD SCHEMATIC

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

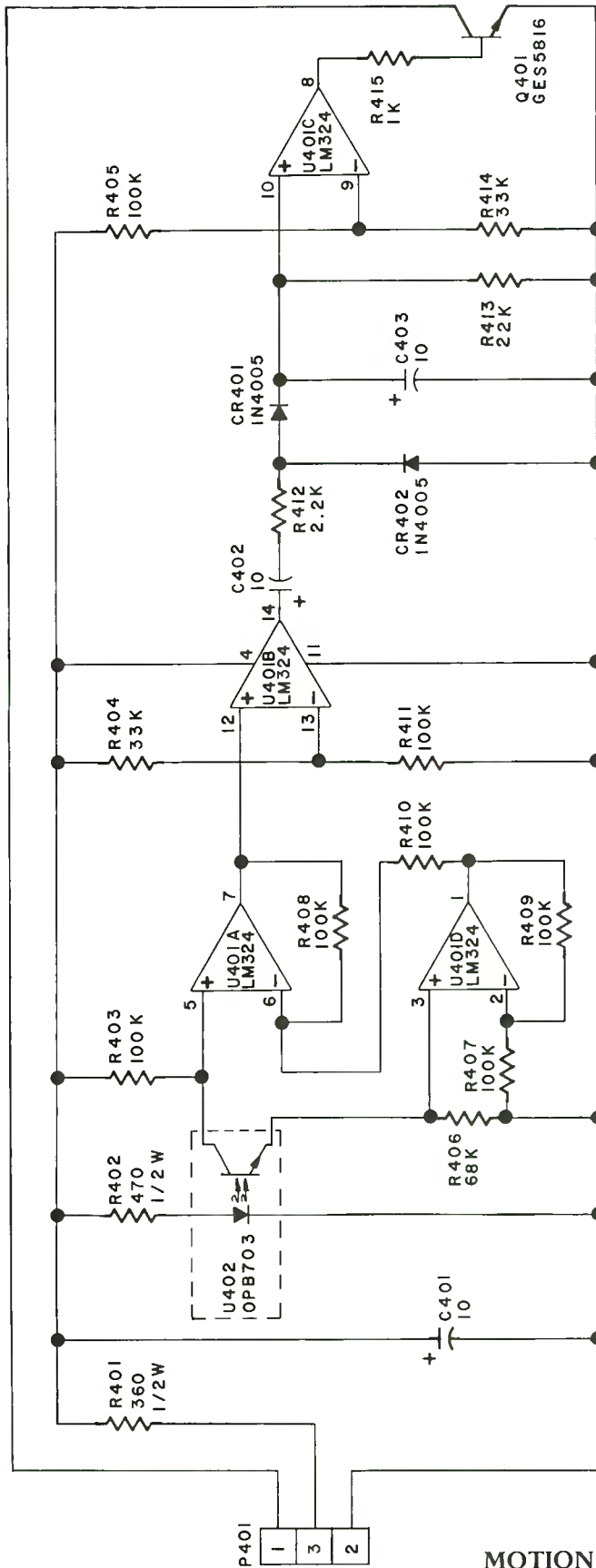
SWITCH CARD

SWITCH CARD			Symbol	Part Number	Description
Symbol	Part Number	Description			
Tape Sensor					
A301	832-0500-250	Sensor assembly - complete			
Capacitor					
C301	694-0005-000	1 uFd. 35v, tantalum			
Diodes					
CR301	575-0007-000	1N 4005			
DS301	575-0012-000	MV 5045-1 L.E.D.			
Resistors (5% Tolerance Unless Noted)					
R301	626-0463-000	1K ohms, carbon comp.			
R302	636-0042-000	200K ohms, potentiometer			
R303	630-0063-000	1K ohms, 1/4 watt, carbon film			
R304	630-0119-000	220K ohms, 1/4 watt, carbon film			
R305	630-0071-000	2.2K ohms, 1/4 watt, carbon film			
R306	630-0119-000	220K ohms, 1/4 watt, carbon film			
R307	630-0115-000	150K ohms, 1/4 watt, carbon film			
R308	630-0071-000	2.2K ohms, 1/4 watt, carbon film			
R309	626-0463-000	1K ohms, 1/4 watt, carbon film			
Transistor					
Q301	590-0022-000	2N6038 NPN Darlington			
			Switches		
			S301	390-0015-000	Toggle SPDT
			S302	391-0021-000	Pushbutton, SPST momentary
			S303	391-0021-000	Pushbutton, SPST momentary
			S304	391-0021-000	Pushbutton, SPST momentary
			S305	391-0021-000	Pushbutton, SPST momentary
			S306	390-0015-000	Toggle SPDT
			S307	390-0015-000	Toggle SPDT
				404-0049-000	Lens, white
				404-0050-000	Lens, green
				404-0051-000	Lens, blue
				404-0052-000	Lens, yellow
			Integrated circuit		
			U301	606-0007-000	LM 358
			Interconnect Cable		
			P301& J701	837-0016-002	Switch card to mother board



MOTION SENSE PC BOARD
831-0229-002

MOTION SENSE COMPONENT
LOADING AND OVERLAY



NOTE:

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

**MOTION SENSE
SCHEMATIC**

MOTION SENSE

Symbol	Part Number	Description	Symbol	Part Number	Description
Capacitors			Integrated Circuit		
C401	694-0002-000	10 uFd. 20v, tantalum	U401	606-0006-000	LM 324
C402	694-0002-000	10 uFd. 20v, tantalum	Reflective Object Sensor		
C403	694-0002-000	10 uFd. 20v, tantalum	U402	585-0003-000	OPB 703
Diodes			Connector		
CR401	575-0007-000	1N 4005	P401	376-0049-000	3 pin post header, locking
CR402	575-0007-000	1N 4005	J401	380-0127-000	3 pin housing
Transistor					
Q401	590-0017-010	GES 5816			
Resistors (5% Tolerance Unless Noted)					
R401	630-0252-000	360 ohms, 1/2 watt, carbon film			
R402	630-0255-000	470 ohms, 1/2 watt, carbon film			
R403	630-0111-000	100K ohms, 1/4 watt, carbon film			
R404	630-0099-000	33K ohms, 1/4 watt, carbon film			
R405	630-0111-000	100K ohms, 1/4 watt, carbon film			
R406	630-0107-000	68K ohms, 1/4 watt, carbon film			
R407	630-0111-000	100K ohms, 1/4 watt, carbon film			
R408	630-0111-000	100K ohms, 1/4 watt, carbon film			
R409	630-0111-000	100K ohms, 1/4 watt, carbon film			
R410	630-0111-000	100K ohms, 1/4 watt, carbon film			
R411	630-0111-000	100K ohms, 1/4 watt, carbon film			
R412	630-0071-000	2.2K ohms, 1/4 watt, carbon film			
R413	630-0107-000	68K ohms, 1/4 watt, carbon film			
R414	630-0099-000	33K ohms, 1/4 watt, carbon film			
R415	630-0063-000	1K ohms, 1/4 watt, carbon film			

SECTION IX. 25 Hz DETECTOR

A. INTRODUCTION

1. GENERAL DESCRIPTION

The ITC 25 Hz detector is designed to provide sub-audible tone detection capability for the ITC 770 open reel playback deck. This unit is configured as an add-on module to any 770 playback deck. Normal audio and remote functions of the playback deck are made available on connector plugs at the back side of the detector module, along with remote output functions from the detector logic.

Double sided printed circuit card construction, state of the art integrated circuits and semi-conductors, and miniature discrete circuit components provide for a compact, maintenance free, reliably operating detector. An all metal cover completely protects the detector card while permitting easy access to rear controls on both the detector and 770 playback deck.

2. SPECIFICATIONS

- a) Input Impedence: Unbalanced - 50K ohms max., 15K ohms min.
Balanced - 60K ohms max., 25K ohms min.
- b) Sensitivity: -42 dBm max.
- c) Band Width: 25 Hz \pm 4 Hz nominal*
- d) Detector Enable: 240 m sec. from beginning of 25 Hz tone
- e) Power: +24 volts DC - 16 ma DC idle current - 66ma DC current at tone detect
- f) Temperature Range: 0°C to +55°C
- g) Rejection:**
35 Hz -23 dB nominal
50 Hz -45 dB nominal
100 Hz -45 dB nominal
- h) E.O.M. Relay: Activates upon detection of 25 Hz tone for length of tone. Single Set of form "C" dry contacts.

