

THE INFORMATION
CONTAINED IN THE
TECHNICAL MANUAL
PERTAINS TO THE
MACHINE BEARING THE
FOLLOWING SERIAL
NUMBER

**ESL IV Series
Cartridge
Tape Eraser/Splice Locator
890-0016-000**

INTERNATIONAL TAPETRONICS CORPORATION

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

**TECHNICAL MANUAL
890-0016-000**

**ESL IV Series
Cartridge
Tape Eraser/Splice Locator**

(Combination Unit 834-0003-000)



INTERNATIONAL TAPETRONICS CORPORATION

2425 SOUTH MAIN STREET • BLOOMINGTON, ILLINOIS 61701

TELEPHONE: 309-828-1381

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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

TO: CHIEF ENGINEER

SUBJECT: ITC CARTRIDGE MACHINE GAUGES

REASON: GAUGE UPDATE

ITC has made numerous changes recently regarding gauge usage on it's many models of tape machines. Because of improvements in pressure roller design, we find it advantageous to clarify the use of the appropriate gauges when performing preventative maintenance on your ITC gear.

Due to a change in pressure roller composition in ITC cartridge machines, a minor change has been made in the mechanical adjustments necessary to provide optimum performance regarding the Wow and Flutter specifications. All ITC cartridge machines manufactured after (February 1, 1979) utilize the new pressure roller compound "525-K". This compound is greatly improved over the older rubber rollers you are familiar with in that it is much less hygroscopic - that is, it is not affected by changes in temperature and humidity, which caused the old style rubber rollers to change in size and durometer (compression factor) with changes in weather. It is also immune to most cleaning agents. The result is much more consistent performance, relating to tape skew and phase performance. Mechanically, the new "525-K" rollers will fit your existing ITC cartridge tape equipment. They look exactly like the older rubber rollers, but upon close examination, you will find the new "525-K" rollers to be slightly larger in the overall outside diameter than the old rubber rollers. Because of this, ITC has made minute changes in the setup gauges used in the mechanical adjustment of ITC cartridge tape gear. The procedure used in adjustment of your equipment remains the same as in your technical manuals. The only change is the gauge itself, which is available from ITC. Please refer to the gauge chart at the rear of this bulletin to determine your specific need.

022780/DM

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ITC is presently shipping cartridge machine pressure rollers made with the new "525-K" compound to customers who purchase pressure rollers as replacement parts. When changing from the old rubber pressure rollers to the new "525-K" compound pressure rollers, mechanical adjustments should be made to your cartridge tape machines to maintain optimum performance. We suggest you develop a method of segregating your "old" supply of pressure rollers from any "new" rollers you may have as spare parts in order to keep the two different pressure roller "compounds" apart when replacement time comes. The "old" rollers are .01" smaller in outside diameter than the 525-K compound pressure rollers.

Gauge number 830-0029 has replaced 830-0006. This is the pressure roller pressure gauge used in ITC Series SP, WP, RP, RPD, 3D, and PD-II cartridge tape machines. The distinguishing difference between the gauges is physical shape: the new gauge has a single step at the end, where the old gauge had two steps. Refer to the pictorial gauge chart at the end of this bulletin for distinguishing differences. Use gauge number 830-0029 when making mechanical adjustments where the new "525-K" compound pressure rollers are in use. Gauge number 830-0006 should be used only when making mechanical adjustments where the old "rubber" pressure roller is in use.

Gauge number 830-0028 has replaced gauge number 830-0007 as the capstan shaft locator gauge. This gauge is used in SP, RPD, WP, RP, 3D, and PD-II cartridge tape machines. The distinguishing difference between the two gauges can be discovered in a simple comparison of physical size. The 830-0028 gauge is approximately 1.6 cm tall, while the 830-0007 gauge is approximately 1.8 cm tall. The 830-0028 gauge is also slightly larger in diameter, and can be "felt" if the two gauges are held end to end. The actual difference in diameter can be measured with a micrometer. Use gauge number 830-0028 in place of gauge number 830-0007 when the new "525-K" compound pressure rollers are in use.

Gauge number 830-0022 replaces gauge number 830-0003. This gauge is for adjusting head height in the SP, WP, RP, 3D, PD-II and Series 99 cartridge tape machines. It is similar to the old number 830-0003 gauge, except that we have cut an extra "notch" at the rear of the gauge to facilitate its fitting into the more compactly designed tape decks such as the 3D. These two gauges may be used interchangeably where space is not a limiting factor. Please refer to Fig. 1 for physical differences.

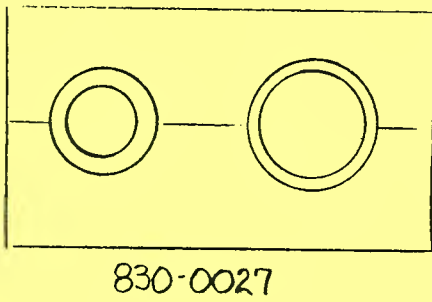
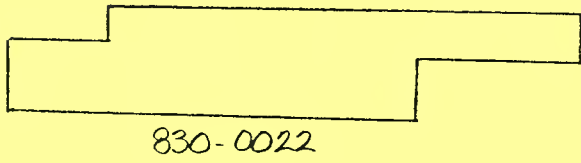
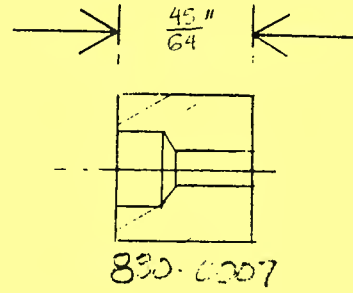
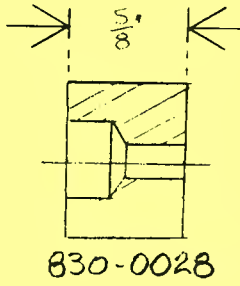
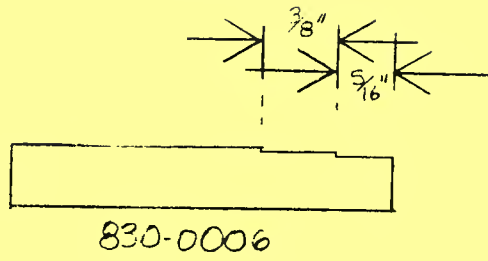
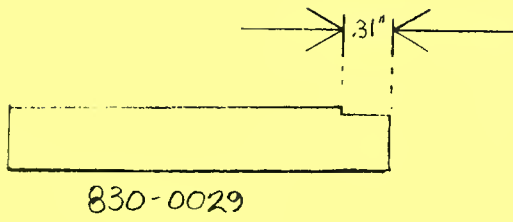
Gauge number 830-0027 is new, and is used as the capstan shaft locator gauge on ITC Series 99 cartridge tape machines. Please refer to your Series 99 Technical Manual for instructions on its use.

The new ITC gauge numbers are listed below, in chart form. These new gauge numbers are for your convenience in ordering the appropriate gauges necessary for your particular needs. If you have any questions regarding gauge usage, or wish to order them, call ITC Technical Service at (309) 828-1381, or write to:

International Tapetronics Corporation
 2425 S. Main Street
 P.O. Box 241
 Bloomington, Illinois 61701

CARTRIDGE MACHINE GAUGES - USER INFORMATION

Description and ITC Part Number	SP-WP-RP-RPD	3-D	PD-II	Series 99	Description and ITC Part Number
Capstan Shaft Locator 830-0027				X	Capstan Shaft Locator 830-0027
Capstan Shaft Locator 830-0028	X	X	X		Capstan Shaft Locator 830-0028
Pressure Roller Pressure 830-0029	X	X	X		Pressure Roller Pressure 830-0029
Head Height 830-0022	X	X	X	X	Head Height 830-0022



ADDENDUM

811-0080-000
ADDENDUM

ESL-IV Delayed Start Motor Control

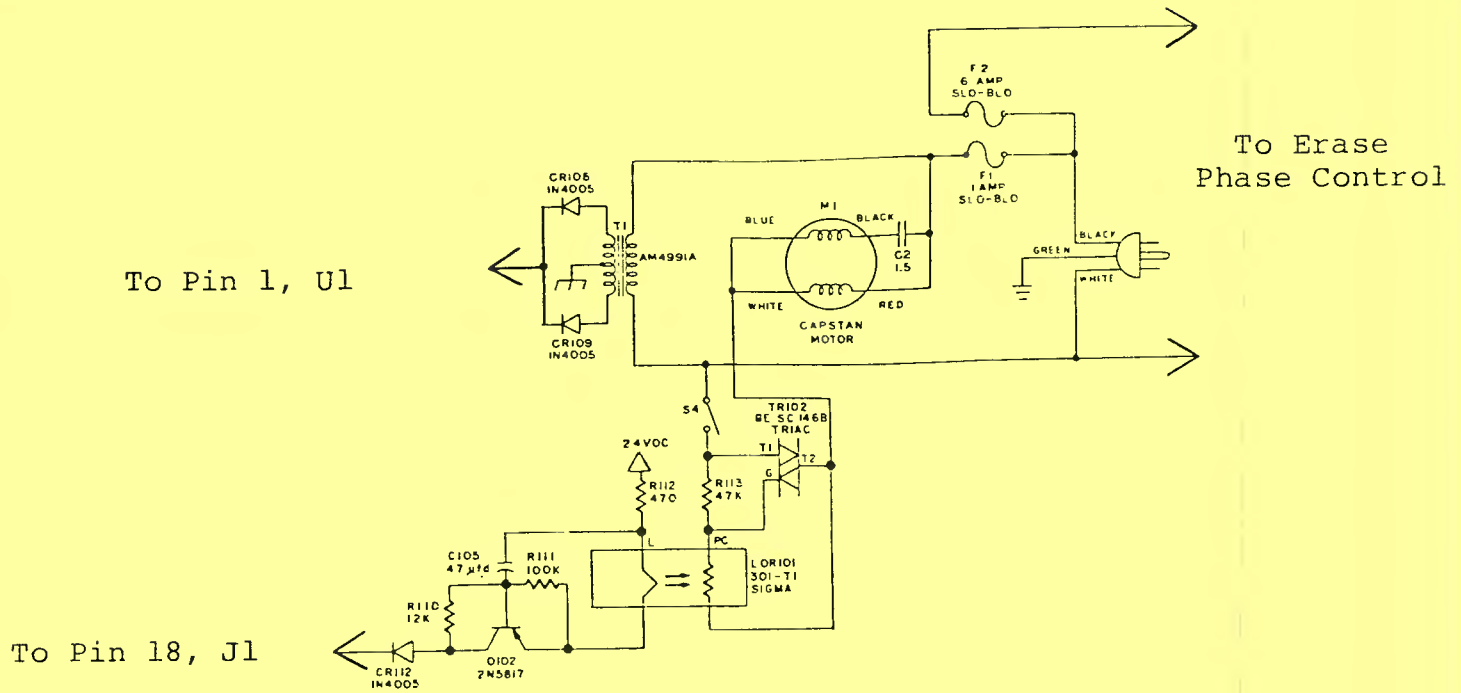
This addendum describes circuit changes made on the motherboard (part number 831-0111-003). The changes were made to provide for smoother start-up of the motor to minimize excess tape tension. This has been achieved by inhibiting capstan motor starting until the start button is pushed and the pinch roller is engaged. When the motor starts in this manner, its inertia causes the motor to slowly come up to full speed. In previous models, the motor was running at full speed when the pinch roller engaged, thus causing the tape to start moving too rapidly, possibly damaging the tape.

Circuit Description

When a cartridge is inserted, switch S4 closes connecting one side of the AC line to triac TR102. When the start button is pushed, a ground is provided from the start logic control through CR112. This ground causes C105 to charge through R112 and R110. As C105 approaches full charge, Q102 turns on providing a ground through its emitter - collector junction for the lamp portion of LDR101. The resistor portion of LDR101 approaches zero resistance turning on triac TR102 which in turn, allows the capstan motor to run. Resistor R113 is provided for current limiting protection to the LDR.

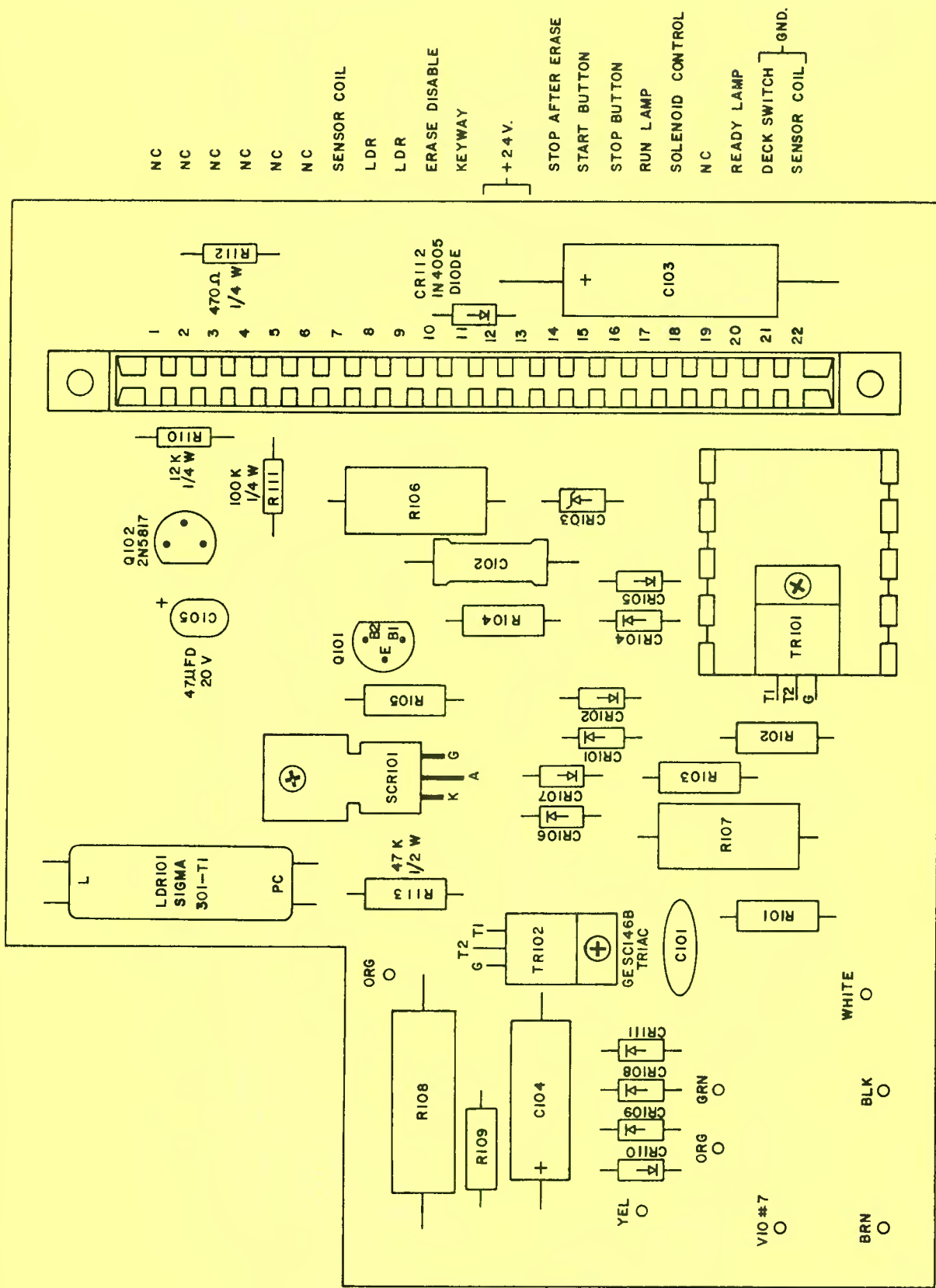
GL0581

ESL DELAYED START CIRCUIT

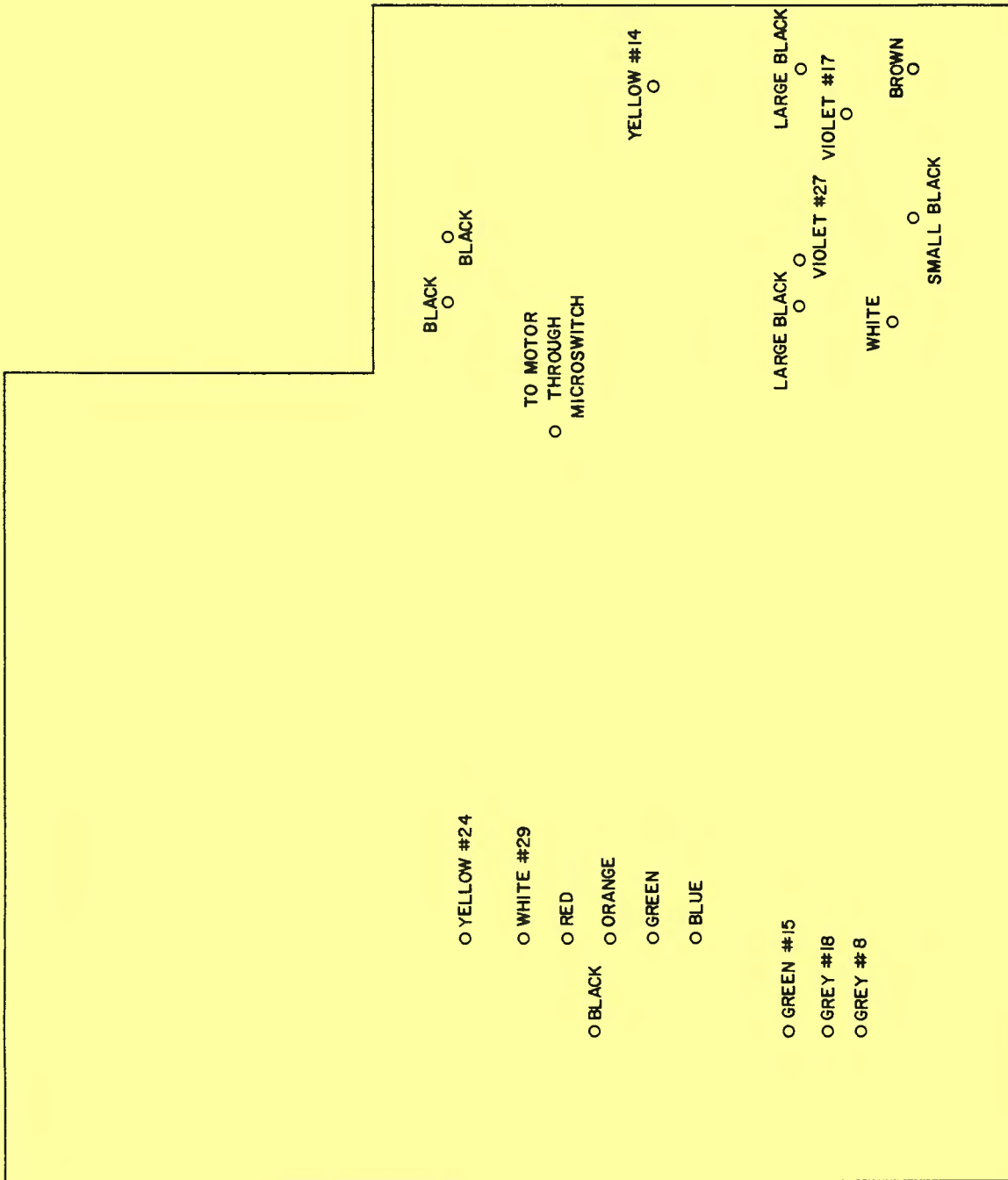


GL0581

811-0080-000



831-0111-003A
ESL-IV MOTHER BOARD
COMPONENT SIDE WIRING COLORS



ESL-IV MOTHER BOARD
FOIL SIDE WIRE COLORS

TECHNICAL
SERVICE
INFORMATION

TO: All ITC Customers
(Please forward to Engineering Department)

RE: Returned Equipment and Components Policy

Dear Chief Engineer:

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, at 309-828-1381. 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.



