TECHNICAL MANUAL

OPERATOR'S, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT MAINTENANCE MANUAL

TOPOGRAPHIC SUPPORT SYSTEM DRAFTING SUPPORT SECTION MODEL ADC-TSS-4 NSN: 6675-01-105-5754

This manual , together with TM 5-6675-316-14-1, supersedes TM 5-6675-316-14, 20 June 1983.

HEADQUARTERS, DEPARTMENT OF THE ARMY

7 JUNE 1985

WARNING

HIGH VOLTAGE is used in this equipment. DEATH ON CONTACT or severe injury may result if personnel fail to observe safety precautions.

Do not be misled by the term LOW VOLTAGE. Low voltage can cause serious injury or death.

Test procedures requiring the operator or maintenance personnel to investigate equipment or restore casualties with interlocks disconnected or covers removed may result in DEATH ON CONTACT if personnel fail to observe safety precautions.

Voltages in switches and circuit breaker panels may result in DEATH ON CONTACT if personnel fail to observe safety precautions.

Failure to ground the section or equipment may result in DEATH ON CONTACT if personnel fail to observe safety procedures.

For Artificial Respiration refer to FM 21-11.

WARNING

Dry Cleaning solvent P-D-680, used to clean parts, is potentially dangerous to personnel and property. Avoid repeated and prolonged skin contact. Wear solvent-impermeable gloves and eye/face protective equipment when using solvent. Do not use near open flame or excessive heat. Flash point of solvent is 100°F to 138°F (38°C to 59°C).

WARNING

Rotating and spinning equipment may snag loose clothing, hair, or jewelry resulting in SEVERE PERSONNEL INJURY.

WARNING

Attempting to move overweight or top-heavy equipment that is unsecured may result in SEVERE PERSONNEL INJURY. Always have sufficient personnel and equipment to accomplish the task.

TM 5-6675-316-14-2
C3

Change
No. 3

HEADQUARTERS,
DEPARTMENT OF THE ARMY
Washington, DC, 1 September 2005

Operator's, Unit, Direct Support and General Support Maintenance Manual
Topographic Support System
Drafting Section, Model ADC-TSS-4
(NSN 6675-01-105-5754) (EIC: YT4)

REPORTING ERRORS AND RECOMMENDING IMPROVEMENTS

You can help improve this manual. If you find any mistakes, or if you know of a way to improve the procedures, please let us know. We'd prefer that you submit your recommended changes electronically, either by e-mail (AMSEL-LC-LEO-PUBS-CHG@mail1.monmouth.army.mil) or online (http://edm.monmouth.army.mil/pubs/2028.html). Alternatively, you may mail or fax your letter, DA Form 2028 (Recommended Changes to Publications and Blank Forms) or DA Form 2028-2 located in back of this manual to: Commander, US Army Communications-Electronics Command and Fort Monmouth, ATTN: AMSEL-LC-LEO-E-ED, Fort Monmouth, NJ 07703-5006. The fax number is 732-532-3421, DSN 992-3421.

In any case, we will send you a reply.

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TM 5-6675-316-14-2, dated 7 June 1985, is changed as follows:

1. Title of manual is changed as shown above.

2. Appendix B., Maintenance Allocation Chart, has been revised to implement Army Maintenance Transformation and changes the Maintenance Allocation Chart (MAC) to support Field and Sustainment Maintenance. Because the entire Appendix is revised, no change bars/hands are used.

Remove Pages	*Insert Pages*
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CHANGE

NO. 2

HEADQUARTERS
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WASHINGTON, D. C., 24 JUNE 1992

Operator's, Organizational, Direct Support and
General Support Maintenance Manual

TOPOGRAPHIC SUPPORT SYSTEM
DRAFTING SUPPORT SECTION
MODEL ADC-TSS-4
NSN 6675-01-105-5754

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Operator's, Organizational, Direct Support and
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TOPOGRAPHIC SUPPORT SYSTEM
DRAFTING SUPPORT SECTION
MODEL ADC-TSS-4
NSN: 6675-01-105-5754

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B-5 through B-13/B-14	B-5 through B-13/B-14
C-1 through C-18	C-1 through C-18
D-1/D-2	D-1/D-2
E-1 through E-9/E-10	E-1 through E-7/E-8

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3-0	0	3-97	0
3-1	1	3-98 through 3-102	1
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INTRODUCTION

This manual is divided into two volumes:

Volume 1, TM 5-6675-316-14-1 consists of Chapters 1 and 2.
Volume 2, TM 5-6675-316-14-2 consists of Chapters 3 through 12, Appendixes A through E, Glossary and Index.

The Appendixes, Glossary and Index in Volume 2 are applicable to both volumes.

TECHNICAL MANUAL

NO. 5-6675-316-14-2

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D. C., 7 June 1985

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TOPOGRAPHIC SUPPORT SYSTEM
DRAFTING SUPPORT SECTION
MODEL ADC-TSS-4
NSN: 6675-01-105-5754

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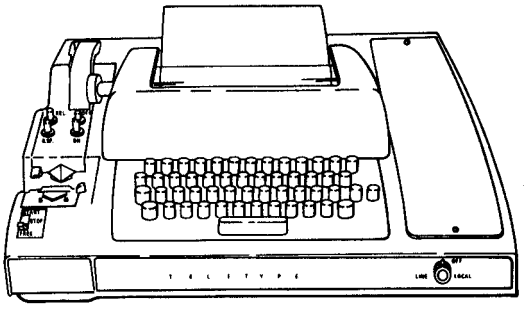
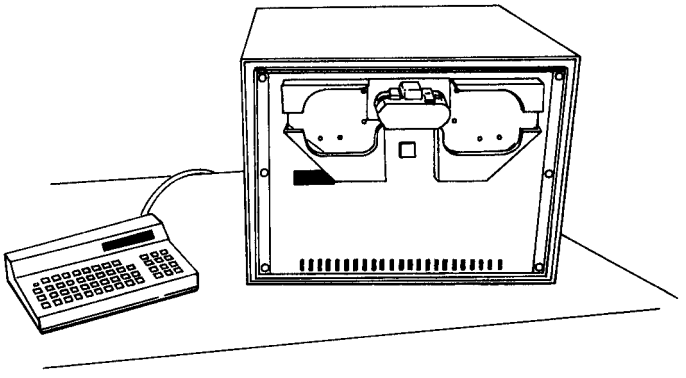
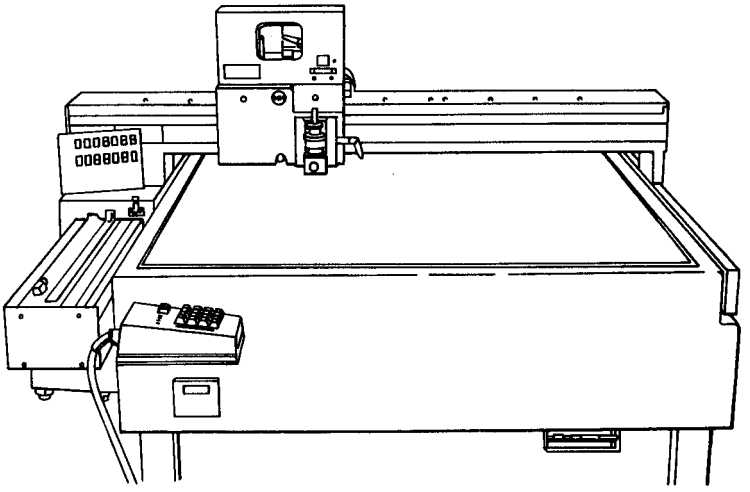






CHAPTER 3

COMBINED DRAFTING AND MEASURING MACHINE

Section I INTRODUCTION

3-1. GENERAL INFORMATION.

3-1.1 Scope.

a. Model Number and Equipment Name. Model 102K Combined Drafting and Measuring Machine.

b. Purpose of Equipment. To measure and/or draft shapes, lines, or points.

3-1.2 Reference Information. TM11-5815-599-14-1, TM 11-5815-599-14-2, TM 11-5815-599-14-3, and TM 11-5815-599-14-24P, cover description, installation, operation, and Operator's, Organizational, Direct Support, and General Support Maintenance of Teletypewriter Set, Model ASR-33.

3-1.3 List of Abbreviations.

ASCII	American National Standard for Information Interchange
AIR	Automatic Send-Receive
ALU	Arithmetic Logic Unit
BCD	Binary Coded Decimal
CPU	Central Processing Unit
CU	Control Unit
EOL	End-of-Line
EOF	End-of-File
IC	Integrated Circuit
KSR	Keyboard Send/Receive
LED	Light Emitting Diode
MU	Microprocessing Unit
NC	Numeric control
ROM	Read-only Memory
RAM.....	Reader-addressable Memory

TTY. . . . . Teletype

SD . . . . . Stepping Direction

RI . . . . . Read Instruction

EOT . . . . . End-of-Transmission

PC . . . . . Printed Circuit

MR . . . . . Motor Release

3-1.4 Glossary

Bus	Transmits information or signals grouped by function.
Digitizing	Defining geometric shapes, lines and points by using numeric characters to express or represent data.
Default Conditions	Factory preset or automatic parameters and conditions used by machine in its operation if not ordered to change.
Scale Factor	A number used as a multiplier, so chosen that it will cause a set of quantities to fall within a given range of values.
Scale Factor Magnification	Dimensional scale of drawn object is larger than unit scale of DKA display and machine surface. Example: 25 x magnification is 25 in. (on drawing) = 1 in. (of physical object).
Scale Factor Reduction	Dimensional scale of drawn object is smaller than unit scale of DKA display and machine surface. Example: 100 x reduction is 1 in. (on drawing) = 100 in. (of physical object).

3-2. EQUIPMENT DESCRIPTION.

3-2.1 Equipment Characteristics, Capabilities, and Features.

a. Operates in manual or automatic mode.

b. Can be moved (jogged) in any direction or run from operator's panel or by programs entered by paper tape.

c. Can be used to measure and/or digitize points, lines, and shapes.

d. Shapes once traced and recorded can be reproduced by running tape.

e. Shapes can be drawn on paper, scribed on film, or cut out in either automatic or manual mode.

f. Can copy prepunched tapes.

g. TTY can provide printout of codes punched on paper tape program.

h. Constantly displays location of traverse carriages to seven significant digits and sign (±).

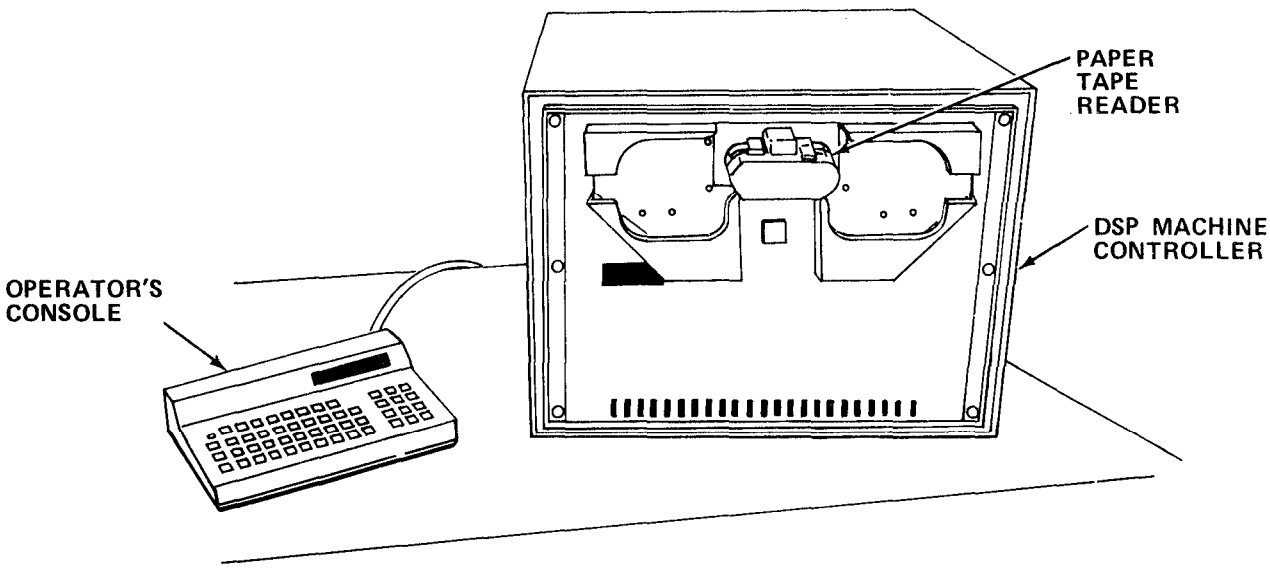
i. Ventilated by built-in fans.

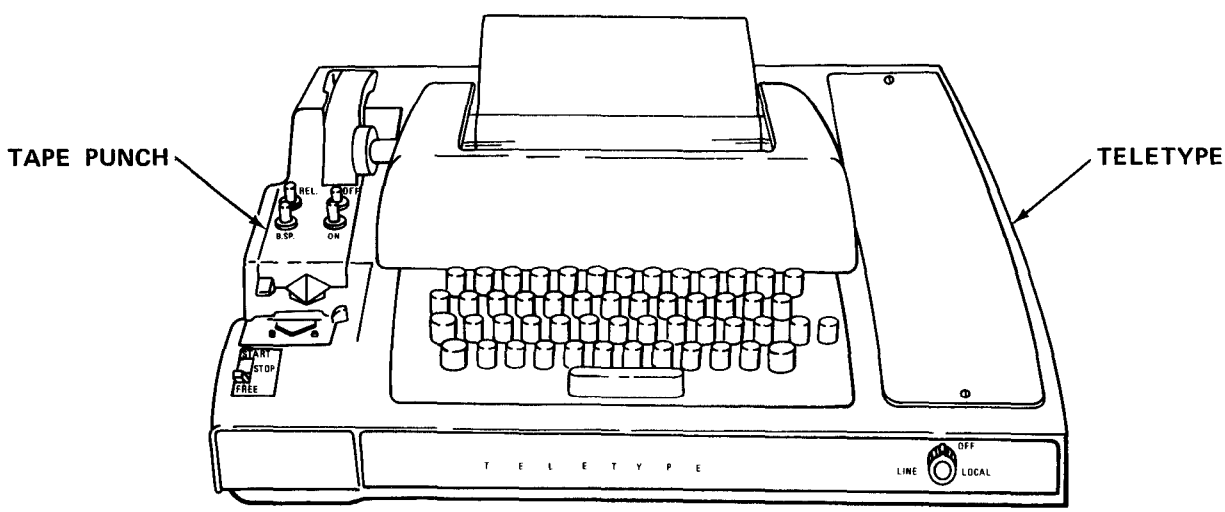
j. Special coating on underlighted glass top provides even, non-glare light table-type illumination of surface.

k. Mobile operator's console and keyboards allow combined drafting and measuring machine to be operated from three positions around machine.

l. Programs for drafting any shape can be typed and punched simultaneously on TTY.

3-2.2 Location and Description of Major Components.

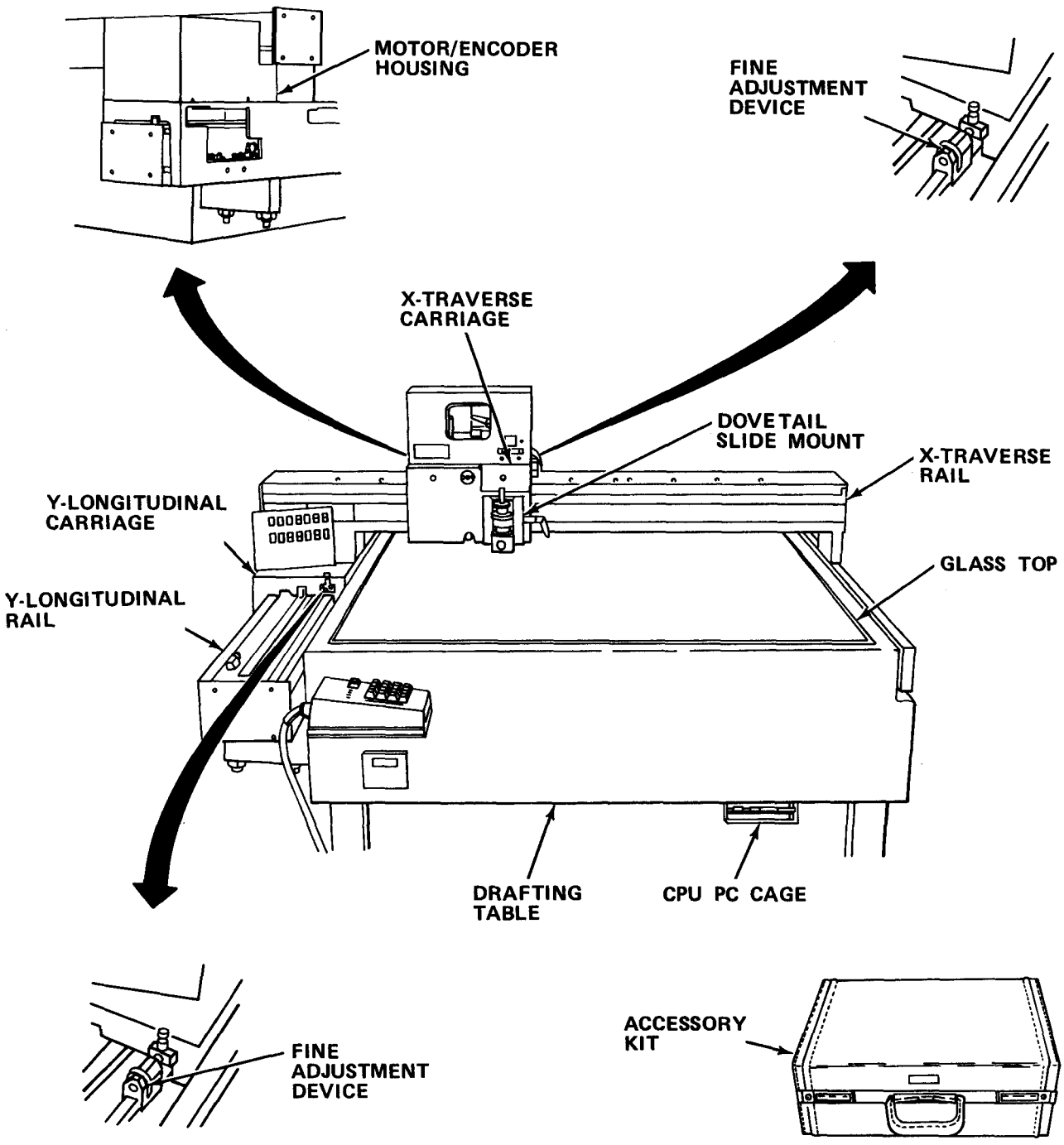




DSP MACHINE CONTROLLER. Houses CPU, paper tape reader, and power supply. Controls automatic operation of combined drafting and measuring machine.

OPERATOR'S CONSOLE. Used to operate DSP controller and drafting machine in automatic mode.

TELETYPE. Used to type and/or punch program, provide printouts of tape programs, and record digitizing information.



DRAFTING TABLE. Performs al 1 drafting operations.

Y-LONGITUDINAL RAIL. Supports the XY carriage system.

Y-LONGITUDINAL CARRIAGE. Moves along Y-longitudinal rail to supply Y-coordinate information.

MOTOR/ENCODER HOUSING . Protective cover over the X and Y drive motor/encoder assembly.

X-TRAVERSE CARRIAGE. Moves along the X-traverse rail to supply X-coordinate information.

GLASS TOP. Allows for a non-glare underlighting of the map, drawing, etc. during drafting operations.

FINE ADJUSTMENT DEVICES. Allows movement in small increments to give precise positioning of the X and Y carriages.

DOVETAIL SLIDE MOUNT. Used to mount all tools and accessories to the XY coordinate system.

CPU DC CAGE. Central processing unit printed circuit card cage. Used to hold the PC cards necessary to process the information needed to perform all drafting operations.

X-TRAVERSE RAIL. Supports the X-traverse carriage.

ACCESSORY KIT. Contains all tools necessary for all drafting operations.

3-2.3 Equipment Data.

Combined Drafting and Measuring Machine

Power Requirements	120 V, 10 amps, 60 Hz
Resolution per Display Digit	0.0002 in. (0.005 mm)
Drafting Surface Size	34 in. x 34 in. (86.4 cm x 86.4 cm)
DKA3 Display Size	2 rows of 7 digits
Display Resolution Accuracy	0.0002 in. (0.005 mm)
Drafting Speed	5.9 ft/min (1.8 m/min), max
Pen Line Widths (ink)	0.01-0.03 in. (0.25-0.8 mm)
Manual Scribe Line Widths	0.004-0.012 in. (0.10-0.30 mm)
Interpolation Modes	Linear and circular
Positioning Accuracy	±0.0008 in. (±0.020 mm)
Angular Accuracy	0.0008 in. (0.020 mm)
Drafting Accuracy	±0.0016 in. (±0.041 mm)
Repeatability	±0.0004 in. (±0.010 mm)

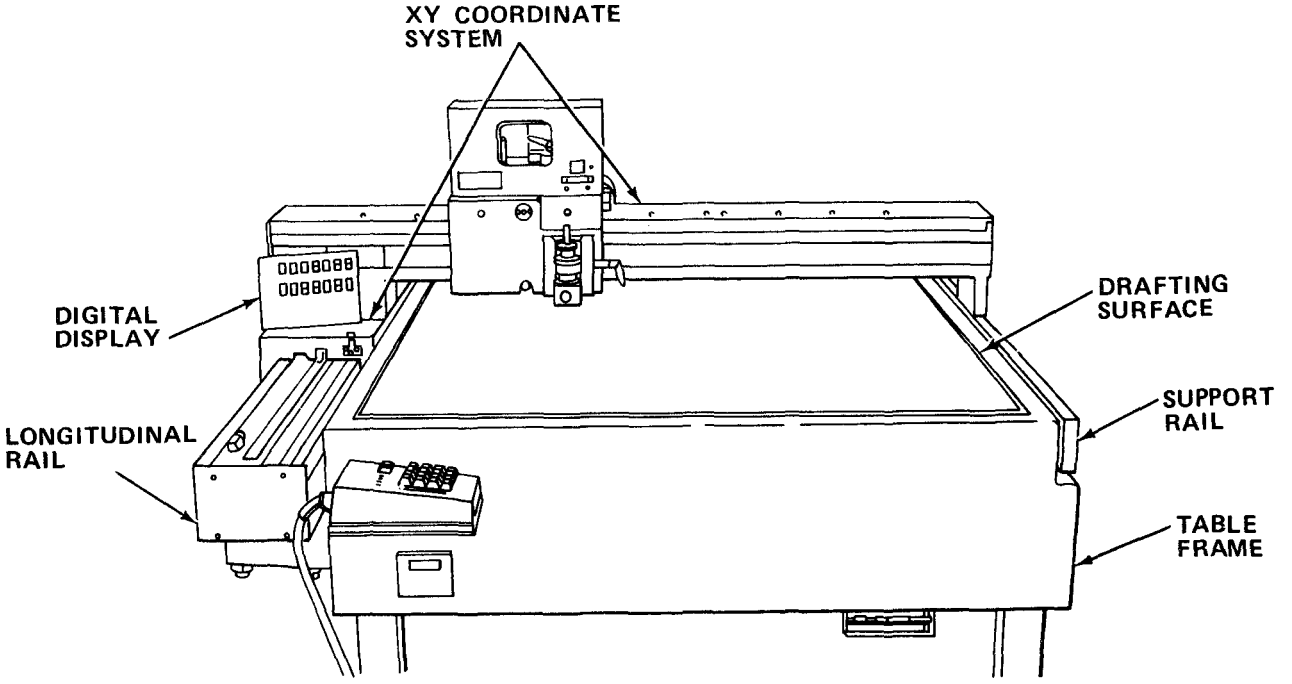
Dimensions	
Width	61.4 in. (155.9 cm)
Depth	52.4 in. (13.30 cm)
Height	47.7 in. (121.1 cm), min 50 in. (127.0 cm), max
Adjustable Height Range	0-3 in. (0-76 mm)
Table Lighting Source	Fluorescent Lamps
Bulb Size	30 in.
Average Bulb Life and Intensity	9000 hrs (steady burn) at 2290 lm
Squirrel Cage Fan Power Rating	120 V, 28 amp, 18 W, 60 Hz
Squirrel Cage Fan Size	3.5 in. (8.9 cm) dia.
Squirrel Cage Fan Output	40 f3/min (1.13 m3/min) at 3250 rpm
Drive Motor Parameters	Min = 0.75 amp Max = 4 amp
Drive Motor Type	DC stepper motor (5 phase)
Tangential Scribing Tool Line Widths	ZBZ331 = 0.004 in. (0.10 mm) ZBZ332 = 0.008 in. (0.20 mm) ZBZ333 = 0.012 in. (0.30 mm)
Tangentially Controlled Device	
Resolution	1
Alining Speed	3.3 /ms
Eccentricity	0.0002 in. (0.005 mm)
Vertical Movement of Tools	0.118 in. (2.99 mm), max
Adjustable Cutting Pressure	0.011-0.551 lbs (5-249 g)
Scribing Head Weight	1.322 lbs (600 g)
Motor Parameter	3.9 V dc

Teletype	
Power Requirements	120 V, 60 Hz, ± 10%
Paper Feed Type	Friction feed
Operating Speed	10 char/sec (110 baud)
Communication code	ASCII, no parity (mark pulse)
Transmission Modes	Full Duplex
Interface	20 mA current loop
Classification	KSR
Character Density	10 char/in (pica)
Character Line Length	72 char/line (8± in. paper) 6 lines/in.
EOL Activation	71st character
Intelligence Pulse Pattern	8 time units
Stop Pulse Pattern	2 time units
Start Pulse Pattern	1 time unit
Signal Line Current	0.020 amp
Nominal Selector Input	0.500 amp at 20 V dc
Dimensions	
Width	18-5/8 in. (47.3 cm)
Depth	18-1/2 in. (47 cm)
Height	8-3/8 in. (21.3 cm)
Weight	40 lbs. (18 kg)
Tape Reader	
Reading Speed	0-120 char/sec bidir
Reading Method	Optical
Tape Feed	Stepping motor and sprocket
Tape Width	8 track 1 in. (25.4 m)

Inner Char. Spacing	0.100 in. (2.54 mm); ± 0.5% accum after 50 rows; ± 3% between adjacent rows.
Tape Thickness	0.010 in. (0.25 mm), max
Input Signal Levels	Logical 1 = 2.4-5.3 V Logical 0 = 0-0.4 V (at 1.6 mA)
Output Signal Levels	Logical 1 = 2.7-5.3 V (at 400 A) Logical 0 = 0-0.4 V (at 4 mA)
Data Channels 1-8, Feed Hole and EOT Output Signals	Hole and EOT = logical 1 No hole = logical 0
SD Signal	Logical 1 or open input = forward motion Logical 0 = backward motion
RI Signal	Logical 0 (pulse width 25-100us) = read
MR Signal	Logical 1
DSP Machine Controller and Operator's Console	
Power Requirements	120 V, 60 Hz, ± 10%
Program Input	Punched tape; ASCII-coded
Microprocessor	MC68000 at 8 kHz
Operating Software	NC drafting program subset
Operating Program Storage	64K memory
Input Buffer Size	3 blocks of tape (24 bytes)
Power Supply Voltages	+24V, ±15V, +5V
Output Fuse	15 amp Bus
Operator's Panel	
Interface	RS-232C
Display Size	16 digits

3-3. TECHNICAL PRINCIPLES OF OPERATION. The purpose of the Model 102K Combined. Drafting and Measuring Machine is to measure and/or draft geometric shapes, lines, points, and to process geometric and positional data. It is composed of the following items:

Drafting Table
DKA-3 Digitizing System
DSP-2 Machine Controller



3-3.1 Drafting Table. Performs all drafting and measuring operations. It is composed of:

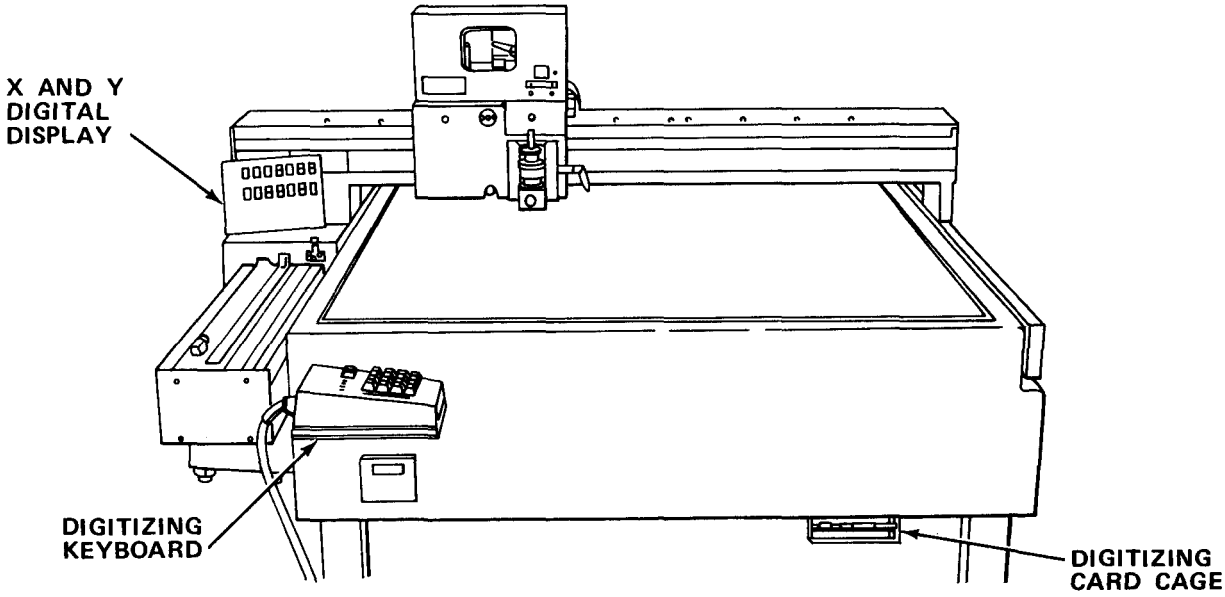
Table Frame
Drafting Surface
X-Y Coordinate System
X-Y Digital Display

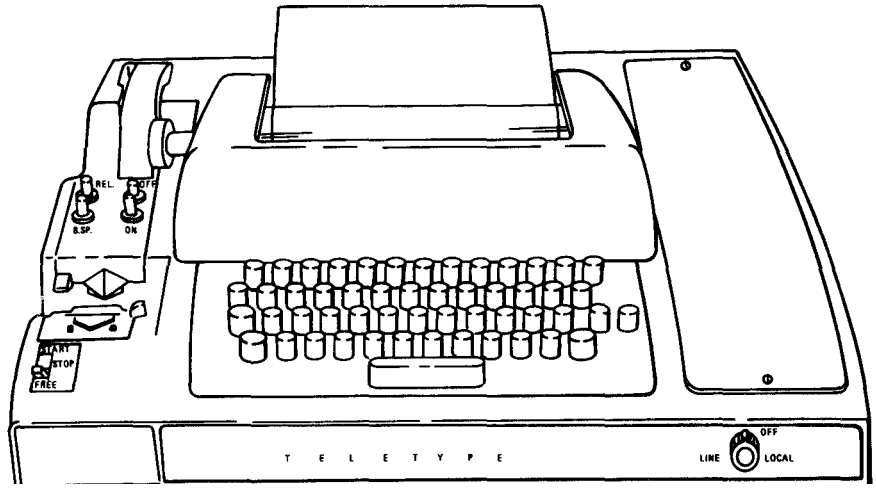
a. Table Frame. The basic frame is steel with four legs and contains the drafting surface and lighting unit. The carriage system's longitudinal rail and support rail are mounted on the sides of table. The table frame also houses the primary power wires (F03-1).

b. Drafting Surface. The drafting surface is glass which has a special coating on its bottom which provides for non-glare lighting. The glass provides a smooth surface for the drafting material to be attached.

c. X-Y Coordinate system. The rails for the coordinate system are arranged in a rectangular shape. The orthogonal coordinate values are measured and displayed by using rotary photoelectric encoders with 1000 slots generating 4000 usable electronic signals per revolution. The signals from the encoders are 5V square waves which are sent to the encoder circuit boards, then to the MC6800 microprocessor for routing to the digital display for read out. The encoders are coupled to pinions which are engaged to precision measuring racks. In the automatic drafting mode, the coordinate system follows programmed information from a teletype punched tape or the operator's console via the DSP machine controller. When not in the automatic mode, the coordinate system can be used for manual drafting and digitizing of maps or other drawings.

d. X-Y Digital Display. Provides a readout indicating X and Y dimensions by 7 digits per axis and sign (±). The X and Y coordinate signals are received from the encoders and encoder circuit boards via the MC 6800 microprocessor.





ASR-33 TELETYPEWRITER

3-3.2 DKA-3 Digitizing System. The digitizing system is a microprocessor device which can calculate all necessary information to write machine control data for controls which process linear and circular interpolation. The following components comprise and DKA-3 digitizing system and are housed (with the exception of the keyboard and teletypewriter) in the card cage located-on the underside of the table frame:

Keyboard
Power Supply
Encoder Circuit Boards
Keyboard Interface Circuit Board
ROM Memory Circuit Board
Teletypewriter Interface Board (TTY)
Central Processing Unit Circuit Board
ASR-33 Teletypewriter

a. Keyboard. The keyboard contains 16 keys, BCD coded, 10 of which are numeric keys and 6 are alpha keys. The minus key and alpha keys have two functions each while the numeric keys are for numeric entries. The numeral 7 is also used to call the second function of the alpha keys (paragraph 3-4.1). The keys control the digitizing operation and the numerical entries can be read on the digital display. The measuring mode, coordinate presets, and scale factor entries are made via the keyboard. The four LED's on the keyboard indicate the various operations taking place and they will extinguish upon termination of the current entry, The 7 segment digital LED indicates the current measuring mode of the digitizing operation (Table 3-4). The push button on the keyboard starts the microprocessor after turning the display on, clears, and resets the display to all zeros. The resetting of the microprocessor causes the system to default to the English measuring system showing an E on the 7 segment LED. Depressing the X, Y, or B key allows the digitized information to be sent to the teletypewriter from the TTY interface circuit card. The interface circuit card enables the teletypewriter to produce the digitized information on a numeric control punch tape for the automatic drafting operation.

b. Power Supply. The power supply provides the necessary voltage to the DKA-3 logic circuit boards for the digitizing operation.

c. Encoder Circuit Boards. There are two encoder boards; one for the encoder on the X-carriage and one for the encoder on the Y-carriage. The signals from the encoders are processed and routed to the X-Y digital display. During the digitizing operation, the signals are stored in the RAM memory on the CPU circuit board.

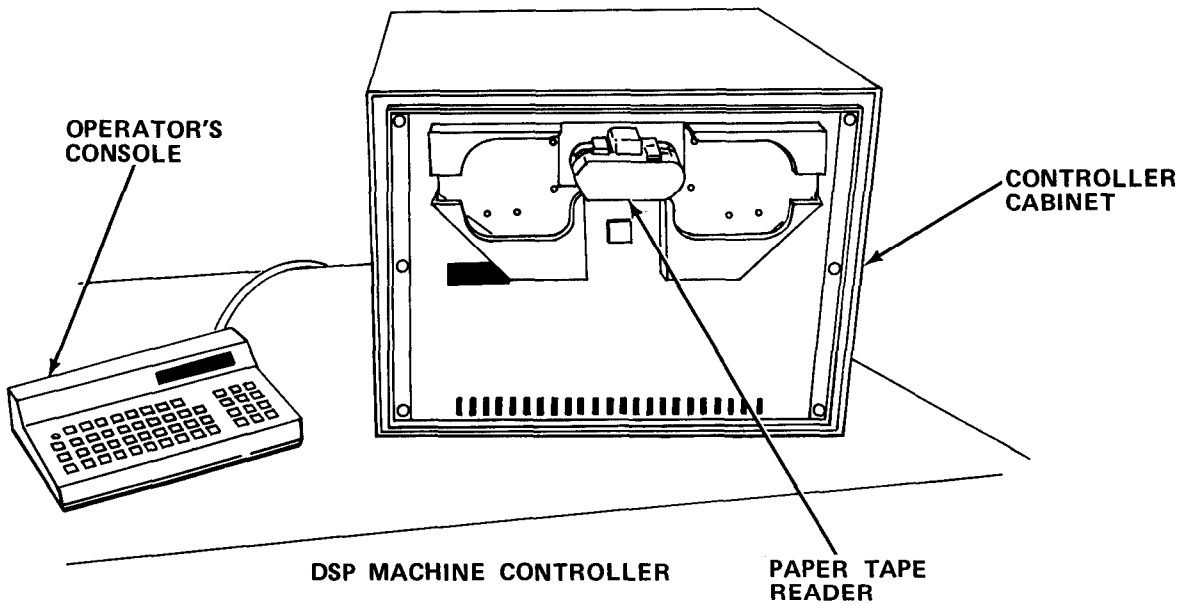
d. Keyboard Interface Circuit Board. The keyboard interface has two purposes; the first is to decode the keyboard for use by the other circuits, and the second is to provide a common bus to the digital display.

e. ROM Memory Circuit Board. The ROM contains the complete operational program for the digitizing mode.

f. Teletypewriter Interface Circuit Card. The TTY interface links the digitizing system to the teletypewriter and allows the information to be passed to the teletypewriter which produces the numeric control punched tape to be used in the automatic drafting operation.

9. Central Processing Unit Circuit Card. The CPU (MC 6800) card contains the microprocessor and RAMs with associated IC chips to control the digitizing operation.

h. ASR-33 Teletypewriter. The teletypewriter receives the digitizing information via the TTY interface circuit card for the printing of information and for punching of the numeric control tape. The ASR-33 teletypewriter used with the Model 102K only receives information.



3-3.3 DSP Machine Controller. The DSP machine controller contains a machine dedicated microprocessor with interfaces to control the various automate drafting functions. It consists of two basic units:

Operator Console
Controller Cabinet

a. Operator Console. The operator's console is microprocessor controlled and is designed in a keyboard fashion. It has a full set of alphanumeric ASCII characters plus eight additional machine function keys. These keys are used to program drafting information or can be used to override the punched tape program (paragraph 3-4.1). A 16 digit alphanumeric display shows all operator's entries or shows present machine status.

(1) The keyboard on the operator panel can be used to directly control the movement of the X and Y carriage system and provides for the input of manual drafting commands.

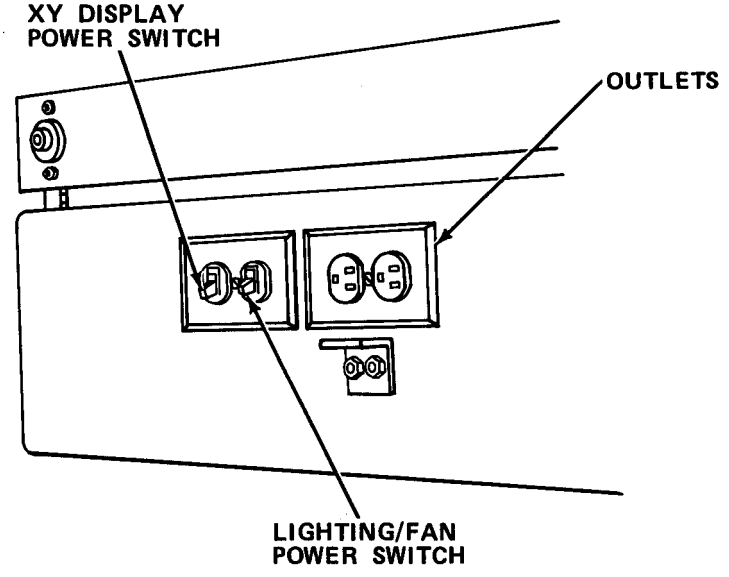
(2) The operator console is freely movable and is connected to the machine controller with a single cable and uses a RS232C serial interface.

b. Controller Cabinet. The machine controller is the main unit of the automatic drafting and scribing operations. The controller contains a machine dedicated microprocessor with interfaces needed to control these operations. The controller houses the FACIT 4031 tape reader which reads the punched tape from the teletype-writer for automatic drafting/scribing operations, two D100 boards which are the motor drive circuits for the X and Y carriages, and the pen drive/tangential tool control circuit board. The +5 V, ±15 V and +24 V power supplies which provide the voltage for proper operation of the DSP machine controller are also housed within the controller cabinet.

Section II OPERATING INSTRUCTIONS

3-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.

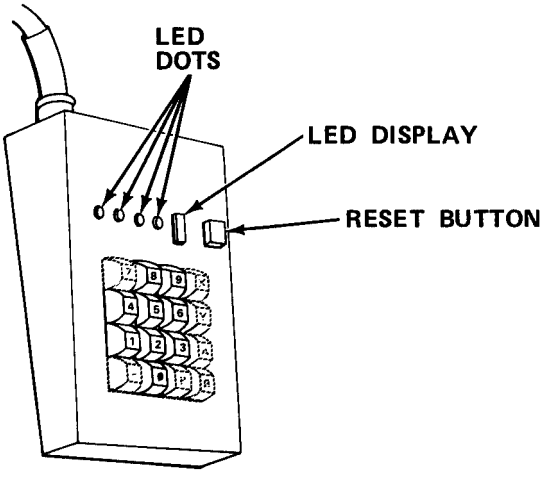
Key	Control or Indicator	Function



Main Machine Controls

XY Display Power Switch	Controls power to DKA3 keyboard, display, and PC cage.
Lighting/Fan Power Switch	Controls power to fluorescent underlights and ventilation fans.
Outlets	Provide power source for any auxiliary equipment.

Key	Control or Indicator	Function



Digitizing Keyboard (DKA 3)

	XY Display Reset Button	Used to reset (zero) XY display and start display microprocessor. System will default to 000.0000 on XY display and English units measuring system, with scale factor 1 in. = 1 in.

NOTE

Dark keys have second functions involving operation of keyboard and machine displays.

7	7 Key (Shift Key)	Has two functions: Used to input the number 7 or, when pressed before keys X, Y, A, B, or P, activates second function of those keys.

Key	Control or Indicator	Function
[X]	**X** Key	Pressing alone transmits current X and Y coordinates shown on XY Display, at last set scale factor and units of selected measuring system, and with built-in “pen up” command. When preceded by 7 key, used to preset X-axis to specific value, with machine stationary at desired point. Input is completed and displayed by pressing X a second time after number.

NOTE

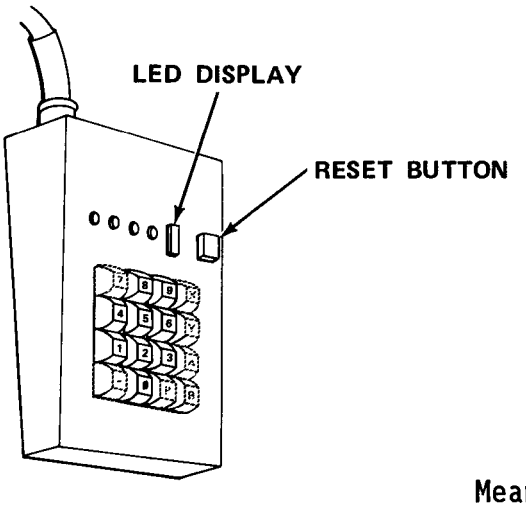
Pressing 7, X, and X, without entering number, cancels second function of X.

[Y]	Y Key	Operates same as X key above, except that it has built-in “pen down” command for drafting.
[A]	Data Key A	Pressed alone, it transmits both X and Y coordinates on display as point location data for measuring or digitizing arcs or circles. Indicates to CPU that coordinates are first point of arc or circle. When pressed after 7 key, used to set scale factor for X-axis measurements. Scale factor input is completed and displayed by pressing A again after number.

Key	Control or Indicator	Function
	NOTE When in entry mode, XY display freezes and will not change until completed, even if carriage is moved.	
B	Data Key B	Pressed at endpoint of arc or circle to transmit displayed coordinates as block of data describing arc or circle. When pressed after 7 key, used to set scale factor for Y-axis measurements. Scale factor input is completed and displayed by again pressing B.
-	Minus (-)/Diameter Key	Pressed before numerical entry to designate that entry is circle diameter. When pressed after 7 key, designates and transmits “End of Program” or “End of File” (EOF) code. When pressed after 7A, 7B, 7X, or 7Y, enters negative sign into scale factor.
	Numerical Entry Keys 0-9	Used to input corresponding number.
	LED Dots	Used to indicate status of input and keyboard. (See Table 3-1 for meanings of lighting combinations.)

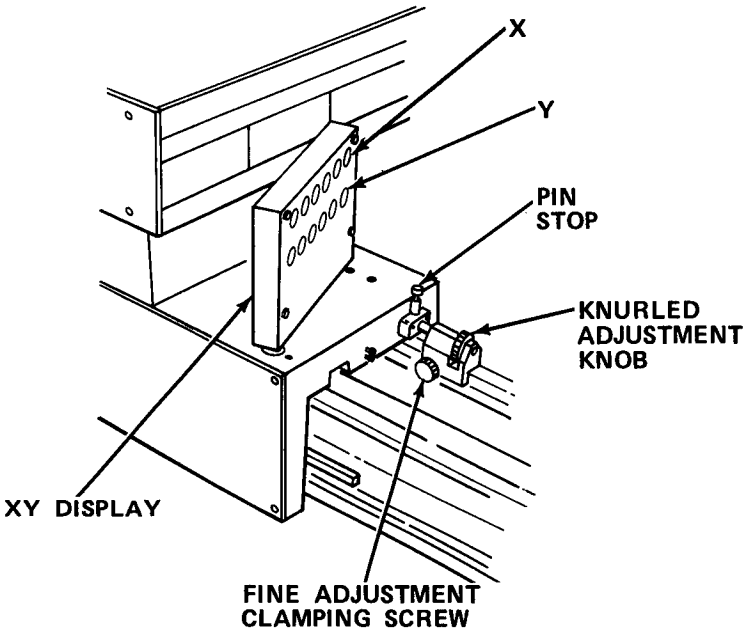
Key	Control or Indicator	Function
	LED Display	Indicates current measuring system selected. Displayed code letters are: E = English (Inch) System of Units A = English Mapping System (Feet) C = Metric System

Table 3-1. MEANING OF DIGITIZING KEYBOARD LIGHTING COMBINATIONS



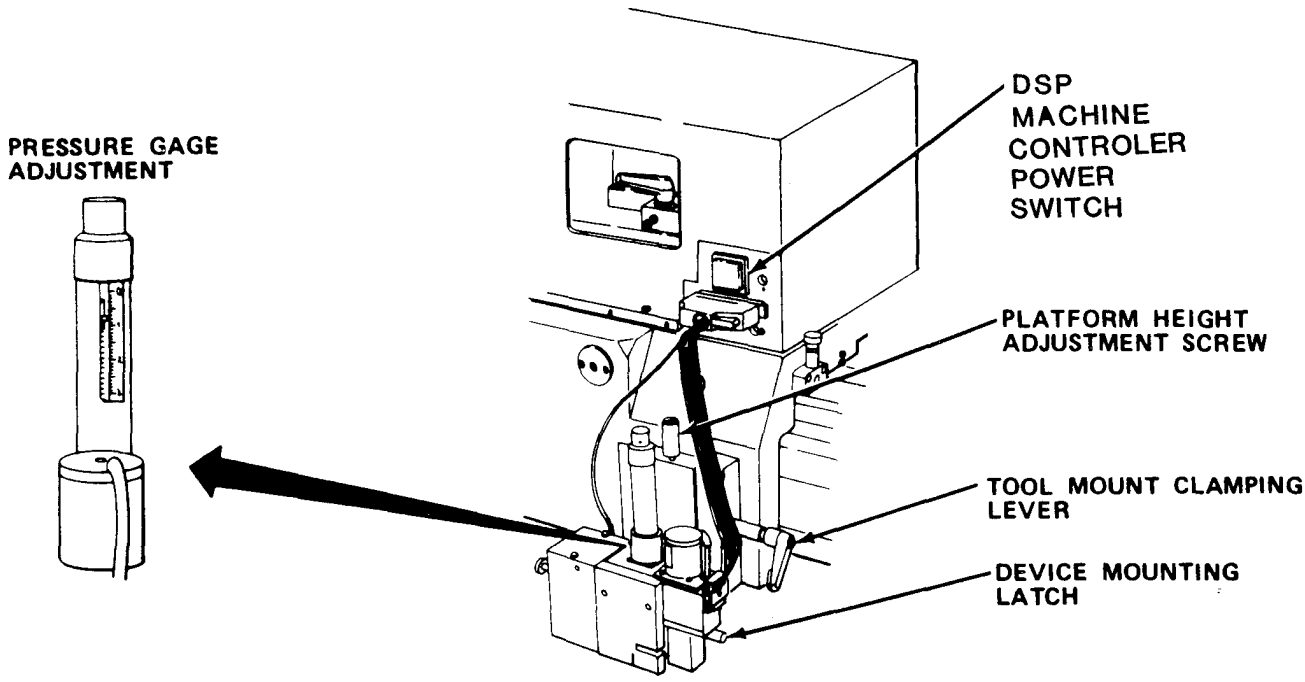
Led	Meaning
NOTE If any two LEDs are on, you are still in the "entry" mode, and value of XY display will not change regardless of carriage movement.	
A and D on	Entry not complete, second function of X or Y key not entered.
A and B on	Axis scale factor selection entry not complete, second function of A or B key not entered.
C and D on	Reset or (-) just pressed.
A through D on	Keyboard locked out or reset just pressed. (LEDs light momentarily when reset is pressed.)
D on	7 key just pressed.
D comes on, goes off	7, P just pressed.
D stays on	Display and DKA-3 at default, or no special functions have been selected.

Key	Control or Indicator	Function



	(DKA3) XY Display	Indicates, in selected measuring system units and scale factor, exact position of drafting tool point over surface of table as pair of position coordinates. Top number in XY display represents X-axis coordinate; bottom number, Y-axis coordinate. Can be moved on pivot to position for best display.
	Fine Adjustment Device	
	Stop Pin and Knurled Adjustment Knob	Pin attaches device to carriage. Fits into hole in tool end. Thumbwheel used to adjust tool position on rail, thus adjusting carriage position.
	Fine Adjustment Clamping Screw	Locks device into position against rail to hold carriage in position.

Key	Control or Indicator	Function



Tangentially Controlled Device and Machine Mounting

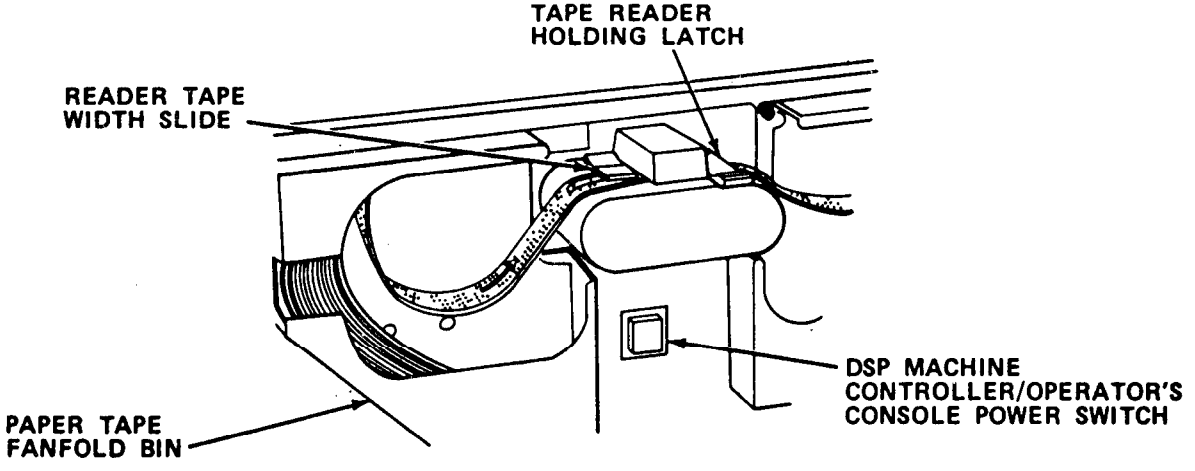
Pressure Gage Adjustment	Controls pressure applied on drafting surface by points mounted in tangentially controlled device. Turning knob at top of device moves indicator pin down gage and increases pressure.

NOTE

Markings on gage do not correspond to established pressure.

Device Mounting Latch	Spring latch holds tangentially controlled device or ink pen in place on platform.

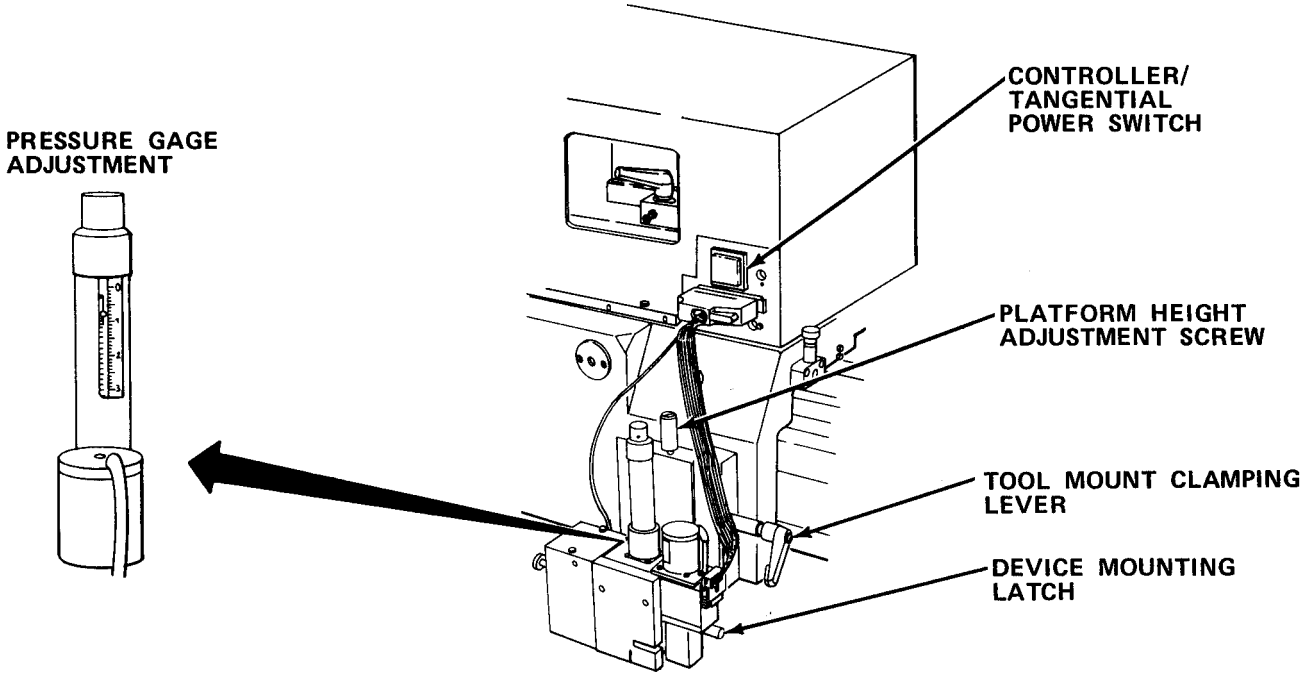
Key	Control or Indicator	Function
	Tool Mount Clamping Lever	Turned right to hold tool-holding platform in place.
	Platform Height Adjustment Screw	Turning moves platform up or down in slide mount to adjust height of drafting points from drafting surface.
	DSP Machine Controller Power Switch	Allows power to DSP machine controller and tangentially controlled device to be controlled from machine. This is a self-locking switch.



Controller Cabinet

	DSP Machine Controller/Operator's Console Power Switch	Controls power to DSP machine controller and operator's console. Will also turn on power to tangentially controlled device if power is not on.
	Tape Reader Holding Latch	Holds paper tape in place.
	Tape Reader Width Slide	Slides in or out to adjust to tape.
	Paper Tape Fanfold Bin	Holds and guides paper tape.

Key	Control or Indicator	Function



Tangentially Controlled Device and Machine Mounting

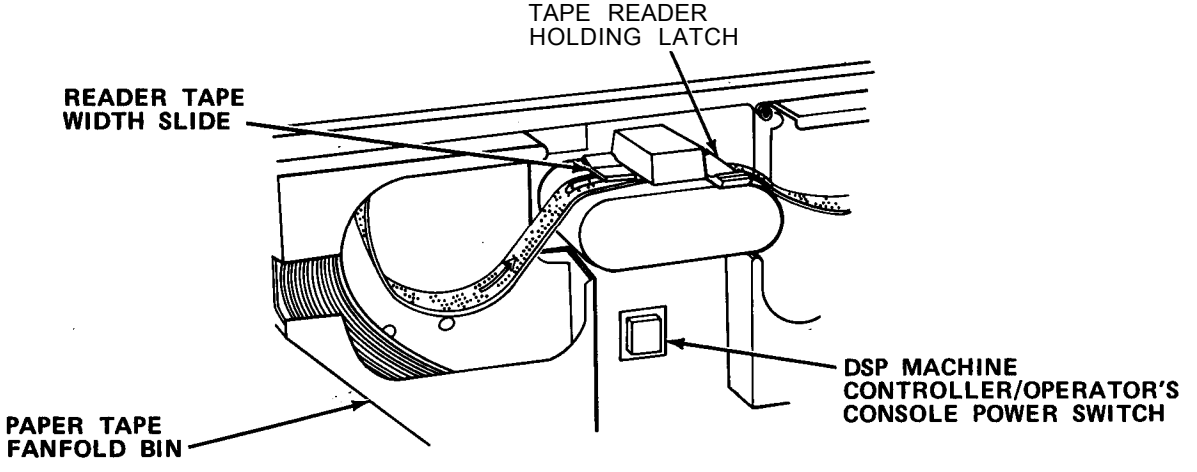
Pressure Gage Adjustment	Controls pressure applied on drafting surface by points mounted in tangentially controlled device. Turning knob at top of device moves indicator pin down gage and increases pressure.

NOTE

Markings on gage do not correspond to established pressure.

Device Mounting Latch	Spring latch holds tangentially controlled device or ink pen in place on platform.

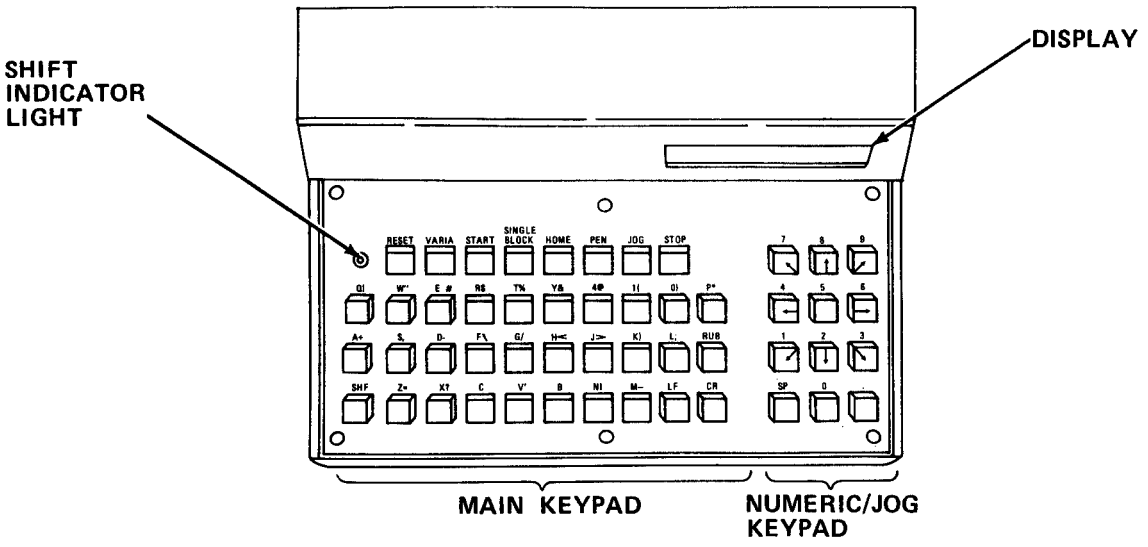
Key	Control or Indicator	Function
	Tool Mount Clamping Lever	Turned right to hold tool-holding platform in place.
	Platform Height Adjustment Screw	Turning moves platform up or down in slide mount to adjust height of drafting points from drafting surface.
	Controller/Tangential Power Switch	Allows power to DSP machine controller and tangentially controlled device to be controlled from machine. This is a self-locking switch.



Controller Cabinet

	DSP Machine Controller/Operator's Console Power Switch	Controls power to DSP machine controller and operator's console. Will also turn on power to tangentially controlled device if power is not on.
	Tape Reader Holding Latch	Holds paper tape in place.
	Tape Reader Width Slide	Slides in or out to adjust to tape.
	Paper Tape Fanfold Bin	Holds and guides paper tape.

Key	Control or Indicator	Function



Operator's Console-Main Keypad

	Display	Displays current input to panel. Entries into display appear at far right side and flow to left.
	Shift Indicator Light	Indicates when SHF (shift) key has been pressed, activating shift function and setting keyboard to operate upper case function of each key.

NOTE

On numeric keypad, first function is written above key; directional arrows on keys are only active in "JOG" mode. On main keypad, function on right is upper case of key.

RESET	Reset Key	Resets display and DSP machine controller. When pressed, display shows " ---RESET---."

Key	Control or Indicator	Function
VARIA	Variable Key	Calls up variable function for entering program command statement, such as scale or preset. Display shows "---VARIA---" when pressed.
START	Start Key	Controls tape reader on DSP machine controller. Pressed to start reading tape. Display shows "---START---" when pressed.
SINGLE BLOCK	Single Block Control Key	Controls tape reader on DSP machine controller after pressing START. Tape reader reads one block of data each time START is pressed. Display shows "---SINGLE BLOCK---" when pressed.
HOME	Home Key	Moves machine to start point on table surface. Display shows "---HOME---" when pressed.
PEN	Pen Control Key	Enables pen control function. Allows commands controlling pen position to be input. Display shows "PEN" in left corner when pressed.
JOG	Jog Control Key	Enables JOG function. Allows pressing of arrow keys on numeric keypad to control movement of machine carriages. Display shows "JOG" in left corner when pressed.

CAUTION

Only one directional key should be pressed at a time or damage could result.

Key	Control or Indicator	Function
JOG - Cont	Jog Control Key - continued	Initial JOG speed is automatically set to fast speed. Change speed by typing one of four commands: SLO (Slow) depress CR MED (Medium) depress CR FAS (Fast) depress CR STP (Step) depress CR

NOTE

In STP, transverse moves one step 0.0002 in. (.005 mm) each time arrow button is pressed.

STOP	Stop Key	Stops tape reader from reading tape. Display shows " ---STOP---" when pressed.

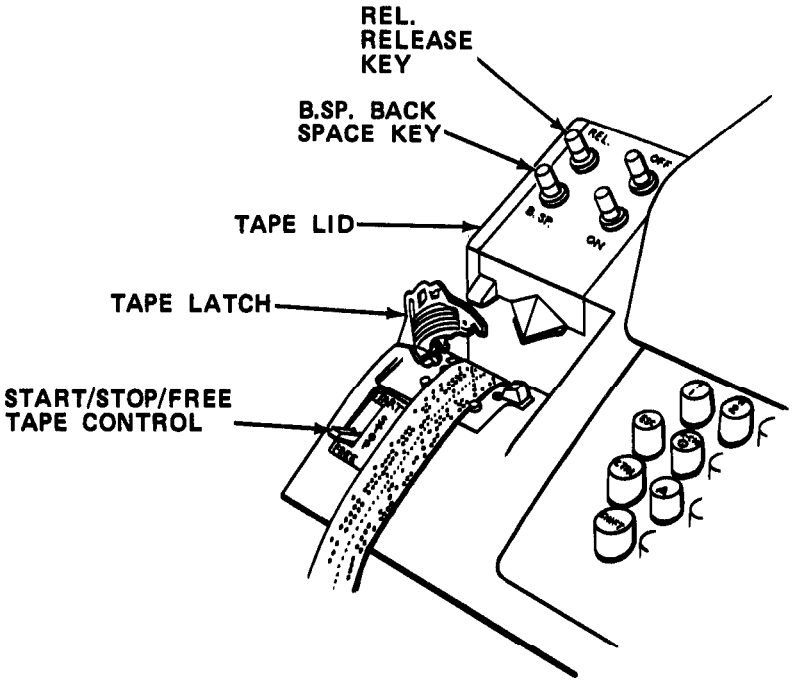
NOTE

Machine always runs 3 data blocks behind tape reader. Machine will take several minutes to stop after stopping reader.

SHF	Shift Key	Allows use of second functions of main keypad. Pressing turns on shift indicator lamp. Shift key must be pressed again to return to primary functions.
LF	Line Feed Key	Not used.
CR	Carriage Return Key	Commands carriage return. Clears display. Outputs current line in display to controller. CR = End of data block.

Key	Control or Indicator	Function
RUB	Rubout Command Key	Used to rub out or remove characters from display, one character at a time. Removes rightmost character, and display moves right to fill gap.
	↑(Not Used - Inactive)	
	←(Not Used - Inactive)	
	Main Typing/Symbol Keys	Used to input most of alphanumeric characters and symbols found in standard ASCII character set into display. Characters or symbols written above and on left side of key are primary functions, activated by pressing key with shift key off.
SP	Space Key	Used to place space in display. Performs same function as typewriter space bar.
	Operator's Console Numeric Keypad	
	Numeric/Job Direction Keys	Used to input numbers, including decimal point into display. Those functions above keys are primary functions. Arrow (direction) functions written on keys are secondary functions and cannot be used unless JOG is activated. When arrow keys are activated, pressing them causes machine to move in direction indicated by arrow.

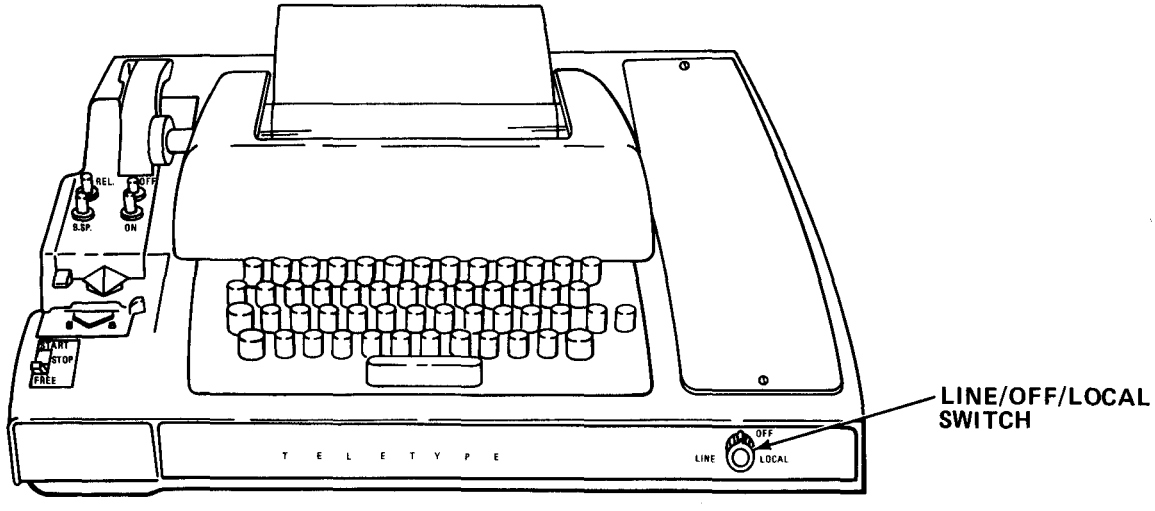
Key	Control or Indicator	Function



Paper Tape Punch (TTY)

B.SP.	Back Space Key	Backspaces tape reader one character.
REL	Release	Release paper tape so it can be inserted or removed from tape punch mechanism.
OFF		Turns off tape punch mechanism and disengages it from typing unit.
ON		Turns on tape punch mechanism. Any code input to teletype or typed on keyboard will be punched on tape.

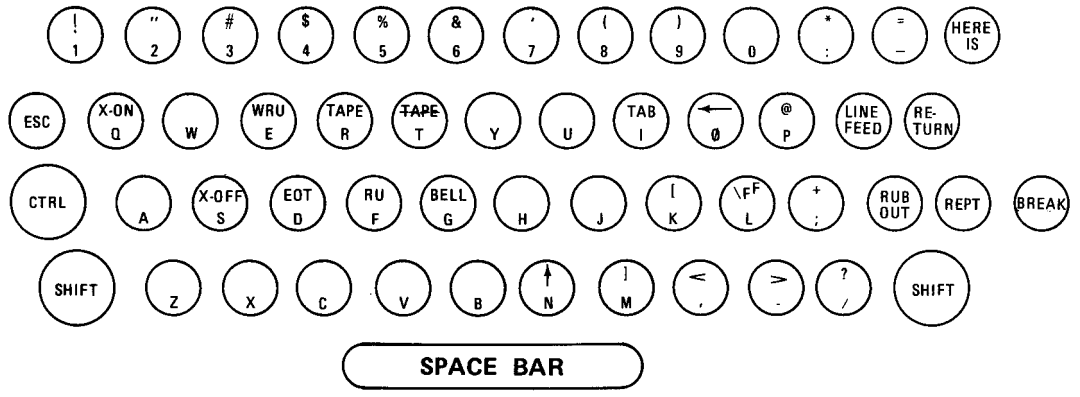
Key	Control or Indicator	Function
	Paper-Tape Reader (TTY)	
START/STOP/FREE	Tape Control	Controls tape reader for duplicating/reading tapes. Place in FREE position to position tape in reader. Placed in START position to start reader reading tape. Placed in STOP position to stop reader.
	Tape Lid and Latch	Plastic lid holds tape in position while being read. Spring-operated tab latch locks lid in place over tape.



Teletype Keyboard

LINE/OFF/LOCAL	Switch	Turns teletype on and off. When turned to LINE, teletype operation is controlled by inputs from drafting machine during digitizing operation. When turned to LOCAL, machine is controlled via its keyboard and unaffected by signals from drafting machine.

Key	Control or Indicator	Function



	Space Bar	Spaces typewriter head one character space to right.
SHIFT	Shift Key	Allows use of functions written above keys. Press key to activate function.
CTRL	Control Key	Used in conjunction with other keyboard keys to produce ASCII control codes and characters.
ESC	Escape Key	Cancels last keyboard-generated command.

NOTE

In order to rub out, you must first backspace to error, then rub out.

RUB OUT	Rub Out Key	Cancels key pressed inadvertently on tape by putting holes across tape at that spot. Holes across tape are interpreted as “ignore this” by receiving unit.

Key	Control or Indicator	Function
HERE IS	Here Is Key	Used to create leader holes in tape. Translates as “ready” signal to receiving unit.
RETURN	Carriage Return Key	Typing unit moves print head all the way to left-hand margin of next line.
LINE FEED	Line Feed Key	Advances paper and tape one line, without moving print head. Punches in ASCII line feed (LF) code on tape.
REPT	Repeat Key	Causes typing unit and tape punch to repeat last key pressed.
BREAK	Break Key	Cancels other keyboard operations and resets unit for input.
	Main Typing/Symbol Keys	Used to type and/or punch most of symbols of ASCII character set. Pressing key on keyboard causes letter, number, or symbol written on key to be typed on paper and, if desired, punched on tape. Characters at top of key are input by first pressing SHIFT key.

3-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If your equipment fails to operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

3-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials for PMCS is as follows:

Item	Quantity
Flat Tip Screwdriver	1 ea
Glass Cleaner Solution (Item 11, appendix E)	ar
Cheesecloth (Item 6, Appendix E)	ar
Mineral Oil (Item 16, Appendix E)	ar
General Purpose Detergent (Item 9, Appendix E)	ar
Camelhair Lens Brush	1 ea
Air Filter	ar

Table 3-2. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		COMBINED DRAFTING AND MEASURING MACHINE	
1	B	Inspect Machine.	
		1. Inspect cabinets, casings, frames, and other exterior surfaces of machine for signs of damage, such as cracks and breaks.	Glass broken or cracked.
		2. Check that all cables are connected and are tight.	Loose cables.
		3. Check glass surface and pinion racks for dirt and foreign particles. Clean as required.	
		4. Check teletype platen for dirt and foreign particles, Clean as required.	
		5. Check that keys on operator's console keyboard are free.	Keys stuck.
		6. Turn on machine and controller. Check that machine fluorescent lights and ventilation fans are on. Check that controller power button is lit and operator's console displays asterisk (*) in its right-hand corner. Check that you can hear ventilation fans in rear of cabinet working.	Ventilation fans inoperative.
		7. Turn on XY Display and press RESET on digitizing keyboard. Check that display shows all zeros and keyboard measuring mode display shows an "E".	XY display inoperative.
		8. Turn teletype power switch to LOCAL. Check that it is on by listening for hum of drive motor located beneath paper roll inside cabinet. .	Drive motor not on.

Table 3-2. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
BI - Biennially

(Number) - Hundreds of Hours

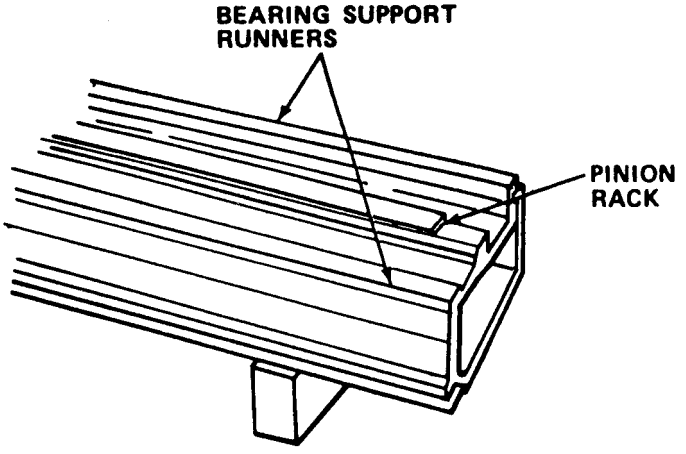
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		COMBINED DRAFTING AND MEASURING MACHINE - Cent	
2	B	Service Rails.	
			
		1. With camelhair lens brush, brush away dust and foreign matter from pinion racks and bearing support runners of both table rails.	Pinion rack has broken teeth or has come loose from rail.
		2. Inspect rails to be sure pinion rack and runners are clean and smooth.	

Table 3-2. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before	**W - Weekly**	**AN - Annually**	**(Number) - Hundreds of Hours**
D - During	**M - Monthly**	**S - Semiannually**	
A - After	**Q - Quarterly**	**BI - Biennially**	

ITEM NO.	IN-TER-VAL-	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If;
		COMBINED DRAFTING AND MEASURING MACHINE -Cont	
6	AN	Service Table (Clean Ventilation filters) - Cont 5. Wash filters in water and detergent to remove dust and dirt. If filter will not come clean, replace. 6. Rinse filters thoroughly in clean water and reinstall when dry. 7. Reinstall filter grilles and secure. 8. Reinstall front panel and turn mounting screws half right.	

3-6. OPERATION UNDER USUAL CONDITIONS.

3-6.1 Assembly and Preparation for Use.

WARNING

Death or serious injury may occur from electrical shock unless power cords are unplugged before servicing.

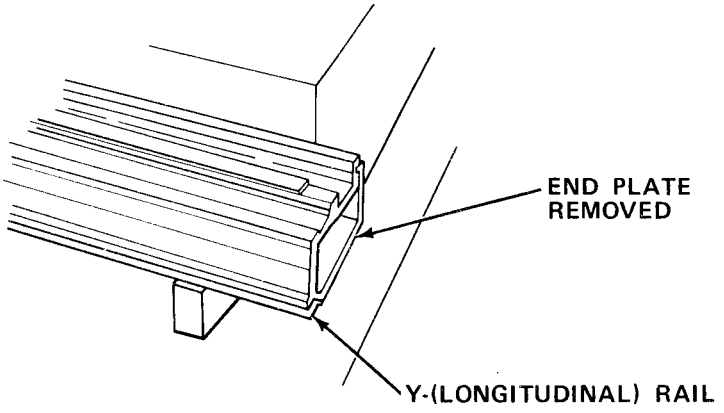
NOTE

Some steps in this procedure require two persons to perform.

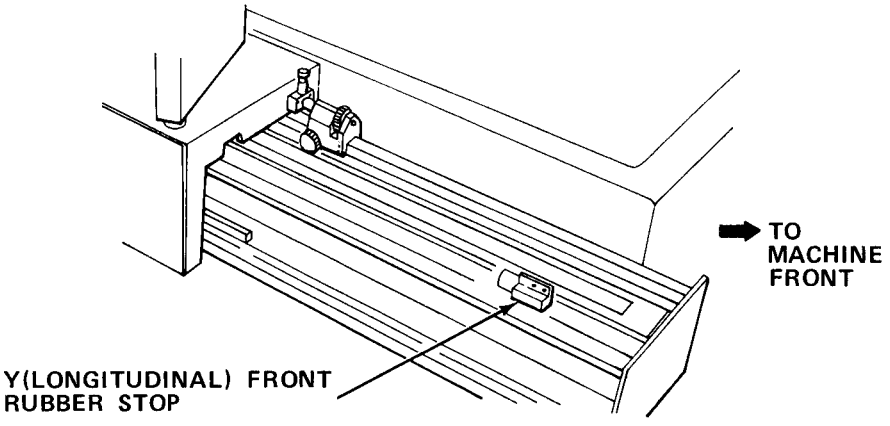
a. Remove straps and wooden plate hold down.

b. Remove and stow two shipping brackets from table top.

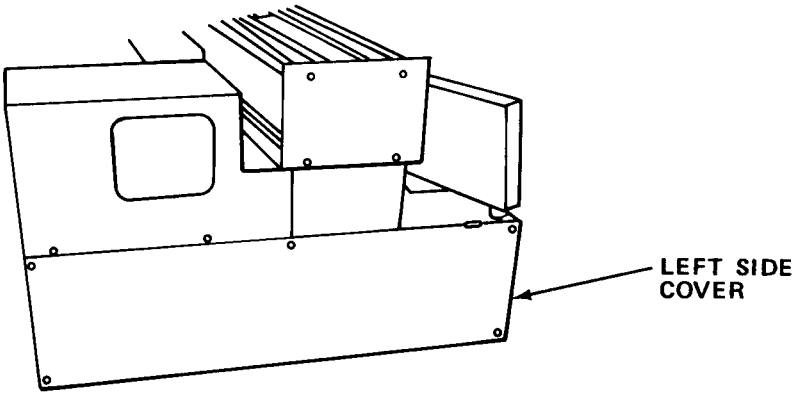
c. Mount Y (longitudinal) and X (transverse) carriages as follows.



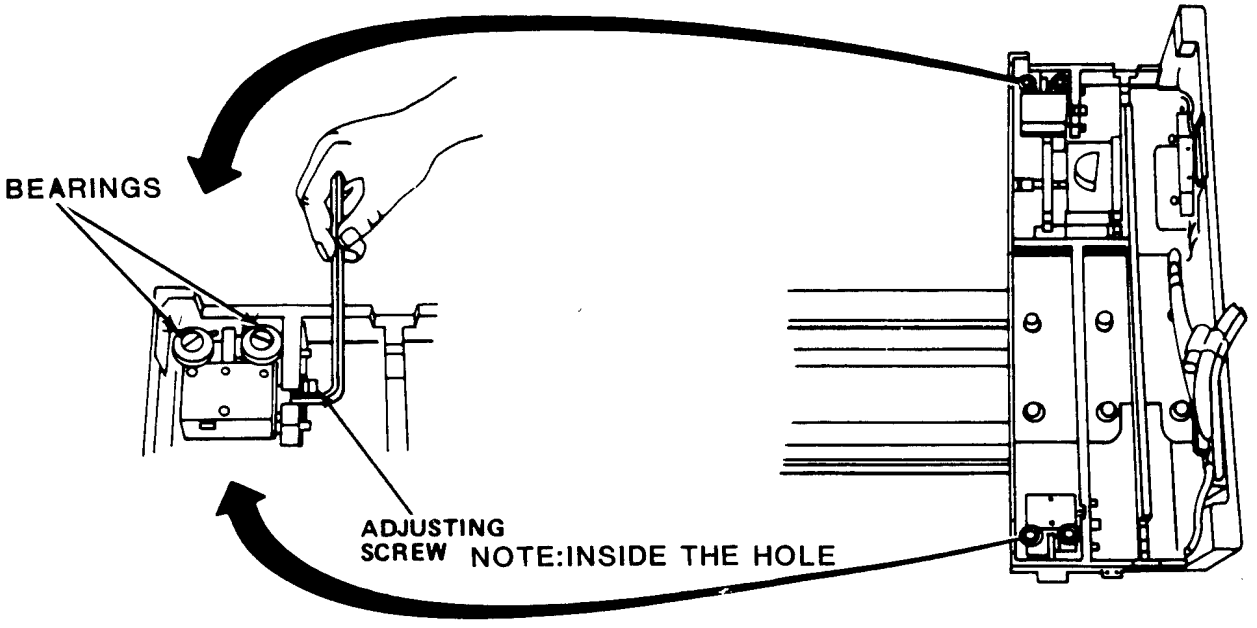
(1) Remove front end cover plate from end of Y-rail.