Contact rating: 2 amps maximum at 26 VDC resistive; .5 amps maximum at 120 VAC resistive.

* Exact Band Width dependent upon component tolerance

**Exact depth dependent upon component tolerance
"Rejection Independent of Input Level"

Functions:	Operation:
Machine Stop	Activates at trailing edge of 25 Hz tone.
From End of Message (E.O.M.)	Stop pulse: sinking (ground switching) for 500 m/sec.

Delayed Machine Stop:	Activates as sinking pulse (ground switching) for 500 m/sec after .5 to 5.5 sec. variable delay. Available upon special request in variable 5 sec. delay span after "customer specified" fixed delay.
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B. INSTALLATION

1. UNPACKING AND HANDLING

Carefully remove the 25 Hz detector module 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 should be kept in hand until installation has been completed. In case concealed damage is found, contact International Tapetronics for assistance in claims. ITC suggests that packing material be retained for any future use.

2. AUDIO CONNECTIONS

Audio connections from the 770 playback audio connector J102 are transferred into the detector module on six pin plug P102 and out of the module on six pin plug jack J2. The connections at jack J2 are pin to pin duplicates of the output audio connector J102 of the 770 playback deck.

P102 is terminated to the detector circuit and can be line fed from the playback deck as either balanced or unbalanced output. In stereophonic systems, proper phasing of the audio connections must be observed.

Terminal information is provided below:
OUTPUT FROM DETECTOR CONNECTOR J2

Terminal Function
1 Monophonic Shield (Ground) (Left channel stereo)
3 Monophonic (Left) Audio Output (-)
5 Monophonic (Left) Audio Output (+)
2 Right channel stereo shield (ground)
4 Right channel stereo audio output (-)
6 Right channel stereo audio output (+)

Audio termination at output jack J2 of the detector is totally dependent on the type of termination scheme used at the audio output of the 770 playback connector. For further explanation of the 770 reel to reel reproducer audio connections, please refer to 770 Section of this Technical Manual.

3. CONTROL CONNECTIONS

Remote control connections from the 770 playback remote connector J101 are brought into the detector module on 15 pin plug P101 and out of the module on 18 pin jack J1. In addition to the remote control functions transferred to J1 of the module from J101 of the playback deck is a single set of form "C" contacts from relay K101 (mounted on the detector PC board). The pin number assignments between playback deck jack J101 and detector module output jack J1 are as follows:

770 PLAYBACK	25 Hz DETECTOR MODULE	
J101	P101	J1
1 thru 15	1 thru 15	
	(same as 770 J101)	
	16 Relay Common	
	17 Normally Closed	
	18 Normally Open	
	(Form "C" Contacts, K101)	

Remote control termination (pins 1 through 15 at output jack J1) of the detector is the same as the termination scheme for pins 1-15 at output jack J101, the 770 playback connector. For further explanation of the 770 Reel to Reel Reproducer remote connections, please refer to Section II-E. A sample remote control schematic is shown in Figure 9-1.

4. MOUNTING THE DETECTOR (FIELD INSTALLATION)

The 25 Hz detector module is made for easy mounting directly to the rear chassis cover of any ITC 770 open reel playback deck. To install the module on the playback chassis:

- a) Remove the relay retainer bar by unscrewing the two 6-32 x 7/16 screws (350-0612-000) holding it to the two 6-32 x 1-1/4 supporting spacers (300-0009-000). (Leave the spacer on the machine.
- b) Plug the detector module (P101 and P102) into the remote and audio jacks (J101 and J102) in the 770 playback chassis.
- c) Install two 6-32 x 1/4 screws (350-0605-000) through the two upper corner holes in the detector panel and tighten these into the corresponding tapped spacers projecting from the rear chassis cover of the playback deck.

C. PRINCIPLES OF ELECTRICAL OPERATION

The detector module consists of two basic sections. These sections are the tone detector and the detector logic. While the sole purpose of the detec-

tor is to identify a specific frequency regardless of input level, the logic circuits perform several specific functions. DC power for both circuit subsections (+24 volts DC) is obtained from the adjacent 770 playback deck through P101-5.

1. DETECTOR CIRCUIT

A 25 Hz subaudible tone is separated from all other frequencies through the application of active filters constructed around a quad operational amplifier. The first stage of the op amp is configured as a flat amplifier with a high frequency roll-off capacitor C118. The second stage is a low pass filter, where the high frequency components are removed. Next the signal is passed through a 50 Hz twin-T notch filter, which further isolates low frequency audio from the desired 25 Hz tone. Stages three and four of the op amp are configured as a second-order, feed forward band pass filter tuned to 25 Hz.

2. EXTERNAL OUTPUT-RELAY DRIVER AND CONTROL CIRCUIT

The 25 Hz signal is rectified by a transistor zero bias rectifier creating the necessary DC level to activate RDTL logic on the card.

Relay coil K101 is then energized to signal remote equipment of tone presence. K101 remains energized until the 25 Hz tone is removed from the detector. To insure the normal off state of K101, the logic circuit contains an R-C timer which prevents logic outputs from changing state when the DC power is first applied. Changes in logic state cannot occur until all circuit components stabilize to full voltage. When the 770 is put into either fast forward or rewind the logic is disabled by ground on either pin 9 or 14 of P101.

3. END OF TONE STOP CIRCUIT

When the beginning of tone is sensed by the 25 Hz detector, the RDTL is preset to await the end of tone. At the trailing edge of the 25 Hz burst, the RDTL presents a ground going or collector sinking interface to the remote stop line of the 770 playback deck via P101-2. This ground going signal stops the playback deck directly after the end of tone.

4. DELAYED STOP CIRCUIT

The logic circuit of the detector module has a strappable option which permits the end of tone stop signal to be delayed. The indicated strapping points A, B, and C appear on the 25 Hz Circuit Schematic. This delayed stop is made adjustable to operate from .5 to 5.5 seconds after the end of the 25 Hz tone. (By loading the correct components on the PC card, it is possible to change both the minimum delay time and span of adjustable delay from that which is normally provided.) The output from the delayed stop circuit is similar to that from the end of tone stop circuit. Once the delay timer has

timed out after first being set by the end of tone sensor, a second timer presents a ground going or collector sinking signal. As before, this signal stops the 770 playback deck via the remote stop line at P101-2.

D. SETUP, ALIGNMENT, AND CALIBRATION

1. BOOST ADJUST

A hole is present in the upper right hand corner of the detector module (when attached to a playback deck viewed from the rear) and is labeled "Boost Adjust". This hole permits access to the torque boost adjustment in the 770 playback chassis. Complete explanation of this adjustment is given in the front of this Manual.

2. DETECTOR SENSITIVITY ADJUST

Since it is entirely probable that subaudible cue tones recorded on various reel to reel tapes will be at varying levels, the adjustment of the 25 Hz detector should be made to reliably detect tones at a level of at least -8 to -10 dB below the normal recorded level of these cue tones. This adjustment is made with potentiometer R102 located on the lower right of the detector card (831-0116-003). Refer to Figure 9-2 for exact location of this screw driver adjustment pot. Turning the pot in the clockwise direction will increase sensitivity and the opposite is true when turned in the counterclockwise direction. Oversensitivity of the cue detector may result in false cueing and, therefore, use caution when adjusting pot R102. *R102 should always be used to limit the sensitivity of the detector and not to needlessly enhance it.*

3. STOP DELAY ADJUST

When the stop delay option is used on the detector card, a control is provided to adjust the time delay between the sensing of end of tone and the machine stop pulse. This control is normally adjustable over a 5-second span. Adjustment is provided by potentiometer R139 located in the upper left hand corner of the detector card (831-0116-003). Refer to Figure 9-2 for the exact location of this screwdriver adjustment pot. Turning the pot in the clockwise direction will increase the time for the delayed stop pulse. Rotation of the pot in the opposite direction will decrease the delay to the minimum length determined and limited by the value of R138. Different lengths of minimum stop delay and span of delay adjustment can be obtained by changing the values of resistor R138 and potentiometer R139.