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810-0008-000

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.

Thank you for your cooperation.

ADDENDUM

POWER SUPPLY CIRCUITRY FOR PD-II RECORDER/REPRODUCER ESL-IV ERASER/SPLICE LOCATORS

General Description

All International Tapetronics Corporation PD-II Series Recorder/Reproducers and ESL-IV Erasers/Splice Locators now incorporate an improved voltage regulator circuit in the power supply portion of the machine. This revised circuitry offers greater transient immunity and allows for substantially greater fluctuations in the A.C. line voltage.

Circuit Description

This circuitry accepts direct current from the power transformer, rectifiers and the 1000 MFD filter capacitor, and thru the action of UI (MC7805CT), provides a regulated positive 23 volts (nominal) for use by other circuits in the machine. UI is a three terminal integrated circuit voltage regulator with a specified output voltage of +5 volts (referenced to Pin 2 on the device).

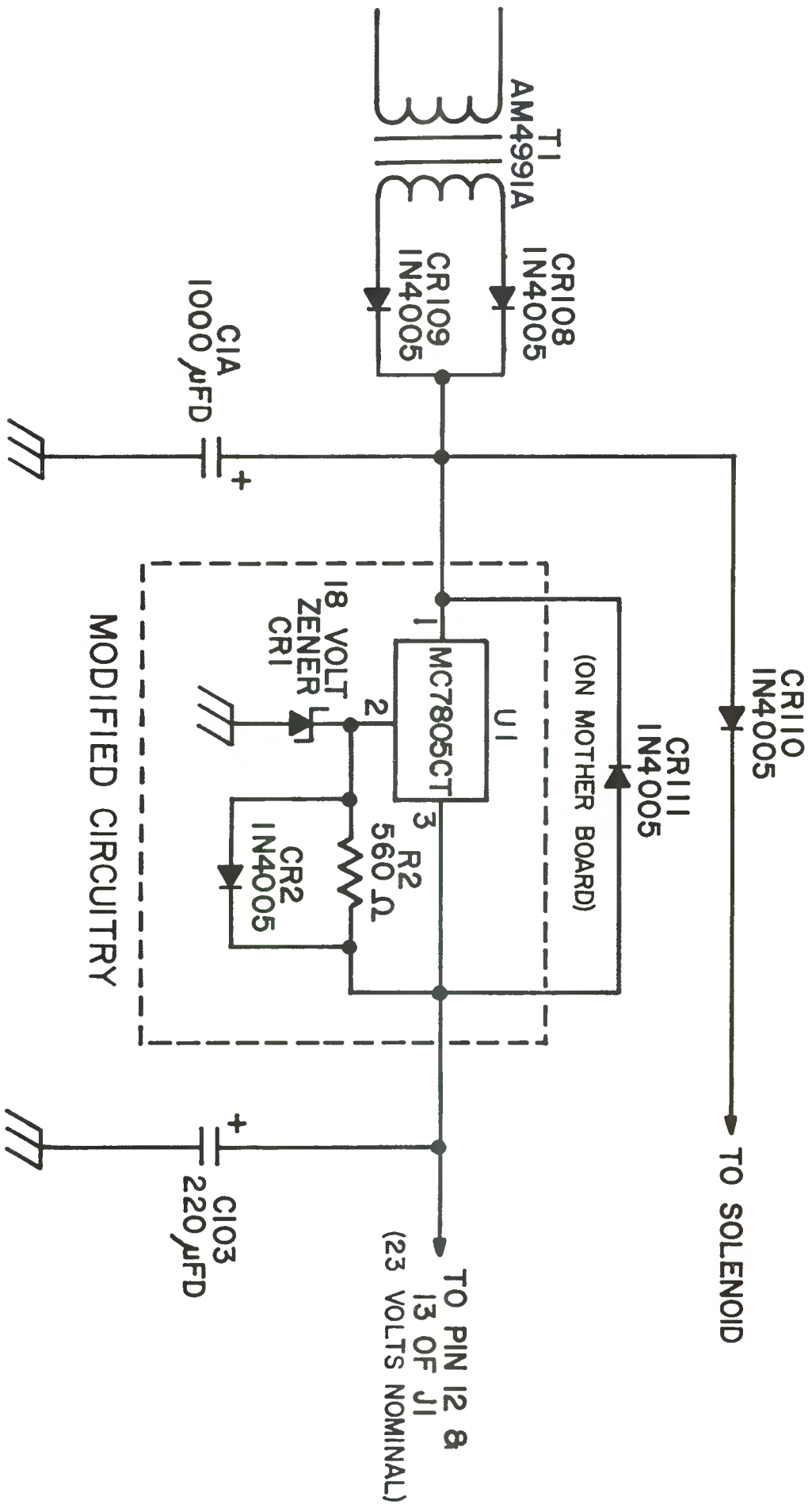
In this specific application, Pin 2 of UI is referenced at a point that is +18 volts above true ground. Therefore, the regulated voltage from the power supply is +18 volts plus +5 volts, or, +23 volts referenced to ground. The input of the regulator is thus capable of withstanding as much as +58 volts D.C. allowing major line voltage surges with no danger of regulator failure.

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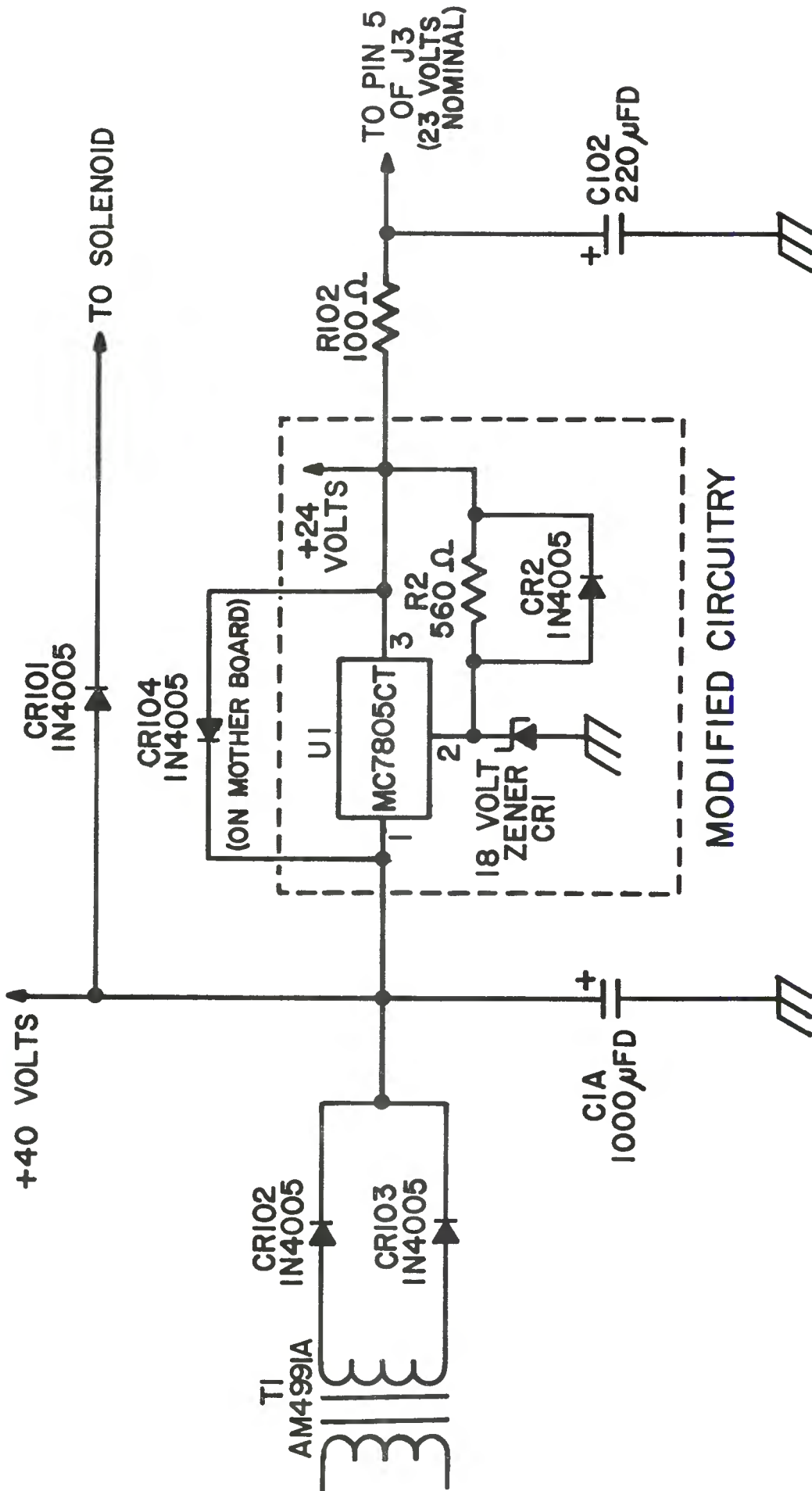
PARTS LIST

(Revised)

<u>Component</u>		<u>ITC Part Number</u>	<u>Description</u>
<u>PD-II</u>	<u>ESL-IV</u>		
T1	T1	526-0002-000	Transformer, Power AM4991A
CR101	CR108	575-0007-000	Diode, IN4005
CR102	CR109	"	"
CR103	CR110	"	"
CR104	CR111	"	"
CR2	CR2	"	"
CR1	CR1	577-0006-000	Diode, Zener 1N4746
C1A	C1A	698-0004-000	Capacitor, Dual 1000 MFD, 50 volt
C102	C103	687-0006-000	Capacitor, 220mfd, 25V, Electrolytic
R2	R2	630-0057-000	Resistor, 560 ohm, 1/4 watt 5%
R102	--	626-0239-000	Resistor, 100 ohm, 1/2 watt 10%
--	--	376-0002-000	Strip, Terminal Smith
--	--	613-0014-000	Insulator, Mica Transistor
--	--	352-0004-000	Screw, Nylon 6-32 x 1/4 slot



ESL IV POWER SUPPLY
893 - 0101 - 001



PD 11 POWER SUPPLY
#893-0102-001

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 in the time of crisis when equipment malfunction is suspected. When this happens, the manual is usually missing or at best difficult to locate. To start with, *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 at ITC will be most appreciative.

TECHNICAL MANUAL

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SECTION I

INTRODUCTION

ESL IV SERIES

A. GENERAL DESCRIPTION

The ITC Series ESL IV Cartridge Tape Eraser/Splice Locator is designed to provide an automatic unit which prepares NAB Type AA (nee type A) cartridges for recording. This unit is capable of automatically and uniformly erasing recorded materials from and/or locating the splice in an NAB endless loop cartridge. Either of these two operating modes can be selected individually or can be combined in the sequence previously mentioned.

The printed circuit electronics include the latest silicon/solid state diodes, transistors and integrated circuits. The series regulated power supply is an integrated circuit in a T0-220 case. All switching and logic is performed with solid state components. No relays are used.

Several other features improve the ease and reliability of operation and serviceability. The ITC ESL IV units are designed with a removable top cover which facilitates cleaning, maintenance and adjustment. A full-swing pressure roller is connected to the actuating solenoid by a mechanically simple chain linkage with a screw adjustment for pressure roller/capstan pressure and parallelism. Air damping of the solenoid is adjustable with a needle valve. The direct-capstan, 1750 RPM induction drive motor with precision machined shaft provides optimum tape drive. Alignment of the splice sensor is simplified by easy access to all moving parts of this assembly.

B. SPECIFICATIONS

Power: 117 volts AC, 60 Hz, 50 Watts
Continuous; 625 volt amperes
intermittent (at peak erasure)

Tape Speed: 25-29 inches per second (direct drive, high speed motor with electrolyzed shaft and instrument-type permanently lubricated ball bearings)

Splice Detection Sensitivity: Senses splicing tape thickness of 1/2 mil or greater

Tape Capacity: NAB size AA (nee size A) cartridges 2 seconds to 10 1/2 minutes with 1 mil lubricated tape at 7 1/2 IPS

Erase Depth: 45 dB or better from 0 dBm — 50 to 15,000 Hz

Start Time: Depends on air damping adjustment on solenoid

Cycle Time: For complete Eraser/Splice Location Cycles:
Minimum Any length tape loading 15 seconds
Maximum
70 sec. tape loading 35 seconds
10 1/2 min. tape loading 180 seconds

Ambient (Operating) Temperature: 55 degrees Centigrade (131°F.) maximum

Mounting: All units supplied as desk top mounting

Dimensions: 5 1/4 in. high (add 3/8" for rubber feet) — 15 in. deep 5 3/4 in. wide

Weight: 17 pounds

SECTION II

INSTALLATION AND OPERATION

ESL IV SERIES

A. UNPACKING

Remove the ITC cartridge eraser/splice locator 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 until installation has been completed in case concealed damage is discovered.

B. INSTALLATION

The ESL IV cartridge eraser/splice locator is built for desk top mounting. A minimum of two inches of space should be provided above the machine for adequate ventilation. Foreign material such as records or paper should not be placed on top of the machine. *UNDER NO CIRCUMSTANCES SHOULD PRE-RECORDED CARTRIDGES OR OPEN REELS OF TAPE BE PLACED ON TOP OF THE MACHINE.*

C. BEFORE OPERATION INITIAL TESTS

Before operating the ITC ESL IV unit, determine that the capstan motor shaft and splice sensor mechanism are free and work easily. Check to see that the control PC card is properly seated in the mother board. Examine the line fuses to insure that they are of the correct values and placed in the correct (respective) fuse holders (see Figure 2-1). Insure that the line frequency and voltage are correct before plugging in the AC cord. Insert the AC power cord into an appropriate socket and depress the lower microswitch on the deck. The capstan motor should run. Now depress the upper microswitch on the deck and the ready lamp on the stop switch will light. If either of these conditions does not occur *do not* attempt to run the machine with a cartridge inserted.

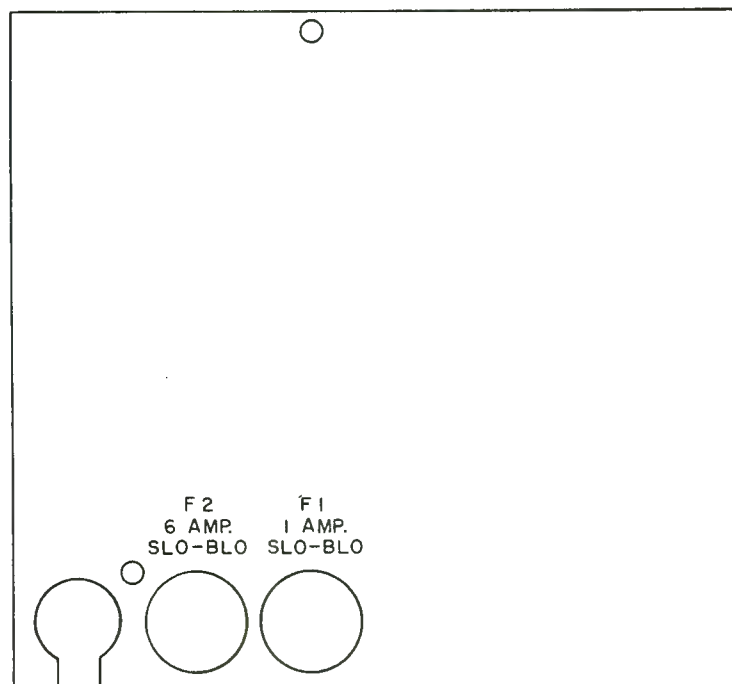


FIGURE 2-1

D. CONTROL SWITCHES AND INDICATORS (See Figure 2-2)

Cartridge Switch (Upper): This cartridge sensing microswitch provides a “ready” indication to the machine’s control circuit and illuminates the indicator lamp in the “stop” switch. The upper cartridge switch must be activated in order for the machine electronics to be started.

Cartridge Switch (Lower): This cartridge sensing microswitch controls the direct drive capstan motor in the machine. The lower cartridge switch must be activated in order for the capstan motor to be started.

Start switch: The start switch is used to energize the machine’s pressure roller solenoid and put the tape in motion. The indicator lamp in the start switch shows that the machine is in a “run” condition.

Stop Switch: The stop switch can be pressed to stop the tape drive system. (Remember that unless a cartridge stops automatically, it may not be erased properly and/or the splice may not be in the desired position.) The indicator lamp in the stop

switch shows that a cartridge has been properly loaded and the machine is "ready" to be started.

Mode Select Switch: The mode select switch is needed to select or command one of three possible operational sequences for the machine. When this three position toggle switch is placed in the upper position, the machine only erases. Placing the toggle in the center position enables both the automatic erase and splice locate functions. The lowest switch position permits only the splice locate function to be enabled.

Erase Indicator Lamp: The erase indicator lamp shows when the magnetic erase field is present. Furthermore, the intensity of the lamp is

directly proportional to the strength of the erase field.

E. OPERATING PROCEDURES

To prepare a cartridge for future recording:

1. Select the center position (erase/splice locate) of the mode select switch.
2. Insert the recorded tape cartridge into the right hand side of the cartridge slot.
3. Check to see if the ready lamp (stop switch) is illuminated, indicating that the cartridge has been properly inserted and that the machine is ready for operation.