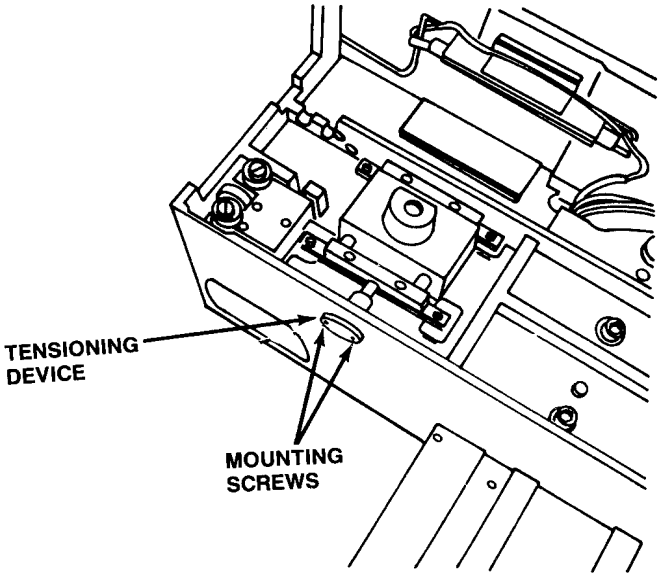
(2) Remove Y-rail front rubber stop.



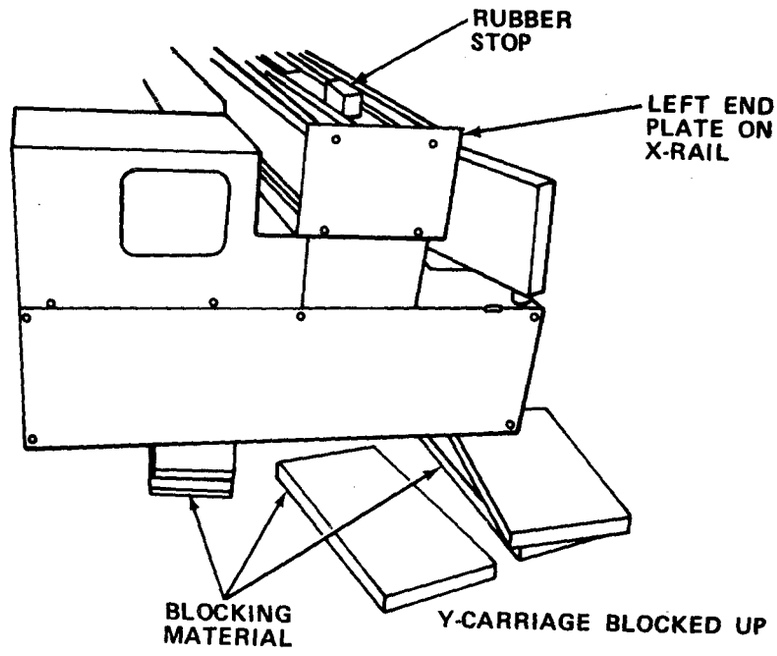
(3) Remove Y-carriage left side cover.



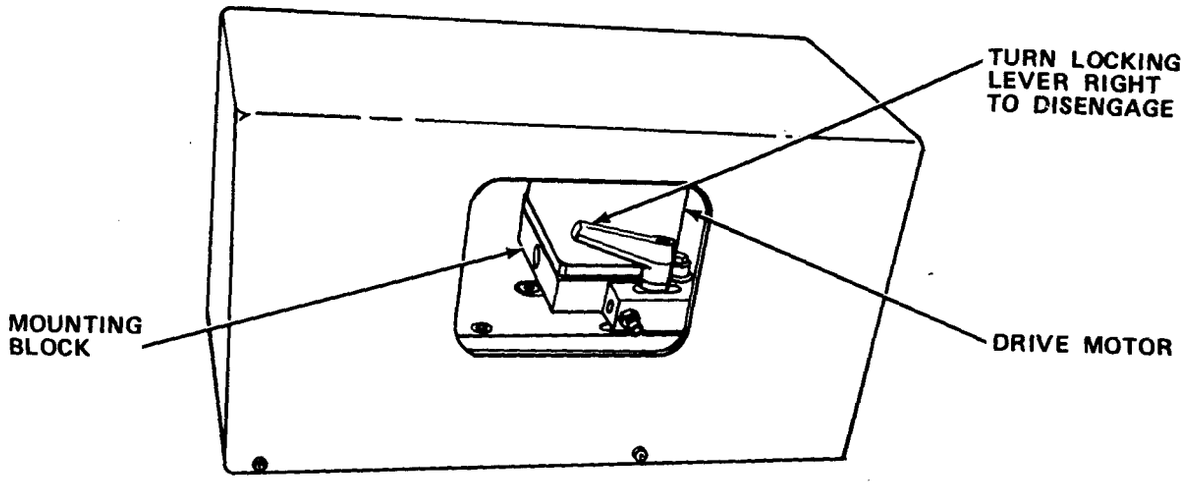
(4) Turn Y-carriage adjusting screws right to loosen bearings.



(5) Remove two mounting screws and tensioning device from Y-carriage.



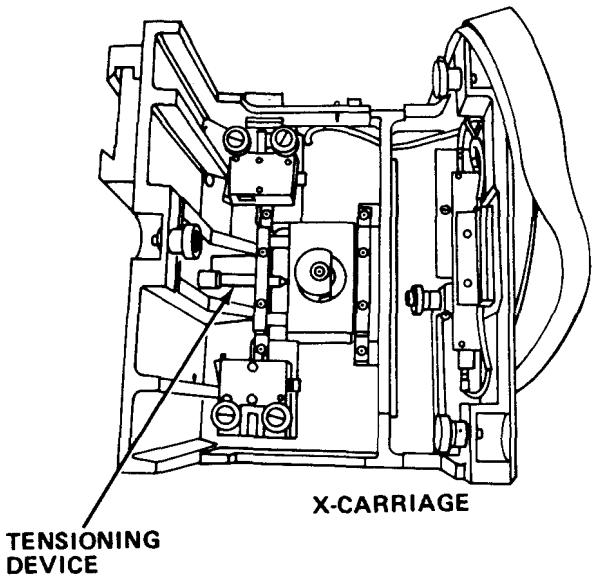
(6) Turn Y-carriage over and block end.

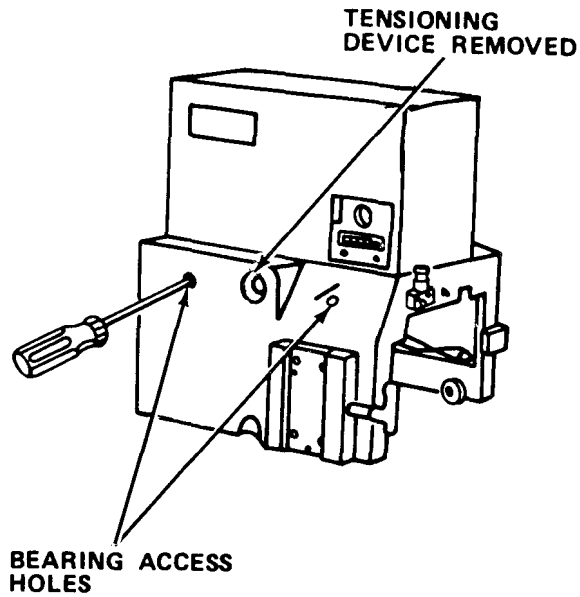


NOTE
Moving block left engages drive and encoder gears. Moving block right disengages.

(7) Disengage Y-carriage drive motor by loosening locking lever and moving motor back. Then lock motor into place.

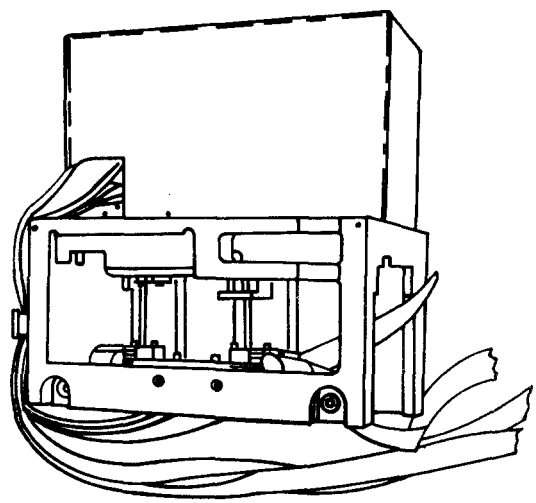
(8) Remove plate and rubber stop from left end of X-rail.





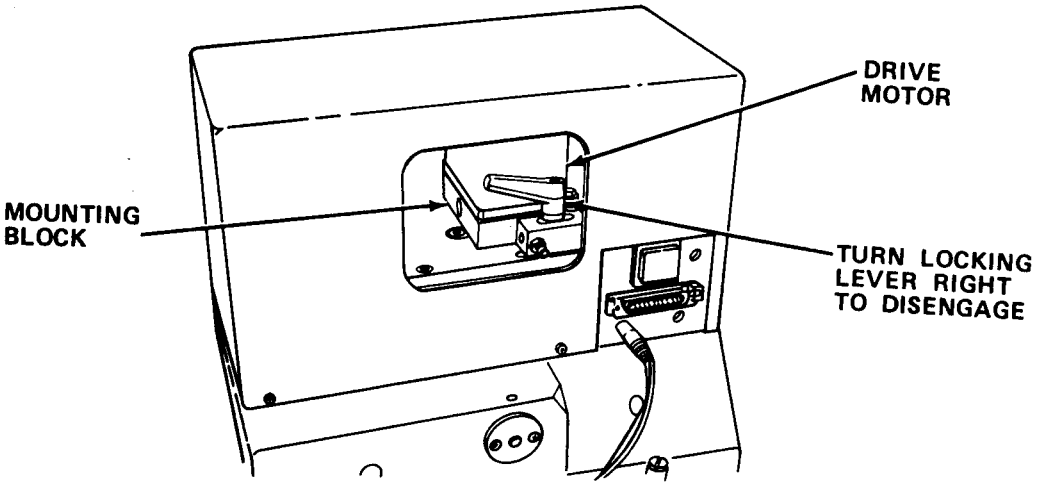
(9) Remove tensioning device from X-carriage.

(10) Turn X-carriage adjusting screws left to loosen bearing.



BOTTOM BACK COVER REMOVED FROM X-CARRIAGE

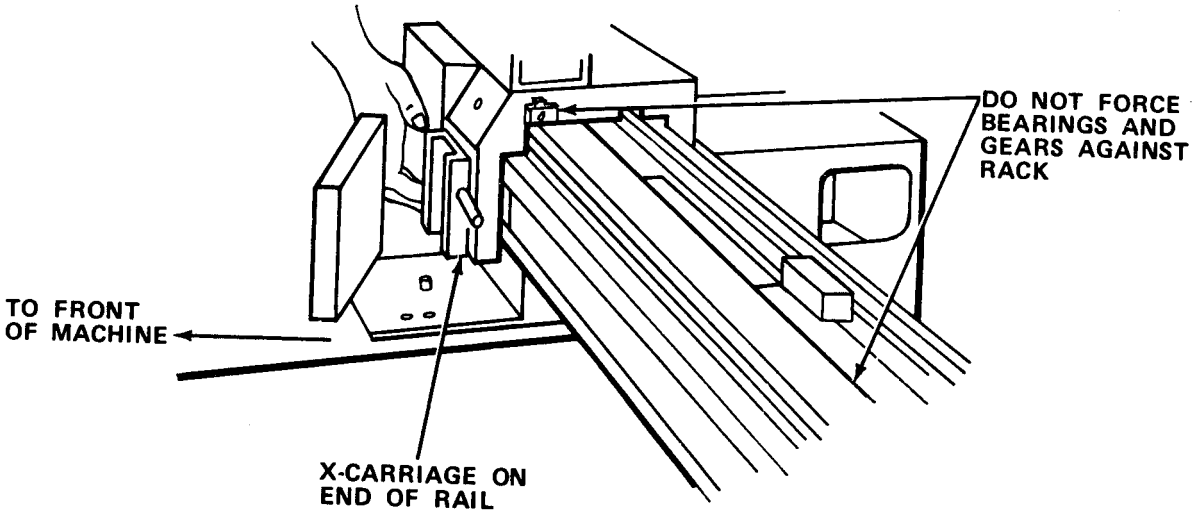
(11) Remove screws and bottom back cover from X-carriage.



(12) Disengage X-carriage drive motor by loosening locking lever and moving motor back. Then lock motor into place.

(13) Perform before operation PMCS (table 3-2, item 2).

(14) Perform lubrication (paragraph 3-8).



CAUTION

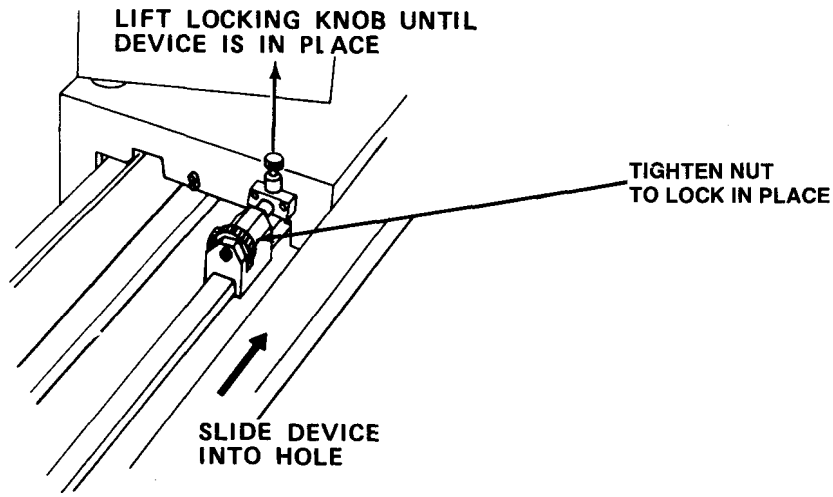
. When mounting X-carriage, do not attempt to force in place or damage to gears and rack will result.

. Be sure that limit switch cams are held back so they do not catch on trip dogs or damage to cams could result.

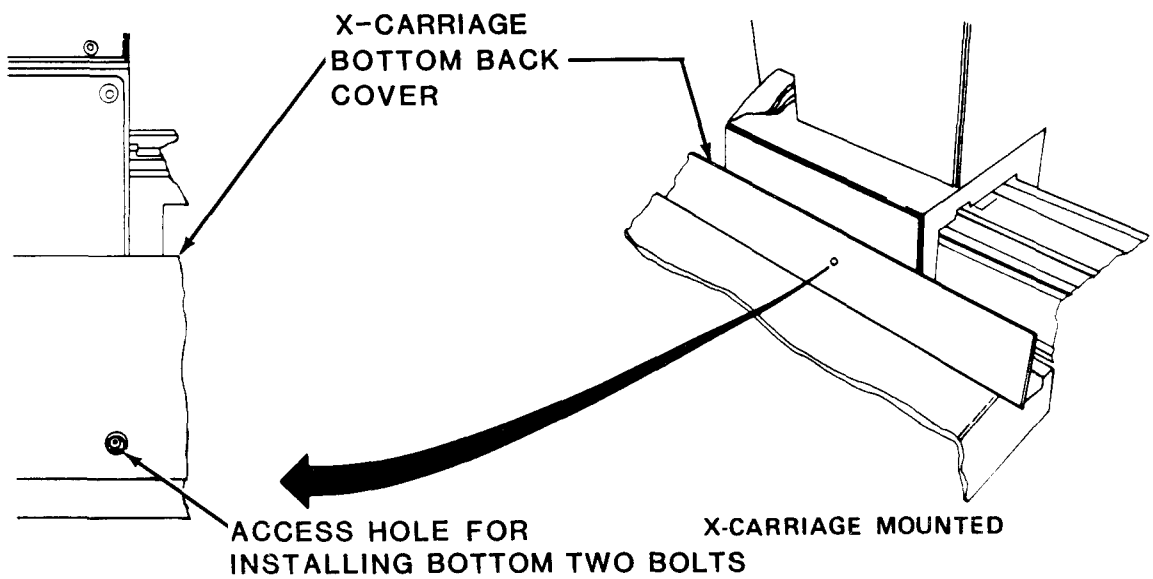
- When front set of bearings are on rail, pull against motor mount to hold pinion gear away from rack to prevent possible damage.

- Be sure ribbon cable is not twisted when installing X-carriage or equipment damage may occur.

(15) Lift X-carriage with both hands and slide onto X-rail with end plate removed. After carriage is initially set on X-rail, hold cams of limit switches back before pushing carriage further so they are not caught on trip dogs.

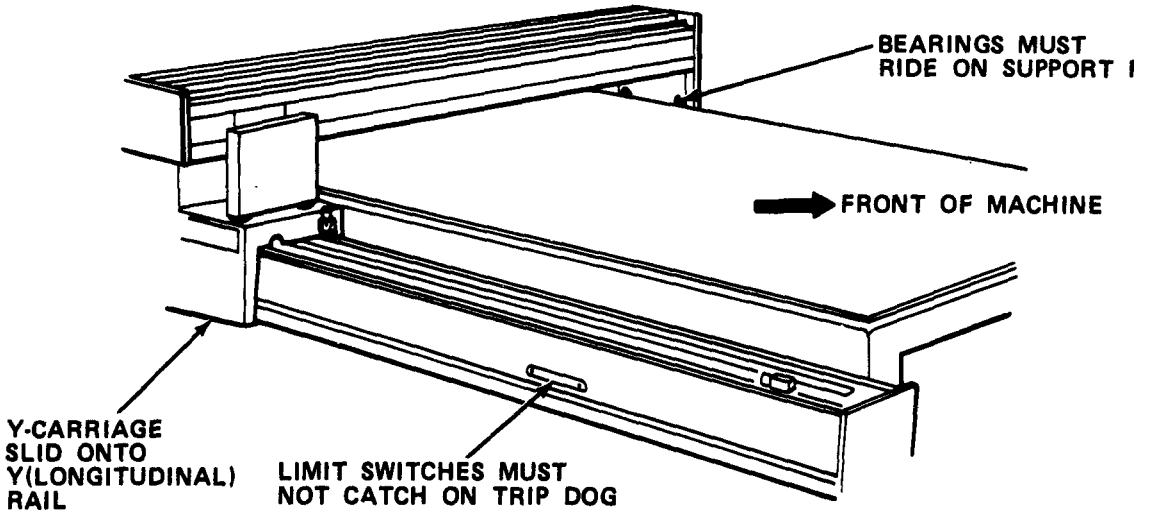


(16) Mount fine adjustment device on X-rail and tighten. Attach to X-carriage by lifting stop pin, sliding in tool shaft, and dropping stop pin into hole in top of tool shaft.



(17) Reinstall bottom back cover on X-carriage.

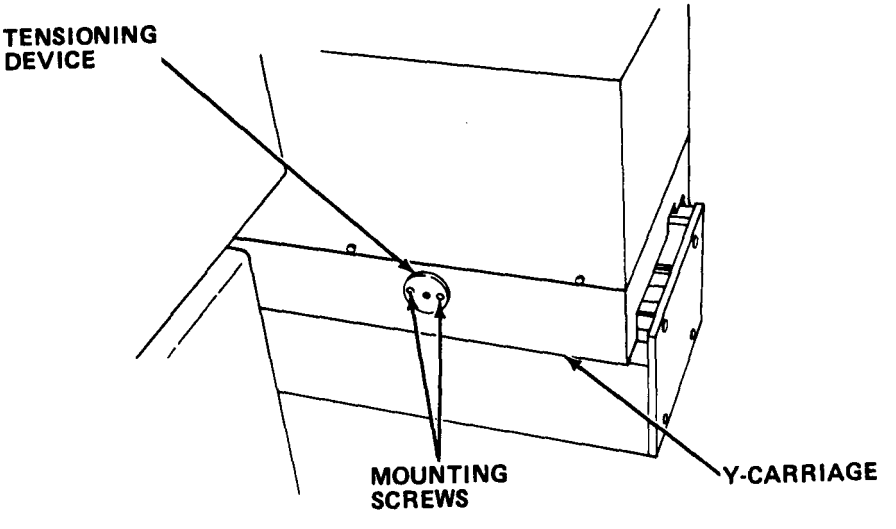
(18) Reinstall X-carriage tensioning device. Be sure that the set screw is up.



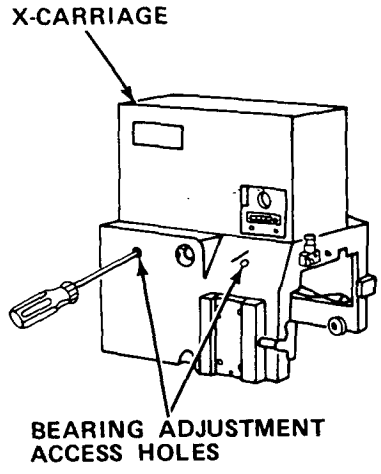
CAUTION

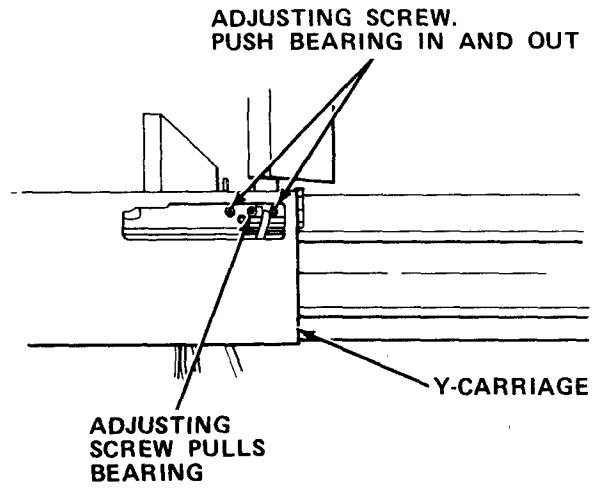
When mounting Y-carriage, do not force it or damage to gears will result. Limit switch cams must be held back to prevent breaking on trip dog.

(19) Lifting both ends together, slide Y-carriage onto Y-rail from end from which plate was removed. Check that end bearings ride on rail properly, and limit switch cams do not catch on trip dogs on side of rail.



(20) Move Y-carriage to rear of Y-rail and reinstall tensioning device.



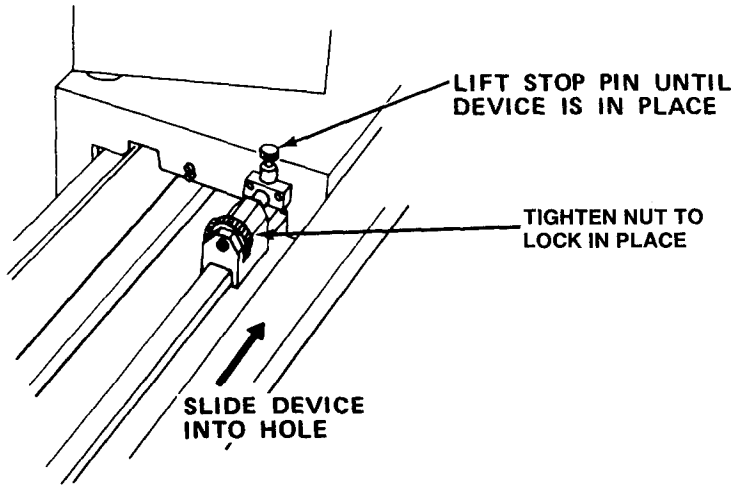


(21) Reinstall Y-rail front end plate and front rubber stop.

NOTE

Turn Y-carriage bearing adjusting left until they just begin to loosen. Turn X-carriage bearing adjusting screws right until they just begin to loosen.

(22) Move Y-carriage forward and reset X- and Y-carriage bearings.

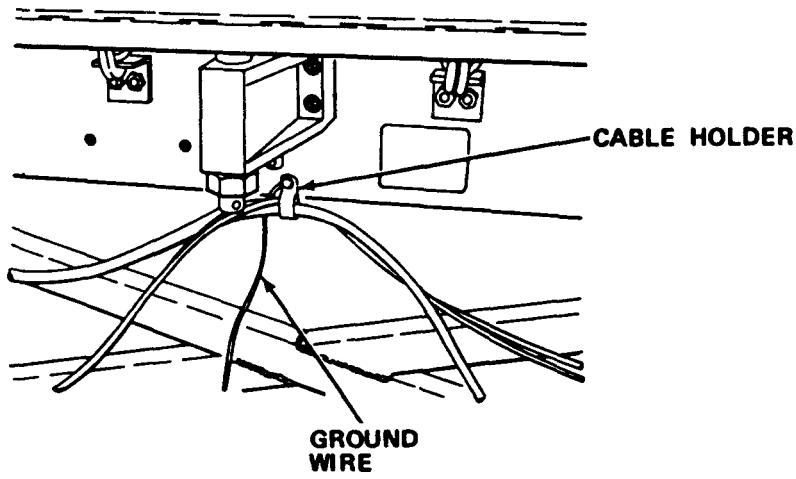


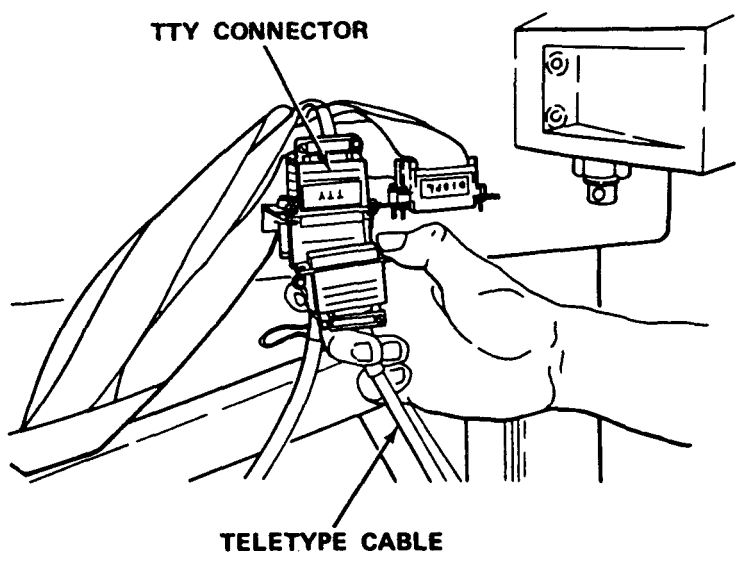
(23) Mount fine adjustment device on Y-rail. Attach to Y-carriage by lifting stop pin, sliding tool shaft in, and dropping stop pin into hole in top of tool shaft.

(24) Reinstall X-rail end plate and end rubber stop.

(25) Reinstall Y-carriage left side cover.

d. Connecting cables and power cords,



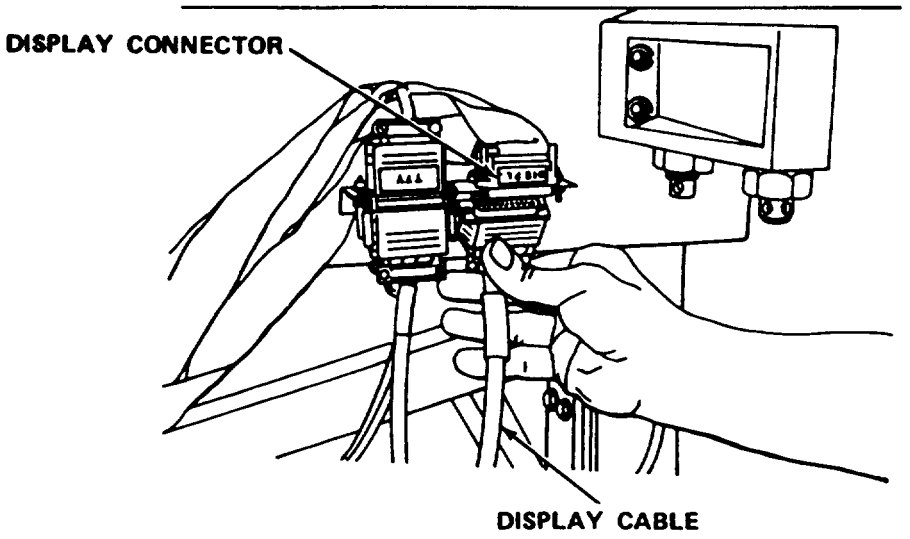


(1) Connect small black ground wire to chassis of machine with screw attaching cable holder under center longitudinal rail support. Feed the display and encoder cables into cable holder.

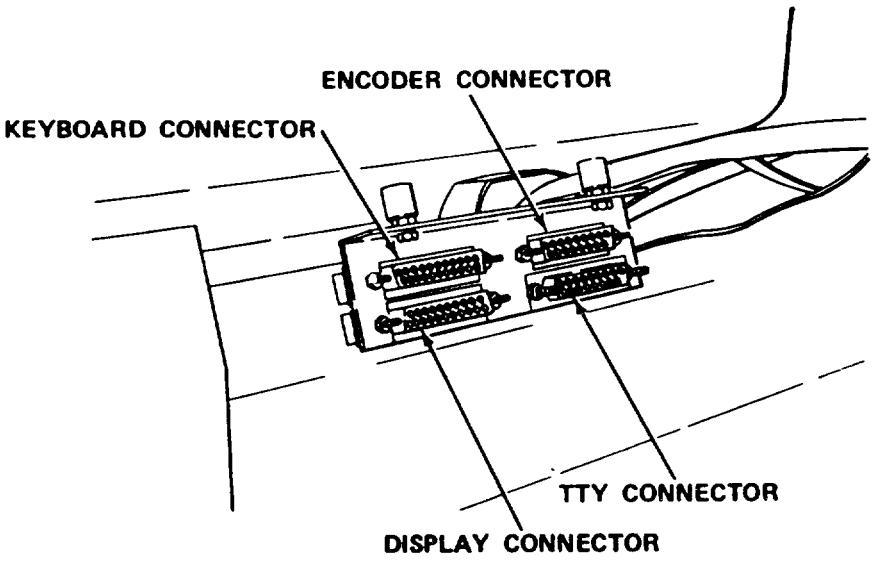
CAUTION

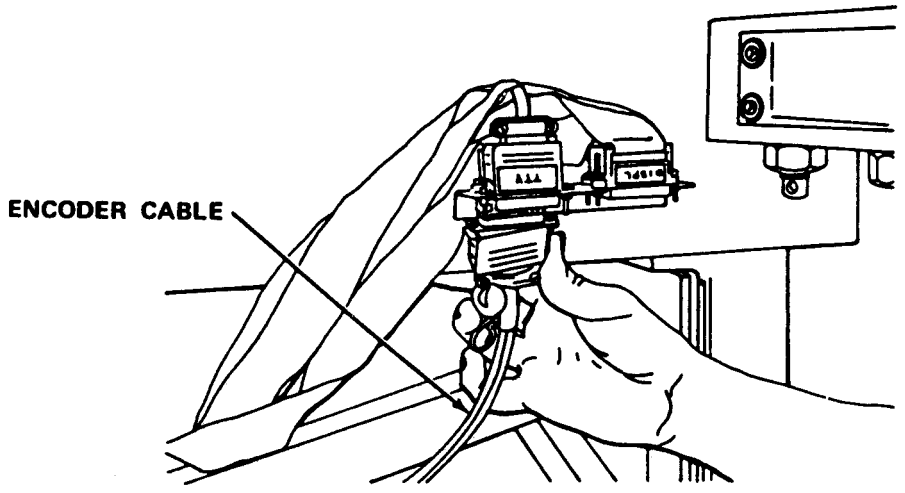
. Be sure that cables are connected to proper connections or equipment damage may occur.

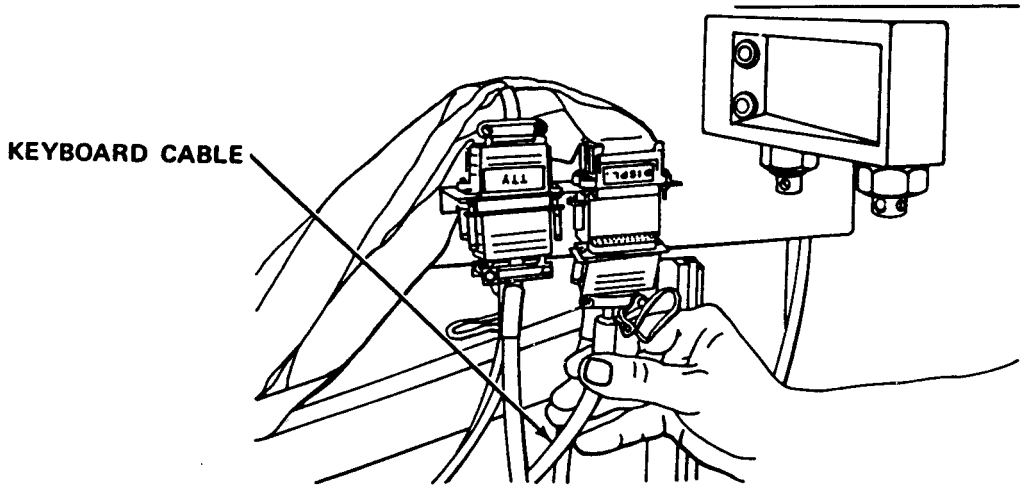
(2) Connect digitizing keyboard cable to keyboard connector, directly behind DISPLAY connector.



(3) Connect twin white encoder cables to encoder connector, directly behind TTY connector.

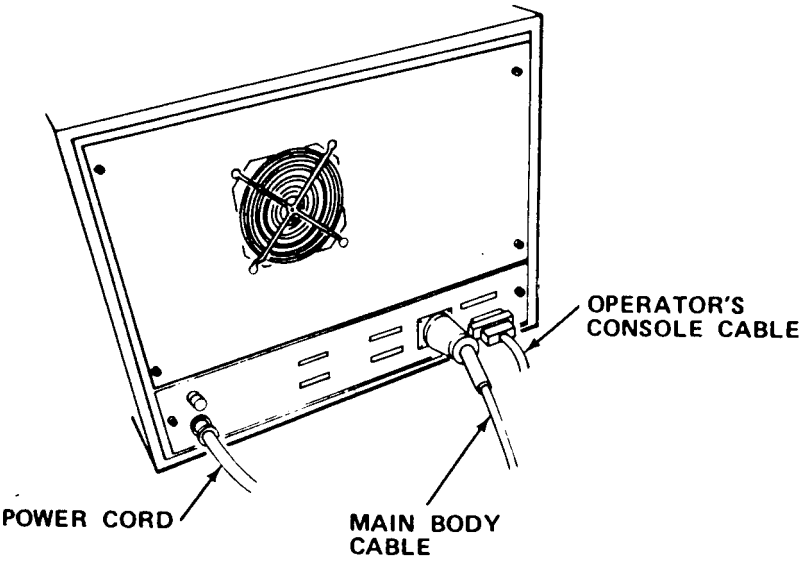






(4) Connect teletype cable to TTY connector at left forward corner of machine.

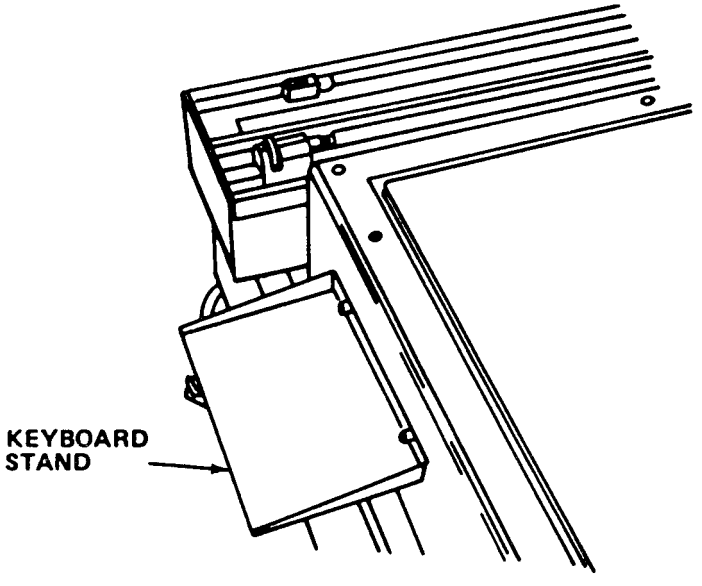
(5) Connect display cable to DISPLAY connector (25-pin connector).



(6) Connect operator's console cable to receptacle in rear of DSP machine controller to right of main body cable receptacle.

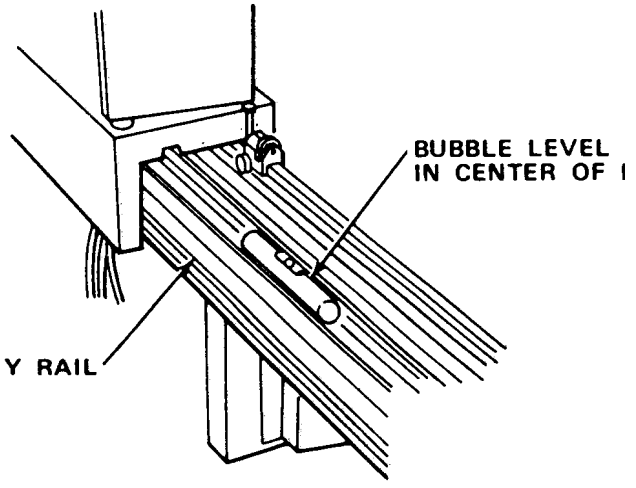
(7) Connect main body cable to receptacle in rear of DSP machine controller (37-pin connector).

(8) Plug in light table, DSP machine controller and teletypewriter to 120V ac wall receptacles.



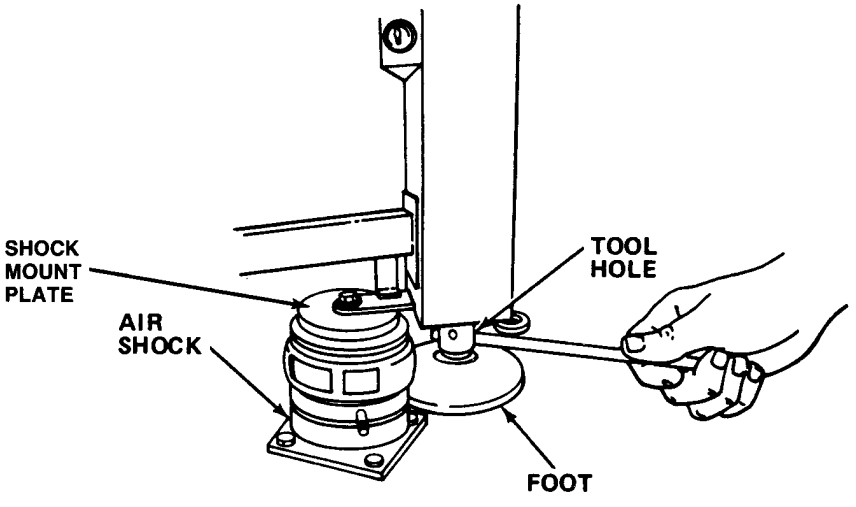
(9) Mount digitizing keyboard stand to table frame and place keyboard on stand.

e. Leveling the machine and making final adjustments.



(1) Place bubble level on surface of Y-rail, approximately in center of rail.

(2) Remove side covers from machine frame.



CAUTION

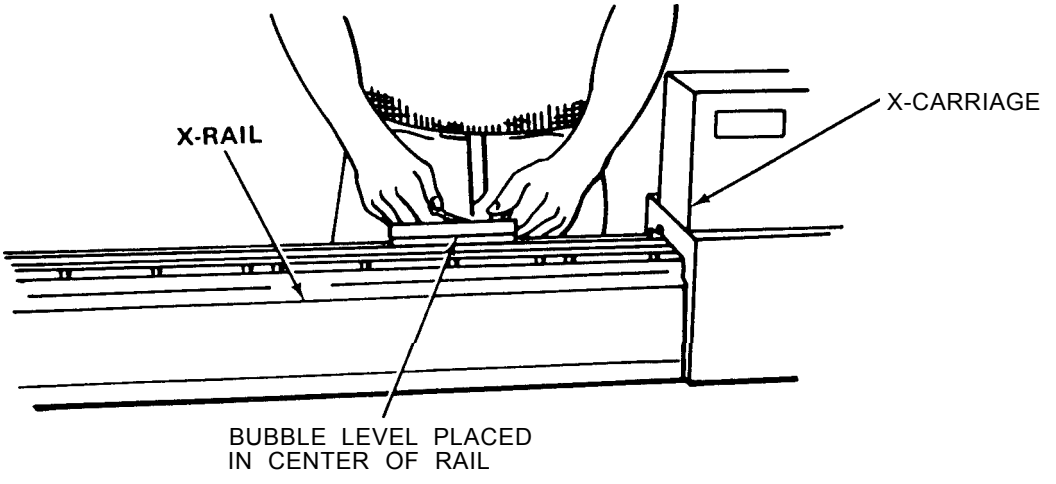
Lower adjustable legs to within 1/2 in. (12.7 mm) of floor. Let air out of shocks gradually going from one leg to another, allowing table legs to contact floor at approximately the same time or table warping could result, possibly breaking glass plate.

(3) Remove bolts from shock mounts.

NOTE

Be sure section is level before continuing this procedure. (Refer to Chapter 1 for leveling procedures.)

(4) If bubble level indicates machine is not level, insert leveling tool, and raise or lower front left leg until



(5) Place bubble level approximately in center of X-rail. If bubble level indicates machine is out of level, insert leveling tool and raise or lower rear right leg until bubble indicates level.

(6) Unlock fine adjustment device holding Y-carriage. Move Y-carriage to front end of Y-rail against rubber stop.

(7) Place bubble level approximately in center of X-rail. If bubble indicates machine is out of level, insert leveling tool and raise or lower right front leg until level.

(8) Repeat steps (1) through (7) until machine is level.

(9) Reinstall side panels.

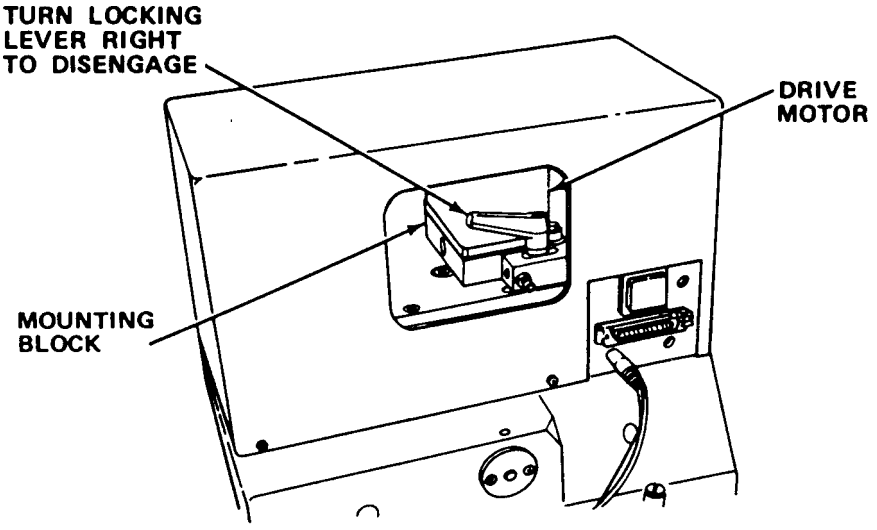
NOTE

Do not reconnect machine to shock mounts as long as it is in use.

(10) Insert drafting tool in X-carriage dovetail mount (table 3-5, items 1 and 3). Check that point does not touch glass surface. Gap of 0.040 in. to 0.060 in. (1 .02 mm to 1.52 mm).

(11) Unlock X- and Y-carriages. Manually move tool over perimeter of drafting surface and across center while watching tool point. If necessary, adjust height of tool by turning knob at top of tool holder.

(12) Turn on fluorescent lamps and XY display. Check that display changes when each carriage is moved. If XY display does not operate correctly, refer to troubleshooting.



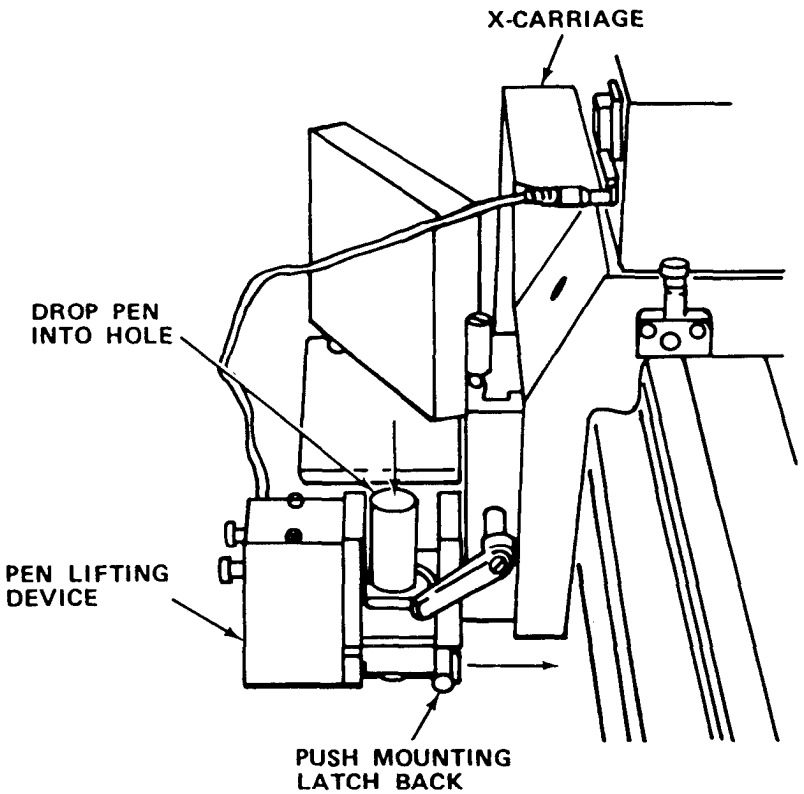
(13) Engage drive motors on each carriage by loosening locking lever, moving motor gear against encoder gear, and locking latch.

3-6.2 Initial Adjustments, Daily Checks and Self Test.

NOTE

- Moving mounting block left engages drive and encoder gears. Moving mounting block right disengages.
- DSP-2 machine controller can be turned on with power button on X-carriage or on front of DSP machine controller. Button originally pressed must be pressed again to reset or turn system off.

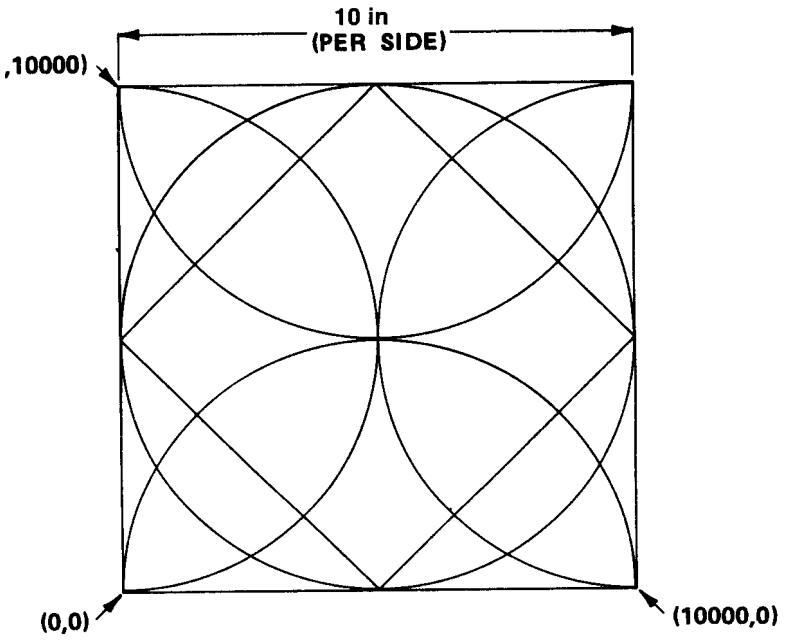
a. Press power button on X-carriage or on DSP machine controller.



b. Mount pen lifting device with ball point pen on X-carriage (table 3-5, items 1 and 3).

c. Attach piece of drafting paper (36” x 24 “) to center of table surface.

d. Run test tape (paragraph 3-6. 3q). If tape is not available, input test program, shown in “Test Tape Program Listing” following step f of this procedure, into console or use program to produce tape on teletype (paragraph 3-6. 3n).



e. Compare figure resulting from tape run to figure above to be sure they are identical.

f. Use magnifying glass to inspect line quality of test figure. Check that lines touch at correct spot and do not overlap or run over. In the event the lines are not satisfactory, correct as follows:

(1) Check that bearings of both X and Y carriages have been properly reset (paragraph 3-6.1).

(2) Check that X and Y carriages are properly and fully engaged.

(3) Check that tensioning device is properly installed (paragraph 3-6.1).

TEST TAPE PROGRAM LISTING

NOTE

Each command does not have to be repeated unless it actually changes.

Input Line (On Teletype)*	Purpose
G1 D2X0Y0	Move origin (0,0).
G1D1X1OOOOYO	Draw 10 in. line in X-direction.
G1X10000Y10000	Draw 10 in line in Y-direction.
G1X0Y10000	Draw 10 in. line in X-direction.
G1X0Y0	Draw 10 in. line back to 0 (square complete).
G2X10000Y0I5000J0	Draw half circle.
G2X10000Y10000I10000J5000	Draw half circle.
G2X0Y10000I5000J 10000	Draw half circle.
G2X0Y0I0J5000	Draw half circle.
G1 D2X5000Y0	Move to middle of left side.
G3D1X5000Y0I5000J5000	Draw full circle.
G1X1OOOOY5OOO	Draw 10 in. line to middle of right side.
G1X5OOOY1OOOO	Draw 10 in. line to middle of top line.
G1X0Y5000	Draw 10 in. line to middle of left line.
G1X5000Y0	Draw 10 in. line to middle of bottom line.
G1D2XOY0	Return to origin.
MOO	stop.

•Ail functions that are to be executed simultaneously have to be programmed in same sentence. See operating procedures.

3-6.3 Operating Procedures.

INDEX

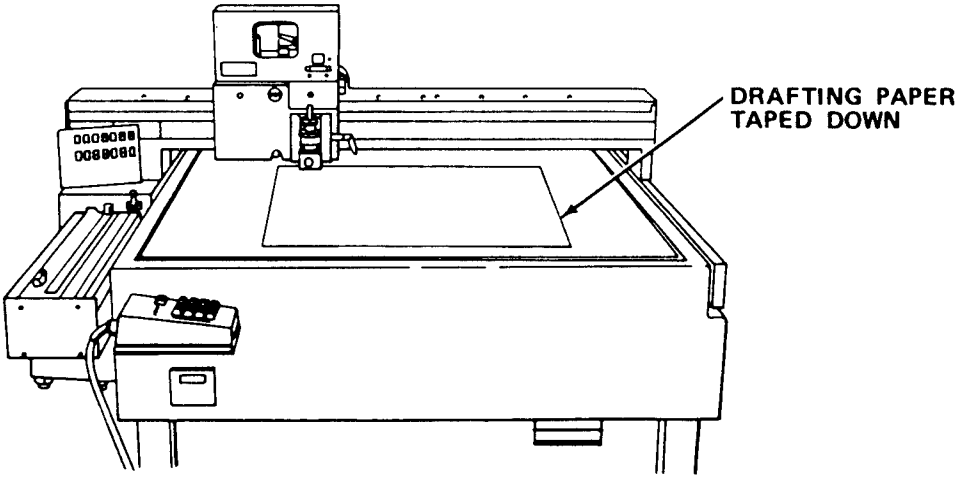
NOTE

Basic procedures for operating machine are found in the following paragraphs. Those basic operations, such as use of various drafting tools or accessories, that are common to several operating procedures, are located in appropriate tables and/or procedures. Procedure a, below, must be performed prior to any other procedure.

a. Preparation for Operation.

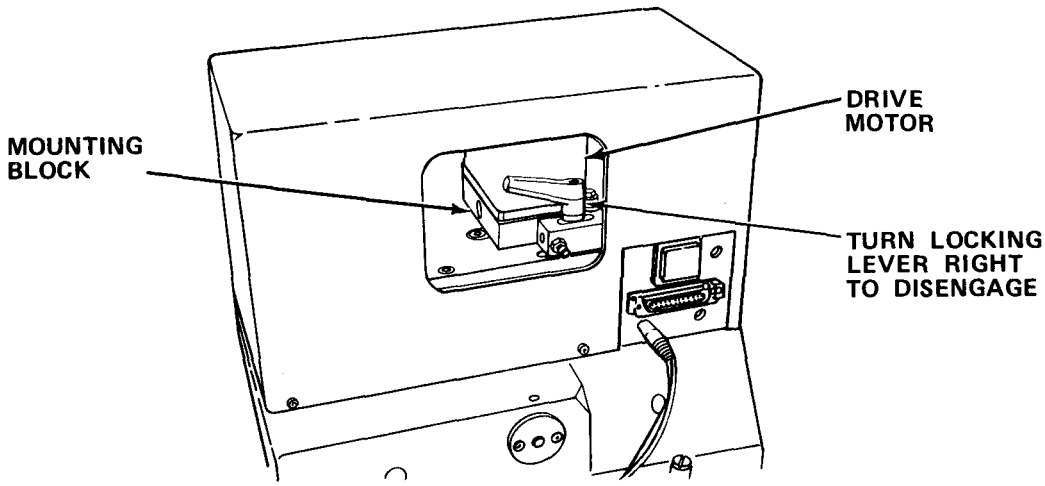
(1) Turn on XY display and fluorescent lights. If machine is to be used in automatic mode, depress power button on X-carriage or DSP machine controller. Check that all cables are connected.

(2) Press white reset button on digitizing keyboard. Check that both numbers in display read'(± 000,0000."



(3) Check that glass top is clean. Attach paper or any other drafting medium to be used by taping to table surface at corners.

(4) If machine is to be used initially in manual mode, proceed as follows (if not, proceed to step 5).



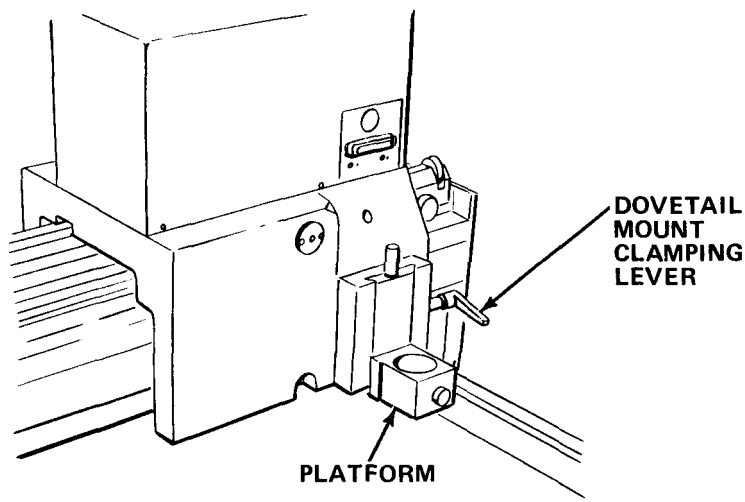
CAUTION

Be sure drive motors are disengaged before moving carriages or damage to gears and bearings will result.

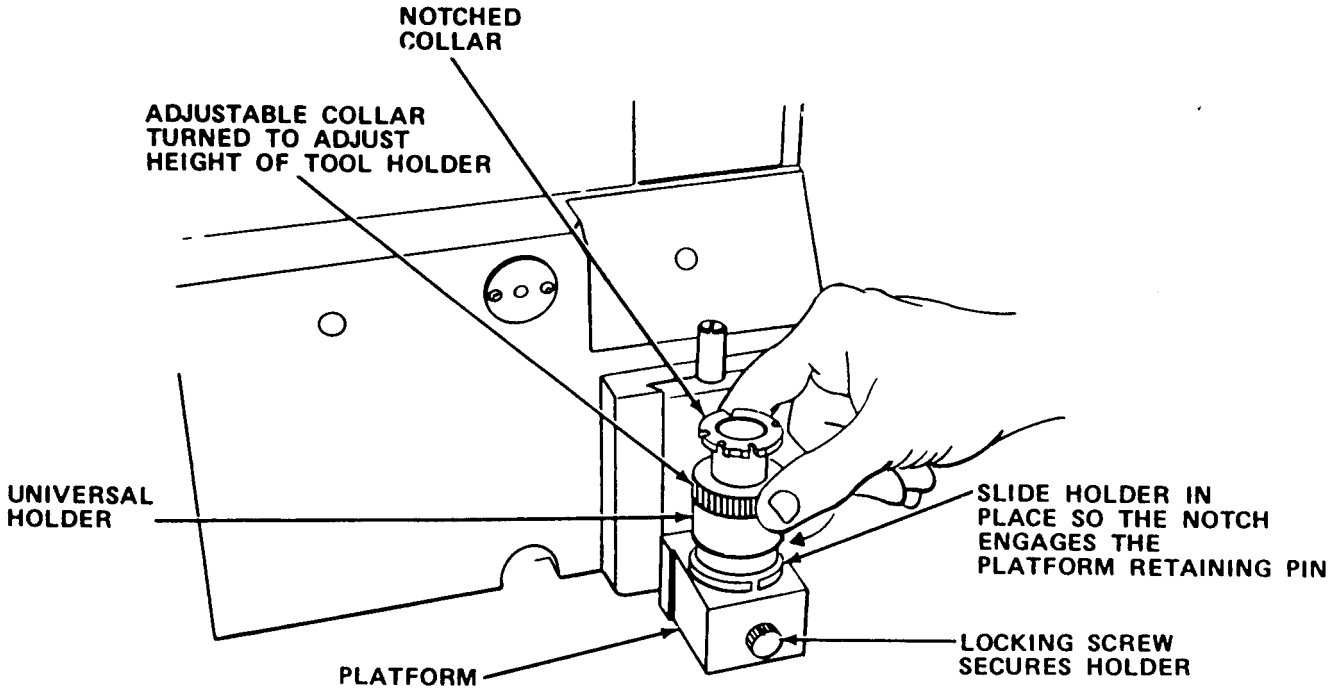
NOTE

Moving block left engages drive and encoder gears. Moving block right disengages.

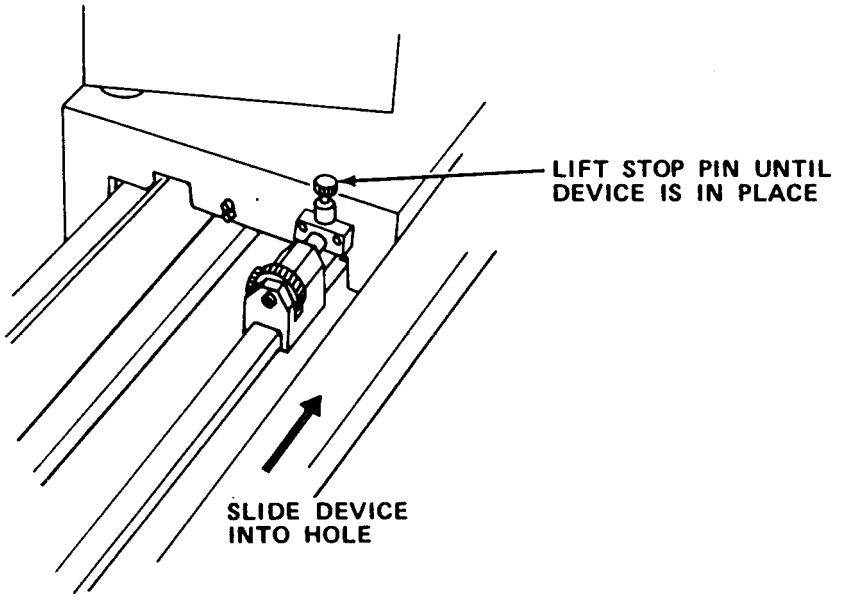
(a) Disengage carriage drive motors, if engaged, by turn ing locking lever right and moving motor block away from encoder.



(b) Mount tool holder platform by sliding it into X-carriage dovetail mount. Turn clamping ever up to secure platform in place.



(c) Mount universal tool holder by sliding it into hole in platform, until notch engages retaining pin. Turn lock screw right to secure holder in place. Turn adjustable collar to set holder height (table 3-4, item 1).



(d) Attach fine adjustment device to each carriage by lifting stop and inserting device shaft into holding hole. Drop knob into hole in top of shaft to hold device in place. Check that each device is loose and not locked against rail.

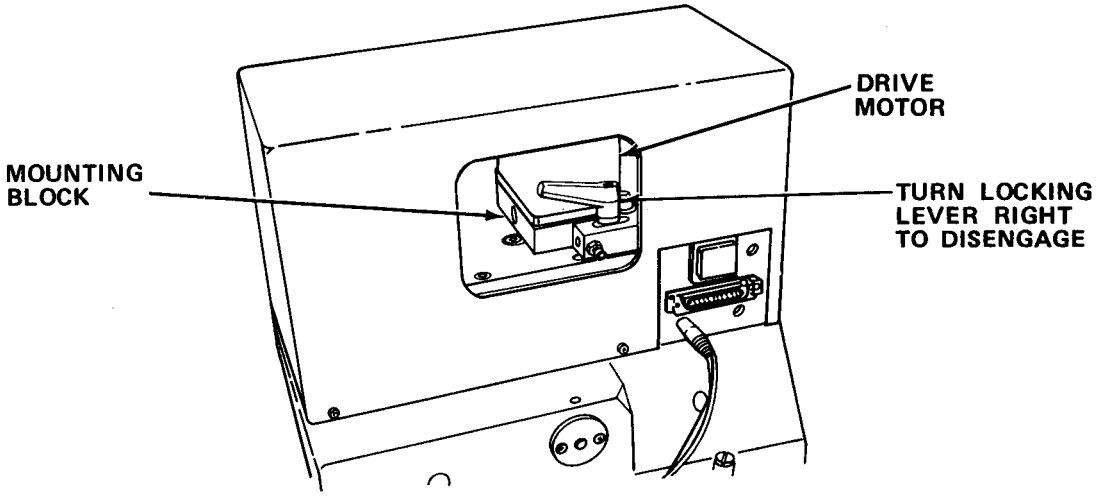
(5) If machine is to be used initially in automatic mode, proceed as follows:

CAUTION

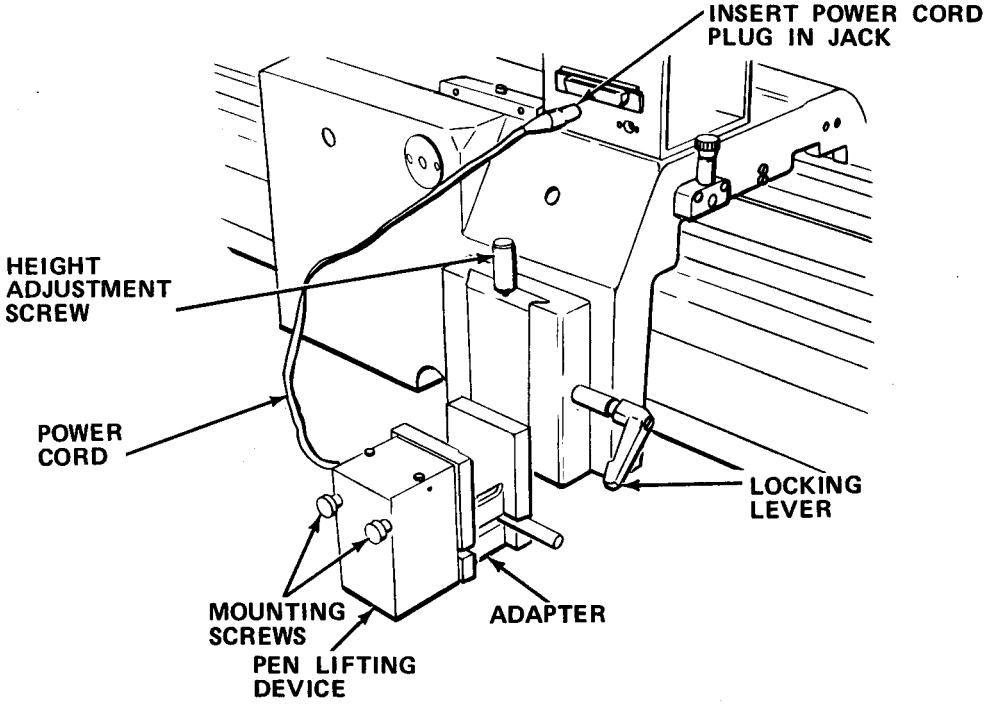
Be sure fine adjustment devices are removed before automatic operations start or damage to machine could result.

NOTE

Moving block left engages drive and encoder gears. Moving block right disengages.



(a) Loosen locking lever by turning right. Move motor gear against encoder and tighten locking lever.



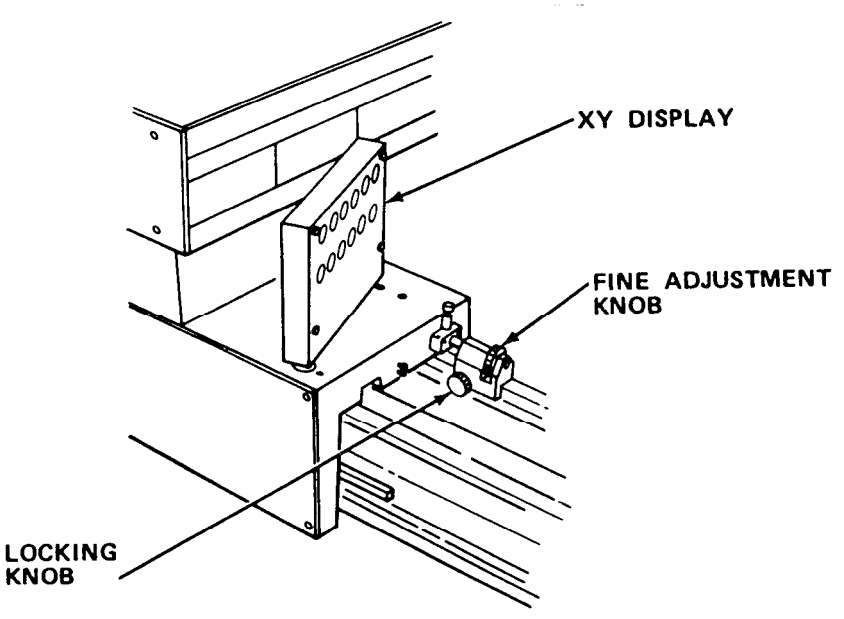
(b) Mount pen lifting device. If tangentially controlled device is to be used, mount pen lifting device on side of adapter with two mounting screws as shown. Plug power cord into jack on front of X-carriage (table 3-5, item 1).

b. Setting (DKA3) XY display for operation.

NOTE

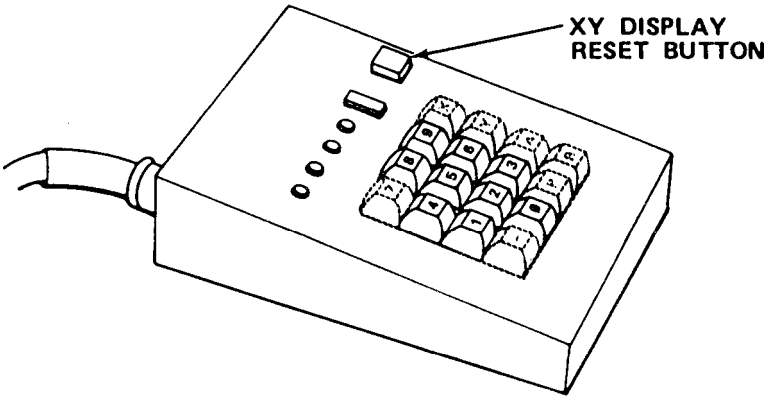
Prior to any procedure using XY display, display must be set by selecting measurement system, scale factors, and preset values via keyboard.

(1) Select zero point or origin of drawing or tracing to be worked. Position tool or pen point over this spot by moving cartridges.



(2) Turn locking knobs to secure carriages in place. Adjust position of carriages by turning fine adjustment knob.

(3) Zero and reset XY display by pressing white reset button. Check that XY display shows two lines of zeros.



NOTE

XY display resets (defaults) to English measuring system. Scale factor resets to 1 in. = 1 in. Display will reset to ±OOO.0000.

(4) Press 7 and. P on XY keyboard while watching XY keyboard. Repeat this procedure until XY keyboard shows code letter for measuring system desired. Table 3-3 lists possible code displays.

Table 3-3. MEASURING SYSTEM DISPLAY CODES

Code Displayed	Measuring System Represented
E	English System (Units = Inch per Inch)
A	English Mapping System (Units = Feet per Inch)
C	Metric System (Units = mm)

(5) Set scale to be used on drawing, tracing, or digitizing as follows:

NOTE

Scale factors for X- and Y-coordinate axes are set (entered) separately.

(a) Press 7 and A to enter scale factor for X-axis.

(b) If scale factor is magnification, convert it to units of measuring system selected and key in factor using P key for entering any decimal points.

(c) If scale factor is reduction, convert it to units of measuring system selected and find reciprocal. Key in reciprocal of scale factor using P key for entering any decimal points.

(d) Press A key again to terminate entry of scale factor for X-axis.

(e) Press 7 and B to enter scale factor for Y-axis. Repeat steps (a) through (d) above to enter scale factor, but press B key to terminate entry.

(6) If origin (or any other point on drawing) is to have value other than 0, move to point and preset value as follows:

NOTE

Preset value is entered by entering value of X-coordinate first and then Y-coordinate.

(a) Press 7 and X on keyboard to enter value of X-coordinate.

(b) If preset value is negative number, press negative key. Key in number using P key to enter any decimal points.

(c) Press X again to terminate X entry. Check X line of XY display to be sure correct number is displayed.

(d) Press 7 and Y on keyboard to enter value of Y-coordinate.

(e) If value to be entered is negative number, press negative key. Key in preset value using P key to enter any decimal point.

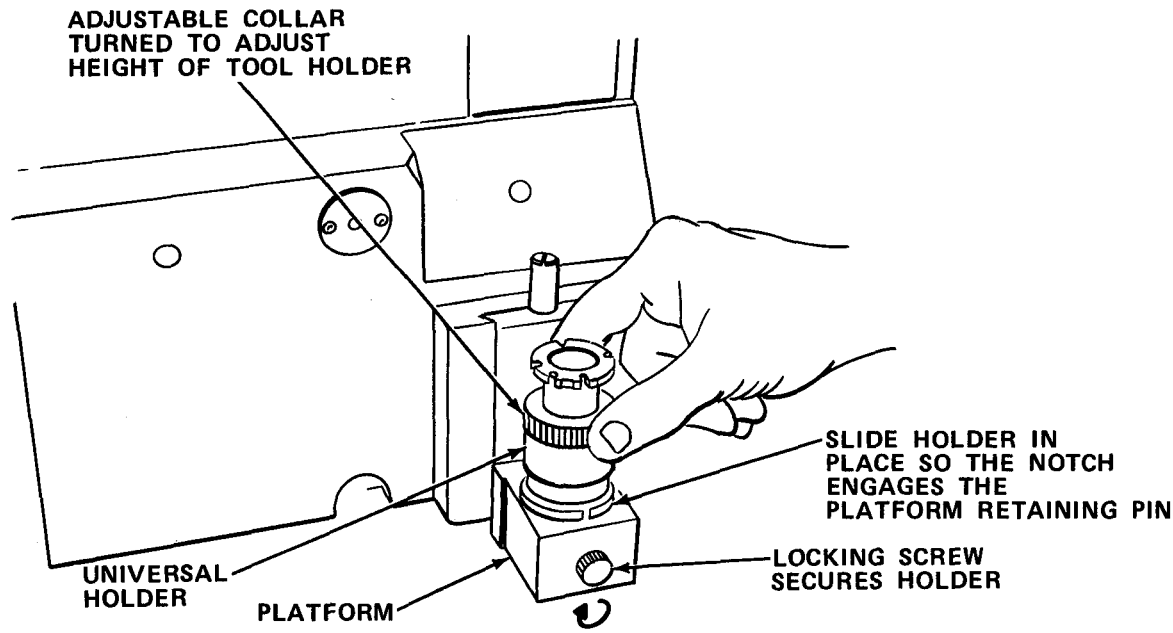
(f) Press Y again to terminate Y entry. Check Y line of XY display to be sure correct number is displayed.

Using manual drafting tools. For procedures concerning use of manual drafting tools, including mounting, installation of attachments, and operating adjustments, refer to applicable tool and procedure in Table 3-4.

Table 3-4. NOTES ON USE OF MANUAL DRAFTING TOOLS

Tool	Mounting and Operation Instructions
1. Universal Tool Holder	MOUNTING

a. Slide universal tool holder in place so that notch engages platform retaining pin.

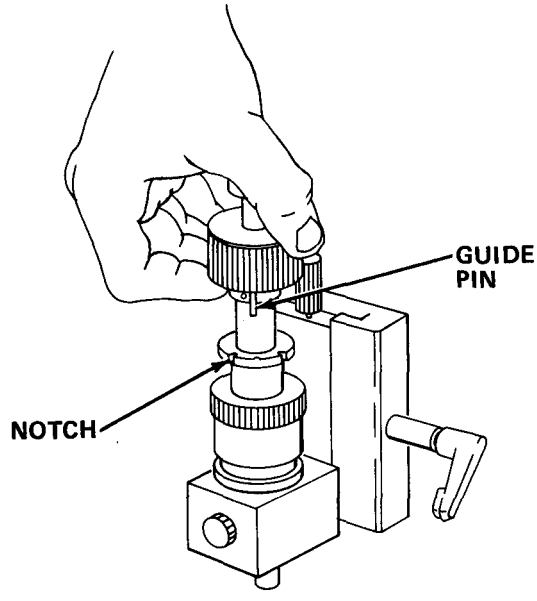


b. Turn platform lock screw to secure universal tool holder in place.

c. Turn adjustable collar right to lower tool holder, left to raise holder.

Table 3-4. NOTES ON USE OF MANUAL DRAFTING TOOLS - Cont

Tool	Mounting and Operation Instructions



d. Slide selected tool into universal tool holder.

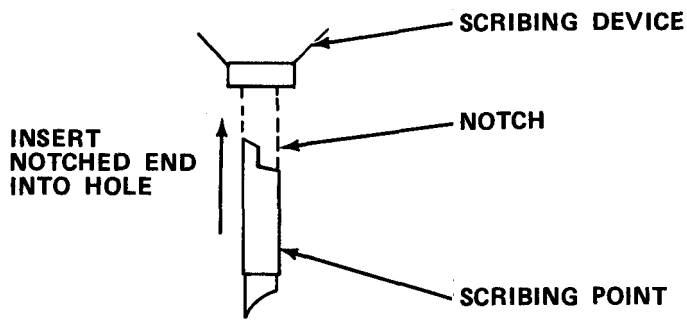
e. Move tool by collar until guide pin engages notch in universal tool holder.

NOTE

For manual blades the notched end is in line with cutting edge. For automatic blades the notched end is 90° to cutting edge.

Table 3-4. NOTES ON USE OF MANUAL DRAFTING TOOLS - Cont

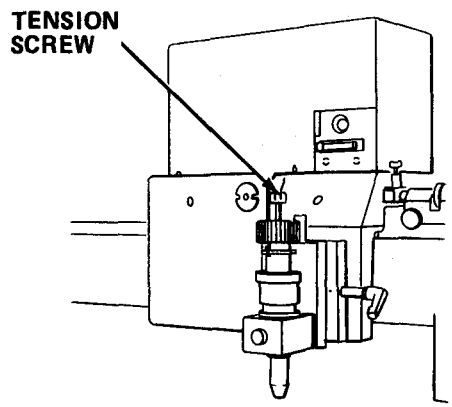
Tool	Mounting and Operation Instructions
2. Manual Scribing Device	ATTACHMENTS - Scribing Point



a. Slide notched end of scribing point into hole in scribing device.

b. Turn scribing point, while pressi ng in, until notched end engages notch inside scribing device.

c. Adjust pressure of scribing point on film as follows:

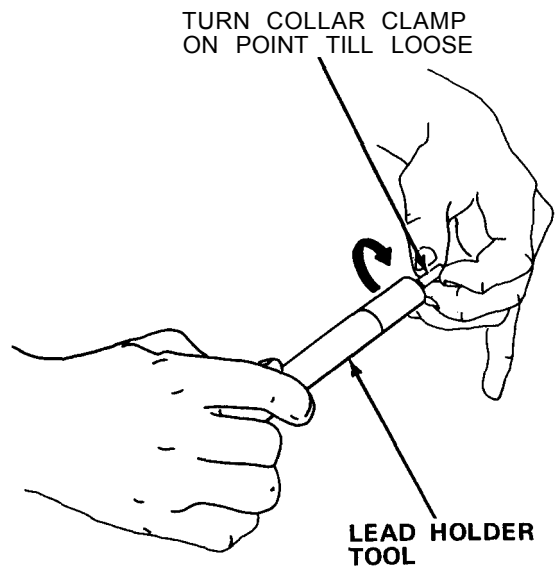


(1) Turn tension screw right to increase pressure of scribing point on scribing medium. Turn left to decrease pressure.

(2) The more pressure applied, the deeper the cut. Too much pressure will cause scribing point to cut through film and backing (look for clean scribe with no burred edges).

Table 3-4. NOTES ON USE OF MANUAL DRAFTING TOOLS - Cont

Tool	Mounting and Operation Instructions
3. Lead Holder Tool	ATTACHMENTS - Lead



a. Loosen collar clamp on end of lead holder tool by turning left.

b. When collar clamp has been loosened several turns, insert lead into end.

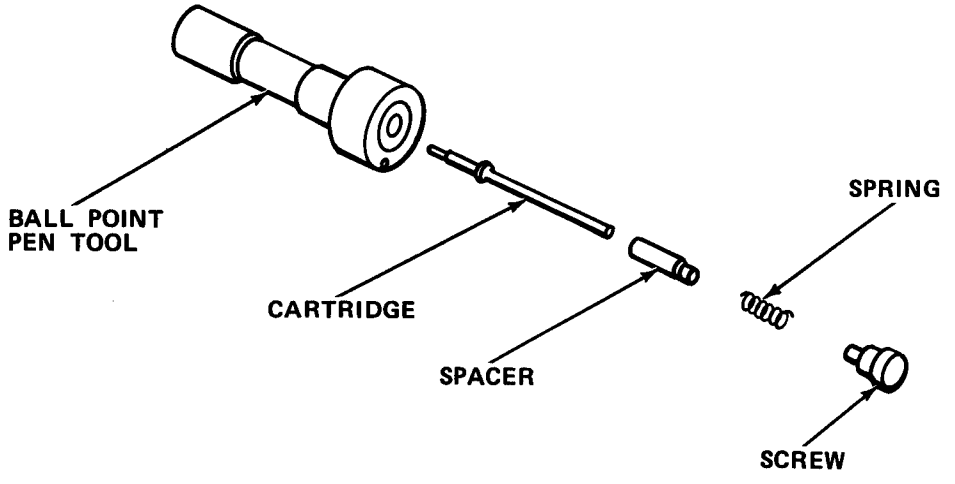
c. Tighten' clamp.