4. DETECTOR FREQUENCY TRIM

ITC subaudible detector card (831-0116-003) will normally have maximum detection sensitivity at 25 Hz and maximum audio signal rejection at approximately 50 Hz. If a particular application requires retuning the frequency of maximum sensitivity and frequency of maximum signal rejection, these two frequencies can be shifted slightly from normal. Changing the value of resistor R114 shifts the maximum sensitivity point from 25 Hz. Likewise, changing the value of resistor R111 shifts the maximum signal rejection point from 50 Hz. Neither of the two points should be shifted more than $\pm 15\%$ from normal by the methods indicated.

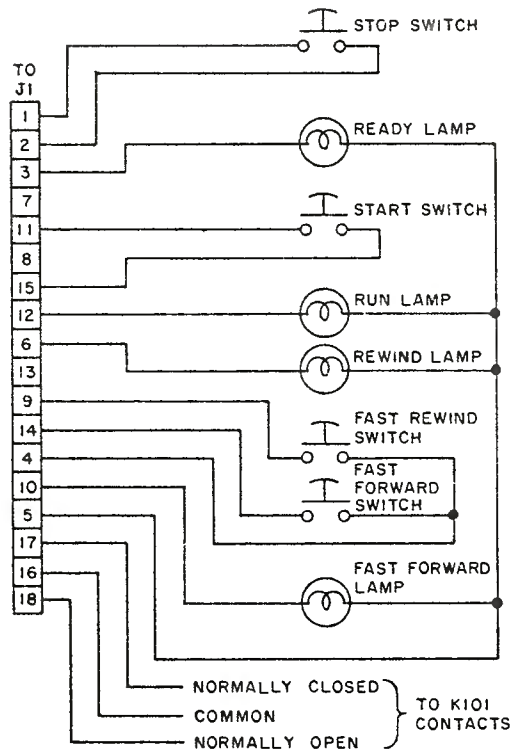


Figure 9-1

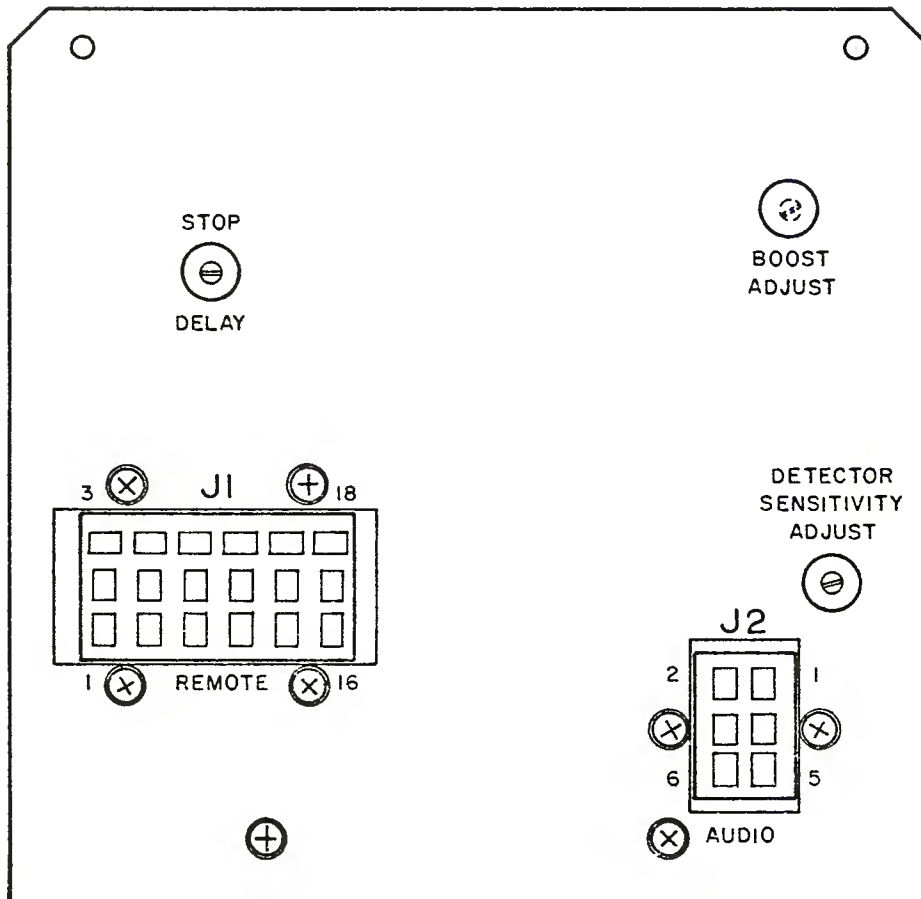
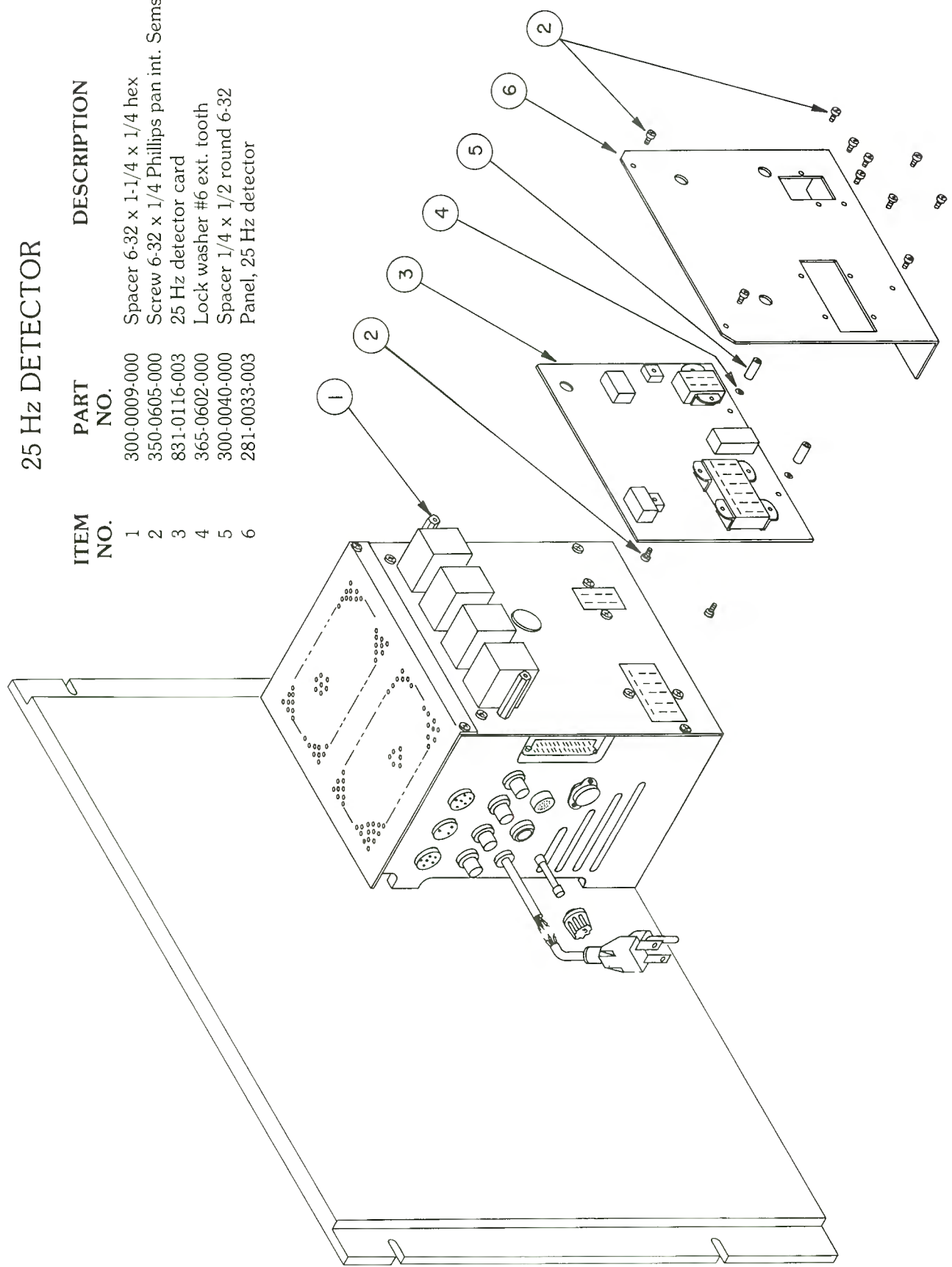
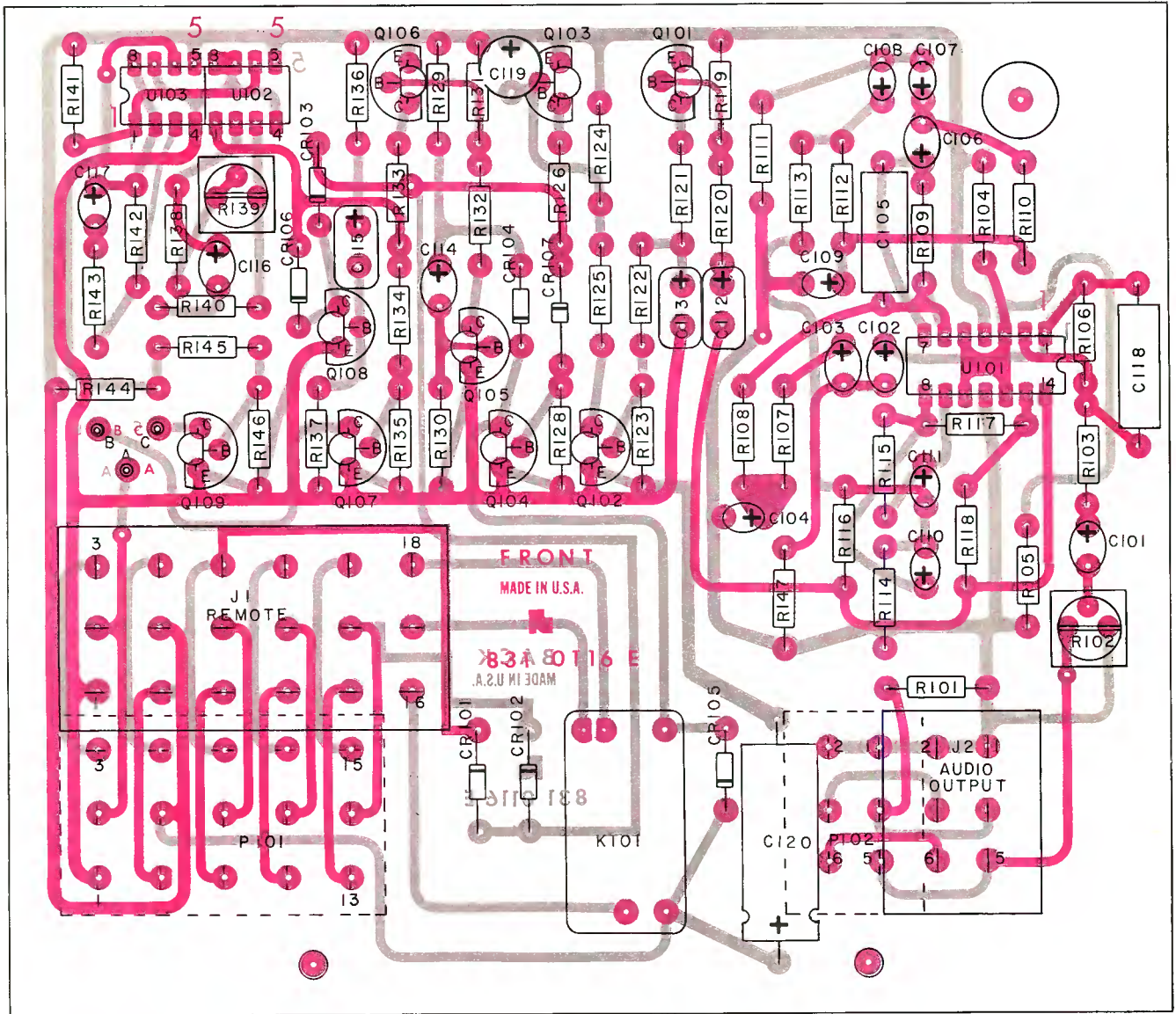