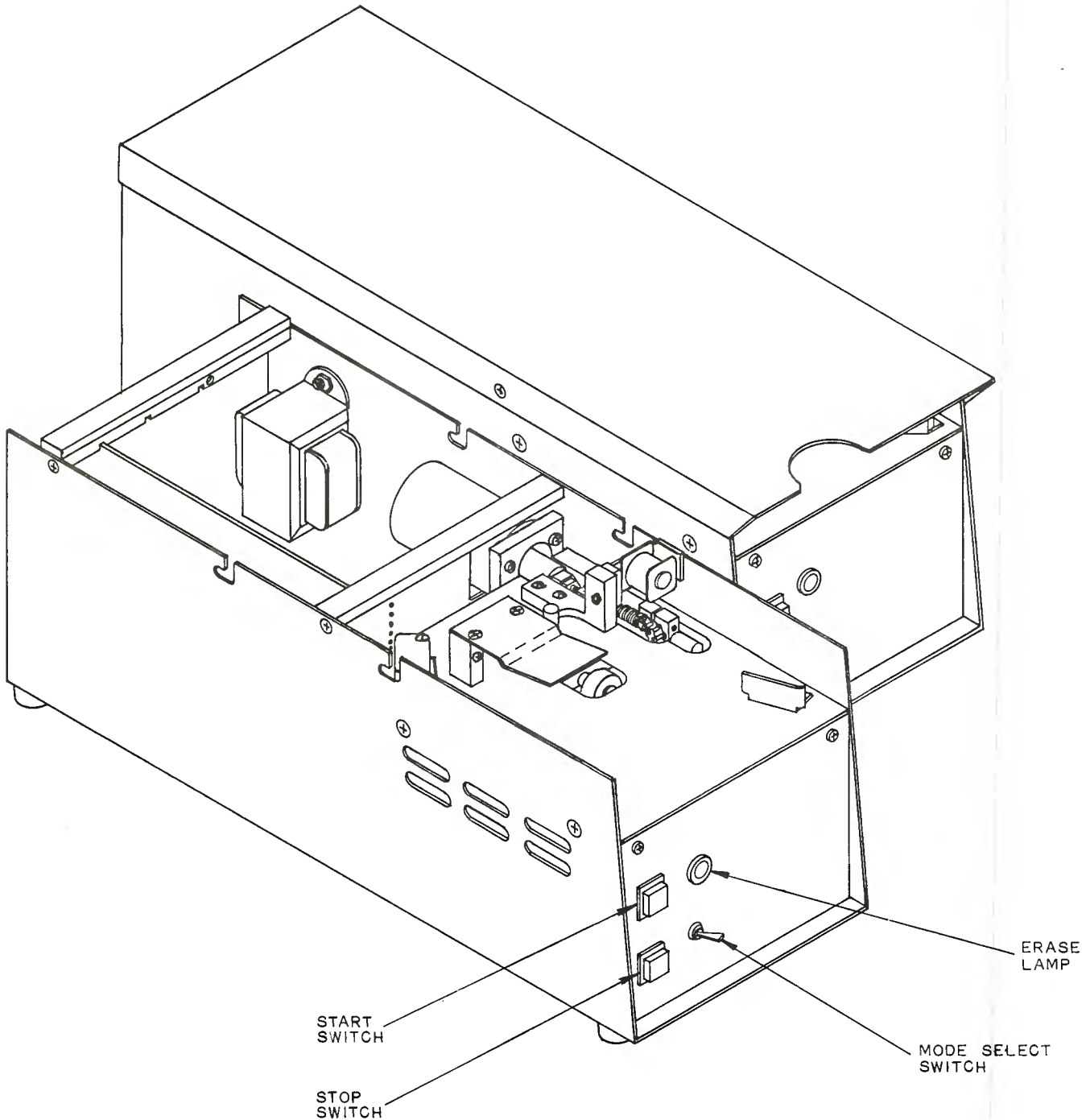


FIGURE 2-2

4. Press the start switch momentarily. The tape drive system will be started, and the tape motion will continue until the eraser has cycled and the splice locator automatically stops the machine or until the stop switch is pressed.

To erase a cartridge only:

1. Select the upper position (erase only) of the mode select switch.
2. Follow prior steps 2, 3, and 4. Tape motion will continue until the eraser has cycled and an internal electronic timer stops the machine or until the stop switch is pressed.

To locate the splice in a cartridge only:

1. Select the lowest position (splice locate

only) of the mode select switch.

2. Follow prior steps 2, 3, and 4. Tape motion will continue until the splice locator automatically stops the machine or until the stop switch is pressed.

A general provision in the operation of the machine is that a cartridge can only be erased a single time by pressing the start switch. This prevents unintentional secondary erasures of the same cartridge. To re-erase the cartridge, it must be removed from the deck and re-inserted.

In contrast to the erase cycle, the splice locate cycle can be reactivated any number of times without withdrawing the cartridge from the machine. This feature assists in the alignment of the splice locating mechanism.

A. CAPSTAN DRIVE

Proper high speed drive of cartridge tape without abusing either the tape or moving parts within the cartridge demands the use of a carefully designed transport system. In a cartridge, the tape pulls from the center and winds back on the outside of an endless loop of tape. Therefore, the tape must slip upon itself as the cartridge plays. This slipping action does not occur at an even rate and the tape tends to jerk as it pulls from the center of the hub. Also, the tape is coated with a lubricant which reduces drive friction. One means of improving tape drive would be to use a larger pressure roller. However, this is not possible since there is insufficient clearance in the bottom of the cartridge for a larger roller. Increasing the size of the capstan results in the improved tape drive required for a high speed system. The use of a 1750 RPM direct-drive motor results in a large capstan diameter (.3162) to provide approximately 4 times (30 IPS) normal (7.5 IPS) speed. Dependent upon tightness of the tape stacking, a minimum tape speed of 25 IPS to maximum tape speed of 29 IPS is achieved.

With a large capstan, directly driven, extremely efficient tape drive can be achieved if the tape is not permitted to slip between the pressure roller and capstan. In the ESL IV, this problem is eliminated by machining the shaft to a very high polish (4 micro inch finish or less) and then blasting the shaft with aluminum oxide particles. This causes a random roughened pattern which provides the same positive tape drive provided by standard ITC cartridge machines. A solution to holding the roughened pattern and not permitting it to wear off is accomplished with a process called electrolyzing which provides a shaft finish life of approximately five years. This resistance to shaft surface wear is very important for a transport system which works continuously in the high speed wind mode.

B. PRESSURE ROLLER LINKAGE

The chain assembly which causes the pressure roller to contact the motor capstan is a very simple mechanical concept which has a design life in excess of a million operations. For proper tape drive at high speeds, the pressure roller cross shaft must have much greater turning torque as the roller contacts the capstan. In the ESL IV, the required torque is achieved by using a very simple but reliable spring loaded chain and sprocket. The correct pressure between the motor capstan and pres-

sure roller is achieved by adjusting the spring tension of a plunger loading spring to the point where the plunger just bottoms. This loading spring provides constant pressure and accurate parallelism between the motor capstan and pressure roller. This adjustment is accomplished by the screw which attaches the loading spring to the plunger.

The solenoid and pressure roller action of the ESL IV machine is extremely quiet in its operation. The only sound emitted is the slight "tick" produced as the plunger strikes the bottom of the solenoid. The speed and resultant noise of this assembly is controlled by a needle valve at the rear of the solenoid.

C. TAPE GUIDE ASSEMBLY

The ESL IV tape guide assembly contains a precision tape guide of non-magnetic material which is rigidly supported and will not lose alignment. This guide prevents the moving tape from skewing when it comes into contact with the pressure roller.

D. SPLICE SENSOR

Many methods are available for sensing the splicing tape in an NAB endless loop cartridge. Several of these approaches require that recorded information be on the tape in order to sense absence of the information as the splice passes. This general method is not suited for the ESL IV due to the automatic erase function preceding the splice locating operation. Consequently, ITC has developed and employed a totally unique electro-mechanical detector which locates the splice by sensing the change in overall tape thickness between normal cartridge tape and splicing tape overlaid on cartridge tape. As the cartridge tape travels at high speed through the transport, no mechanical deflection is produced in the sensor mechanism. However, as the tape splice travels through the transport, the pressure roller is deflected. This deflection is transmitted through the cross shaft to a magnet. An electrical signal is produced by the armature in response to the mechanical deflection of the magnet. By feeding this signal to the electronic splice detector circuit of the ESL IV, the transport stops the tape movement just after the splice has passed through the transport and beyond the relative position of a playback head with respect to the cartridge. Long life and dependable operation with a minimum of maintenance is the basis of design of the ESL IV Series Cartridge Erase/Splice Locator.

MECHANICAL ADJUSTMENTS

A. GENERAL MECHANICAL INFORMATION

The ITC Cartridge Tape Eraser/Splice Locator is designed to provide reliable rugged mechanics which require a minimum of simplified adjustment:

1. Motor
2. Chain Linkage/Solenoid Assembly
3. Tape Guide
4. Splice Sensor Assembly

B. MECHANICAL TOOLS AND EQUIPMENT

The following tools are recommended for comprehensive adjustment and maintenance of the mechanical portion of the ESL IV unit:

1. Capstan shaft locator gauge — ITC Part #830-0007-001
2. Tape Height Gauge — ITC Part #830-0003-001
3. A set of Allen wrenches of various sizes
4. An assortment of Phillips and flat blade screwdrivers
5. Open end wrenches — sizes 3/8" and 9/16"

C. CAPSTAN SHAFT (MOTOR) POSITION

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

1. Temporarily remove from the deck assembly the splice sensor actuator bracket and cartridge hold-down spring. Both parts can be easily lifted from the deck after first loosening and removing the proper screws. After both parts are lifted from the deck, complete access is given to the motor mounting screws. The actuator armature is factory mounted and *should not be removed* from the actuator bracket.
2. Remove the rubber pressure roller and place the round steel capstan shaft locator gauge on the pressure roller shaft as shown in Figure 4-1.
3. Loosen the motor mounting screws and manually press the steel capstan shaft locator gauge against the capstan shaft.
4. While squeezing the steel tool gauge and the capstan shaft together, position the capstan shaft as shown in Figures 4-1 and 4-2. The steel tool must lie flat against the capstan shaft to make the pressure roller shaft parallel with the capstan shaft. This

parallelism of the two shafts is necessary in assuring correct operation of the splice locator mechanism.

A slight offset between the two shafts allows the tape to come into contact with the capstan shaft after the pressure roller. This offset permits the tape to slightly "wrap" around the capstan shaft for more positive drive through the high speed transport. (See Figure 4-2.)

5. Tighten the motor mounting screws and recheck the adjustment.
6. Leave the capstan shaft locator on the pressure roller shaft as shown in Figure 4-1. The locator will be used in following steps for pressure roller adjustment.

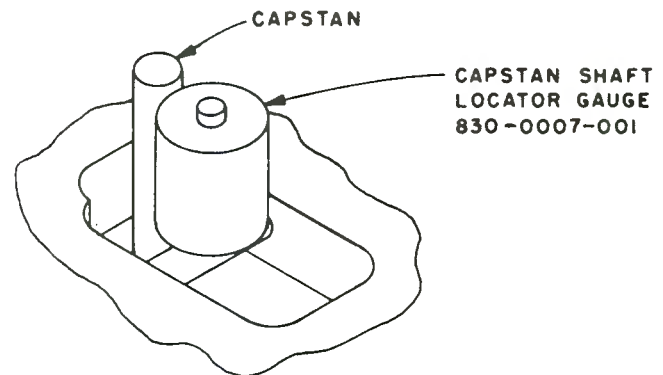


FIGURE 4-1

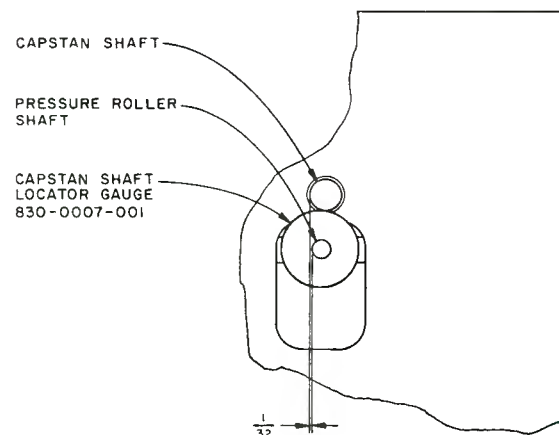


FIGURE 4-2

D. PRESSURE ROLLER — SOLENOID ADJUSTMENT

This adjustment is made at the factory and should not normally have to be readjusted unless the motor assembly or the chain pulley is replaced.

1. Check to see that the pin protruding from the cross shaft clamp is inserted into the seventh (counting from the solenoid plunger) link of the roller chain as shown in Figure 4-3.
2. Visually check the position of the magnet and clamp. The magnet must be parallel with the pressure roller shaft. The cross shaft clamp must rotate freely in its slot without binding. If realignment is required, loosen the clamping screws (see Figure 4-3) and reposition the cross shaft clamp on the cross shaft.
3. Manually depress the solenoid plunger. When the solenoid plunger hits bottom (plunger strikes the solenoid seat) the locator gauge should be held flat against the capstan shaft by the plunger loading spring.
4. If the plunger cannot be bottomed, or if the plunger bottoms before the locator

gauge contacts the capstan, loosen the solenoid plunger locknut, bottom the solenoid plunger, and rotate the plunger until a visible tensioning of the plunger loading spring (see Figure 4-3) is observed.

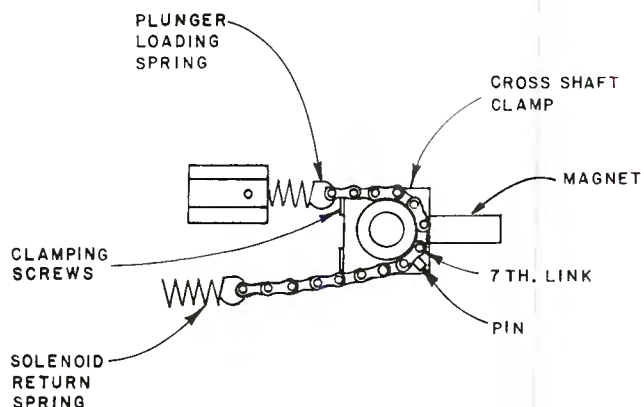


FIGURE 4-3

E. SOLENOID DAMPING

The air damping of the solenoid is controlled by the adjustment of the set screw at the rear end of the solenoid seat. The speed of the solenoid operation is proportional to the speed at which air is allowed to move through the small hole on the underside of the solenoid seat. The noise of the solenoid operation shares the same relationship. See Figure 4-4 for parts location.

1. Turn the damping screw clockwise to re-

duce or counter-clockwise to increase the speed of the solenoid operation.

2. Check the adjustment by inserting a cartridge or “wedging” the microswitches as in Subsection G-4 and starting the machine. Repeat the adjustment as required.
3. Damping should also be adjusted to minimize the “tick” as the solenoid plunger bottoms during normal operation.

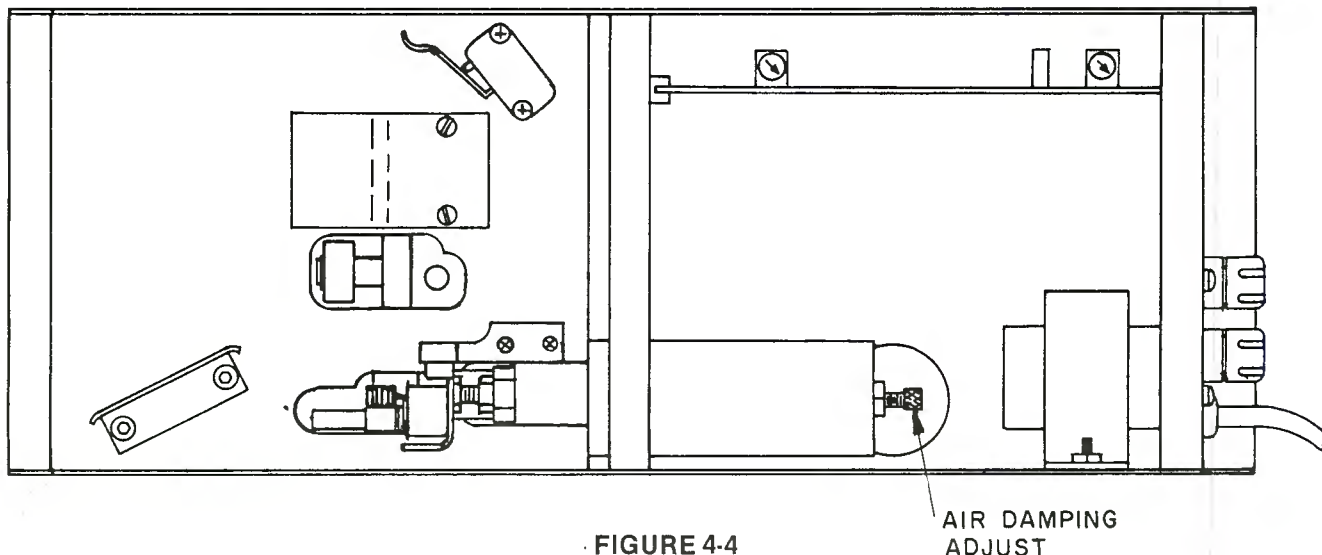


FIGURE 4-4

AIR DAMPING
ADJUST

F. TAPE GUIDE ADJUSTMENT

ESL IV Series units use a tape guide to provide the best tape guidance outside the cartridge. If tape skew is to be prevented during high speed winding conditions, the guide must be positioned correctly.

1. Remove the cartridge hold-down spring as in Subsection C. Check the positioning of the tape guide by advancing the tape height gauge into the tape guide as shown in Figure 4-5. The gauge should advance fully into the tape guide without friction, while resting flat on the deck — not tilted as shown by the dashed line (or its opposite) in Figure 4-5. Before using the tape height gauge, it should be demagnetized.
2. If adjustment of the guide is required, loosen the two screws holding it to its guide mounting block.
3. Keeping the tape height gauge flat on the deck, position the tape guide as shown in Figure 4-5.
 - a. Keep the tape guide positioned so that it just comes into contact with the sides of the height gauge.
 - b. Keep the tape guide vertical. Normally the bottom edge of the tape guide's mounting surface should rest on or very near the surface of the deck plate.
4. Tighten the tape guide mounting screws and check the adjustment.
5. The slot in the tape guide is $.250 + 0.000 - 0.001$ inch wide (actual tape width is $.248 + 0.000$ inch). The width of this slot can also -0.002 be properly gauged with the tape height gauge. The arm on the gauge should advance fully into the slot without friction. There should be no room for noticeable movement of the tool in the slot.

Adjustments obtained with the tape height gauge should be accurate to less than $.001$ of an inch — much better than that obtained with most inexpensive optical aids.