Table 3-4. NOTES ON USE OF MANUAL DRAFTING TOOLS - Cont

Tool	Mounting and Operation Instructions

4. Ball Point Pen Tool

ATTACHMENTS - Pen Cartridge



a. Remove screw in top of ball point pen tool.

b. Remove steel spacer and spring.

c. Remove old ink cartridge, if present.

d. Drop in new ink cartridge, point first.

e. Drop in steel spacer.

f. Drop in spring.

9. Reinstall and tighten screw on top of ball point pen tool.

NOTE

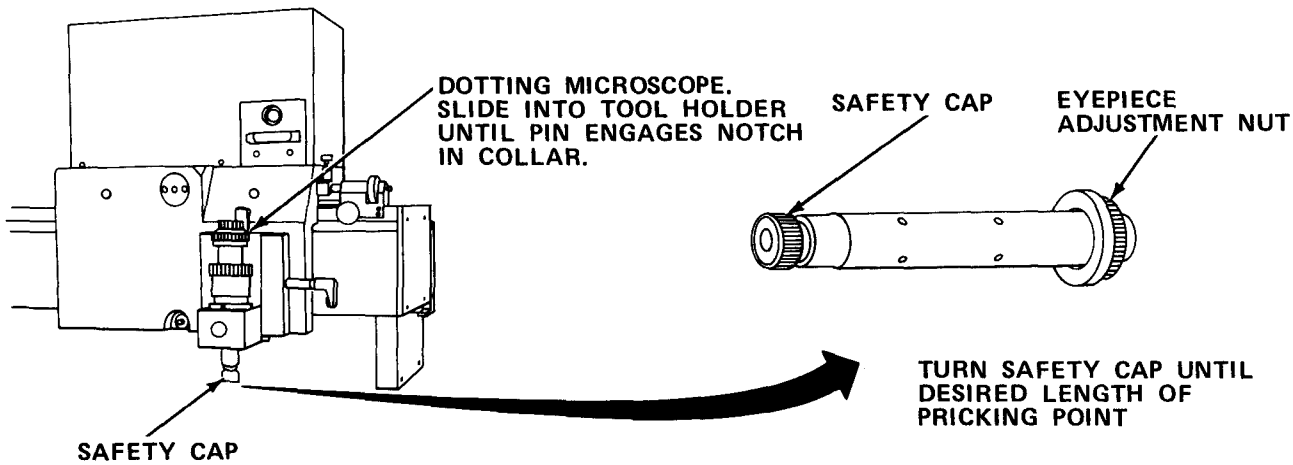
Spring will provide constant, even pressure on drafting surface.

Table 3-4. NOTES ON USE OF MANUAL DRAFTING TOOLS - Cont

Tool	Mounting and Operation Instructions

5. Dotting Microscope

MOUNTING



a. Slide dotting microscope into universal tool holder as shown.

b. Turn collar until small guide pin falls into hole in universal tool holder's notched collar.

c. Adjust depth of penetration of point by turning safety cap left until desired length of point extends beyond flat surface of safety cap.

d. The more point extending beyond cap, the greater the depth of penetration and the larger the dot.

e. Adjust focus of points viewed through dotting microscope by turning eyepiece adjustment nut.

NOTE

Be sure dotting microscope crosshairs are in focus.

d. Manual scribing. Basic procedure involves scribing lines into scribing (coated) foils or films. Scribing device is pushed or pulled by hand to scribe lines. Shapes produced by cutting lines are peeled from backing to produce positive image.

NOTE

It is not possible to manually move scribing device to accurately cut circles or curves without additional equipment.

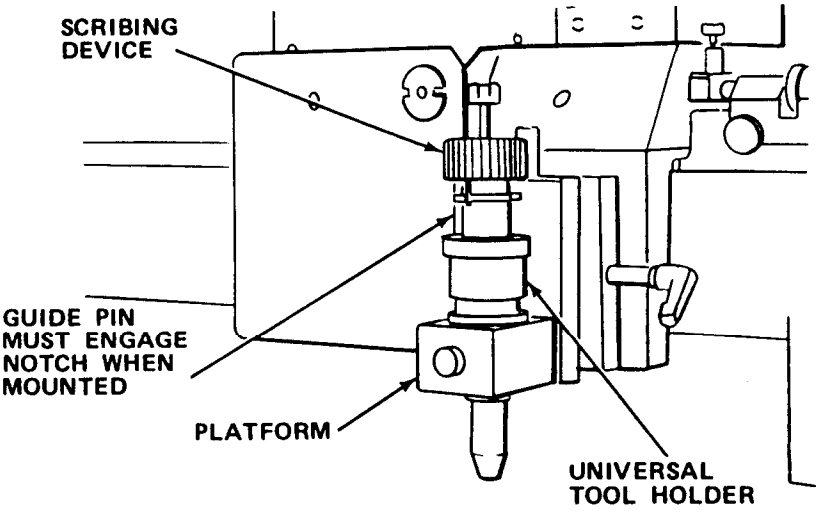
(1) Set machine for manual operation (paragraph 3-6.3. a).

(2) Set XY display for operation (paragraph 3-6.3 b).

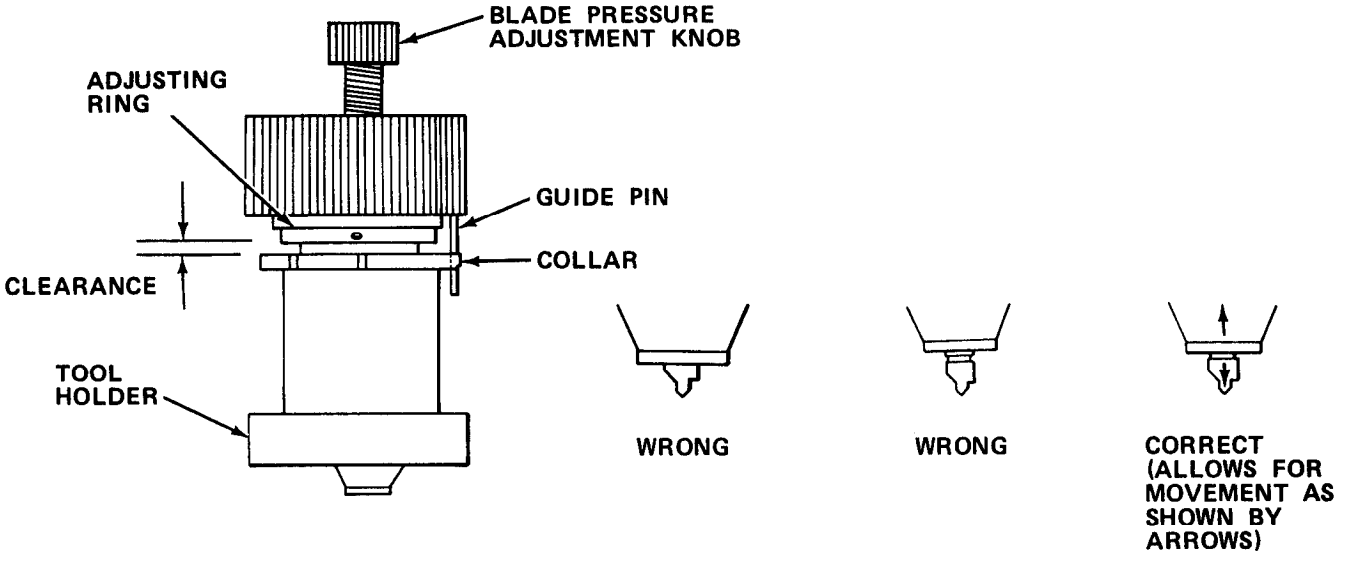
(3) Select scribing point to be used.

NOTE

Scribe points are marked with line widths in millimeters.



(4) Mount scribing device (table 3-4, item 2). Check that guide pin engages collar notches.



(5) Adjust ring until zero clearance between ring and collar is obtained; turn blade pressure adjustment knob until the scribe blade is positioned as shown in correct view. To place device in rest position, raise and rotate device to allow guide pin to clear notch, put guide pin on solid part of collar.

NOTE

For accuracy and ease of positioning, use fine adjustment devices to control positioning of X- and Y-carriages.

(6) Position scribing point by grasping scribing device and carriages and moving point to beginning of first line to be scribed.

(7) If XY display is to be changed, such as when origin is not located on drawing, input desired values.

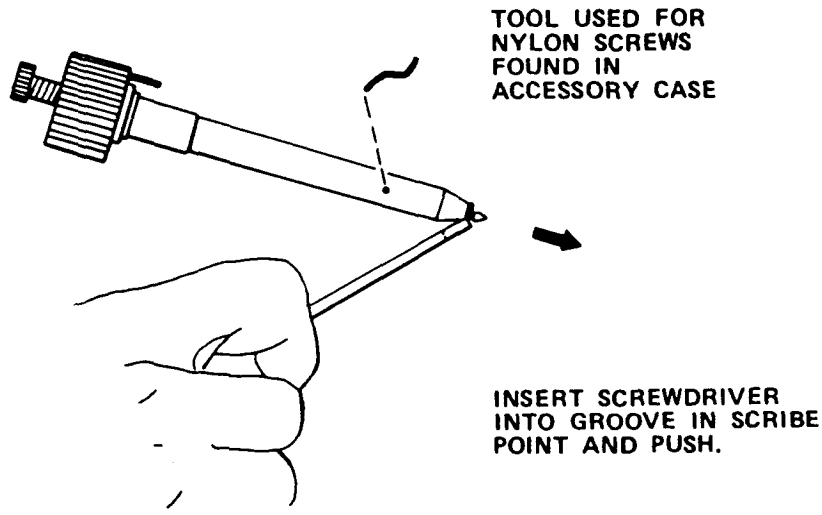
Turn scribing point so that cutting edge faces intended cutting direction. (8)

(9) Engage scribing device (guide pin in collar notch).

(10) Move scribing device to cut line desired. Use XY display to guide positioning and/or length of line being cut. If line is to be drawn precisely in X- or Y- direction, carriage (X or Y) that should not move should be locked in place using fine adjustment device.

(11) When end of line is reached, raise scribing point by lifting on scribing device and set guide pin on top of collar.

(12) Turn cutting edge so that it faces next intended scribing direction and repeat steps (9) through (11) until all lines have been scribed.



(13) Remove scribing device from universal tool holder and with small screwdriver, pry scribing point out of device. (Use tool for nylon screw found in accessory case.)

(14) Clean and store scribing device and point.

e. Manual tracing/drafting. Basic procedure involves drawing lines on drafting medium using lead holder tool or ball point pen tool. Drawing points are moved over medium by moving X-and/or Y-carriages by hand.

NOTE

It is not possible to manually trace circles or curves without additional equipment.

(1) Set machine for manual operation (paragraph 3-6.3a).

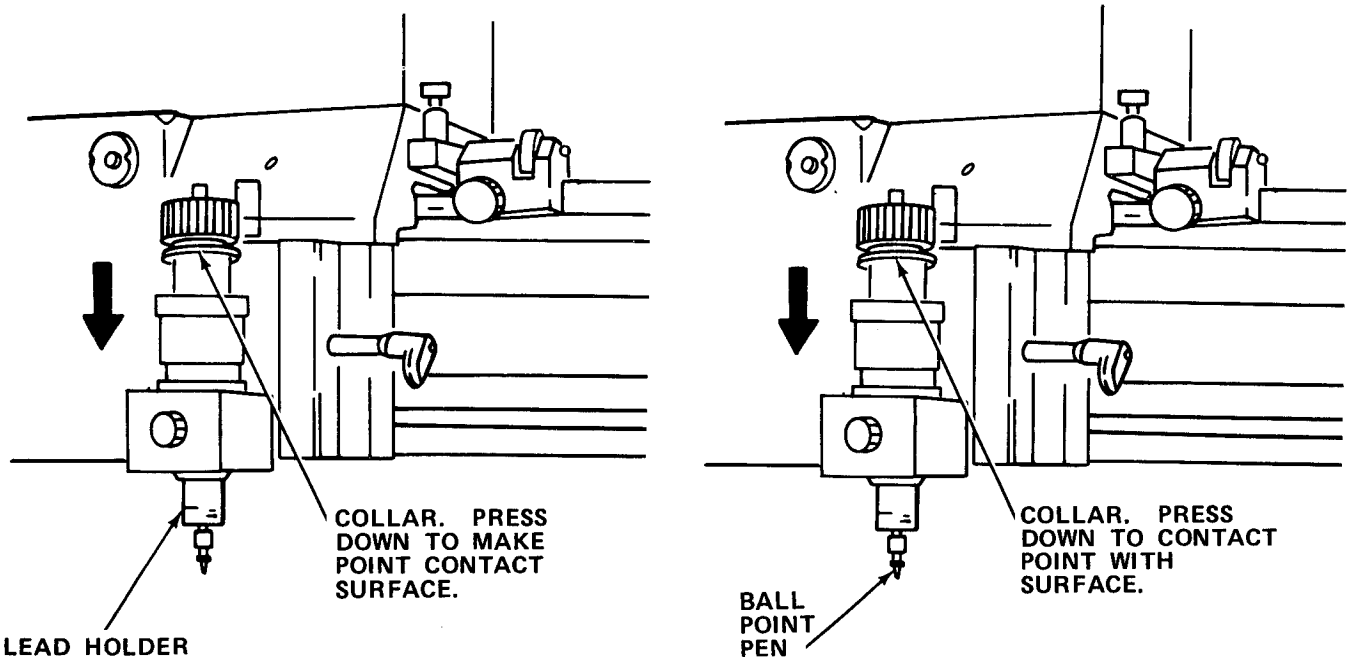
(2) Set XY display for operation (paragraph 3-6.3 b).

(3) Select lead holder tool or ball point pen tool.

NOTE

Ball point pen tool will produce ink line of constant width. Lead holder tool will produce graphite line of width which will only remain constant if point is kept sharpened.

(4) Mount correct tool and adjust height of point for operation (table 3-4, item 3 or 4).



NOTE

Point should not contact surface when in rest position.

(5) Position point by grasping and moving tool holder platform and X-and Y-carriages.

NOTE

For extremely accurate point positioning, fine adjustment devices should be used to control carriage positions.

(6) Place input values desired into XY display.

(7) When point is positioned at beginning of line, engage (guide pin in notch on collar) tool.

NOTE

If diagonal lines are required, a straightedge may be used.

(8) Keeping point in contact with medium, draw line by pushing tool in desired direction. Use XY display to guide positioning and/or length of line being drawn. If line is to be drawn in X-or Y-direction, unused carriage must be locked in place.

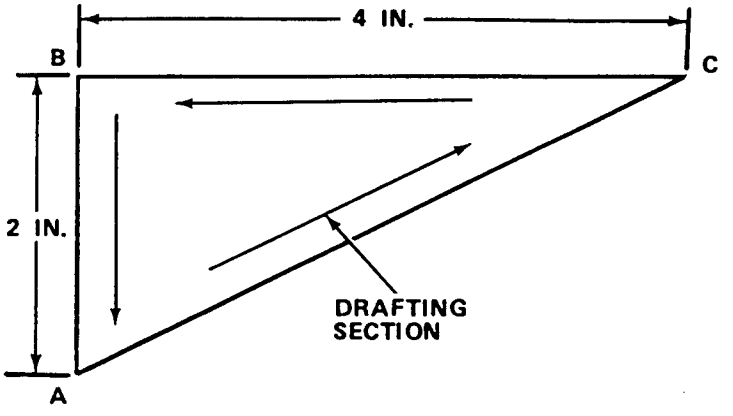
NOTE

If more exact positioning of line is desired, dotting microscope should be used and points connected with straightedge used as movement guide.

(9) When end of line is reached, rest drafting tool on collar.

(10) Repeat steps (5) through (8) as necessary. If lead holder tool is used, sharpen lead point frequently and repeat step (4).

(11) Example below demonstrates how to use ball point pen tool and XY display to draw triangle.



Example: Triangle shown above is drafted as follows:

Set machine for manual operation (paragraph 3-6.3. a),

Dotting microscope is mounted (table 3-4, item 5) and used to position machine at point A. Mark point A.

NOTE

If less precision is acceptable ball point pen tool could be mounted (table 3-4, item 4) and used for marking.

XY display is reset to 0 and set for English units and 1:1 scale. Display shows:

+ 000.0000 (X)

+ 000.0000 (Y)

Using dotting microscope and XY display, machine is positioned over point B. Mark point B. Display shows:

+000.0000 (x)

+002.0000 (Y)

Mark point C in same manner. Display shows:

+004.0000 (x)

+002.0000 (Y)

Machine is repositioned over point A. Ball point pen tool is mounted. Straightedge is positioned to connect points A to C.

Using straightedge as guide, point is depressed and line drawn from points A to C. XY display is checked to be sure correct line length and direction is drawn.

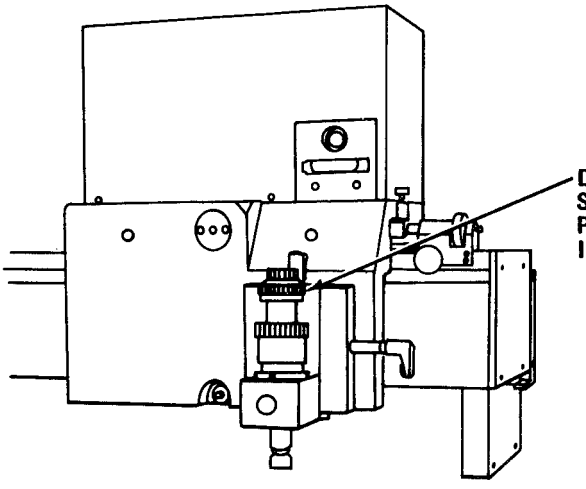
Use X-and Y-carriages to draw remaining two lines.

NOTE

Line A-B should be 2 in. (5.08 cm) long and line B-C should be 4 in. (10.16 cm) long. Measure line length as check.

f. Manual location/measurement of coordinate (data) points. Basic procedure involves setting XY display to display in coordinate values, using dotting microscope, or digitizing lens to locate your points.

(1) Mount drawing or map to be measured. Set machine for manual operation. (Paragraph 3-6.3.a)



(2) Mount digitizing lens or dotting microscope and adjust for viewing/marking (table 3-4, item 5, or table 3-5, item 4).

(3) Using dotting microscope, locate origin (0,0) point of drawing or map.

(4) Using fine adjustment device, secure X and Y-carriages over origin point.

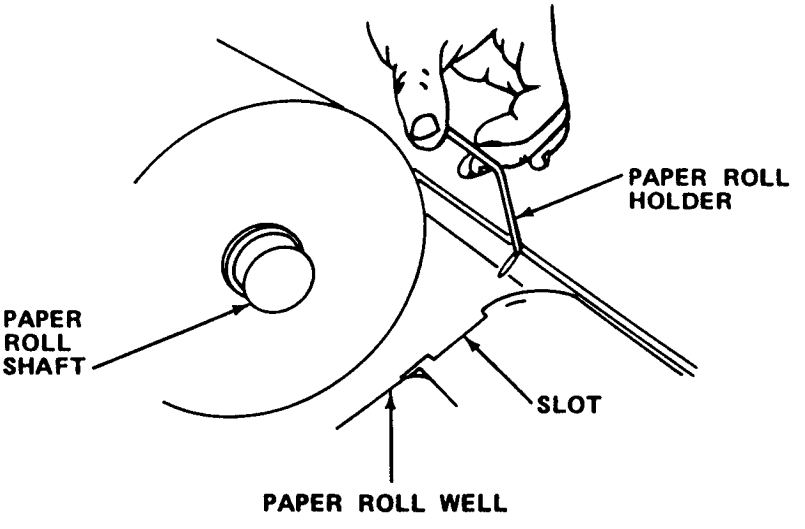
(5) Zero XY display and set for operation. Be sure to select mapping system, any scale factors, and preset values to match drawing or map to be measured.

(6) Release X-and Y-carriages (paragraph 3-6.3b). Locate each point to be measured with dotting microscope, using aiming dot in view field to precisely position tool over point. If microscope is used, point can be marked by pressing down on microscope.

(7) When point is located and tool positioned, observe XY display to read coordinates of point.

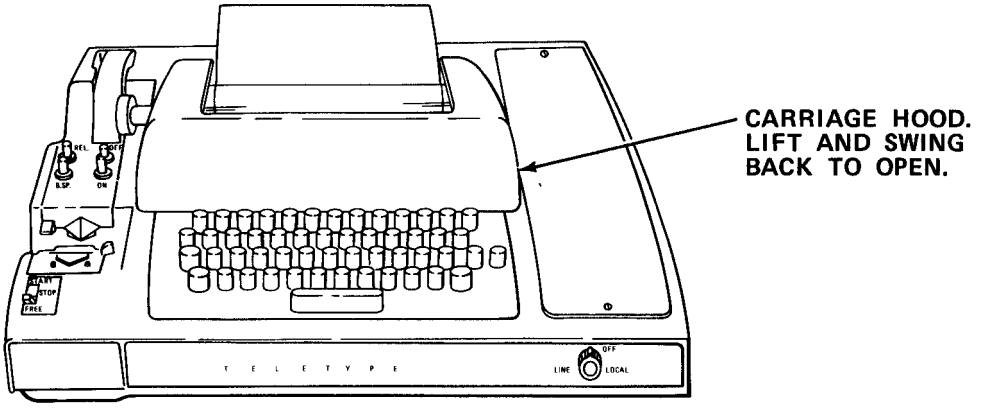
g. Installing paper roll in teletype

(1) Remove and discard old paper roll. Remove shaft and insert shaft in new roll.

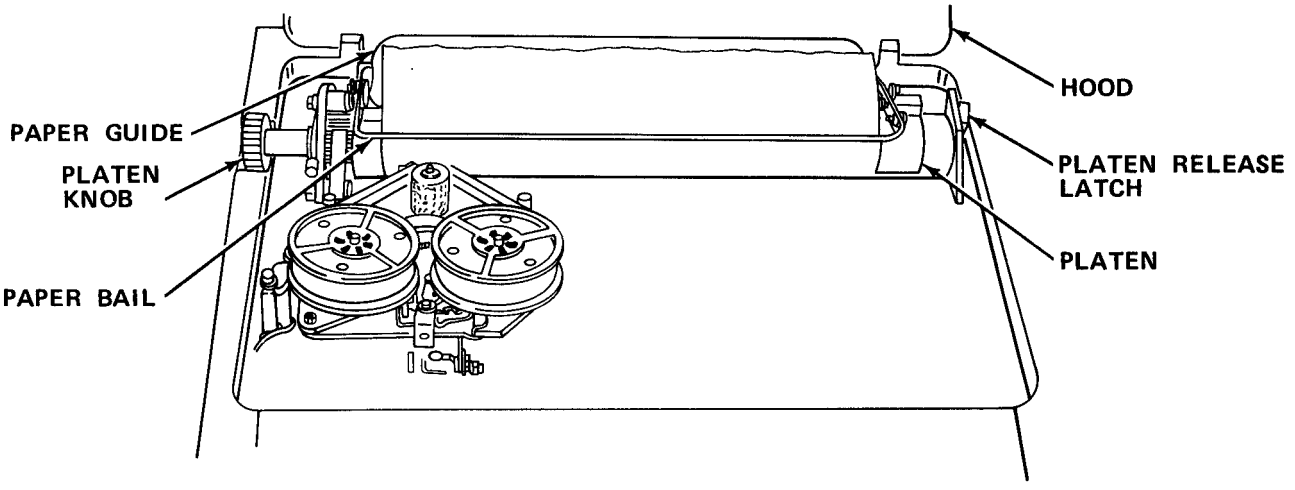


(2) Pull back and hold paper roll holder in back of paper roll well.

(3) Insert new paper roll into paper roll well by sliding roll shaft (on both sides) down slot in teletype cabinet. Insert roll so that paper unrolls from bottom of roll.



(4) Lift teletype carriage hood and swing back on hinges.



(5) Unroll several inches of paper.

(6) Flip paper guide plate forward.

(7) Turn platen with platen knob until it catches edge of paper and pulls it around platen.

(8) Flip paper guide plate back to original position.

(9) Turn platen knob until several inches of paper are pulled through

(10) Lift paper bail and pull platen release forward.

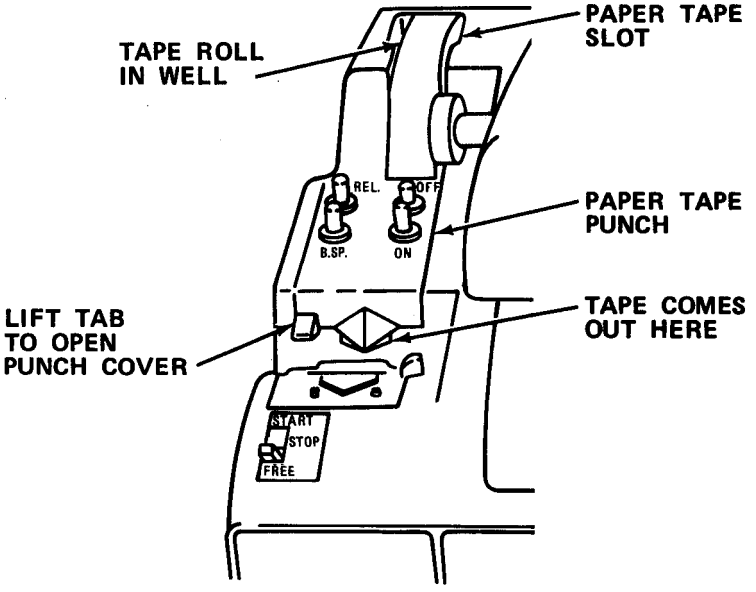
(11) Push paper behind paper bail and position it so that it will unroll straight.

(12) Push platen release back in place and drop paper bail.

(13) Lower teletype carriage hood.

(14) Type several lines to see if they are printed on paper straight and paper does not bind at edges. If paper is not straight, repeat steps (6) through (10) until it is straight.

h. Installing paper tape in teletype.



(1) Turn teletype power swi tch to local position.

(2) Remove and discard old paper tape roll. Press HERE IS key until all old paper tape in tape punch is out. Turn off power.

(3) Insert paper tape roll into well by sliding hub of roll down slot in teletype cabinet. Insert roll so that tape unrolls from top.

(4) Open tape punch cover and feed paper tape through slot in rear of punch. Push tape in as far as it will go.

(5) Close tape punch cover.

(6) Turn power switch to LOCAL. Press ON.

(7) Press HERE IS key until paper tape comes out front of tape punch.

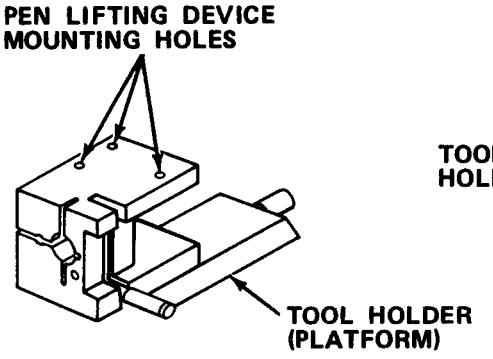
(8) If paper tape will not go through, pull tape out of tape punch, cut several inches from end, and repeat steps (2) through (7).

i. Using automatic tools. All automatic drafting/scribing tools are mounted and used with pen lifting device. For procedures concerning use of this device and other drafting tools, including mounting attachments, and adjustments, refer to applicable tool and procedure in Table 3-5.

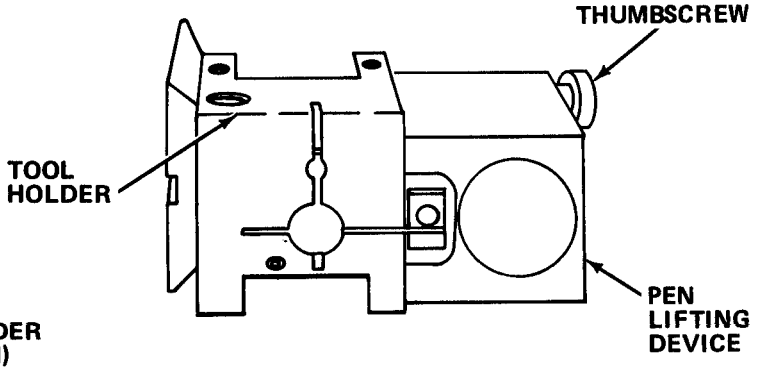
Table 3-5. USING AUTOMATIC DRAFTING TOOLS

Tool	Operating Procedure

1. Pen Lifting Device



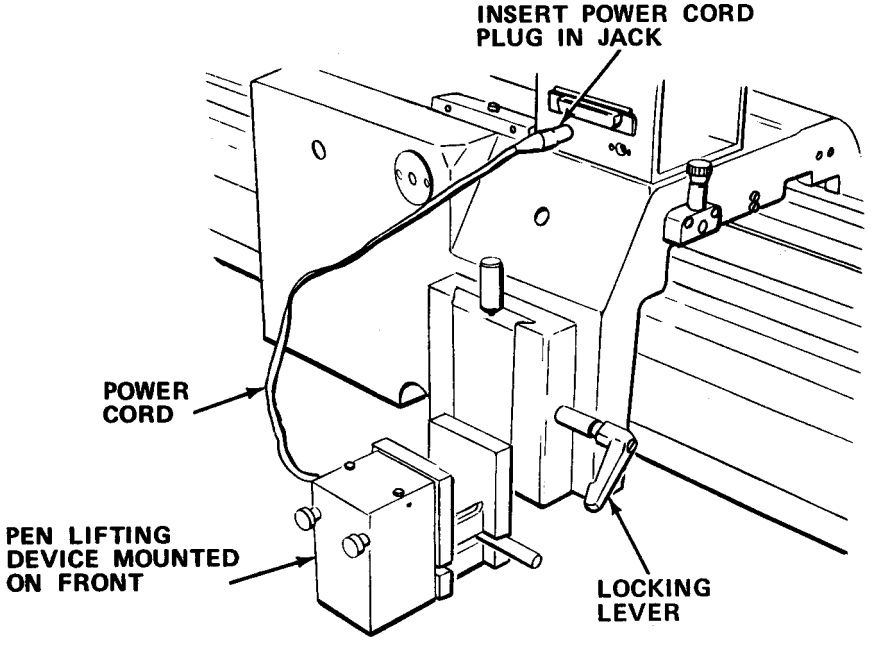
MOUNTING



a. Attach pen lifting device to tool holder and secure by tightening mounting thumbscrews.

NOTE

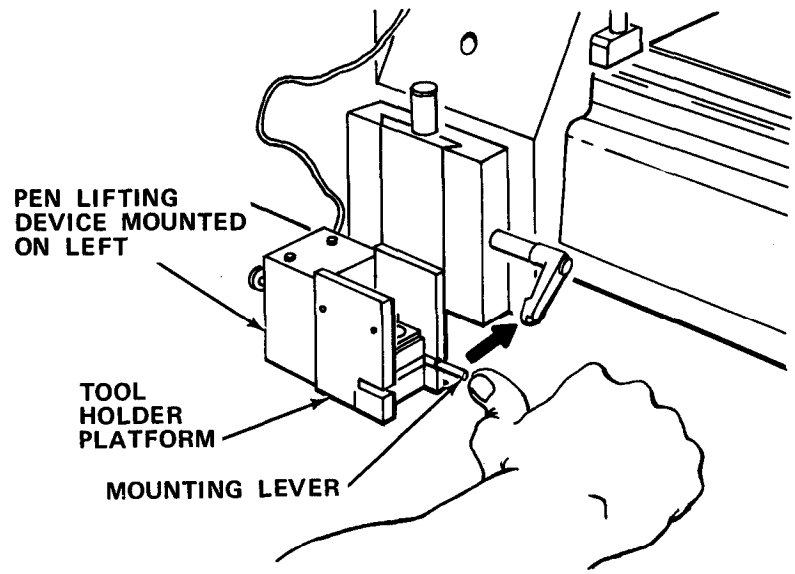
Pen lifting device may be mounted on left side of tool holder platform when using tangential device.



b. Slide tool holder platform into dovetail slide.

Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

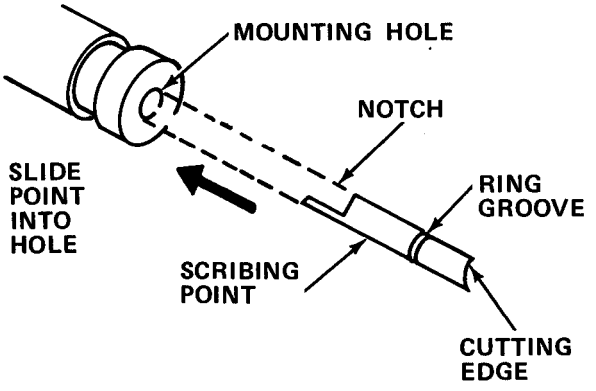
Tool	Operating Procedure
1. Pen Lifting Device - Cent	MOUNTING
	c. When tool holder is in place, secure by tightening locking lever. Turn locking lever right (up) to lock.
	d. Insert power plug into jack on X-carriage.
2. Tangentially Controlled Device	MOUNTING



a. Mount pen lifting device on left side of tool holder platform.

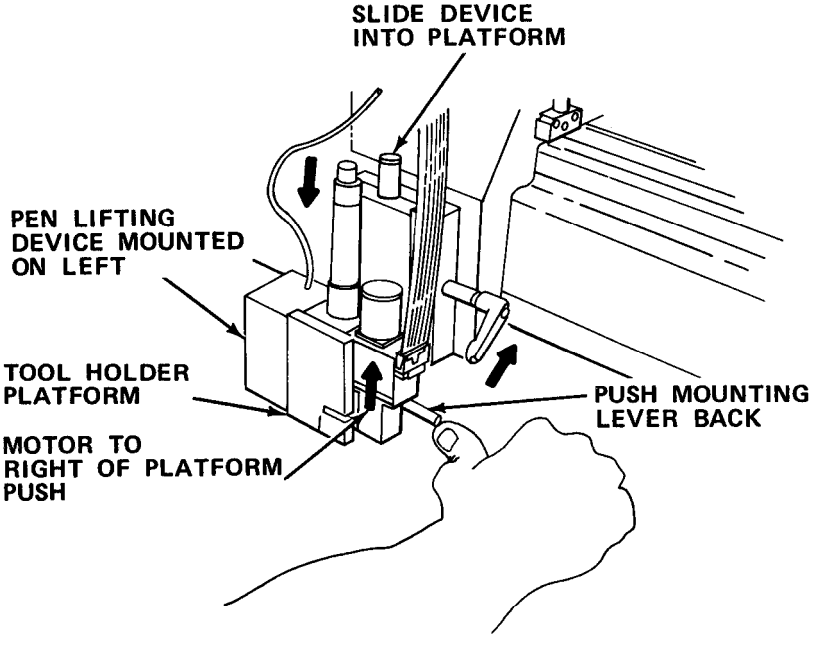
Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

Tool	Operating Procedure
2. Tangentially Controlled Device - Cont	MOUNTING



b. Slide scribing point into end of tangentially controlled device.

c. Turn scribing point until notched end engages notch inside device.



d. Slide tangentially controlled device into tool holder and push down as far as it will go.

Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

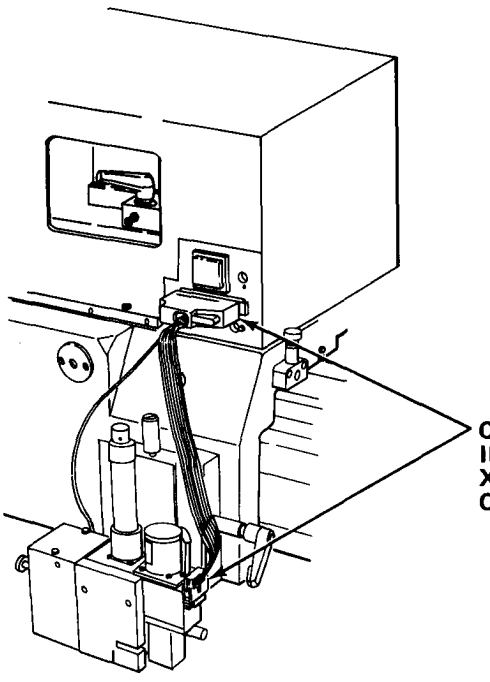
Tool	Operating Procedure
2. Tangentially Controlled Device - Cont	MOUNTING

e. Push in mounting latch and push device down again as far as it will go.

f. Release mounting latch.

NOTE

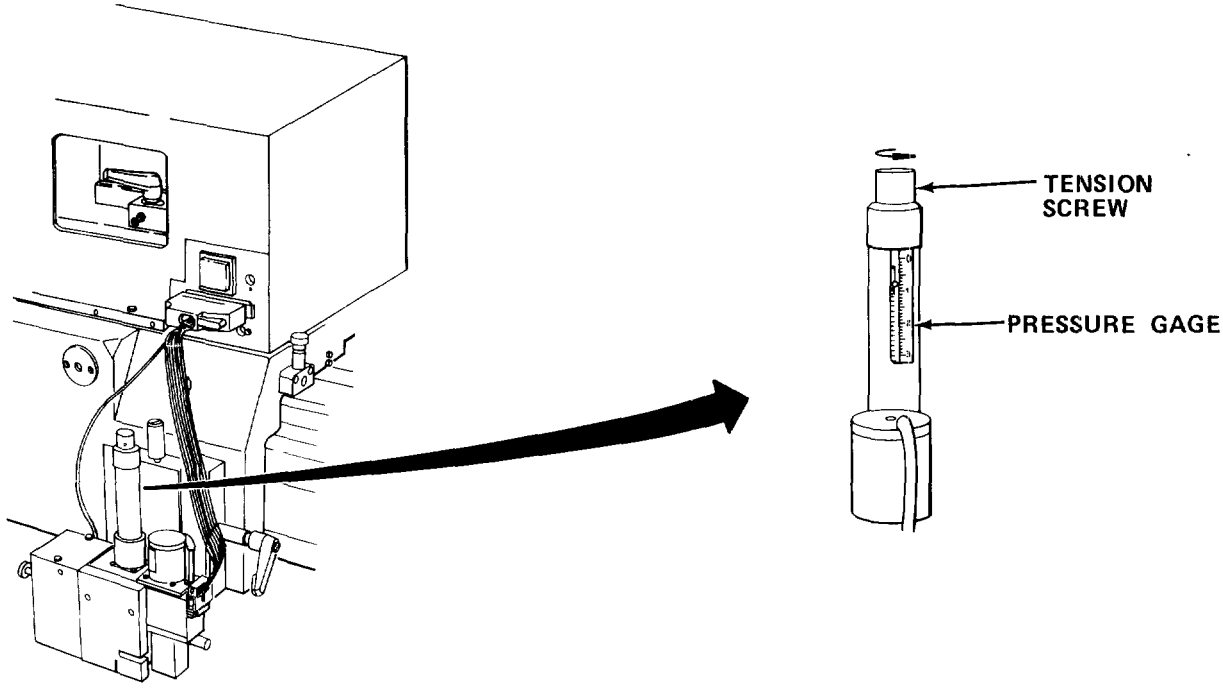
If mounting latch does not spring all the way back in place, gently lift or push tangentially controlled device slightly until it does. Latch should fit into groove in shaft of device.



g. Plug ribbon cable into device and connector on X-carriage.

Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

Tool	Operating Procedure
2. Tangentially Controlled Device - Cent	MOUNTING



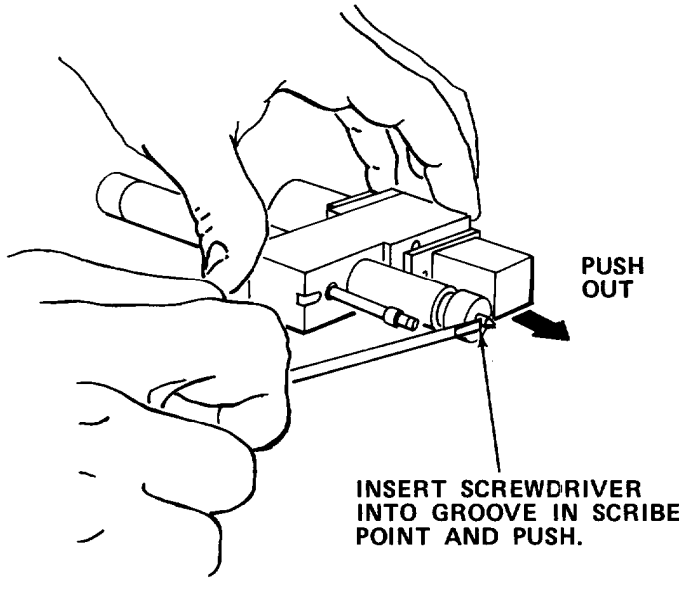
NOTE

- Turn tension screw left to increase tension on scribing point.
- Scale on scriber shaft is arbitrary and does not represent units of pressure.

h. Adjust tension on scribing point.

Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

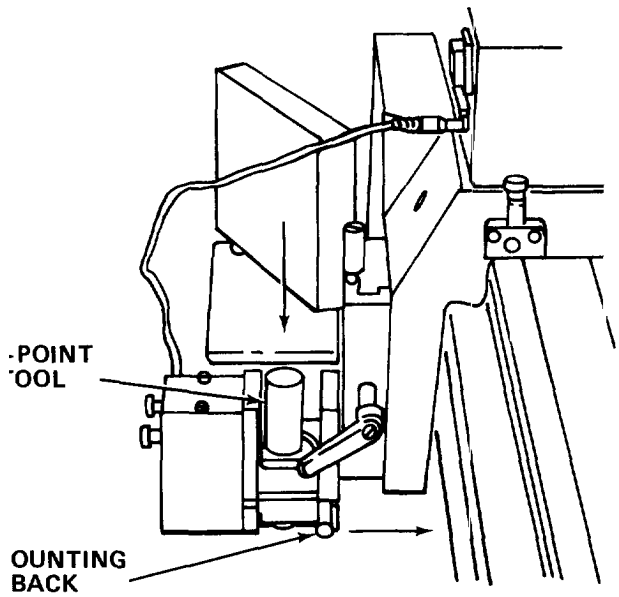
Tool	Operating Procedure
2. Tangentially Controlled Device - Cont	MOUNTING



i. To remove scribing point, insert screwdriver in ring groove and push point out.

Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

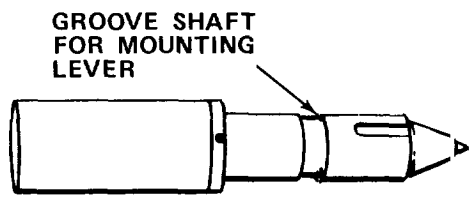
Tool	Operating Procedure
3. Ball Point Pen Tool	MOUNTING



a. Mount pen lifting device on front of tool holder platform.

b. Insert ink cartridge into ball point, pen tool.

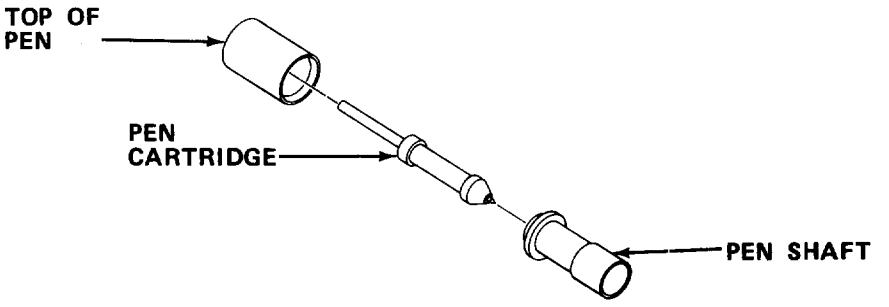
c. Push mounting lever back and insert ball point pen tool into hole in tool holder platform.



d. Release mounting lever. If lever does not spring all the way back, position pen until lever engages groove shaft of ball point pen tool .

Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

Tool	Operating Procedure
3. Ball Point Pen Tool - Cont	MOUNTING



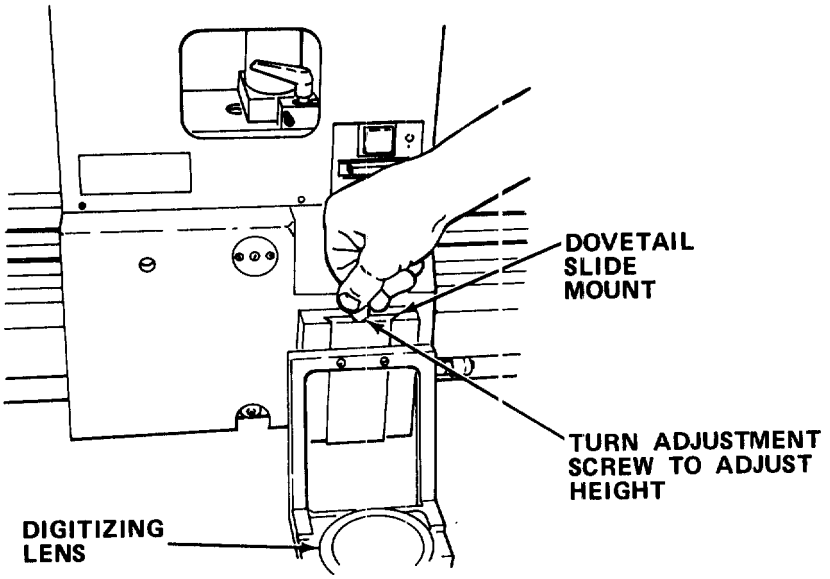
e. Unscrew top of ball point pen tool from shaft.

f. Slide old ink cartridge out and insert new cartridge.

g. Replace screw top.

Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

Tool	Operating Procedure
4. Digitizing Lens	MOUNTING



a. Slide digitizing lens into dovetail slide mount.

NOTE

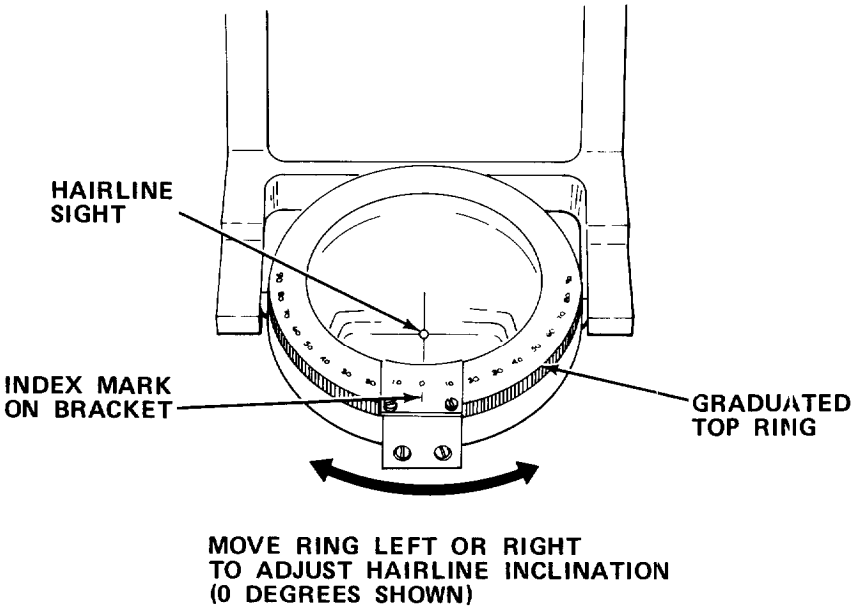
The cardboard backing on a standard notebook is approximately the correct thickness for the following procedure.

b. Adjust height of digitizing lens above table surface with height adjustment screw to approximately 0.06 in. (1.52 mm).

c. When digitizing lens is adjusted to desired height, turn locking lever up to lock lens in place.

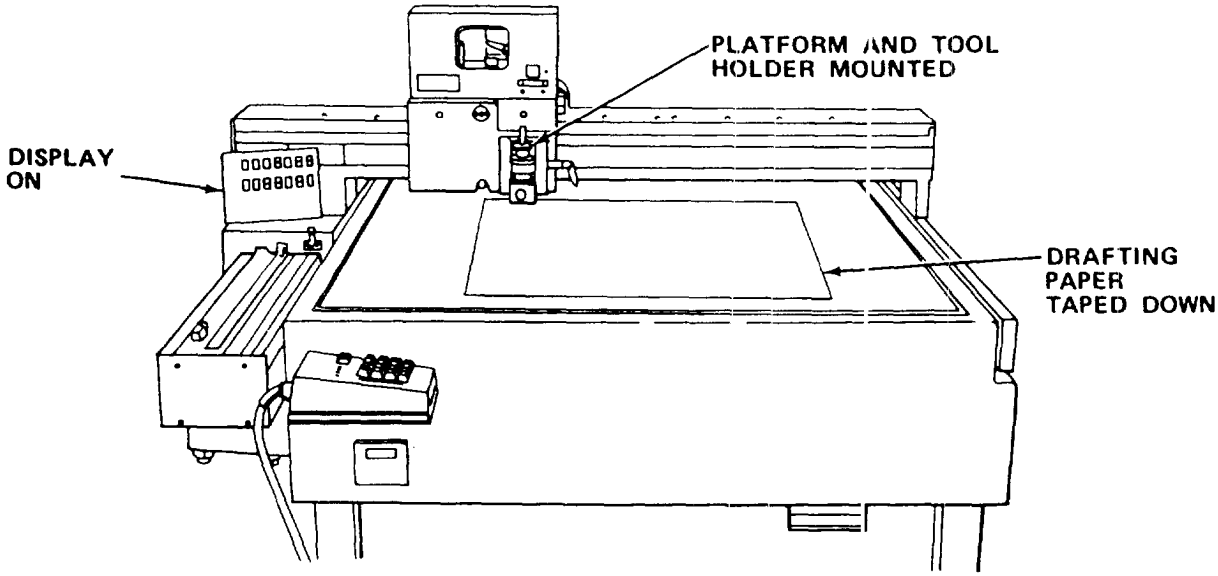
Table 3-5. USING AUTOMATIC DRAFTING TOOLS - Cont

Tool	Operating Procedure
4. Digitizing Lens - Cont	MOUNTING ADJUSTMENTS - Angle of Digitizing Lens Hairline



d. Turn graduated top ring of digitizing lens until index mark on plastic bracket indicates desired degree of inclination of hairline sight in lens.

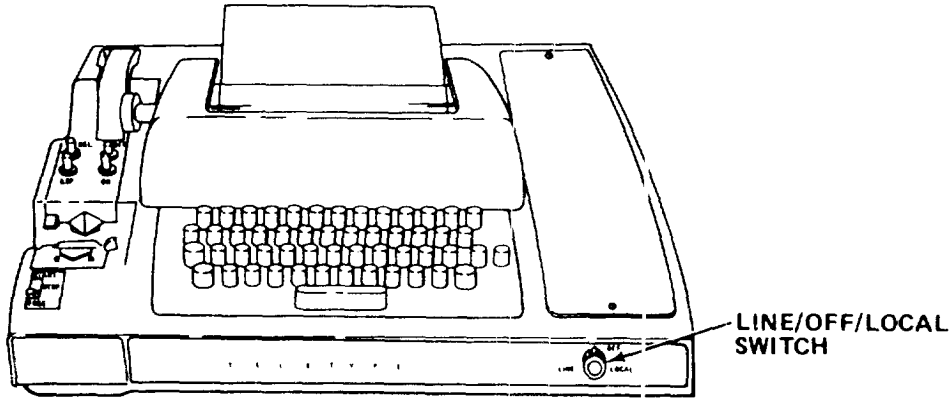
j. Digitizing points and/or]ines. Basic procedure involves entering coordinates of points at beginning and end of line with X key. Digitized data is sent to the teletype using the digitizing keyboard, via the digitizing card cage, for recording and punching tape. Data is recorded as lines composed of drafting commands (for drawing lines) with coordinates of points.



(1) Mount drawing or map to be digitized on table.

(2) Set machine for manual operation (paragraph 3-6.3.a).

(3) If needed, place new paper roll or paper tape in teletype (paragraph 3-6.3g or h).



(4) Turn teletype power switch to local.

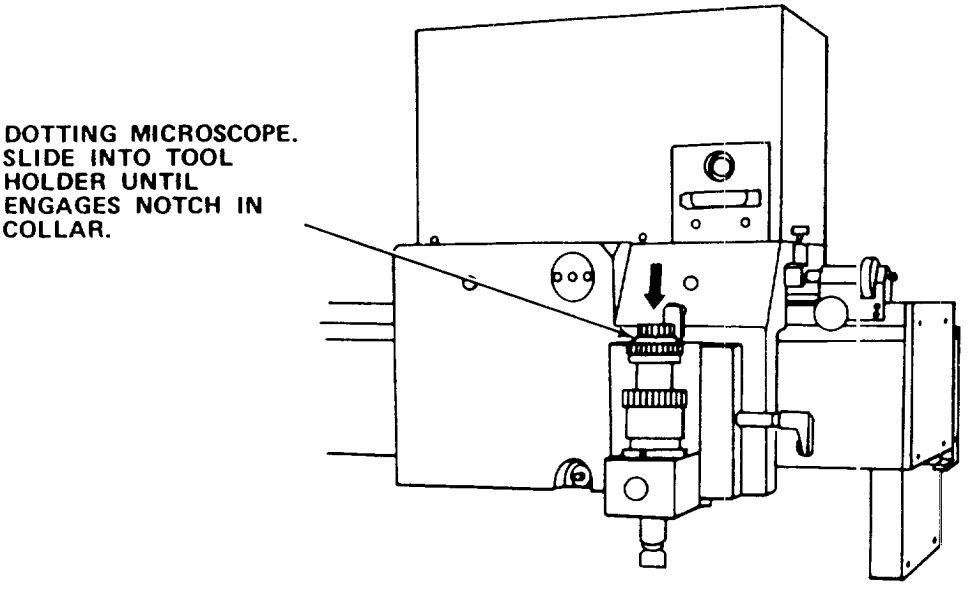
(5) Remove any previous programs or data from teletype and paper punch.

(6) Turn punch off.

(7) If paper tape is to be punched, perform (a) and (b).

(a) Turn on tape punch (press **ON).**

(b) Press **HERE IS** several times to produce tape leader holes.



(8) Mount dotting microscope or digitizing lens (table 3-4, item 5 or table 3-5, item 4).

(9) Adjust for viewing/marking (paragraph 3-6.3 b).

NOTE

Be sure measuring system preset values and scale match drawing or map being digitized.

(10) Press reset key to set XY display for operation.

(11) Turn teletype power switch to LINE.

NOTE

Fine adjustment devices may be necessary for precise positioning.

(12) Use aiming dot of dotting microscope or digitizing lens to locate beginning point of first line to be digitized.

NOTE

When X key is depressed, X and Y-coordinates on XY display are sent to teletype along with code for "pen up" command. When tape is played back, machine will move to this point with pen up, as commanded, and no line will be drawn. When Y key is depressed after point, coordinates are sent with code for "pen down" command. Machine, when tape is played back, will move to these coordinates with pen down, drawing line,

(13) When beginning of first line is located, press X on XY display keyboard.

(14) Locate end of first line and press Y.

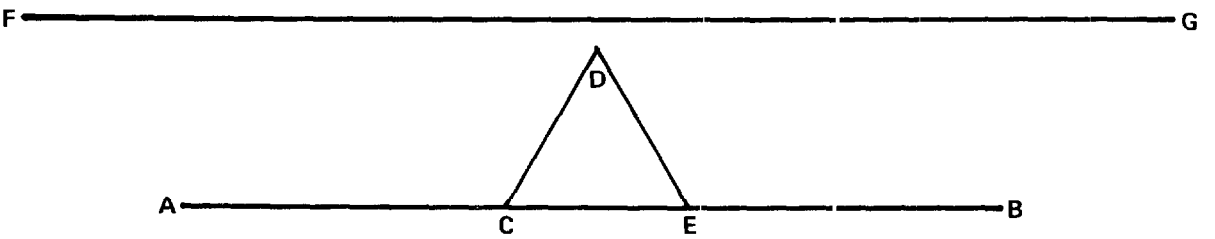
NOTE

How and where dotting microscope is moved in getting to end has no effect on results. Only final coordinates are recorded. Line will be drawn straight from last point to present point.

(15) Repeat steps (12) through (14) for each new line to be digitized. See example below.

NOTE

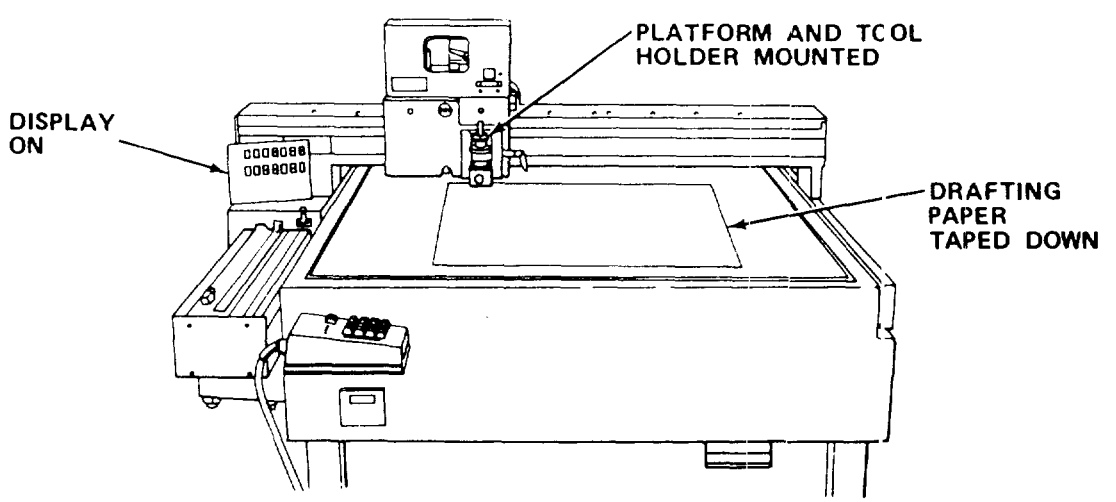
For lines connected, i.e., the beginning of one is the end of another, it is not necessary to use X key to reenter common point. After end of first line is recorded, simply move to end of next line and record coordinates with Y key. Anywhere two lines meet from different angles can be beginning or end.



Example: After performing steps (1) through (11), digitizing above line is done as follows:

Step	Result (in Program)
Locate point A. Press X.	Beginning of first line. No line is drawn to coordinates (from origin).
Move to point B. Press Y.	Line is drawn from point A to coordinates of point B.
Locate point C. Press X.	Machine moves from point B to point C without drawing line.
Move to point D. Press Y.	Line is drawn from point C to coordinates of point D.
Move to point E. Press Y.	Point D is in common. Line is drawn from D to E.
Locate point F. Press X.	Machine moves from point E to F without drawing line.
Move to point G. Press Y.	Line is drawn from F to G.

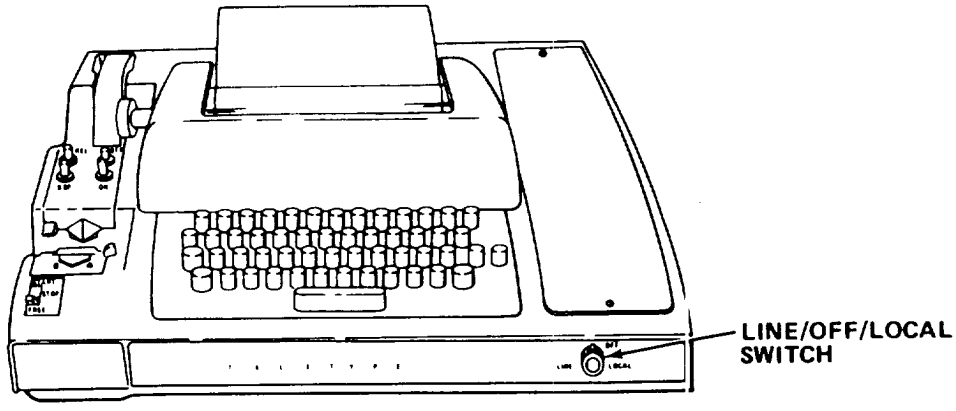
k. Digitizing arcs and circles. Basic procedure is similar to digitizing lines, except d fferent keys are usecl to send coordinate data. Full circles can be digitized several ways, but each requires location of center point. Digitized data is sent to the teletype using the digitizing keyboard, via the digitizing card cage, for recording and punching tape. Data is recorded as program command lines containing drafting commands (for arcs and circles) and coordinates of points.



(1) Mount drawing or map with arcs or circles to be digitized on table.

(2) Set machine for manual operation (paragraph 3-6.3a).

(3) If needed, place new paper roll or paper tape in teletype (paragraph 3-6.3g or h).



(4) Turn teletype power switch to local.

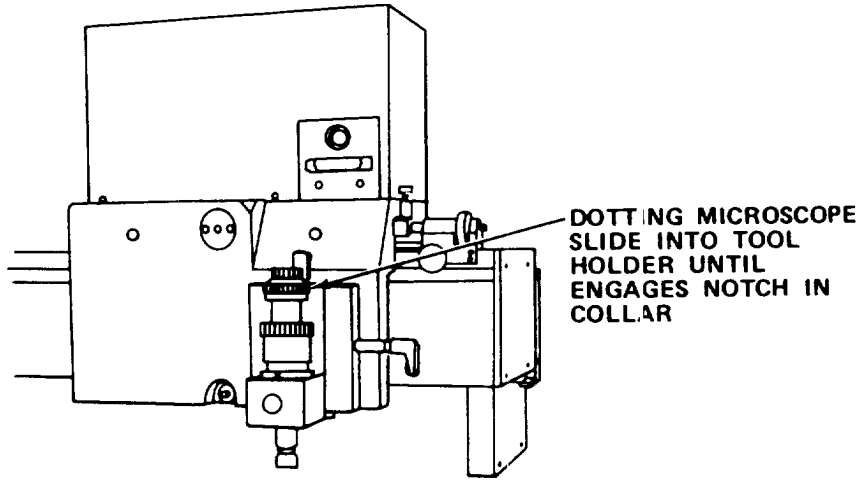
(5) Remove any previous programs or data from teletype and paper punch.

(6) Turn punch off.

(7) If paper tape is to be punched, proceed as follows.

(a) Press tape punch **ON** key.

(b) Press **HERE** IS key several times until leader holes produced can be seen on tape.



(8) Mount dotting microscope or digitizing 1ens (table 3-4, item 5, or table 3-5, item 4).

(9) Adjust for marking/viewing.

NOTE

Be sure measuring system, preset values, and scale are selected correctly.

(10) Set XY display for operation (paragraph 3-6.3b).

(11) Turn teletype power switch to LINE.

(12) Digitize arc as follows:

NOTE

Fine adjustment devices may be necessary for precise positioning.

(a) Locate starting point of arc with dotting microscope or digitizing lens.

(b) Press X.

(c) Move to some point on arc approximately halfway to end.

(d) Press A.

NOTE

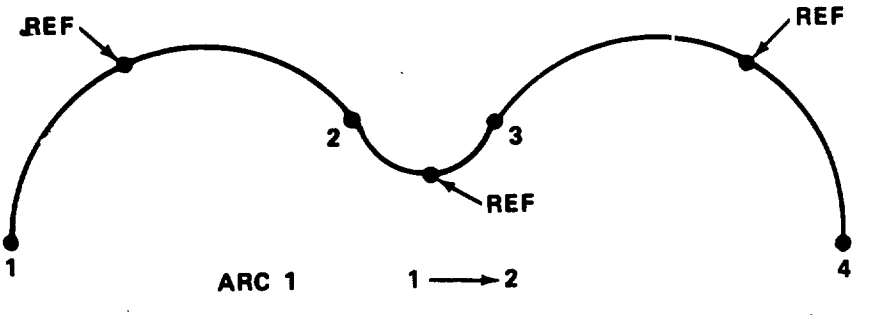
Displayed coordinate on arc is not sent to teletype. It is stored for use in calculating center point, radius, and rotation of arc.

(e) Move to endpoint of arc and press B.

NOTE

If endpoint of last arc is also beginning of next arc, it is not necessary to repeat the first step. Repeat second and third steps only.

Example: Digitize arcs in illustration below as follows:



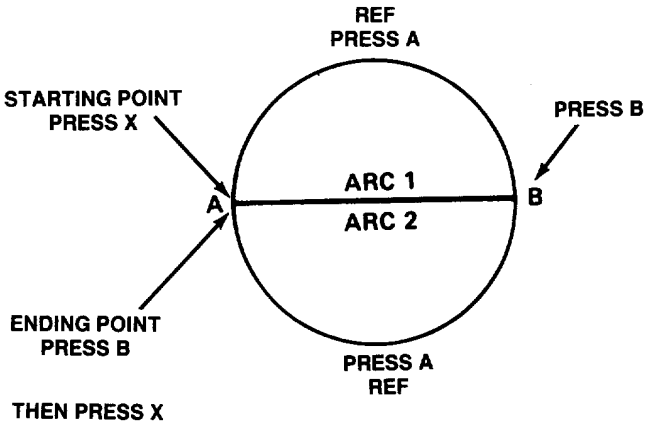
DIGITIZING AN ARC

Step	Result
Locate point 1. Press X.	Starting point of arc 1 (shown on XY display) is recorded.
Move to some reference point. Press A.	Reference point is stored but not recorded.
Move to endpoint 2. Press B.	Coordinates of point B are recorded. Center point, radius, and direction of rotation for arc are computed and recorded as command.
Move to reference point on arc 2. Press A.	Point is stored.
Move to endpoint 3. Press B.	Coordinates of endpoint and computed information for second arc are recorded.
Move to reference point on arc 3. Press A.	Point is stored.
Move to endpoint 4 of arc. Press B.	Arc complete.

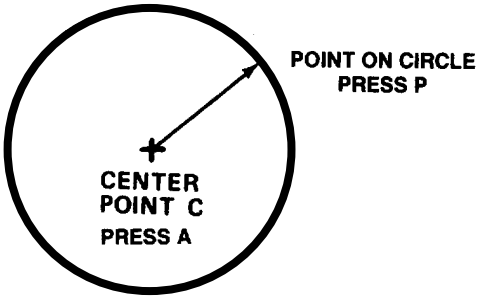
(8) To digitize circle, select one of methods from table 3-6.

Table 3-6. DIGITIZING FULL CIRCLES

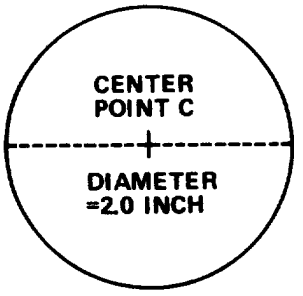
Method	Procedure
1	Divide circle into two equal arcs. Digitize these arcs, one after the other.



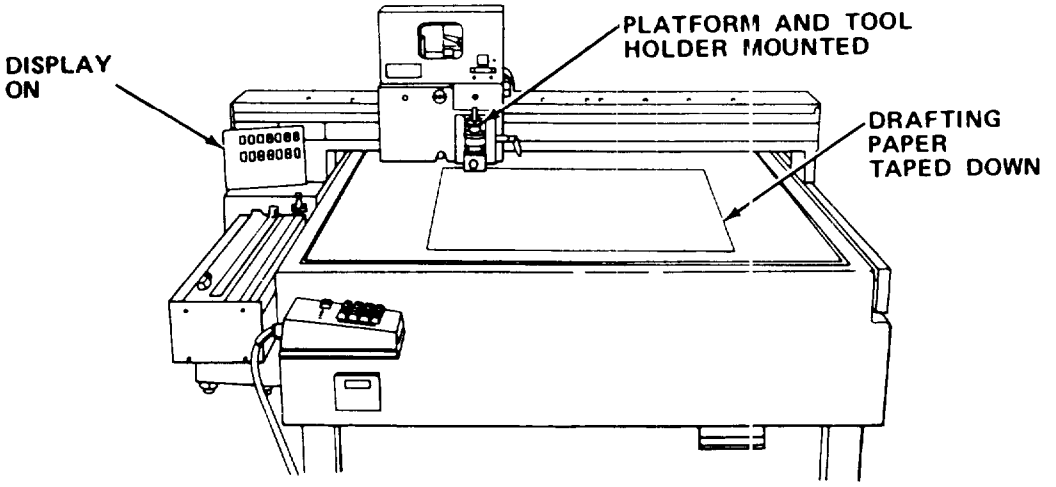
2	Locate center of circle. Record with **A** key. Move to any point on circumference of circle. Record with **P** key.



3	Locate center of circle, Record with **A** key. Press minus (-) key, type in diameter of circle, including any decimal points, and then press **B.**



l. Digitizing a combined shape. Basic procedure for digitizing a shape invo ves dividing figure into components of lines, arcs, and circles, and then digitizing each as they are encountered. Digitized data is sent to the teletype using the digitizing keyboard, via the digitizing card cage, to be recorded on paper and, if desired, punched on program tape. Recorded printout is composed of program command lines containing drafting commands and coordinates of points.

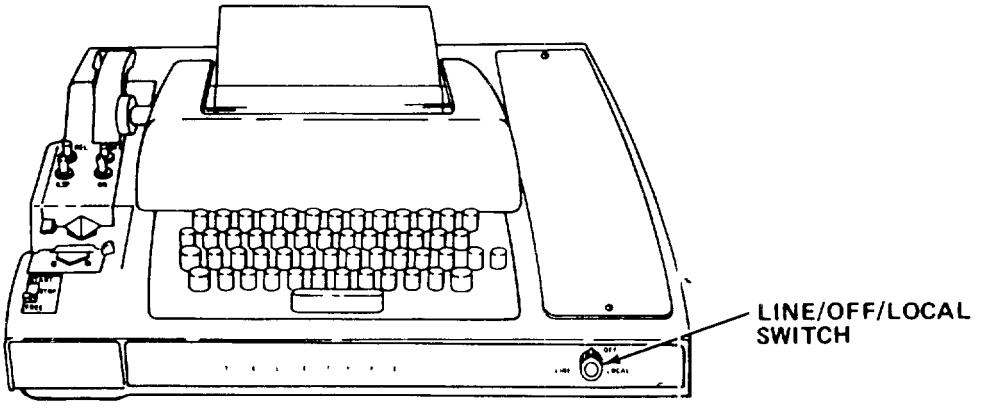


(1) Mount drawing or map with shape to be digitized on table.

(2) Orient drawing so that origin point (0,0) can be located in lower left corner.

(3) Set machine for manual operation (paragraph 3-6.3a).

(4) If needed, replace paper or paper tape in teletype (paragraph 3-6.3g or h).



(5) Turn teletype power switch to LOCAL.

(6) Remove any previous programs or data from teletype and paper punch.

(7) Turn punch off.

(8) If a paper tape is to be punched, proceed as follows:

(a) Press paper tape ON key.

(b) Press HERE IS key several times until leader holes can be seen on tape.

(9) Mount dotting microscope or digitizing lens (table 3-4, item 5 or table 3-5, item 4).

(10) Adjust for marking/viewing.

NOTE

Be sure that measuring system, preset values and indicated scale on document being digitized agree.

(11) Set XY display for operation (paragraph 3-6-3b).

(11.1) Install fine adjustment devices.

(12) Turn teletype power switch to LINE.

(13) Locate origin point in lower left of drawing as reference point.

(14) Press X to store coordinates.

NOTE

If origin cannot be set to 0, enter appropriate coordinates.

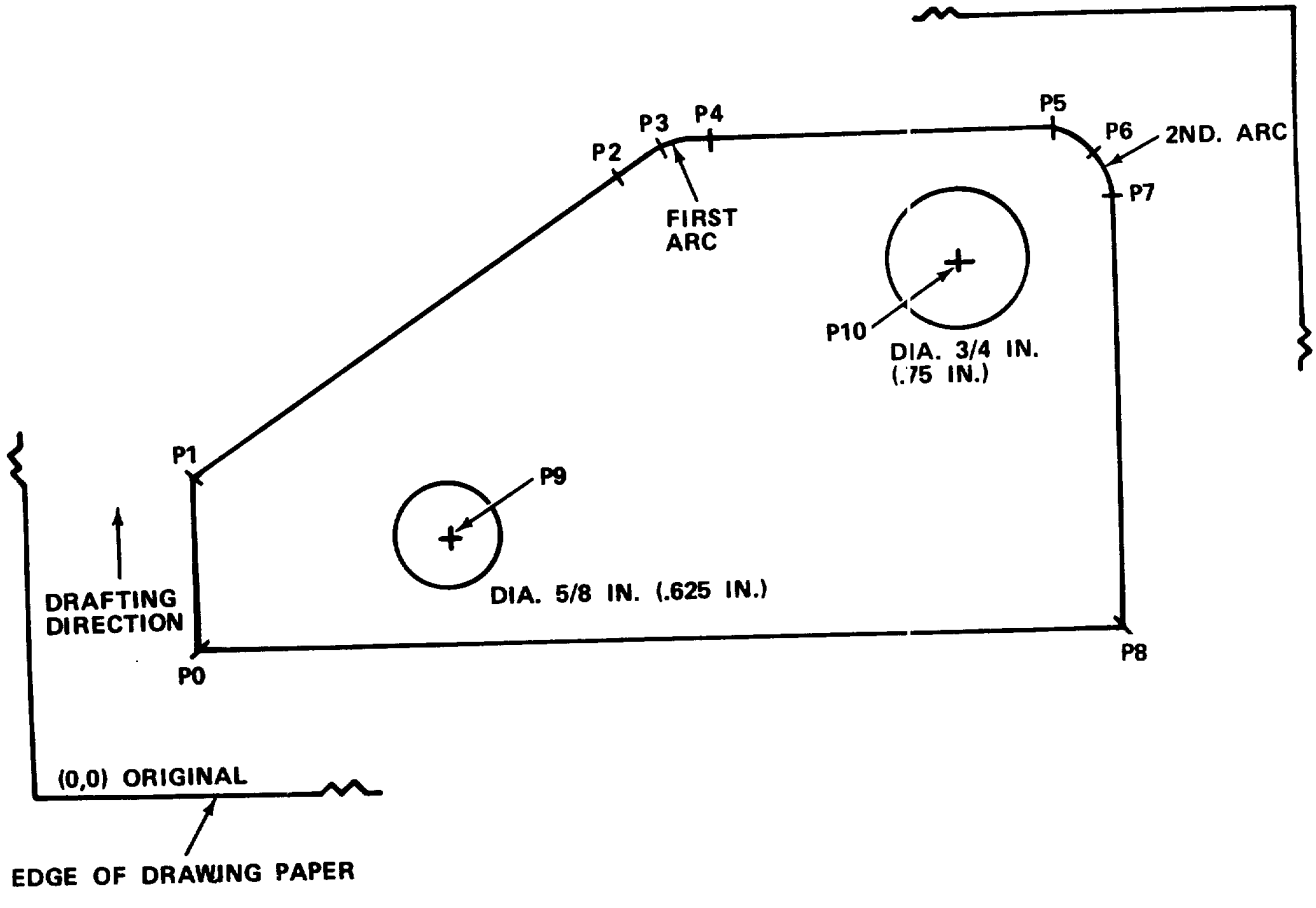
(15) Digitize all lines, arcs, and circles of figure. See example below:

NOTE

When digitizing, try to input coordinates and commands so that, when machine drafts digitized figure, it will draw figure in one continuous motion.

Example: After performing steps (1) through (15), proceed as follows:

Step	
Move to point PO. Press **X**	Coordinates of PO are recorded. Machine will move with pen up.
Move to point PI. Press **Y.**	First line is recorded. On XY display, coordinate of X should not change.
Move to point P2. Press **Y.**	Second line is recorded.
Move to point P3. Press **A.**	Reference point for first arc is stored.
Move to point P4. Press **B.**	Endpoint of arc is stored. Radius and direction of arc are computed and recorded as drafting command.



Action	Result
Move to point P5. Press **Y.**	Third line is recorded. Coordinate of Y in XY Display should not change.
Move to point P6. Press **A.**	Reference point is stored.
Move to point P7. Press **B.**	Endpoint and computed arc are recorded as command.
Move to point P8. Press **Y.**	Fourth line is recorded. Coordinate of X should not change.
Move to point P0. Press **Y.**	Fifth line is recorded. Coordinate of Y should not change.
Move to point P9. Press **A, -, P, 6, 2, 5,** and **B.**	Center point of circle is recorded. Diameter (0.625 in.) is entered manually.
Move to point P10. Press **A, -, P, 7, 5,** and **B.**	Center point of second circle is recorded. Diameter (0,75 in.) is entered manually.
Move to point PO again. Press **X, 7,** and **-.**	Machine is commanded to move back to starting point. Then EOF code **(7,** -) is recorded.

(16) Shift teletype to LOCAL.

(17) Press HERE IS key.

(18) If digitizing is complete, remove digitizing tool.

m. Writing tape drafting program. To write tape program, use commands listed in table 3-7. These commands tell machine where and how to move. Pen commands determine if command results in line being drawn or scribed. (A line, circle, or arc will be drawn or scribed if pen or scribing poirt is down when machine moves, line, circle, or arc will be drawn or scribed.) Commands are written in program lines with no line longer than 64 characters. Drafting (movement) command code is always first item in program line, followed by pen commands and/or appropriate coordinate data. All coordinate data is entered with prefixes that identify it as normal point coordinates X and Y for line or coordinates I and J for center point of circle.

Example: Possible program line is as follows:

G2D1X200Y300I250J275

Where G2 = Drafting Command

D1 = Pen Command (down)

X200 = X Portion of (X,Y) Point Coordinate (for Lines)

Y300=Y Portion of (X,Y) Point Coordinate (for Lines)

1250 = Distance of Center Point of Circle Along X-Axis (X-Coordinate)

J275 = Distance of Center Point of Circle Along Y-Axis (Y-Coordinate)

NOTE

I-and J-coordinates together (I,J) locate center point of circle in machine coordinate system in exactly the same manner as X-and Y-coordinates (X,Y).

When writing tape programs, the following guidelines should be fol" owed:

(1) First program 1 ine type % character.

(2) Second program 1 ine should select measuring system (G70 English, G71 metric).

(3) Third line should set common scale factors for both axes.

(4) Next 1 ines should preset zero reference point, preferably in left-hand corner of drawing.

(5) Rest of lines are program lines and should be written, whenever possible, so that entire figure is drawn in one (or as few as possible) continuous motion, beginning in lower left portion of figure.

(6) Do not forget to insert pen commands. When used, they should be typed immediately after drafting command.

(7) All programs must end with "program stop" command (MOO).

(8) Each program 1 ine typed (on teletype or console) must end with carriage return and line feed.

Table 3-7. DRAFTING TAPE COMMANDS

Command Code	Meaning	Notes on Use
	Point/circle Coordinate Codes	
X	Following coordinate is X-coordinate.	Typed just before value of coordinate. **Example: X125**
Y	Following coordinate is Y-coordinate.	Typed just before value of coordinate. Example: Y126
I	Following coordinate is X-coordinate for center point of circle.	Typed just before coordinate. Example: I250
	Following coordinate is Y-coordinate for center point of circle.	Typed just before coordinate. Example: J275
	Drafting Codes	
G1	Draws straight line.	Followed by X-and Y-coordinates. Example: G1X125Y126
G2	Draws clockwise circle.	Followed by I-and J-coordinates. Example: G2I125J126
G3	Draws counterclockwise circle.	Followed by I-and J-coordinates. Example: G3I125J126

Table 3-7. DRAFTING TAPE COMMANDS - Cont

Command Code	Meaning	Notes on Use
	Pen Codes	
D1	Lower pen.	Typed immediately after drafting code. Example: G1D1
D2	Raise pen.	Typed immediately after drafting code. Example: G1D2
	Scale Codes	
D39	Input scale factor.	Followed by scale factor. Example: D39I25 (Factor 1:400, both axes)
G70	Designates English measuring system (for scale).	Used alone. Example: G70
	Point Input Codes	
G71	Designates metric measuring system (for scale).	Used alone. Example: G71
G90	Designates absolute input.	All points will be measured from one zero point. Followed by pen codes and/or X-and Y-point coordinates. Used alone. Example: G90

Table 3-7. DRAFTING TAPE COMMANDS - Cont

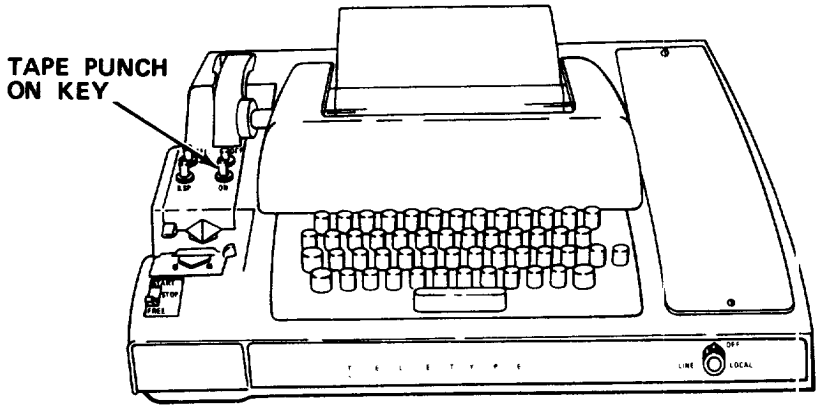
Command Code	Meaning	Notes on Use
	Point Input Codes—Cent	
G91	Designates incremental input.	Zero point changes after each input. Followed by pen codes and/or X-and Y-point coordinates. Used alone. Example: G91
M00	Program stop command.	Typed on line alone.

n. Punching tape on teletype.