Figure 9-2

25 Hz DETECTOR

ITEM NO.	PART NO.	DESCRIPTION
1	300-0009-000	Spacer 6-32 x 1-1/4 x 1/4 hex
2	350-0605-000	Screw 6-32 x 1/4 Phillips pan int. Sems
3	831-0116-003	25 Hz detector card
4	365-0602-000	Lock washer #6 ext. tooth
5	300-0040-000	Spacer 1/4 x 1/2 round 6-32
6	281-0033-003	Panel, 25 Hz detector





25 Hz DETECTOR PC BOARD
831-0116-003

Printed Circuit Card 25 Hz Detector
831-0116-003

25 Hz DETECTOR

Symbol	Part Number	Description	Symbol	Part Number	Description
DIODES			R109	630-0111-000	Resistor, 100K ohms, 1/4 watt, film
CR101	575-0007-000	Diode, IN4005	R110	630-0083-000	Resistor, 6.8K ohms, 1/4 watt, film
CR102	575-0007-000	Diode, IN4005	R111	630-0075-000	Resistor, 3.3K ohms, 1/4 watt, film
CR103	575-0007-000	Diode, IN4005	R112	630-0083-000	Resistor, 6.8K ohms, 1/4 watt, film
CR104	575-0007-000	Diode, IN4005	R113	630-0109-000	Resistor, 82K ohms, 1/4 watt, film
CR105	575-0007-000	Diode, IN4005	R114	630-0071-000	Resistor, 2.2K ohms, 1/4 watt, film
CR106	575-0007-000	Diode, IN4005	R115	630-0109-000	Resistor, 82K ohms, 1/4 watt, film
CR107	577-0005-000	Diode Zener, IN4372A	R116	630-0099-000	Resistor, 33K ohms, 1/4 watt, film
INTEGRATED CIRCUITS			R117	630-0109-000	Resistor, 82K ohms, 1/4 watt, film
U101	606-0006-000	Amplifier, Operational LM324, National	R118	630-0105-000	Resistor, 56K ohms, 1/4 watt, film
U102	609-0001-000	Timer, Precision LM3905 National	R119	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
U103	609-0001-000	Timer, Precision LM3905 National	R120	630-0063-000	Resistor, 1K ohms, 1/4 watt, film
TRANSISTORS			R121	630-0039-000	Resistor, 100 ohms, 1/4 watt, film
Q101	590-0018-000	Transistor, 2N5817, PNP	R122	630-0063-000	Resistor, 1K ohms, 1/4 watt, film
Q102	590-0017-000	Transistor, 2N5816, NPN	R123	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
Q103	590-0018-000	Transistor, 2N5817, PNP	R124	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
Q104	590-0017-000	Transistor, 2N5816, NPN	R125	630-0087-000	Resistor, 10K ohms, 1/4 watt, film
Q105	590-0017-000	Transistor, 2N5816, NPN	R126	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
Q106	590-0018-000	Transistor, 2N5817, PNP	R127	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
Q107	590-0017-000	Transistor, 2N5816, NPN	R128	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
Q108	590-0017-000	Transistor, 2N5816, NPN	R129	630-0091-000	Resistor, 15K ohms, 1/4 watt, film
Q109	590-0017-000	Transistor, 2N5816, NPN	R130	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
RESISTORS			R131	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
R101	630-0087-000	Resistor, 10K ohms, 1/4 watt, film	R132	630-0087-000	Resistor, 10K ohms, 1/4 watt, film
R102	636-0013-000	Potentiometer 100K ohm 1/4 Watt Cermet Laydown	R133	630-0071-000	Resistor, 2.2K ohms, 1/4 watt, film
R103	630-0095-000	Resistor, 22K ohms, 1/4 watt, film	R134	630-0071-000	Resistor, 2.2K ohms, 1/4 watt, film
R104	630-0111-000	Resistor, 100K ohms, 1/4 watt, film			
R105	630-0111-000	Resistor, 100K ohms, 1/4 watt, film			
R106	630-0121-000	Resistor, 270K ohms, 1/4 watt, film			
R107	630-0081-000	Resistor, 5.6K ohms, 1/4 watt, film			
R108	630-0081-000	Resistor, 5.6K ohms, 1/4 watt, film			