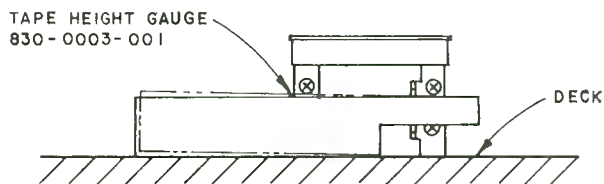


FIGURE 4-5

G. SPLICE SENSOR ADJUSTMENT

Alignment of the splice sensor mechanism is mandatory if reliable detection of tape splices is to

be expected. This device is factory adjusted, but should be checked according to the recommended maintenance schedule to assure reliable operation (Section IX, B). If adjustment becomes necessary, the following procedure should be used. The alignment procedure must be completed before final adjustment of the electrical sensor is made (see Section VII, C). For assistance in performing the procedure refer to Figure 4-6.

1. If Section IV, C to E, has been performed, reinstall the splice sensor actuator bracket but do not tighten.
2. Place the capstan shaft locator gauge on the pressure roller shaft as in C-2. While manually holding the gauge against the capstan shaft, position the actuator bracket so that there is a uniform gap of approximately $.01$ inch between the armature and the magnet. (See Figure 4-6.) Tighten the two mounting screws.
3. Remove the steel locator gauge and replace the rubber pressure roller on its shaft. The steel washer goes on the bottom and the nylon washer goes on the top just under the retainer clip.

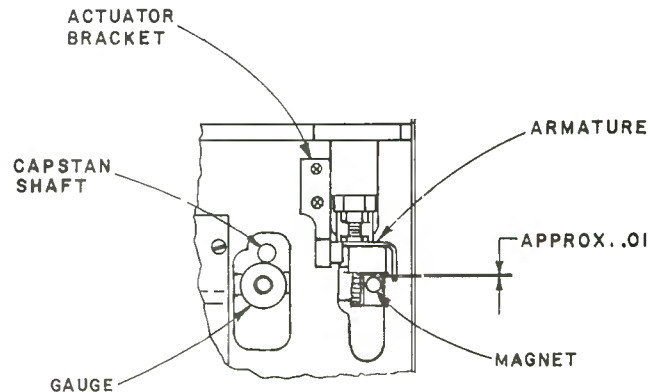


FIGURE 4-6

4. Insert a small strip of paper between the switch arms and switch cases of the microswitches on the deck. Once the contacts of the switches have been closed by the paper "wedge," push the start button to energize the solenoid.
5. Check for excess mechanical vibration by placing a fingertip lightly on the magnet while the machine is running. If excess vibration does exist, repeat Subsection D until it is brought to a minimum.
6. Observe the gap between the armature and the magnet as the machine is running. The gap should be nearly the same as the gap observed in Step G-2. In no case should the magnet actually touch the armature.

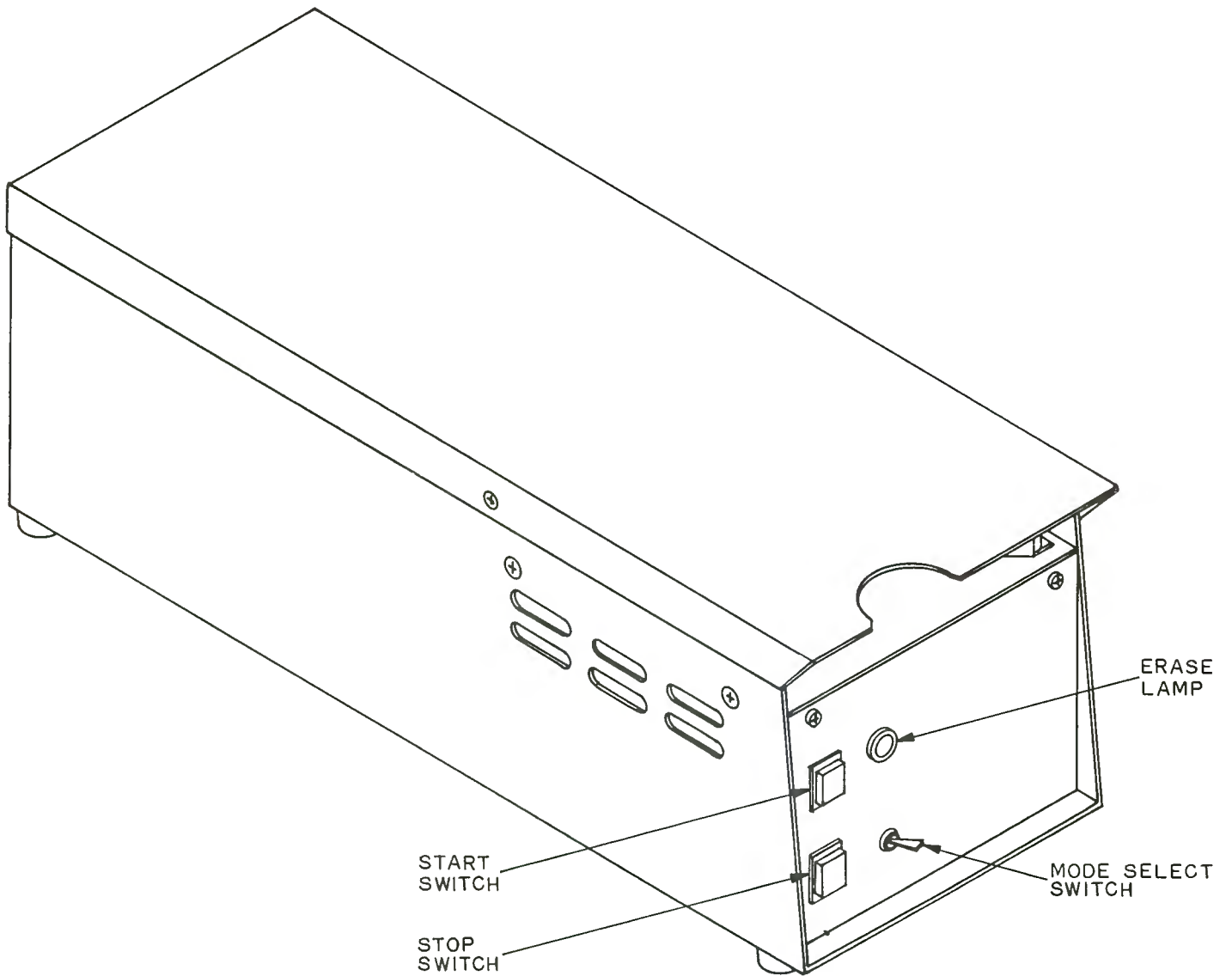
7. After proper location and spacing are achieved, retighten the two mounting screws of the actuator bracket.
8. Set the splice detector sensitivity adjustment as described in Section VII-C.

For best performance and the least maintenance problems, the mechanical adjustments to the ESL IV should be performed in a careful, orderly manner. While rugged, the various mechanical members are by no means indestructible; therefore, due care should be used not only in maintenance but also in everyday use of the machine.

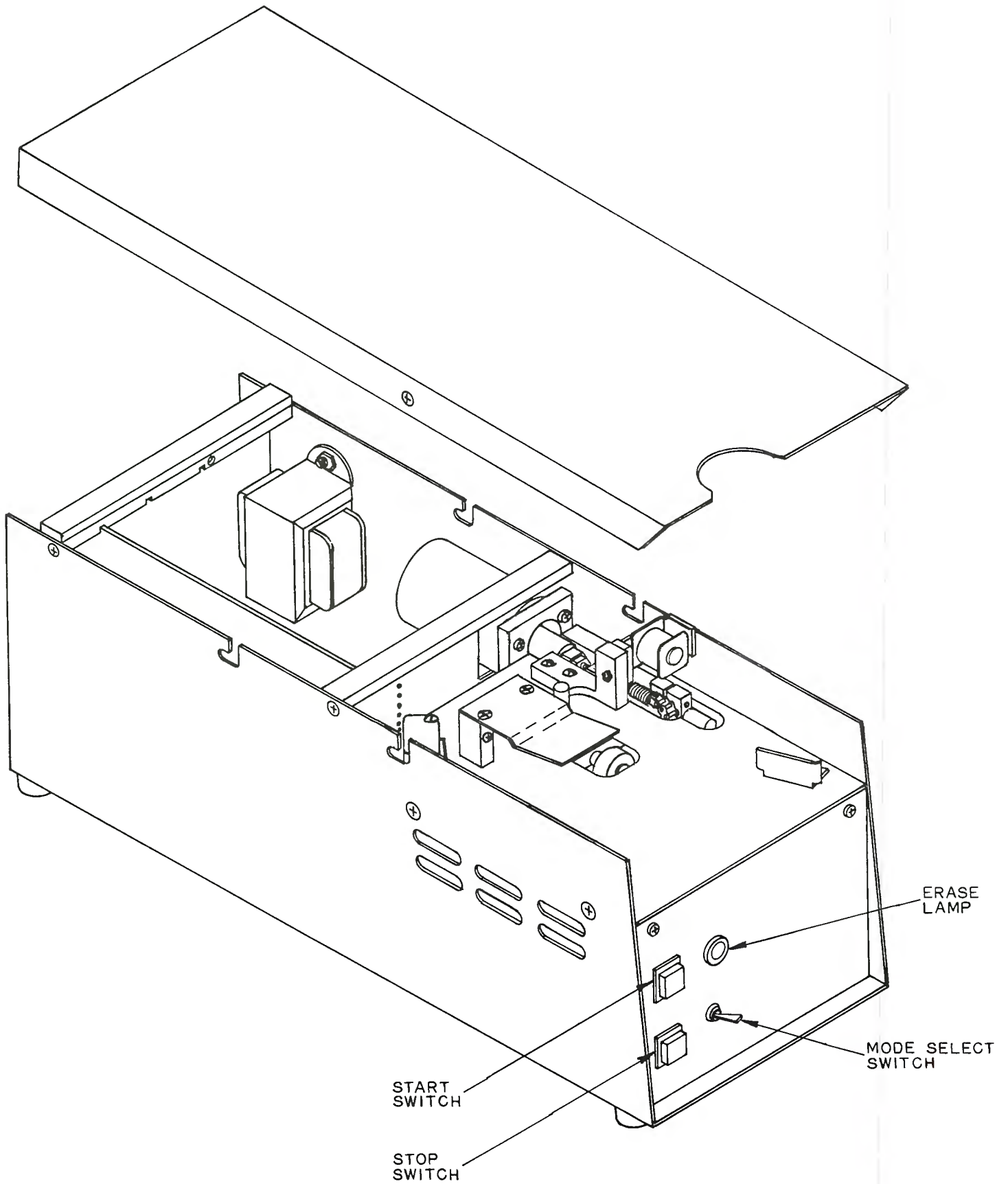
SECTION V

MECHANICAL DRAWINGS

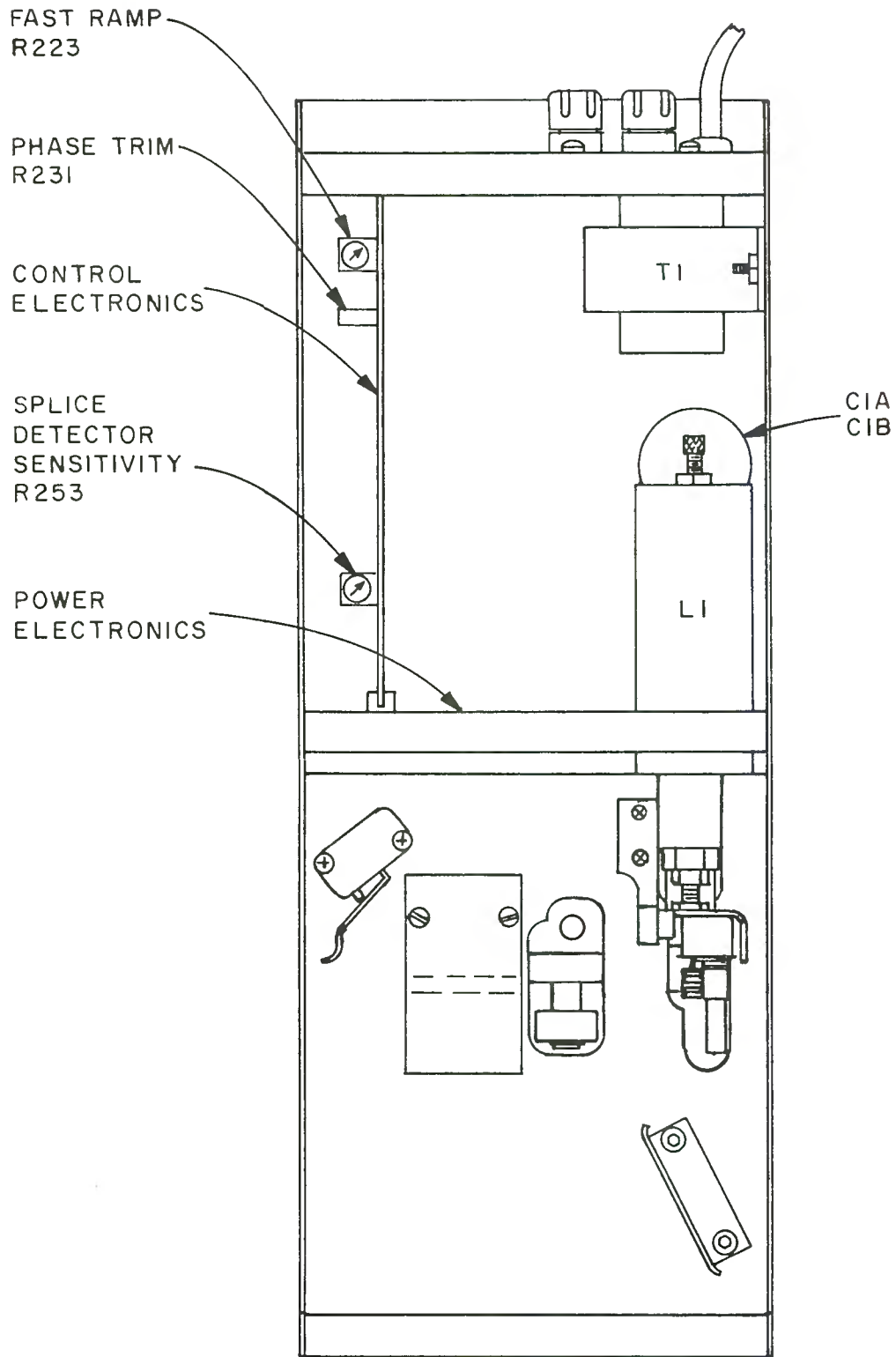
ESL—IV SERIES



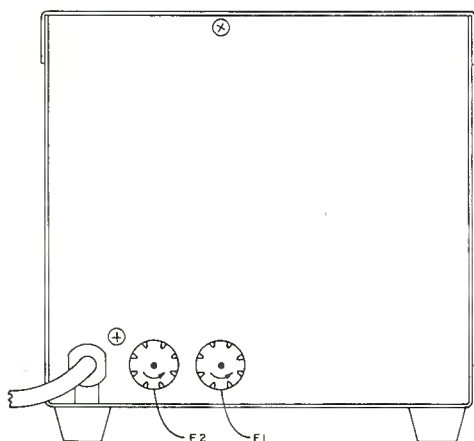
ESL-IV CARTRIDGE ERASER/SPLICE LOCATOR
FIGURE 5-1