(1) Assemble system and set for automatic operation (paragraph 3-6.3a).

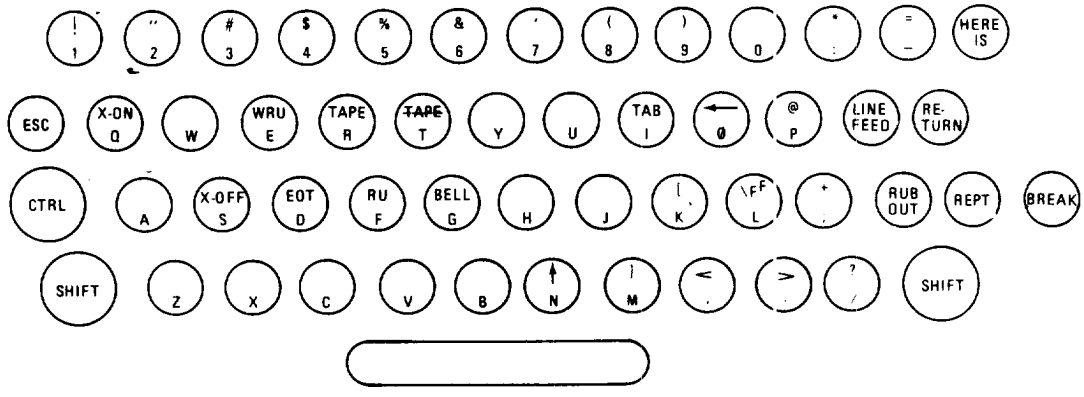
(2) Turn teletype power switch to LOCAL.

(3) If needed, install paper tape and/or paper roll in teletype (paragraph 3-6.3g or 3-6.3 h).



(4) Remove any old programs on paper roll or tape.

(5) Press tape punch ON key.



(6) Press **HERE IS** key on teletype keyboard until tape exits from punch with leader holes.

NOTE

If **HERE IS** key is not used to produce leader lines, paper tape will not feed through controller tape reader or teletype tape reader properly.

(7) Type program commands in the program lines in order that they are written.

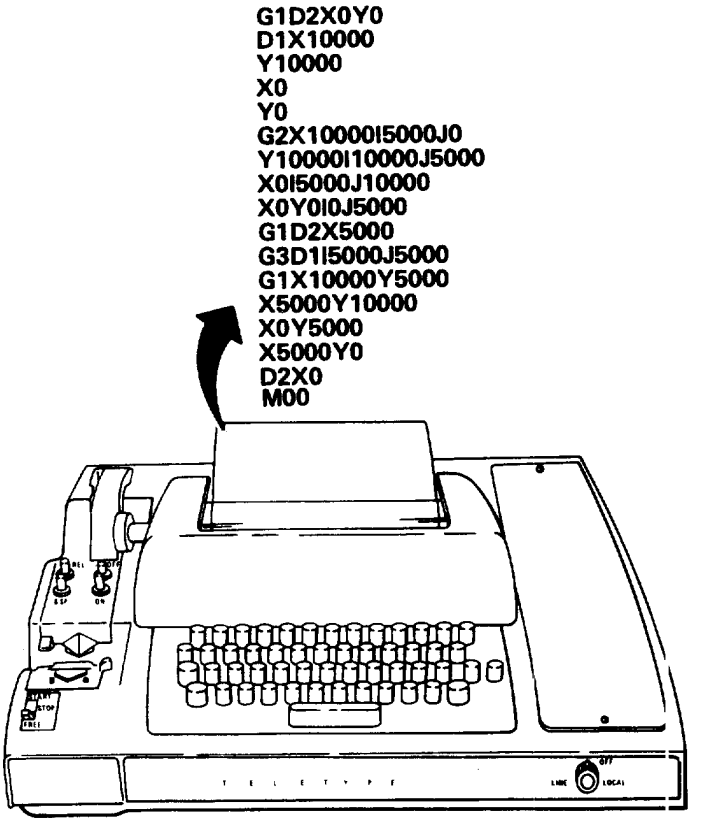
NOTE

Each time key on teletype is pressed, tape punches and advances one character. **B.SP.** key will back tape up one character. **RUBOUT** key inserts nulls in that character and controller will ignore the command.

(8) Use **RETURN** key and **LINE FEED** to end one line and start another.

(9) Use **B.SP.** (backspace) and **RUB OUT** keys on teletype to correct incorrect character.

(10) When last of program is entered, press **HERE IS** until the only holes in tape as it leaves punch are leader holes.



(11) Remove punched tape and printout from teletype. Check printout to make sure program was input correctly. If there are any errors, tape must be corrected.

o. Correcting or changing tape program with teletype.

(1) Set tape to be changed in tape reader as if it is to be duplicated (paragraph 3-6.3a).

(2) While watching printout, turn tape reader to START, and duplicate tape up to point where program is to be changed or corrected. When this point is reached, push reader lever to STOP.

(3) If tape reader and punch copies too many blocks, proceed as follows:

(a) Backspace tape punch with B.SP. key.

(b) Press RUB key to nullify unwanted codes.

(4) Type in change or correction to tape with teletype keyboard.

NOTE

If change or correction being input is only addition of commands in middle of tape and none of codes already on tape will be changed, it is not necessary to manually type in rest of program. Simply turn tape reader on after addition is typed in and duplicate rest of program.

(5) If any codes (commands) on old tape were changed or eliminated, manually type remainder of program on teletype keyboard.

(6) When tape is complete, run it on tape reader and check printout for errors.

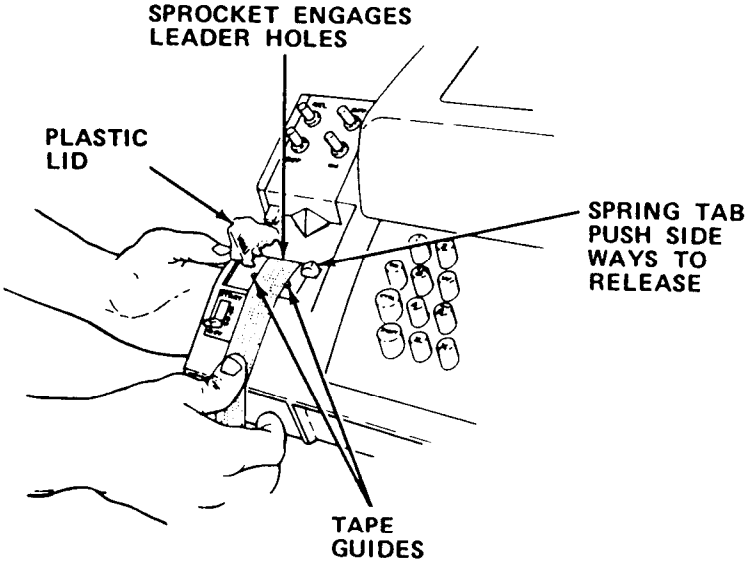
(7) Discard old tape.

p. Duplicating and/or printing tape program with teletype. Basic procedure involves placing tape to be duplicated in tape reader of teletype, blank tape in tape punch, and then turning on both units. Everything read on tape by reader will be printed out (in alphanumerics) by teletype. When tape punch is on, anything typed by teletype is also punched on tape.

(1) Assemble and set machine for manual operation (paragraph 3-6.3 a).

(2) Turn teletype power switch to LOCAL.

(3) Remove any old tapes or programs from teletype and tape punch.



(4) Press spring tab on tape reader to one side so that plastic lid springs up.

(5) Push tape reader lever to FREE.

CAUTION

Use care when handling and mounting paper tape or damage to tape could result,

(6) Carefully lay tape on reader between guides so that sprockets of drive wheel engage leader (HERE IS) holes in beginning of tape.

(7) Push plastic lid in place over tape, so that locking tab engages.

(8) Push tape punch ON key.

(9) Push tape reader lever to STOP and then to START.

(10) Observe tape printout on teletype.

NOTE

Unless tape is being changed or corrected, let entire tape run before stopping reader.

(11) To stop tape reader at any time, push reader lever to STOP.

(12) When entire tape has been read, stop tape reader.

(13) Remove old tape from reader and copy from tape punch.

(14) To make sure copy was punched correctly, run copy through tape reader and compare its printout to printout of original.

NOTE

If tape is only being read and printed, not copied, tape punch should be OFF.

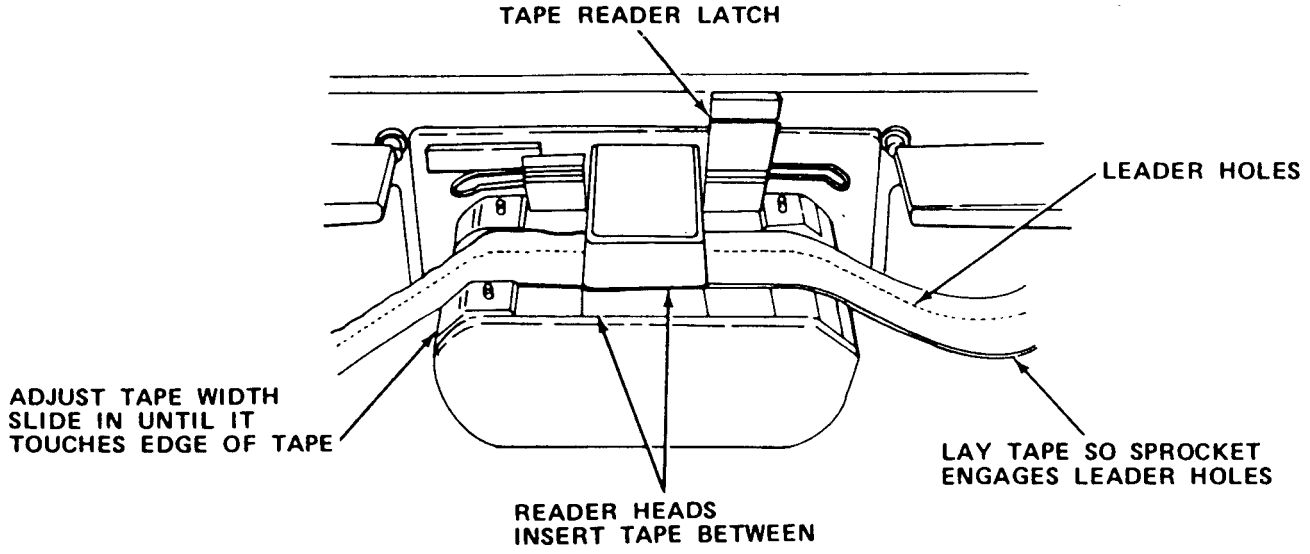
q. Running tape on machine controller. Basic procedure involves placing tape in machine controller tape reader and using operator's console to control reader.

(1) Check that correct drawing, map, and tools are mounted on drafting machine.

(2) Set machine for automatic operation (paragraph 3-6.3a).

(3) Turn on machine controller.

(4) Perform operator's test of automatic system (paragraph 3-6.2).



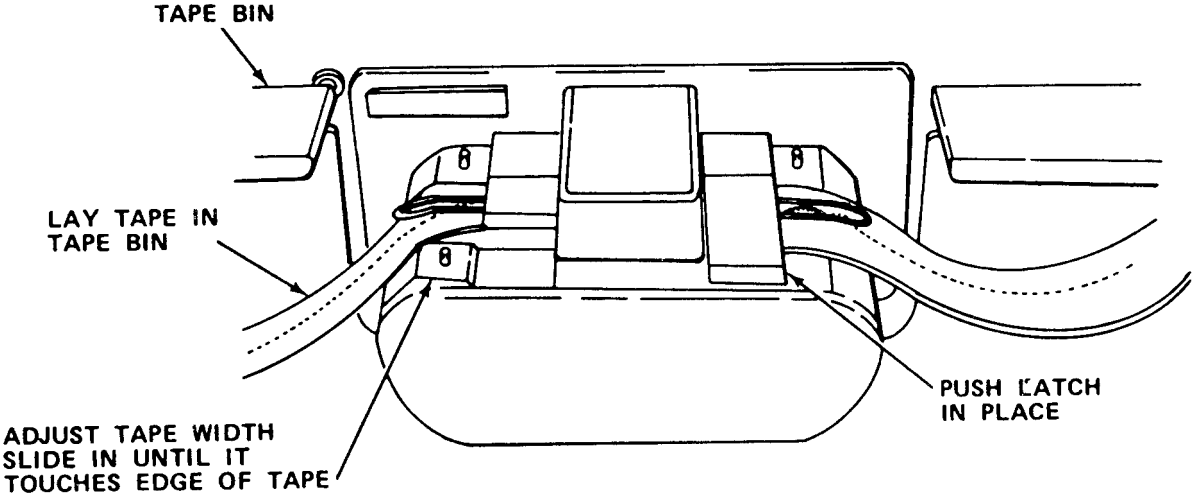
CAUTION

Use care when handling and mounting paper tape or damage to tape could result.

(5) Lift tape reader latch.

(6) Lay tape between heads of tape reader and inside of tape guides so that sprockets of drive wheel engage leader holes.

(7) Snap tape reader latch back into place over tape.



(8) Slide tape between guide posts.

(9) Lay tape inside left-hand side of fanfold bin so tape will pull through smoothly.

(10) Press **RESET** key on operator's console and on the digitizing keyboard.

(11) Deleted.

(12) Key scale and preset factors into console if they are not to be set by tape (paragraph 3-6.3s)

NOTE

If one block of tape is to be read and executed at a time, press SINGLE BLOCK after pressing START.

(13) To start machine controller tape reader, press START on operator's console.

NOTE

Tape reader can be stopped at any time by pressing STOP on operator's console.

(14) When tape has finished reading and drafting machine has stopped, press RESET on operator's console.

r. Basic use of (machine controller) operator's console. Operator's console operates like terminal keyboard. Set of two symbols, numbers, or letters is printed above each key on main keypad. Just pressing key will input symbol, letter, or number printed to left into display. To input what is printed to right, shift (SHF) key must be pressed first to enable right-hand functions. Shift key will stay in effect until it is pressed again. Arrows on numeric keypad are only active if JOG is pressed. If numeric keys are pressed without pressing JOG, number above key is input to display. Basic procedure for using console is as follows:

(1) Turn on machine controller.

(2) Press **RESET.**

(3) Press key on main keypad for desired function.

NOTE

If you press two or more keys simultaneously, operator's console will behave erratically and you will have to start over.

(4) If JOG, VARIA, or PEN keys are pressed, operation code must be typed into display (see table 3-8 for list of OP codes and their uses) and then CR (carriage return) pressed to activate code.

NOTE

When OP code is typed into display using main keypad, it will appear in right corner of display when first typed. If syntax is correct, i.e., if code is typed correctly, it will move to left side of display when CR is pressed. if code is incorrect, it will disappear when CR is pressed.

Table 3-8. OPERATOR'S CONSOLE OPERATION (OP) CODES

Code	Meaning and Use
	JOG FUNCTIONS
SLO	Slow speed set for machine movement.
MED	Medium speed set for machine movement.
FAS	Fast speed set for machine movement,
STP	Step movement each time arrow key is pressed.
	NOTE
	Machine will continue to operate at selected speed until reset or changed.
	PEN FUNCTIONS
MAU	Manual override, pen up. Overrides any tape program commands and raises pen.
MAD	Manual override, pen down. Overrides any tape program commands and lowers pen
AUU	Automatic up. Pen raises until console or tape program command says to lower,
AUD	Automatic down. Pen lowers until commanded to raise.
	VARIA FUNCTIONS
CON	Console Command. Enables manual input of tape program drafting commands. Commands are entered after pressing **CR.**
SCA	Scale command. Enable operator to set scale of machine and XY Display CPU with console. Scale is entered after pressing **CR.** (10,000 = 1:1).
PRE	Preset command. Used to enter preset value for 0 (origin) reference point on machine. Value is entered after pressing **CR.**
	NOTE
	Every entry, after **VARIA** command is selected, is ended by pressing **CR.**

s. Manually inputting drafting commands with operator's console. Basic procedure involves using console command of **VARIA** function.

(1) Turn on machine controller.

(2) Set machine for automatic operation (paragraph 3-6.3a).

(3) Press **RESET** on operator's console.

(4) Press **VARIA.**

(5) Type scale factor and preset coordinates into operator's console (table 3-8, items SCA and PRE).

(6) Deleted.

(7) Press **VARIA** and then type **CON** and press **CR.**

NOTE

Display should show asterisk (*) in right-hand corner.

(8) Type in drafting program command lines exactly as they are typed and punched on drafting tapes (table 3-7) one line at a time.

(9) End each command by pressing **CR.**

t. Moving machine to point with operator's console.

(1) Set machine for automatic operation (paragraph 3-6.3a).

(2) Turn on machine controller.

(3) Press **RESET** on operator's console.

(4) Press **VARIA.**

(5) Type scale factor and preset coordinates into operator's console (table 3-8, items SCA and PRE).

(6) Type **CON** and press **CR.**

NOTE

Display should show asterisk (*) in its right-hand corner.

(7) Type in X and numeric value of X; type in Y and numeric value of Y.

(8) Press **CR.**

NOTE

Do not type in commas. Machine will move to point, from its current location, by moving specified number of units in each axis.

Example: Typing X1500Y1400 will cause machine to move 1500 units in current scale and from current position in X-direction, and 1400 units in Y-direction.

u. Jogging (moving) machine with operator's console.

(1) Turn on machine controller. Set machine for automatic operation (paragraph 3-6.3a).

(2) Press RESET on operator's console.

(3) Press JOG on operator's console.

(4) Using keys on main keypad, type into operator's console code for one of four speeds shown below:

Type	Speed
SLO	slow
MED	Medium
FAS	Fast
STP	One Step Each Time Key Is Pressed

NOTE

Speed selection determines how fast machine will move when one of arrow keys is pressed. At "step" speed, carriage will move distance of one unit on XY display ie., 0.005 mm (0.0002 in.).

(5) Press **CR.**

(6) Press arrow (↑, →etc) key on numeric keypad corresponding to direction you want machine to move (use one key at a time).

u.1. Mirroring with operator's console.

(1) Set machine for automatic operation.

(2) Make required adjustments to tool being used. Example: Tangentially controlled device (make height and pressure adjustments).

(3) Insert tape in tape reader and press both reset buttons, (digitizing keyboard and operator's console).

(4) Press "Varia" key and type in scale as required.

(5) Type in "MIR" and press "CR". Type in the axis in which you require the figure to be mirrored. Example: "X" for mirroring in the X axis. "Y" for mirroring in the Y axis X/Y for mirroring in both axis.

(6) Press "start" button on operator's console.

u.2. Lettering with operator's console.

(1) Set machine for automatic operation.

(2) Make required adjustments to tool being used. Example: Tangentially controlled device (make height and pressure adjustments),

(3) Move (JOG) machine to the area in which you wish to letter and press both reset buttons (digitizing keyboard and operator's console).

(4) Press "Varia" key and type in scale as required. Example: Scale of 10,000 is 1 inch letters.

(5) Type in "LET" and press "CR". Type in the information which is to be lettered on the drafting medium and press "CR". The operator's console memory will allow you to type in up to 99 characters per line. The length of the line of lettering will be limited by the size of the letters desired and the size of the drafting medium.

u.3. Rotation with operator's console.

(1) Set machine for automatic operation.

(2) Make required adjustments to tool being used. Example: Tangentially controlled device (make height and pressure adjustments).

(3) Insert tape in tape reader and press both reset buttons (digitizing keyboard and operator's console).

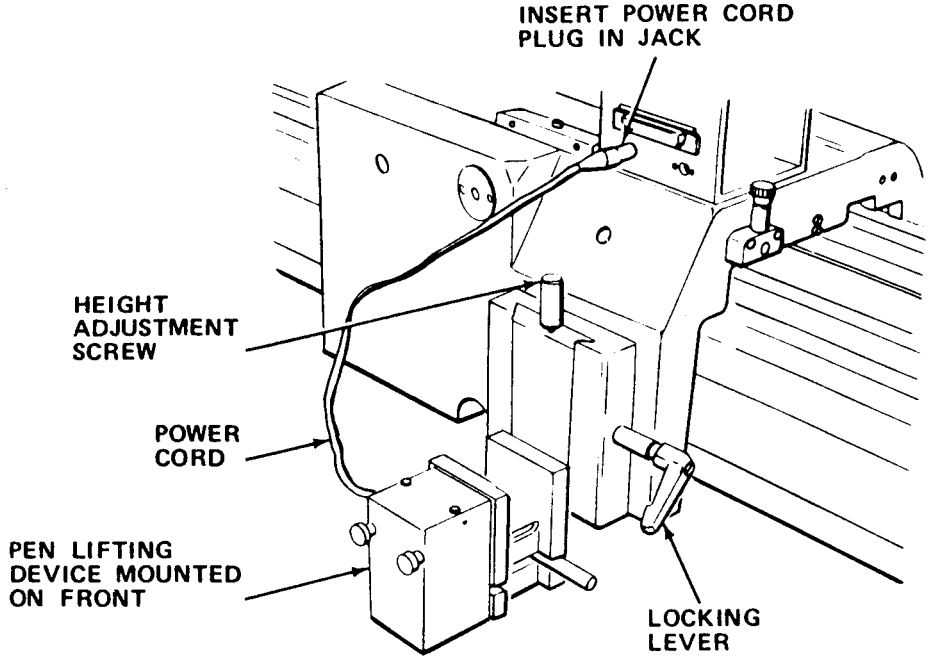
(4) Press "Varia" key and type in scale as required.

(5) Type in "ROT" and press "CR". Type in degrees of rotation expressed in thousandths of degrees. Example: 180 rotation—type 180000. and press "CR".

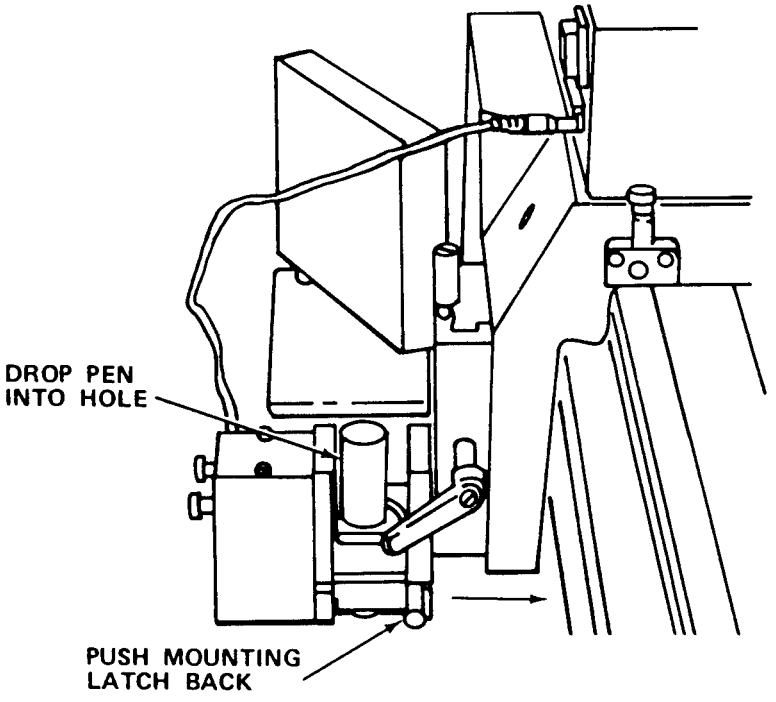
(6) Press start button on operator's console.

v. Automatic drafting/tracing.

(1) Set machine for automatic operation (paragraph 3-6.3a).



(2) Mount tool holder with pen lifting device on X-carriage (table 3-5, item 1).



(3) Mount ball point pen tool in pen lifiing device (table 3-5, item l). Check that pen cartridge has ink.

(4) Check that point of ball point pen tool does not touch drafting surface.

CAUTION

When using machine in automatic mode with drive motors engaged, do not attempt to move carriages by hand or damage to gears and encoder will result.

(5) Input automatic “pen down” (DI) command using operator’s console and check that pen point now touches drafting surface but does not penetrate it too deeply or puncture it (i.e., pen should move smoothly over surface).

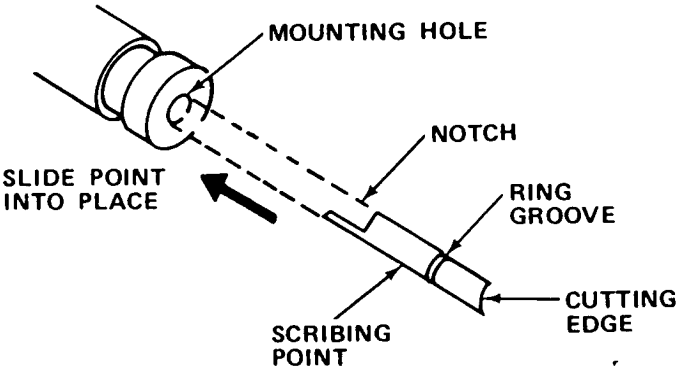
CAUTION

Prior to starting automatic operation be sure fine adjustment devices on both rails are unlocked or damage to drive motor, gears, and encoder may occur.

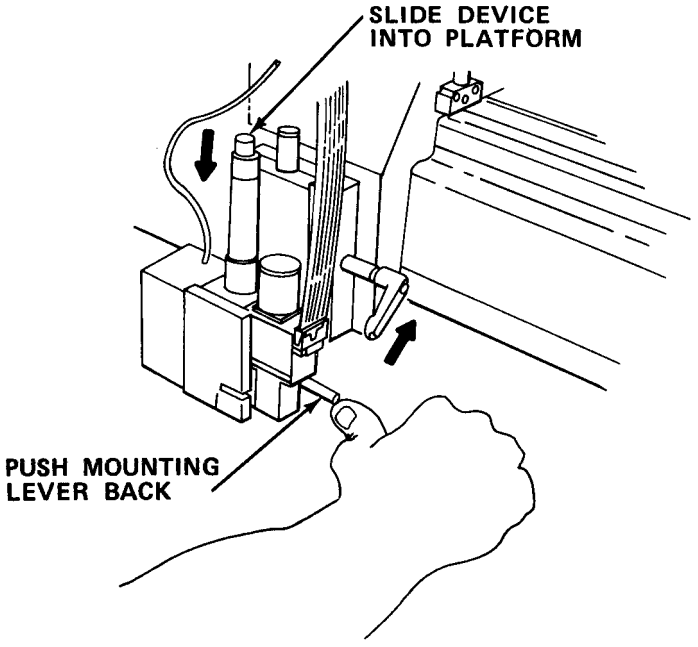
(6) To control drafting operation, use operator’s console to input drafting commands or run program tape on machine controller.

w. Automatic scribing.

(1) Set machine for automatic operation (paragraph 3-6.3a).



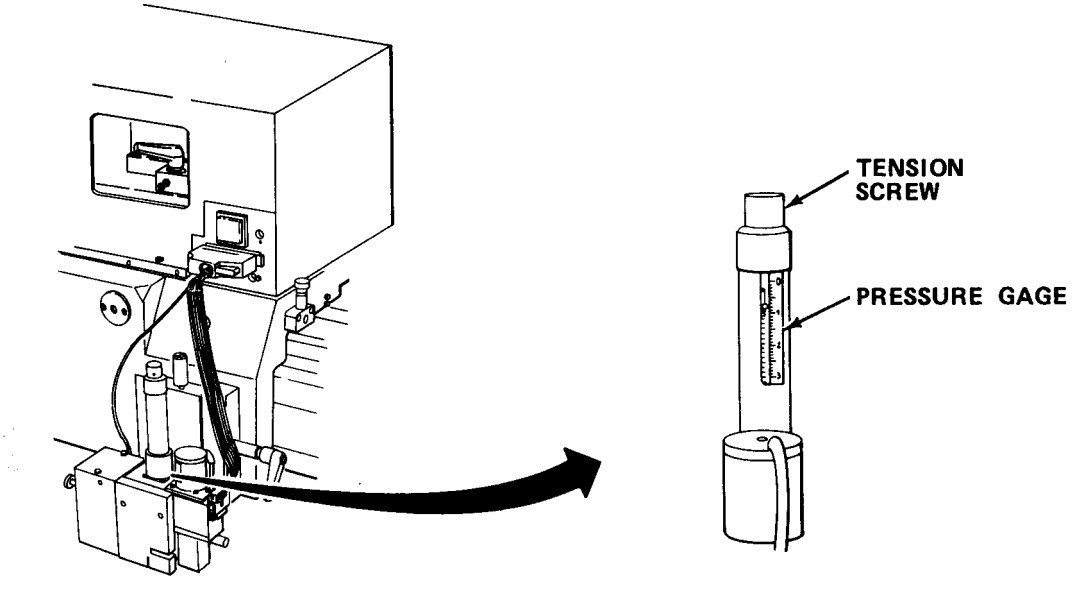
(2) Select and attach scribing point to tangentially controlled device (table 3-5, item 2).



(3) Mount tangentially controlled device on X-carriage as follows:

(a) Push mounting 1 ever back.

(b) Slide tangentially controlled device into platform.



(4) Press RESET key.

(5) Adjust tension for scribe point as follows:

(a) Position scrap scribe material on drafting surface and secure with tape.

(b) Run short tape (1 or 2 lines).

(c) Check scribing for clean smooth lines.

(d) Adjust tension as necessary.

(e) Repeat steps (a) through (d) above until desired result is achieved.

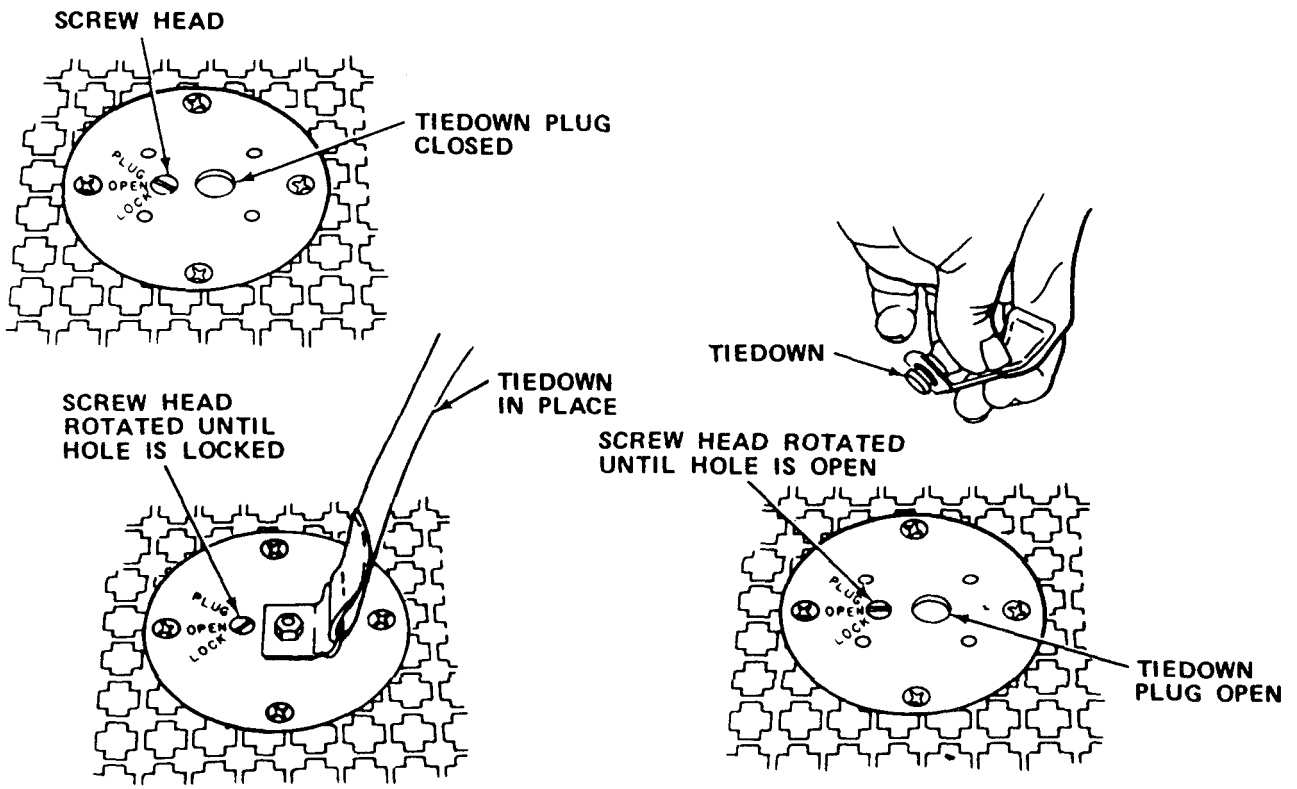
CAUTION

When using machine in automatic mode with drive motors engaged, do not attempt to move carriages by hand or damage to gears and encoder will result.

(6) To control scribing operation, use operator's console to input drafting commands (paragraph 3-6.3s) or run program tape on machine controller (paragraph 3-6.3q).

3-6.4 Preparation for Movement,

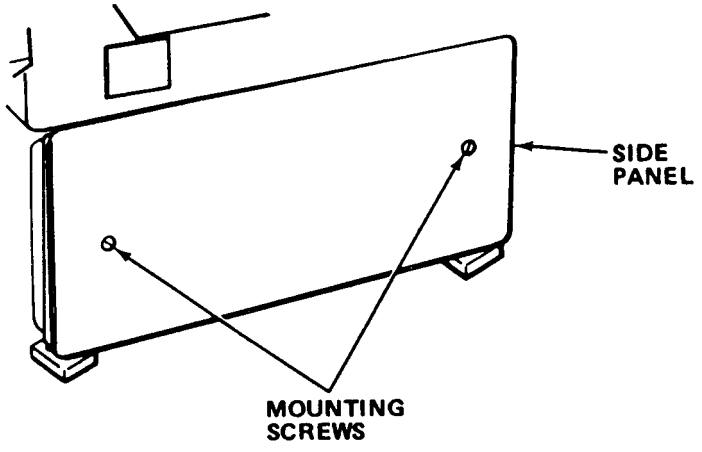
a. Place all accessories in accessory case and store in cabinet drawer.



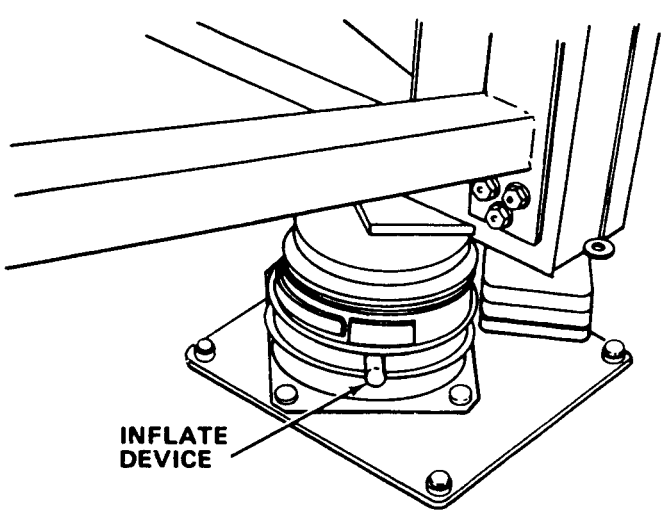
b. Install tiedowns in the tiedown sockets

WARNING

Death or serious injury may occur from electrical shock unless power is turned off before servicing.



c. Turn side panel retaining screws one-half turn left and remove panels.



CAUTION

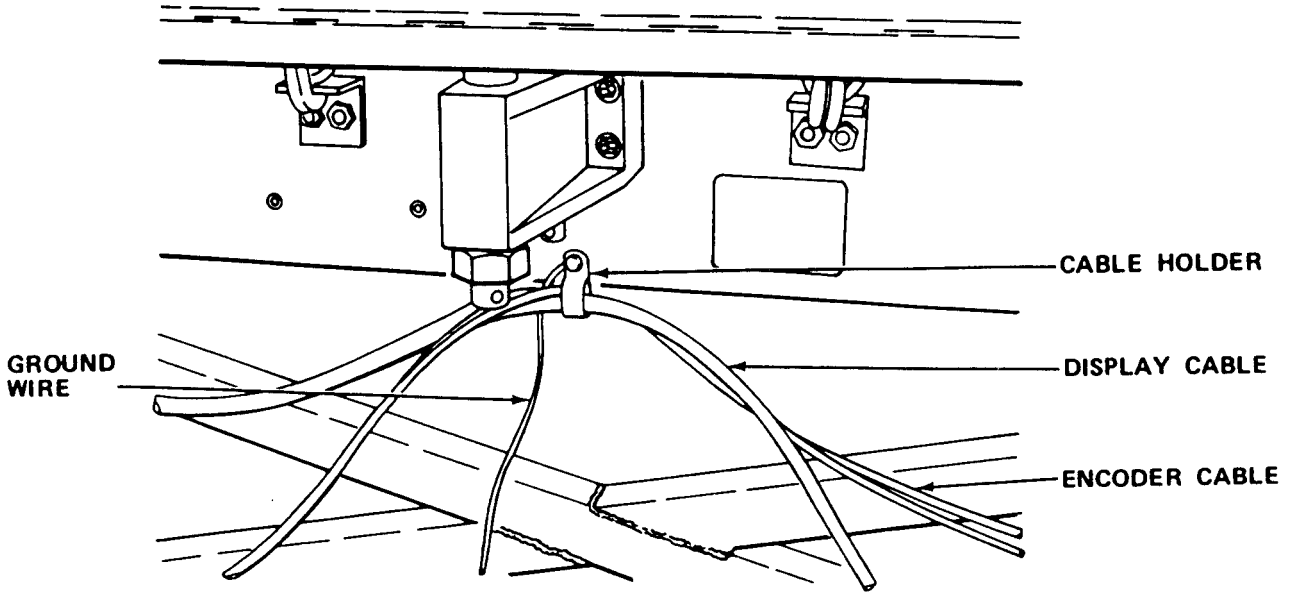
Table must be raised maintaining an approximate level position or warping of table frame may occur, causing glass to break.

c.1. Reinstall air shock mounting bolts.

d. Inflate air shocks to pressure indicated on shocks.

e. Raise adjustable legs into leg frame.

f. Reinstall all side panels and turn retaining screws one-half turn to right.



g. Disconnect ground wire, encoder wire, and XY display wires from table frame

CAUTION

When removing X and Y carriage system for movement, handle ribbon cables with care or damage may result.

NOTE

- When preparing X- and Y-carriages for movement, it is not necessary to remove ribbon cables.
- Some steps in this procedure require two persons to perform.

h. Remove Y-rail front end plate and rubber stop.

i. Disengage X-carriage and lock in place with fine adjustment device.

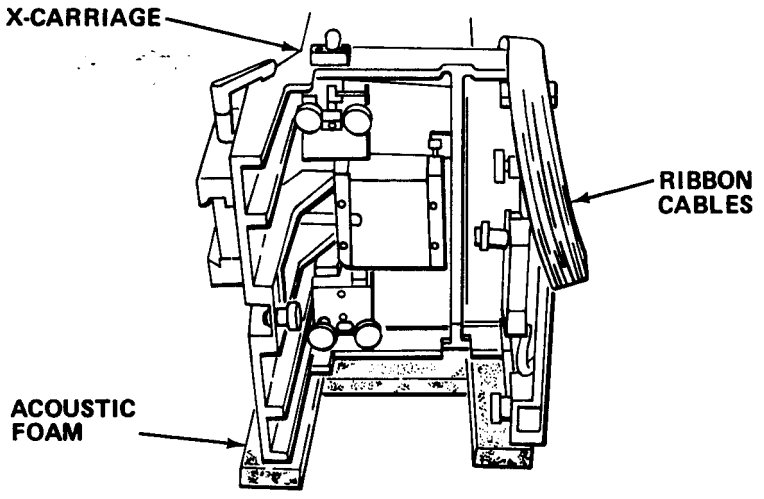
j. Disengage Y-carriage and remove Y-carriage with X-carriage attached and set on floor in area of tiedowns.

k. Reinstall Y-rail front end plate and rubber stop.

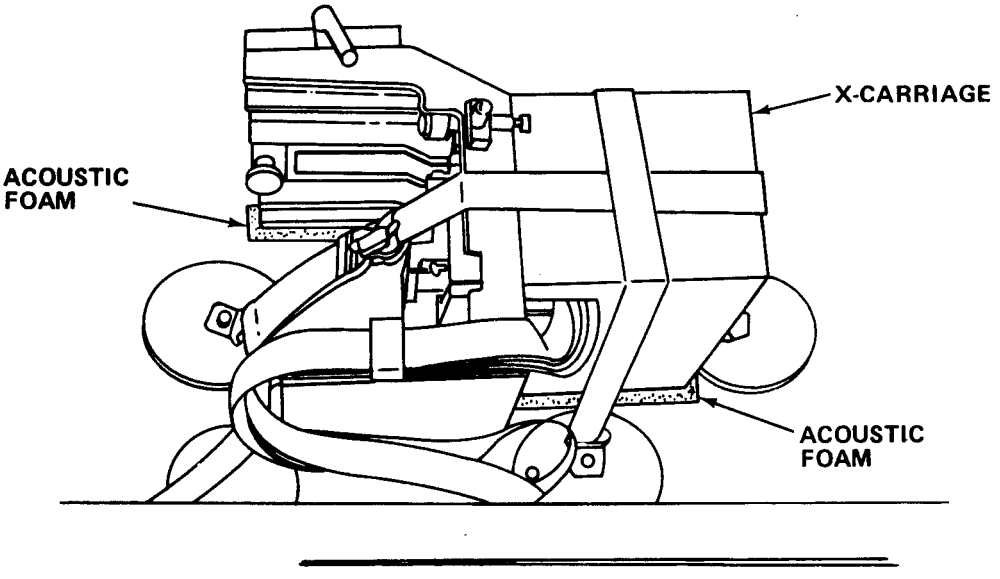
1. Remove plate and rubber stop from left end of X-rail.

m. Release X-carriage from fine adjustment device and remove device.

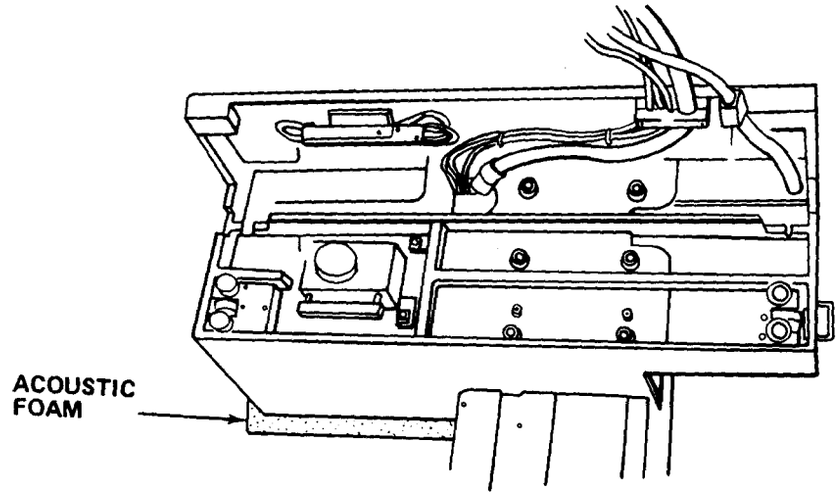
n. Remove X-carriage and reinstall plate and rubber stop.



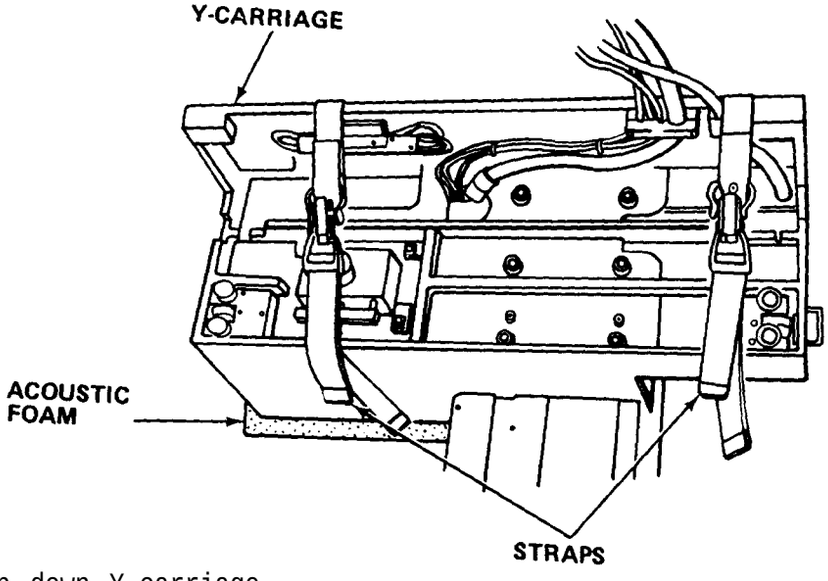
o. Position X-carriage on acoustic foam.



p. Strap down X-carriage.



q. Position Y-carriage with X-rail upside down on acoustic foam.

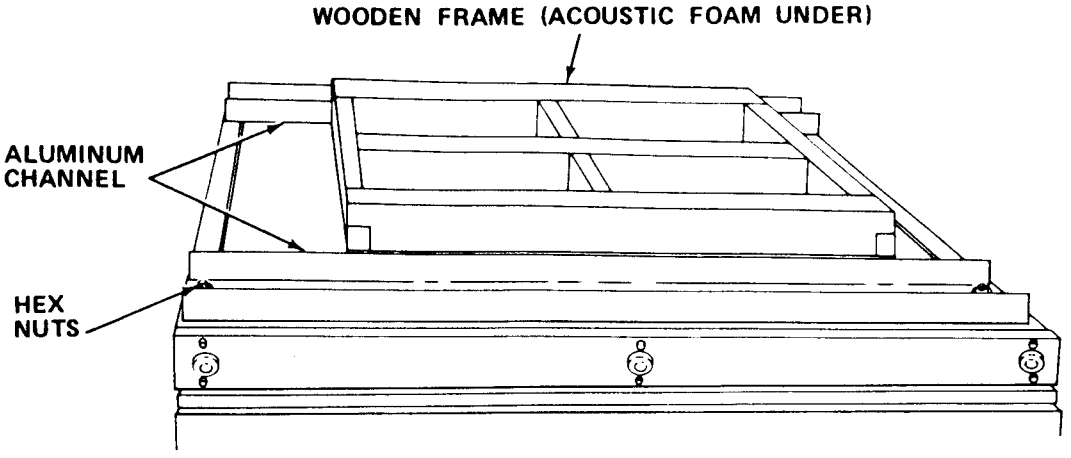


r. Strap down Y-carriage.

s. Strap down X-rail.

CAUTION

Acoustic foam must be positioned under wood or breakage of glass may occur.



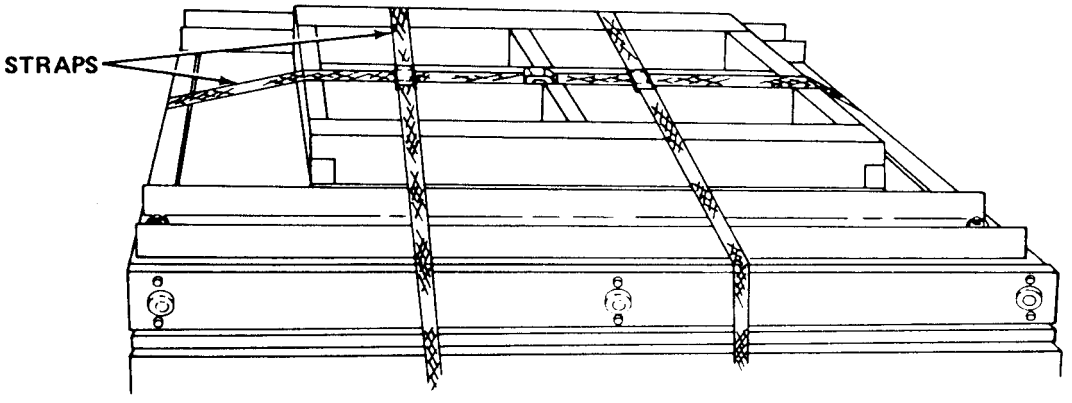
t. Place digitizing keyboard in wooden frame and pack insulation material around keyboard. It is not necessary to disconnect power cord.

u. Install two aluminum channels with seven hex head screws on each channel.

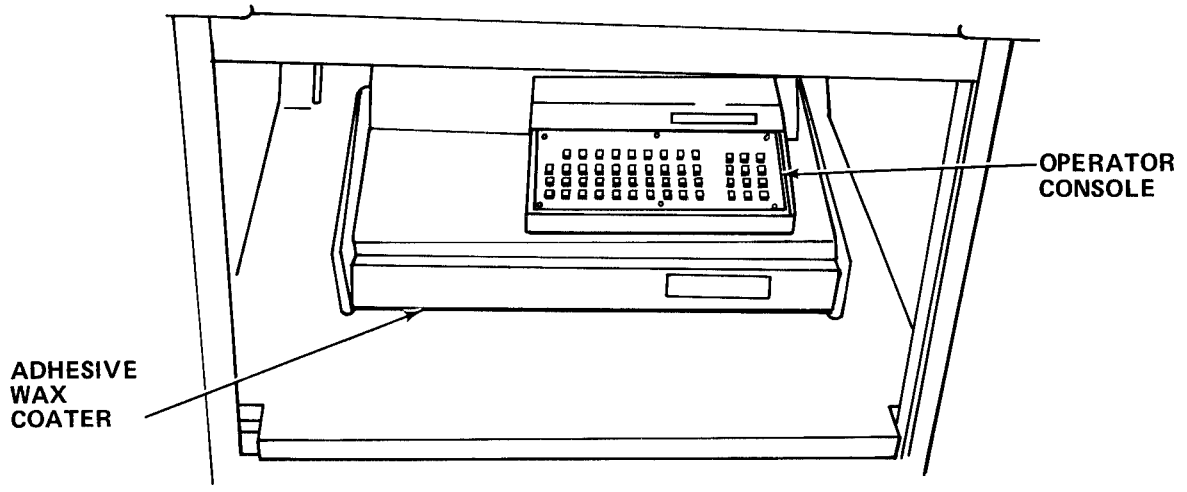
v. Position acoustic foam in center of glass.

w. Position wood on acoustic foam.

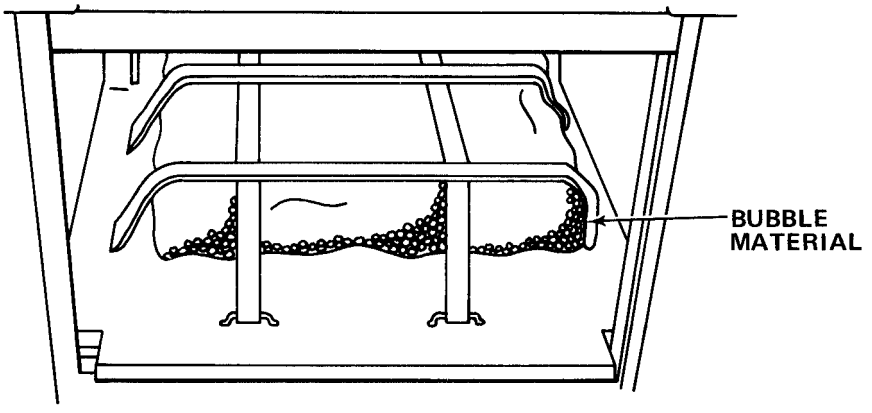
x. Place digitizing keyboard in wooden frame and pack insulation material around keyboard. It is not necessary to disconnect digitizing cable.



y. Strap down wood to top of glass.



Y. Position operator console on top of adhesive wax coater.



z. Position bubble material over operator console and strap down.

3-6.5 Operatinq Instructions on Decals and Instruction Plates. Located on X- and Y- encoders.

CAUTION

THIS IS A DELICATE MEASURING INSTRUMENT DROPPING, ROUGH HANDLING OR EXCESSIVE AXIAL AND RADIAL FORCES ON THE SHAFT MAY CAUSE IT TO FAIL

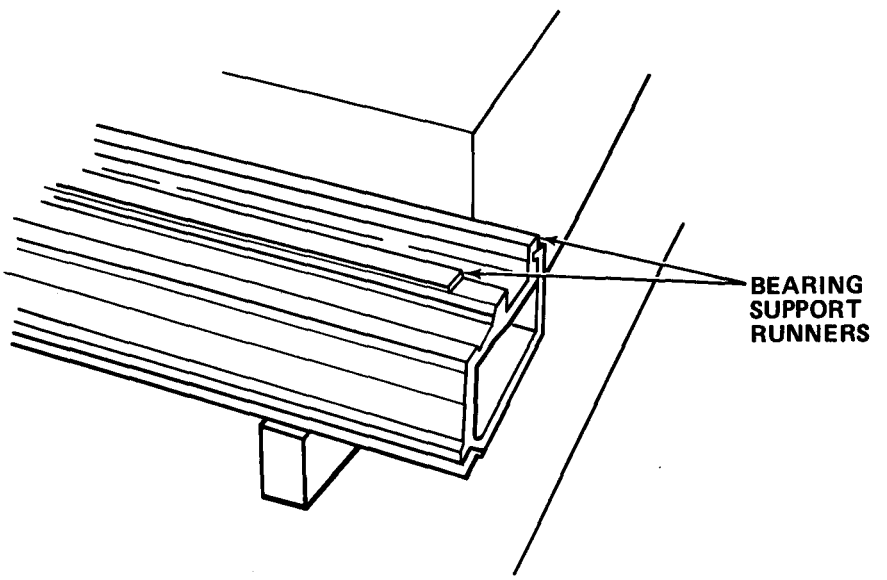
3-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

3-8. LUBRICATION INSTRUCTIONS.

NOTE

These lubrication instructions are mandatory.



3-8.1 Bearing Support Runners. Prior to use, put several drops of mineral oil (Item 16, Appendix E) on clean cheesecloth (Item 6, Appendix E) and wipe down bearing support runners on both table rails.

3-9. TROUBLESHOOTING PROCEDURES.

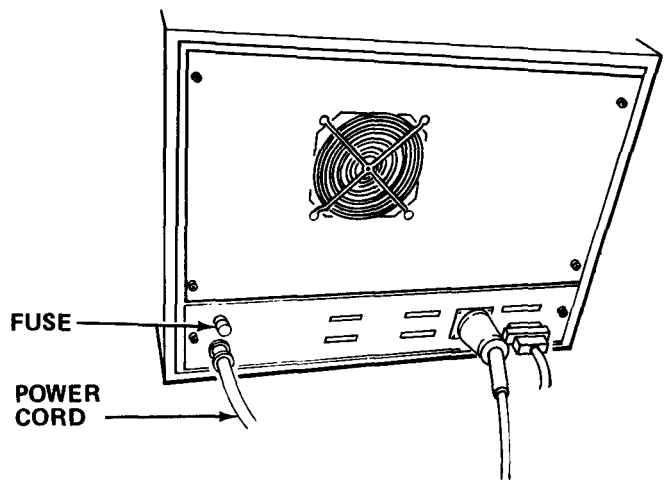
a. The table lists the common malfunctions which you may find during operation or maintenance of the combined drafting and measuring machine or its components. You should perform the test/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all test or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 3-9. TROUBLESHOOTING

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. DSP MACHINE CONTROLLER WILL NOT TURN ON.	Step 1. Check if power cord is plugged into wall outlet.	(a) If plugged in, proceed to step 2. (b) Plug in power cord.

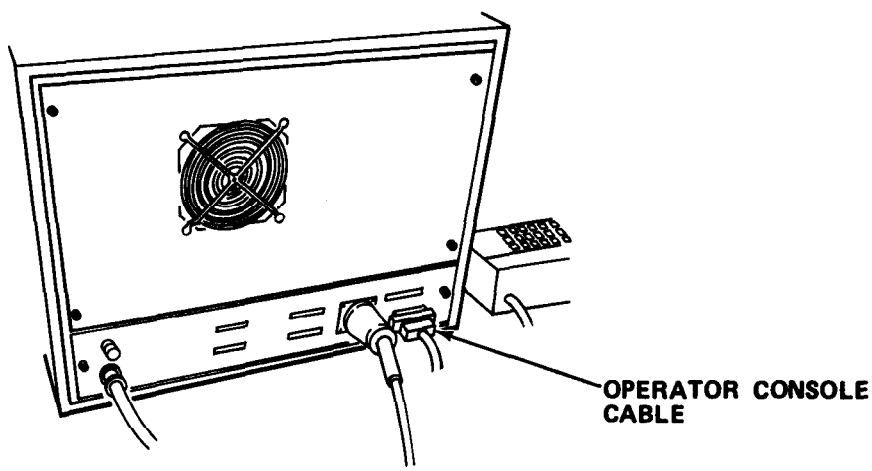
REAR OF DSP MACHINE CONTROLLER



	Step 2. Visually check for blown power fuse.	(a) Remove power cord from outlet. (b) Remove fuse by pushing in and turning left. (c) Visually observe if filament is broken or if fuse is darkened from excessive heat. (d) If the conditions exists, replace fuse. (e) If trouble is not corrected, refer to organizational maintenance.

Table 3-9. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
2. DSP OPERATOR CONSOLE WILL NOT FUNCTION.	Check to see if console cable is properly connected to rear of DSP machine controller cabinet.	Connect cable.

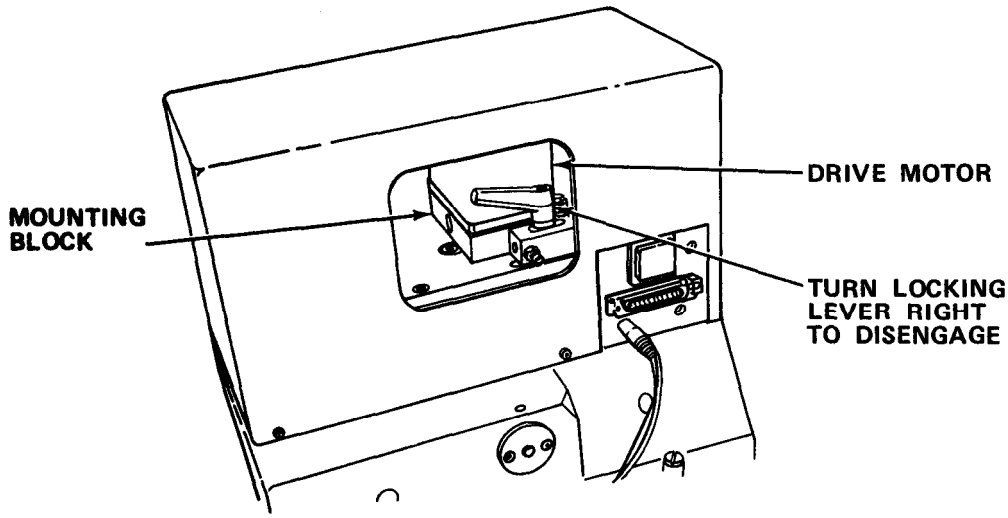


REAR OF DSP MACHINE CONTROLLER

Table 3-9. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

3. X-AND Y-CARRIAGES WILL NOT MOVE WHEN OPERATOR CONSOLE CONTROL KEYS ARE PRESSED.



Step 1. Check that X-and Y-carriage drive motor assemblies are engaged.

(a) Turn locking levers to right.

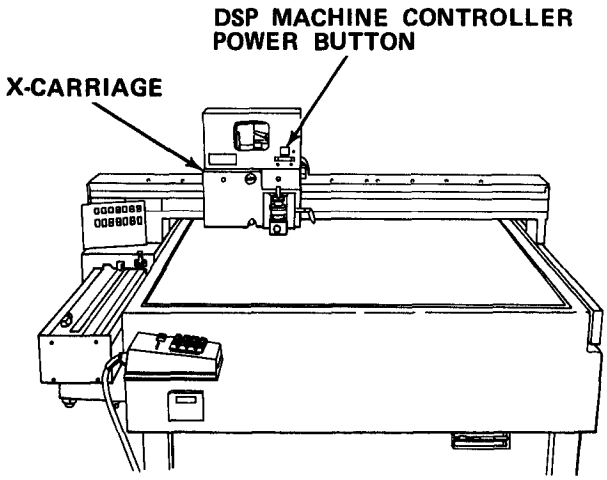
(b) Slide mounting blocks to left.

(c) Turn locking levers to left.

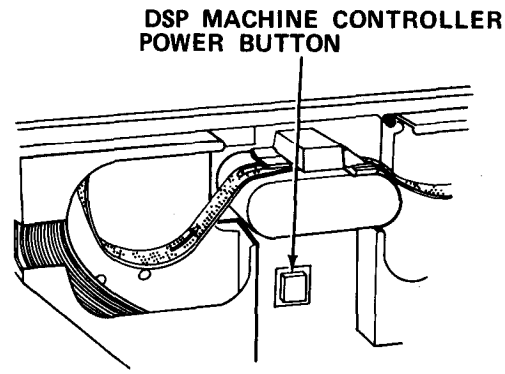
Table 3-9. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

3. X-AND Y-CARRIAGES WILL NOT MOVE WHEN OPERATOR CONSOLE CONTROL KEYS ARE PRESSED - Cont



DSP MACHINE CONTROLLER POWER BUTTONS



DSP MACHINE CONTROLLER

NOTE

DSP machine controller with operator panel can be turned on with power button on front of DSP machine controller or power button on X-carriage. Button originally pressed must be pressed again to reset or turn system off.

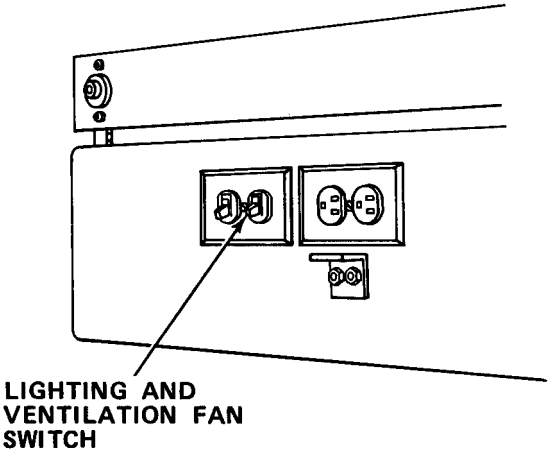
Step 2. Check position of power buttons on X-carriage and controller.

Depress power button to turn on machine.

Table 3-9. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. DRAFTING TABLE UNDERLIGHTING AND VENTILATION FANS WILL NOT OPERATE.		
	Step 1. Check if power cord is plugged into wall outlet.	
		a. If plugged in, proceed to step 2.
		b. Plug in power cord.

TABLE MOUNTED POWER SWITCHES



	Step 2. Check if lighting and ventilation fan electrical switch is on.	
		Turn on switch.

Table 3-9. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

5. DIGITIZING SYSTEM WILL NOT OPERATE.

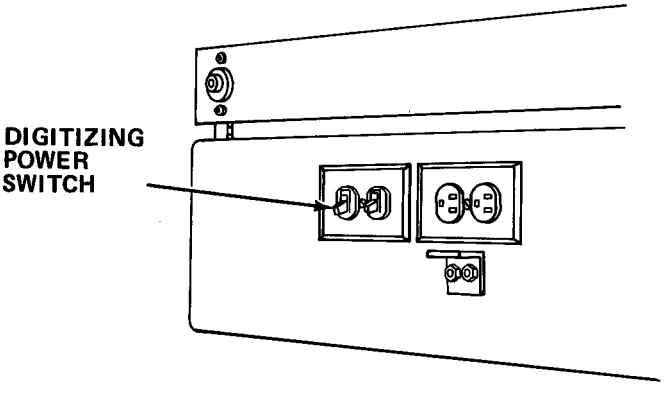


TABLE MOUNTED POWER SWITCHES

Step 1. Check if power cord is plugged into outlet.

a. If plugged in, proceed to step 2.

b. Plug in power cord.

Step 2. Check if digitizing power switch is turned on.

Turn on power switch.

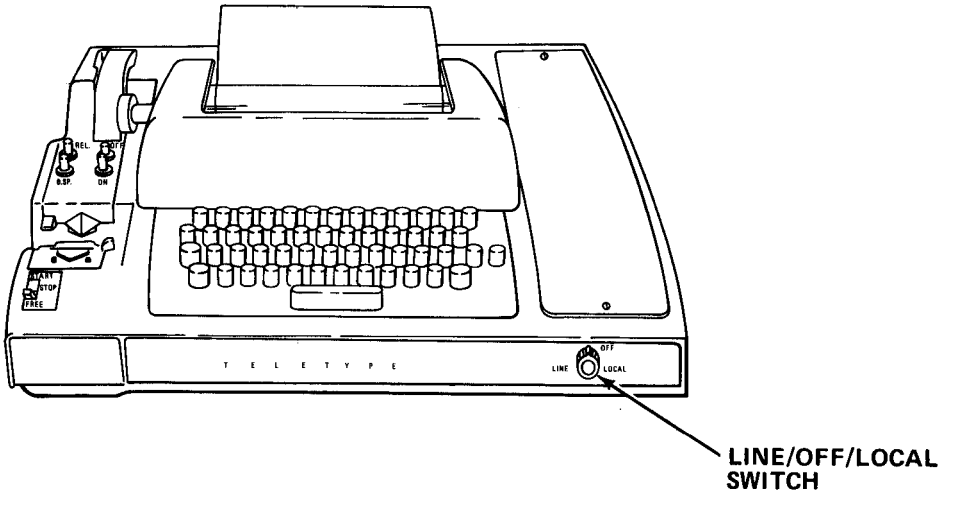


Table 3-9. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

6. TELETYPEWRITER WILL NOT OPERATE IN "LINE" OR "LOCAL" POSITIONS.

Step 1. Check to see if switch is in line or local position.

(a) If in line or local position, proceed to step 2.

(b) Place switch in line or local position.

Step 2. Check if power cord is plugged into outlet.

Plug in power cord.

7. TELETYPEWRITER TYPING HEAD TYPES IN A STATIONARY POSITION WHEN IN "LINE" OR "LOCAL" POSITION.

Check that switch is in line or local position.

Place switch in line or local position.

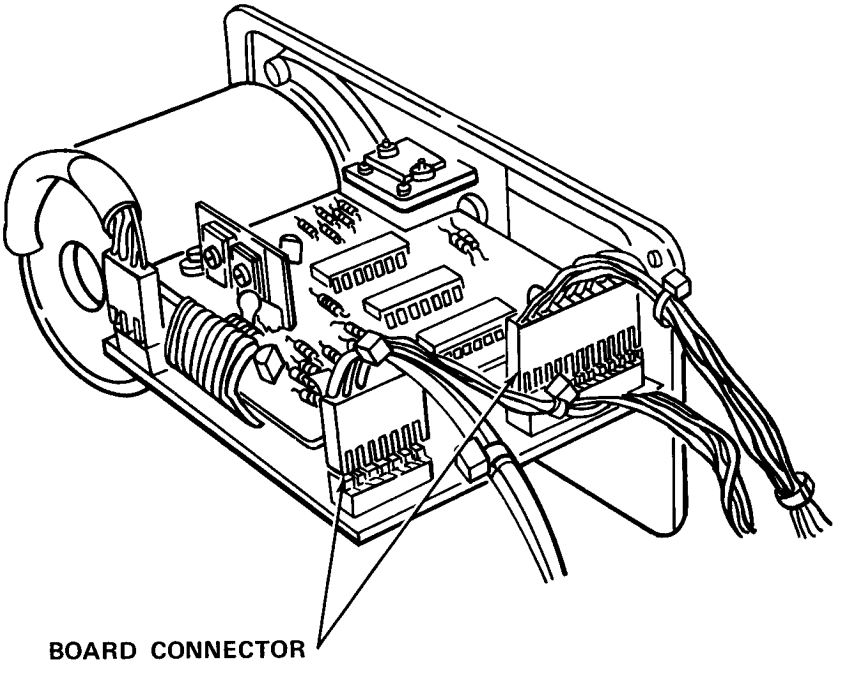
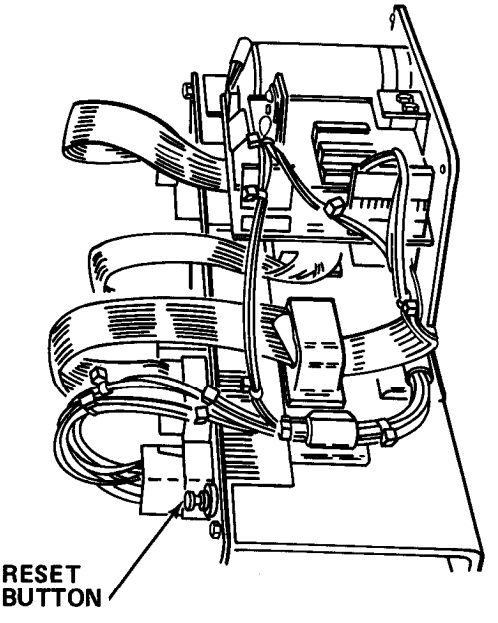


Table 3-9. TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
8. TAPE READER WILL NOT FUNCTION.	Open DSP machine controller cabinet door and check two cable connectors for correct seating.	(a) Seat connectors by pushing.
		
		(b) Push reset button several times.

3-10. MAINTENANCE PROCEDURES. There are no operator maintenance procedures assigned for this equipment.

Section IV ORGANIZATIONAL MAINTENANCE

3-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication at this level of maintenance.

3-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT. These items are not required at the organizational level of maintenance"

3-13. SERVICE UPON RECEIPT.

3-13.1 Checking Unpacked Equipment.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report al 1 discrepancies in accordance with DA Pam 738-750.

c. Check to see whether the equipment has been modified.

3-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

3-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES. There are no organizational troubleshooting procedures assigned for this equipment.

3-16. MAINTENANCE PROCEDURES. There are no organizational maintenance procedures assigned for this equipment.

3-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

3-18. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

3-18.1 Common Tools and Equipment For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

3-18.2 Special Tools: Test, Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE, and Support Equipment is 1 i steal in the applicable repair parts and special tools list and in Appendix B of this manual.

3-18.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-316-24P covering organizational maintenance for this equipment.

3-19. DIRECT/GENERAL SUPPORT TROUBLESHOOTING PROCEDURES.

a. Direct/general support troubleshooting procedures cover the most common malfunctions that may be repaired at the direct/general support level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used by the operator should be conducted in addition to the direct/general support troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/inspection and corrective action. If a malfunction is not listed or corrected by a listed corrective action, notify your supervisor.

c. For unidentified malfunctions, use the facing schematic or the foldout located at the end of this manual for further fault analysis.

d. If the combined drafting and measuring machine does not power up when turned on, verify that 120 V ac is present at the receptacle. If voltage is not present, plug equipment into receptacle with power available and proceed with equipment troubleshooting. Perform no-power procedures for dead receptacle. (Table 1-4)

NOTE

Sufficient data is not available for you to test or troubleshoot printed circuit boards. When associated wiring, ribbon cables, power cords and other related electrical components have been eliminated as possible faults. then the printed circuit boards must be substituted, one for’ one, until the’ fault is isolated.

Table 3-10. DIRECT/GENERAL SUPPORT TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. DSP-2 MACHINE CONTROLLER WILL NOT OPERATE,	

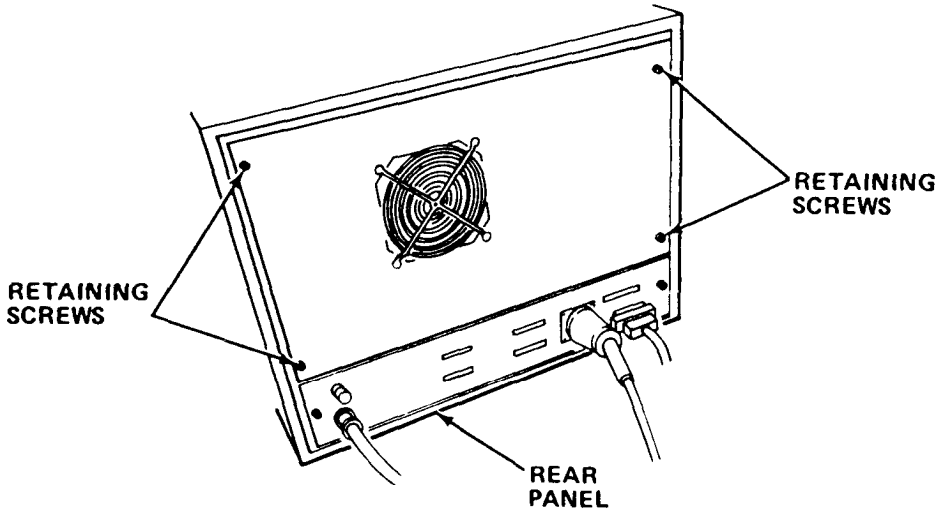
WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing,

Step 1. Check for 120 V ac input to EMI filter as follows.

(a) Unplug power cord,

(b) Remove DSP machine controller from shelf (paragraph 3-20.22).



(c) Remove rear panel.

Table 3-10. DIRECT/GENERAL SUPPORT TROUBLESHOOTING — Cont

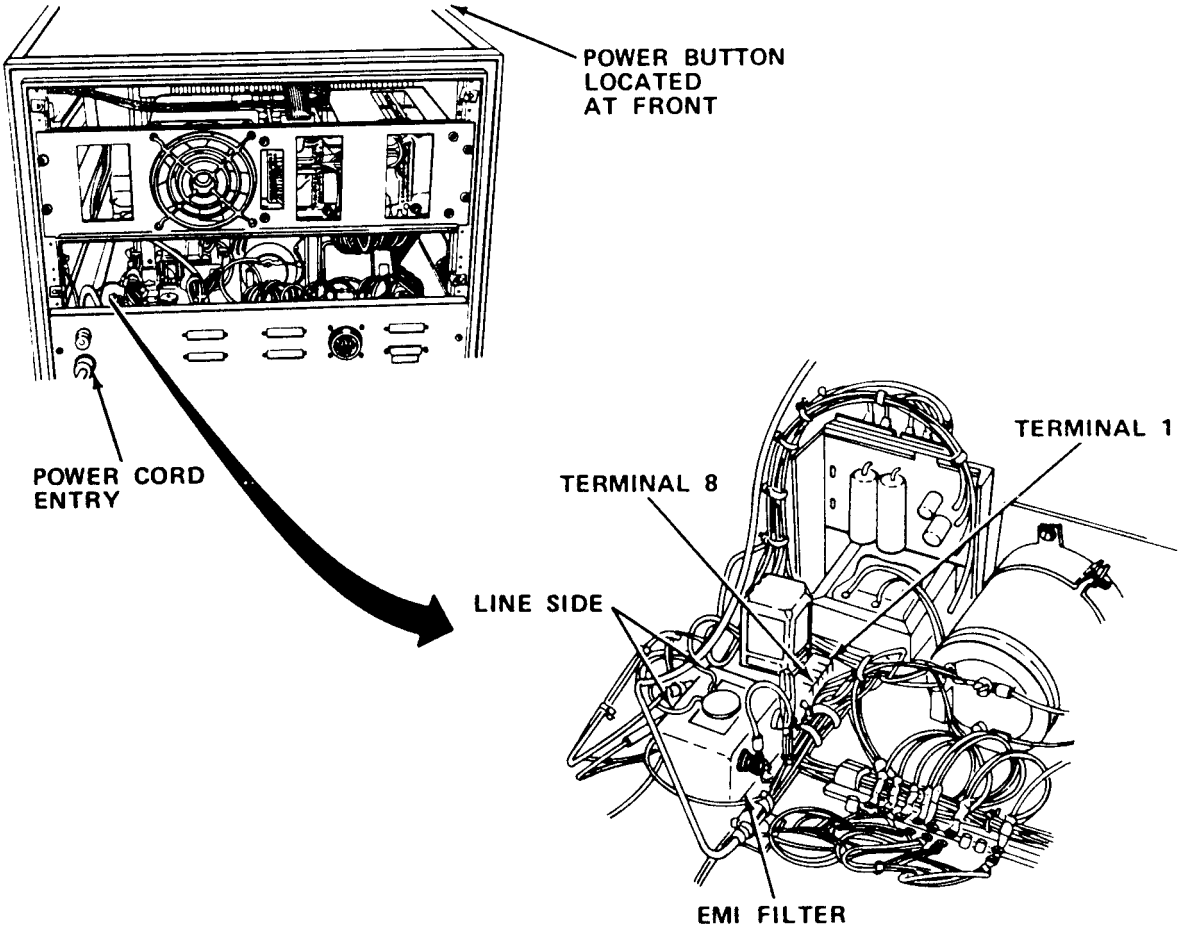
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

1. DSP-2 MACHINE CONTROLLER WILL NOT OPERATE—Cont

WARNING

. High voltage is used in the operation of this equipment. Death on contact may result if personnel fail to observe safety precautions.

• Keep hands clear of rotating fan blade or serious injury to hands or fingers may result.



(d) Plug in power cord.

Table 3-10. DIRECT/GENERAL SUPPORT TROUBLESHOOTING — Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. DSP-2 MACHINE CONTROLLER WILL NOT OPERATE—Cont
(e) Check for 120 V ac, using multi meter at line side of EMI filter.
(1) If voltage is present, proceed to step 2.
(2) If no voltage present, replace power cord (paragraph 2-20.16).
Step 2. Using multimeter, check for 120 V ac at load side of EMI filter.
(a) If voltage is present, proceed to step 3.
(b) If no voltage present, replace EMI filter (paragraph 3-20.17).
Step 3. Test switching relay.
(a) Press DSP machine controller power button.
(b) Using multimeter, check for 120 V ac at switching relay output at terminals 1 and 8.
If no voltage present, replace switching relay (paragraph 3-20.1).
2. OPERATOR CONSOLE DISPLAY PANEL WILL NOT INDICATE.
Check power cord for DSP for continuity.
Replace operator console processor board (paragraph 3-20.2).
3. X-AND/OR Y-CARRIAGES WILL NOT MOVE.
Step 1. Check +24 V power supply fuse for continuity.
(a) If present, proceed to step 2.
(b) If not present, replace fuse (paragraph 3-20.3).

Table 3-10. DIRECT\GENERAL SUPPORT TROUBLESHOOTING - **Cont**

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
3. X-AND/OR Y-CARRIAGES WILL NOT MOVE - Cont	
Step 2. Test drive motor for continuity.	
	(a) If not present, replace motor (paragraph 3-20.5).
	(b) If present, replace D100 boards (paragraph 3-20.4).
4. DRAFTING TABLE UNDERLIGHTING AND/OR VENTILATION FAN(S) WILL NOT OPERATE.	
Step 1. Check ballast for continuity.	
	(a) If present, proceed to step 2.
	(b) If not present, replace ballast (paragraph 3-20.6).
Step 2. Check ventilation fan motor(s) for continuity.	
	Replace fan(s) (paragraph 3-20.7).
5. DIGITIZING SYSTEM WILL NOT FUNCTION.	
Check +5 V power supply fuse for continuity.	
	Replace fuse (paragraph 3-20.8).
6. X-AND/OR Y-COORDINATES NOT INDICATED ON X-Y DISPLAY.	
Check ribbon cables, power cords and wiring on drafting table, x-y display, and digitizing keyboard for continuity.	
	(a) If present, proceed to (c).
	(b) If not present, replace defective cables, power cords or wiring.