Symbol	Part Number	Description
Resistors (Continued)		
R135	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
R136	630-0091-000	Resistor, 15K ohms, 1/4 watt, film
R137	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
R138	630-0107-000	Resistor, 68K ohms, 1/4 watt, film
R139	636-0017-000	Potentiometer, 500K ohms, 1/4 watt, cermet
R140	630-0063-000	Resistor, 1K ohms, 1/4 watt, film
R141	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
R142	630-0127-000	Resistor, 470K ohms, 1/4 watt, film
R143	630-0063-000	Resistor, 1K ohms, 1/4 watt, film
R144	630-0075-000	Resistor, 3.3K ohms, 1/4 watt, film
R145	630-0063-000	Resistor, 1K ohms, 1/4 watt, film
R146	630-0079-000	Resistor, 4.7K ohms, 1/4 watt, film
R147	630-0087-000	Resistor, 10K ohms, 1/4 watt, film
P101	378-0025-000	Plug, 6 pin, wirewrap
P102	378-0026-000	Plug, 15 pin, wire wrap
J1	380-0044-000	Socket, 6 pin, PC mount
J2	380-0051-000	Socket, 18 pin, PC mount

RELAY

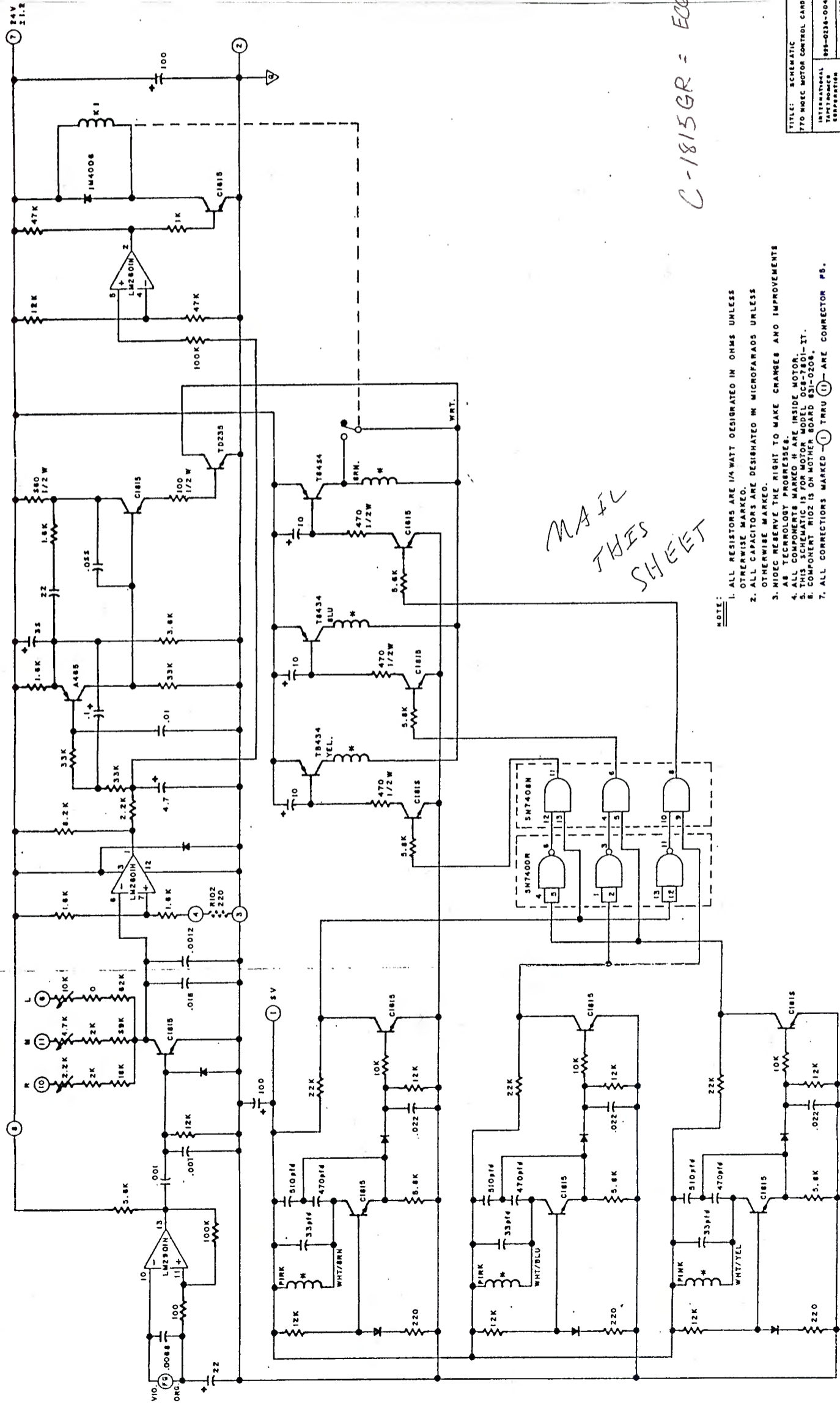
K101	480-0005-000	Relay, SPDT, 60-REI-24v, Sigma
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MISCELLANEOUS

613-0001-000	Socket, transistor
613-0008-000	Socket, I.C. 14 pin DIP
613-0009-000	Socket, I.C. 16 pin DIP
380-0132-000	Socket, spring .05x.26

Symbol	Part Number	Description
CAPACITORS		
C101	694-0002-000	10 ufd, 20V Tantalum
C102	694-0002-000	10 ufd, 20V Tantalum
C103	694-0002-000	10 ufd, 20V Tantalum
C104	694-0005-000	1 ufd, 35V Tantalum
C105	681-0052-000	.033 ufd, 200V Pacer
C106	694-0002-000	10 ufd, 20V Tantalum
C107	694-0004-000	.47 ufd, 35V Tantalum
C108	694-0004-000	.47 ufd, 35V Tantalum
C109	694-0005-000	1 ufd, 35V Tantalum
C110	694-0004-000	.47 ufd, 35V Tantalum
C111	694-0004-000	.47 ufd, 35V Tantalum
C112	694-0007-000	47 ufd, 20V Tantalum
C113	694-0007-000	47 ufd, 20V Tantalum
C114	694-0002-000	10 ufd, 20V Tantalum
C115	694-0007-000	47 ufd, 20V Tantalum
C116	694-0002-000	10 ufd, 20V Tantalum
C117	694-0005-000	1 ufd, 35V Tantalum
C118	681-0050-000	.022 ufd, 200V Pacer
C119	694-0002-000	100 ufd, 10V Tantalum
C120	687-0005-000	100 ufd, 25V Electrolytic