ESL-IV CARTRIDGE ERASER/SPLICE LOCATOR
FIGURE 5-2

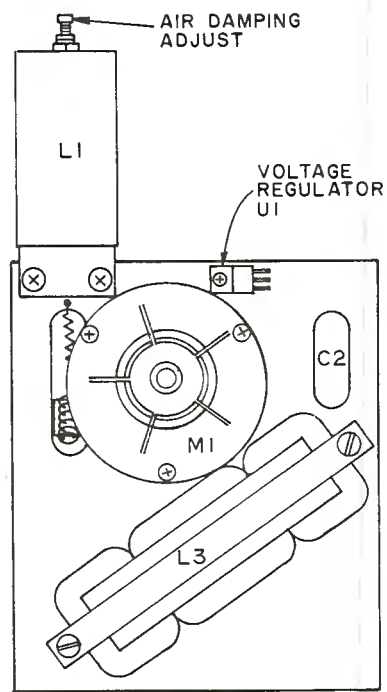


**ESL-IV CARTRIDGE ERASER/SPLICE LOCATOR
TOP VIEW
FIGURE 5-3**



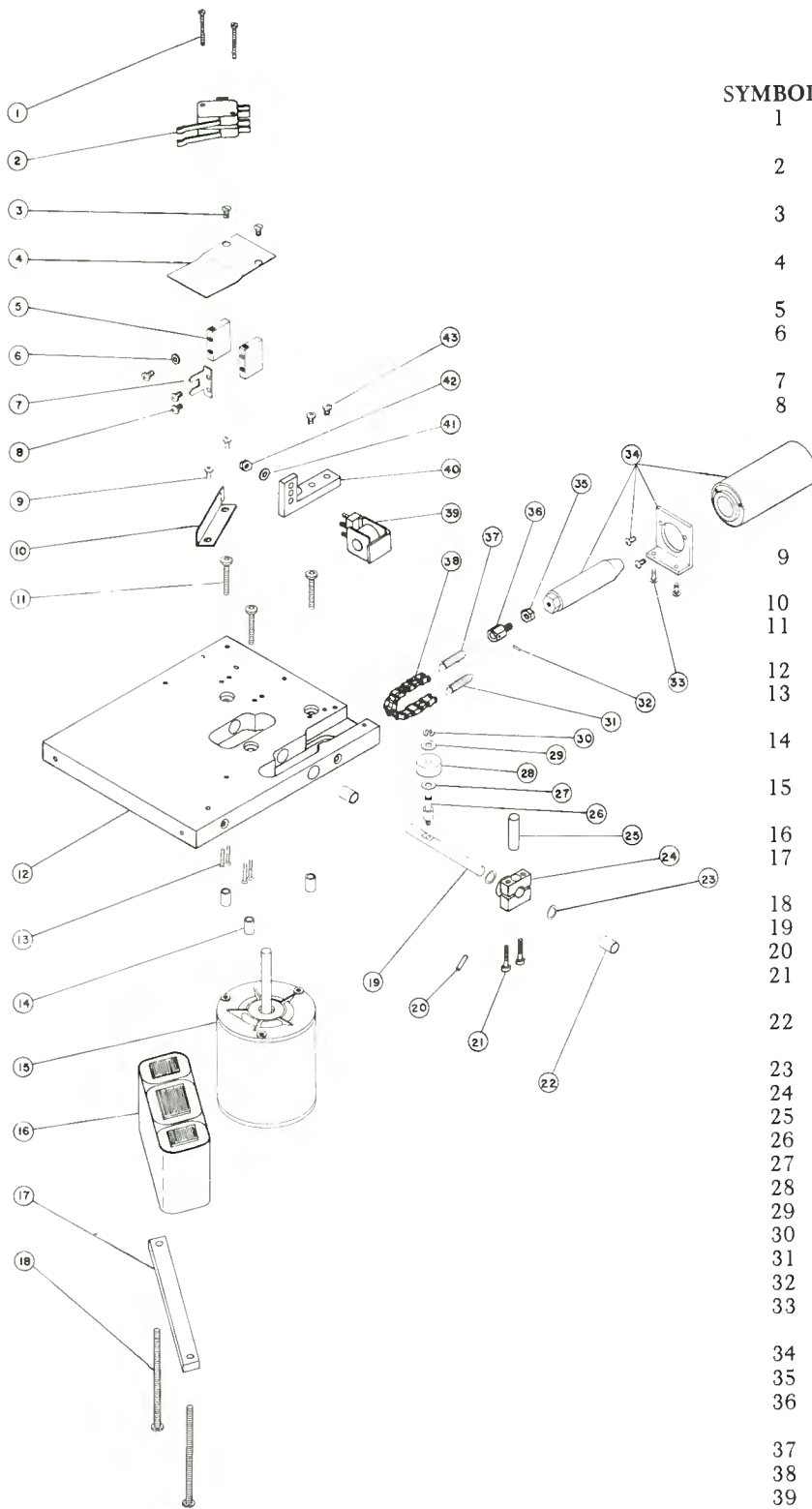
ESL-IV CARTRIDGE ERASER/SPLICE LOCATOR
REAR VIEW

FIGURE 5-4



FRONT
ESL-IV CARTRIDGE ERASER/SPLICE LOCATOR
BOTTOM VIEW

FIGURE 5-5



ESL-IV DECK—EXPLODED VIEW

FIGURE 5-6

SYMBOL	PART NUMBER	DESCRIPTION
1	350-0420-000	Screw, 4-40 xi, Phillips ; anhead
2	392-0001-000	Switch, cartridge (micro)
3	350-0402-000	Screw, 4-40 × 3/16, flathead
4	301-0001-011	Spring, cartridge hold down
5	304-0001-011	Support, tape guide
6	360-0401-000	Washer, steel, #4 × 1/4 × 1/32
7	272-0002-001	Guide, tape (r.h.)
8	350-0403-000	Screw, 4-40 × 3/16, Phillips panhead
9	350-0620-000	Screw, 6-32 × 1/4, Phillips truss
10	272-0001-001	Guide, cartridge
11	353-0031-000	Screw, 8-32 × 1, button- head socket cap black
12	267-0019-004	Deck, ESL-IV
13	350-0418-000	Screw, 4-40 × 5/8, Phillips flathead
14	300-0043-000	Spacer, 3/8 O.D., 170 I.D., #8 × 3/8
15	452-0001-000	Motor, high speed induction
16	514-0001-000	Coil, erase AM7776
17	253-0054-001	Block, erase coil mounting
18	350-0633-000	Screw, 10-24 × 2 3/4
19	296-0001-001	Cross shaft
20	282-0001-000	Pin, roll, 3/8 × 1/16
21	353-0002-000	Screw, socket cap, 6-32 × 1/2
22	251-0014-000	Bearing, 5/16 I.D., 3/8 O.D. × 1/2 length
23	359-0002-000	Washer, nylon, 5/16 I.D.
24	262-0011-002	Clamp, cross shaft
25	449-0001-001	Magnet
26	296-0004-001	Shaft, pressure roller
27	360-1005-000	Washer, steel
28	291-0003-001	Roller, pressure
29	359-0006-000	Washer, nylon
30	289-0002-000	Ring, shaft retaining
31	301-0021-000	Spring, solenoid return
32	282-0001-000	Pin, roll
33	350-1002-000	Screw, 10-24 × 3/8, Phillips panhead
34	477-0013-000	Solenoid assembly
35	340-1001-000	Nut, hex, 10-32 × 3/8
36	264-0001-001	Clevis, screw (solenoid) linkage)
37	301-0036-000	Spring, plunger loading
38	277-0001-001	Chain, solenoid linkage
39	490-0001-001	Actuator
40	254-0052-002	Bracket, actuator
41	360-0401-000	Washer, steel, #4 × 1/4 × 1/32
42	340-0402-000	Nut, hex, 4-40 × 1/4, zinc plated
43	350-0609-000	Screw, 6-32 × 3/8, Phillips panhead black

A. GENERAL

The ESL IV Series Cartridge Tape Eraser/Splice Locator is designed to provide long service and dependable operation. Factors which contribute to this are simplicity of design, selection of high quality components, proper ventilation, and construction which provides ease of maintenance. Both electrical and thermal stability are assured through the liberal use of feedback in discrete circuits. Integrated circuits are used where they can be employed for best performance.

The electronics for the ESL IV are contained almost entirely on two cards, a fixed mother board and one plug-in printed circuit card. All circuit trimming controls are located on the plug-in card. Electrical components too large for mounting on a printed circuit card are firmly mounted on the machine chassis and/or deck. Interconnection of these components is made on the PC mother board.

Advantages of Operation

1. Total solid state control
2. Integrated circuitry
3. Modular construction
4. Switching provided for variations of operational sequence.

Figure 8-3 illustrates the complete electronic schematic layout for the ESL IV Eraser/Splice Locator. This circuit design may be divided into five circuit divisions:

1. low voltage and motor power supply;
2. control logic;
3. eraser ramp control;
4. splice detector;
5. eraser phase control

The purpose of each circuit subsection can be described briefly as follows:

1. The purpose of the power supply section of this machine is to supply AC line voltage to the capstan motor, labeled M1, and 40 volts (surge) DC, and 24 volts DC respectively to the transport solenoid and the control electronics.
2. The control logic is designed to control the logical sequence of operation in the machine, in other words, this circuitry initiates the start, stop functions.
3. Eraser ramp control is designed to provide an analog simulation for ultimate control of the flux field in the eraser coil. This subsection also contains the necessary control logic to provide the correct sequence of operation resulting in the analog simulation.

4. The splice detector converts an electrical pulse into a signal which stops the machine upon detection of a splice in the endless loop cartridge. The amplitude of the electrical pulse is increased by an electro-mechanical detector mounted on the transport deck.
5. Eraser phase control converts the analog simulation from the eraser ramp control into a direct means by which the flux field of the eraser field may be controlled. In other words, the eraser phase control subsection is the direct power interface to the erase coil.

To understand the total operation of the ESL IV, it becomes necessary to describe the operation of each circuit subsection.

B. MOTOR AND LOW VOLTAGE POWER SUPPLY

The ESL IV obtains 60 Hz, 117 volt AC power from the distribution mains. This is transferred to the machine via a line cord with third conductor grounding. AC power overloads are protected against by fuses F1 and F2. F1 provides fusing for both the low voltage power supply and the capstan motor while fuse F2 provides protection for erase coil L3. Once past fuse F1, the AC power provides drive for the split-phase, capacitor start, induction motor M1. This motor provides tape drive on the transport. It is started by the closure of switch S4, which is located on the transport deck. S4 is closed upon insertion of a cartridge into the machine. In parallel with the capstan motor is transformer T1. The mains are connected to the primary of transformer T1 while the secondary of T1 feeds into a full-wave rectifier with chassis common ground. Capacitor CA1 filters the full-wave rectifier AC and feeds into U1, an integrated voltage regulator. From pin 3 of U1, filtered and regulated 24 volts DC is fed across capacitor C103 to pins 12 & 13 of card edge connector J1. C103 provides high frequency suppression at the output of the regulator. Diode CR111 provides a return path for any charge on C103 when the machine is unplugged. This diode protects the regulator from damage due to reverse current flow.

In parallel with the voltage regulator circuit is the circuit to supply power to L1, the pressure roller solenoid, which is mounted on the transport deck. Full-wave rectified AC is filtered by capacitor C1B. It also provides charge to quickly pull up the pressure roller (connected to pressure roller solenoid L1) when the solenoid is first energized.

R109 and C104 provide a transient suppression network for the pressure roller solenoid L1. The ground going control line for the solenoid is connected to card edge connector J1 at pin 18.

C. CONTROL LOGIC

The control logic of the ESL IV is in a non-energized state until cartridge switch S3 is closed by the insertion of a cartridge into the machine. When S3 is closed, it provides a chassis ground which is then transferred to pins 21 and 22 of card edge connector J1. Pins 21 and 22 interconnect the ground bus of the entire control card. Now the control card sees a completed DC circuit. Completion of the DC circuit sets the controlling transistors into the proper states for operation. Q201 is initially in the off state, due to momentary reverse biasing by capacitor C201. Consequently, Q202 is also off. Q203 is likewise off due to momentary reverse biasing by capacitor C202. Since Q203 is in the off state, no base drive is provided to Q204. Q204, therefore, is also off. However, Q205 is in the on state due to base drive received through resistors R209 and R210. Because Q205 is in the on state, a ground path is provided for ready lamp I2. Current therefore flows through the ready lamp and it remains lit. Q206 is in the off state because base drive for this transistor is diverted through transistor Q205.

Q206 has its base tied to ground through resistors R213 and R214. When the start switch S1 is momentarily closed, a path is provided through R206 for base current from transistor Q203. Q203 therefore turns on, supplying base drive to transistor Q204. When Q204 turns on, several alternate functions occur simultaneously. Continuous base drive for Q203 is provided through R206, CR204, and Q204 to ground. This flow of current will provide continuous base drive to transistor Q204. Therefore, these two transistors latch into the on state because Q204 is on and its collector is essentially at ground potential. Q204 and CR213 can supply a path for current to flow through the solenoid L1. CR213 causes the machine to turn on in the normal way even if a cartridge has been inserted prior to plugging in the machine. Diode CR211 in parallel with Q204 is a free wheeling pass element to suppress destructive inductive kick from the pressure roller solenoid. Thus, the pressure roller in the transport pulls up into contact with the capstan shaft which is running, since deck switch S4 has been previously closed by the insertion of a cartridge into the machine. A ground path is provided for a run lamp I1 through diode CR206. The ready lamp I2, which was previously lit, is now extinguished because its current path is interrupted. This interruption occurs because Q205 is turned off, its base drive being diverted through CR205 and Q204.

Three additional functions occur due to the turning on of Q204. Since Q205 has been turned off, base drive is now enabled to flow into transistor Q206. Because Q206 is turned on, the light driven resistor LDR201 is now enabled. Notice that current does not yet flow through the LDR, it is simply placed into the enabled mode. Additionally, the point between resistor R212 and R213 is at sufficient potential to supply drive to transistor Q217 in the splice detector subsection. As long as Q217 is on, the splice detector is disabled. This momentary disable allows the pressure roller to come into contact with the splice sensor without turning the machine off.

An additional clamp out path is provided into the machine; however, since in some strapping options it is not in use, Q217 must be provided to cover all operational variations. Q217 is disabled only as long as current flows through capacitor C217. As soon as C217 is charged Q217 will then turn off, once again enabling the splice detector subsection, unless the auxiliary circuit just mentioned is also disabling the detector.

The last of the three additional operations triggered by the turning on of Q204 is centered in transistors Q201 and Q202. As Q204 turns on, a current path is provided through CR202. This diode, in conjunction with resistor R204, provides a base current path for transistor Q201. As Q201 turns on, it provides base drive through resistors R201 and R202 for transistor Q202. Therefore, transistors Q201 and Q202 latch one another into on states. Since Q201 is now in an on state, it provides +24 volt DC through the ramp timer enable line to the eraser ramp control subsection.

D. ERASER RAMP CONTROL

Please recall that LDR201 is now in a ready state to be energized. As 24 volts DC is applied through the ramp timer enable line to eraser ramp control, its sequence of operation begins.

Integrated circuit timers U201 and U203 are set into the correct initial states. Initially, timer U201 is set so that a path for current flow through pins 6 to 7 occurs. When 24 volts appears at pin 1 of precision timer U203 through resistor R241, the timer is set so that a path for current flow does not exist. Pin 6 is at plus potential. Because base drive exists in transistor Q211, it is turned on, and its collector is essentially at ground. The lamp of the LDR, however, is not turned on yet, since diode CR208 protects against current flow through the lamp filament. Recalling that pin 7 of U201 is at 24 volts, a 24 volt drop occurs across resistor R217, biasing Q208 on and Q207 off. Q208 receives forward bias through resistor R218 and provides for emitter drive of R225, R227, Q209 and consequently Q210. The emitter drive from Q208 positively charges C206 through R225 and R227. At the same time, since Q210 is on, the lamp

of the LDR201 is now turned on. Because the lamp of the LDR is on, the resistance of the LDR is now very small. Q209 and Q210 are in darlington configuration, so that the required base drive for Q209 is small. Resistor R233 is provided as a ballast resistor in parallel with the lamp of LDR201. Even though Q210 is turned on very hard, current flow through the lamp of the LDR is controlled, consequently limited by resistor R230. The lamp of the LDR remains on within current limits provided by R230, until precision timer U201 changes states. The timing interval for U201 is controlled by R215, R216 and C203. After U201 changes states, pin 7 of this timer goes from +24 volts to ground, 0 volts. Because there is no longer any base current flow to transistor Q208, Q208 turns off. Transistor Q207, however, now turns on since base current may flow through resistor R220, C204 and R217. Q207 will remain on only as long as current flows through capacitor C204. When capacitor C204 charges to a positive voltage, Q207 will turn off. This charge loop provides for a positive going pulse from the collector of Q207.

This positive pulse enters pin 1 of timer U202. Pins 6 and 7 of this timer, which had been initially set in an open state, now provide a current path. In other words, pin 6 of U202 approaches ground potential. A discharge path is therefore provided for C206 through R226. An alternate discharge path is provided through R228 and R266, however. Since the series resistance of R228 and R266 is much larger than the resistance of R226, the capacitor will discharge more quickly through R226. Timer U202 will only remain in an on condition until it is turned off by timing components R222, R223, C205 and R224. While the timer is on, a fast discharge path is provided to capacitor C206. After the timer turns off, only a slower discharge path is provided to this capacitor through series resistors R228 and R266.

The consequence of this fast and then slow discharge is to transition Q210 through its active region at differing speeds. A further consequence of this action is to turn off the lamp of LDR201 in a non-linear (piecewise-linear) fashion. The non-linear shutdown of the lamp, however, provides for a near linear characteristic from the resistive output of this LDR.

After the lamp turns off, timer U203 completes its timing cycle. The timing cycle of this timer is controlled by components R234, R235 and C207. When the timer times out, pin 6 goes from a positive voltage to ground. Base drive is then denied to transistor Q211, which now turns off. Since this transistor turns off, its collector goes to a positive voltage. Since the collector of Q211 has now gone to a plus voltage, consequently Q212 is turned on. The collector of Q212 goes to ground. LDR201 is clamped off through diode CR208. This is purely a preventive action, since the lamp is

already off, however, because the lamp is clamped off, it is unable to turn on. Because the collector of Q212 has gone to ground, base drive is removed from transistor Q213. A tie down path for this transistor is provided by components CR209, R240 and R239. The collector of Q213 is now removed from ground potential and is essentially floating.

E. SPLICE DETECTOR

Since the collector of Q213 is now floating, the splice detector circuit is now enabled. The detector is supplied both +24 volts DC and chassis ground. Also, Q218 is no longer clamped off by transistor Q213. A splice is sensed in the inserted endless loop cartridge by splice sensor L2. The pulse resulting from sensing a splice is transferred to card edge connector J1, and onto the splice detector.

Q214 is the first transistor in the detector and is used as a class B bias amplifier stage. Offset bias is used as a means of noise rejection from the electro-mechanical sensor. Furthermore, this first stage is a boot-strap amplifier which provides a high impedance to the splice sensor. The high impedance enables the signal to be sampled from the sensor without loading the sensor. C209 is a coupling capacitor for the first stage. R245 and C210 provide the bootstrapping effect for the first stage. Resistors R247 and R246 establish the bias point for the first stage which is transferred through R245 to the base of Q214. The bootstrapping effect is further enhanced by resistors R248 and R249. The gain of the first stage is established by the direct ratio of collector resistor R251 to R248 in series with R249. R250 provides additional DC feedback to the first stage. Bypass capacitor C211 removes unwanted low frequency noise from the first stage.

The signal from the tape sensor is amplified by the first stage, transferred through the capacitor C212, resistor R252, and potentiometer R253 to ground. The wiper of R253 samples the correct amount of signal and couples it through capacitor C213 to the second stage for further amplification. R254 and R255 provide DC biasing for transistor Q215. The gain of this stage is established by the direct ratio between resistors R256 and R257. Capacitor C214 provides for negative feedback of high frequency noise. Negative feedback of this high frequency noise cancels it out in the second stage. R258 creates an additional amount of DC stability in the second stage. Bypass capacitor C215 is used to remove unwanted low frequency noise.

As mentioned, the second stage, using Q215 as an active element, amplifies the sensor pulse to

the required level. When a negative going pulse appears at the collector of Q215, it can overcome the break-over voltage requirements of zener diode CR210 if the pulse is of sufficient amplitude. Since CR210 feeds into the base of Q116, it becomes necessary to look at the initial state of Q216. When DC power is first applied, C216 provides momentary reverse bias to the base of Q216, turning it off. However, when a negative going pulse manages to overcome the zener voltage of CR210, Q216 is turned on because base current flows through zener diode CR210. Consequently, current flows through the collector of Q216 on through R262, R264, and the base of Q218, turning it on. When Q218 turns on, its collector goes from a high state to a low state. When Q218 is on, current will flow through its collector by way of R261, C208 and R263. Collector current through this transistor will be maintained only until C208 is charged. Also base current will be maintained for Q216 through C208, R263 and Q218 until C208 is charged. When C208 has become charged sufficiently, base current will be starved away from Q216, eliminating the base drive through R262, to Q218. The collector of Q218 then will return from chassis ground to a positive voltage. As the collector of Q218 is at chassis ground, it provides the correct pulse to stop the entire machine.

A foil is connected between the collector of Q218 and the base of Q204 in the control logic circuit. This foil is connected via CR201 and CR203. When the collector of Q218 is low, the point between resistor R207 and CR203 in the control logic circuit is essentially at ground potential. This condition starves base current from Q204 turning it off. When Q204 turns off, base current is starved away from Q203 via R206 and CR204. The collector of Q204 goes high and the pressure roller solenoid on the transport turns off, dropping the pressure roller away from the motor capstan shaft, stopping the moving tape in the cartridge. The run lamp turns off because no ground path is provided for it through CR206. The ready lamp, however, returns to an on state because Q205 once again receives base drive through R209, R210 and R211.

F. ERASER PHASE CONTROL

As previously mentioned, AC power is provided to erase coil L3 through Fuse F2. Power through the erase coil is regulated by triac TR101. Around the triac is shown a transient suppression circuit consisting of R101, and C101. Control lines to the eraser phase control are connected to the resistive output of LDR201. In series with LDR201 are trimming potentiometer R231, and ballast resistor R232. R231 and R232 enable the resistive output of the LDR201 to control only a limited portion of the total series resistance. R231 is provided to trim the overall resistance of the series

elements to the desired value. These series components make up a lumped but variable resistance in series with capacitor C102.