Table 3-10. DIRECT/GENERAL SUPPORT TROUBLESHOOTING — Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
6. X-AND/OR Y-COORDINATES NOT INDICATED ON X-Y DISPLAY—Cont
(c) Replace printed circuit boards.
(1) Keyboard interface circuit board (paragraph 3-20.9).
(2) Encoder circuit board (paragraph 3-20.9).
(3) X-Y display circuit board (paragraph 3-20.15).
(4) CPU circuit board (paragraph 3-20.9).
7. DIGITIZER KEYBOARD WILL NOT INPUT DATA TO X-Y DISPLAY.
Check all related wiring and ribbon cables for continuity.
(a) If present, proceed to step (c).
(b) If not present, replace cable or wiring.
(c) Replace CPU circuit board (paragraph 3-20.9).
(d) Replace digitizer keyboard (paragraph 3-20.11).
(e) Replace keyboard interface circuit board (paragraph 3-20.9).
8. DIGITIZING INFORMATION NOT RECEIVED BY TELETYPEWRITER.
Check all wiring and ribbon cables for continuity.
(a) If present, proceed to step (c).
(b) If not present, replace cables or wiring.
(c) Replace TTY interface circuit board (paragraph 3-20.9).
(d) Replace CPU circuit board (paragraph 3-20.9).

Table 3-10. DIRECT/GENERAL SUPPORT TROUBLESHOOTING — Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
9. TAPE READER WILL NOT FUNCTION. Inspect tape reader for damage. Replace tape reader (paragraph 3-20. 12).
10. DSP MACHINE CONTROLLER WILL NOT FUNCTION PROPERLY WHEN ALL OTHER INDICATIONS APPEAR NORMAL. Check all related wiring and ribbon cables for continuity. (a) If not present, replace cable or wiring. (b) If present, replace controller circuit card (paragraph 3-20.13).
11. TANGENTIALLY CONTROLLED DEVICE OR PEN LIFTING DEVICE WILL NOT FUNCTION Check continuity at device cable. Replace pen drive and tangential tool control circuit board (paragraph 3-20.14).

3-20. MAINTENANCE PROCEDURES.

a. This section contains instructions covering direct/general support maintenance functions for the combined drafting and measuring machine. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

3-20.1 Replace Switching Relay.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Thin Flat Tip Screwdriver
13 mm Combination Wrench
4 mm Hex Head Key Wrench

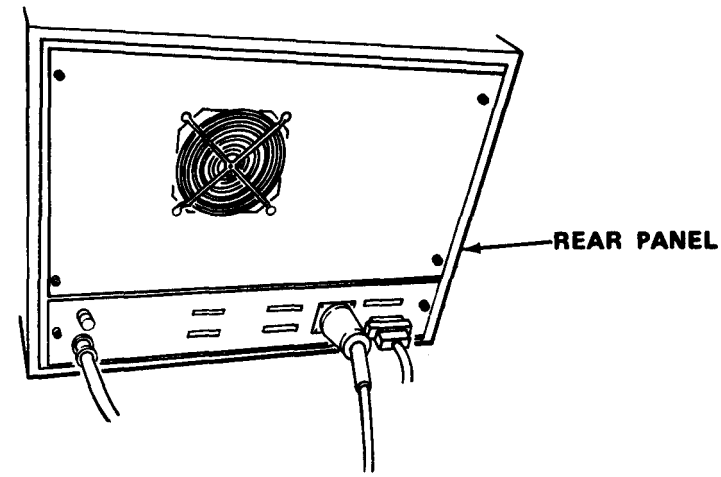
SUPPLIES: Switching Relay

WARNING

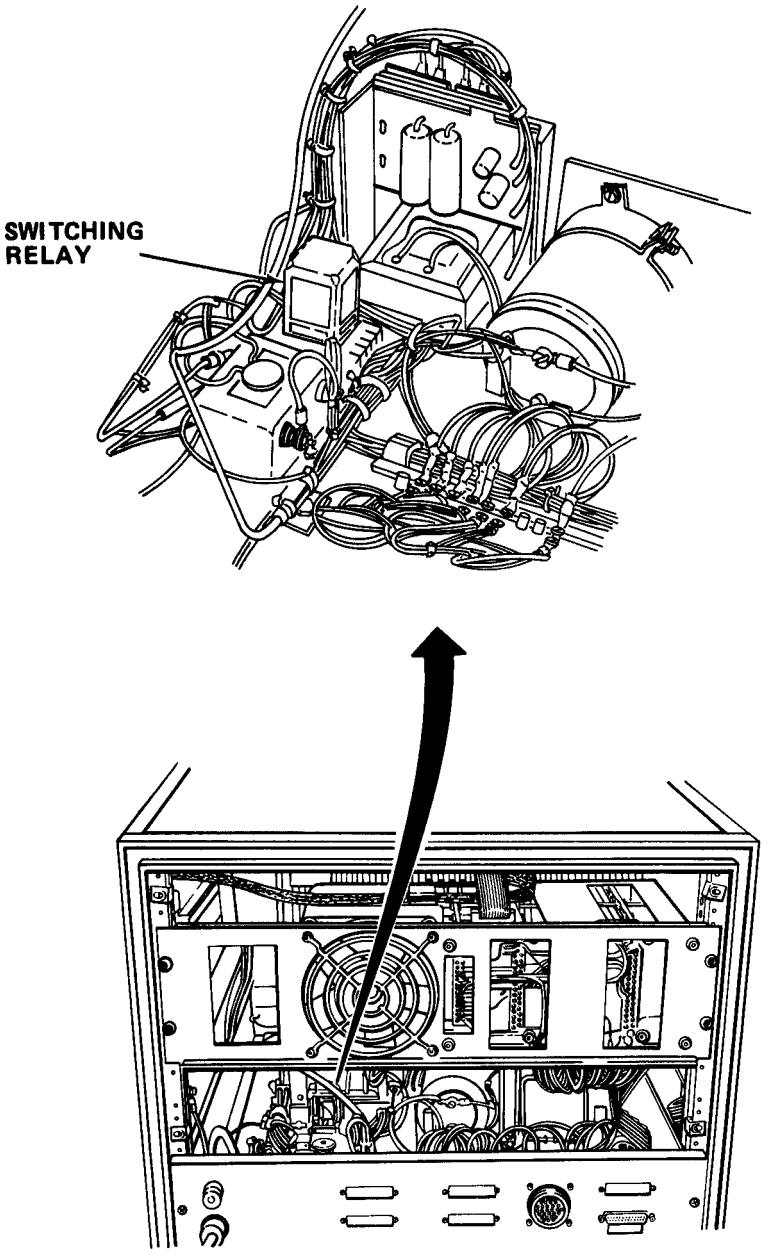
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug all power cords.

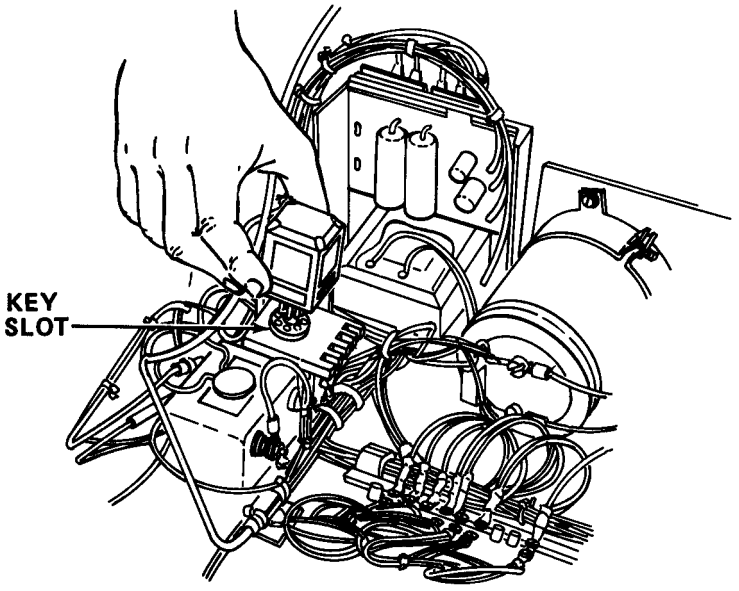
b. Remove DSP machine controller from shelf (paragraph 3-20.22).



c. Remove rear panel.



d. Locate switching relay on left bottom side of cabinet.



e. Remove defective switching relay by pulling straight up.

f. Aline relay key and key slot and install new switching relay by pushing down in place securely.

g. Reinstall rear panel.

h. Reinstall machine controller on shelf.

i. Plug in power cords.

3-20.2 Replace Operator Console Processor Board.

MOS: 35E, Special Electronic Devices Repairer

TOOLS : 3/32 in. Hex Head Key Wrench
7/64 in. Hex Head Key Wrench

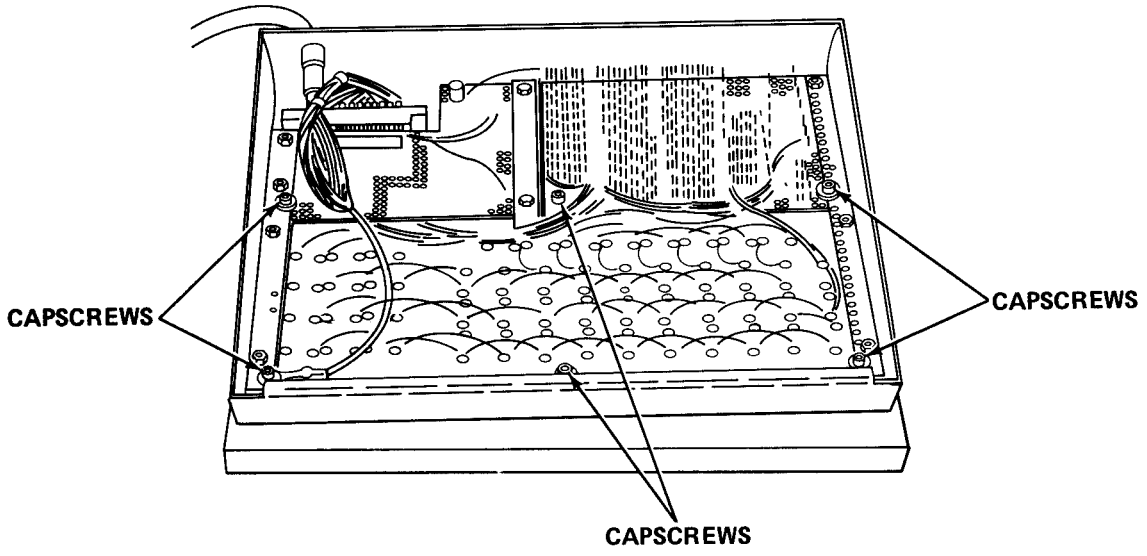
SUPPLIES: Operator Console Processor Board

WARNING

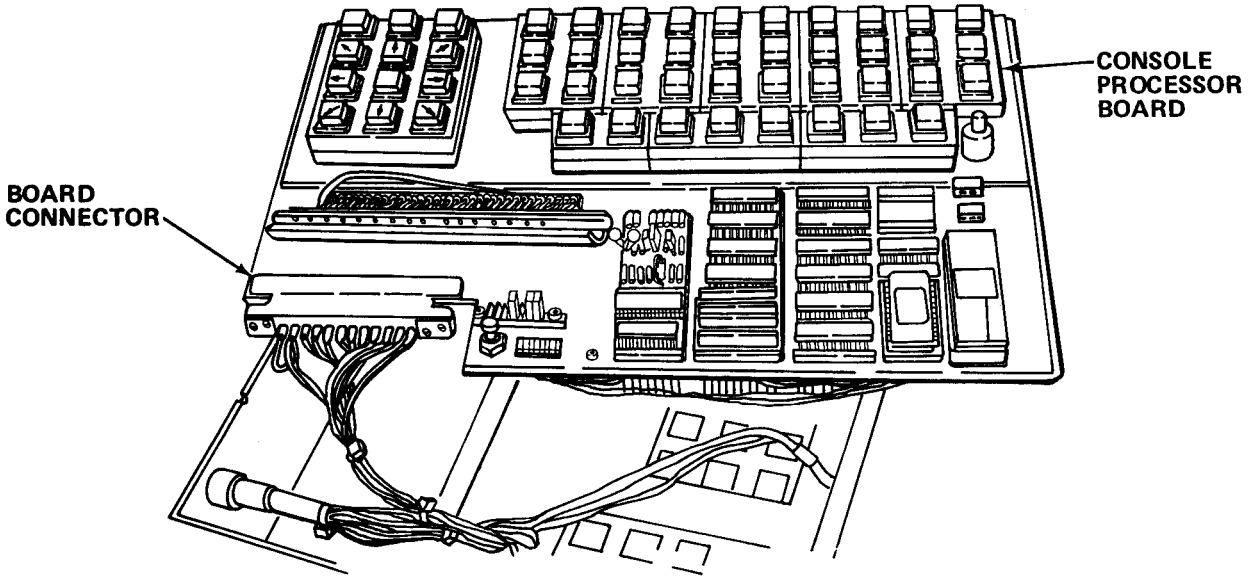
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug all power cords.

b. Remove 2 socket head screws and bottom plate.



c. Remove socket head capscrews.



CAUTION

Exercise extreme care when removing processor board or damage and/or wire breakage could result.

d. Note position and remove board connector.

e. Remove defective processor board.

CAUTION

Exercise extreme caution when installing processor board or damage and/or wire breakage could result.

f. Carefully install new processor board and secure with screws.

g. Reconnect connector.

CAUTION

Snug socket head capscrews only. Do not tighten excessively or damage to processor board could result.

h. Reinstall bottom plate and socket head capscrews.

i. Plug in all power cords.

3-20.3 Rerplace Power Supplv Fuse, 24 V.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Thin Flat Tip Screwdriver
13 mm Combination Wrench
4 mm Hex Head Key Wrench

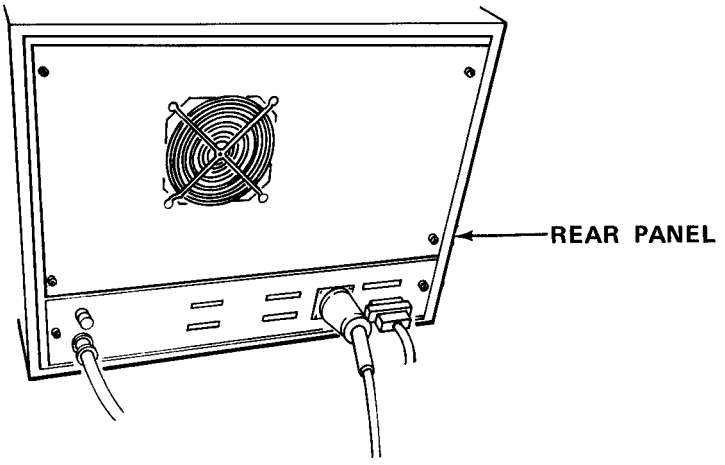
SUPPLIES: 15 amp Fuse

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Remove all power cords.

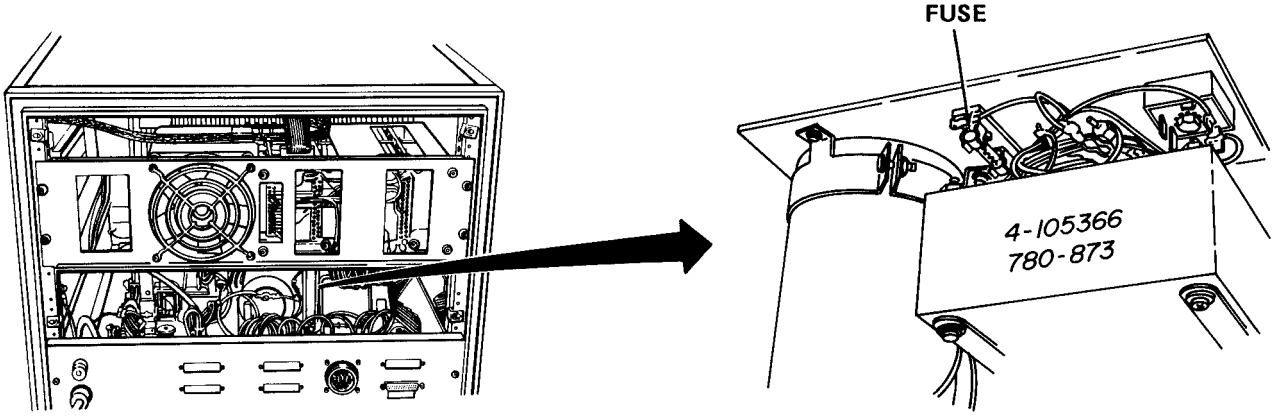
b. Remove DSP machine controller cabinet from shelf (paragraph 3-20.22).



c. Remove rear panel.

CAUTION

Bottom panel is hardwired to power supply. Do not attempt to pull away from cabinet or damage to wiring could result.



NOTE

The power supply fuse is accessible from front or rear of controller but is difficult to reach from either position. Use access easiest for you.

d. Replace defective fuse.

e. Reinstall rear panel.

f. Reinstall DSP machine controller on shelf (paragraph 3-20.22).

g. Plug in all power cords.

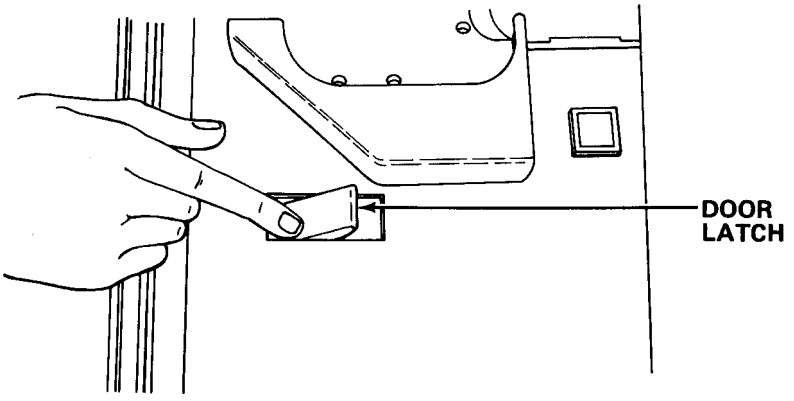
3-20.4 Replace D100 Motor Drive Circuit Board.

MOS: 35E, Special Electronic Devices Repairer

SUPPLIES: D100 Circuit Board

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.



a. Unplug all power cords.

b. Open cabinet door.

c. Remove defective D100 circuit board by pulling straight out.

d. Install new board in grooves and push in. Check that board is properly seated.

e. Close cabinet door.

f. Plug in all power cords.

3-20.5 Replace X or Y Drive Motor.

MOS: 35E, Special Electronic Devices Repairer

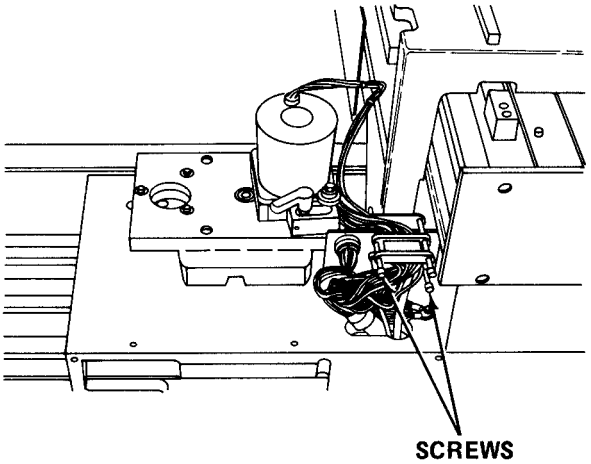
TOOLS : Flat Tip Screwdriver
2 mm Hex Head Key Wrench
5 mm Combination Wrench
7 mm Combination Wrench
Jewelers Screwdriver

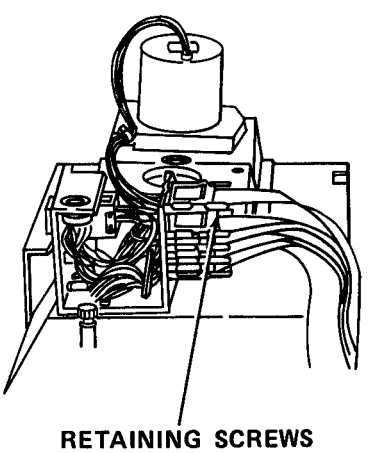
SUPPLIES: Drive Motor

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug all power cords.



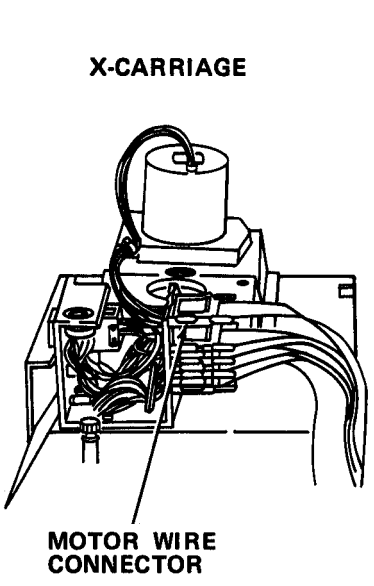


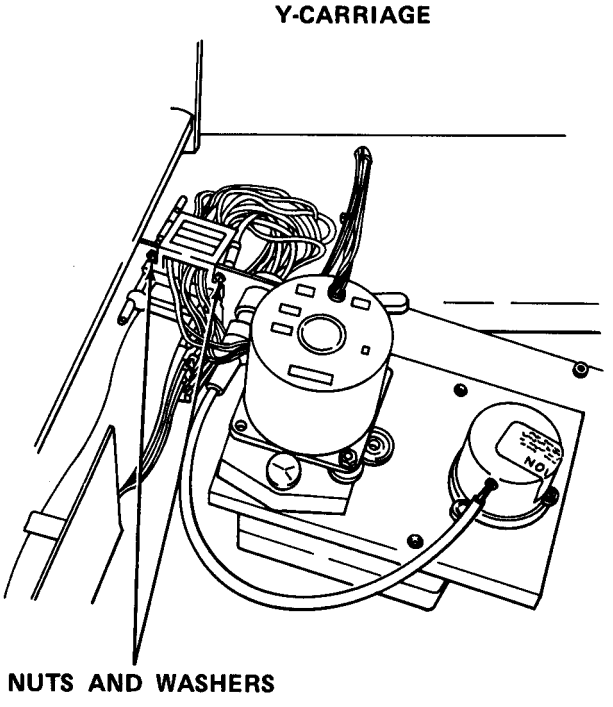
b. Remove carriage cover socket head capscrews.

c. Remove cover.

d. Loosen two retaining screws from top connector assembly.

e. Pull connector away.

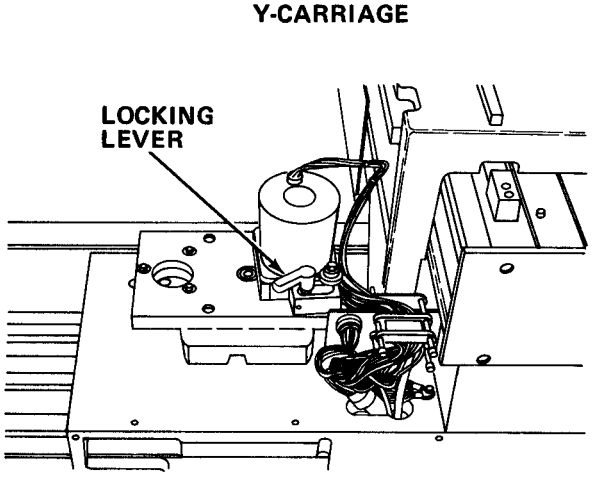


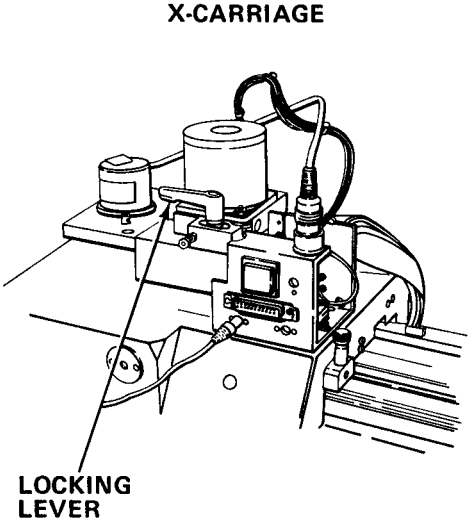


f. Remove two nuts and washers from motor wire connector.

g. Remove connector.

h. Disconnect single wire connected between drive motor and ribbon cable connector. Use jewelers screwdriver to release wire from connector.



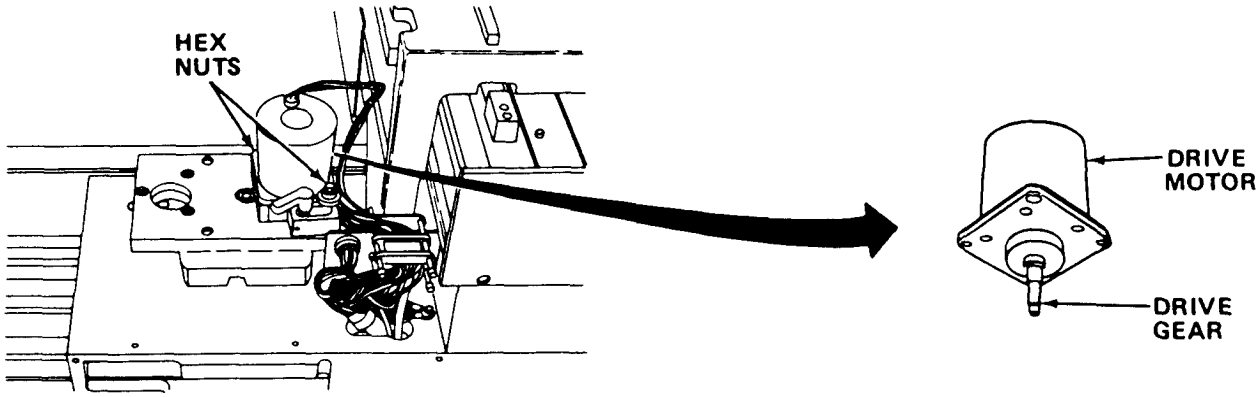


CAUTION

Disengage X or Y motor assembly before attempting removal of drive motor or damage to rack and gear may result (paragraph 3-16.1 b (7) or 3-6.1b(12)).

i. Turn locking lever to right.

j. Slide motor mount to right.



k. Remove two nuts, washers, and drive motor assembly.

1. Measure and record gap between bottom of drive gear and motor.

m. Using hex head key wrench, loosen capscrew and remove drive gear.

n. Install drive gear on new motor and discard old motor.

o. Reinstall drive motor assembly.

p. Reinstall motor wire connector.

CAUTION

Connector retaining screws and pins are very fragile. Exercise care when assembling or damage to pins or threads on screws may result.

q. Reinstall top connector assembly.

r. Reinstall carriage cover.

s. Plug in all power cords.

3-20.6 Replace Fluorescent Lamp(s), and/or Ballast, or Glass Table Top.

MOS: 35E, Special Electronic Devices Repairer

PERSONNEL: Three persons are required to perform this procedure

TOOLS : 3 mm Hex Head Key Wrench
Flat Tip Screwdriver
Cross Tip Screwdriver
Accessory Kit (Consists of two special tools required for glass removal)

SUPPLIES: Fluorescent Lamp(s)
Ballast
Glass

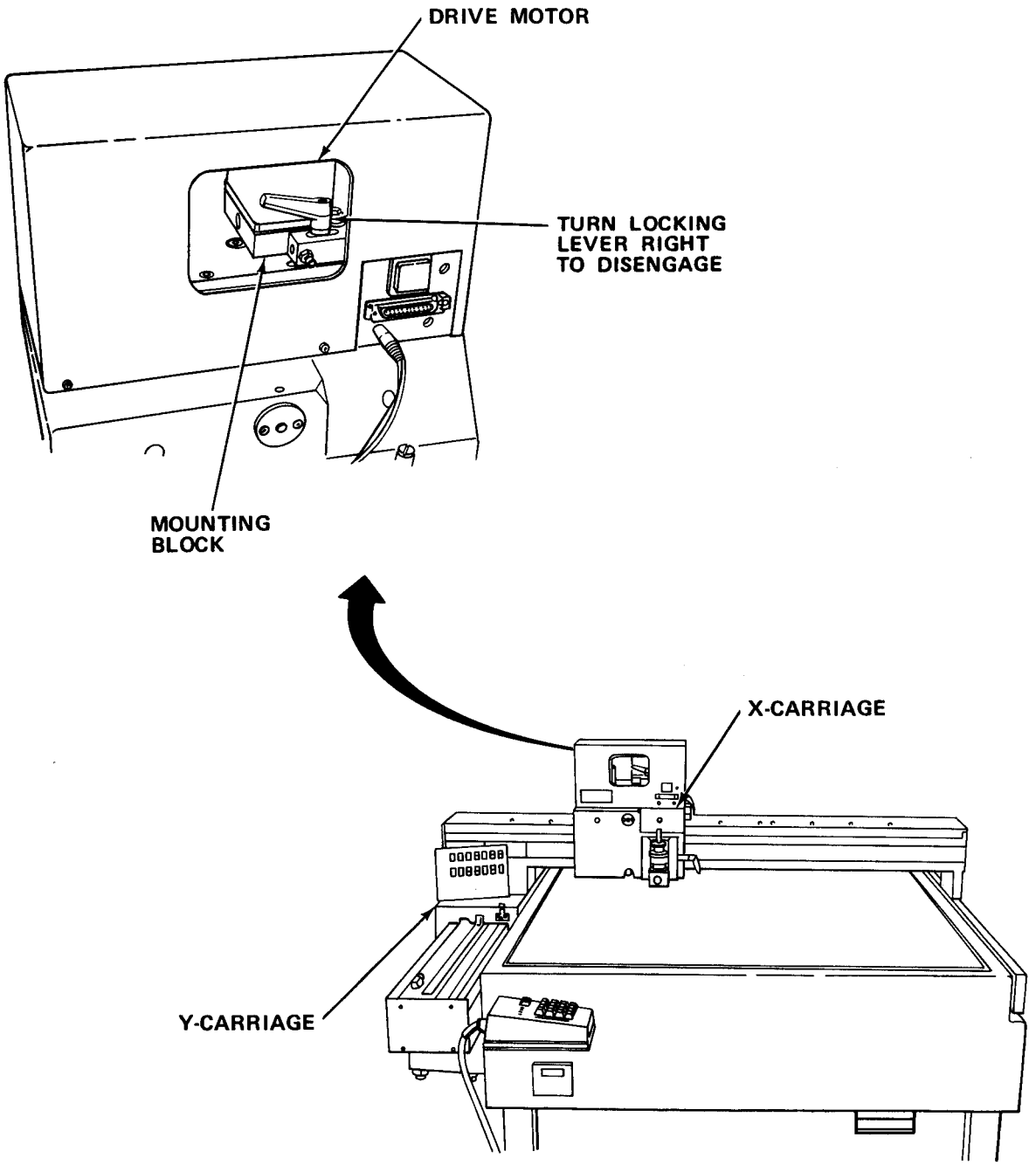
WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

CAUTION

Glass support studs are factory adjusted. Do not change settings or glass table top may be damaged.

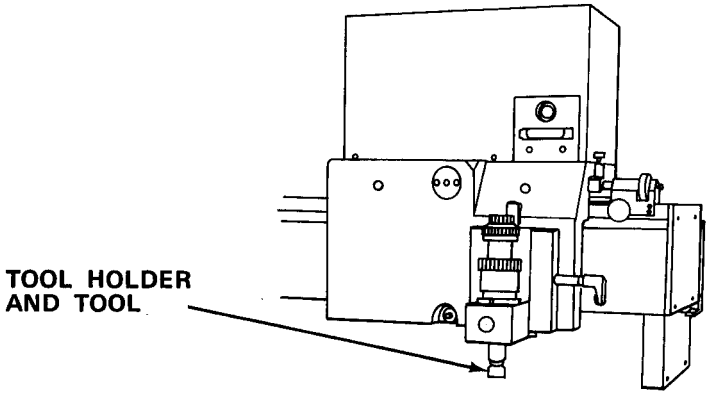
a. Unplug drafting table power cord.



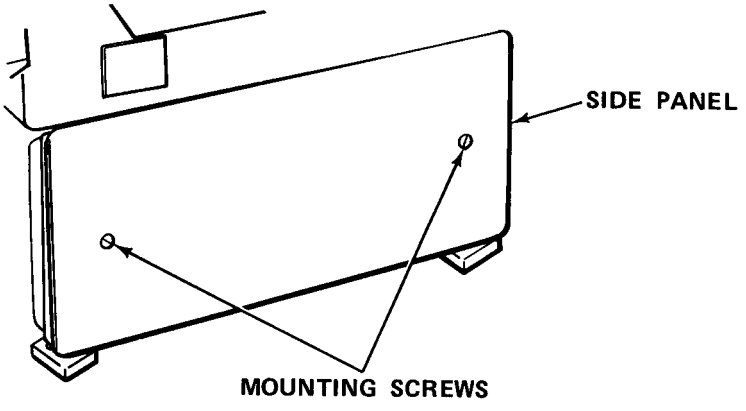
b. Turn locking lever right on both carriages.

c. Slide motor mount to right on both carriages.

d. Move Y-carriage to rear against Y-rail rubber stop.



e. Remove tool holder and tool (if mounted).

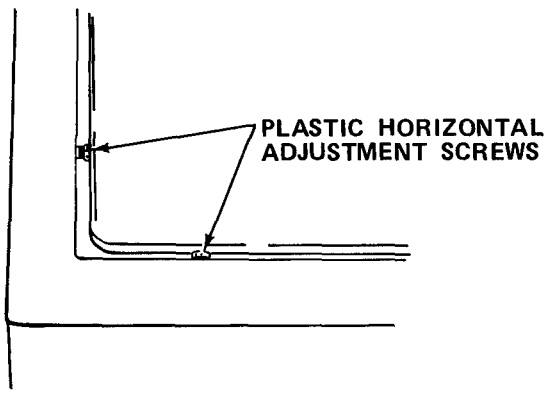


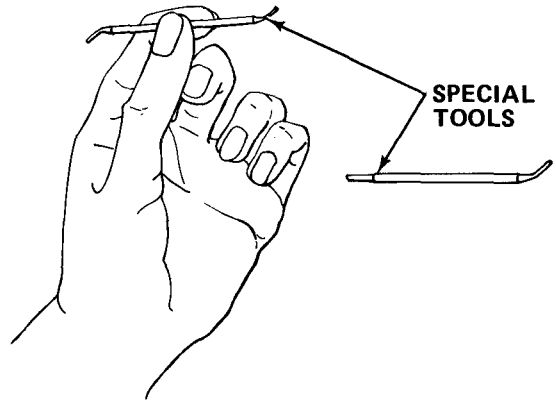
f. Turn side panel mounting screws half left.

g. Remove panel.

h. Remove screws from wooden panel located under table.

i. Remove wooden panel.





j. Loosen plastic horizontal adjustment screws located on edge of glass. Use the-two special tools for this step.

CAUTION

Glass is fragile and can be easily broken. Handle with care and do not allow glass to contact machine frame or X-carriage during removal.

NOTE

Three personnel are required to perform steps k., 1., m., and n. One person under table and one person at each side of glass.

k. From underside of table, raise glass up only enough to allow persons at each side access to glass.

l. Move glass toward front of machine to clear X-carriage.

CAUTION

Glass is fragile and can easily be broken. Store glass in safe area or breakage or damage may result.

m. Replace defective fluorescent lamp(s), ballast, or glass as required.

n. Reinstall wooden panel.

o. Reinstall side panels.

p. Turn mounting screws half right.

q. Plug in drafting table power cord.

3-20.7 Replace Ventilation Fan Assembly.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Flat Tip Screwdriver
Cross Tip Screwdriver
3 mm Hex Head Key Wrench
Accessory Kit (Consists of two special tools required for glass removal)

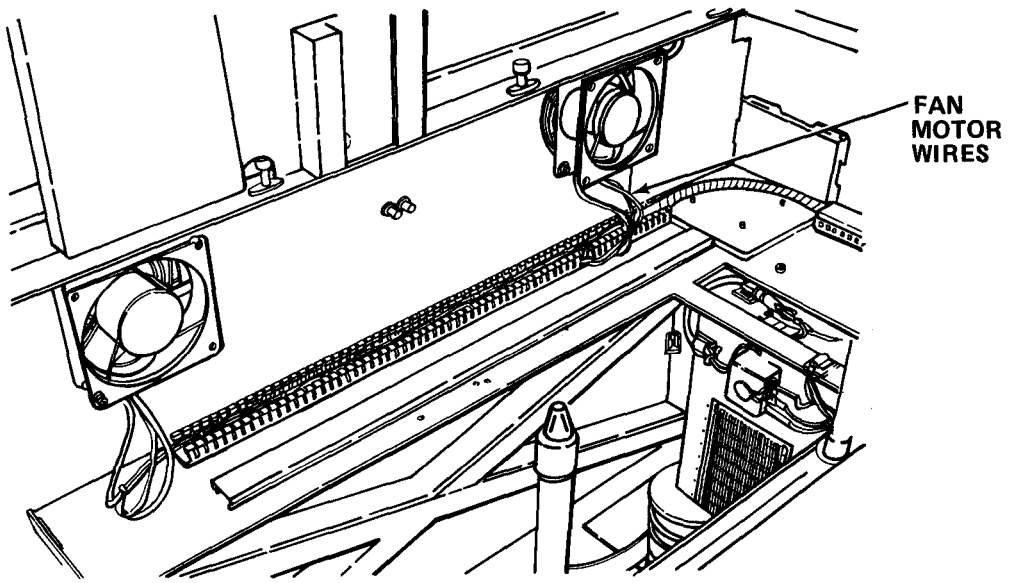
SUPPLIES: Fan Assembly

WARNING

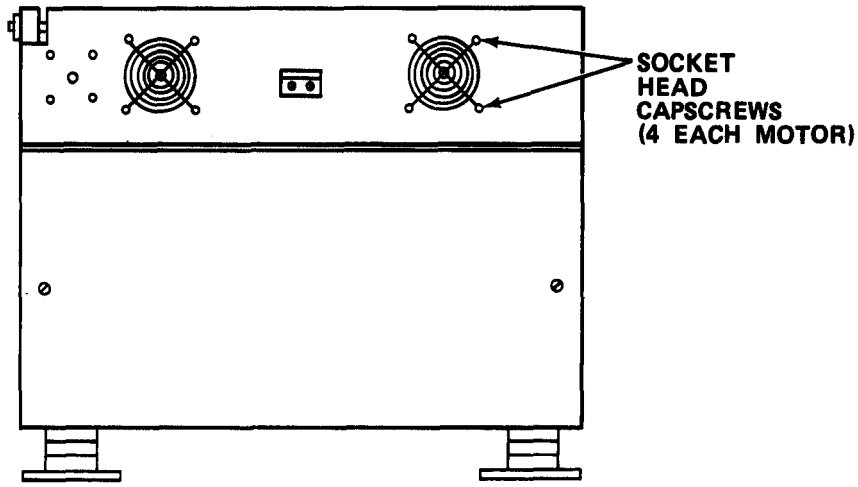
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug drafting table power cord.

b. Remove glass from table (paragraph 3-20.6).



c. Tag and disconnect fan motor wires from terminal connector.



REAR OF DRAFTING/MEASURiNG TABLE

d. Remove four socket head capscrews from motor mount and defective fan assembly.

e. Install new fan assembly and secure with screws.

f. Reconnect fan wires to motor.

g. Reinstall glass.

h. Plug in power cord.

3-20.8 Replace Digititizing System Power Supply Fuse.

MOS: 35E, Special Electronic Devices Repairer

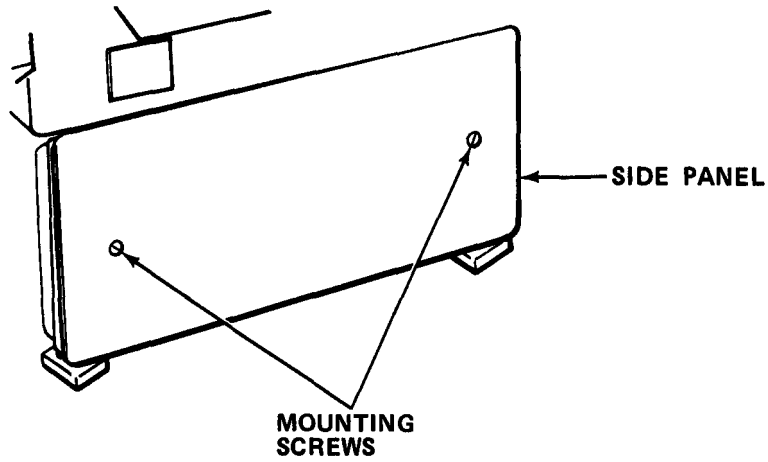
TOOLS: 3 mm Hex Head Key Wrench
Flat Tip Screwdriver

SUPPLIES: 1 amp Fuse

WARNING

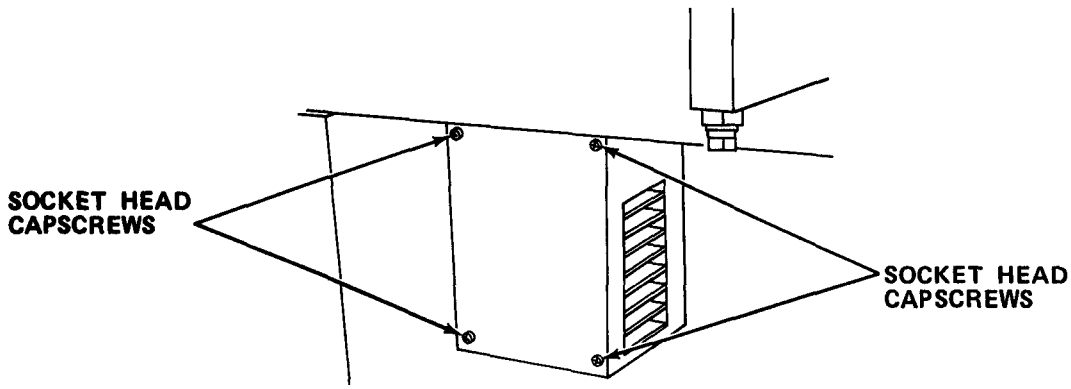
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug drafting table power cord.

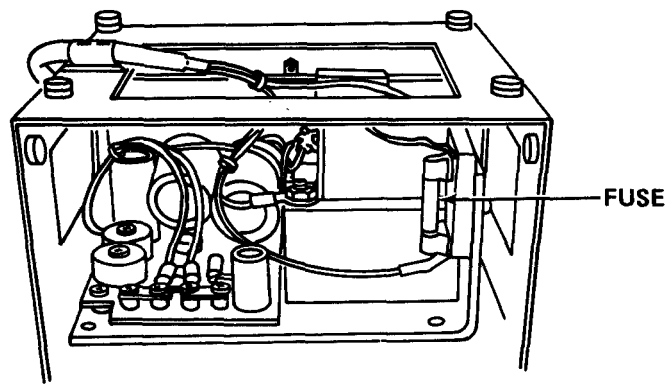


b. Turn side panel mounting screws half left.

c. Remove panel.



d. Remove four socket head capscrews and cover from digitizer card cage.



e. Replace defective fuse.

f. Reinstall cover.

g. Reinstall side panel.

h. Plug in power cord.

3-20.9 Replace PC Board(s).

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Flat Tip Screwdriver
3 mm Hex Head Key Wrench
PCB Puller

SUPPLIES: PC Board

WARNING

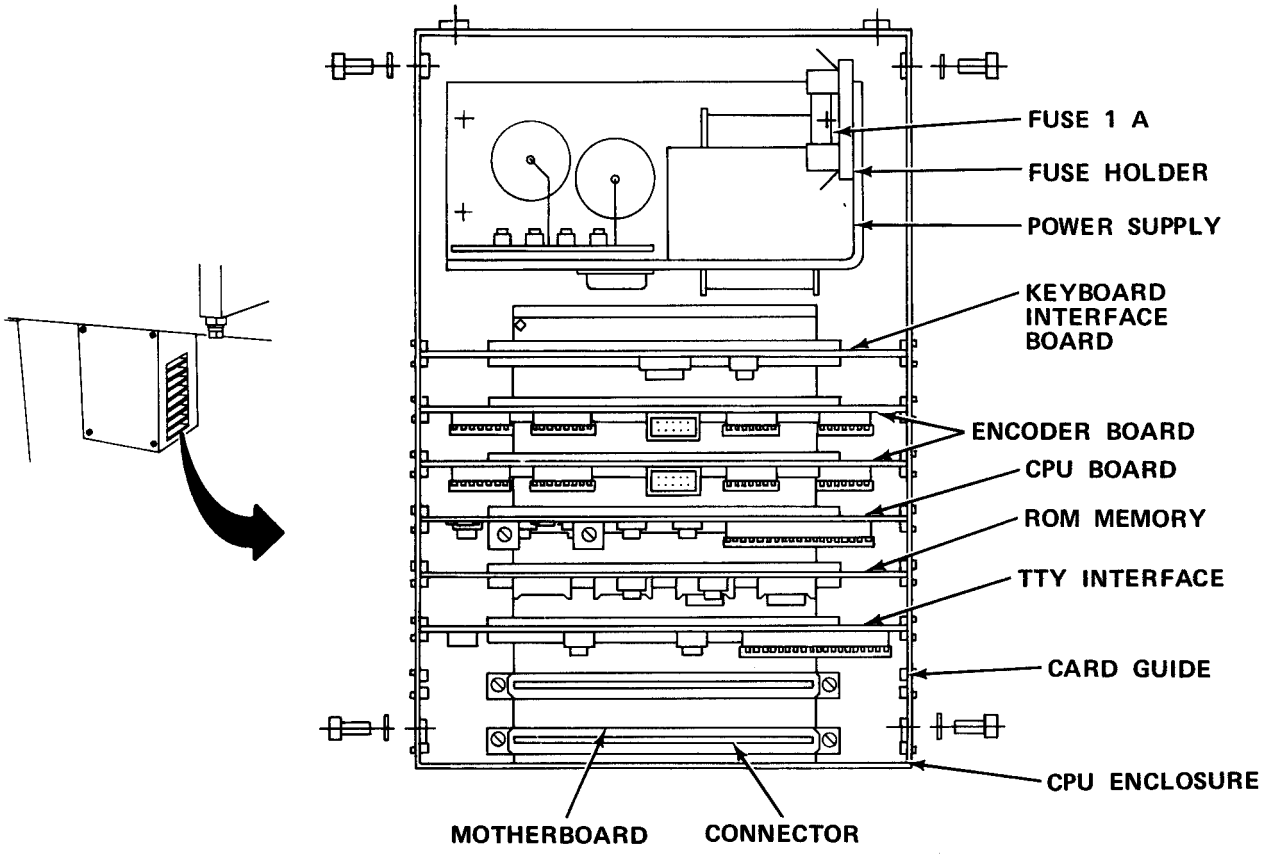
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

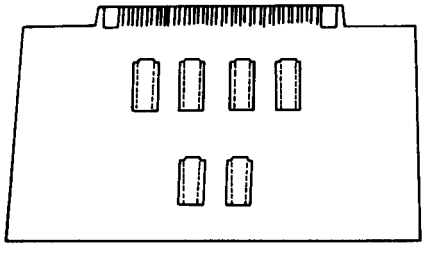
NOTE

Board locations may vary between machines.

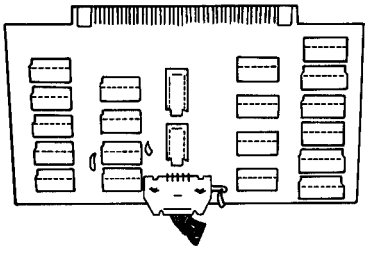
a. Unplug drafting table power cord.

b. Turn side panel mounting screws half left and remove panel.

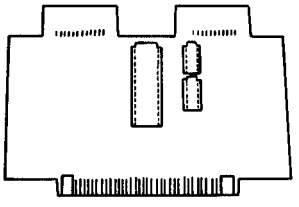




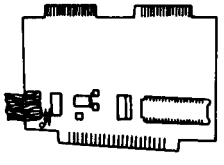
ROM BOARD



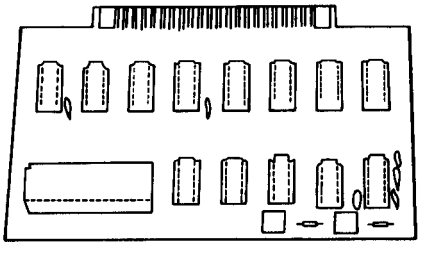
ENCODER BOARD (2)



KEYBOARD INTERFACE BOARD



TELETYPE INTERFACE BOARD



6800 CPU BOARD

c. Remove digitizing system card cage cover.

d. Remove ribbon cable from PC board if required.

e. Remove defective PC board(s) with card puller.

NOTE

Be sure cards are fully seated.

f. Install new PC board(s) carefully to avoid component damage.

g. Reinstall card cage cover and side panel.

h. Plug in power cord.

3-20.10 Replace Encoder.

MOS: 35E, Special Electronic Devices Repairer

TOOLS : Flat Tip Screwdriver
2 mm Hex Head Key Wrench
7/64 in. Hex Head Key Wrench

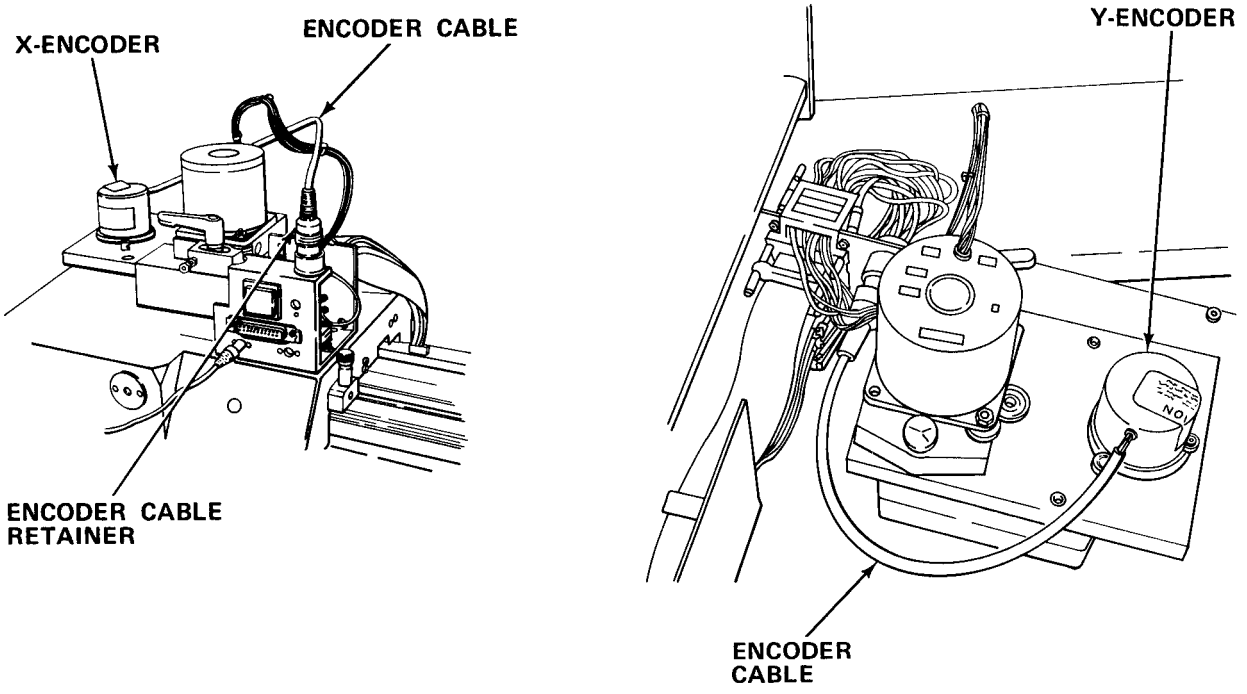
SUPPLIES: Encoder

WARNING

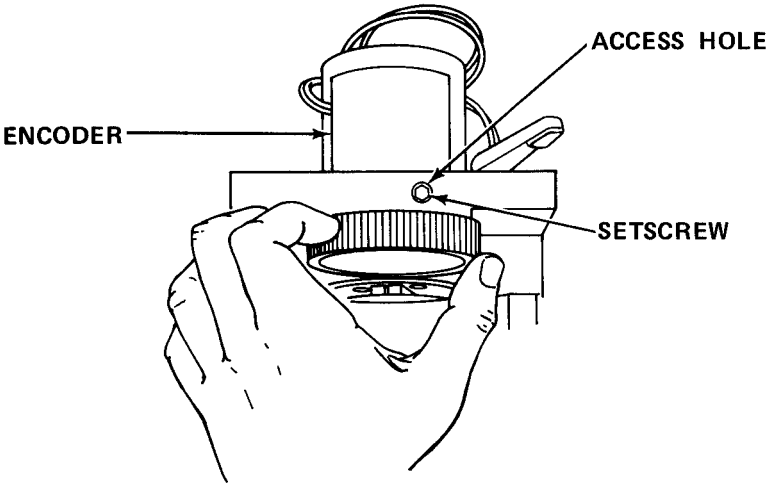
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug drafting table power cord.

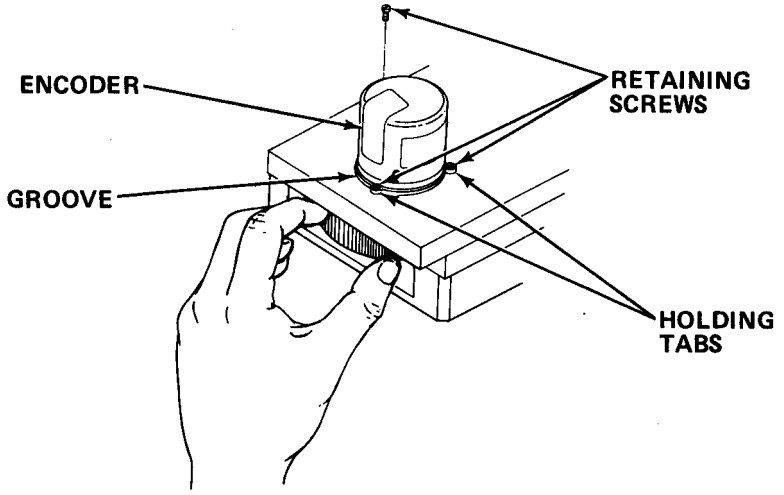
b. Remove socket head capscrews and carriage cover.



c. Disconnect encoder cable.



d. Turn socket head capscrew left to loosen gear shaft clamp.



e. Loosen three retaining screws.

f. Rotate encoder holding tabs to clear encoder groove.

g. Hold gear and remove encoder.

h. Install new encoder while holding gear.

i. Rotate gear until shaft socket head capscrew is seen through access hole and then tighten screw.

j. Position encoder holding tabs in groove.

k. Tighten screws.

l. Reconnect encoder cable and tighten.

m. Reinstall carriage cover.

n. Plug in power cord.

3-20.11 Replace Digitizer Keyboard.

MOS: 35E, Special Electronic Devices Repairer

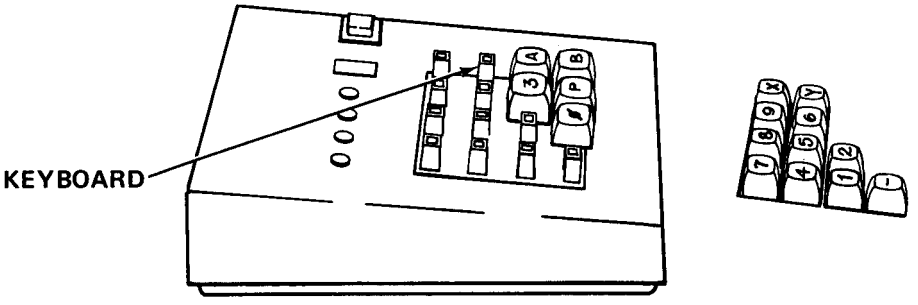
TOOLS : Flat Tip Screwdriver

SUPPLIES: Digitizing Keyboard

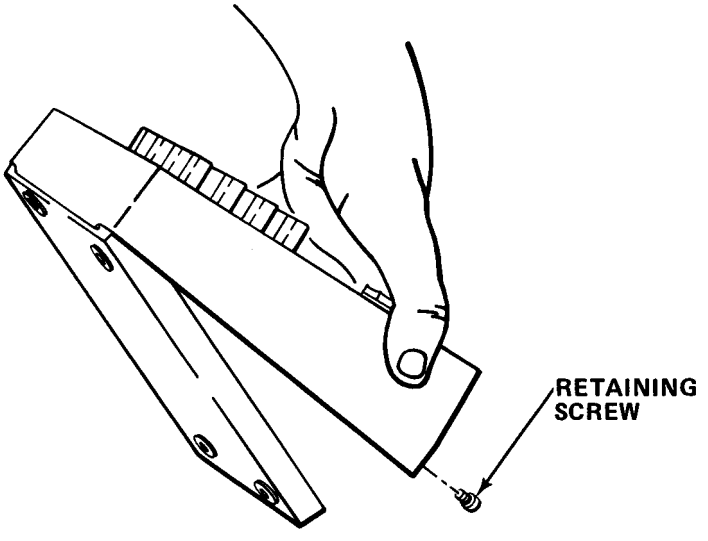
WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

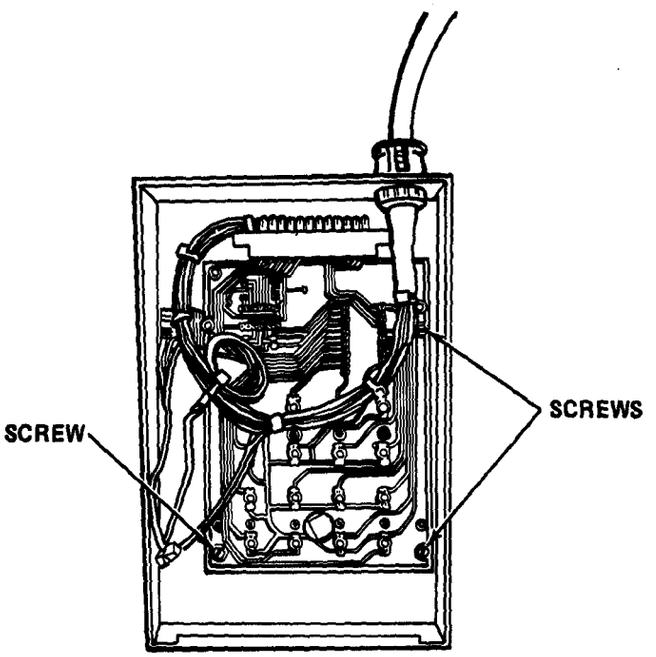
a. Unplug drafting table power cord.



b. Note key positions and remove keys.



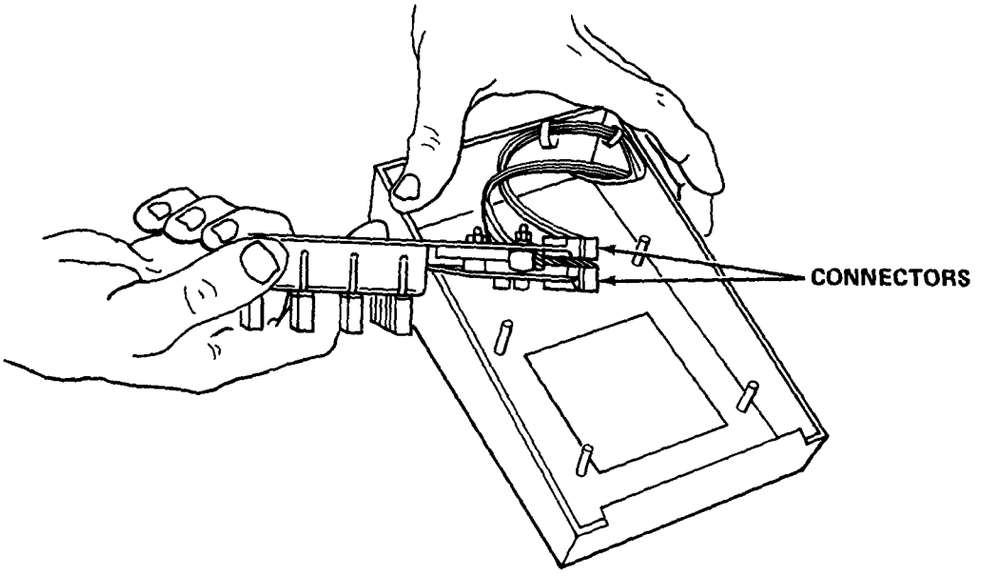
c. Remove two retaining screws and bottom panel.



d. Remove four screws.

CAUTION

Handle keyboard with care or keyboard and wires may be damaged.



e. Remove keyboard.

CAUTION

The connections are interchangeable, but damage to equipment will result if proper connections are not made.

f. Note position of connectors and disconnect.

9. Replace defective keyboard.

h. Reconnect connectors in proper position.

i. Reinstall screws.

j. Reinstall bottom plate.

k. Reinstall keys in proper positions.

l. Plug in power cord.

3-20.12 Replace Tape Reader.

MOS : 35E, Special Electronic Devices Repairer

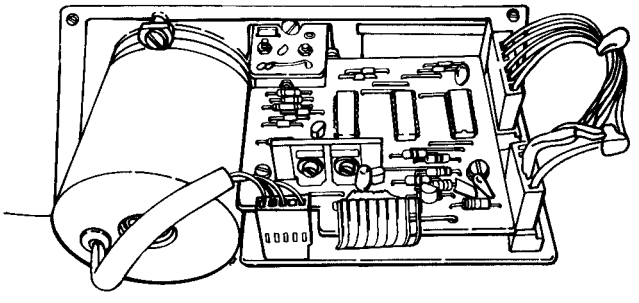
TOOLS: 3 mm Hex Head Key Wrench

SUPPLIES: Tape Reader

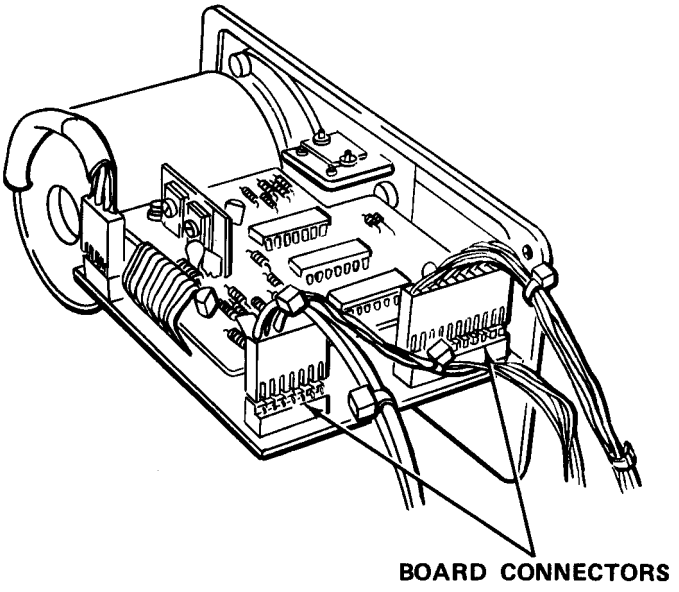
WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

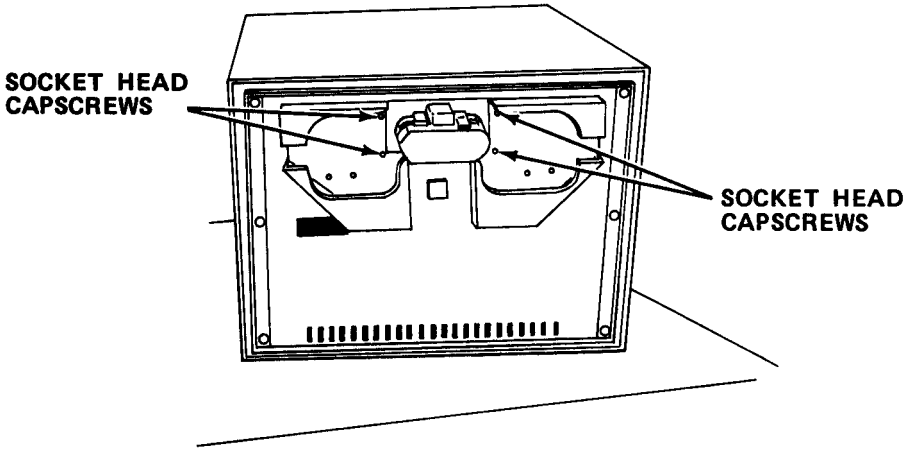
a. Unplug all power cords.



b. Open cabinet door.



c. Note position of board connectors and disconnect.



d. Remove socket head capscrews and defective tape reader.

e. Install new tape reader and secure with capscrews.

f. Reconnect connectors on circuit board in proper position.

g. Close cabinet door.

h. Plug in power cords.

3-20.13 Replace DSP Machine Controller Board.

MOS: 35E, Special Electronic Devices Repairer

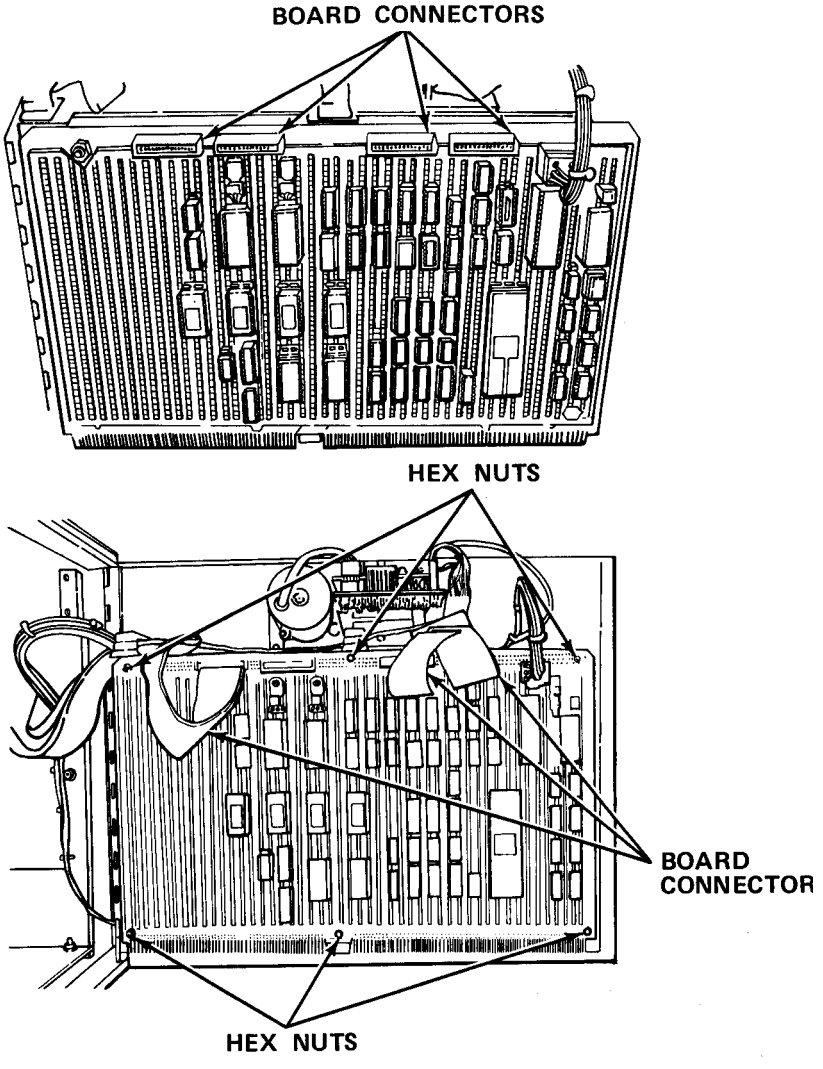
TOOLS: 5.5 mm Socket, 1/4 in. Drive
1/4 in. Drive Ratchet
1/4 in. Nut Driver

SUPPLIES: Controller Board

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug power cord.



b. Open cabinet door.

c. Note position of board connectors.

d. Disconnect connectors.

e. Remove six hex nuts, washers, and defective controller board.

f. Install new controller board.

g. Reinstall washers and hex nuts.

h. Reconnect board connectors in proper position.

i. Close cabinet door.

J. Plug in power cord.

3-20.14 Retplace Pen Drive/Tangential Tool Control Board.

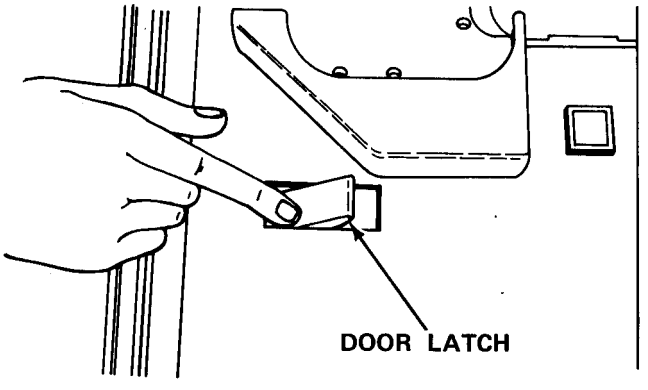
MOS: 35E, Special Electronic Devices Repairer

SUPPLIES: Pen Drive/Tangential Tool Control Board

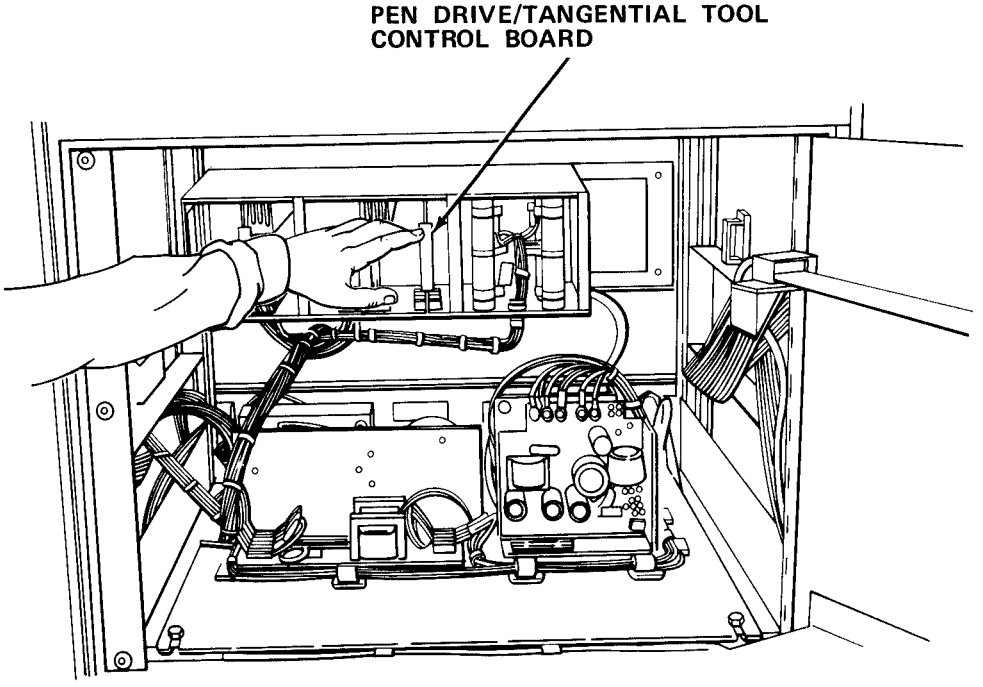
WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before-servicing.

a. Unplug power cord.



b. Open cabinet door.



c. Remove defective pen drive/tangential tool control board by pulling straight out.

d. Install new board by pushing in, making sure new board is securely in place.

e. Close cabinet door.

f. Plug in power cord.

3-20.15 Replace XY Display Circuit Card.

MOS: 35E, Special Electronic Devices Repairer

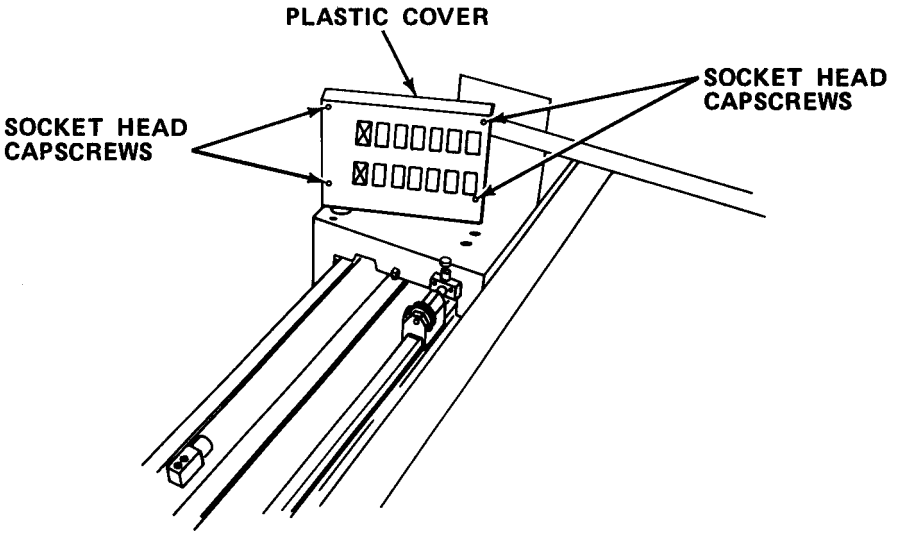
TOOLS: 2.5 mm Hex Head Key Wrench

SUPPLIES: XY Display Circuit Card

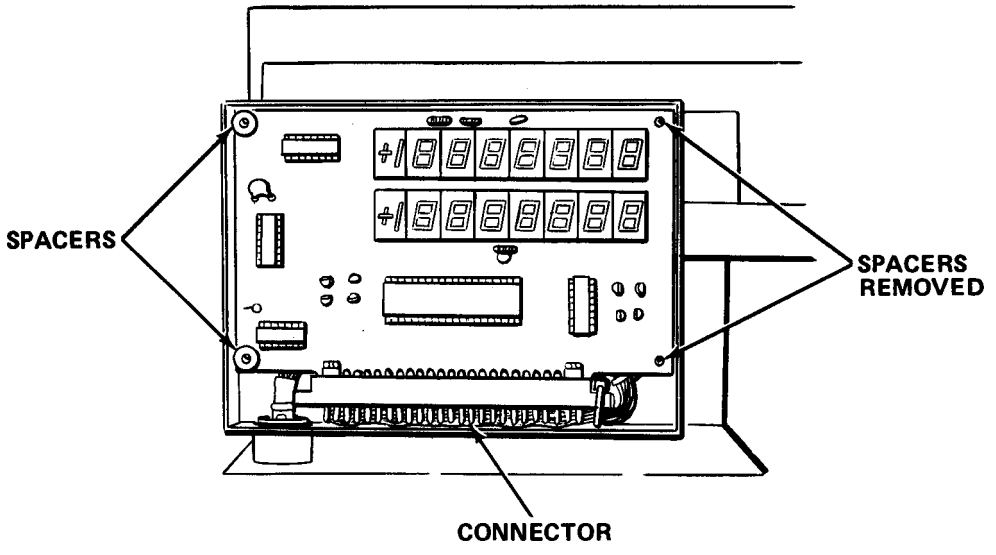
WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug all power cords.



b. Remove four socket head capscrews and plastic cover.



c. Remove four screws and spacers.

CAUTION

XY display circuit and associated connector and wires must be handled with care or damage may result

d. Remove defective ci rcuit card and carefully pull connector from board.

e. Place connector on new board and install assembly into housing.

f. Reinstall four spacers and screws.

g. Reinstall plastic cover.

CAUTION

Do not overtighten capscrews or plastic cover may break.

h. Plug in power cord(s).

3-20.16 Replace DSP Machine Controller Power Cord.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Thin Flat Tip Screwdriver
13 mm Combination Wrench
9 mm Combination Wrench
3 mm Combination Wrench
4 mm Hex Head Key Wrench
3 mm Hex Head Key Wrench
Pliers

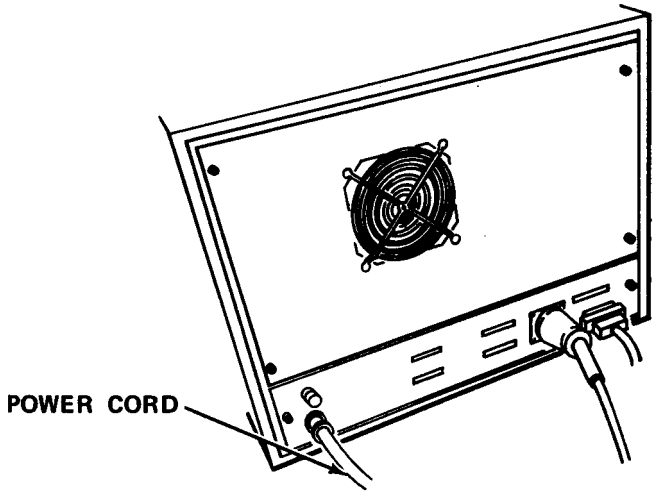
SUPPLIES: Power Cord

WARNING

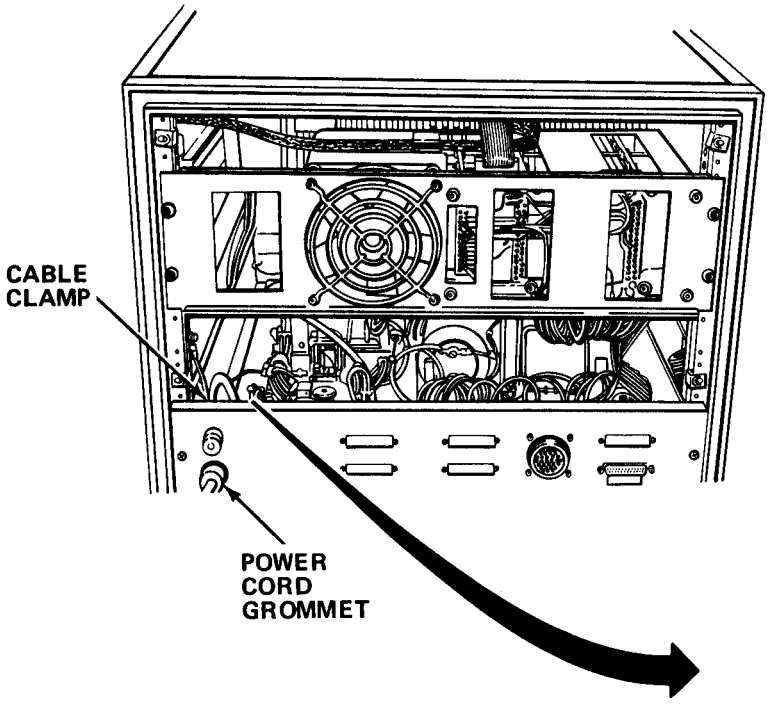
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

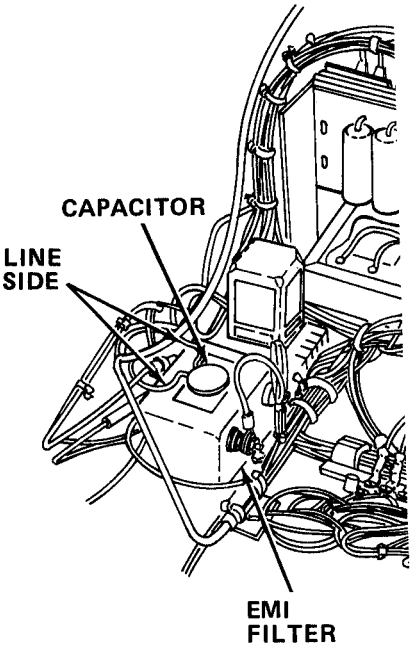
a. Unplug DSP machine controller power cord.

b. Remove DSP machine controller cabinet from shelf (paragraph 3-20.22).



c. Remove rear panel.





WARNING

High voltages that are capable of causing death may be stored in Capacitor after power is removed. Be sure capacitor is discharged and reduced to zero volts.

d. Remove nuts, washer, and capacitor from line side of EMI filter.

e. Note power cord wire positions, tag and remove from line side of EMI filter.

f. Remove screws and cable cl amp.

g. Remove power cord grommet

h. Remove defective power cord from cabinet.

i. Install new power cord.

j. Reinstall capacitor.

k. Reinstall rear panel.

1. Reinstall DSP machine controller on shelf.

m. Plug in power cord.