ITC 770 SERVO CARD



C-1815GR = ECG 88

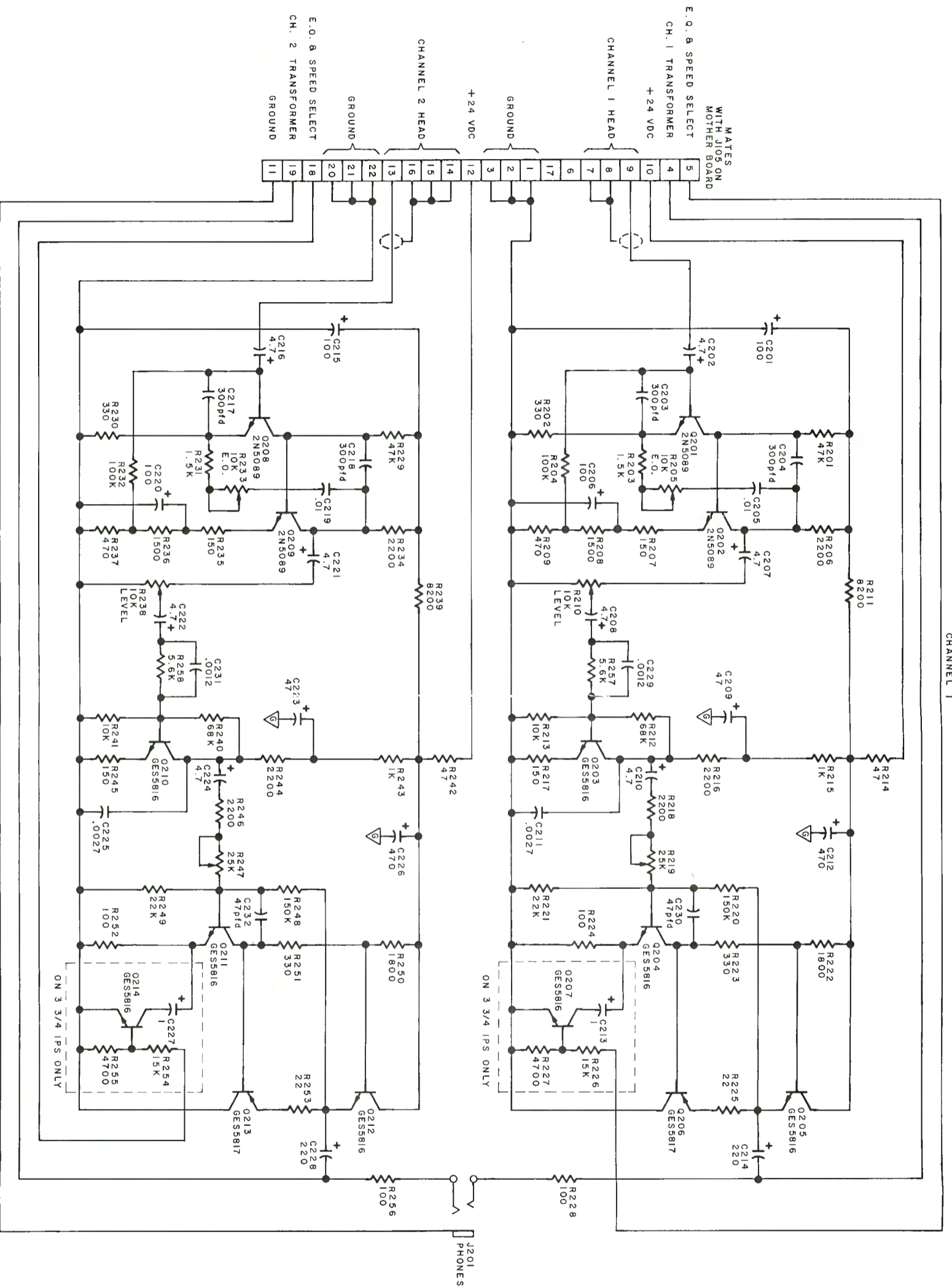
MAIL THIS SHEET

- NOTE:
1. ALL RESISTORS ARE 1/4 WATT DESIGNATED IN OHMS UNLESS OTHERWISE MARKED.
 2. ALL CAPACITORS ARE DESIGNATED IN MICROFARADS UNLESS OTHERWISE MARKED.
 3. HIDE RESERVED THE RIGHT TO MAKE CHANGES AND IMPROVEMENTS AS TECHNOLOGY PROGRESSES.
 4. ALL COMPONENTS MARKED "H" ARE INSIDE MOTOR.
 5. COMPONENTS MARKED "M" ARE MOTOR MOUNTED.
 6. COMPONENTS MARKED "S" FOR MOTOR BOARD 80-0266.
 7. ALL CORRECTIONS MARKED "1" THRU "11" ARE CONNECTOR PINS.

TITLE: SCHEMATIC	PROJECT: ITC 770 SERVO CARD
DATE: 8/1/68	DESIGNER: ECG 88
INTER-OFFICE: 895-0238-004	REVISION: 1
COMPANY: INTERNATIONAL TELEPHONIC CORPORATION	REVISION NUMBER: 1
	DATE: 8/1/68

4/6/68

REPRODUCE AMPLIFIER CHANNEL 1



CHANNEL 2

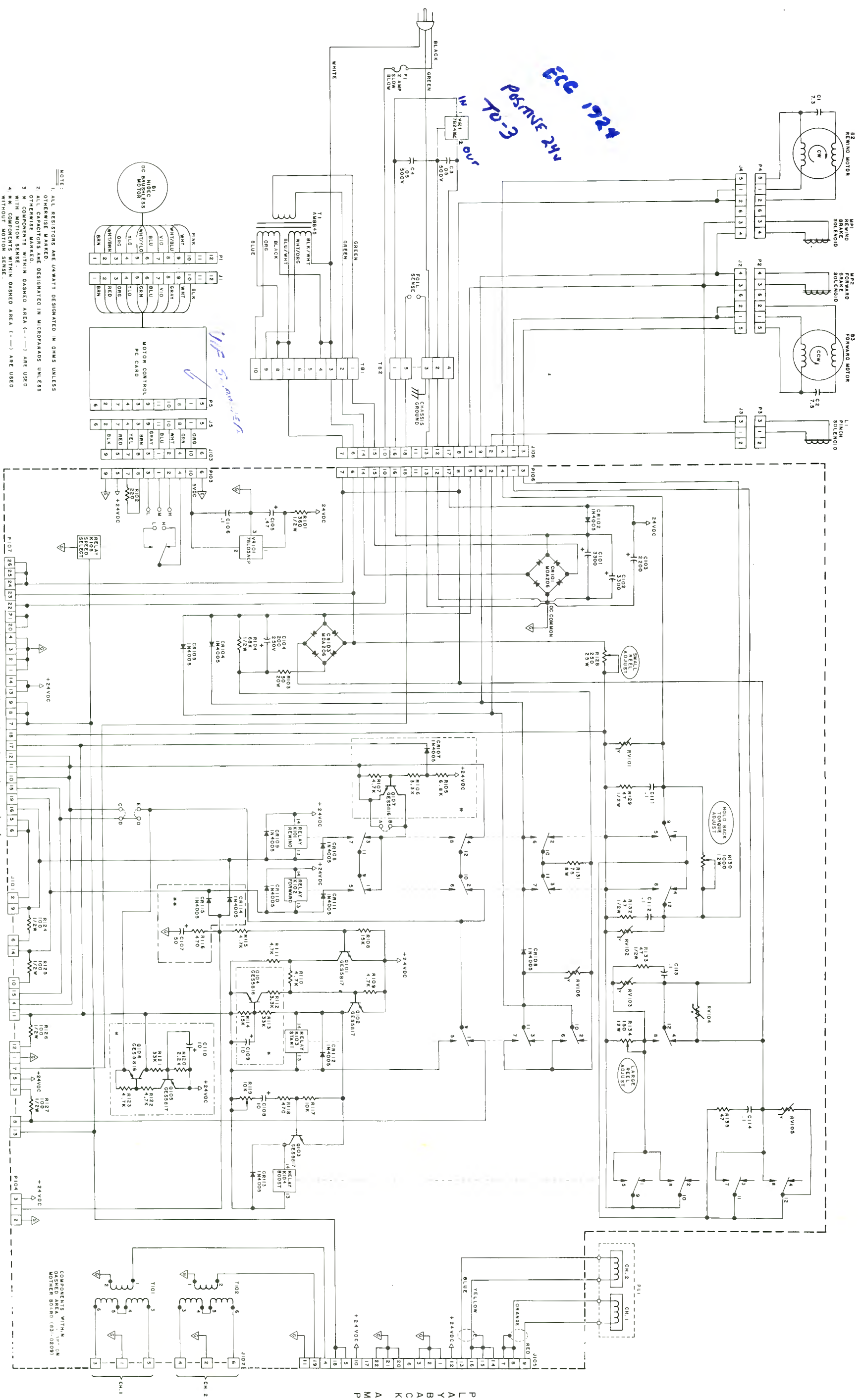
NOTE:

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

REPRODUCE
AMPLIFIER
SCHEMATIC

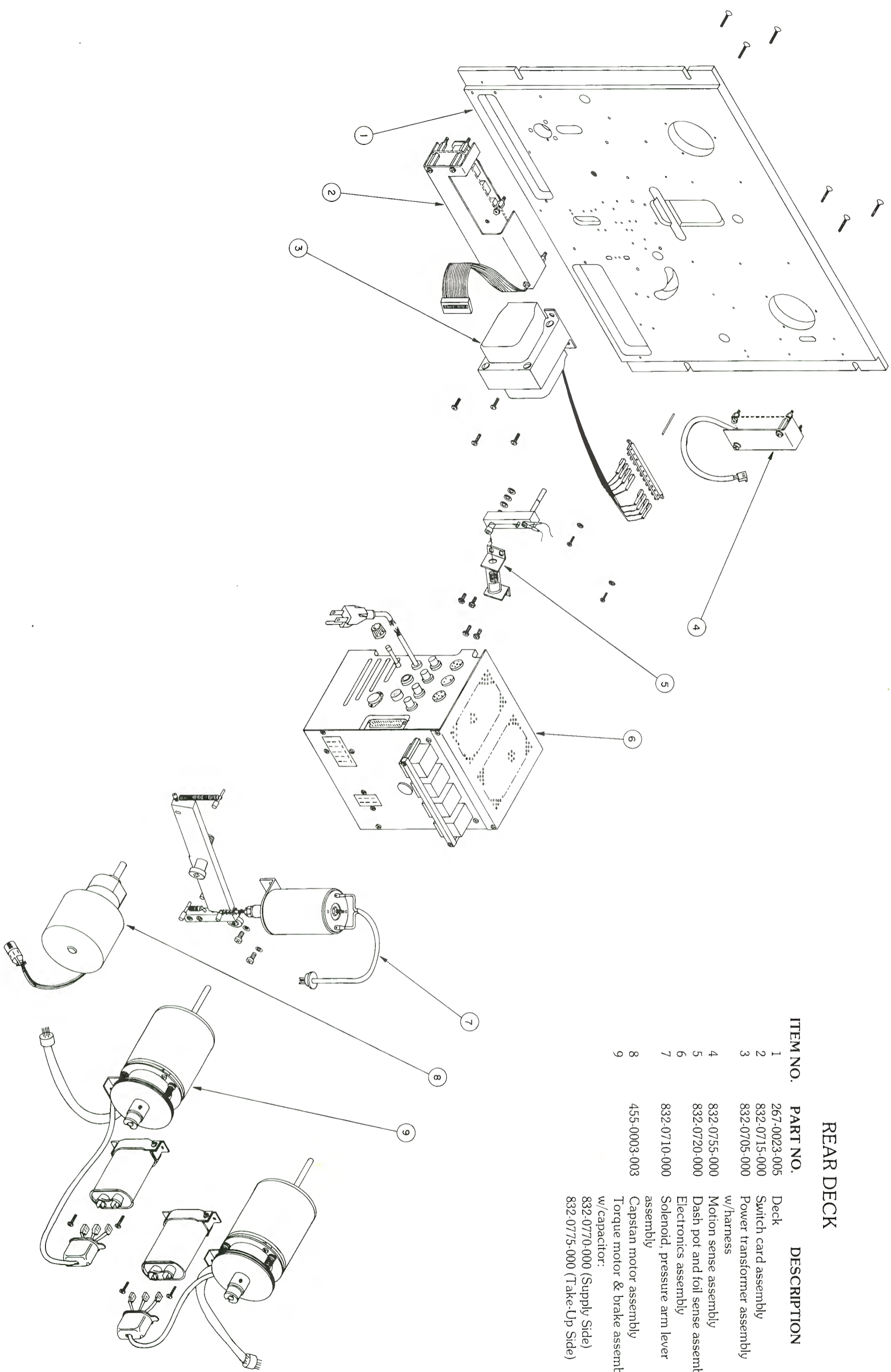
1-5200-816-44102

ECG 1924
POSITIVE 24V
TO-3



MACHINE INTERCONNECT
AND MOTHER BOARD SCHEMATIC

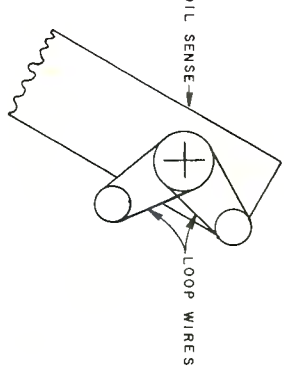
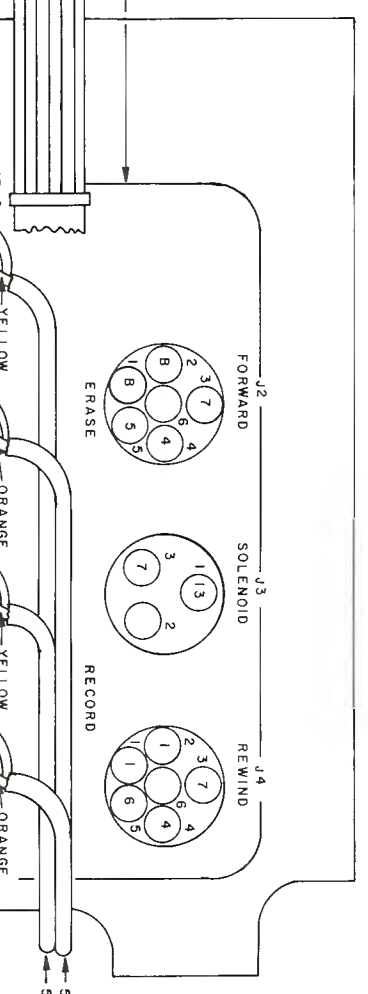
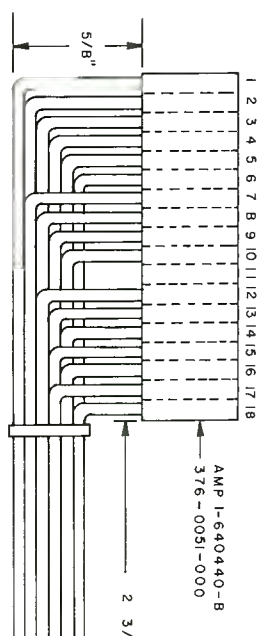
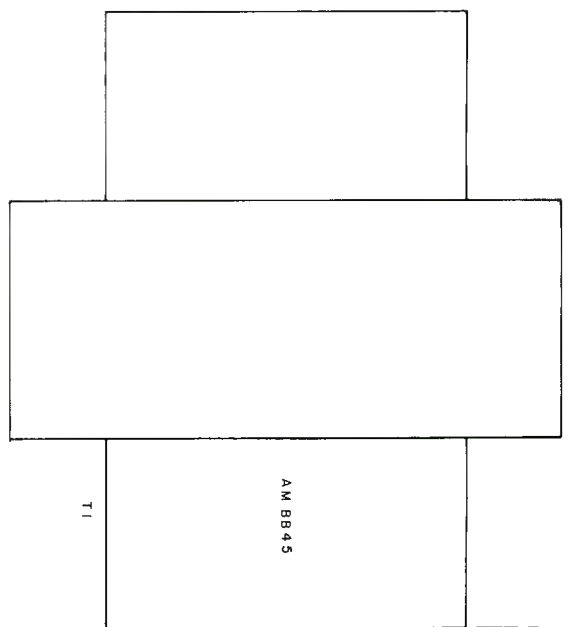
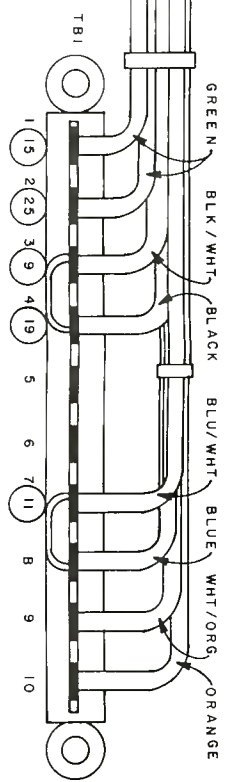
REAR DECK



ITEM NO.	PART NO.	DESCRIPTION
1	267-0023-005	Deck
2	832-0715-000	Switch card assembly
3	832-0705-000	Power transformer assembly w/harness
4	832-0755-000	Motion sense assembly
5	832-0720-000	Dash pot and foil sense assembly
6		Electronics assembly
7	832-0710-000	Solenoid, pressure arm lever assembly
8	455-0003-003	Capstan motor assembly
9		Torque motor & brake assembly w/capacitor: 832-0770-000 (Supply Side) 832-0775-000 (Take-Up Side)