This network is part of the charging loop controlling the firing rate of relaxation oscillator, whose active element is unijunction transistor Q101. The firing rate of this oscillator controls the firing angle of triac T101. The relaxation oscillator does not interface directly with the triac for phase control, since the triac TR101 is controlling a highly reactive load. R102, R103, CR101, CR102 and SCR101 are used in conjunction with the relaxation oscillator to insure that proper firing of the triac is insured. Full wave rectified voltage from the mains is provided to the firing circuitry through the bridge consisting of diodes CR104 through CR106. Current limiting through this bridge is provided by resistor R107. R106 in conjunction with zener diode CR103 provides 24 volts to the relaxation oscillator. Trigger pulses to the SCR101 appear across resistor R104 feeding directly into the gate of SCR101. R105 is used as part of the normal configuration of the unijunction relaxation oscillator.

Neon indicator I3 shows when coil L3 is on. The brightness of this indicator gives a visual indication of the relative flux density in the coil.

When the lamp LDR201 is on, minimum resistance is presented by the series R network, R231, LDR201, and R232. This gives the quickest firing rate of the relaxation oscillator and results in full line voltage across L3. As the resistance of the LDR increases, per the erase ramp control circuit, the firing angle of the triac TR101 is adjusted to reduce the voltage appearing across erase coil L3. Thus, the voltage across the coil is ramped down, via phase control. The total flux density resulting in the coil diminishes accordingly.

This controlled collapse of field in the coil provides for the correct magnetic transition to erase the cartridge on the transport. A gradual diminishing of the flux in the coil is necessary to avoid imprinting pops upon the tape being erased.

It is necessary to note that the general configuration of the ESL IV circuitry is not subject to change for a variety of erasure times. Thus, varieties of erasure times can be accomplished by simply changing the values of components in the circuit. THE CIRCUIT CONFIGURATION DOES NOT CHANGE.

G. OPERATING MODES

The ESL IV is equipped with a mode selection switch which can provide three distinct modes or sequences of electrical operation.

1. Erase/Splice Locate
2. Erase Only (end of erase stop)
3. Splice Locate Only (erase bypass)
 1. Erase/Splice Locate

Switch S5 is selected so that +24 volt power is applied to the portion of the control circuit containing Q201 and Q202 at the same time the rest of the control circuit receives +24 volts. This condition permits the erase ramp control to receive +24 volts when the start switch is depressed. As a result, the splice detector is disabled by Q213 until the erase cycle has been completed. After the splice detector is enabled at the end of erase, it remains active until the splice is located and the machine stops via control card strap A-B. This combination of erase cycle and splice sensing follows the previous circuit explanation exactly.

2. Erase Only (end of erase stop)

As with the combination sequence previously described, switch S5 is selected so that +24 volts is present at the entire control logic circuit before and as the start switch is depressed. Again, this permits the erase ramp control to operate correctly. However, the selected position of S5 offers the capability to stop the machine at the end of the erase cycle. Also, strap C-D must be jumpered on the control card for switch selected stop at end of the erase cycle.

When strap C-D is used in conjunction with front panel switch S5, diode CR207 must be absent from the control card (831-0112-003). If CR207 is not removed and the machine is switched to the combinational mode of operation, the splice sensor protect timer will not prevent the pressure roller from activating the splice detector (if operated more than once with the *start* switch).

A control line is provided from the collector of Q212 to point C. As the collector of Q212 goes to chassis ground, after the cycling of timer U203 (the master timer of the erase cycle) a stop path is provided to either points A or D, depending on the strapping employed (See Section VIII, D).
NORMAL FACTORY PREPARED CARDS ARE STRAPPED FROM POINTS A-B AND C-D. The effect of the ground going path is identical to the end of the splice find stop function. In other words, a strap from point A to B (hard wired), A to C (hard wired), or C to D (switchable) stops the machine by the same sequence of events in the control logic.

OPERATIONAL NOTE: End of Erase Stop (hard wired)

The ESL IV is equipped with a strappable option, on the control card. This strappable option offers the capability to stop the machine at the end of the erase cycle. When this option is hard wired into the machine, the front panel switch S5 should be disconnected and a small bus wire strap (see Figures 8-2 and 8-3) added to the control card (831-0112-003). A control line is provided from the collector of Q212 to point C. As the collector of Q212 goes to chassis ground, after the cycling of timer U203 (the master timer of the erase cycle), a stop path is provided to point A. The effect of this ground going path is identical to the end of splice find stop function. In other words, a strap from point A to B, or from A to C., stops the machine by the same sequence of events in the control logic. An additional strapping option is provided from point C to D. As the collector of Q212 goes to chassis ground, points C and D provide a path through diode CR207 to starve base drive from transistor Q205. If this is done, the ready lamp will not return to an on state, while simultaneously the run lamp is also in an off state. This strap therefore provides for a ready light disable at the end of the erase cycle. The ready lamp will once again light if ground going switch S3 on the deck is open and the entire control logic is reset.

Providing that diode CR207 is removed from the PC card, switchable strap C-D will function exactly like hard wired strap A-C. With CR207 gone from the circuit, the ready lamp will come on and remain lit after the end of erase. The cartridge must still be removed and re-inserted into the deck (logic reset) before the erase cycle can be performed again.

3. Splice Locate Only (erase bypass)

In order to bypass the erase function of the machine, the position of switch S5 is selected to prohibit +24 volts from appearing at the part of the control circuit containing Q201 and Q202. Absence of power to this circuit further prohibits power from appearing at the erase ramp control, and consequently releases Q213 from clamping off the splice detector circuit. S5 also switches Strap C-D out of the circuits and allows only Strap A-B as the control path for end of splice locate stop signal. (Strap A-C must not be hard wired for the erase bypass to work properly.)

When the machine is started, the splice detector lockout through Q217 via charge path C217, R259, and R260 clamps the detector off until the pressure roller solenoid has activated and the high speed transport is at full speed. After this lockout "releases" the base of Q218, the detector remains active until a splice is sensed and the pressure roller drops to stop the cartridge. The machine goes to

the stop mode with the ready lamp lit until the start button is pushed to restart the transport. It is not necessary to remove the cartridge from the machine to restart it as was the case with the “erase only” feature.

SECTION VII

ELECTRICAL ADJUSTMENTS

ESL IV SERIES

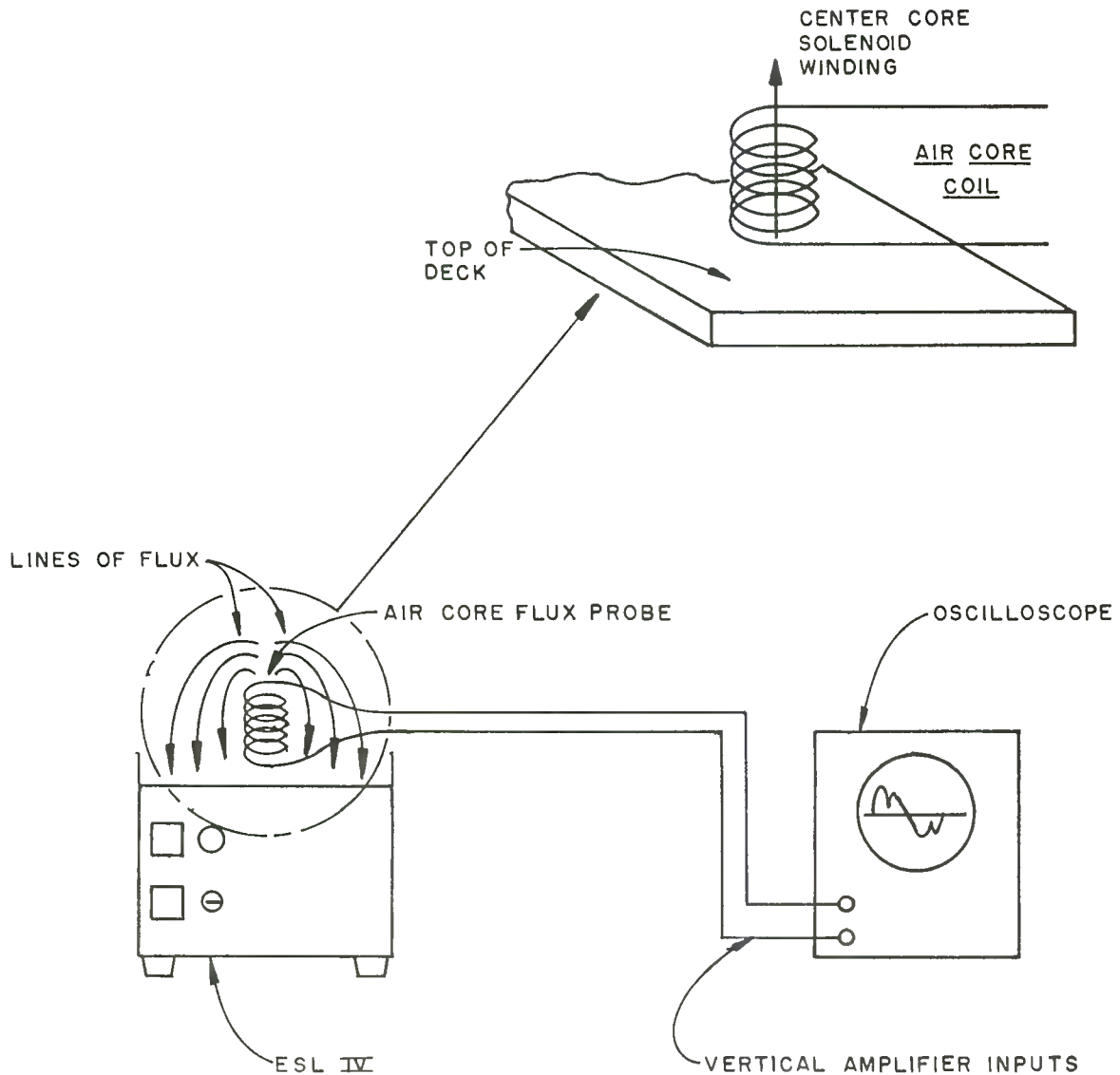


FIGURE 7-1

A. GENERAL

The following electrical controls are adjusted at the factory to provide optimum operation of the ESL IV unit. At the time of installation, the only control which may require adjustment is the splice sensor sensitivity control. The following tests and adjustments should not be performed by anyone other than a qualified electronics engineer. Some of the adjustments are dependent upon and interact with each other. Therefore, when one specific adjustment is made, it may be necessary to proceed through the entire line of procedure before proper operation of the unit is obtained. *Electrical adjustments should be checked as a part of the monthly maintenance schedule.*

B. ELECTRONIC TEST EQUIPMENT

Before making any type of electronic adjustments or tests, it is necessary that the operator have

certain electronic test equipment. The omission of certain pieces of test equipment may prohibit or at best make very difficult the testing and/or recalibration of certain electrical adjustments made at the factory. The following is a list of equipment which ITC recommends using:

1. High impedance voltmeter
2. Oscilloscope
3. Magnetic fluxprobe
(for the oscilloscope)

While instrument #3 is commercially available, a temporary fluxprobe can be fabricated from any air core coil having either a single or multiple solenoid winding. An example of this type of coil is ITC Part #512-0001-000 (10 mHy, 100 ma RF/J.W.Miller Allied #855-2726). Since in the tests performed the probe is used to monitor the

“shape” of the magnetic flux from the ESL IV erase coil and not its absolute amplitude, the level of output voltage from the probe (coil) is not important. Only enough amplitude must be achieved to be within the maximum sensitivity ranges of the monitoring oscilloscope (See Figure 7-1 for correct position of probe).

C. SPLICE DETECTOR SENSITIVITY ADJUST

The electrical sensitivity of the splice detector is factory adjusted for the corresponding mechanical alignment of the splice sensor mechanism (see Section IV, G). Mechanical adjustment is used to achieve the maximum peak of detector sensitivity, with the electrical control used only as a control to account for variations and tolerances in the splice sensor mechanism. Electrical sensitivity is controlled by potentiometer R253 located on the plug-in control card. Exact location of this potentiometer is shown in Figures 5-3 and 8-2. When the wiper of this potentiometer is revolved to the farthest point counter clockwise, the sensitivity of the detector circuit is nil. As potentiometer R253 is turned in the clockwise direction, the electrical detector passes from zero sensitivity to maximum sensitivity. Normally, the potentiometer would not be left in the extreme clockwise position since mechanical noise external to the machine but coupled through the sensor mechanism may be sensed by the (now) highly sensitive detector. To set the potentiometer R253 to the proper setting, the following steps should be performed:

1. Mechanically align the splice sensor mechanism as explained in Section IV, G.
2. Assure that the machine is in the splice locating mode.
3. Turn pot R253 to the full counter clockwise position (zero detector sensitivity).
4. Insert a cartridge with low tape loading (20-70 seconds at 7.5 IPS) into the machine. The tape and splice in this cartridge should be representative of the type to be used in the normal application.
5. Start the ESL IV unit by depressing the start button.
6. With a small flathead screwdriver, advance the wiper of R253 clockwise until the splice detector just activates as the tape splice passes through the transport. If the mechanical splice sensor is aligned properly and the electrical detector is working properly, the pot should be approximately 1/3 advanced.
7. Advance the pot to the midpoint setting. The splice sensor should now reliably stop the machine at the tape splice after each time, being restarted with the start button. If the splice locator stops the machine intermittently, or fails to stop the machine at the midpoint setting, recheck the mechanical alignment of the sensor mechanism (Step 1).
8. Advance the pot slightly past the midpoint setting. This completes the electrical adjustment of the splice detector. (The pot R253 can be advanced approximately 2/3 clockwise if the extra sensitivity is required. Caution should be exercised in advancing the control beyond this point for the reasons previously described.)

D. PHASE TRIM ADJUST (See Figures 5-3, 7-2 and 8-2)

Control potentiometer R231 is used to compensate for unit differences of resistance of light driven resistor LDR 201. The resistance of LDR 201 directly controls the flux waveform during the magnetic field rampdown cycle. R231 is factory adjusted to provide a sinusoidal flux waveform when the LDR turns full on (at the beginning of rampdown). (Figure 7-2a) The necessity of field adjusting R231 should only become apparent if LDR 201 is replaced or aging causes the on resistance of the LDR to change. If R231 needs to be field adjusted, a simple and accurate calibration procedure can be performed.

1. For ease in calibration, remove the rear chassis cover from the machine, and place the control card (831-0112-003) on a 22 pin extender card (831-0082-003). Remove the slot key from the mother board (831-0111-003) 22 pin card edge connector before attempting to insert the extender card.
2. Switch the mode select toggle to Erase Only.
3. Plug the machine in, remove the top cover, and insert a small strip of paper between the switch arm and switch case of the top microswitch on the deck. Once the contacts of this switch have been closed by this paper “wedge” the ready lamp in the stop switch will light.
4. In the center of the deck (over the erase coil center pole piece) place an (air core) magnetic flux probe. The probe should be connected to an oscilloscope in order to monitor the magnetic flux emitted from the erase coil (See Figure 7-1).

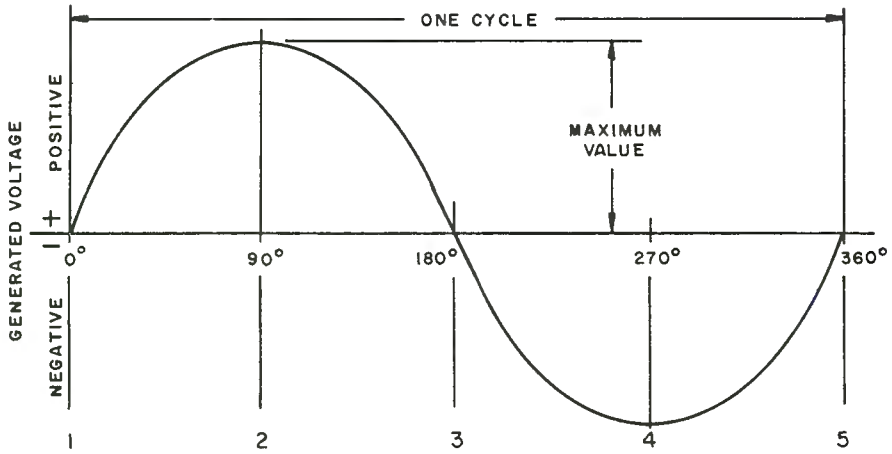
5. Turn the wiper of the potentiometer R223 (Fast Ramp Adjust) full counter clockwise to lengthen the rampdown time to maximum. This lengthened rampdown will allow time to "trim" the phase control potentiometer R231.
6. Start the machine by depressing the start button. The wave form of the phase controlled flux pattern will appear on the oscilloscope screen. When this pattern first appears, the wave shape should be sinusoidal. (Figure 7-2a.) If the waveform is chopped in at the peaks, phase controlled rampdown is starting to occur before the flux pattern has had a chance to reach maximum level. This is shown in Figure 7-2b.
7. Adjust R231 to just provide a sinusoidal flux pattern before the phase controlled rampdown cycle begins (see Figure 7-2a). Turning R231 counter clockwise delays the phase control while the opposite direction prestarts the phase control cycle.
8. Unless Section VII, E, is to be performed, remove the extender card, replace the card edge connector card key and reinstall the control card (831-0112-003) into the ESL IV unit. Replace and tighten down the rear chassis cover to the back of the machine. Also, remount the top cover.