3-20.17 Replace DSP Machine Controller EMI Filter.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Thin Flat Tip Screwdriver
4 mm Hex Head Key Wrench
3 mm Hex Head Key Wrench
13 mm Combination Wrench
9 mm Combination Wrench

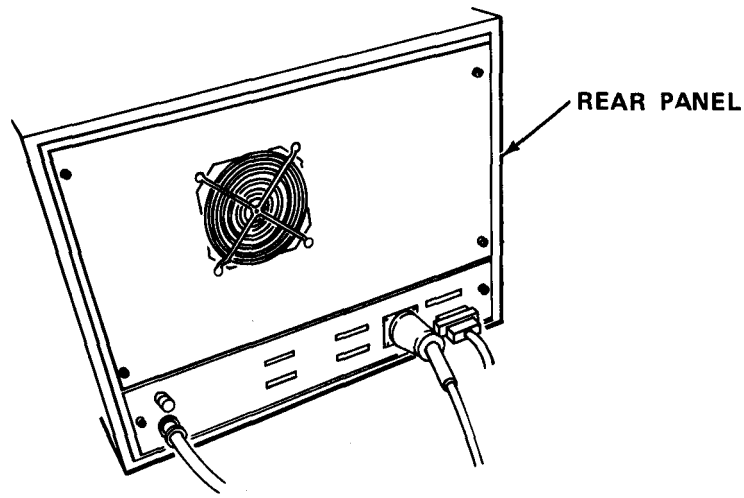
SUPPLIES: EMI Filter

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

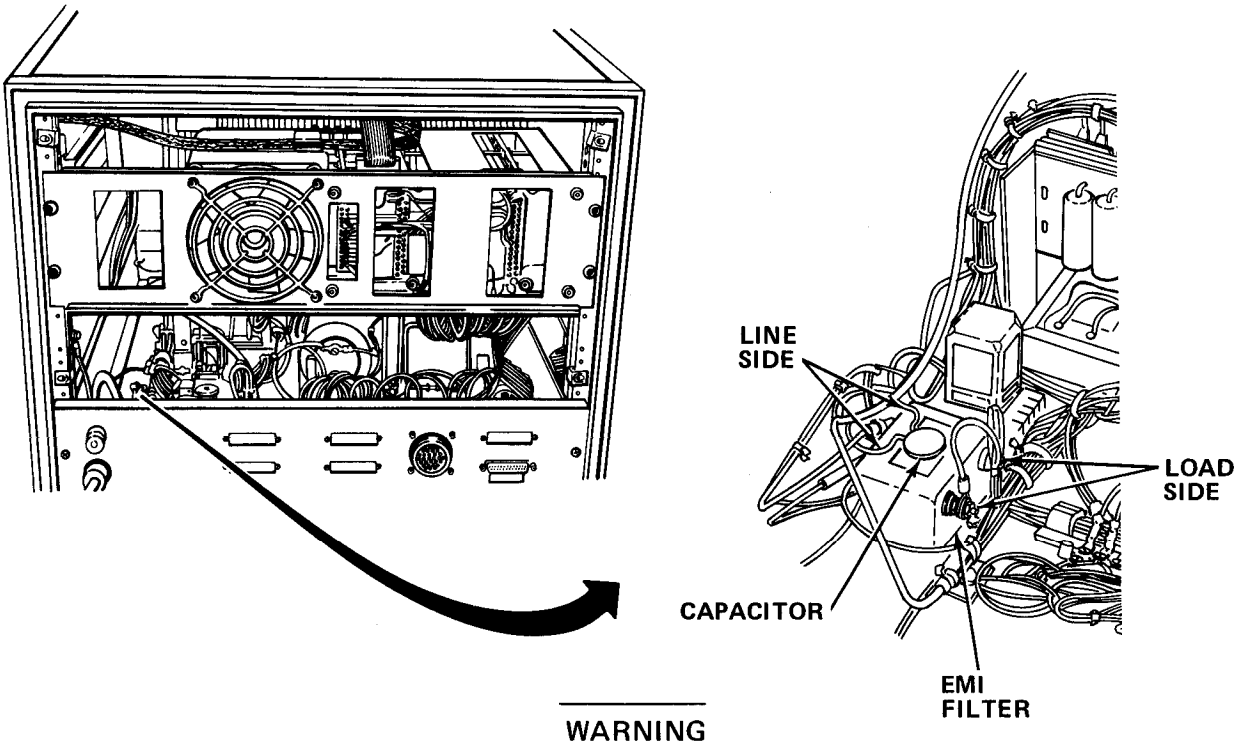
a. Unplug DSP machine controller power cord.

b. Remove DSP machine controller cabinet from shelf (paragraph 3-20.22).



REAR OF DSP MACHINE CONTROLLER

c. Remove rear panel.



WARNING

High voltages that are capable of causing death may be stored in capacitor after power is removed. Be sure capacitor is discharged and reduced to zero volts.

d. Remove nuts, washers, and capacitor from line side of EMI filter.

e. Note power cord wire positions, tag and remove from line side of EMI filter.

f. Note wire positions on load side of defective EMI filter, tag and remove wires.

g. Remove two hex head screws from base of EMI filter.

h. Replace defective EMI filter.

i. Reconnect wires in proper position on load side of EMI filter.

j. Reinstall power cord wires.

k. Reinstall capacitor.

l. Reinstall rear panel.

m. Reinstall DSP machine controller on shelf.

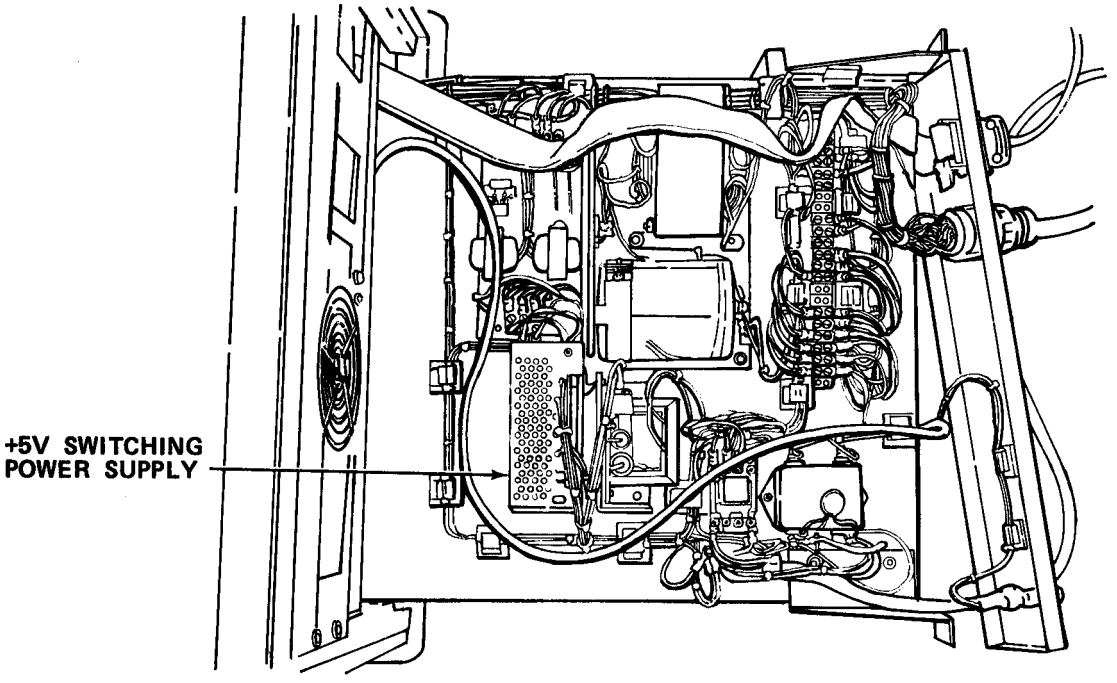
n. Plug in power cord.

3-20.18 Replace +5V Switching Power Supply.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: No. 1 Cross Tip Screwdriver
1/4 in. Drive Ratchet
7 mm Socket with 1/4 in. Drive
8 mm Socket with 1/4 in. Drive
4 mm Hex Head Key Wrench
7/64 in. Hex Head Key Wrench

SUPPLIES: +5 V Switching Power Supply



WARNING

Death or serious injury may occur from electrical shock unless power cord unplugged before servicing.

a. Remove DSP controller from shelf (paragraph 3-20.22).

b. Open front panel of DSP controller and remove rear cover.

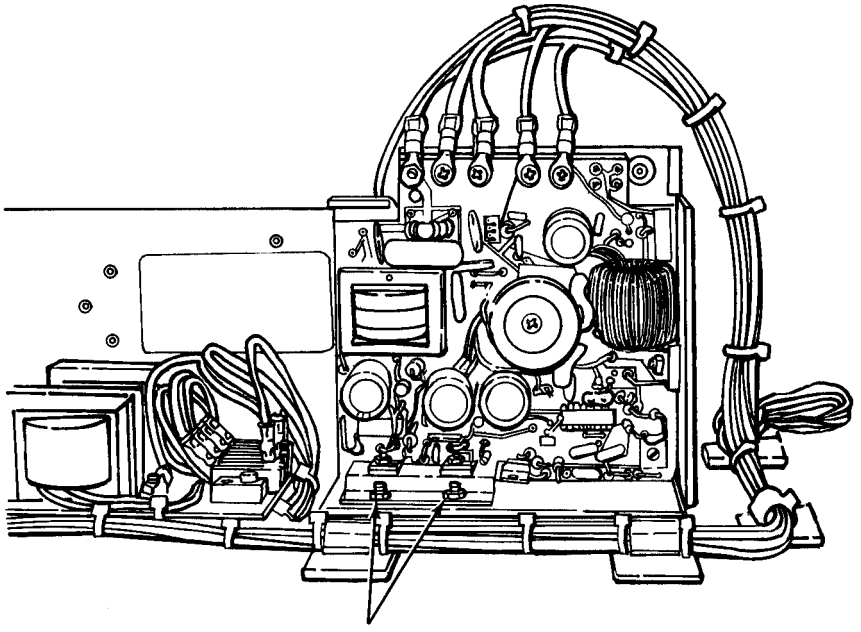
c. Loosen nuts at front of power supply base plate.

d. Remove two screws and rear connector panel assembly.

e. Remove two screws from rear of power supply base plate.

f. Slide power supply base plate from the controller.

g. Remove power supply screen.



h. Tag and disconnect wiring from switching power supply.

i. Turn base plate on end and remove two screws and defective power supply assembly.

j. Install new power supply assembly and secure with two screws.

k. Reconnect wiring to new power supply.

l. Reinstall power supply screen.

m. Slide power supply base plate into controller and secure with two screws at rear of base plate.

n. Reinstall rear connector panel assembly and secure with two screws.

o. Tighten nuts at front of power supply base plate.

p. Close front panel of DSP controller.

q. Reinstall rear cover of controller.

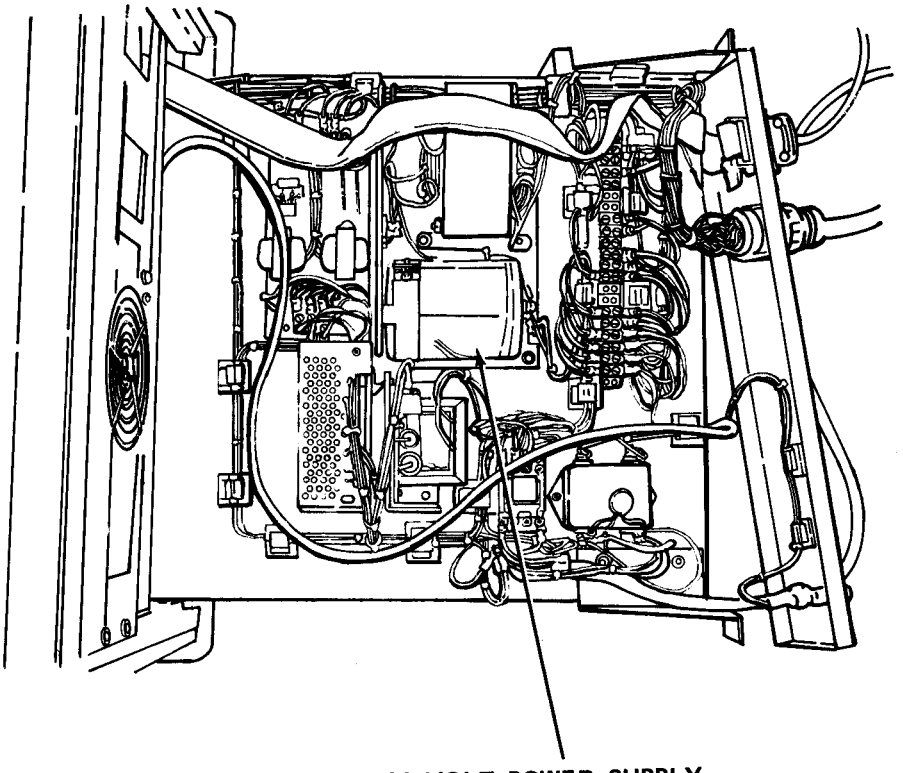
r. Reinstall controller on shelf.

3-20.19 Replace +24 V Power Supply.

MOS: 35E, Special Electronic Devices Repairer

TOOLS: Flat Tip Screwdriver
Cross Tip Screwdriver
7 mm Socket with 1/4 in. Drive and 1/4 in. Drive Ratchet
8 mm Socket with 1/4 in. Drive
4 mm Hex Head Key Wrench
7/64 in. Hex Head Key Wrench

SUPPLIES: +24 V Power Supply



24 VOLT POWER SUPPLY

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Remove DSP Controller from shelf (paragraph 3-20.22).

b. Open front panel of DSP Controller and remove rear cover.

c. Loosen nuts at front of power supply base plate.

d. Remove two screws from rear of power supply base plate,

e. Remove two screws and rear connector panel assembly.

f. Slide power supply base plate from controller.

g. Tag and disconnect wiring from +24 V power supply.

h. Turn base plate on end and remove six retaining nuts, washers and defective +24 V power supply.

i. Install new power supply and secure with six retaining nuts and washers.

j. Reconnect wiring to new power supply.

k. Slide power supply base plate into DSP Controller and secure with two screws-at rear" of-base plate.

1. Reinstal l rear connector panel assembly and secure with two screws.

m. Tighten nuts at front of power supply base plate.

n. Close front panel of DSP Controller.

o. Reinstall rear cover.

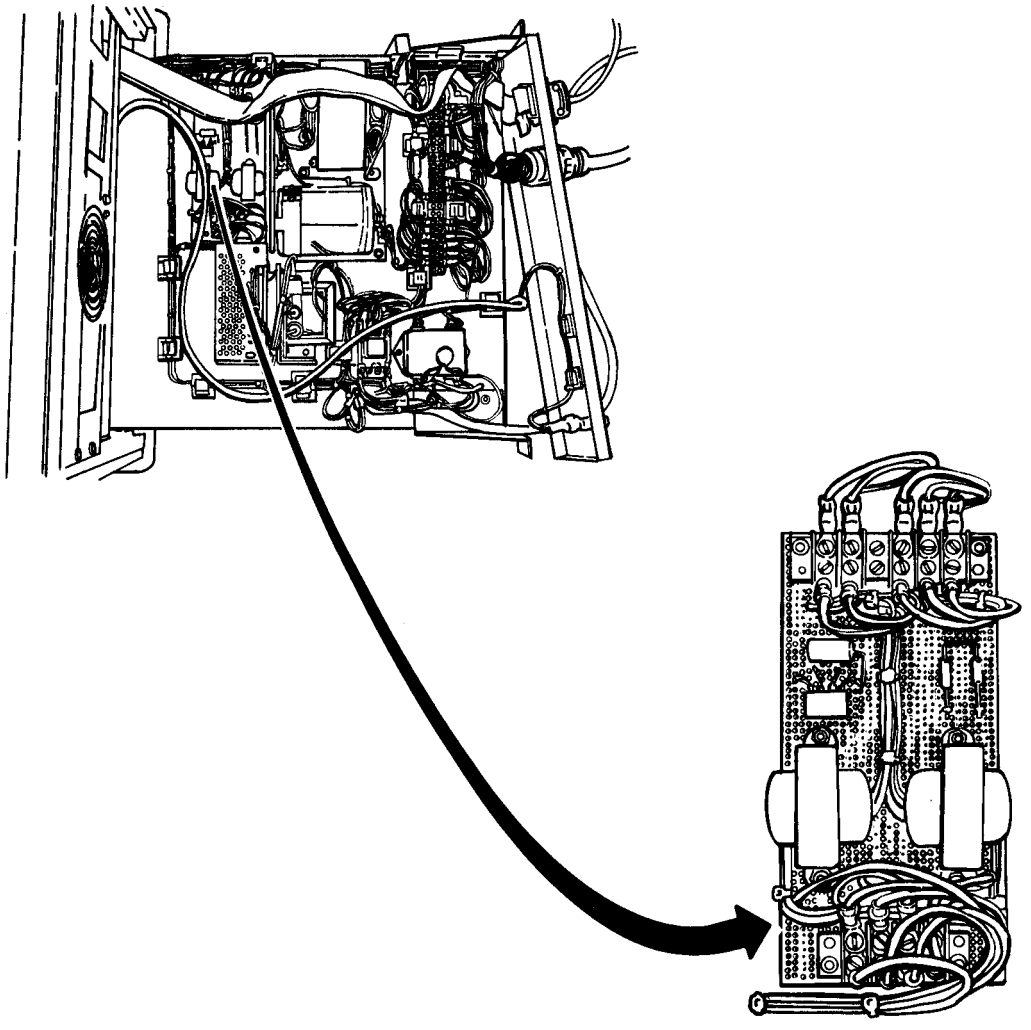
p. Reinstall controller on shelf.

3-20.20 **Replace +15 V Switching Power Supply.**

MOS: 35E, Special Electronic Devices Repairer

TOOLS: 4 mm Hex Head Key Wrench
3 mm Hex Head Key Wrench
7 mm Socket with 1/4 in. Drive and 1/4 in. Drive Ratchet
Solder and Desolder Set

SUPPLIES: +15 V Switching Power Supply
Solder (Item 23, Appendix E)



15V POWER SUPPLY

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Remove DSP Controller from shelf (paragraph 3-20.22).

b. Open front panel of DSP Controller and remove rear cover.

c. Loosen nuts at front of power supply base plate.

d. Remove two screws and rear connector panel assembly.

e. Remove two screws from rear of power supply base plate.

f. Slide power supply base plate from the controller.

g. Tag and desolder wiring from +15 V power supply.

h. Turn base plate on end, remove two nuts, washers and defective power supply.

i. Install new +15 V power supply and secure with two nuts and washers.

j. Solder wiring to new power supply.

k. Slide power supply base plate into controller and secure with two screws at rear of base plate.

l. Reinstall rear connector panel assembly and secure with two screws.

m. Tighten nuts at front of panel supply base plate.

n. Close front panel of DSP Controller.

o. Reinstall rear cover of controller.

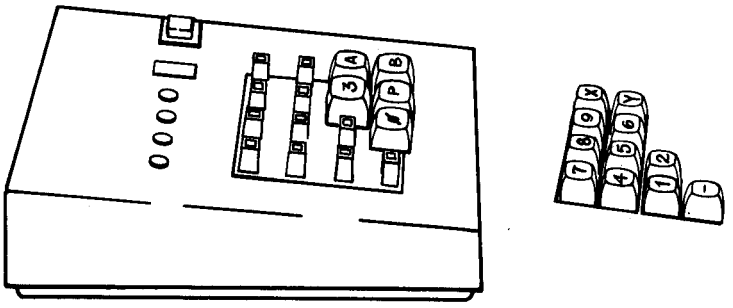
p. Reinstall controller on shelf.

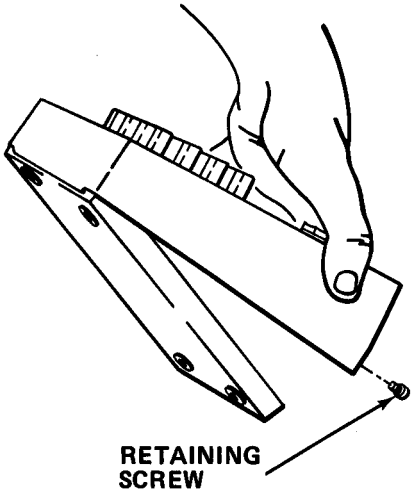
3-20.21 Replace Code Indicator Circuit Board.

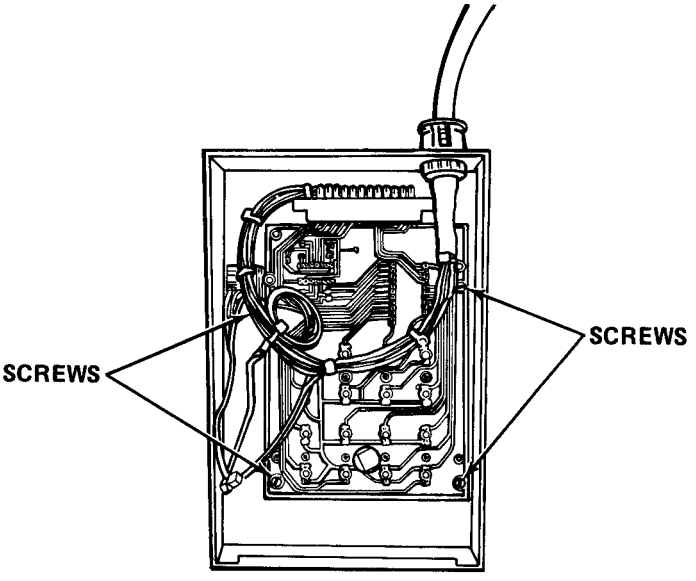
MOS: 35E, Special Electronic Devices Repairer

TOOLS: Flat Tip Screwdriver
2.5 mm Hex Head Key Wrench

SUPPLIES: Code Indicator Circuit Board





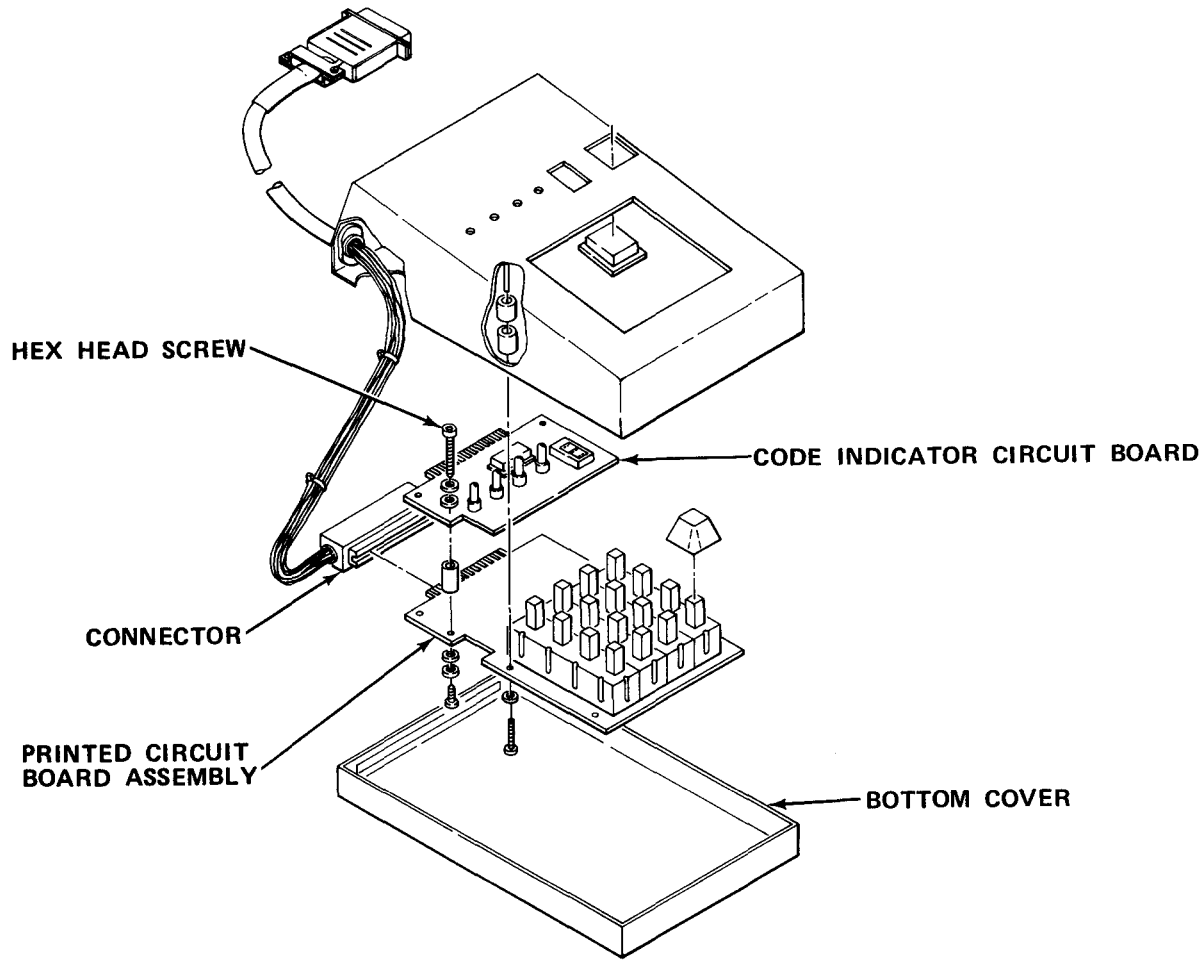


WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Remove two screws and bottom cover from digitizing keyboard.

b. Note position and remove keys from keyboards.



c. Remove screws and printed circuit board assembly.

d. Remove two hex head screws and code indicator circuit boards.

e. Note position, remove connector from defective board, and install on new board.

f. Secure code indicator circuit board with two hex head screws.

g. Reinstall printed circuit board assembly in keyboard and secure with screws.

h. Reinstall all keys on keyboard.

i. Reinstall bottom cover and secure with two screws.

3-20.22 Remove/Install Drafting and Measuring Machine.

MOS: 35E, Special Electronic Devices Repairer
81C, Cartographer

PERSONNEL: Four persons are required to perform this procedure

TOOLS: Flat Tip Screwdriver
Cross Tip Screwdriver
2 mm Hex Head Key Wrench
2.5 mm Hex Head Key Wrench
3 mm Hex Head Key Wrench
1/2 in. Combination Wrench
Accessory Tool Kit (contains two special tools for removing glass)

SUPPLIES: Drafting and Measuring Machine

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Remove drafting table, teletypewriter, and DSP machine controller power cords from electrical outlets.

b. Remove toolholder from dovetail mount on X-carriage.

c. Loosen retaining screws on four ribbon cable connectors located on left side of table frame.

d. Note position and remove cables.

e. Remove socket head capscrew holding ground wire and cables to center left side of table frame.

f. Remove wires and cables from screw.

g. Reinstall screw in table frame.

h. Loosen X-rail fine adjustment device setscrew.

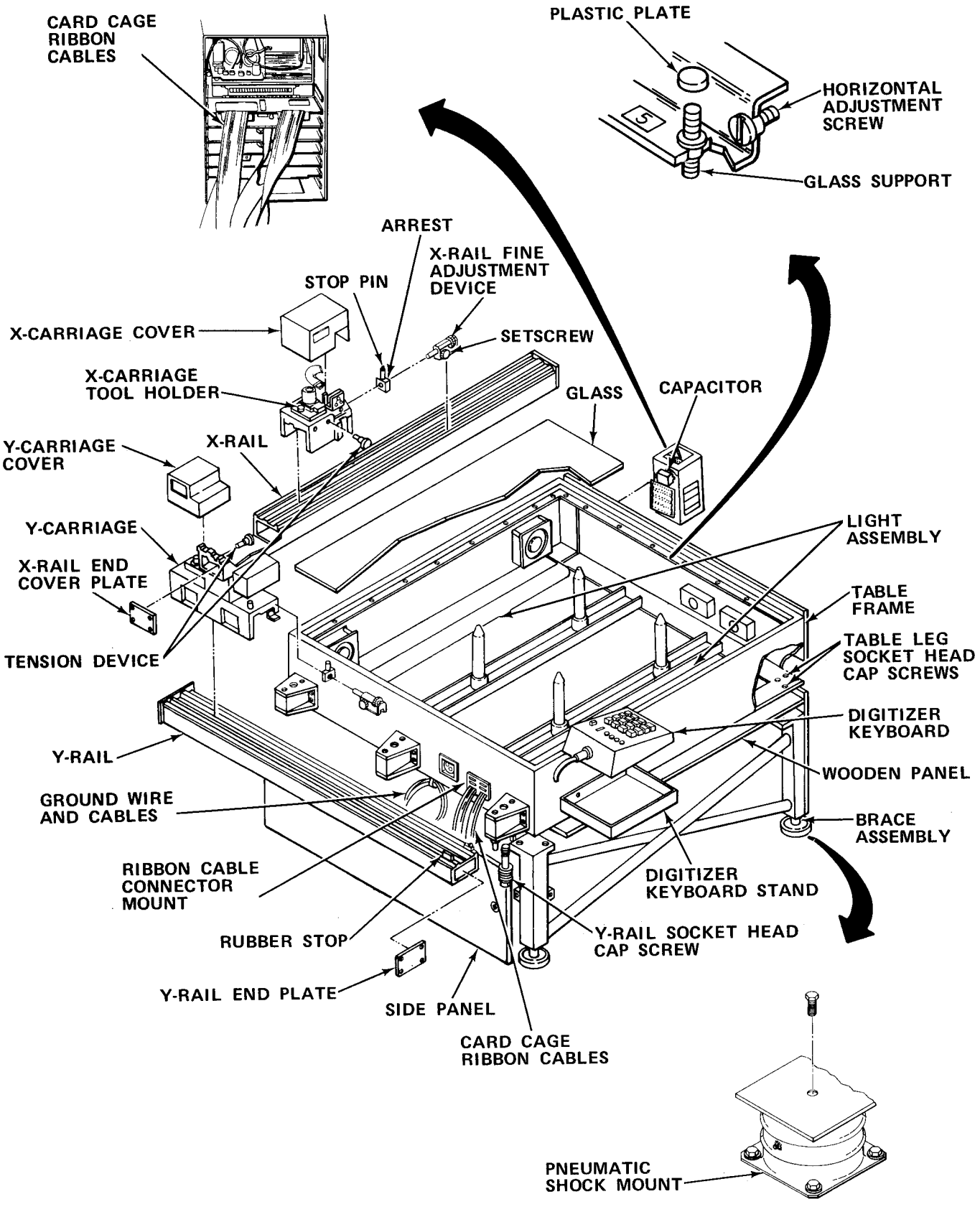
i. Raise arrest stop pin.

j. Slide device away from arrest.

k. Remove device.

l. Remove two socket head capscrews from X-carriage tensioning device.

m. Remove device.


CARD CAGE RIBBON CABLES
PLASTIC PLATE
HORIZONTAL ADJUSTMENT SCREW
GLASS SUPPORT
ARREST
X-RAIL FINE ADJUSTMENT DEVICE
STOP PIN
SETSCREW
X-CARRIAGE COVER
X-CARRIAGE TOOL HOLDER
GLASS
CAPACITOR
Y-CARRIAGE COVER
X-RAIL
LIGHT ASSEMBLY
Y-CARRIAGE
X-RAIL END COVER PLATE
TABLE FRAME
TABLE LEG SOCKET HEAD CAP SCREWS
TENSION DEVICE
DIGITIZER KEYBOARD
Y-RAIL
WOODEN PANEL
GROUND WIRE AND CABLES
BRACE ASSEMBLY
RIBBON CABLE CONNECTOR MOUNT
DIGITIZER KEYBOARD STAND
Y-RAIL SOCKET HEAD CAP SCREW
RUBBER STOP
Y-RAIL END PLATE
SIDE PANEL
CARD CAGE RIBBON CABLES
PNEUMATIC SHOCK MOUNT

n. Remove capscrews from X-carriage cover.

o. Remove cover.

p. Remove socket head capscrews from rubber stop at left end of rail,

q. Remove stop.

r. Remove socket head capscrews from X-rail end cover at left end.

s. Remove cover.

t. Loosen retaining screws on five ribbon cable connectors in X-carriage.

u. Tag cables as to position for reinstallation.

v. Remove cables.

w. Remove cable clamp to remove cables from X-carriage, and reinstall cable clamp.

x. Move X-carriage motor locking lever to right.

y. Slide motor mount to right.

CAUTION

When moving X-carriage, do not attempt to force movement. Damage to gears and rack may result.

z. Install X-carriage cover.

aa. Install cover capscrews.

ab. Move X-carriage to left end of rail.

ac. Remove X-carriage.

ad. Install tensioning device.

ae. Install rubber stop.

af. Install rail end cover.

ag. Loosen Y-rail fine adjustment device setscrew.

ah. Raise arrest stop pin.

ai. Slide device away from arrest.

aj. Remove device.

ak. Remove socket head capscrews from rubber stop at front end of Y-rail.

al. Remove stop.

am. Move Y-carriage motor locking lever to right.

an. Slide motor mount to right.

CAUTION

When moving Y-carriage, do not attempt to force movement or damage to gears and rack may result.

ao. Move Y-carriage to rear end of Y-rail.

ap. Remove two socket head capscrews from Y-carriage tensioning device.

aq. Remove device.

ar. Remove socket head capscrews from end plate at front end of Y-rail.

as. Remove plate.

CAUTION

Two personnel are required to remove Y-carriage. One person at Y-carriage and one person at end of X-rail to remove assembly in level position or damage to carriage bearings will occur.

at. Remove Y-carriage with attached X-rail and cables.

au. Install tensioning device.

av. Install rubber stop.

aw. Install end cover.

CAUTION

Glass top is fragile and can be easily broken. Handle with care and do not allow glass to hit machine frame.

NOTE

Three personnel are required to perform steps bc, bd and be. One person under table and one at each end of glass.

ax. Rotate front mounting screws half left.

ay. Remove front panels.

az. Remove screws from wooden panel located under table.

ba. Remove wooden panel.

bb. Loosen plastic horizontal adjustment screws located around edge of glass.

bc. From underside of table, push glass up approximately one inch.

bd. Holding glass at each side, lift to clear machine frame.

NOTE

Store glass in a secure area.

be. Remove glass.

bf. Remove fluorescent lamps.

bg. Reinstall wood panel.

WARNING

High voltages that are capable of causing death may be stored in capacitor after power is removed. Be sure capacitor is discharged and reduced to zero volts.

bh. Tag and remove wires from capacitor on side of card cage under table.

bi. Remove two nuts from ribbon cable connector mounted on left side of table.

bj. Remove mount with ribbon cables attached.

bk. Tag and disconnect wiring from card cage.

bl. Remove socket head capscrews holding card cage to table frame.

bm. Remove cage.

bn. Remove digitizing keyboard.

bo. Remove two capscrews and keyboard stand.

bp. Remove socket head capscrews from all legs.

WARNING

- Serious injury may occur unless an adequate number of personnel are used to move equipment.
- Four personnel are required to lift table frame from legs.

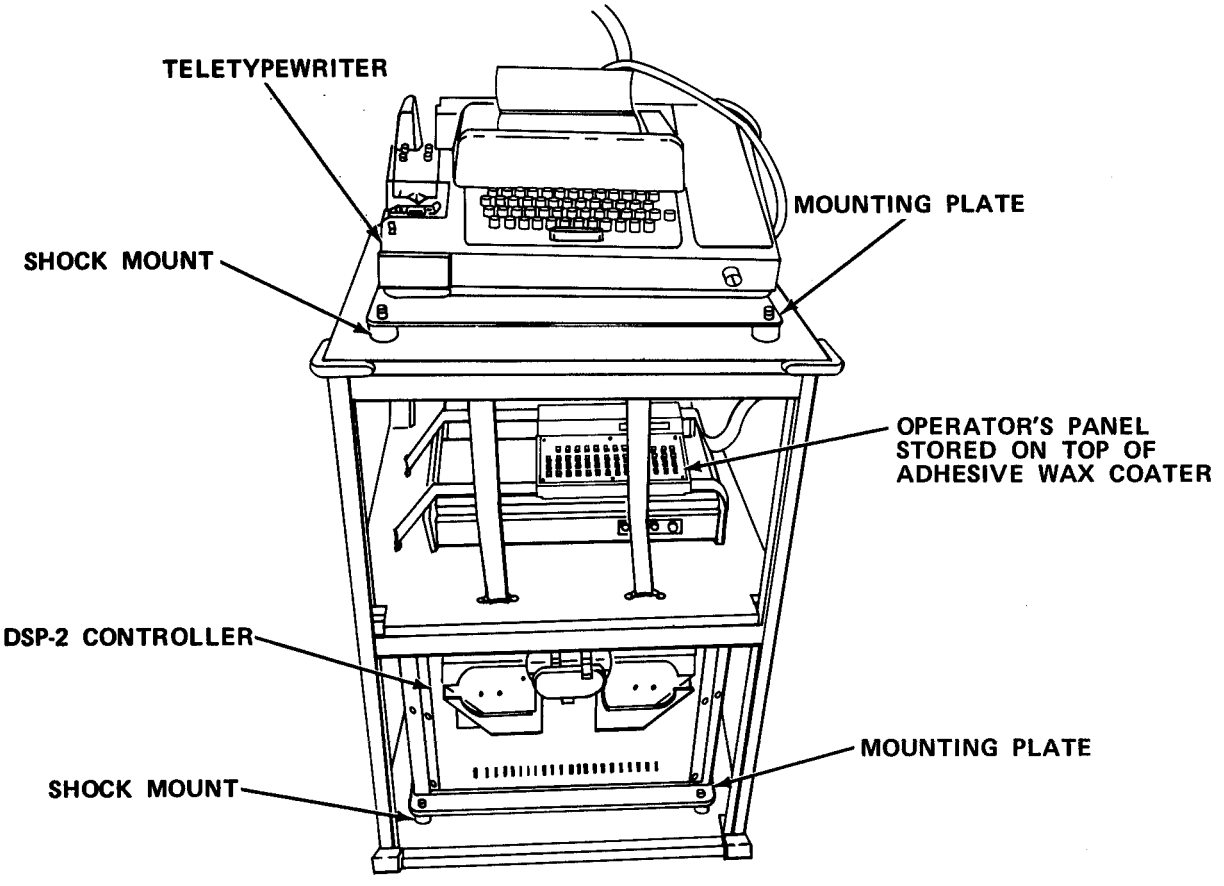
bq. Lift and remove table frame.

br. Remove table legs from brace assembly.

bs. Remove four nuts and washers from teletype mounting plate.

bt. Remove teletype with mounting plate attached.

bu. Remove mounting plate.



bv. Install mounting plate on stand.

bw. Remove four nuts and washers from DSP controller mounting plate.

bx. Raise front of controller enough to remove front two rubber shocks,

by. Remove shocks.

bz. Lower controller.

ca. Raise rear of controller enough to clear rear shock bolts.

cb. Slide controller forward enough to remove main body cable and operator's console cable.

cc. Remove cables.

cd. Remove controller with attached mounting plate.

ce. Remove mounting plate.

cf. Reinstall mounting plate on stand.

cg. Remove operator's console from top of sealing machine located on middle shelf.

ch. Remove defective machine or components from section.

ci. Remove screws on wooden panel on bottom of new table frame.

cj. Remove wooden panel.

ck. Attach legs to brace assembly at locations as per numbers on bottom of legs.

cl. Attach brace assembly with legs to shock mounts.

WARNING

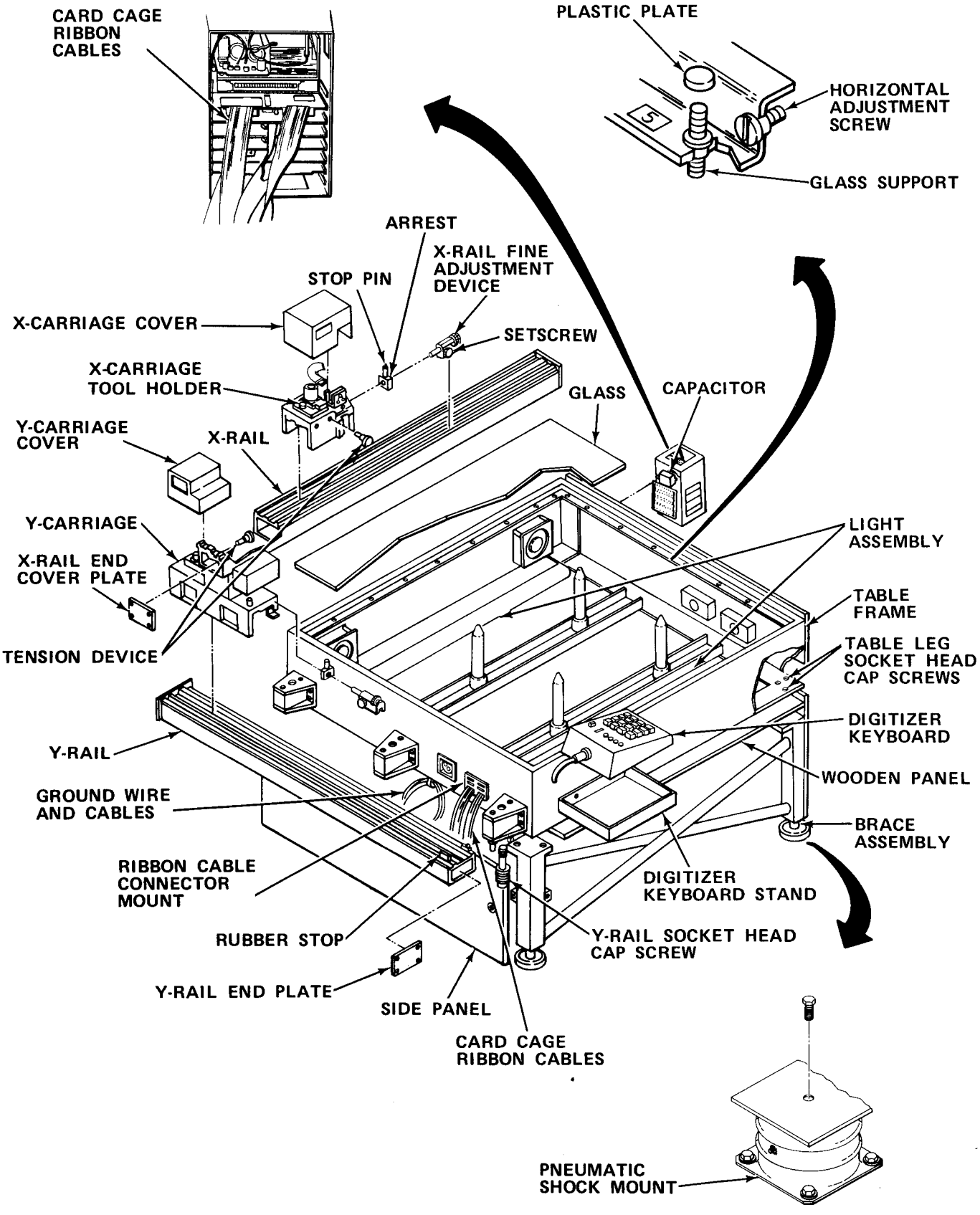
Serious injury may occur unless an adequate number of personnel are used to move this equipment. Four personnel are required to carry frame.

cm. Position frame on legs with frame corners matching leg numbers.

cn. Locate socket head capscrews for legs.

co. Attach frame to legs with screws.

cp. Install lighting assemblies into frame.


CARD CAGE RIBBON CABLES
PLASTIC PLATE
HORIZONTAL ADJUSTMENT SCREW
GLASS SUPPORT
ARREST
X-RAIL FINE ADJUSTMENT DEVICE
STOP PIN
SETSCREW
X-CARRIAGE COVER
X-CARRIAGE TOOL HOLDER
GLASS
CAPACITOR
Y-CARRIAGE COVER
X-RAIL
Y-CARRIAGE
X-RAIL END COVER PLATE
TENSION DEVICE
LIGHT ASSEMBLY
TABLE FRAME
TABLE LEG SOCKET HEAD CAP SCREWS
DIGITIZER KEYBOARD
WOODEN PANEL
BRACE ASSEMBLY
Y-RAIL
GROUND WIRE AND CABLES
RIBBON CABLE CONNECTOR MOUNT
DIGITIZER KEYBOARD STAND
RUBBER STOP
Y-RAIL SOCKET HEAD CAP SCREW
Y-RAIL END PLATE
SIDE PANEL
CARD CAGE RIBBON CABLES
PNEUMATIC SHOCK MOUNT

NOTE

Plastic plates for glass supports must be installed with numbers corresponding to numbers on frame.

cq. Install plastic plates on glass supports.

CAUTION

Glass top is fragile and can be easily broken. Handle with care and do not allow glass to hit machine frame.

NOTE

Three personnel are required to install glass onto frame. Two personnel to carry and position glass and a third person to support glass from beneath table frame as it is lowered onto supports.

cr. Install digitizer keyboard stand to left front of table. Secure with two capscrews.

cs. Position digitizer keyboard on keyboard stand.

ct. Reinstall wooden panel.

cu. Install card cage underneath table frame with socket head capscrews.

cv. Connect three wires as marked to capacitor located on side of cage.

cw. Install ribbon cable connector to left side of frame.

cx. Connect ribbon cable harness to card cage and connector.

cy. Reconnect wiring to card cage.

cz. Remove socket head capscrews from Y-rail end plate at front end.

da. Remove plate.

db. Remove socket head capscrews from rubber stop at front end of Y-rail.

dc. Remove stop.

dd. Remove socket head capscrews from Y-carriage tensioning device.

de. Remove tensioning device.

df. Move Y-carriage motor locking lever to right.

dg. Slide motor mount to right.

NOTE

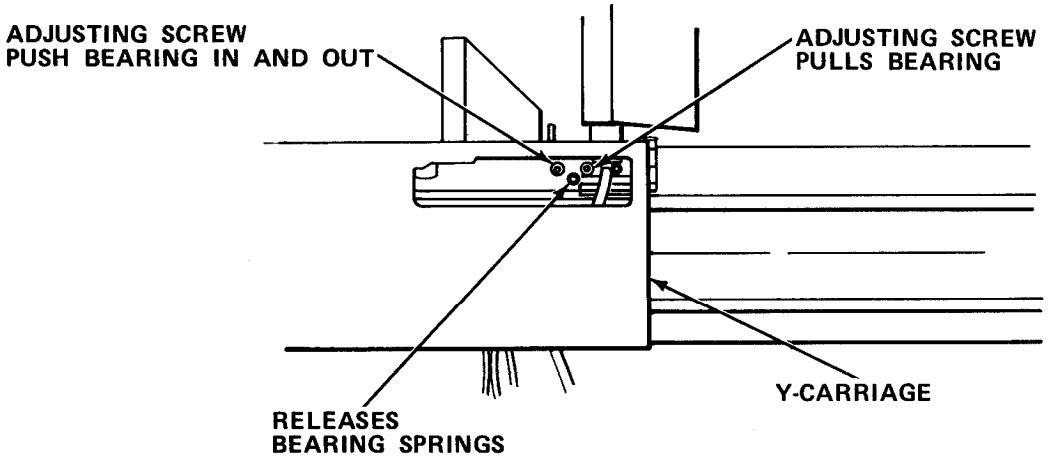
Two personnel are required to mount Y-carriage. One person at Y-carriage and one person at end of X-rail to hold assembly level for mounting.

dh. Remove Y-carriage left side cover panel.

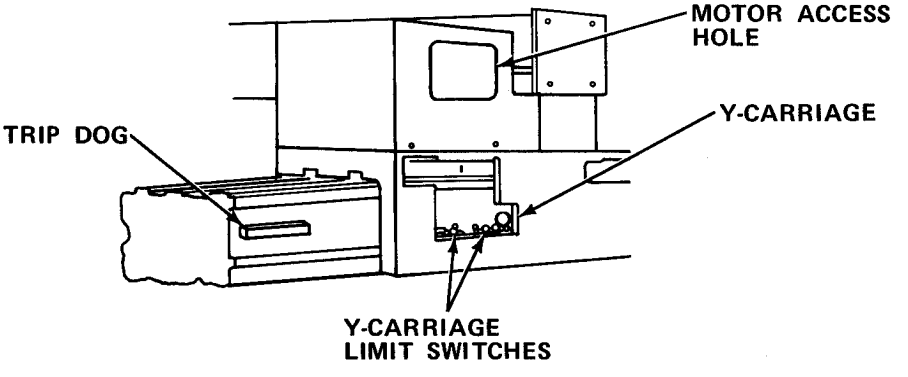
di. Loosen Y-carriage bearing adjustment screws.

CAUTION

When mounting Y-carriage, do not force movement or damage to gears and rack may result. Limit switch cams must be held back to prevent damage to trip dog.



dj. Lifting both ends together, set Y-carriage on front of Y-rail.



NOTE

Through motor access hole, push motor assembly toward table and hold until carriage is approximately in center of Y-rail, then release.

dk. Hold limit switch cams clear of trip dog.

dl. Slide Y-carriage onto Y-rail past trip dog.

dm. Reattach end plate.

dn. Reattach stop.

do. Move Y-carriage to rear of Y-rail.

dp. Install tensioning device.

dq. Mount fine adjustment device on Y-rail.

dr. Raise arrest stop pin.

ds. Slide device into arrest.

dt. Lower stop pin into hole in shaft of device.

du. Adjust Y-carriage bearing screws to allow Y-carriage to move easily, and with no restrictions.

dv. Move Y-carriage to mid-position on Y-rail.

dw. Remove socket head capscrews from end plate at left end of X-rail.

dx. Remove end plate.

dy. Remove socket head capscrews from rubber stop at left end of X-rail.

dz. Remove stop.

ea. Remove socket head capscrews from X-carriage tensioning device.

eb. Remove device.

ec. Move X-carriage motor locking lever to right.

ed. Slide motor mount to right.

CAUTION

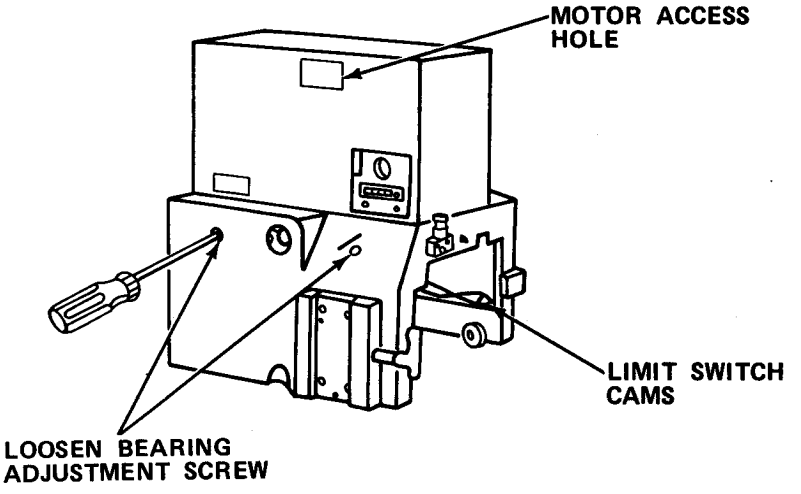
When mounting X-carriage, do not force movement or damage to gears and rack may result. Limit switch cams must be held back to prevent damage to trip dog.

ee. Loosen X-carriage bearing adjustment screws.

NOTE

Through motor access hole, push motor assembly to right and hold until carriage is approximately in center of X-rail, then release.

ef. Set X-carriage at end of X-rail with end plate removed. ,



eg. Hold limit switch cams clear of trip dog.

eh. Carefully move X-carriage past trip dog to approximately center of X-rail.

ei. Install tensioning device.

ej. Mount fine adjustment device on X-rail.

ek. Raise arrest stop pin.

el. Slide device into arrest.

em. Lower stop pin into hole in shaft of device.

en. Adjust X-carriage bearing screws to allow X-carriage to move easily, and with no restrictions.

eo. Move X-carriage to mid-position of X-rail.

ep. Remove socket head capscrews from X-carriage cover.

eq. Remove cover.

er. Connect five ribbon cables to cable connector on X-carriage.

es. Tighten cable connectors.

et. Reinstall cover.

eu. Install four side panels.

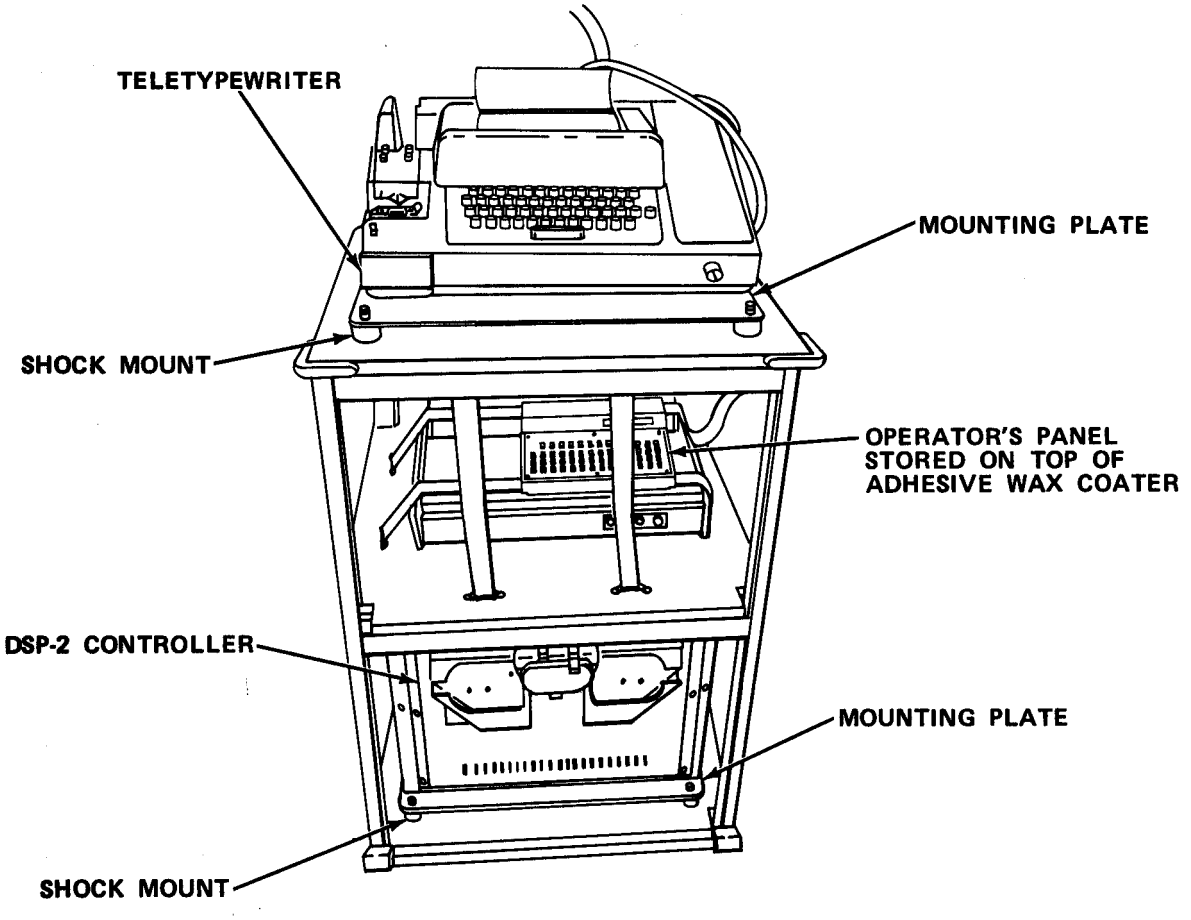
ev. Secure side panels by rotating retaining screws one-half turn to right.

ew. Attach main body cable, ground wire, and other cables to center left of table with plastic harness.

ex. Install mounting plate to bottom of teletypewriter with four nuts and washers.

ey. Install teletypewriter with plate attached onto shock mounts on top shelf, using four nuts and washers.

ez. Connect cable to cable connector on left side of drafting table where tagged for teletype.



fa. Install mounting plate to DSP-2 controller with four nuts and washers.

fb. Remove front two shock mounts on bottom shelf.

fc. Position controller on shelf leaving room to connect main body cable and operator’s control cable.

fd. Connect cable.

fe. Put operator’s console on top of sealing machine for stowage until use.

ff. Raise rear of controller so that plate rests on rear shock mounts properly.

fg. Raise front of controller enough to install shock mounts.

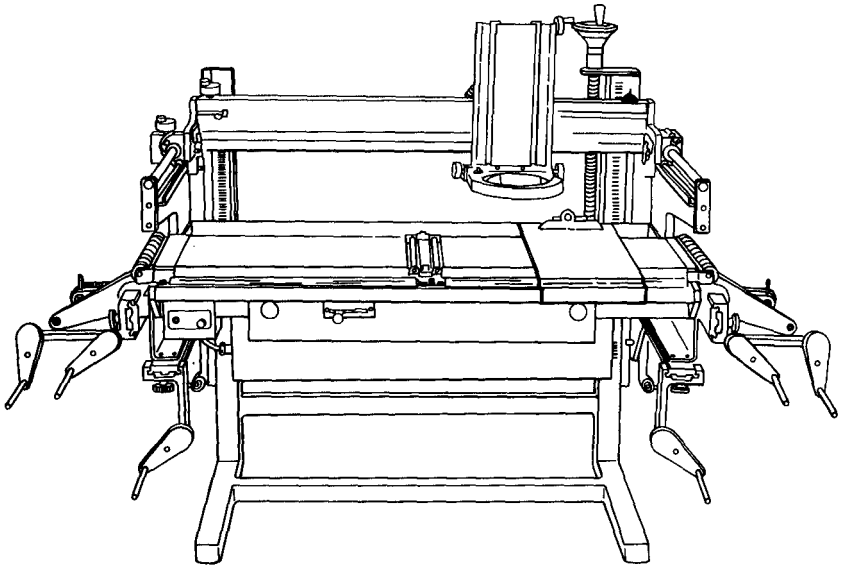
fh. Install shock mounts.

fi. Lower controller mounting plate onto front shock mounts.

fj. Install four nuts and washers to mounting plate.

fk. Install socket head cap screw with small plastic harness holding ground wires and cables to left side of table frame.

fl. Plug in teletypewriter, DSP-2 controller and drafting table power cords into electrical outlets.



CHAPTER 4

SPLIT-STAGE LIGHT TABLE

Section I INTRODUCTION

4-1. GENERAL INFORMATION.

4-1.1 Scope.

a. Model Number and Equipment Name. Model MIM3-3510O Split-Stage Light Table

b. Purpose of Equipment. To stereoscopically view aerial roll film for analysis and interpretation.

4-1.2 Reference Information.

Glossary

Collimation.	To make light rays parallel by adjustment of optical/mechanical system.
Interpupillary Distance	Distance between center of operator's eyes.
Stereo-Pair Photograph	Photographs taken of same object or area from two different positions.
Stereoscope.	Optical device to apparently super-impose two separate photographs.
Stereoscopic	An apparent three-dimensional image obtained when 2 two-dimensional photographs are viewed through stereoscope.
X-Axis	Horizontal or left-right direction.
Y-Axis	90° from X-axis in same plane or front-back direction.
Z-Axis	Vertical direction or up/down.

4-2. EQUIPMENT DESCRIPTION.

4-2.1 Equipment Characteristics, Capabilities, and Features.

Reel configurations for conventional, split-vertical, short, or long-loop film threading.

b. Accepts up to 1000 ft (304.80 m) of film (dual strand up to 5-1/2 in. (13.97 cm) wide; single strand up to 9-1/2 in. (24.13 cm) wide).

c. Variable-intensity light grids.

d. Electrically coupled clutches for movement of optical mounting in horizontal plane.

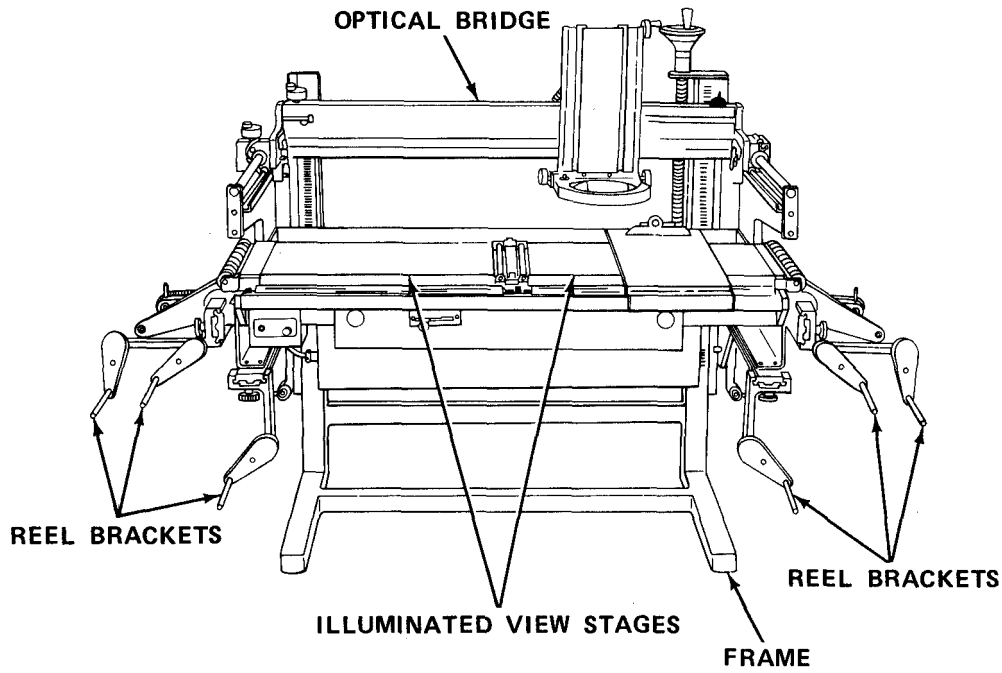
Safety clutch on optical mount prevents rapid movement of optical system toward view stages.

f. Has variable stage height.

g. Optical bridge assembly is removable.

h. Has masking assemblies contained in view stages.

4-2.2 Location and Description of Major Components.



OPTICAL BRIDGE. Mounts stereoscope.

REEL BRACKETS. Transport aerial roll film across view stages.

FRAME. Maintains alinement of components.

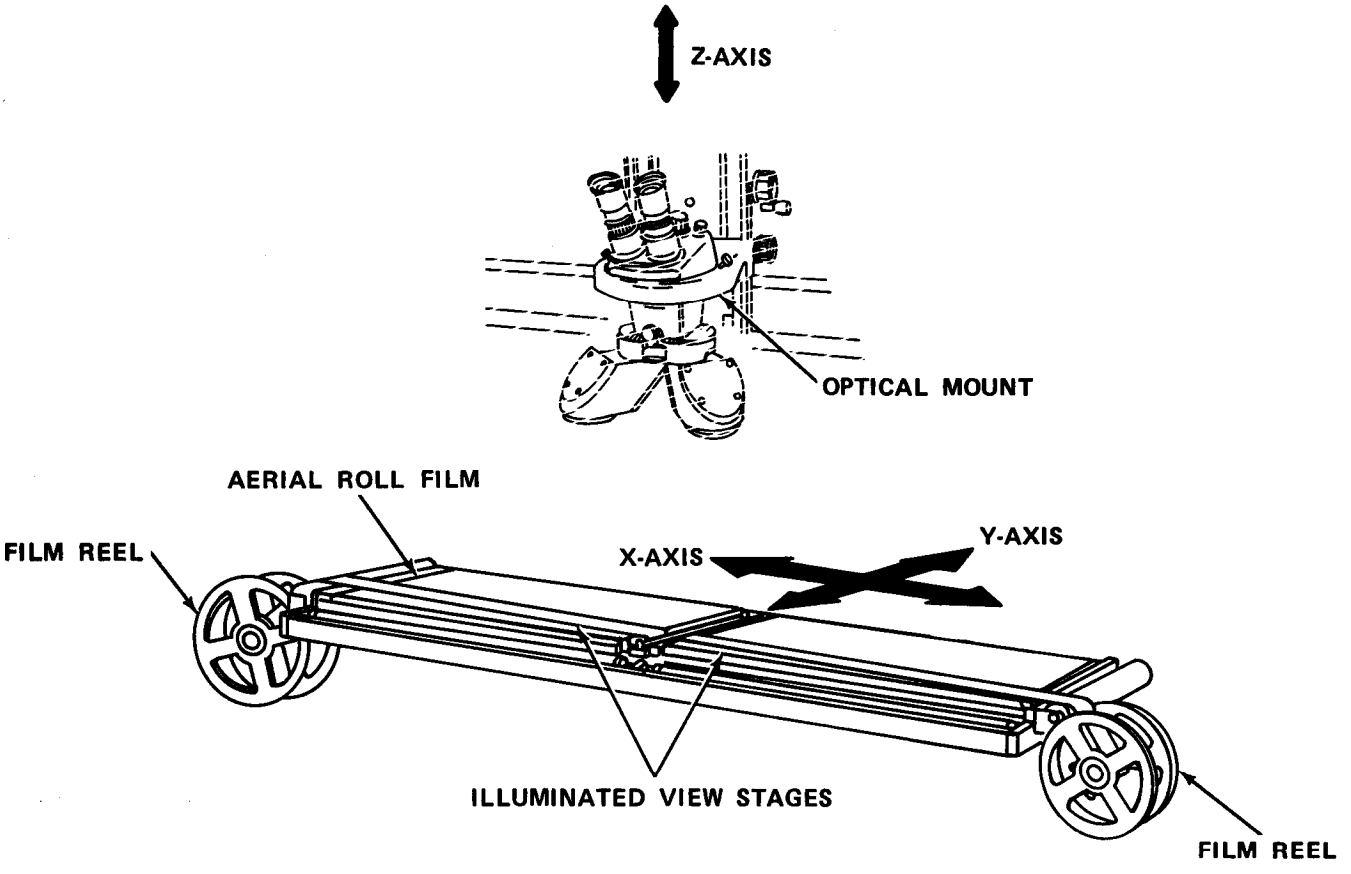
ILLUMINATED VIEW STAGES. Controlled-intensity light grids shine light through aerial roll film.

4-2.3 Equipment Data.

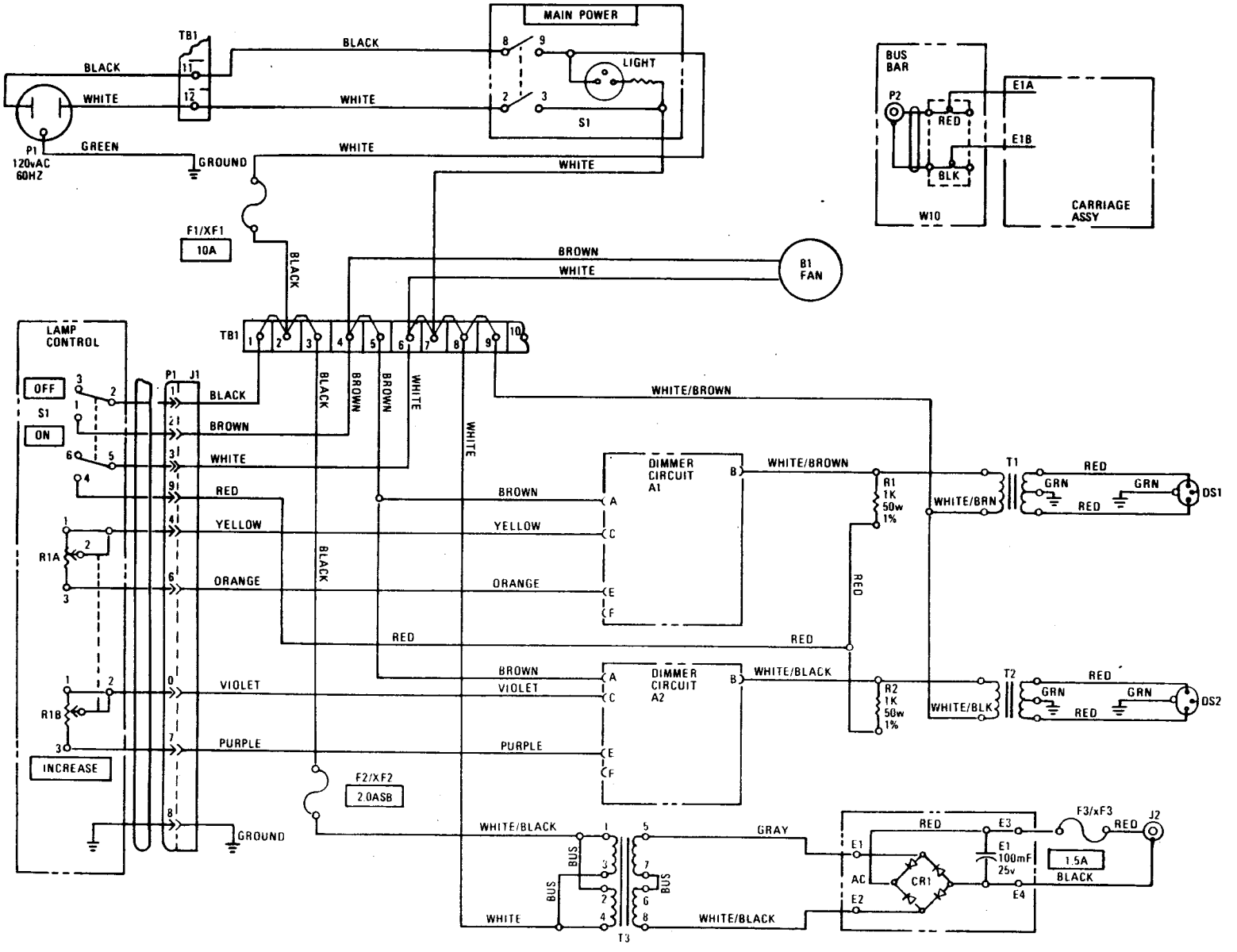
Dimensions	
Length	
Reel Brackets Removed	45-1/2 in. (115.57 cm)
With Reel Brackets	56-3/4 in. (144.15 cm)
Width	26-3/4 in. (67.95 cm)
Height	63-5/8 in. (161.61 cm)
Weight	360 lbs (163.3 kg)

Illumination	
Two Stages (Each Stage)	11 in. X 18 in. (27.95 cm x 45.72 cm)
Maximum Intensity	2500 ft lamberts
Dimming Control	Variable Intensity to 20% of Maximum Illumination
Power Requirements	120 V, 50/60 Hz, 8 amps

4-3. TECHNICAL PRINCIPALS OF OPERATION.



4-3.1 General. Aerial roll film is manually moved between film reels, over rollers, across illuminated view stages. Optical mount moves stereoscope right-left (X-axis), front-back (Y-axis) or up-down (Z-axis) for analysis and interpretation of stereo-pair images on aerial roll film. Stereoscope movement is accurately controlled to maintain collimation over entire viewing area.

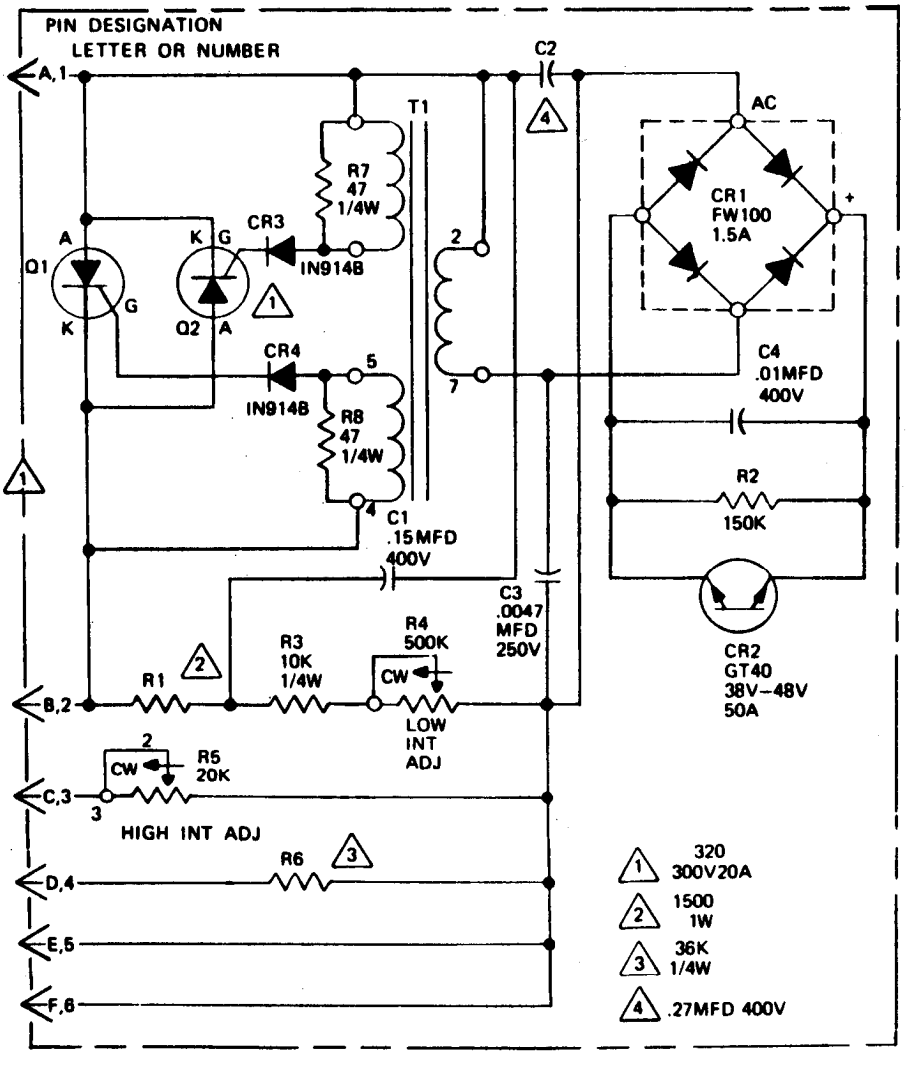


SPLIT-STAGE LIGHT TABLE
WIRING DIAGRAM

4-3.2 Detailed Theory of Operation.

a. Illumination. Two encapsulated, cold-cathode, argon mercury light grids each provide a maximum of 2500 ft lamberts of brightness through viewing surfaces. Intensity of light is controlled by a dimming circuit. Light can be reduced to 20-percent of maximum value.

(1) Current (120 V, 50/60 Hz) is passed through the main power switch. The illumination control panel on the switch operates the fan and light grids. The



(2) Alternating current voltage enters the dimmer circuit boards through pin A and is transferred to pin B through silicon-controlled rectifier (SCR) Q1 or Q2 which determines the amount of the ac sine wave voltage that is applied to the external high-voltage transformer to light the grid lamp. The SCR's prevent all of each ac half-wave from being transferred, but when triggered allow current to flow during the remaining portion of each half sine wave until the zero crossing point is reached, whereupon the SCR is turned off and the ac waveform is again

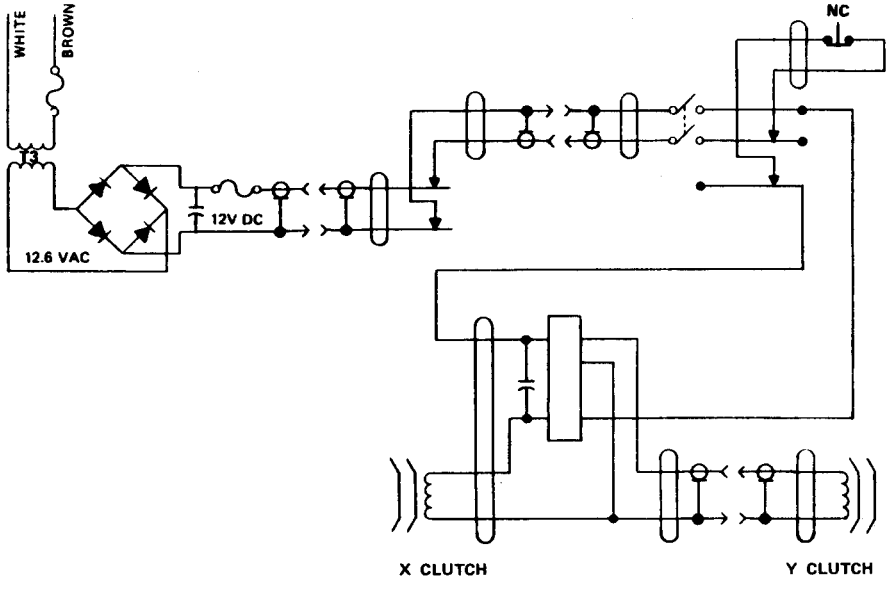
(3) When the ac voltage enters the control board, it is applied to C1 and R1 which provide a slight delay in the input voltage, which is applied to the timing circuit composed of capacitor C2 and resistors R4, R3, R5, and external potentiometer 1R1. (Note that resistor R6 is not used in this application.)

(4) As the delayed ac voltage is applied across capacitor C2, the capacitor begins to charge at a rate depending upon the setting of potentiometer 1R1. The voltage across C2 also appears across rectifier CR1 and trigger diode CR2. When the trigger diode reaches the breakover voltage of 43 ±5 V, it conducts to complete the path across rectifier bridge CR1. This forms a closed loop circuit through capacitor C2, the primary of pulse transformer T1, and rectifier CR1, and current flows until capacitor C2 is discharged. The discharge time is very fast and a short duration pulse is generated, shaped by capacitor C3.

(5) The pulse current flowing through the primary of pulse transformer T1 induces a voltage across the appropriate secondary which is applied through diode CR3 or CR4 to the gates of SCR Q2 or Q1 respectively. When either SCR is triggered, it allows the rest of the ac half-wave to pass to external grid lamp transformer 1T1 through pin B. The SCR will continue to conduct until the ac half-wave reaches the zero crossing point, at which time it turns off.

b. Clutch Control.

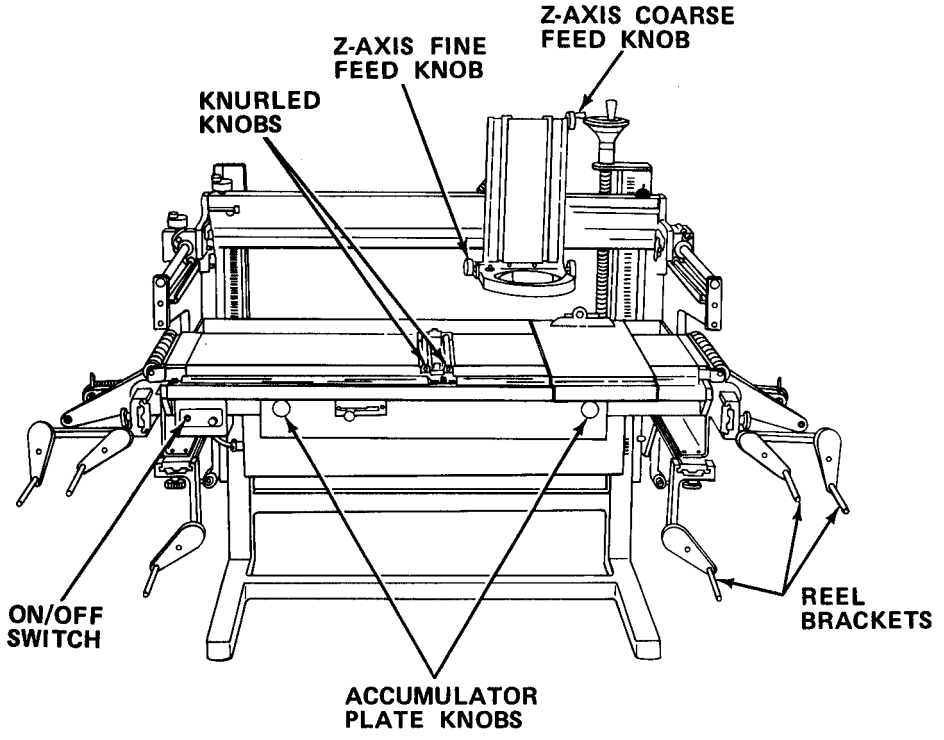
(1) X- and Y-axes manual motion controls are connected through electrically operated clutches to chain drives. Power to the clutches may be interrupted to decouple chain drives and permit rapid movement of the optical mount in the X- and Y-axes.



(2) Voltage, 120 V, 50/60 Hz, is stepped down to 12.6 V ac in the transformer, rectified in PCA A4 to 12 V dc. Current passes through the quick-disconnect and brushes to the quick-disconnect and clutch power switch. The momentary switch on the optical carriage is normally on except when depressed by the operator. Twelve volts dc passes through the brushes to the series-connected clutches. Note that the quick-disconnect separates the Y-axis clutch from the circuit.