COLOR	LENGTH
GREEN	8 3/4
GREEN	9 1/8
BLK/WHT	9 1/2
BLACK	9 7/8
BLU/WHT	10 7/8
BLUE	11 1/4
WHT/ORG	11 3/8
ORANGE	12



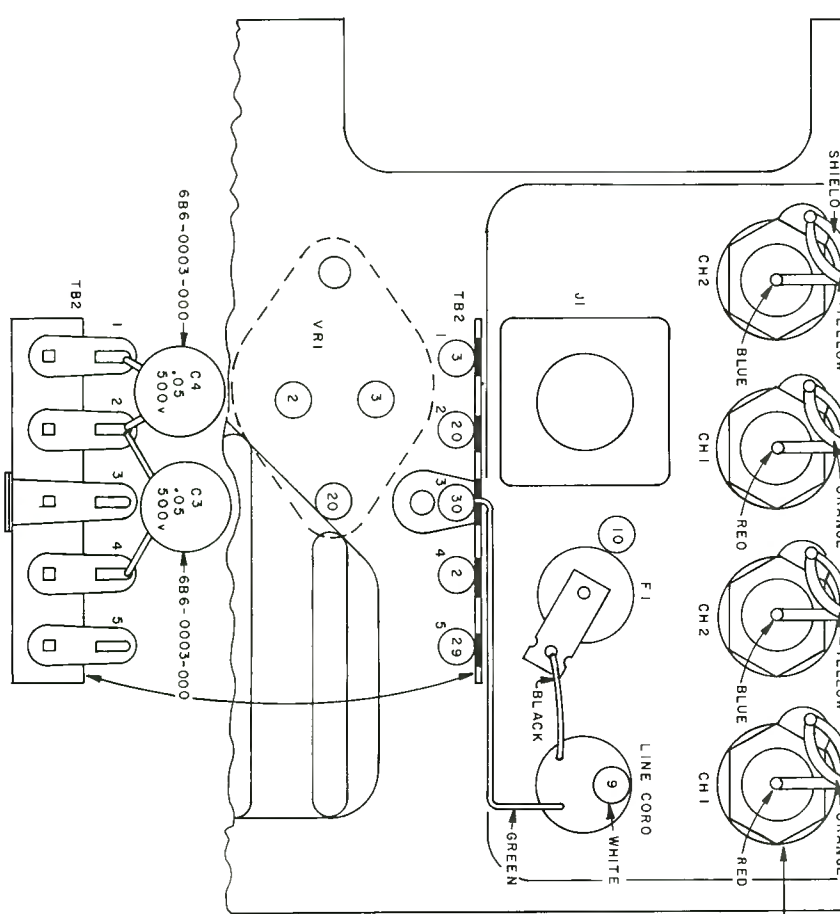
PIN NO. WIRE COLOR CODE NO.

1	B	B
2	13	B
3	5	RED
4	6	ORANGE
5	7	YELLOW
6	19	GREEN
7	11	BLUE
8	1	VIOLET
9	4	GRAY
10	10	WHITE
11	20	
12	30	
13	15	
14	25	
15	3	
16	2	
17	29	
18		

WIRE COLOR CODE CHART

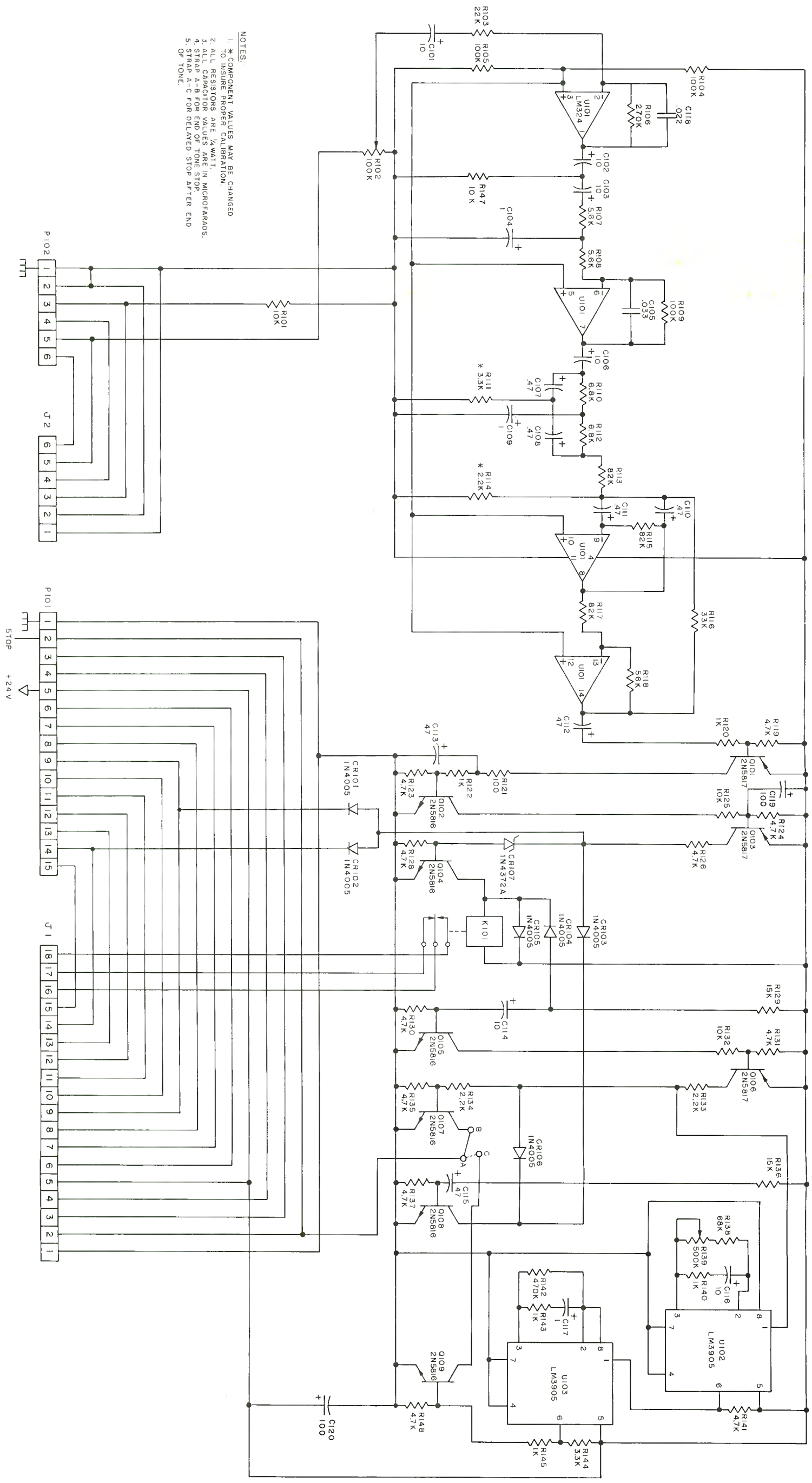
WIRE NUMBER ENDING WITH	COLOR
1	BROWN
2	RED
3	ORANGE
4	YELLOW
5	GREEN
6	BLUE
7	VIOLET
8	GRAY
9	WHITE
0	BLACK

NUMBERS IN CIRCLES (1) ARE WIRE COLOR CODE NUMBERS.



ITEM	PART NUMBER	DESCRIPTION	QUANT. RECORD/PLAY	QUANT. PLAY
TB1	376-0039-000	TERMINAL STRIP SMITH 3010	1	1
TB2	376-0003-000	TERMINAL STRIP SMITH B66	1	1
F1	418-0001-000	FUSE HOLDER WITH CAP	1	1
	417-0007-000	FUSE 2 AMP SLOW BLOW	1	1
	443-0001-000	LINE CORD GRAY	1	1
LINE CORD	311-0003-000	CLIP, LINE CORD	1	1
J2	380-0007-000	SOCKET, W/CLIP 6 PIN MOTOR	1	1
J3	380-0001-000	SOCKET, W/CLIP 3 PIN MOTOR	1	1
J4	380-0007-000	SOCKET, W/CLIP 6 PIN MOTOR	1	1
ERASE A	380-0048-000	BNC SOCKET CONNECTOR	4	0
RECORD	376-0022-000	LUG TERMINAL SMITH 1497	4	0
CH1 B CH2	359-0011-000	SHOULDER WASHER 3/8" I.O. X 5/8" O.D.	1	0
VRI	605-0007-000	I.C. REGULATOR 7824 KC TO-3	1	1
	613-0003-000	INSULATOR TO-3	1	1
	613-0002-000	SOCKET, POWER SUPPLY TO-3	1	1

ELECTRICAL HOUSING WIRING CHART



- NOTES:
1. * COMPONENT VALUES MAY BE CHANGED TO INSURE PROPER CALIBRATION.
 2. ALL RESISTORS ARE 1/4 WATT.
 3. ALL CAPACITOR VALUES ARE IN MICROFARADS.
 4. STRAP A-B FOR END OF TONE STOP.
 5. STRAP A-C FOR DELAYED STOP AFTER END OF TONE.

25 Hz Detector