E. FAST RAMP ADJUST (See Figures 5-3, 7-3, and 8-2)

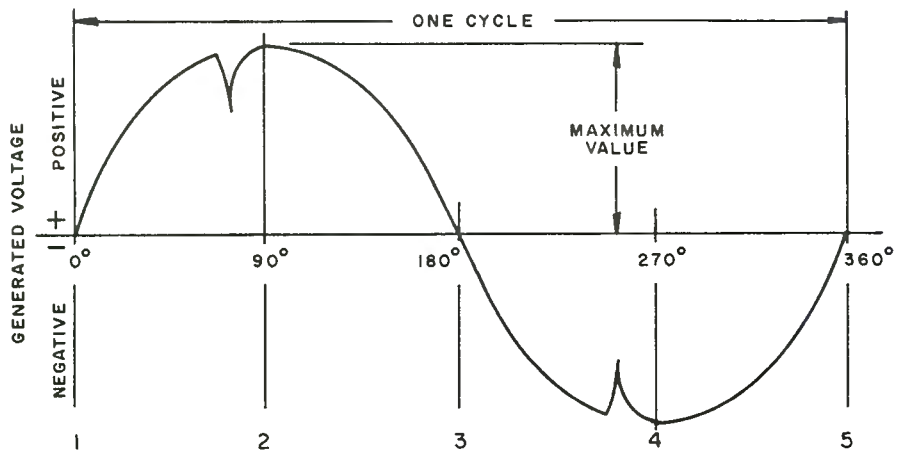
Control potentiometer R223 is used to compensate for differences in both active and passive discrete components in the circuit which generates the rampdown of the magnetic erase field. This control is factory adjusted for maximum erase

depth (as produced by the gradually decaying magnetic erase field). The factory tests are not easily duplicated in the field, however, if optimizing the depth of erasure (long after the factory alignment) dictates the adjustment of R223, a simple and reasonably accurate calibration procedure may be performed:

1. Unless Section VII, D has just been performed, repeat steps 1 through 3 of Section VII, D.
2. In the center of the deck (over the erase coil center pole piece) place an (air core) magnetic flux probe. The probe should be connected to an oscilloscope in order to monitor the magnetic flux emitted from the erase coil. (See Figure 7-1.)
3. Start the machine by depressing the start button. The phase controlling flux pattern will appear on the oscilloscope while simultaneously the pressure roller pulls up against the capstan. (If R223 is adjusted correctly the magnetic field will finish decaying 2 to 2.5 seconds before the pressure roller falls away from the capstan. (See Figure 7-3)
4. Set R223 to allow the field to collapse 2 to 2.5 seconds before the pressure roller falls away from the capstan (stopping the machine). Turning the wiper of R223 counter clockwise lengthens the rampdown time. (If the rampdown cuts into machine stop, no matter what the setting of R223, call ITC Technical Service for assistance.)
5. Remove the extender card, replace the card edge connector card key and reinstall the control card (831-0112-003) into the ESL IV unit. Replace and tighten down the rear chassis cover to the back of the machine (Figure 5-3 & 5-4).

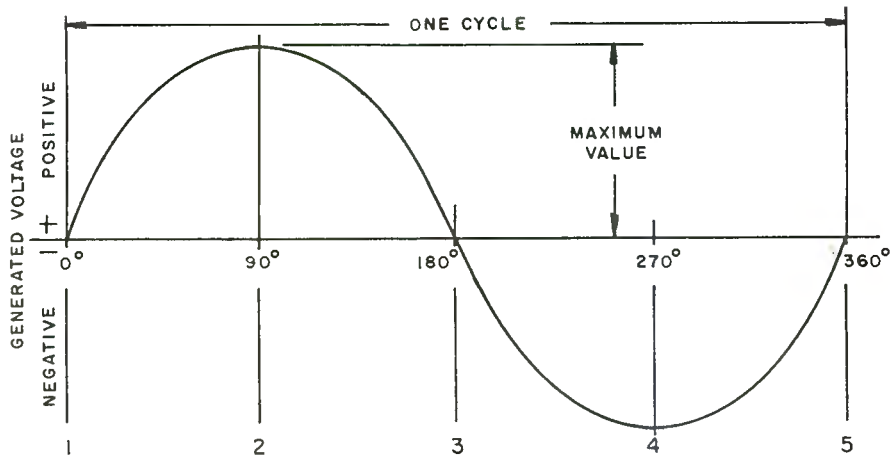


a) Full Flux at Start of Rampdown Phase Control Triggering Correct

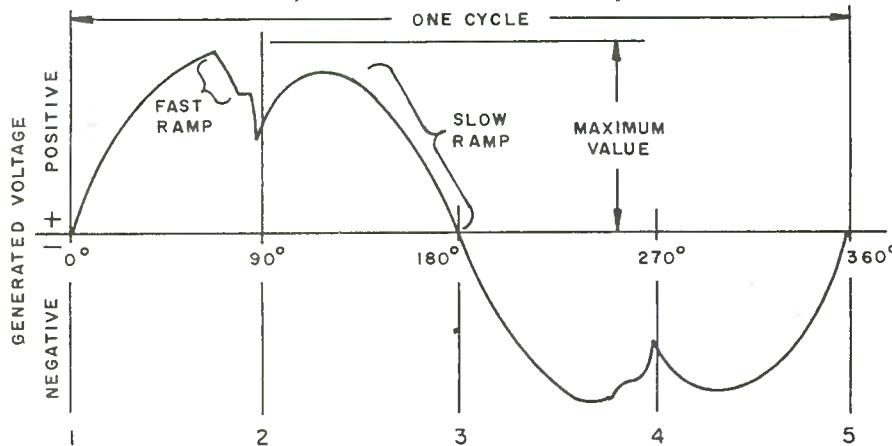


b) Phase Control Triggering Prematurely at Start of Rampdown Incorrect

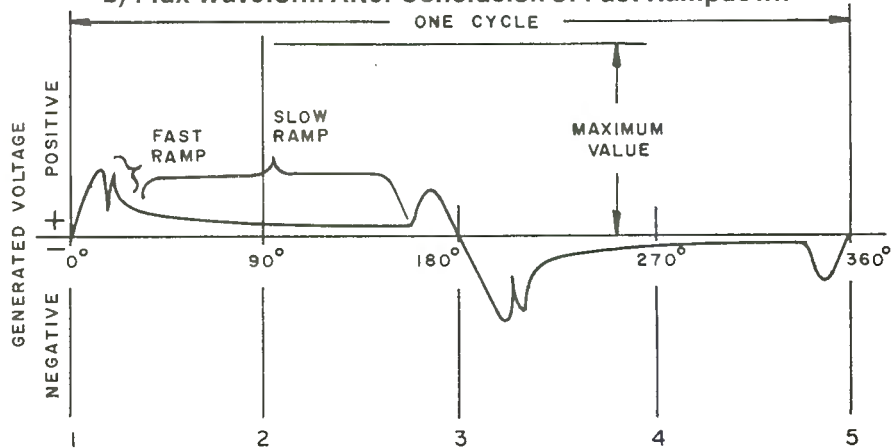
FIGURE 7-2



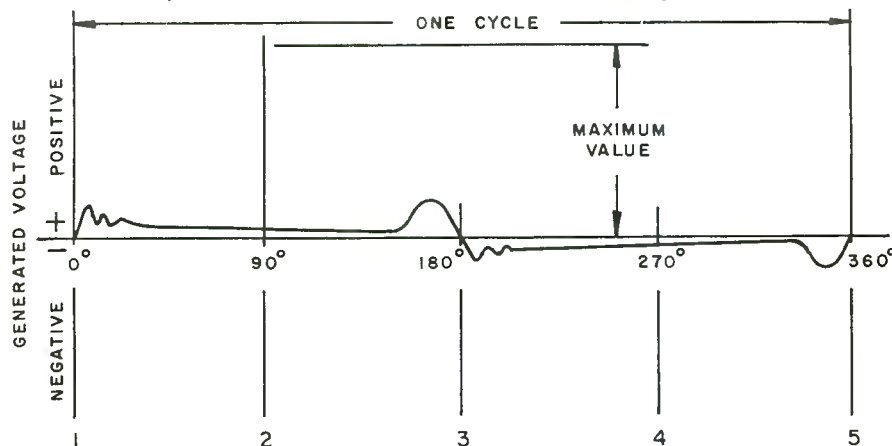
a) Full Flux at Start of Ramp



b) Flux Waveform After Conclusion of Fast Rampdown



c) Flux Waveform Near End of Slow Rampdown



d) Flux Waveform Before Clamp-off, but after Conclusion of Slow Rampdown

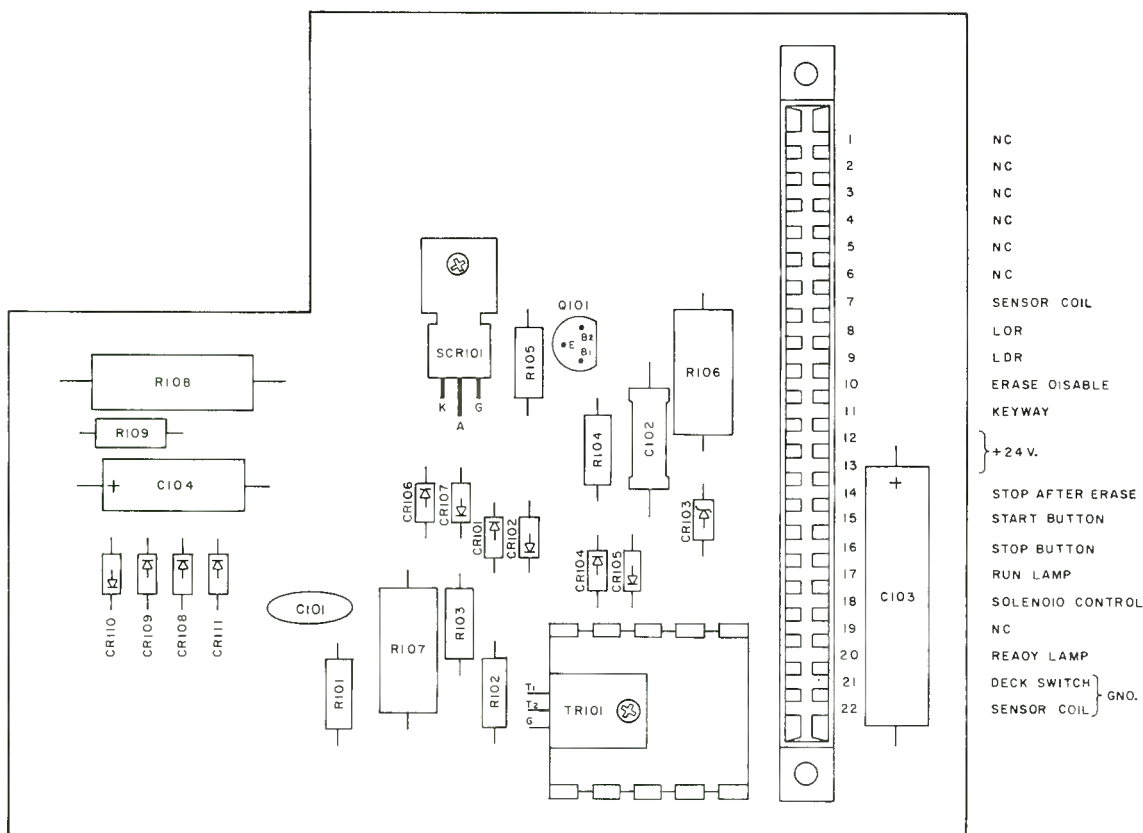
FIGURE 7-3

SECTION VIII

ELECTRICAL PARTS LIST

FIGURE 8-1

ESL IV SERIES

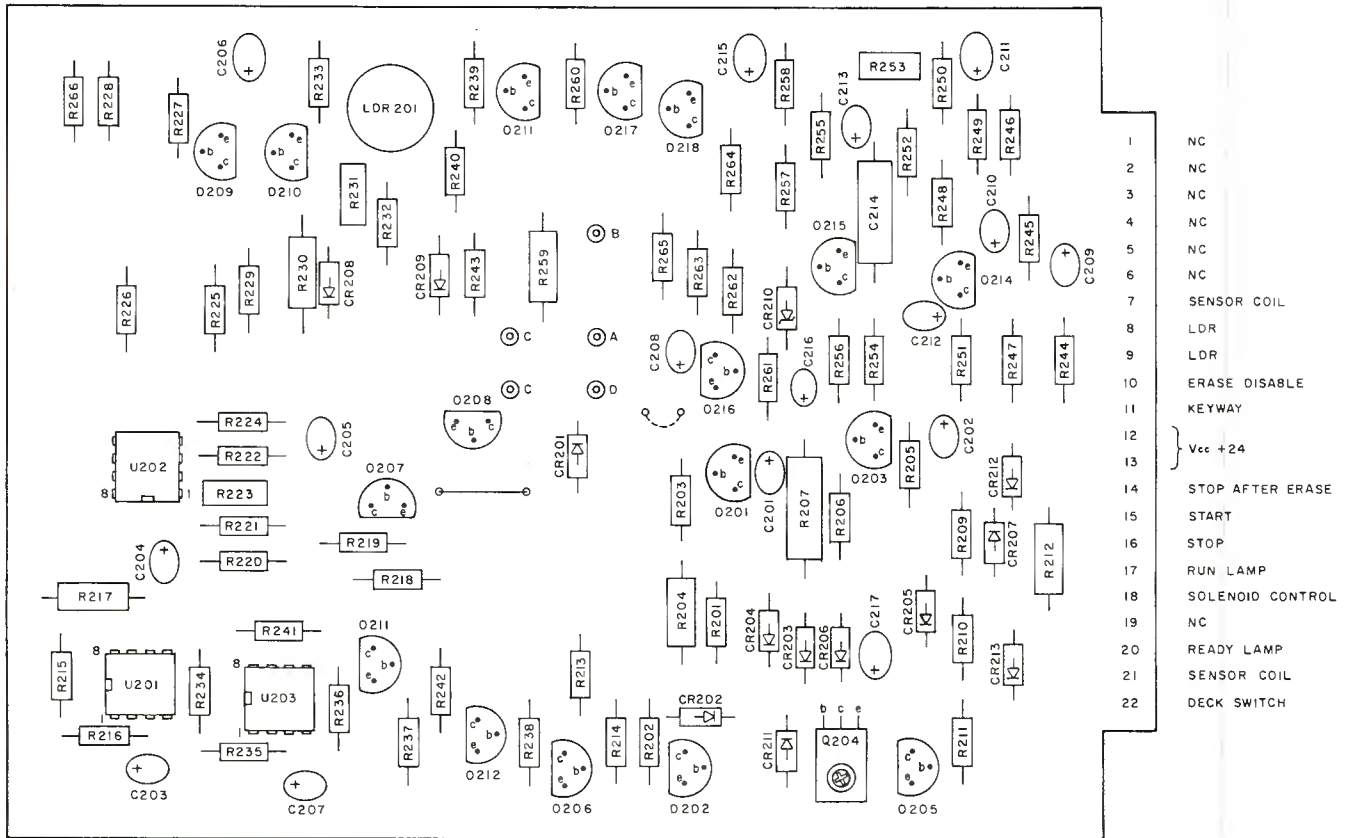


A. MOTHER BOARD (831-0111-003)

SYMBOL	PART NUMBER	DESCRIPTION	SYMBOL	PART NUMBER	DESCRIPTION
CAPACITORS			DIODES (cont.)		
C101	686-0001-000	Capacitor, .1 mfd, 500 volt, ceramic disk	CR104	575-0007-000	Diode, 1N4005
C102	681-0058-000	Capacitor, .1 mfd, 200 volt, paper	CR105	575-0007-000	Diode, 1N4005
C104	687-0006-000	Capacitor, 220 mfd, 25 volt, electrolytic	CR106	575-0007-000	Diode, 1N4005
C103	687-0004-000	Capacitor, 22 mfd, 25 volt, electrolytic	CR107	575-0007-000	Diode, 1N4005
RESISTORS			TRANSISTORS		
R101	630-0215-000	Resistor, 10 ohms, 1/2 watt, film	Q101	601-0001-000	Transistor, Unijunction 2N4870
R102	630-0223-000	Resistor, 22 ohms, 1/2 watt, film	THYRISTORS		
R103	630-0215-000	Resistor, 10 ohms, 1/2 watt, film	SCR101	581-0003-000	Silicon controlled rectifier, C106B1
R104	626-0231-000	Resistor, 47 ohms, 1/2 watt, film	TR101	584-0001-000	Triac, SC146B
R105	630-0263-000	Resistor, 1 K ohms, 1/2 watt, film	CONNECTORS		
R106	626-0683-000	Resistor, 6.8 K ohms, 2 watts, fixed composition	J1	380-0039-000	Socket, card edge — 22 conductor
R107	626-0683-000	Resistor, 6.8 K ohms, 2 watts, fixed composition	MISCELLANEOUS		
R108	628-0181-000	Resistor, 20 ohms, 8 watts, wire wound	613-0001-000	Socket, transistor	
R109	630-0231-000	Resistor, 47 ohms, 1/2 watt, film	613-0006-000	Heat sink	
DIODES					
CR101	575-0007-000	Diode, 1N4005			
CR102	575-0007-000	Diode, 1N4005			
CR103	577-0002-000	Diode, Zener, 1N4749A			

B. CONTROL (DAUGHTER) BOARD
(831-0112-003)

FIGURE 8-2



SYMBOL PART NUMBER DESCRIPTION

CAPACITORS

C201	694-0002-000	Capacitor, 10 mfd, 20 v, tantalum
C202	694-0002-000	Capacitor, 10 mfd, 20 v, tantalum
C203	694-0005-000	Capacitor, 1 mfd, 35 v, tantalum
C204	694-0005-000	Capacitor, 1 mfd, 35 v, tantalum
C205	694-0005-000	Capacitor, 1 mfd, 35 v, tantalum
C206	694-0009-000	Capacitor, 100 mfd, 10 v, tantalum
C207	694-0002-000	Capacitor, 10 mfd, 20 v, tantalum
C208	694-0002-000	Capacitor, 10 mfd, 20 v, tantalum
C209	694-0005-000	Capacitor, 1 mfd, 35 v, tantalum
C210	694-0002-000	Capacitor, 10 mfd, 20 v, tantalum
C211	694-0007-000	Capacitor, 47 mfd, 20 v, tantalum
C212	694-0002-000	Capacitor, 10 mfd, 20 v, tantalum
C213	694-0003-000	Capacitor, 4.7 mfd, 35 v, tantalum
C214	682-0001-000	Capacitor, .15 mfd, 100 v, mylar
C215	694-0002-000	Capacitor, 10 mfd, 20 v, tantalum
C216	694-0004-000	Capacitor, .47 mfd, 35 v, tantalum
C217	694-0002-000	Capacitor, 10 mfd, 20 v, tantalum
C218	681-0034-000	Capacitor, .001 mfd, 200 v, pacer

DIODES

CR201	575-0007-000	Diode, 1N4005
CR202	575-0007-000	Diode, 1N4005
CR203	575-0007-000	Diode, 1N4005
CR204	575-0007-000	Diode, 1N4005
CR205	575-0007-000	Diode, 1N4005
CR206	575-0007-000	Diode, 1N4005
CR207	575-0007-000	Diode, 1N4005
CR208	575-0007-000	Diode, 1N4005
CR209	575-0007-000	Diode, 1N4005

SYMBOL PART NUMBER DESCRIPTION

DIODES (cont.)