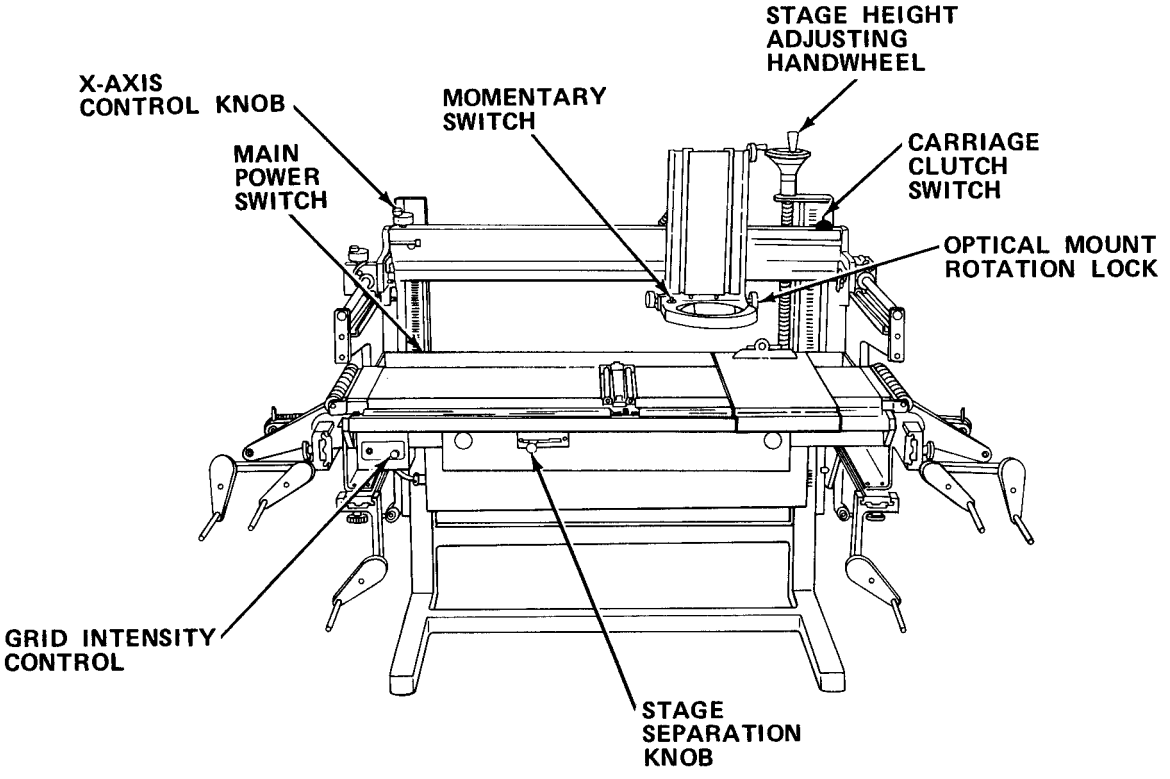
Section II OPERATING INSTRUCTIONS

4-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.



Control or Indicator	Function
Knurled Knobs	Retract masking assemblies.
Z-Axis Fine Feed Knob	Moves optical mount up or down for fine adjustment.
Z-Axis Coarse Feed Knob	Moves optical mount up or down. (Mount can be pulled up manually, but cannot be pushed down.)
Reel Brackets	Support film reels and manually transport film across view stages.

Control or Indicator	Function
Accumulator Plate Knobs	Secure accumulator plates. Releasing knobs permits access to accumulator rollers under viewing surface.
ON/OFF Switch	Controls power to fan, lights, and clutches.



X-Axis Control Knob	Moves optical mount to left or right when power is supplied to electrical clutches.
Carriage Clutch Switch	Provides power to electrical clutches.
Stage Height Adjusting Handwheel	Moves stage up or down for operator comfort.

Control or Indicator	Function
Optical Mount Rotation Lock	Locks inner ring to allow mounted optics to be rotated and locked.
Momentary Switch	Decouples electrical clutches and permits rapid movement of optical mount in X or Y direction.
Stage Separation Knob	Moves left view stage to permit access to center film rollers.
Grid Intensity Control	Increases or decreases light intensity for both right and left light grids.
Main Power Switch	Controls power to table.

4-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

4-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good worki ng condi tion by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform-specified service" tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equi pment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor,

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your “TM Number” Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

g. Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Item	Quantity
Cheesecloth (Item 6, Appendix E)	ar
Chamois (Item 3A, Appendix E)	1 ea
Lens Cleaning Liquid (Item 5, Appendix E)	ar

Table 4-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can safely be checked and serviced without disturbing operation. Made the complete checks and services when the equipment can be shut down.

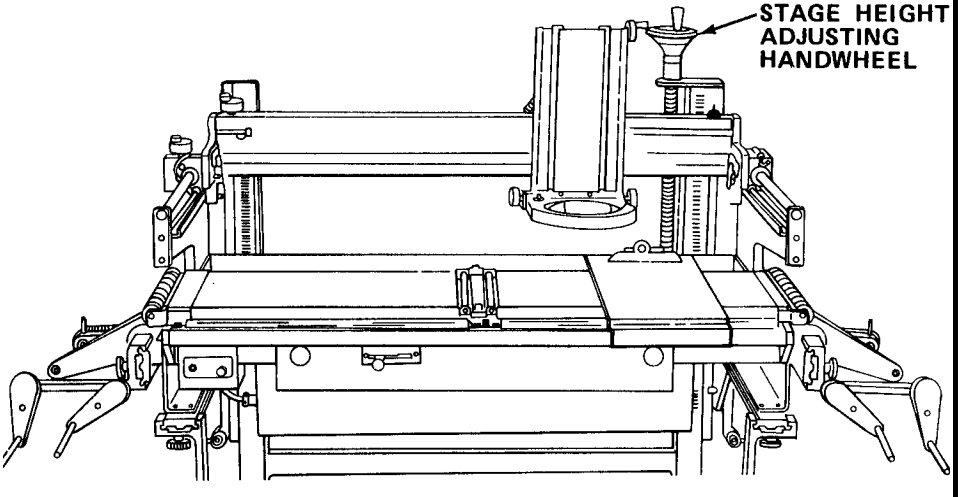
B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

ITEM NO,	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SPLIT-STAGE LIGHT TABLE	



WARNING

Unp lug power cord before servicing split-stage liqht table. Failure to do so may result in death or serious injury.

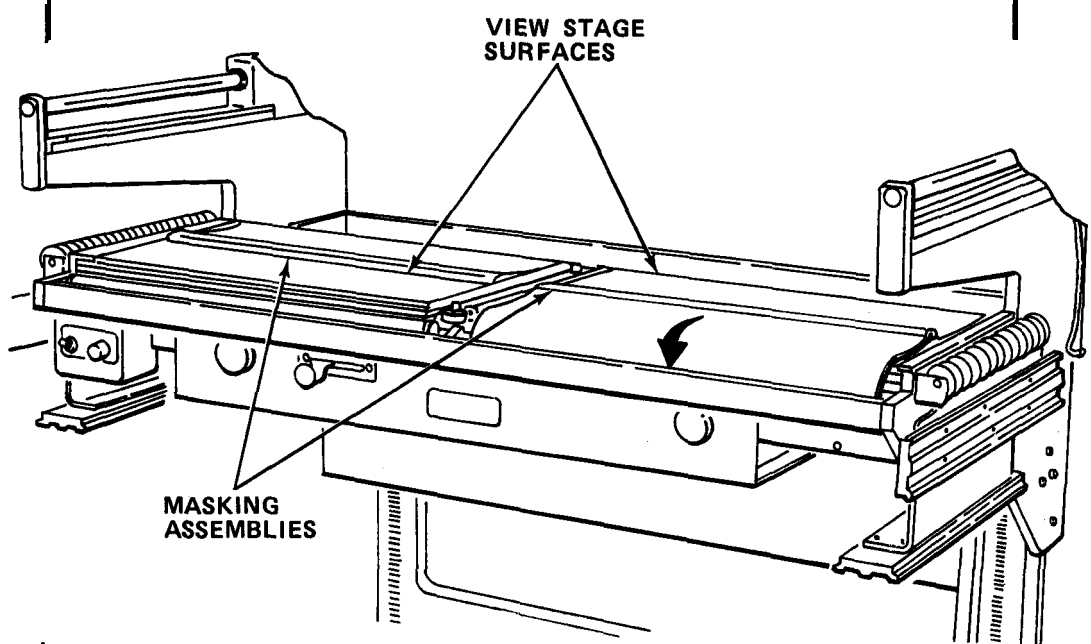
NOTE

The side braces must be removed before performing PMCS on split-stage light table (paragraph 4-6. 1).

Table 4-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M . Monthly Q - Quarterly | AN - Annually S - Semiannually BI . Biennially | (Number) . Hundreds of Hours

ITEM NC	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SPLIT-STAGE LIGHT TABLE - Cont	
1	B	Inspect Stage Height Adjusting Handwheel. Rotate left and right. Check for free movement of gear mechanism. Check that view stage height changes.	View stage binds.



2	B	Inspect Masking Assemblies. Retract four masking assemblies into wells by rotating knurled knobs. Check that knobs move freely and that assemblies are not torn.	

Table 4-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before, D - During, A - After | W - Weekly, M - Monthly, Q - Quarterly | AN - Annually, S - Semiannually, Bl - Biennially | (Number) - Hundreds of Hours

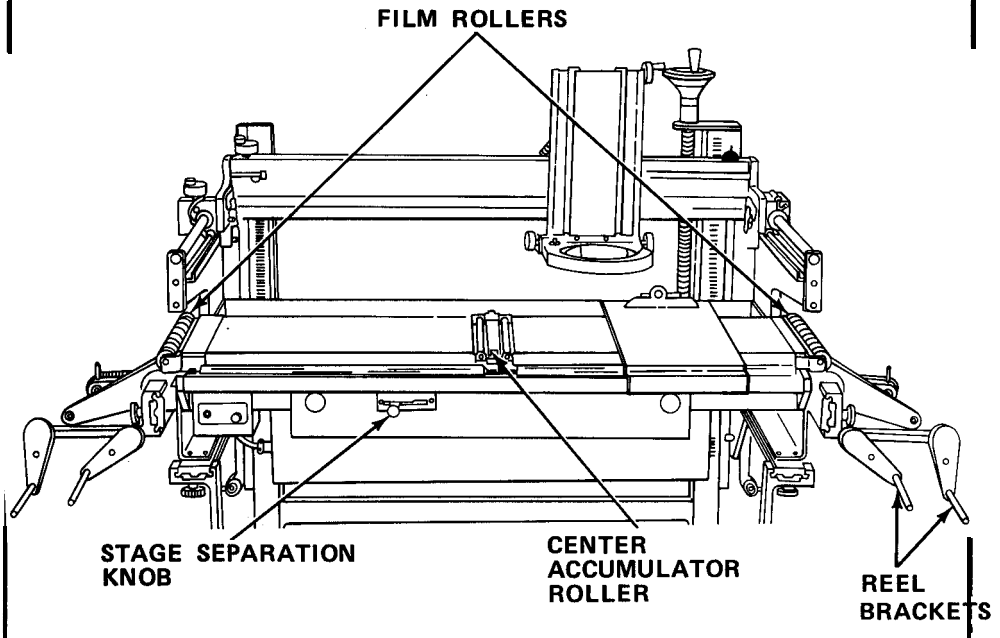
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED / PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SPLIT-STAGE LIGHT TABLE - Cont	
3	B	Inspect View Stage Surfaces.	
		1. Check view stage surfaces for dust or dirt. Clean with moistened cheesecloth. Dry with chamois.	
		2. Check view stage surfaces for cracks or scratches.	View stage is damaged.
			
4	B	Inspect Stage Separation Knob.	
		Move knob to right (notched position) and then to left. Check for freedom of movement.	Stages are frozen in place.
5	B	Inspect Film Rollers.	
		Inspect rollers for scratches and abrasions.	

Table 4-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS **AND SERVICES - Cont**

B - Before **W - Weekly** **AN - Annually** **(Number) - Hundreds of Hours**
D - During **M - Monthly** **S - Semiannually**
A - After **Q - Quarterly** **BI - Biennially**

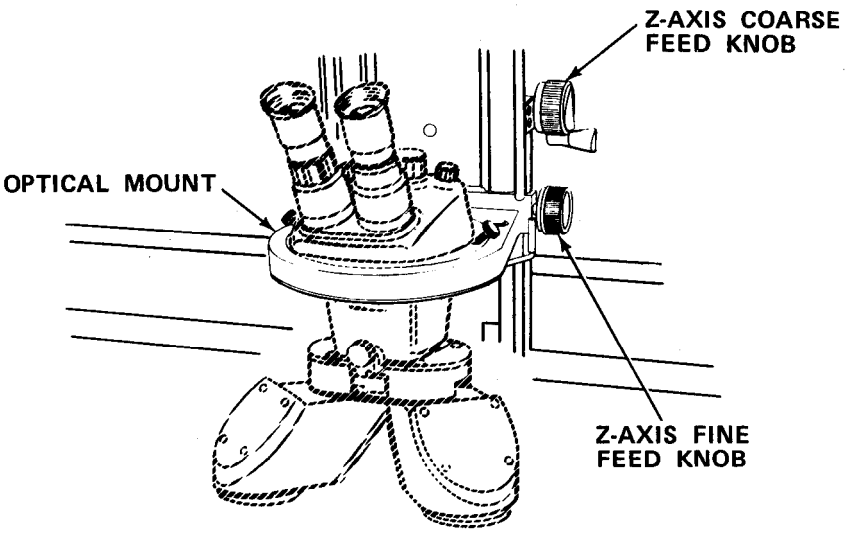
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED / PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SPLIT-STAGE LIGHT TABLE - **Cont**	
6	B	Inspect Reel Brackets.	
		Check for security of mounting, free movement of spinal" es, and slight end-play of reels.	Reel brackets are missing or broken.
			
		NOTE Make sure spring clips securing optical mount are disengaged.	
7	B	Inspect Optical Mount.	
		Check that optical mount can be moved left-right (X-axis), front-back (Y-axis), and up, but cannot be pushed down.	Optical mount binds or slips.

Table 4-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

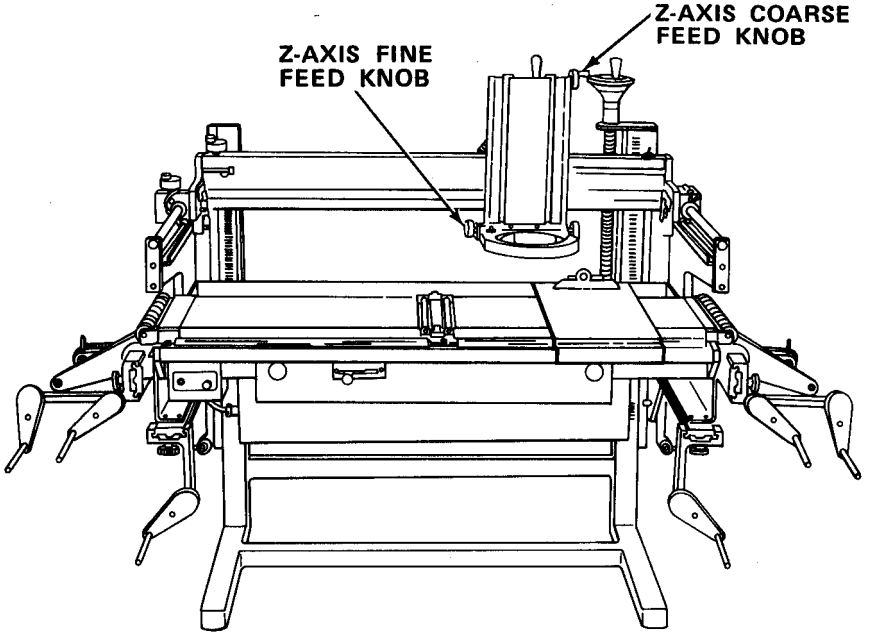
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available if:
		SPLIT-STAGE LIGHT TABLE - Cont	
8	B	Inspect Z-Axis Course Feed Knob and Z-Axis Fine Feed Knob.	
		Rotate both controls and check that optical mount moves up and down freely.	Z-axis binds.
			
		WARNING Do not use equipment with defective or worn wiring. Death or serious injury may result.	
9	B	Inspect Power Cord and Wiring.	
		Inspect for breaks, tears, frayed or broken connectors.	Wiring is defective or worn.

Table 4-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B . Before W - Weekly AN - Annually (Number) - Hundreds of Hours
D - During M - Monthly S - Semiannually
A - After Q - Quarterly BI - Biennially

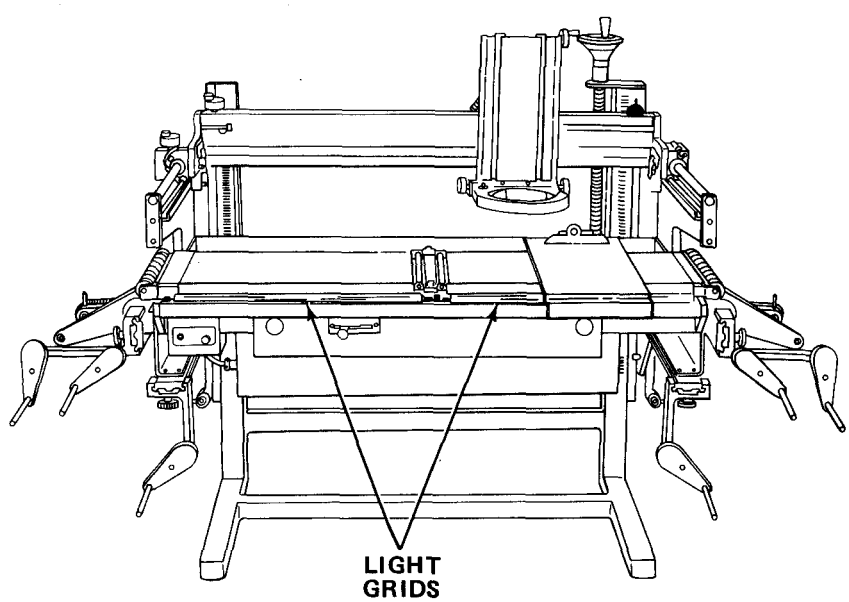
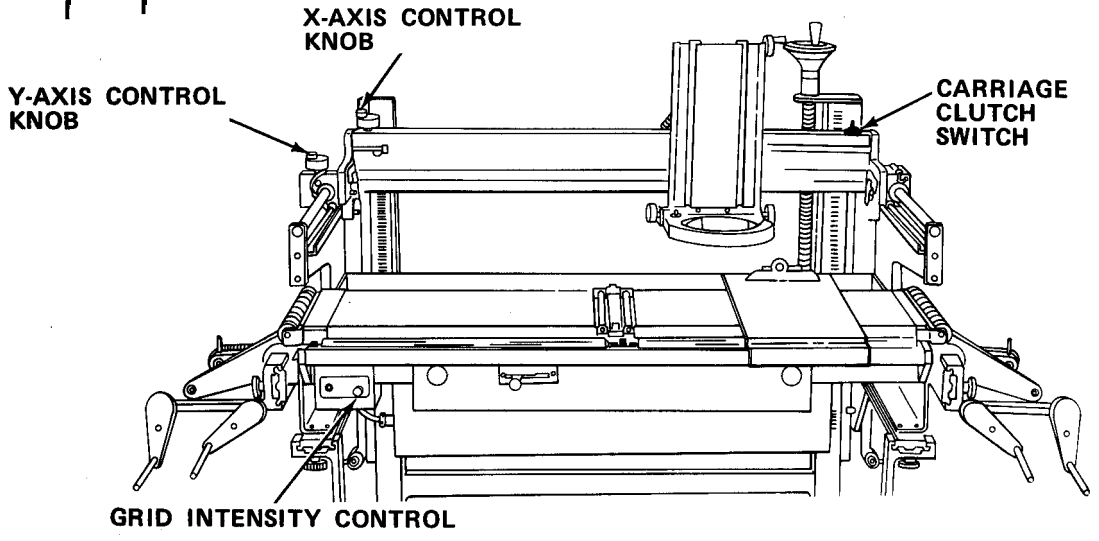
ITEM No.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SPLIT-STAGE LIGHT TABLE - Cont	
9	B	Inspect Power Cord and Wiring - Cont	
			
10	B	Inspect Light Grids.	
		Plug in power cord. Turn main power on. Set light grid ON/OFF switch to ON. Check that both light grids light.	One or both light grids do not light.

Table 4-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Number) . Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SPLIT-STAGE LIGHT TABLE - Cont	
10	B	Inspect Light Grids - Cont	



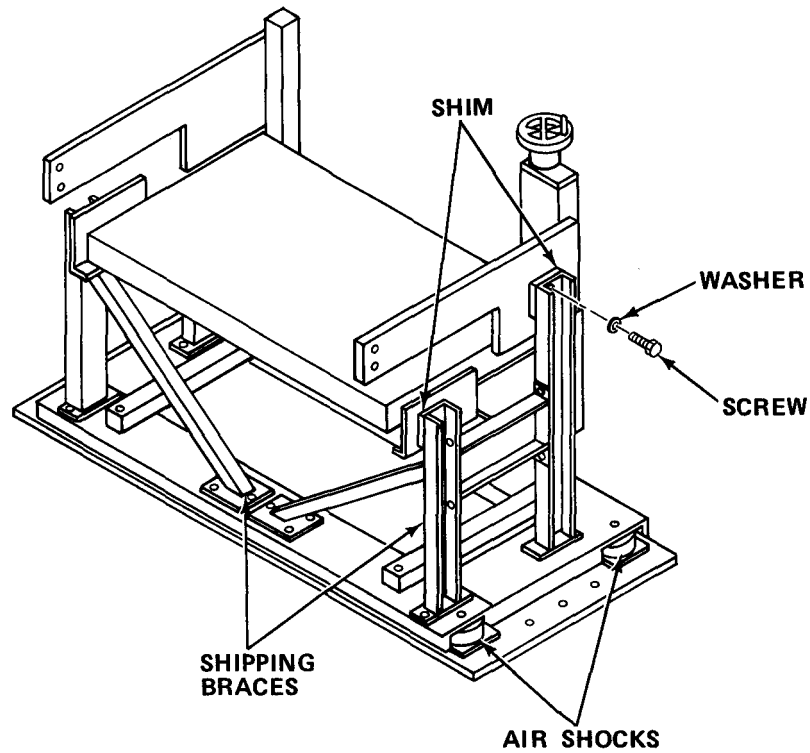
11	B	Inspect Grid Intensity Control. Turn control fully right. Check that light intensity of both grids increases and continues to increase until control reaches maximum. Turn control gradually left. Check for even decrease in intensity.	
12	B	Inspect Clutch Switch, X-Axis and Y-Axis Control Knobs. Check for tight connections at clutch switch connectors. Turn power on. Set carriage clutch switch to ON. Rotate X-Axis and Y-Axis control knobs. Check that optical mount moves left-right and front-back.	Clutch is inoperative. X- and Y-axis controls are inoperative.

4-6. OPERATION UNDER USUAL CONDITIONS.

4-6.1 Assembly and Preparation for Use.

NOTE

Do not remove side braces until there is a mission that requires the use of the lower reel brackets.



a. Remove side braces.

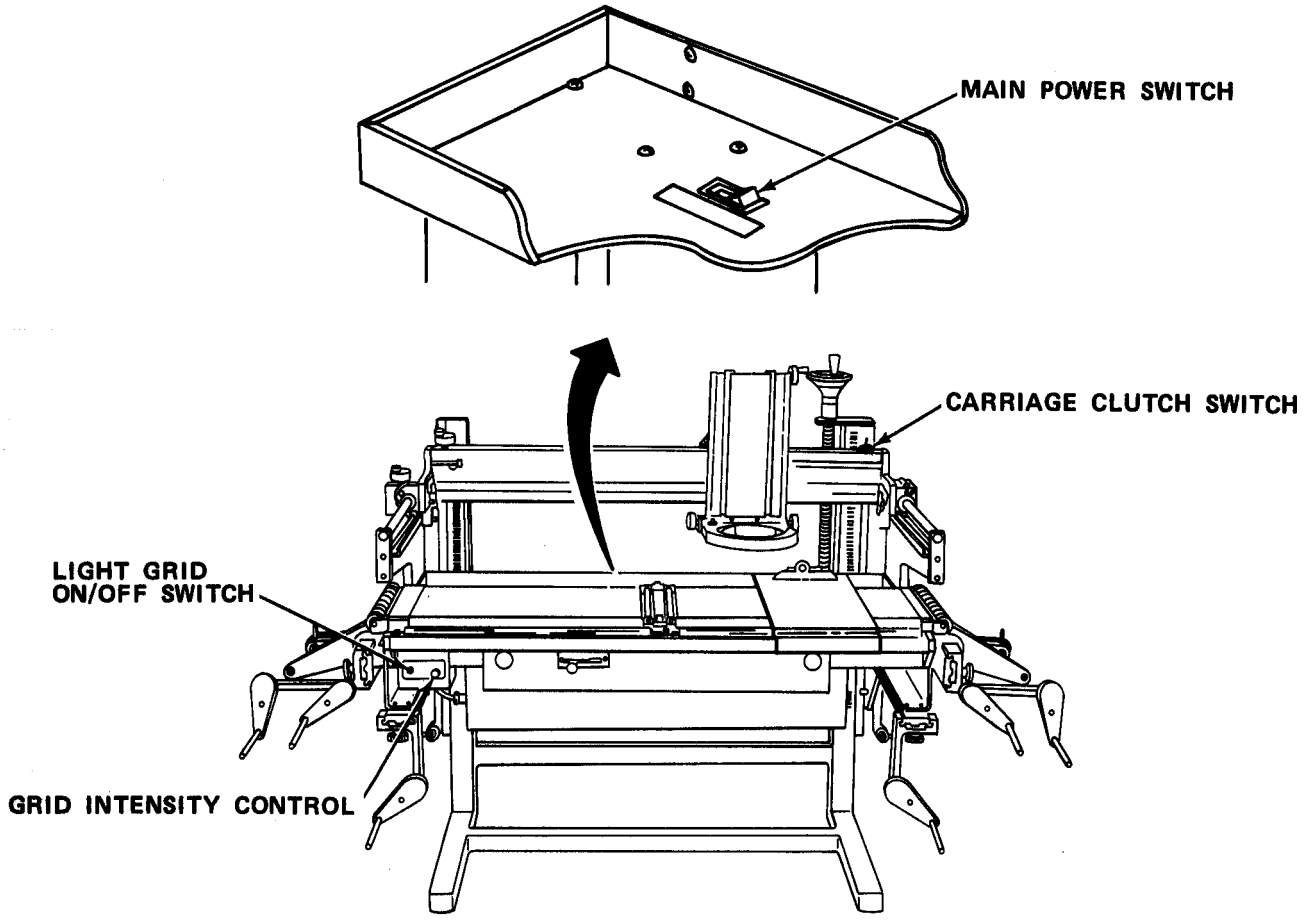
(1) Remove 22 capscrews and washers from sides and base of table.

(2) Remove shims.

(3) Save screws, washers, and shims for reuse.

(4) Slide braces out from underneath table.

b. Release air from air shocks.



c. Plug in power cord, and turn main power switch ON.

d. Set ON/OFF switch to ON and turn grid intensity control fully right.

e. Set carriage clutch switch to ON.

NOTE

Light grids require at least 15 minutes to warm up.

f. Place stereoscope in optical mount.

(1) Remove shipping bracket.

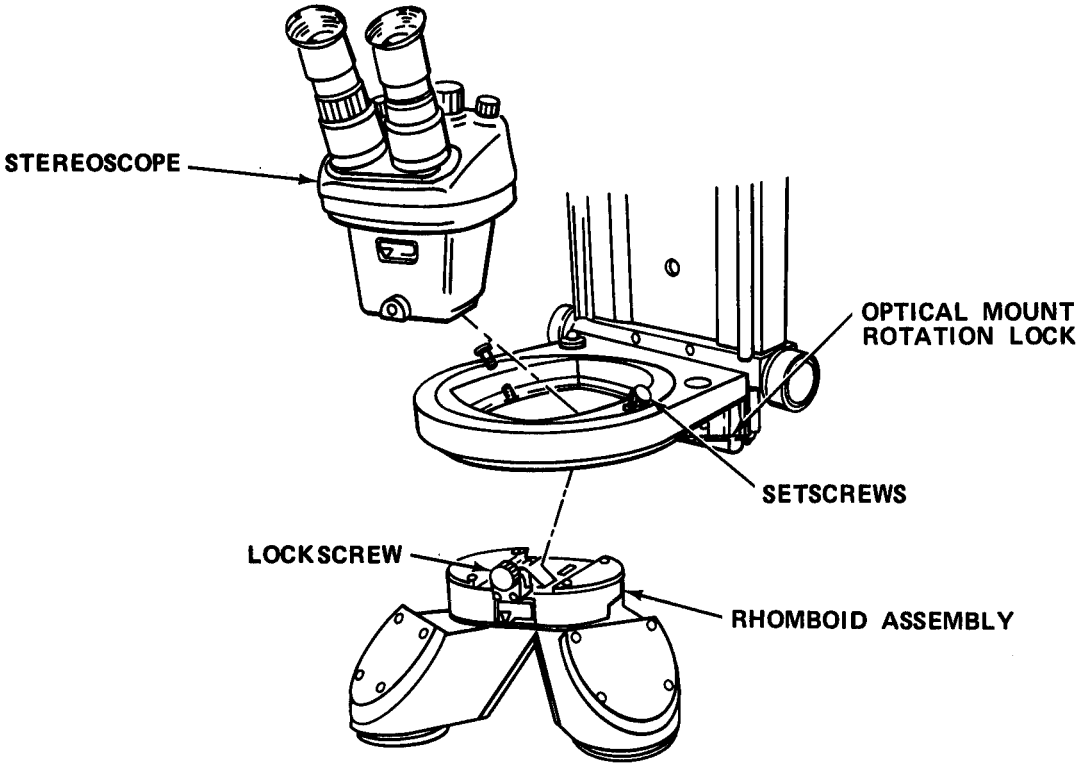
(2) Lift optical mount to at least midpoint of travel.

(3) Loosen two setscrews.

(4) Insert stereoscope and tighten two setscrews.

(5) Connect rhomboid assembly and tighten locking screw.

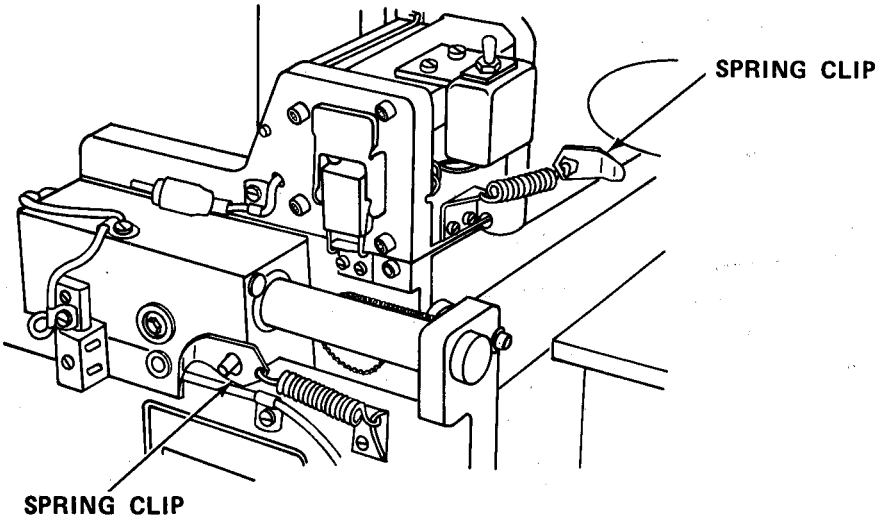
(6) Lock stereoscope in place with optical mount rotation lock.



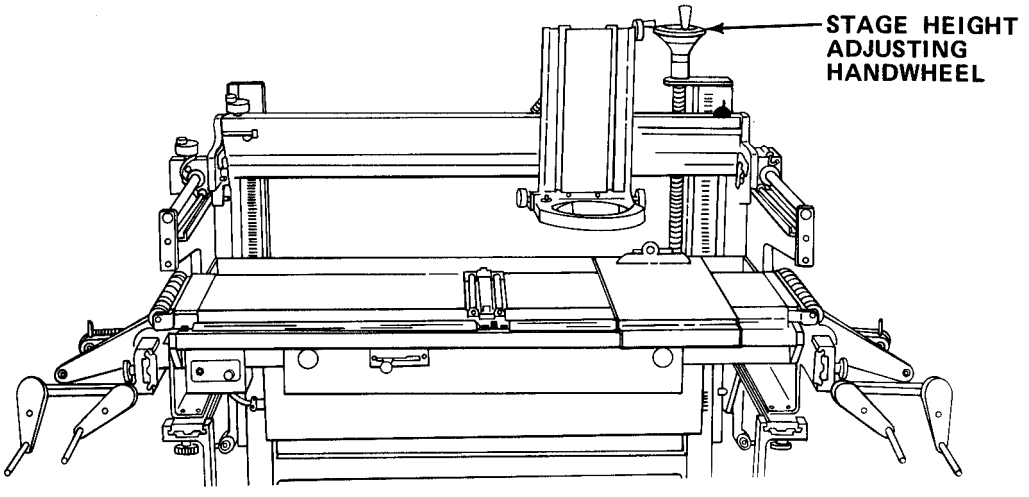
(7) Remove plastic dust protectors.

(8) Install eyepieces.

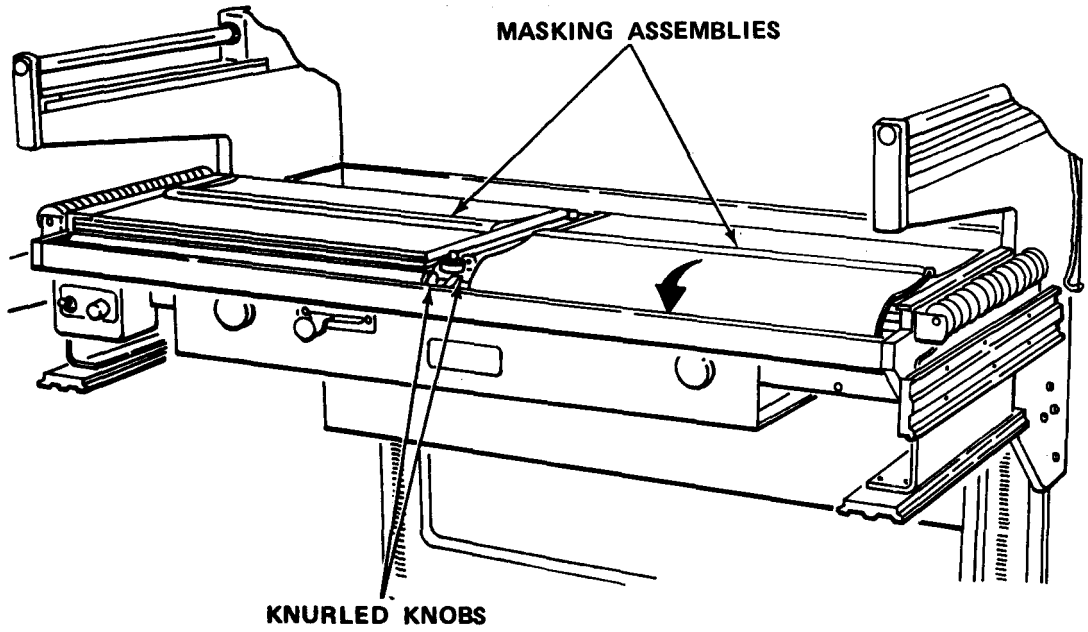
(9) Install eyeguards, if desired.



g. Free optical mount by moving spring clips.



h. Rotate stage height adjusting handwheel left or right to raise or lower view stage to be comfortable for the operator.

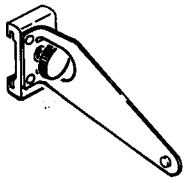


i. Rotate knurled knobs until masking assemblies are retracted into their wells.

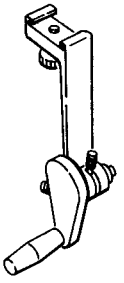
NOTE

This step is required if reel brackets have been removed for preventive maintenance, storage, or shipment.

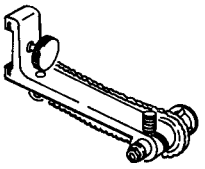
j. Mount reel brackets.



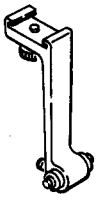
CENTER IDLER BRACKET



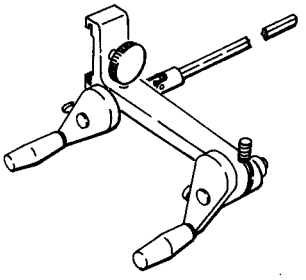
DRIVER BRACKET T-1-10



REAR BRACKET T-2-10-DC



IDLER REEL BRACKET T-1-10

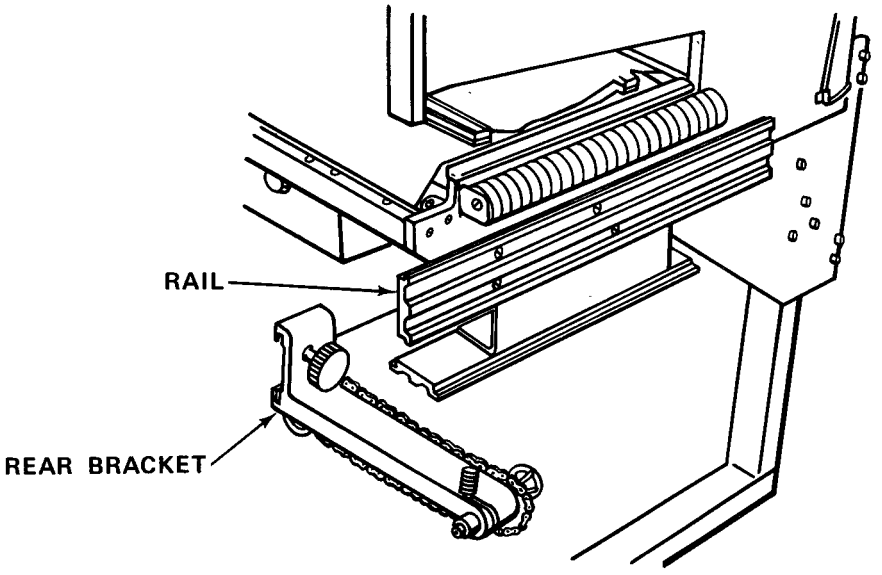


FRONT BRACKET T-2-10-DC

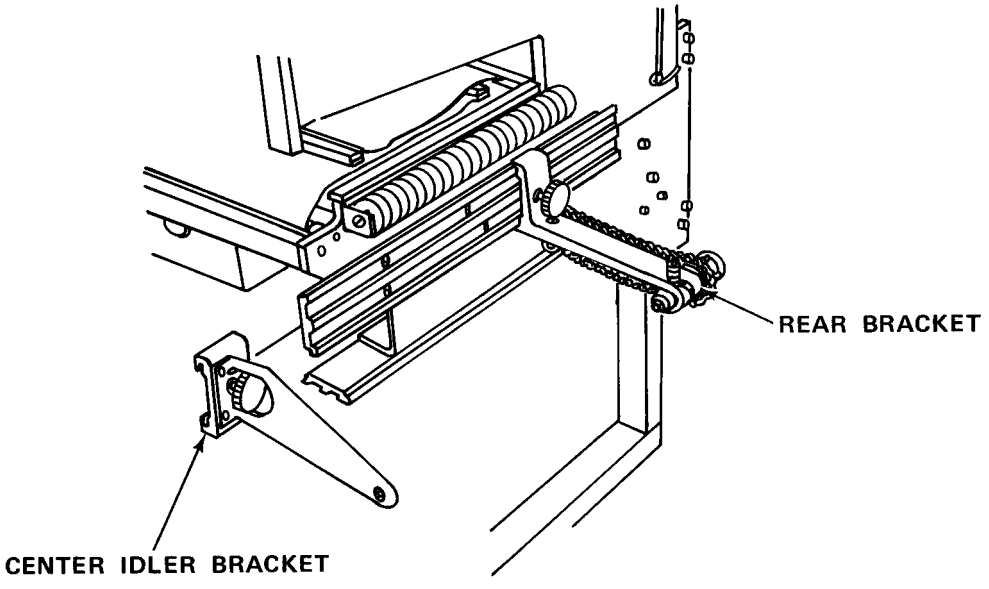
NOTE

T-2-10-DC brackets are used to transport dual film strands. T-1-10 brackets are used to transport single film strands and as take-up brackets for split vertical film.

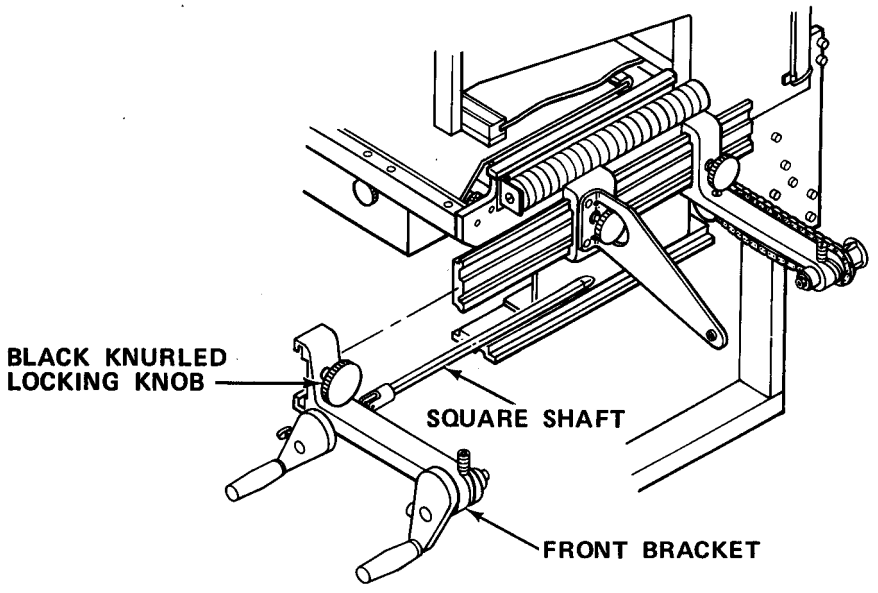
(1) Install T-2-10-DC brackets.



(a) Slide each rear reel bracket to rear of rail.



(b) Slide each center idler bracket into position on rail near center of rail. Aline bearings with spindle tip of each rear bracket.

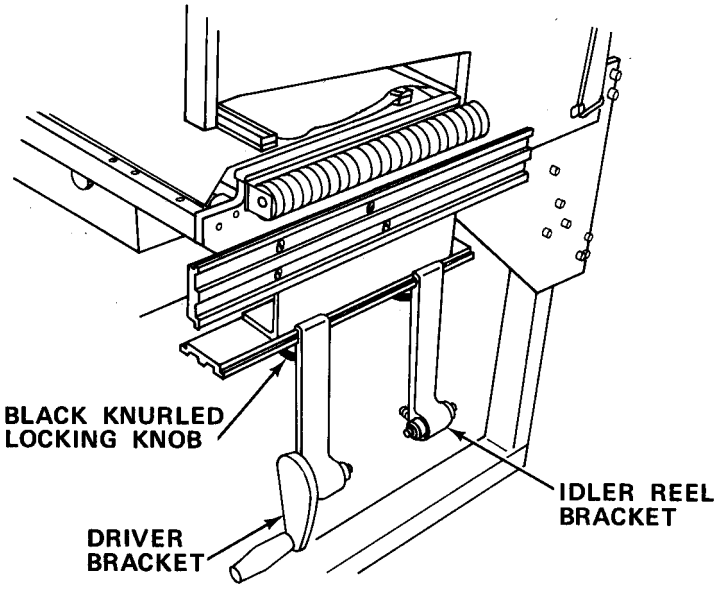


(c) Slide each front bracket on rail . Guide square shaft of bracket into hole in center sprocket of rear bracket.

(d) Aline front bracket base with front edge of rail.

(e) Turn black knurled locking knobs.

(2) Install T-1-10 brackets.

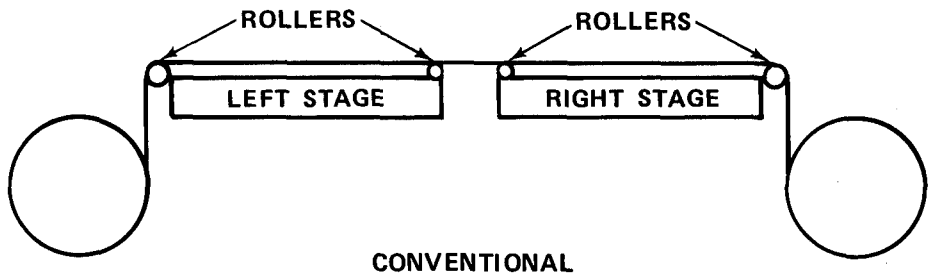


(a) Slide idler reel bracket to rear of lower rail. Spindle tip faces front.

(b) Slide driver bracket on lower rail, crank facing front. Aline front of bracket with front of rail.

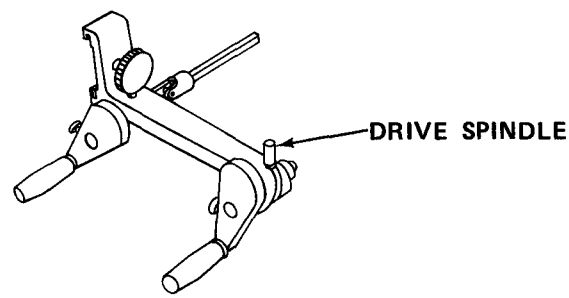
(c) Tighten black knurled locking knobs.

k. Thread film.



CONVENTIONAL

(1) Conventional threading.



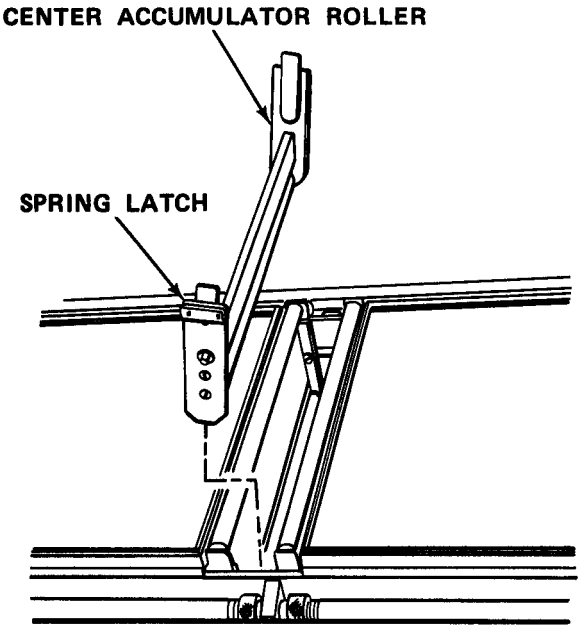
(a) Extend drive spindles on all drive reel brackets by turning grooved spindle-retracting knob to upper locked position.

(b) Insert film supply reel between front bracket and center idler bracket. Front bracket drive spindle engages key slot on reel.

(c) Loosen black knurled locking knob on center idler bracket. Move bracket toward film reel, and engage bearing on bracket with center hole in reel. Adjust position so that film reel is securely held and has very slight end-play.

(d) Tighten black knurled locking knob on center idler bracket.

(e) Install take-up reel at opposite end of table using same procedure.



(f) Remove center accumulator roller by pinching spring-loaded latches and lifting from between view stages.

(g) Move stage separation knob to right. Make sure that view stages close and knob locks into slot.

(h) Thread film leader over rollers across view stage to take-up reel.

(i) Adjust drag brake knobs on crank handles until film tension is suitable for operator's use.

NOTE

Perform steps (j) through (n) to view dual film strips.

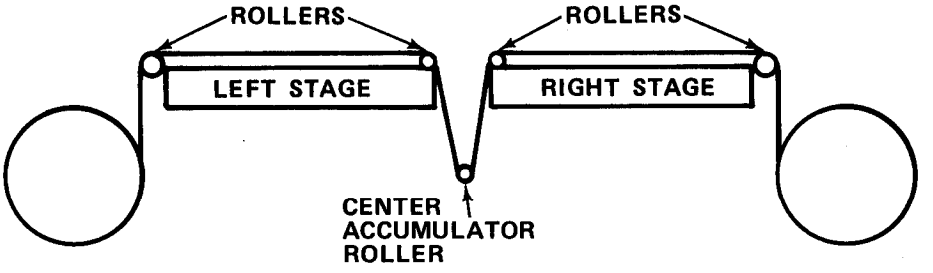
(j) Mount rear film SUPPLY reel on idler bracket. Reel key slot engages bearing on idler bracket.

(k) Slide rear driver bracket to front until drive spindle engages reel key slot.

(l) Tighten black knurled locking knob on driving bracket.

(m) Install take-up bracket at opposite end of split-stage light table.

(n) Thread rear film strand.



SHORT LOOP TAKE-UP

(2) Short loop take-up threading.

NOTE

After film is threaded conventionally, the following steps will provide a short loop take-up.

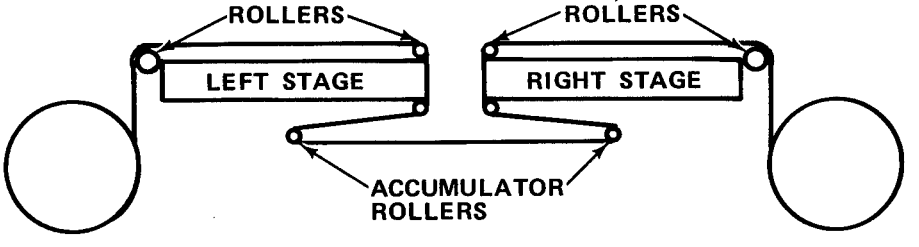
(a) Push stage separation knob down and to the left. Make sure that view stages separate.

(b) Loosen drag brake knobs on reel brackets.

(c) Start short film loop.

(d) Insert center accumulator roller over film between view stages. Pinch spring-loaded latches and latch into position.

(e) Adjust drag brake tension on reel brackets until film tension is suitable for operator's use.



LONG LOOP TAKE-UP

(3) Long loop take-up threading.

CAUTION

Do not close view stages when film is threaded in long loop position. Damage to film may result.

(a) Push stage separator knob down and to the left. Make sure that view stages separate.

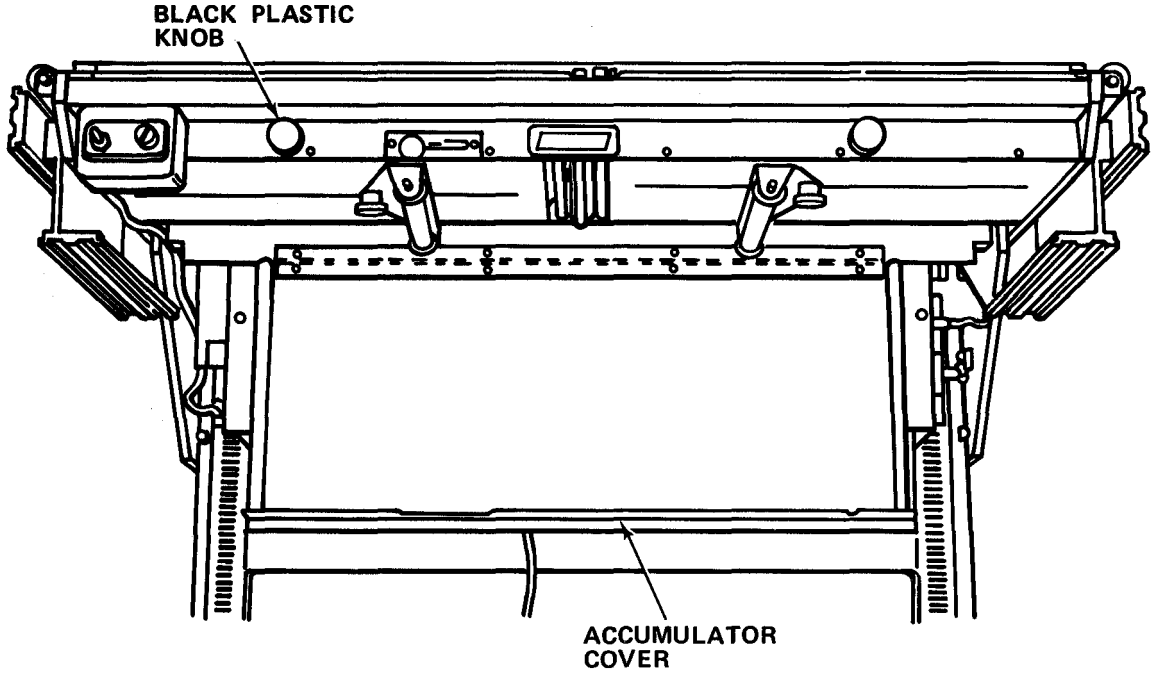
(b) Remove center accumulator roller by pinching spring loaded latches and lifting from between view stages.

(c) Insert film supply reel between front bracket and center idler bracket. Front bracket drive spindle engages key slot on reel.

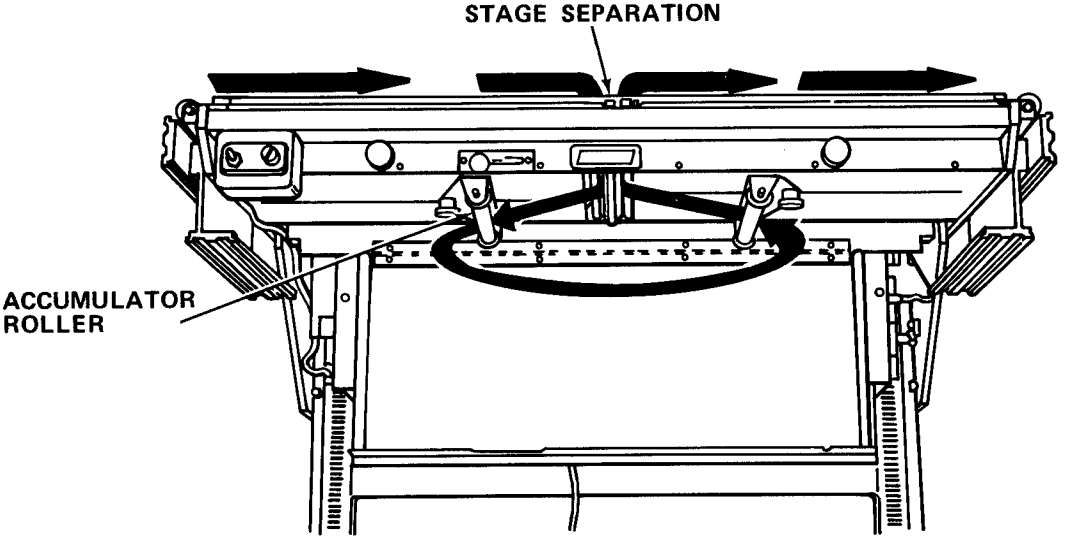
(d) Loosen black knurled locking knob on center idler bracket. Move bracket toward film reel, and engage bearing on bracket with center hole in reel. Adjust position so that film reel is securely held and has very slight end-play.

(e) Tighten black knurled locking knob on center idler bracket.

(f) Install take-up reel at opposite end of table using same procedure.



(g) Loosen black plastic knobs on film accumulator cover, and let cover drop down.



(h) Thread film across view stage, down through stage separator, and over accumulator roller.

CAUTION

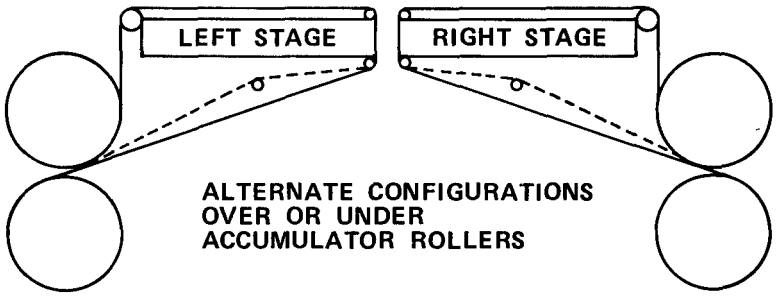
Do not catch film on any hardware while threading. Damage to film may result.

(i) Continue threading the film across to second accumulator roller. Thread film over roller, up through stage separation, and across second view stage to take-up reels.

(j) Loosen locking knobs, and adjust accumulator rollers for desired length of take-up loop. Tighten locking knobs.

(k) Adjust drag brake knobs on reel brackets until film tension is suitable for operator's use.

(l) Close film accumul ator cover, and secure by tightening knobs.



SPLIT VERTICAL TAKE-UP

(4) Split vertical take-up threading.

(a) Remove center idler brackets.

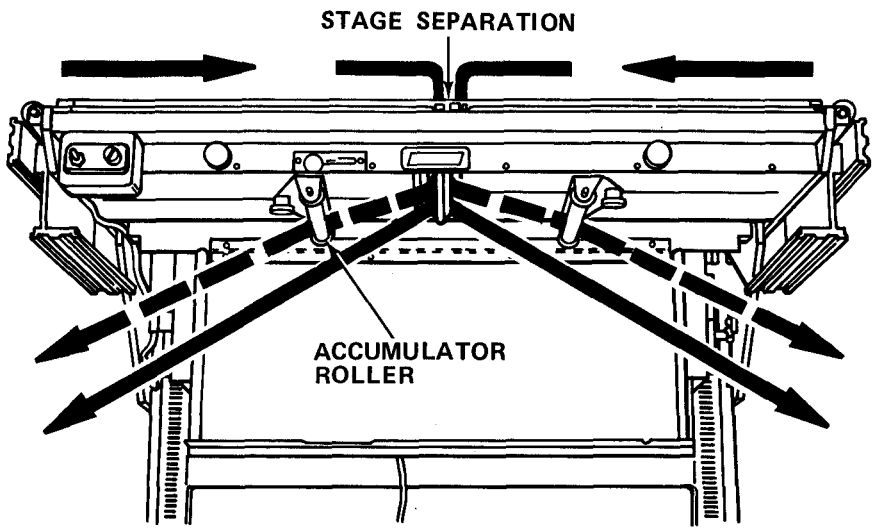
(b) Mount supply reels on top rails.

(c) Mount take-up reels on bottom rails.

(d) Push stage separation knob down and to the left. Make sure that view stages separate.

(e) Remove center accumulator roller by pinching spring-loaded latches and lifting from between view stages.

(f) Loosen black plastic knobs on film accumulator cover. Let cover drop down.



(g) Thread film leader from supply reel, across view stage, down through stage separation, over accumulator roller, and directly to take-up reel.

(h) Adjust drag knobs on reel brackets until film tension is suitable for operator's use.

(i) Move rollers to far left and right travel positions, and tighten locking knobs.

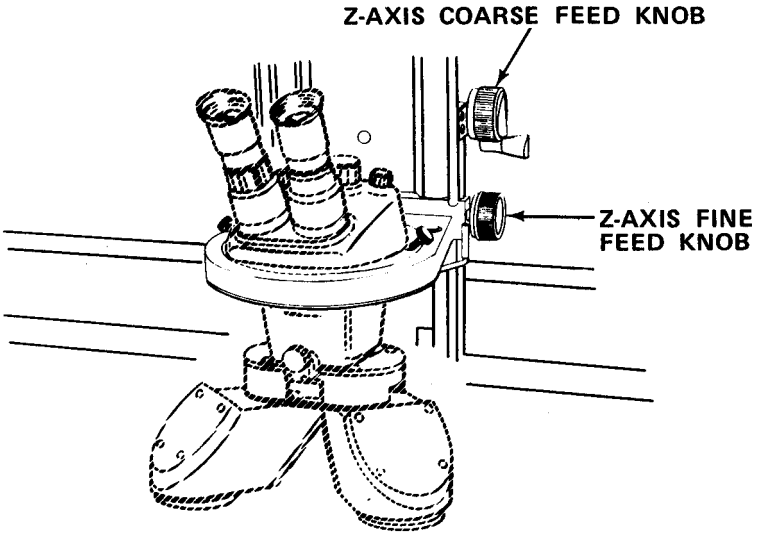
CAUTION

Do not close stage separation. Damage to film may result.

1. Install clipboard over viewing surfaces, if desired.

4-6.2 Operating Procedures.

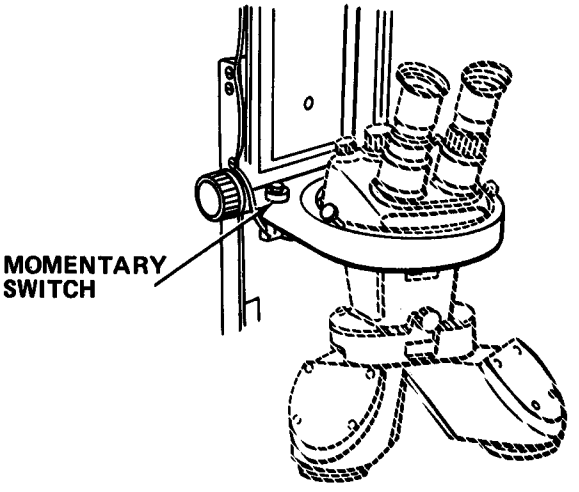
a. Adjust light grid intensity to comfortable illumination level.



b. Position optics at approximate viewing level:

(1) Rotate Z-axis coarse feed knob to left or right.

(2) Rotate Z-axis fine feed knob to obtain operating position.



c. Position optics to approximate horizontal position:

(1) Press momentary switch and hold.

(2) Move mount left, right, forward, or back while switch is pressed.

(3) Use X-axis control knob for fine positioning in left-right direction.

(4) Use Y-axis control knob for fine positioning in front-back direction.

d. Shut down light table.

(1) Rewind film on reel.

(2) Remove film reels.

(3) Set ON/OFF switch to OFF.

(4) Set carriage clutch switch to OFF.

(5) Set main power switch to OFF.

(6) Cover view stages with masking assemblies.

(7) Unplug power cord.

CAUTION

Do not touch optical surfaces with bare fingers. Fingerprints will hinder equipment performance.

(8) Move optical mount to far right rear position.

(9) Secure optical mount with spring clips.

(10) Remove and store optics.

(11) Remove and store reel brackets.

(12) Remove and store clipboard.

(13) Lower optical mount. Install shipping bracket.

(14) Cover with dust cover.

4-6.3 Preparation for Movement.

a. Perform all shutdown light table steps (paragraph 4-6.2d), except covering with dust cover.

b. Reinstall all mounting (red-painted) brackets and tighten bolts.

c. Cover light table with dust cover.

4-7. OPERATION UNDER UNUSUAL CONDITIONS. Operation of the split-stage light table is limited to conditions that will not damage aerial roll film or stereoscopes.

Section III OPERATOR MAINTENANCE

4-8. LUBRICATION INSTRUCTIONS.

CAUTION

Unnecessary or improper attempts to lubricate the split-stage light table will damage film, bearings, or internal components.

No lubrication is authorized at the operator's level. Maintenance procedures at organizational and direct support levels require limited lubrication of chains and precision bearings when there is a reason to perform corrective action requiring the removal of components.

4-9. TROUBLESHOOTING PROCEDURES.

a. The table lists the common malfunctions which you may find during operation or maintenance of the split-stage light table, or its components. You should perform the test/inspections and corrective actions in the order listed.

b. This manual cannot list all the possible malfunctions that may occur, nor all test/inspections and corrective actions. If a malfunction is not listed or is not corrected by a listed corrective action, notify your supervisor.

Table 4-2. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. FAN DOES NOT RUN. LIGHT GRIDS DO NOT WORK. CARRIAGE CLUTCHES DO NOT WORK.
Step 1. Check that power cord is plugged in.
(a) If plugged in, proceed to step 2.
(b) Plug power cord in correctly.
Step 2. Check circuit breakers.
(a) If circuit breakers are on, refer to organizational maintenance.
(b) Reset circuit breakers.

Table 4-2. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
2. CLUTCHES DO NOT OPERATE. GRID LIGHTS OPERATE. Step 1. Check if carriage clutch switch is off. (a) If on, proceed to step 2. (b) Turn on switch. Step 2. Check if fuses are damaged or blown. Replace defective fuses (paragraph 4-10.1).
3. OPTICAL RESOLVING POWER IS LIMITED. FILM IMAGE IS DISTORTED WHEN CARRIAGE POSITION IS MOVED. Replace stereoscope with different stereoscope. (a) If distortion is eliminated, evacuate defective stereoscope through normal maintenance channels. (b) Collimate light table (paragraph 4-20.12) .

4-10. MAINTENANCE PROCEDURES.

This section contains instructions covering operator maintenance functions for the split-stage light table. Personnel required are listed only if the task requires more than one.

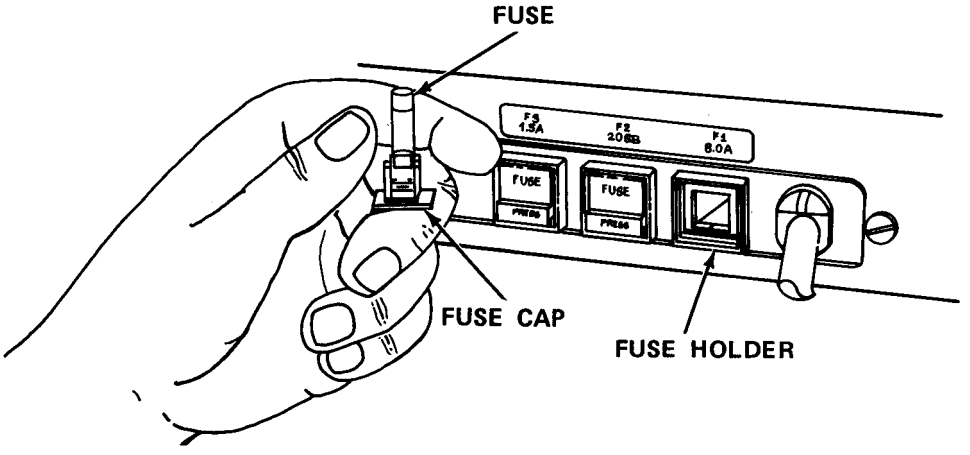
b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

4-10.1 Replace Fuse(s).

MOS: 81C, Cartographer

SUPPLIES: Fuse (8 amp)
Fuse (1.5 amp)
Fuse (2 amp, Slo-Blo)



WARNING

To prevent death or serious injury from electrical shock, unplug power cord before servicing equipment.

a. Turn power off and unplug power cord.

b. Press on fuse holder bottom to release fuse cap.

c. Inspect fuse for burned/broken element.

d. Discard defective fuse.

CAUTION

- New fuse must be of equal value to fuse removed.
- If new fuse burns out immediately, do not operate equipment until electrical fault is isolated and repaired, or serious equipment damage will occur.

e. Install new fuse of equal value and configuration.

f. Push fuse holder with new fuse into receptacle until fuse holder latches.

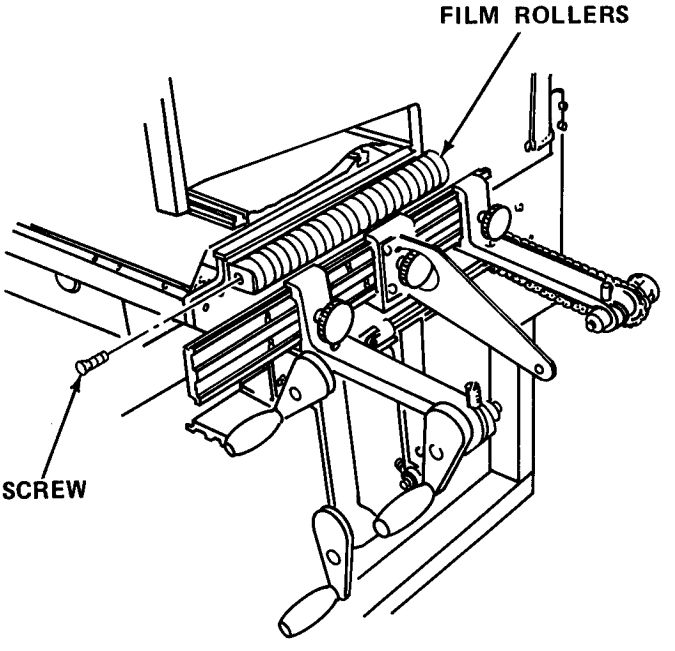
g. Plug in power cord and turn power on.

4-10.2 Replace Film Rollers.

MOS: 81C, Cartographer

TOOLS : 9/64 in. Flat Tip Screwdriver

SUPPLIES: Film Rollers



a. Remove screw from end of film roller assembly.

b. Slide defective rollers off assembly.

c. Install new film rollers on assembly.

d. Reinstall assembly and secure with screw.

Section IV ORGANIZATIONAL MAINTENANCE

4-11. LUBRICATION INSTRUCTIONS. This equipment requires no lubrication at the organizational level.

4-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

4-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4-12.2 Special Tools; Test, Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools List and Appendix B of this manual.

4-12.3 Repair Parts. Repair parts are listed in Repair Parts and Special Tools List, TM 5-6675-316-24P covering organizational maintenance for this equipment.

4-13. SERVICE UPON RECEIPT.

4-13.1 Checking Unpacked Equipment.

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

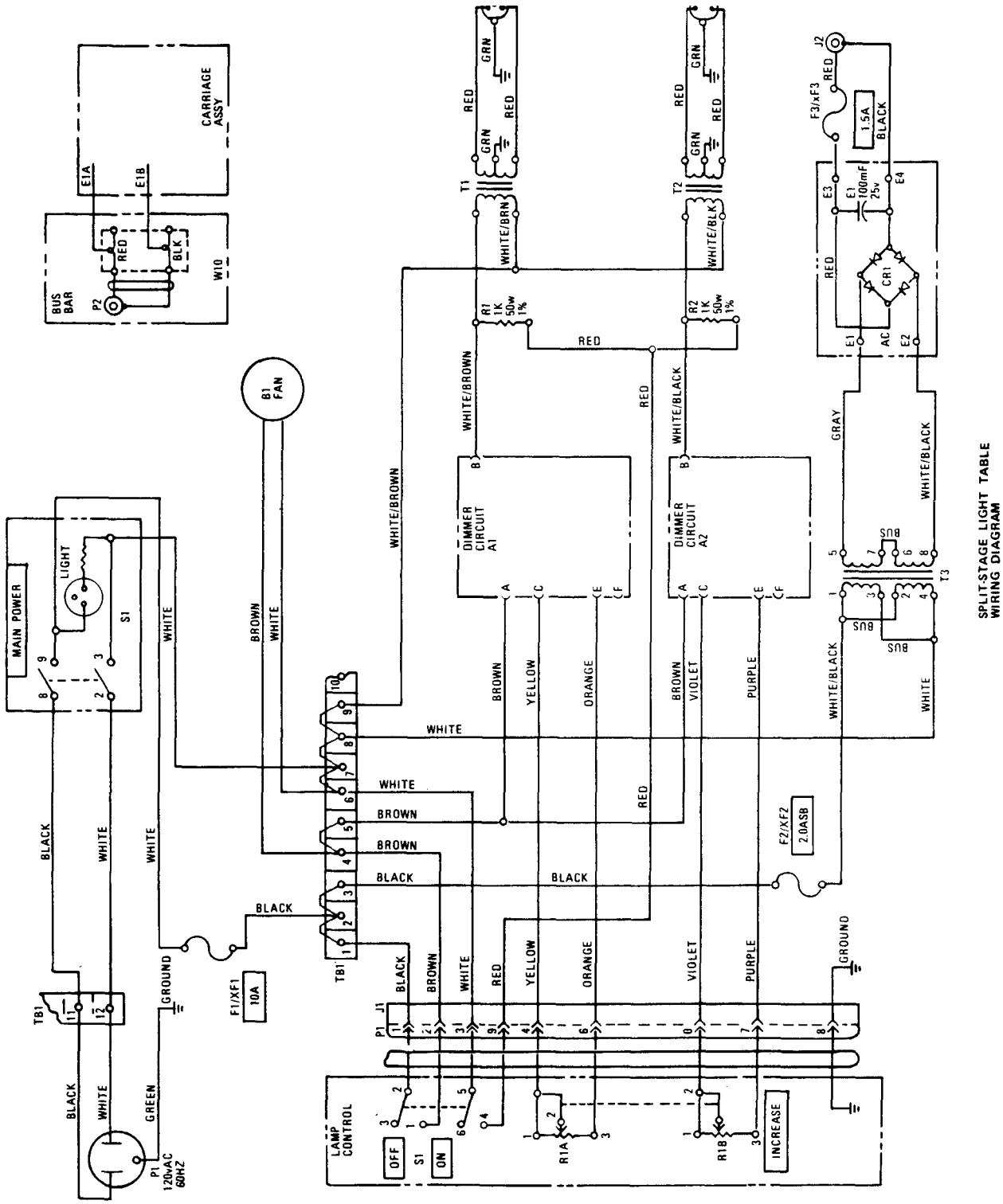
4-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

4-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES.

Organizational troubleshooting procedures cover the most common malfunctions that may be repaired at the organizational level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used by the operator should be conducted in addition to the organizational troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/inspection and corrective action. If a malfunction is not listed or is not corrected by a listed corrective action, notify your supervisor.

c. For unidentified malfunctions, use the facing schematic or the foldout located at the end of this manual for further fault analysis.



SPLIT-STAGE LIGHT TABLE WIRING DIAGRAM

d. If the split-stage light table does not power up when turned on, verify that 120 V ac is present at the receptacle. If voltage is not present, plug equipment into receptacle with power available and proceed with equipment troubleshooting. Perform no-power procedure for dead receptacle (Table 1-4).

Table 4-3. ORGANIZATIONAL TROUBLESHOOTING

MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. LIGHT GRID, FAN MOTOR, AND CARRIAGE CLUTCH SWITCHES ARE INOPERATIVE.

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing the split-stage light table.

Step 1. Remove two quick-disconnect screws and remove cover from power panel.

Step 2. Perform continuity check for ON/OFF switch at terminal board.

If no continuity is present, replace ON/OFF switch (paragraph 4-16.1).

2. LIGHT GRID INTENSITY WILL NOT CHANGE.

Perform continuity check for potentiometer.

(a) If no continuity is present, replace potentiometer (paragraph 4-16.2).

(b) Notify direct support maintenance for reversal of dimmer card connector or replacement of dimmer circuit card.

3. ONLY ONE LIGHT GRID LIGHTS.

Inspect connections to light grid.

(a) Tighten loose connections.

(b) Notify direct support maintenance for replacement of dimmer circuit card.

4. FAN MOTOR WILL NOT RUN. LIGHT GRIDS AND CLUTCHES WORK.

Notify direct support maintenance for replacement of fan.

Table 4-3. ORGANIZATIONAL TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
5. FAN OPERATES. CLUTCHES DO NOT OPERATE. Perform continuity check for carriage clutch switch.	If no continuity is present, notify direct support maintenance for replacement of carriage clutch switch.
6. CLUTCHES DO NOT OPERATE. LIGHT GRID OPERATES. Step 1. Set carriage clutch switch to OFF. Step 2. Perform continuity check for carriage assembly.	If no continuity is present, notify direct support maintenance for replacement of carriage clutch switch.
Step 3. Perform continuity check for X-axis brushes.	If no continuity is present, replace brushes (paragraph 4-16.4).
7. x-, Y-, OR Z-AXIS CHAINS JUMP SPROCKETS. Inspect for slack in chain.	Notify direct support maintenance for tightening of chain.
8. X-, Y-, OR Z-AXIS CONTROLS ARE SLUGGISH. Step 1. Inspect chain for too much tension.	Notify direct support maintenance for loosening of chain.
Step 2. Inspect chains for dirt.	Notify direct support maintenance for servicing of chain.
Step 3. Inspect worm gears and bearings.	Notify direct support maintenance for servicing of worm gears and bearings.

4-16. MAINTENANCE PROCEDURES.

a. This section contains instructions covering organizational maintenance functions for the split-stage light table. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

4-16.1 Replace ON/OFF Switch.

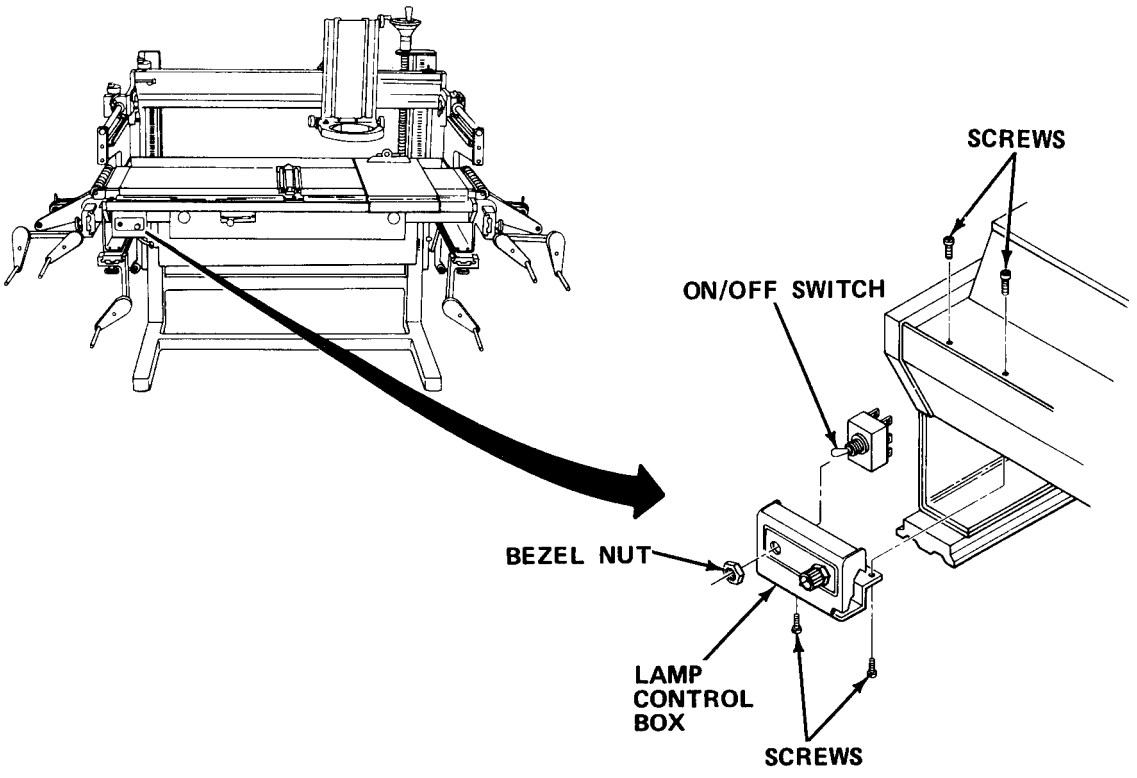
MOS: 41 B, Topographic Instrument Repair Specialist

TOOLS: 7/64 in. Hex Head Key Wrench
7/1 6 in. Open End Wrench
Soldering Gun

SUPPLIES: Toggle Switch
Solder (Item 23, Appendix E)

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.



a. Turn power off and unplug power cord.

b. Remove screws and move cover to expose rear of lamp control box.

c. Remove bezel nut. Withdraw ON/OFF switch from back.

NOTE

Wiring is connected to cover and switches.

d. Tag and desolder wires from ON/OFF switch.

e. Solder wires to new ON/OFF switch.

f. Install new ON/OFF switch and secure with bezel nut.

NOTE

Be certain wires are not loose, crossed, or disconnected before securing cover. Green (ground) wire is connected to cover screw.

g. Reinstall cover and secure with socket head screws.

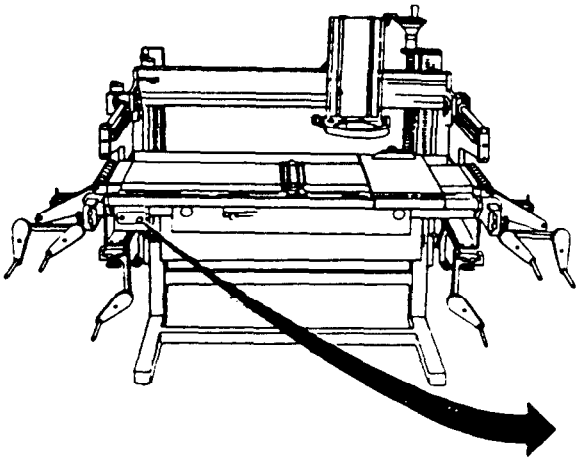
h. Plug in power cord and turn power on.