CR210	577-0001-000	Diode, Zener 1N4742
CR211	575-0007-000	Diode, 1N4005
CR212	575-0007-000	Diode, 1N4005

LIGHT DEPENDENT RESISTORS

LDR201	650-0004-000	LDR, VTL9A4-Vactrol
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TRANSISTORS

Q201	590-0018-000	Transistor, 2N5817, PNP
Q202	590-0017-000	Transistor, 2N5816, NPN
Q203	590-0018-000	Transistor, 2N5817, PNP
Q204	590-0022-000	Transistor, 2N6038, NPN, Darlington
Q205	590-0017-000	Transistor, 2N5816, NPN
Q206	590-0017-000	Transistor, 2N5816, NPN
Q207	590-0018-000	Transistor, 2N5817, PNP
Q208	590-0017-000	Transistor, 2N5816, NPN
Q209	590-0017-000	Transistor, 2N5816, NPN
Q210	590-0017-000	Transistor, 2N5816, NPN
Q211	590-0017-000	Transistor, 2N5816, NPN
Q212	590-0017-000	Transistor, 2N5816, NPN
Q213	590-0017-000	Transistor, 2N5816, NPN
Q214	590-0017-000	Transistor, 2N5816, NPN
Q215	590-0017-000	Transistor, 2N5816, NPN
Q216	590-0018-000	Transistor, 2N5817, PNP
Q217	590-0017-000	Transistor, 2N5816, NPN
Q218	590-0017-000	Transistor, 2N5816, NPN

INTEGRATED CIRCUITS

U201	609-0001-000	Timer, precision LM3905, National
U202	609-0001-000	Timer, precision LM3905, National
U203	609-0001-000	Timer, precision LM3905, National

RESISTORS

R201	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R202	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R203	630-0071-000	Resistor, 2.2 K ohms, 1/4 watt, film
R204	630-0265-000	Resistor, 1.2 K ohms, 1/2 watt, film
R205	630-0071-000	Resistor, 2.2 K ohms, 1/4 watt, film
R206	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R207	630-0271-000	Resistor, 2.2 K ohms, 1/2 watt, film
R209	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R210	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R211	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R212	630-0275-000	Resistor, 3.3 K ohms, 1/2 watt, film
R213	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R214	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R215	639-0119-000	Resistor, 220 K ohms, 1/4 watt, film
R216	630-0135-000	Resistor, 1 meg ohms, 1/4 watt, film
R217	630-0271-000	Resistor, 2.2 K ohms, 1/2 watt, film
R218	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R219	630-0087-000	Resistor, 10 K ohms, 1/4 watt, film
R220	630-0063-000	Resistor, 1 K ohms, 1/4 watt, film
R221	630-0087-000	Resistor, 10 K ohms, 1/4 watt, film
R222	630-0111-000	Resistor, 100 K ohms, 1/4 watt, film
R223	636-0015-000	Potentiometer, 500 K ohms, 1/4 watt, cermet
R224	630-0063-000	Resistor, 1 K ohm, 1/4 watt, film
R225	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R226	630-0091-000	Resistor, 15 K ohms, 1/4 watt, film
R227	630-0063-000	Resistor, 1 K ohms, 1/4 watt, film
R228	630-0123-000	Resistor, 330 K ohms, 1/4 watt
R229	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R230	630-0263-000	Resistor, 1 K ohms, 1/2 watt, film
R231	636-0010-000	Potentiometer, 10 K ohms, 1/4 watt, cermet
R232	630-0095-000	Resistor, 22 K ohms, 1/4 watt, film
R233	630-0063-000	Resistor, 1 K ohms, 1/4 watt, film
R234	630-0119-000	Resistor, 220 K ohms, 1/4 watt, film
R235	630-0135-000	Resistor, 1 meg ohms, 1/4 watt, film
R236	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R237	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R238	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R239	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R240	630-0087-000	Resistor, 10 K ohms, 1/4 watt, film
R241	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R242	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R243	630-0071-000	Resistor, 2.2 K ohms, 1/4 watt, film
R245	630-0075-000	Resistor, 3.3 K ohms, 1/4 watt, film
R246	630-0087-000	Resistor, 10 K ohms, 1/4 watt, film
R247	630-0109-000	Resistor, 82 K ohms, 1/4 watt, film
R248	630-0079-000	Resistor, 4.7 ohms, 1/4 watt, film
R249	630-0039-000	Resistor, 100 ohms, 1/4 watt, film
R250	630-0063-000	Resistor, 1 K ohms, 1/4 watt, film
R251	630-0083-000	Resistor, 6.8 K ohms, 1/4 watt, film
R252	630-0079-000	Resistor, 4.7 ohms, 1/4 watt, film
R253	636-0010-000	Potentiometer, 10 K ohms, 1/4 watt, cermet
R254	630-0103-000	Resistor, 47 K ohms, 1/4 watt, film
R255	630-0087-000	Resistor, 10 K ohms, 1/4 watt, film
R256	630-0087-000	Resistor, 10 K ohms, 1/4 watt, film

RESISTORS (cont.)

R257	630-0039-000	Resistor, 100 ohms, 1/4 watt, film
R258	630-0075-000	Resistor, 3.3 K ohms, 1/4 watt, film
R259	630-0095-000	Resistor, 22 K ohms, 1/4 watt, film
R260	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R261	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R262	630-0085-000	Resistor, 8.2 K ohms, 1/4 watt, film
R263	630-0095-000	Resistor, 22 K ohms, 1/4 watt, film
R264	630-0079-000	Resistor, 4.7 K ohms, 1/4 watt, film
R265	630-0095-000	Resistor, 22 K ohms, 1/4 watt, film
R266	630-0095-000	Resistor, 22 K ohms, 1/4 watt, film

MISCELLANEOUS

613-0001-000	Socket, transistor
613-0007-000	Socket, I.C. 8-pin DIP

C. CHASSIS ELECTRICAL PARTS

SYMBOL PART NUMBER DESCRIPTION

TRANSFORMER

T1	526-0002-000	Transformer Power, AM 4991A, 117 volts
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REGULATOR

U1	605-0004-000	I. C., 7824
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CAPACITORS

C1	698-0004-000	Capacitor, dual 1000 mfd, 50 volts
C2	685-0010-000	Electrolytic capacitor, 1.5 mfd, mylar

INDUCTORS

L1	477-0013-000	Solenoid, pressure roller
L2	490-0001-001	Actuator, C.P.Clare 354A14A2C102, 24 volt
L3	514-0001-000	Coil, erase AM7776

MOTOR

M1	452-0001-000	Motor, 1750 RPM, Induction
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FUSES

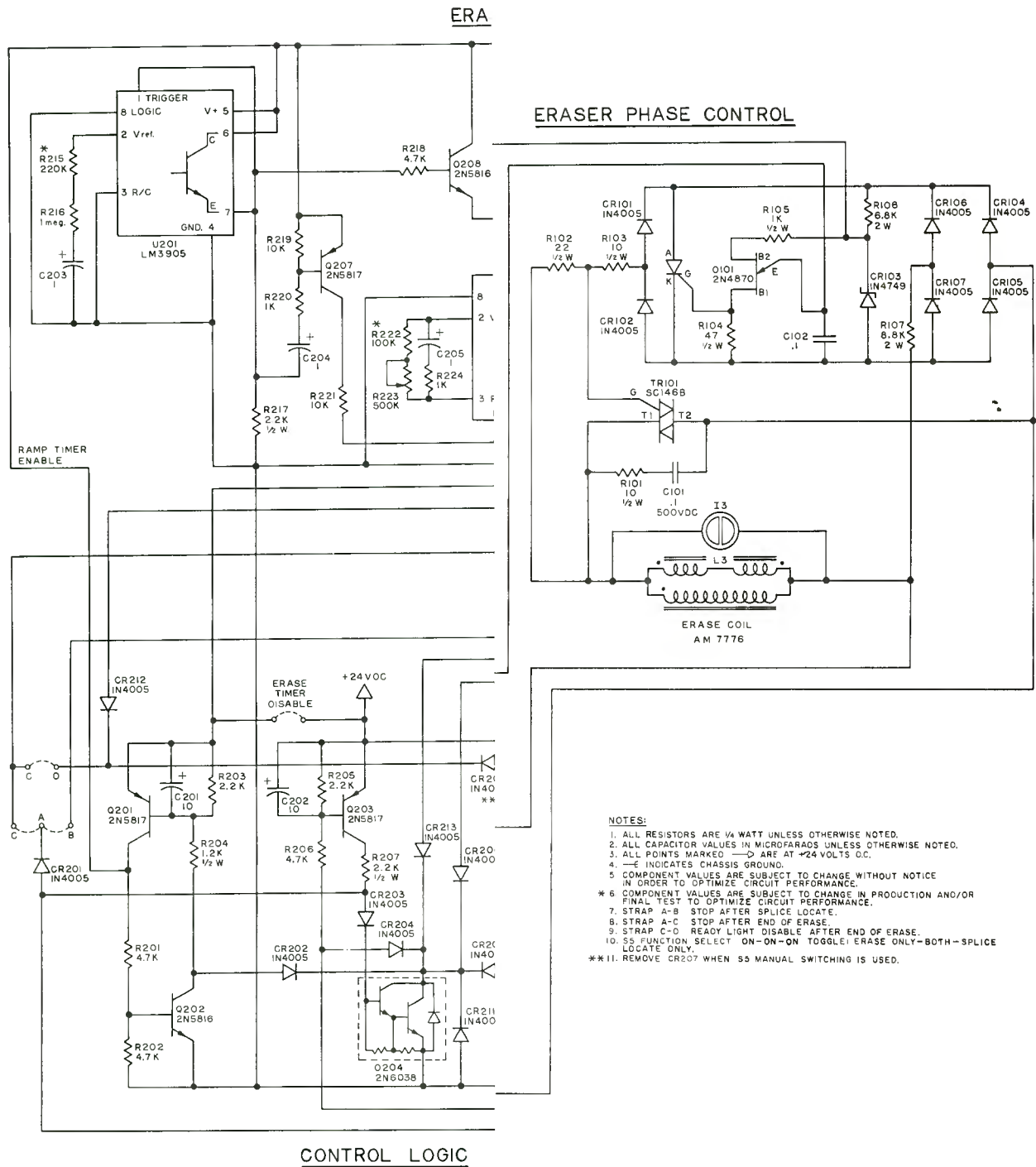
F1	417-0002-000	Fuse, 1 amp, slo-blo 3 AG
F2	417-0008-000	Fuse, 6 amp, slo-blo 3 AG

SWITCHES

S1	391-0008-000	Switch, start (green)
S2	391-0007-000	Switch, stop (yellow)
S3	392-0005-001	Switch, Cartridge sensing
S4	392-0005-001	Switch, Cartridge sensing
S5	390-0006-000	Switch, toggle on-on-on

INDICATORS

I1	415-0006-000	Lamp, BI-PIN 7387
I2	415-0006-000	Lamp, BI-IIN 7387
I3	415-0002-000	Lamp, 117 volt, neon



TITLE	
SCHEMATIC-ESL-IV	
it	893-0077-005
DRAWING NUMBER	REV.

SECTION IX

MAINTENANCE SCHEDULE

ESL IV SERIES

A. GENERAL

International Tapetronics has designed the ESL IV Series equipment with excellent reliability and minimum maintenance as primary design goals. Stark simplicity and mechanical strength are important factors in reducing mechanical maintenance. Electronic dependability is assured through the use of negative feedback and other techniques which stabilize circuits which are subjected to widely varying ambient conditions.

B. MECHANICAL MAINTENANCE

I. Weekly Maintenance:

- a. Clean the capstan, sensor shaft, and pressure roller with a cloth dipped in alcohol. Remove all traces of lubricant and oxide from the rotating surfaces of the capstan, sensor shaft and pressure roller.
- b. Clean the tape guide with a soft cloth or cotton swab dipped in a head cleaning solution.

2. Monthly Maintenance:

- a. Capstan motor
Since the capstan is a 1750 RPM direct drive, split phase induction motor, there are no belts, pulleys, or flywheel assembly. The bearings in this motor are permanently sealed ball bearings which need no lubrication. **ANY EFFORT TO LUBRICATE THE MOTOR BEARINGS WILL RESULT IN OIL SEEPING INTO THE MOTOR WINDINGS!**
- b. Check the pressure roller parallelism using the motor shaft locator gauge #830-0007-001 (Section IV—C & D).

- c. Check the tape guide alignment (see Section IV-F).
- d. Check alignment of the splice locator mechanism (See Section IV-G).
- e. The ESL IV machine requires *no lubrication*. The pressure roller solenoid uses a Teflon coated plunger. All bearing surfaces are either permanently lubricated ball bearings or sintered bronze bearings which require no additional lubrication. A periodic check for freedom of movement for all mechanical parts associated with the transport mechanism should be included as a part of the regular maintenance schedule.

C. ELECTRICAL MAINTENANCE

The electrical maintenance should be conducted monthly and takes the form of measuring the stated electrical adjustments as required. Approximately 5 minutes is required to test the ESL IV machine.

Using the procedures outlined in Section VII, check the

1. Splice Detector sensitivity
2. Phase control vernier (for full magnetic flux at erasure before rampdown).
3. Fast Rampdown (for optimizing depth of erasure).

It must be re-emphasized that 2 and 3 are factory adjustments which normally will not need calibrating for long intervals, if ever. **ADJUSTMENT OF THESE CONTROLS SHOULD BE ATTEMPTED ONLY BY A QUALIFIED ELECTRONICS ENGINEER EQUIPPED WITH THE NECESSARY TEST EQUIPMENT!**

SECTION X

WARRANTY

ESL IV SERIES

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

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

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

INTERNATIONAL TAPETRONICS CORPORATION/3M
 2425 SOUTH MAIN STREET
 POST OFFICE BOX 241
 BLOOMINGTON, ILLINOIS 61701
 TELEPHONE (309) 828-1381
 TWX 510-352-2500 ITC BLMG

MAINTENANCE PARTS PRICE LIST FOR:
 ESL-IV CARTRIDGE SPLICE FINDER/ERASER

THIS PRICE LIST IS PROVIDED FOR YOUR CONVENIENCE. THESE PARTS ARE NORMALLY AVAILABLE FROM OUR STOCK, AS MAINTENANCE OR REPAIR ITEMS. BECAUSE OUR SELLING PRICE IS BASED ON OUR ACTUAL COSTS, YOU MAY FIND THAT SOME ITEMS MAY BE PURCHASED LOCALLY AT COMPARABLE OR LOWER COST THAN FROM ITC.

ALL PRICES ARE SUBJECT TO REVIEW AND CHANGE WITHOUT NOTICE. PLEASE RETAIN THIS LIST FOR PART NUMBER REFERENCE. PRICES LISTED ARE F.O.B. BLOOMINGTON, ILLINOIS. PRICES WILL VARY OUTSIDE TERRITORIAL U.S. MINIMUM ORDER \$20.00.

STOCK NUMBER	DESCRIPTION	PRICE
CAPACITORS		
685-0010-000	CAPACITOR, MOTOR 1.5 MFD 400V (ESL, JPC PD-II, SINGLE SPEED 750)	3.50 EA
698-0004-000	CAPACITOR, DUAL 1000 MFD 50V CAN	6.75 EA
DIODES / RECTIFIERS		
575-0007-000	DIODE, 1N4005	.20 EA
577-0001-000	DIODE, 1N4742 ZENER 12 V	.30 EA
577-0002-000	DIODE, 1N4749A ZENER 24V	.30 EA
577-0006-000	DIODE, 1N4746 18V 1W ZENER	.30 EA
INTEGRATED CIRCUITS		
605-0012-000	IC VOLTAGE REGULATOR MC7805CT +5 VOLT; REPLACES 605-0005-000	2.40 EA
609-0001-000	IC LM3905 TIMER	2.50 EA
MAJOR ASSEMBLIES		
477-0013-000	SOLENOID, 24 VDC	51.00 EA
514-0001-000	ERASE COIL, AM7776	60.25 EA
MISCELLANEOUS PARTS		
272-0001-001	GUIDE, CARTRIDGE PRE-1980 PREMIUM LINE, ESL, PD-II	.80 EA
272-0002-012	GUIDE TAPE (RIGHT HAND & CENTER)	1.00 EA
301-0001-011	SPRING, CART HOLD DOWN (SINGLE SPRING HOLD DOWN SYSTEM)	2.20 EA
490-0001-010	ACTUATOR, SPLICE LOCATE	11.00 EA

MINIMUM ORDER \$20.00

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ESL-IV CARTRIDGE SPLICE FINDER/ERASER

STOCK NUMBER	DESCRIPTION	PRICE
MISCELLANEOUS PARTS		
413-0001-000	SOCKET, TRANSISTOR	.60 EA
878-0012-000	PRESSURE ROLLER REPLACEMENT KIT 70 DUROMETER	9.00 EA
890-0016-000	INSTRUCTION BOOK ESL IV	5.75 EA
MOTORS		
452-0001-020	MOTOR, CAPSTAN ESL-IV WITH PLUG	105.00 EA
OPTIONS, ACCESSORIES, SERVICE AIDS		
177-0046-000	ALLEN WRENCH 7/64" 80% 1301-000	.20 EA
830-0028-021	GAUGE CAPSTAN SHAFT LOCATOR (70 DUROMETER ROLLERS)	15.00 EA
831-0082-003	PCB 22 CONDUCTOR TEST EXTENDER	25.00 EA
878-0089-010	URM-0001 UNIVERSAL RACK MOUNT KIT	100.00 EA
878-0091-000	DRESS PANEL, URM-0001, 1/3 RACK WIDTH	15.00 EA
PRINTED CIRCUIT BOARDS		
831-0111-003	PCB MOTHER BOARD ESL	86.00 EA
831-0112-003	PCB CONTROL DAUGHTER BOARD ESL	182.25 EA
RESISTORS		
650-0004-000	LDR, VACTROL VTL9A4	8.00 EA
SWITCHES, LAMPS, LENSES		
390-0006-000	TOGGLE SWITCH DPDT (ON/ON/ON) ESL	10.75 EA
391-0007-000	SWITCH PUSHBUTTON YELLOW PD-II ESL	4.00 EA
391-0008-000	SWITCH PUSHBUTTON GREEN PD2 ESL	4.00 EA
392-0001-000	SWITCH, SNAP MICRO V3L1123-D8 PREMIUM LINE CART SENSING	2.10 EA
404-0019-000	LENS GREEN PD2 ESL	1.20 EA
404-0020-000	LENS YELLOW PD2 ESL	1.20 EA
415-0002-000	LAMP, POWER INDICATOR ASSY-110VAC	3.50 EA
415-0006-000	LAMP, BI-PIN #7387	.90 EA
TRANSISTORS		
581-0003-000	SCR GEC106B1	1.20 EA
584-0001-000	TRIAC SC1468	3.25 EA

MINIMUM ORDER \$20.00

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ESL-IV CARTRIDGE SPLICE FINDER/ERASER

STOCK NUMBER

DESCRIPTION

PRICE

TRANSISTORS

590-0017-010	TRANSISTOR GES 5816	.30 EA
590-0018-010	TRANSISTOR GES 5817	.75 EA
590-0022-000	TRANSISTOR 2N6038 NPN DARLINGTON	1.50 EA
601-0001-000	TRANSISTOR 2N4870 UJT	2.10 EA

MINIMUM ORDER \$20.00

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