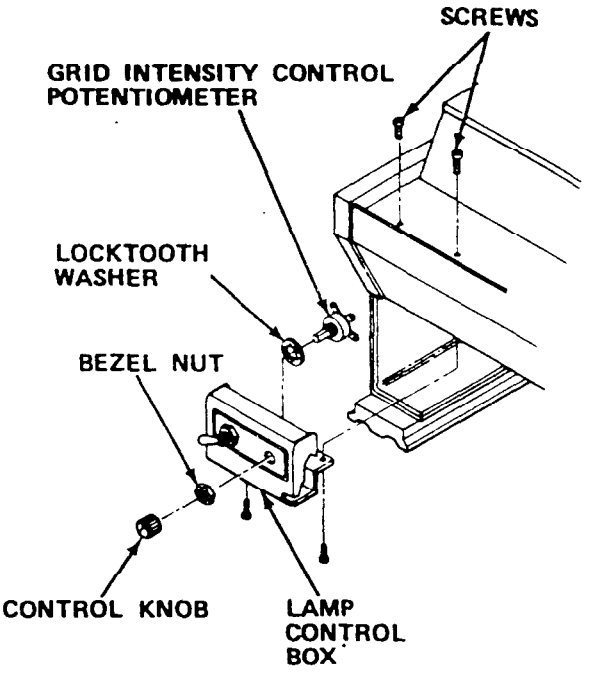
4-16.2 Replace Grid Intensity Control Potentiometer.

MOS: 41 B, Topographic Instrument Repair Specialist

TOOLS: 7/64 in. Hex Head Key Wrench
1/2 in. Hex Head Key Wrench
1/2 in. Open End Wrench
Soldering Gun

SUPPLIES: Potentiometer
Solder (Item 23, Appendix E)





WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

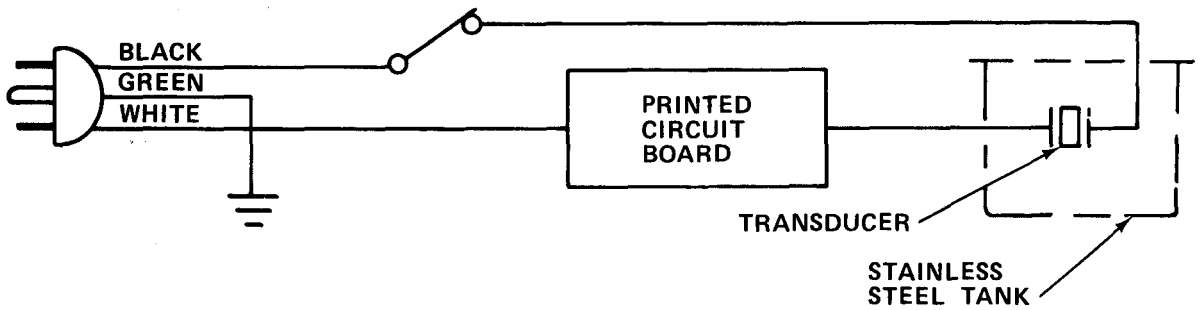
a. Turn power off, and unplug power cord.

b. Remove screws and move cover to expose rear of lamp control box,

c. Loosen socket head screws and remove control knob.

b. This manual cannot list all the possible malfunctions or every possible test/ inspection and corrective action. If a malfunction is not listed or corrected by a listed corrective action, notify your supervisor.

For unidentified malfunctions, use the following schematic or the foldout located at the end of this manual for further fault analysis.



d. If the ultrasonic cleaner does not power up when turned on, verify that 120 V ac is present at the receptacle. If voltage is not present, plug equipment into receptacle with power available and proceed with equipment troubleshooting. Perform no-power procedure for dead receptacle (Table 1-4).

Table 10-2. ORGANIZATIONAL TROUBLESHOOTING

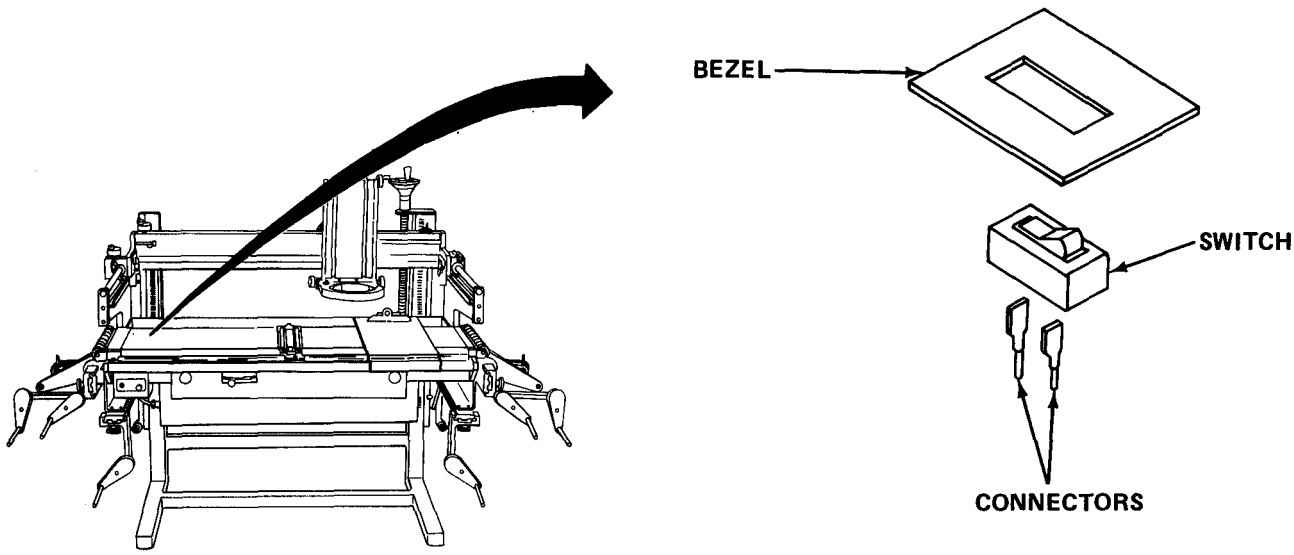
MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. NO CLEANING ACTION, WATER AGITATES. Check cleaning action using fresh cleaning solution. (a) If test was satisfactory, instruct operator to change cleaning solution when dirty. (b) If test was not satisfactory, replace circuit board (paragraph 10-16.3
2. NO WATER AGITATION. Step 1. Using multimeter, check for continuity of power cord. (a) If continuity exists, proceed to step 2. (b) If continuity does not exist, replace power cord (paragraph 10-16.1).

4-16.3 Replace Main Power Switch.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: 9/64 in. Flat Tip Screwdriver

SUPPLIES: Power Switch



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

a. Turn power off and unplug power cord.

b. Loosen quick-disconnect screws and remove front cover.

c. Release switch from bezel retaining clip.

d. Tag and disconnect wires from switch.

e. Connect wires to new switch.

f. Insert switch into bezel retaining clip.

g. Reinstall front cover, and secure with quick disconnect screws.

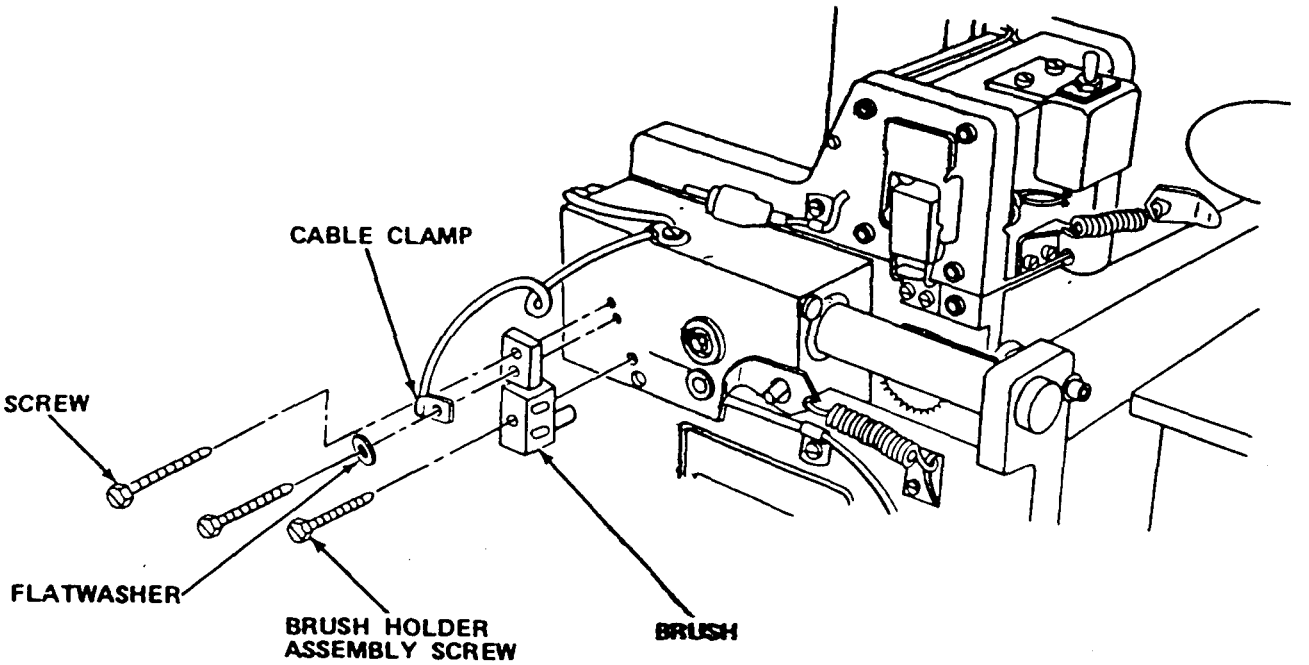
h. Plug in power cord and turn power on.

4-16.4 Replace Brush.

MOS: 41 B, Topographic Instrument Repair Specialist

TOOLS: 0.070 Jewelers Screwdriver
9/64 in. Flat Tip Screwdriver
5/1 6 in. Combination Wrench
Soldering Gun

SUPPLIES: Brush
Solder (Item 23, Appendix E)



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

NOTE

Two brush holder assemblies are used (X- and Y-axes). Procedure for replacement of either X- or Y-axis brush is same.

a. Turn power off and unplug power cord.

b. Remove screw and flat washer from cable clamp adjacent to brush. Remove cable clamp.

c. Remove screw, and lift brush holder assembly from contact strips.

d. Carefully note parts' relationship and disassemble brush holder.

e. Desolder electrical connections to brush.

f. Solder new brush to electrical connections.

g. Reassemble brush holder.

h. Aline brush holder hole with mounting hole and secure with screw,

i. Reinstall cable clamp and flat washer and secure with screw.

j. Plug in power cord and turn power on.

4-16.5 Remove/Install Split-Stage Light Table.

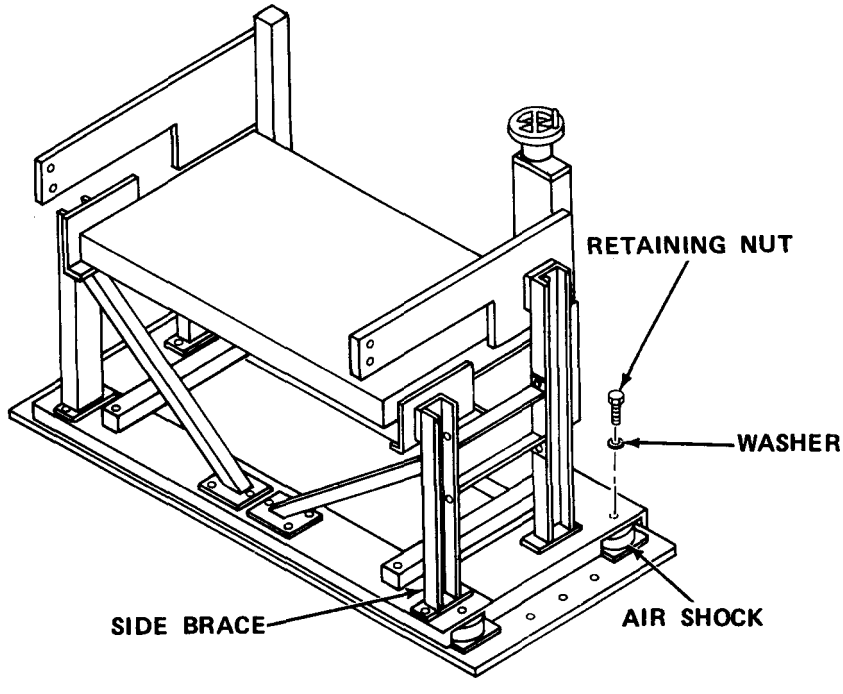
MOS: 41B, Topographic Instrument Repair Specialist

TOOLS : Socket Wrench Set (1/2 in. Drive)

SUPPLIES: Split-Stage Light Table

a. Turn power off and unplug power cord.

b. Coil and tape power cable.



c. Deflate air shocks to allow access to retaining nut. Remove retaining nuts from air shocks.

d. Block table frame.

e. Remove side braces.

(1) Remove capscrews and washers from sides and base of table.

(2) Remove shims.

(3) Slide braces out from underneath table.

f. Remove bolts securing rear legs of table.

g. Remove bolts securing front legs of table.

h. Slide defective table to center aisle and remove from section.

i. Install new table, and secure front legs with bolts.

j. Secure rear legs of table with bolts.

k. Reinstall shims and side braces, and secure with capscrews and washers.

CAUTION

Do not inflate air shocks over 70 psi or damage to equipment could result.

l. Reinstall four retaining nuts in air shocks. Inflate air shocks.

m. Remove tape, and uncoil power cord.

n. Plug in power cord and turn power on.

4-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

4-18. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

4-18.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

4-18.2 Special Tools; Test, Measurement, and Diagnostic Equipment: and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and Appendix B of this manual.

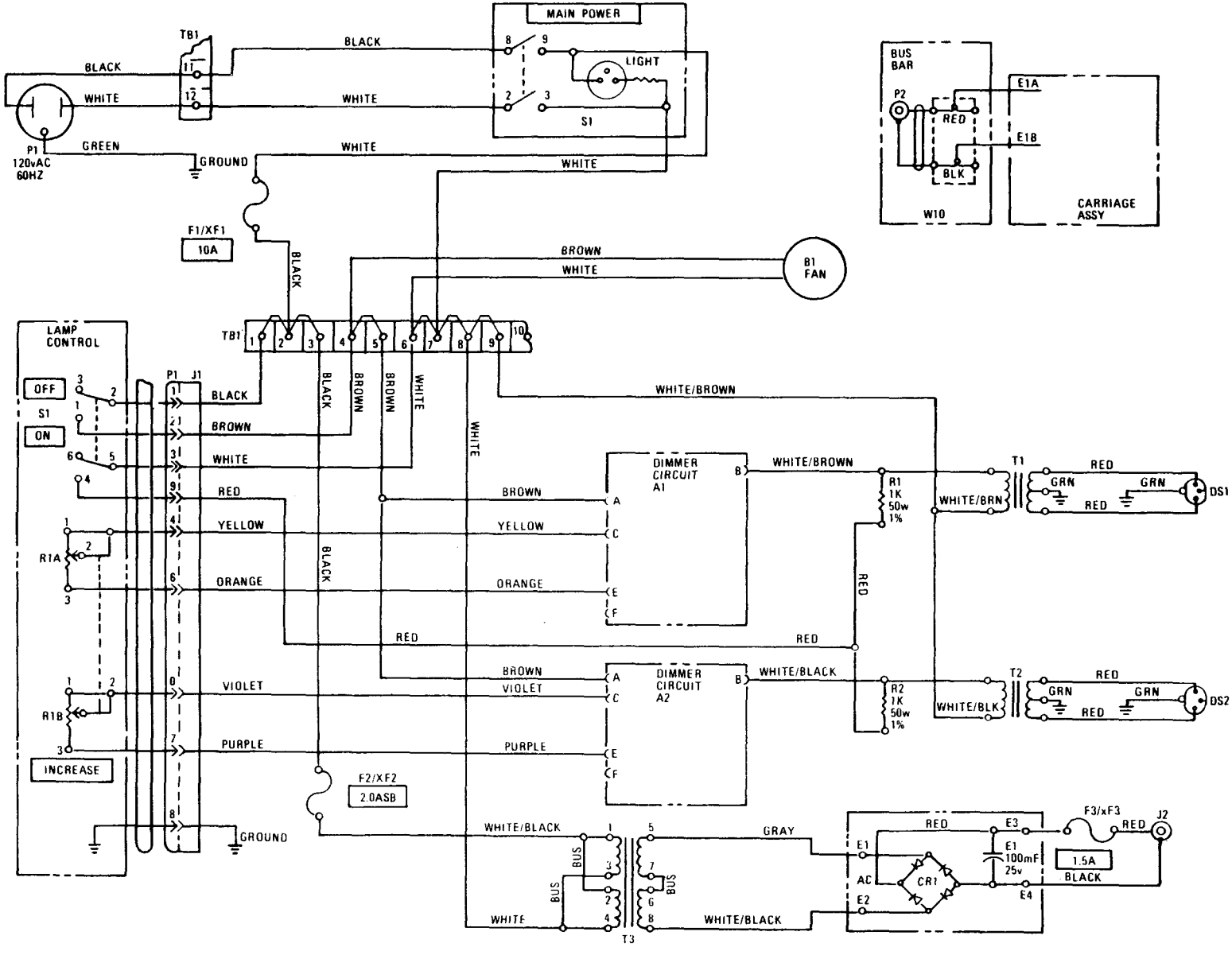
4-18.3 Repair Parts. Repair parts for this equipment are listed in the Repair Parts and Special Tools List, TM 5-6675-316-24P covering direct/general support maintenance for this equipment.

4-19. DIRECT/GENERAL SUPPORT TROUBLESHOOTING PROCEDURES.

a. Direct/general support troubleshooting procedures cover the most common malfunctions that may be repaired at the direct/general support level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used at lower levels should be conducted in addition to the direct/general support troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/inspection and corrective action. If a malfunction is not listed or is not corrected by a listed corrective action, notify your supervisor.

c. For unidentified malfunctions, use the facing schematic or the foldout located at the end of this manual for further fault analysis.



SPLIT-STAGE LIGHT TABLE
WIRING DIAGRAM

Table 4-4. DIRECT/GENERAL SUPPORT TROUBLESHOOTING

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. LIGHT GRIDS ARE TOO DIM OR TOO BRIGHT.	Measure light intensity to determine if high and low level potentiometers on card Al or A2 are out of adjustment.	Adjust light grid intensity to 2500 and 500 ft lamberts (paragraph 4-20.1).
2. Z-AXIS MOVEMENT IS SLUGGISH OR HARD TO MOVE.	Test for free movement without binding.	If movement binds or lugs, adjust, and lubricate Z-axis as required (paragraph 4-20.4).
3. LIGHT GRID LIGHTS BUT INTENSITY WILL NOT CHANGE.	Reverse connector to dimmer card.	**NOTE** Dimmer card connector is not keyed and may be reversed. If card is reversed, grid lamp will operate at maximum intensity and lamp intensity will not change. (a) Mark card and connector to indicate proper connection. (b) Replace dimmer circuit assembly (paragraph 4-20.8).

4-20. MAINTENANCE PROCEDURES.

This section contains instructions covering direct/general support maintenance functions for the split-stage light table. Personnel required are listed only if the task requires more than one.

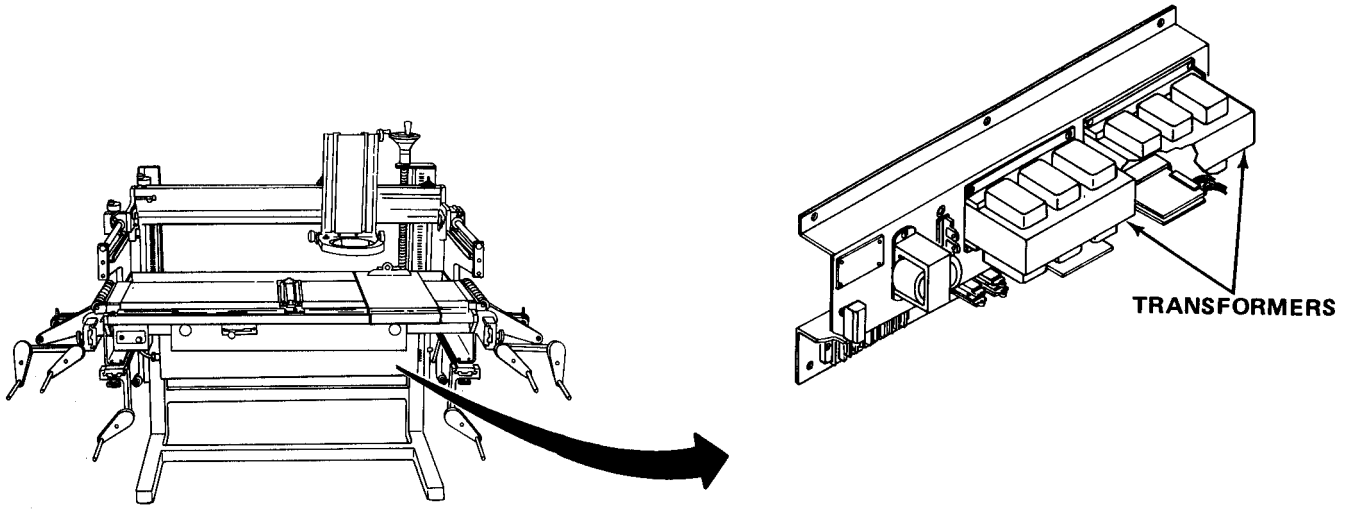
b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

4-20.1 Adjust Light Grids.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS : Photometer (LM150A or Equivalent)
9/64 in. Flat Tip Screwdriver



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

a. Turn power off and unplug power cord.

b. Loosen quick-disconnect screws and remove cover.

c. Be sure wiring is tight and transformers are properly connected.

WARNING

- When voltage is applied to the split-stage light table, 9000 V are present inside power box. This voltage is lethal.

- Use extreme caution when working inside power box while equipment is on. Touch only those components that you are specifically directed to touch. Failure to do so may result in death or serious injury.

NOTE

Do not leave equipment unattended when power is on.

d. Plug in power cord, and turn main power switch ON.

e. Set ON/OFF switch to ON.

f. Turn grid intensity control fully right (maximum intensity).

g. Allow 15 minutes for equipment to warm up. Do not leave equipment during warm-up period.

h. Set photometer at center of one view stage surface.

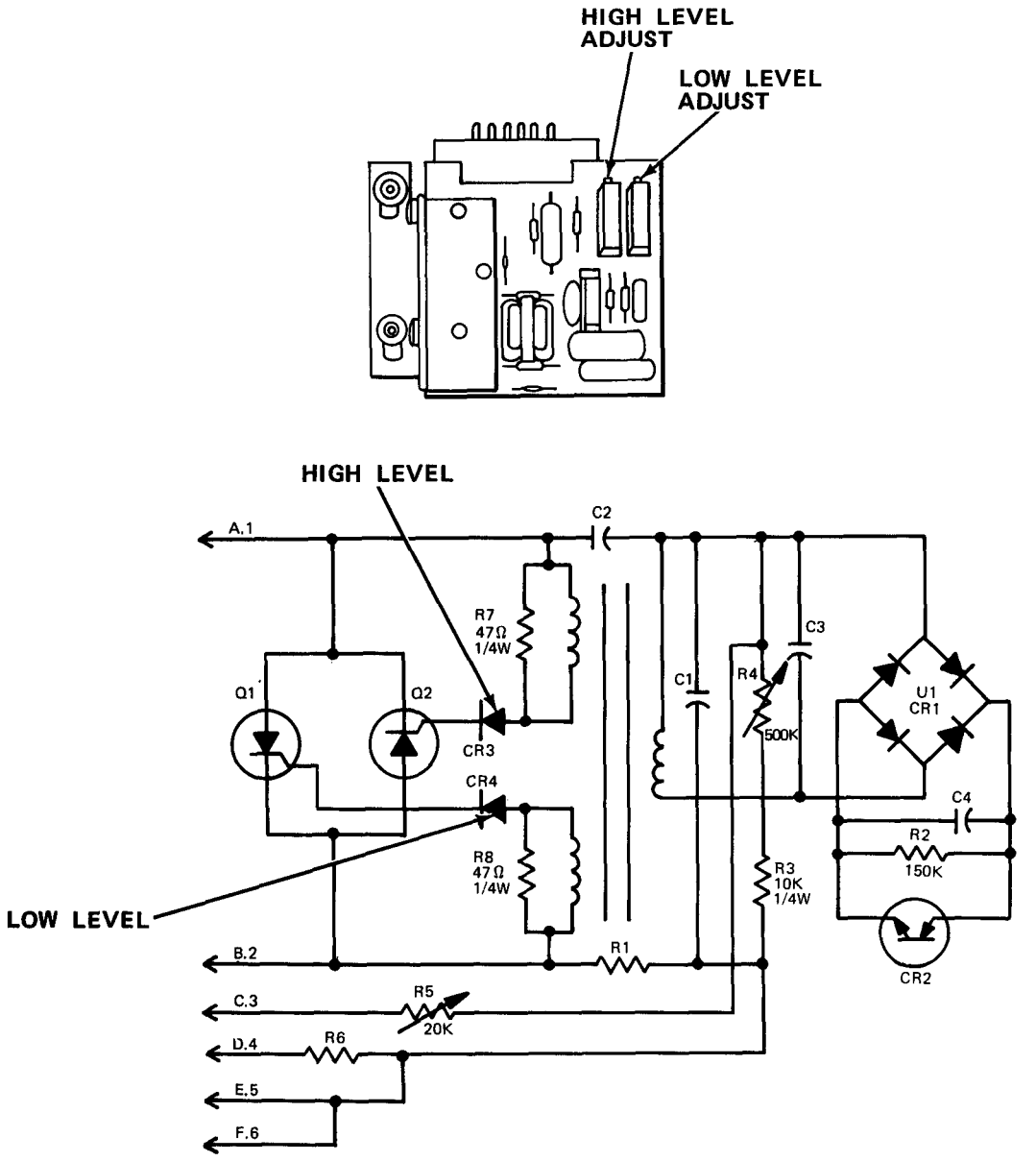
CAUTION

Do not leave light grid intensity set over 2500 fl. Intensity over 2500 fl will shorten grid lamp life.

NOTE

Poorly adjusted resistor may require many complete turns to adjust.

i. Carefully turn screw in high level adjustment resistor to adjust light intensity to 2500 fl.



j. Turn grid intensity control fully left.

k. Carefully turn screw in low level adjustment resistor until light output is 500 fl.

l. Recheck high intensity by turning INCREASE potentiometer knob fully right and readjust as required.

m. Repeat procedure for other light grid. Adjust so that light grids are as equal as possible.

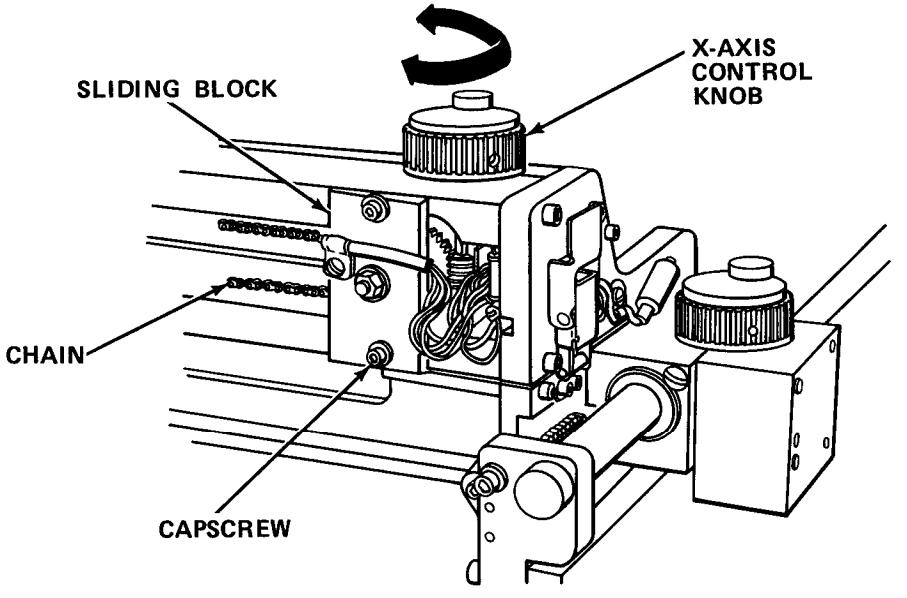
n. Turn main power switch and ON/OFF switch to OFF.

o. Reinstall cover and tighten screws.

4-20.2 Adjust X-Axis Chain.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: 9/64 in. Hex Head Key Wrench



a. Turn power off.

b. Set carriage clutch switch to OFF.

c. Loosen capscrews on sliding block until block can be moved.

d. Move block with fingers toward end of carriage until chain is tight.

e. Hold block with one hand and tighten capscrews.

f. Turn power on. Set carriage clutch switch to ON.

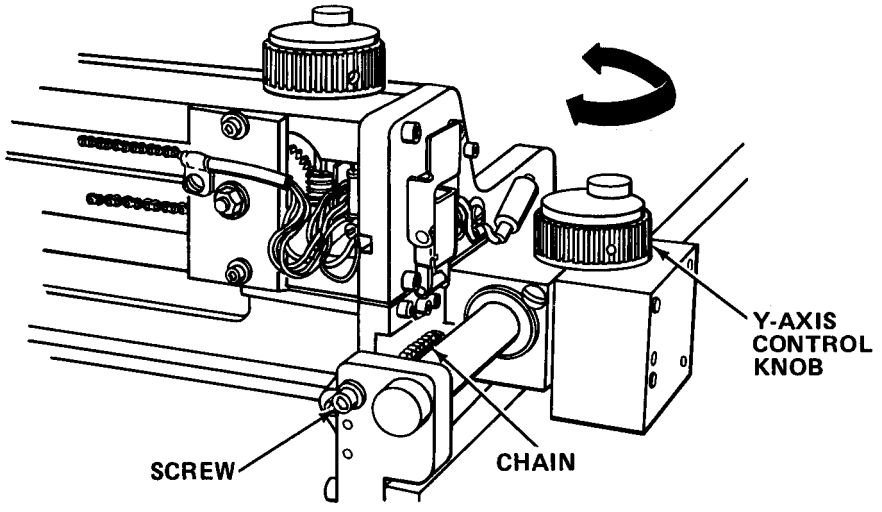
9. Move optical mount to left and right with X-axis control knob. If motion is jerky, chain is too tight. If sprockets jump links, chain is too loose.

h. Readjust as required until optical mount moves smoothly to left and right.

4-20.3 Adjust Y-Axis Chain.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: 9/64 in. Hex Head Key Wrench



a. Turn power off.

b. Set carriage clutch switch to OFF.

c. Turn screws on left and right side equal amounts. Turning to right tightens chain. Turning to left loosens chain.

NOTE

Seven spring washers are under each bolt. Amount of adjustment is limited.

d. Turn power on and set carriage clutch switch to ON.

e. Rotate Y-axis control knob to bring optical mount forward and back. Chain jumps sprockets if too loose. Carriage jerks if too tight.

f. Readjust if necessary.

4-20.4 Service Z-Axis.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: 9/64 in. Flat Tip Screwdriver

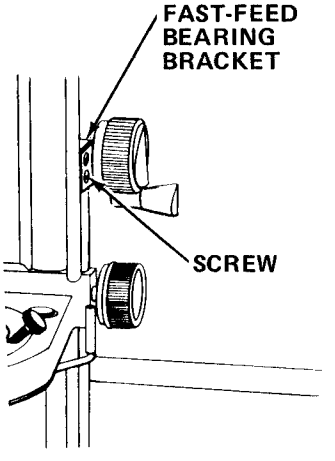
SUPPLIES: Bearing Cleaner (Item 4, Appendix E)
Cheesecloth (Item 6, Appendix E)
General Purpose Lubricating Oil (Item 15, Appendix E)

WARNING

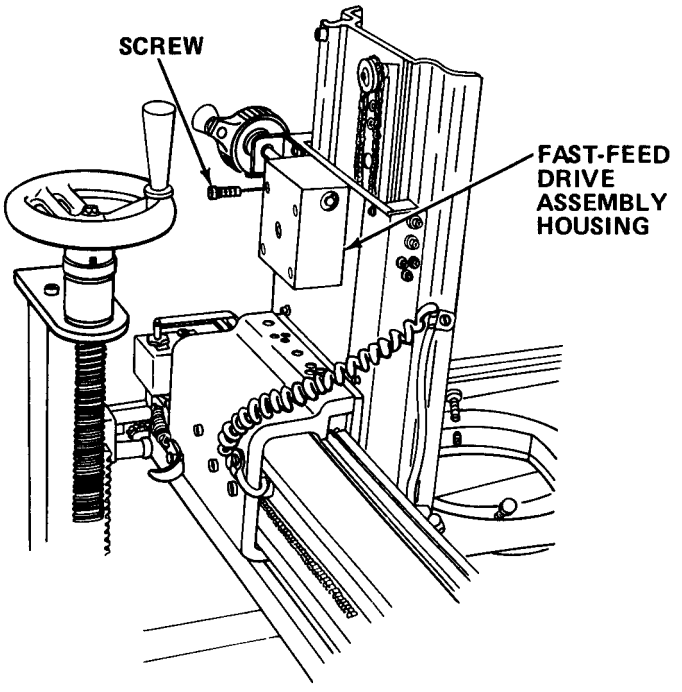
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

a. Turn power off and unplug power cord.

b. Lift optical mount to upper limit of travel.



c. Remove screws to release fast-feed bearing bracket.



d. Remove capscrews and lift off fast-feed drive assembly housing.

CAUTION

To prevent damage to photographic film, do not allow lubricant or solvent to contact any surface other than that being serviced.

e. Clean exposed worm gear and worm with bearing cleaner.

f. Dry exposed worm gear and worm.

g. Spray worm and worm gear with lubricant. Wipe off excess lubricant.

h. Reinstall fast-feed drive assembly. Secure with capscrews.

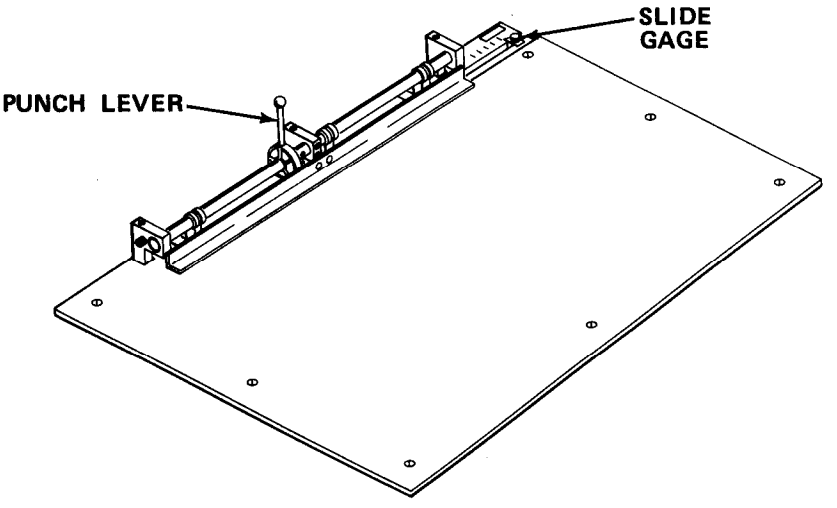
i. Reinstall fast-feed bearing bracket. Secure with screws.

j. Remove optics and move optical mount to lowest limit of travel.

NOTE

Do not proceed unless collimation equipment is available.

12-4.5 Pin Punch Register.



Control or Indicator	Function
Punch Lever	Operates eccentric which presses down on punch pin and forces it through material.
Slide Gage	Positions material for proper positioning of punch holes.

12-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

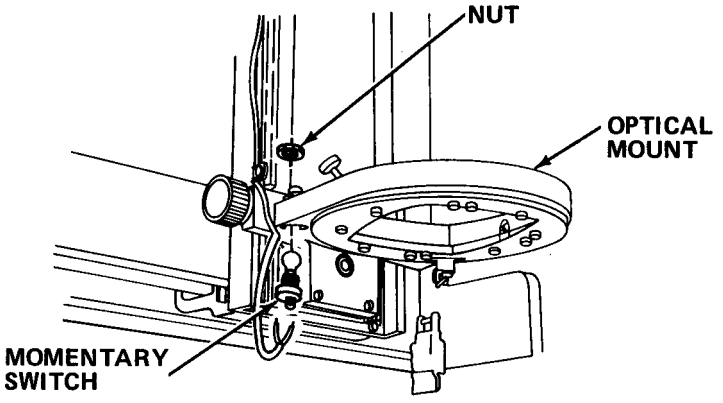
d. If Your Equipment Fails To Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

4-20.5 Replace Momentary Switch.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS : 9/64 in. Flat Tip Screwdriver
5/8 in. Open End Wrench
Soldering Iron
Multimeter

SUPPLIES: Momentary Switch
Solder (Item 23, Appendix E)



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

a. Turn power off and unplug power cord.

b. Raise optical ring assembly to maximum height.

c. Remove cable clamps.

d. Remove nut.

e. Remove momentary switch and wire by withdrawing through bottom of optical mount.

f. Tag and desolder wires from switch.

g. Solder wires to new switch.

NOTE

Be sure to connect wires so that operation of switch interrupts continuity in line. Use multimeter to test continuity.

h. Install momentary switch and secure wi th nut. Avoid twisting switch body as nut is tightened.

i. Install cable clamps.

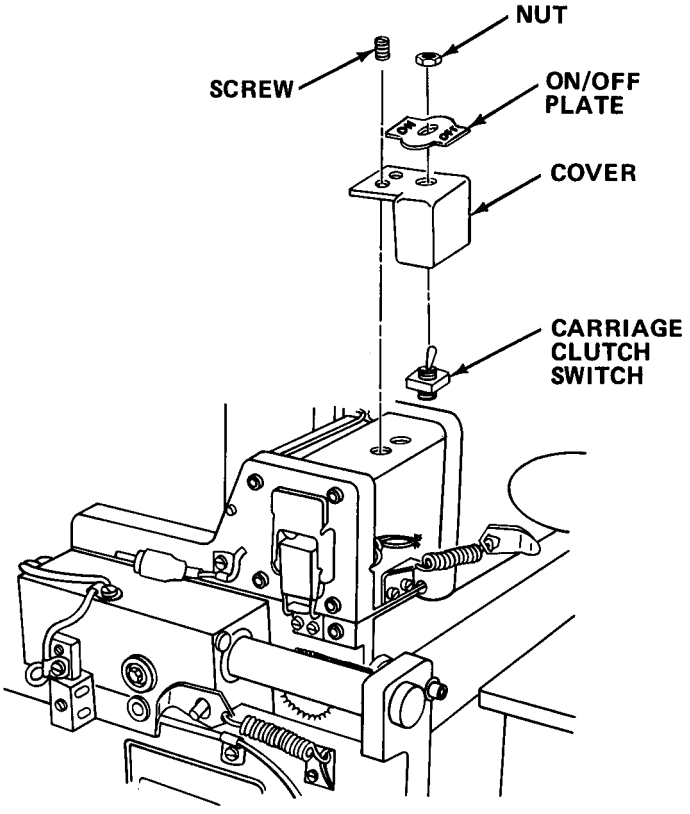
j. Plug in power cord, and turn power on.

4-20.6 Replace Carriage Clutch Switch.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: 9/16 in. Open End Wrench
9/64 in. Flat Tip Screwdriver
Soldering Iron

SUPPLIES: Carriage Clutch Switch
Solder (Item 23, Appendix E)



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

a. Turn power off and unplug power cord.

b. Remove screws.

c. Lift cover and carriage clutch switch free.

d. Remove securing nut and withdraw carriage clutch switch from cover.

e. Tag and desolder wires from switch.

f. Solder wires to new carriage clutch.

g" Insert carriage clutch switch through hole in cover and secure with nut.

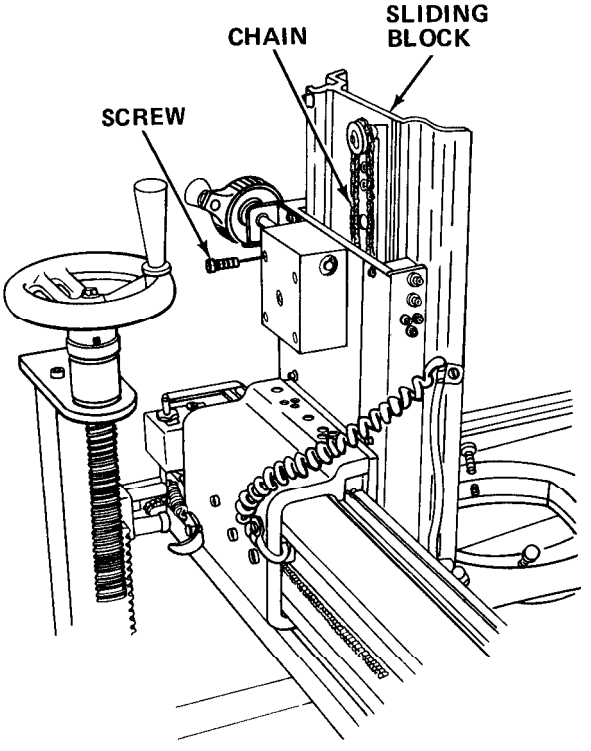
h. Reinstall cover, and secure with screws.

i. Plug in power cord, and turn power on.

4-20.7 Adjust Z-Axis Chain.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: 9/64 in. Flat Tip Screwdriver



a. Turn power off, and set carriage clutch switch OFF.

b. Lift optical ring assembly to point at least 2-1/2 in. (6.35 cm) above lower limit.

c. Loosen screws.

d. Pull sliding block upward to tighten chain.

e. Tighten screws to hold adjustment.

f. Move optical mount from upper limit to lower limit, and observe chain movement. If chain jumps sprockets, it is too loose. If optical mount does not move smoothly, chain is too tight.

9. Readjust, if necessary.

h. Mount stereoscope.

i. Use Z-axis coarse feed knob to move optical mount up and down. Observe movement.

CAUTION

Remove stereoscope before readjusting chain: weight of stereoscope may cause mount to drop and damage viewi ng stages.

j. Remove stereoscope.

k. Readjust chain, if necessary

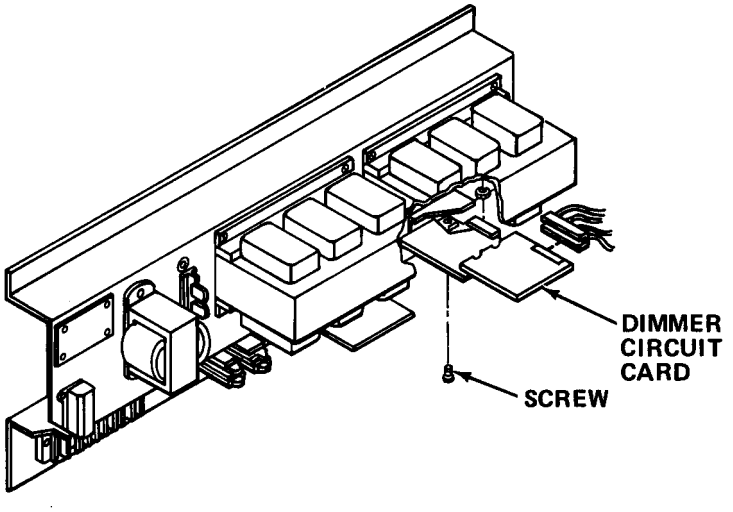
l. Turn power on.

4-20.8 Replace Dimmer Circuit Card.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS : 5/32 in. Off Set Flat Tip Screwdriver
9/64 in. Flat Tip Screwdriver

SUPPLIES: Dimmer Circuit Card
Heat Sink Compound (Item 13, Appendix E)



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power off, and unplug power cord.

b. Loosen two quick-disconnect screws, and remove front cover.

c. Loosen two screws, and remove rear cover.

d. Remove defective dimmer card.

e. Apply heat sink compound to dimmer circuit card mounting bracket.

f. Install new dimmer circuit card by alining pins carefully and pressing into position. Secure with screws.

9. Reinstall rear cover and tighten screws.

h. Reinstall front cover, and tighten quick-disconnect screws.

i. Plug in power cord.

j. Turn power on, and allow grids to warm up.

k. Adjust light grids (pararaph 4-20.1).

4-20.9 Replace Transformer.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: 9/64 in. Flat Tip Screwdriver
Soldering Gun

SUPPLIES: Transformer
Solder (Item 23, Appendix E)

WARNING

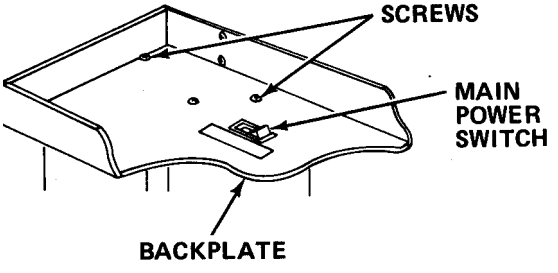
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

NOTE

The same procedure is used to replace transformer T1 and T2.

a. Turn power off and unplug power cord.

b. Loosen screws and remove front cover.



c. Remove quick disconnect from power panel.

d. Remove main power switch from backplate by releasing switch from bezel retaining clip.

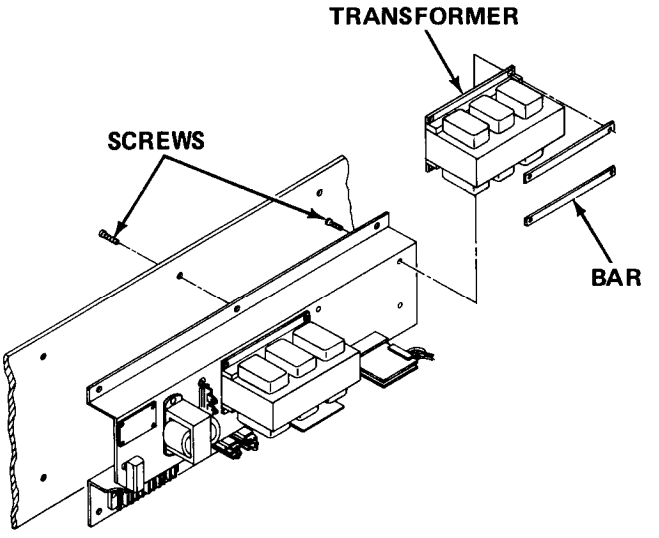
CAUTION

Power panel must be supported when screws are removed from backplate. Damage to equipment will result if power panel falls freely.

e. Remove screws from main power switch backplate.

f. Lower power panel.

g. Remove screws securing back cover.



h. Tag and desolder wires from transformer.

i. Remove screws securing bars and transformer.

j. Reinstall bars on new transformer.

k. Install new transformer and secure with screws.

l. Solder wires and check that all connections are tight.

m. Raise power panel and secure to main power switch backplate with screws.

n. Reinstall main power switch and secure with bezel retaining clip.

o. Reinstall quick disconnect to power panel.

P. Reinstall front and back covers and secure with screws.

q. Plug in power cord and turn power on.

4-20.10 Replace Fan.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: 9/64 in. Flat Tip Screwdriver
5/16 in. Open End Wrench
Wire Cutters

SUPPLIES: Fan
Wire Ties

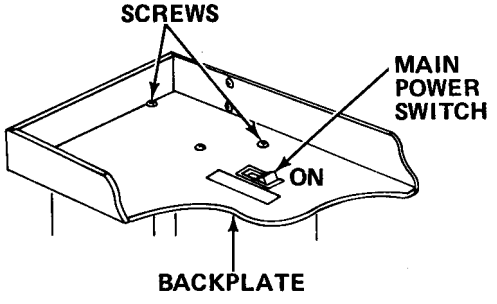
WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power off and unplug power cord.

b. Loosen screws and remove connector from below fan.

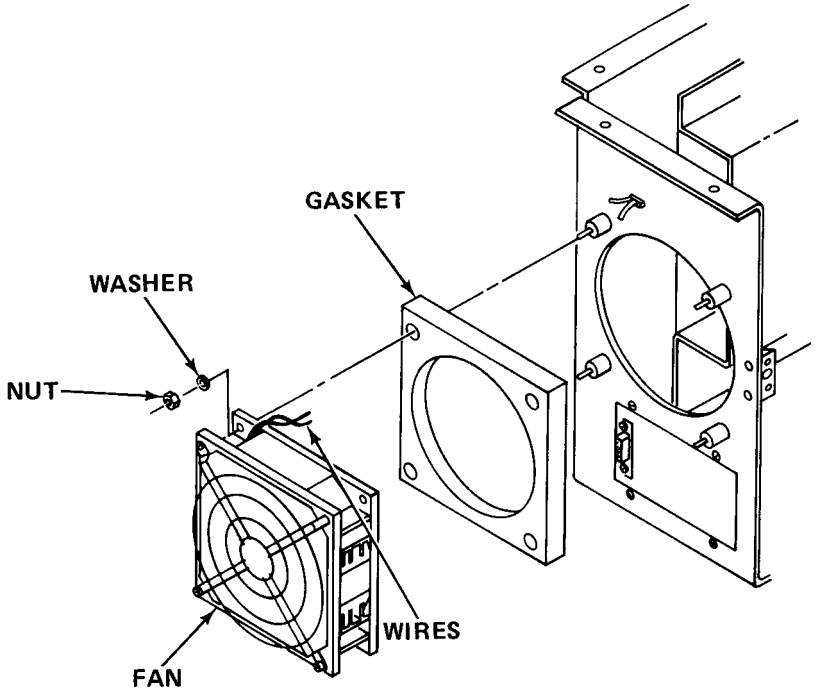
c. Remove quick disconnect from power panel.



d. Remove main power switch from backplate by releasing switch from bezel retaining clip.

e. Remove screws from main power switch backplate.

f. Lower power panel.



g. Disconnect wires from bottom of terminals 4 and 6.

h. Cut wire ties on terminal assembly.

i. Cut wires at fan grid assembly as close as possible to fan. Discard old wiring.

j. Remove nuts and washers securing fan.

k. Remove defective fan. Retain sponge gasket.

l. Thread wires for new fan through housing. Attach terminal lug of white wire to terminal 6 and brown wire to terminal 4.

m. Install new fan with old gasket in place. Secure with nuts and washers.

n. Raise power panel and secure to main power switch backplate with screws.

o. Reinstall main power switch and secure with bezel retaining clip.

p. Reinstall quick disconnect to power panel.

q. Reinstall connector below fan and secure with two screws.

r. Plug in power cord and turn power on.

4-20.11 Replace Light Grid Assembly.

MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: Hex Head Key Wrench Set
3/16 in. Flat Tip Screwdriver
9/64 in. Flat Tip Screwdriver
Diagonal Cutting Pliers
Soldering Iron

SUPPLIES: Light Grid Assembly
Solder (Item 23, Appendix E)

WARNING

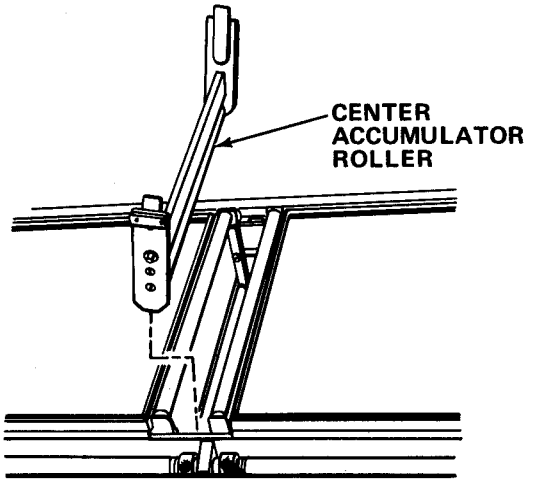
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing equipment.

a. Turn power off and unplug power cord.

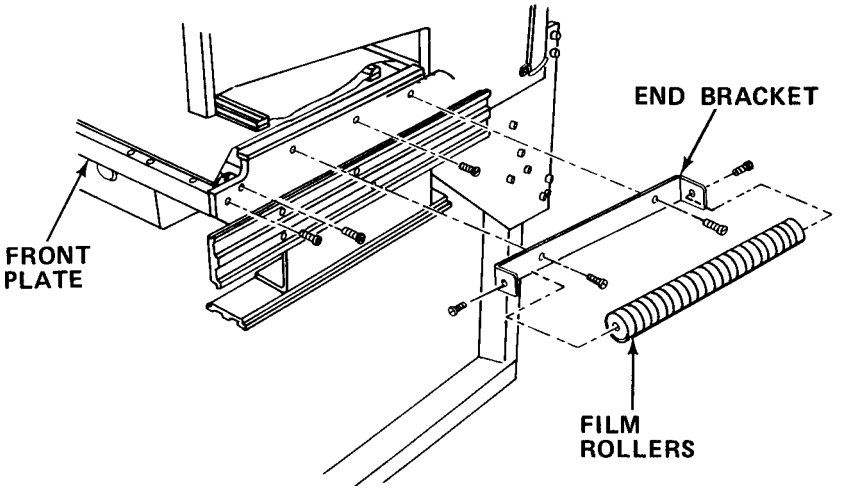
b. Loosen screws and remove front cover from power panel.

c. Retract masking assemblies into their wells by rotating knurled knobs.

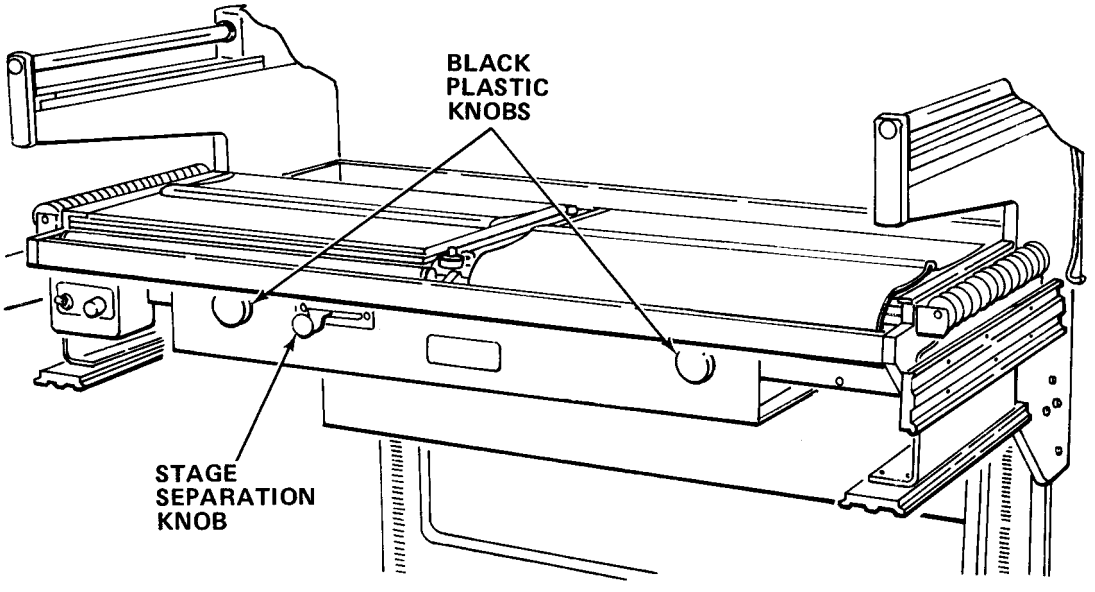
d. Remove screw from end of each film roller. Remove film rollers.



e. Remove center accumulator roller from between vi ew stages by pinching tabs and lifting free.



f. Remove screws securing end brackets and plate. Remove end brackets. Note two screws are on left view stage and three screws are on right view stage.



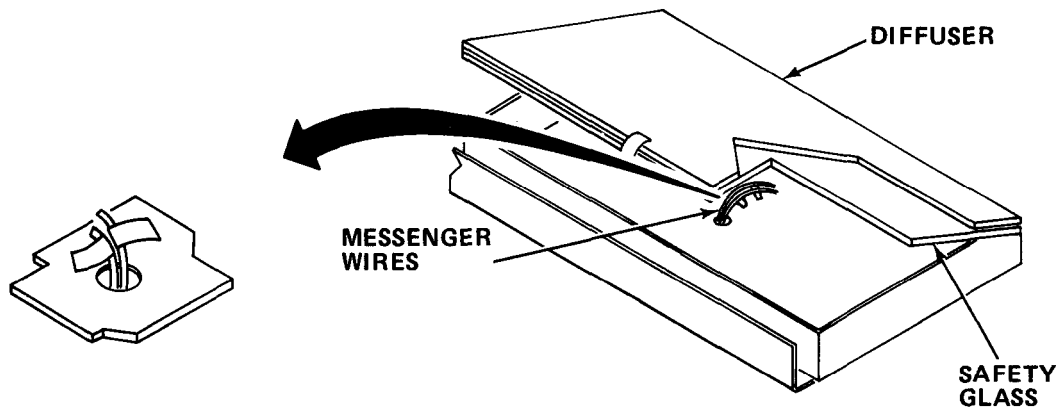
g. Loosen knobs to allow bottom plate to fall free.

h. Remove screws and stage separation plate to locate access hole. Remove screw and stage separation knob.

i. Remove screws securing ON/OFF switch assembly.

j. Remove capscrews to release front plate from end plates.

k. Remove screws and washers securing front plate.



l. Move defective grid until wires are accessible inside light box. Disconnect green wire.

m. Loosen capscrews and washers and remove middle roller as an assembly from view stage. Attach to new grid assembly.

n. Splice red wires from new grid assembly to exposed red wire from defective assembly. Thread new wires to transformer terminal.

o. Desolder old wires from terminal and remove from splice. Solder new wires to transfer terminal. Attach green wire to ground.

p. Ground ON/OFF switch to table chassis. Plug in power cord. Turn main power switch ON.

q. Turn ON/OFF switch to ON. Check that grid assembly lights. Turn main power switch to OFF. Unplug power cord.

r. Reinstall front plate and secure with screws and washers.

s. Reinstall ON/OFF switch assembly. Secure with screws.

t. Aline stage separation knob and view stage. Secure with screw.

u. Reinstall stage separation plate and secure with screws.

v. Reinstall end plates and brackets. Secure to left view stage with screws. Secure to right view stage with screws.

w. Reinstall center accumulator roller.

x. Raise bottom plate, and secure with knobs.

y. Reinstall film rollers. Secure with screw on end of each film roller.

z. Plug in power cord and turn power on.

aa. Adjust light grid intensity (paragraph 4-19.1).

ab. Reinstall front cover on power panel and tighten two screws.

ac. Collimate split-stage light table (paragraph 4-20.12).

4-20.12 Collimation.

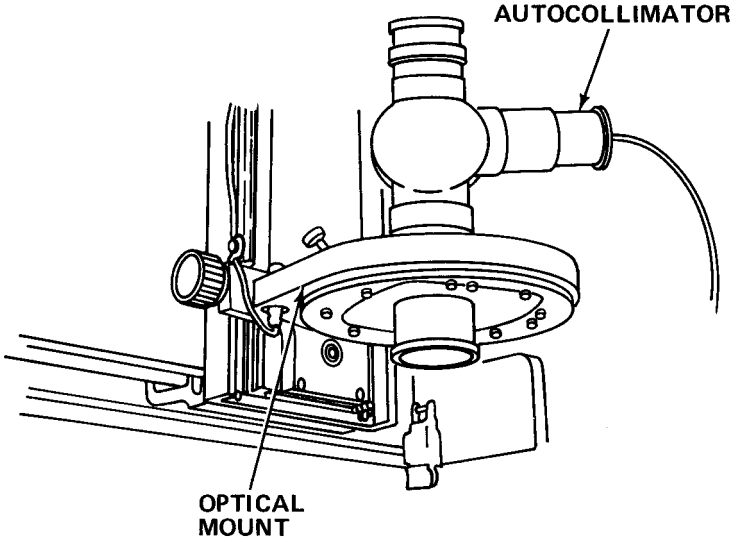
MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: Autocollimator
Adjustable Wrench
9/64 in. Flat Tip Screwdriver

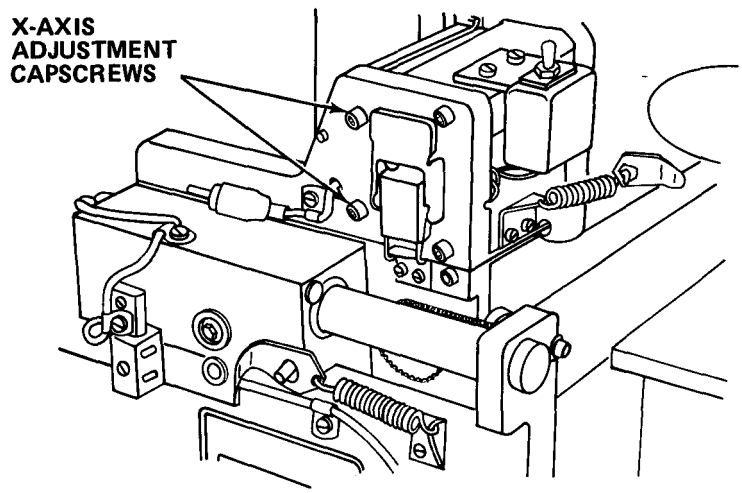
NOTE

. Make sure that all attaching hardware is tight before attempting to collimate split-stage light table.

. Collimation should be performed after movement to new site or when tests indicate collimation is required.



a. Mount autocollimator in optical mount.



b. Loosen capscrews securing X-rail to end support plates. Tighten lower, rear screws at each end. Three other screws on each end should be snug.

c. Fold piece of thick paper over right-hand, rear, upper edge of X-rail to protect surface. Fit wrench over protected section of X-rail.

d. Move optical mount to right-hand stop. Move carriage between front and rear stops. Check collimation.

e. If collimation is outside + 5 minutes of arc, use wrench to turn X-rail to bring collimation within limits. Tighten upper front attaching screw on X-rail support plate on right-hand end securely.

f. Move optical mount to left-hand stop, and repeat procedure for left-hand end of carriage assembly.

9. Check Y-axis collimation at point near center of table. Readjust X-rail, if necessary.

h. Tighten all four attaching screws on both X-rail support plates, and recheck collimation in Y-axis.

i. Move carriage assembly so that autocollimator mirror is near rear end of stage glass. Move optical mount between left-hand and right-hand limits while checking collimation.

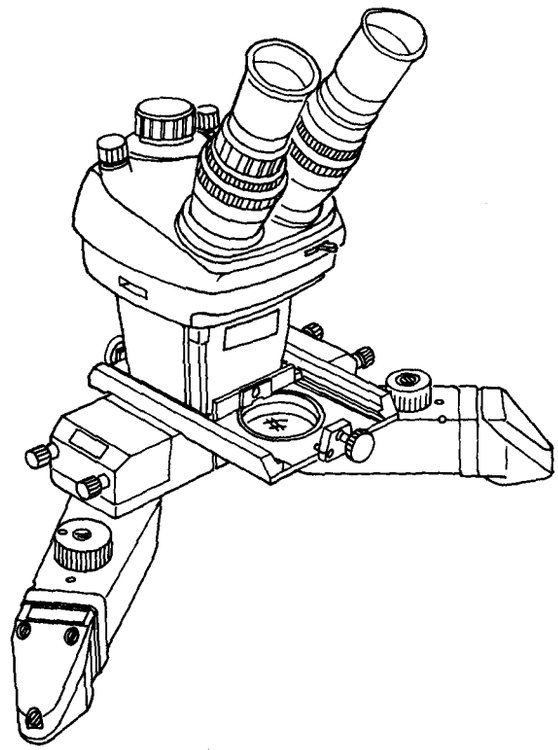
j. Move carriage assembly so that autocollimator mirror is near front end of stage glass. Move optical mount between left-hand and right-hand limits while checking collimation.

k. If collimation is outside of ±3 minutes of arc, move optical mount to point just below uppermost limit of travel.

l. Loosen capscrews attaching vertical carriage to X-bearing housing assembly.

m. Tip vertical carriage assembly slightly to left or right as required to bring collimation song X-axis within limits.

n. Tighten capscrews and recheck collimation.



CHAPTER 5

ZOOM STEREOSCOPE 240R

Section I INTRODUCTION

5-1. GENERAL INFORMATION.

5-1.1 Scope.

a. Model Number and Equipment Name. Model 240R Zoom Stereoscope

b. Purpose of Equipment. Provides stereoscopic (three-dimensional) view of photographs.

5-1.2 Glossary.

Stereoscope	Optical device to apparently superimpose two separate photographs.
Stereoscopic	An apparent three-dimensional image obtained when 2 two-dimensional photographs are viewed through stereoscope.

5-2. EQUIPMENT DESCRIPTION.

5-2.1 Equipment Characteristics, Capabilities, and Features.

a. Independent magnification of right or left image.

b. Independent optical rotation of right or left image.

c. Variable binocular magnification of single image.

d. Movable rhomboid assemblies.

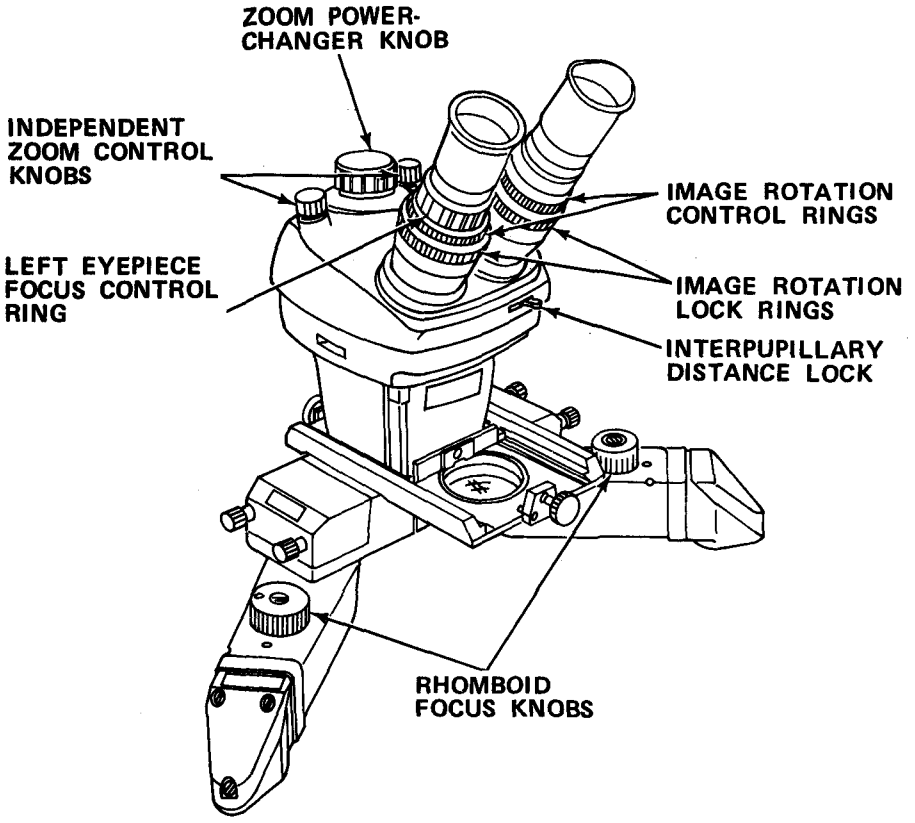
5-2.2 Equipment Data.

Optical Magnification	
Stereoscopic	2x to 120X
Microscopic	7x to 120X
Image Rotation	360°
Scale Matching Range	4 to 1
Rhomboid Separation	1.3 in. to 15.0 in. (3.3 cm to 38.1 cm)
Field of View	240 mm divided by X

5-3. TECHNICAL PRINCIPLES OF OPERATION. Technical principles of operation are combined with operator's controls and indicators for this equipment.

Section II OPERATING INSTRUCTIONS

5-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.



Control or Indicator	Function
Zoom Power Changer Knob	Controls magnification of both right and left optical systems.
Image Rotation Control Rings	Rotate right and left optical images through 360 degrees.
Image Rotation Lock Rings	Lock image control rings when tightened to right.

Control or Indicator	Function
Interpupillary Distance Lock	Locks spacing between eyepieces (Must be unlocked to change eyepiece spacing).
Rhomboid Focus Knobs	Focus individual rhomboid optical assembly.
Adapter Slide Lock Screws	Lock adapter slide in stereoscopic or monoscopic position.
Left Eyepiece Focus Control Ring	Focuses left optical system (after right system is focused by moving up and down).
Independent Zoom Control Knobs	Controls magnification of right or left optical systems.

5-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

a. Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

5-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Item	Quantity
Watchmaker's Blower	1 ea
Lens Dusting Brush	1 ea
Lens Tissue (Item 29, Appendix E)	ar
Lens Cleaning Liquid (Item 5, Appendix E)	ar

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

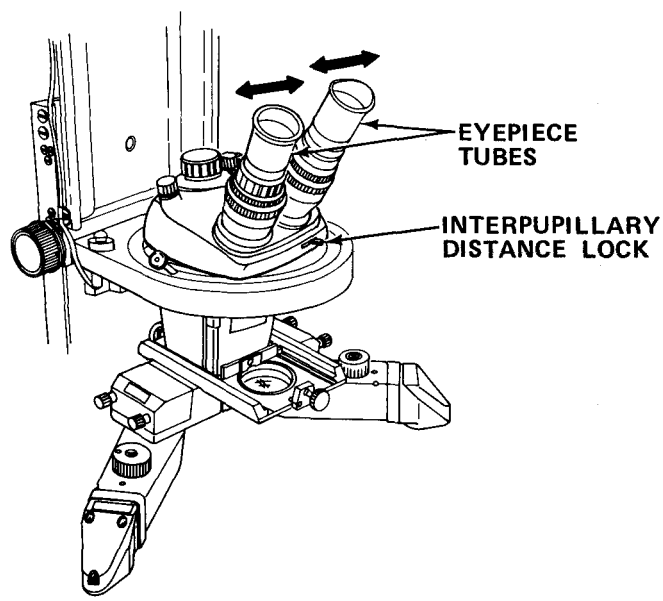
If the equipment must be kept in continuous operation, check and service only those items that can safely be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before, D - During, A - After | W - Weekly, M - Monthly, Q - Quarterly | AN - Annually, S - Semiannually, Bl - Biennially | (Number - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R	
1	B	Inspect Stereoscope.	

CAUTION

Do not touch optical surfaces with fingers. Fingerprints on optical glass will smudge glass and may etch coatings on glass materials.



1. Mount stereoscope on light table.

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) . Hundreds of Hours

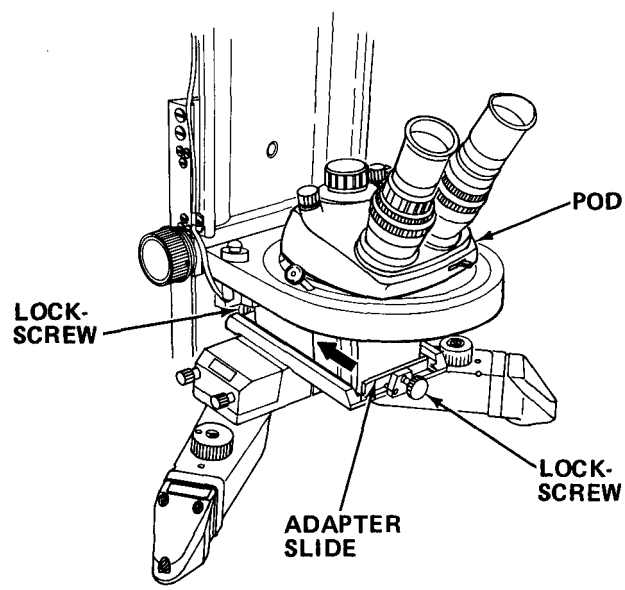
ITEM NO,	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R - Cont	
1	B	Inspect Stereoscope - Cont	
		2. Unlock interpupillary distance lock by moving fully to right.	
		3. Move eyepiece tubes toward and away from each other	Eyepieces frozen in position.
		4. Check for free movement.	
		5. Check that tubes remain in Position until manually changed.	
			
		6. Loosen lockscrew until adapter slide is free to move.	

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

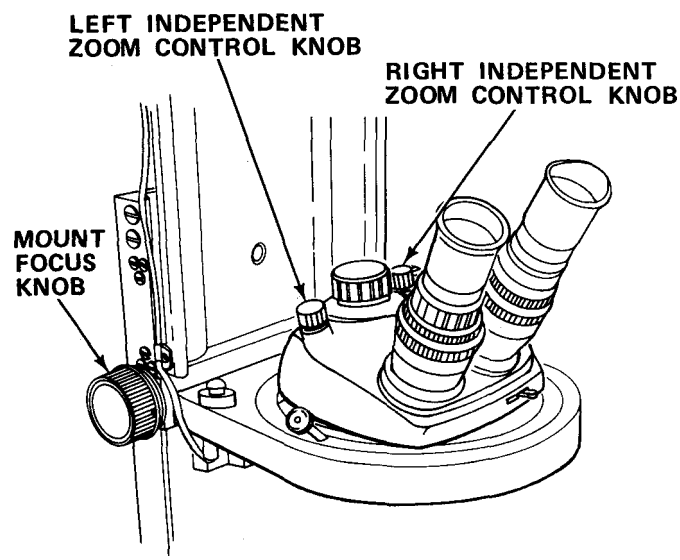
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R - Cont	
1	B	Inspect Stereoscope - Cont	
		7. Move adapter slide forward until lock-screw contacts pod.	
		8. Tighten lock screw finger tight.	
			
		9. Lift zoom power-changer (common magnification) until click is heard. Check for free movement and positive lock.	
		10. Turn left independent zoom control (magnification) knob fully to right. Check for free movement.	Controls bind or are frozen.
		11. Turn zoom power-changer knob to highest number setting.	

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before	**W - Weekly**	**AN - Annually**	**(Number) - Hundreds of Hours**
D - During	**M - Monthly**	**S - Semiannually**	
A - After	**Q . Quarterly**	**BI - Biennially**	

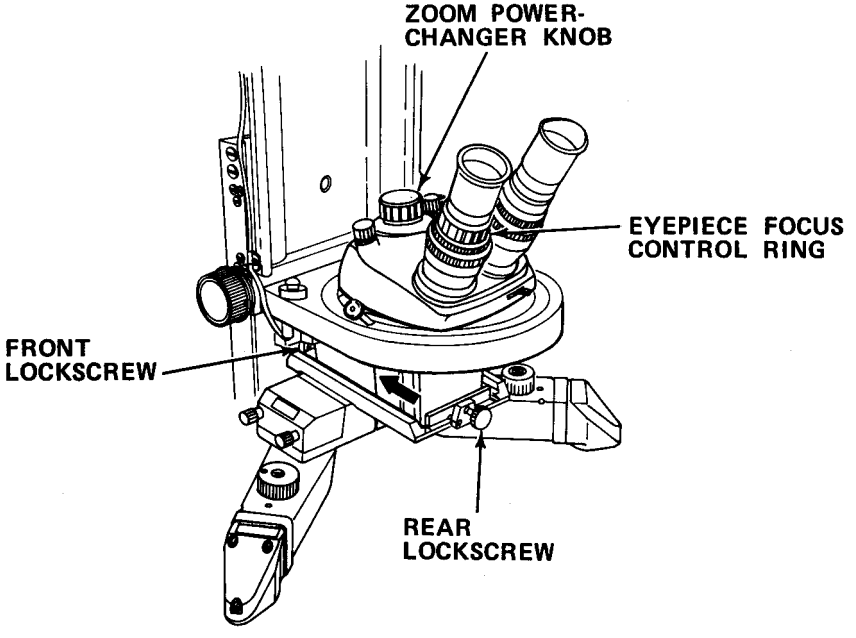
ITEM No.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R - Cont	
1	B	Inspect Stereoscope - Cont	
		12. Focus right eyepiece by moving mount focus knob. Check for vision with right eye.	Focus not clear.
			
		13. Turn zoom power-changer knob to lowest number setting and push down.	
		14. Focus left eyepiece by turning left eyepiece focus control ring. Check for clear vision with each eye.	Focus not clear.
		15. Loosen front lockscrew until adapter slide is free. Pull adapter slide toward operator.	

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B . Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Number) - Hundreds of Hours

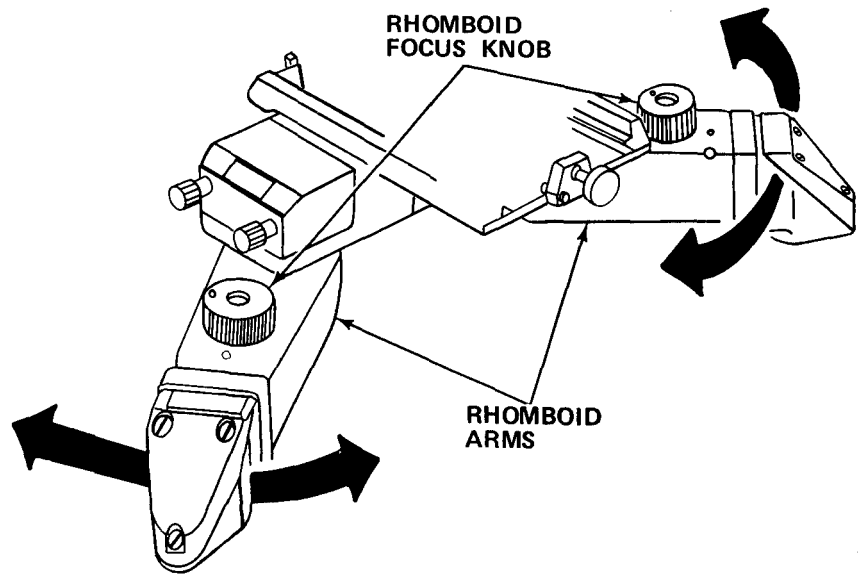
ITEM No.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R - Cont	
1	B	Inspect Stereoscope - Cont	
		16. Tighten rear lockscrew finger tight.	
			
		17. Move rhomboid arms and position over identification points on stereo-pair photographs. Check for free movement.	
		18. Set rhomboid focus knobs to index point (black dot on knob and white dot on rhomboid arm are alined).	
		19. Turn zoom power-changer knob to left and right. Check for equal magnification change.	No change in magnification.

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M . Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Number) - Hundreds of Hours

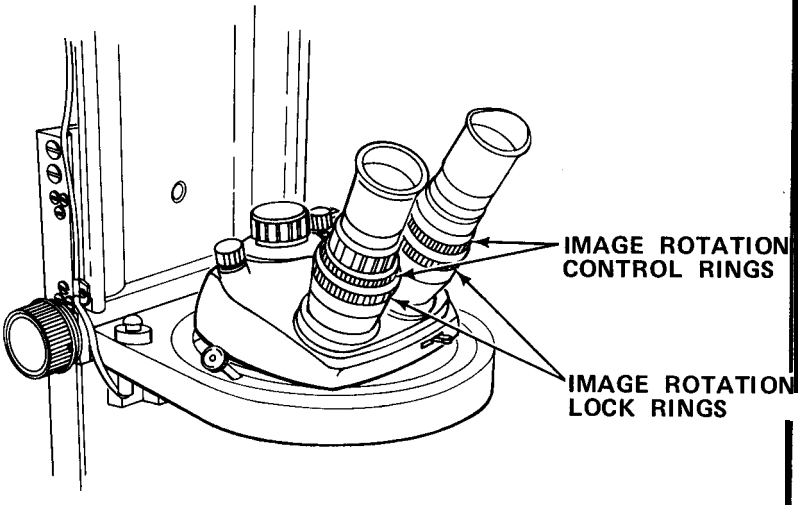
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R - Cont	
1	B	Inspect Stereoscope - Cont	
		20. Lift zoom power-changer knob until click is heard.	
		21. Rotate right and left independent zoom control knobs.	
		22. Check for image s ize changes as knob is rotated.	No change in image size.
		23. Adjust until each image is equal in size.	
			
		24. Turn image rotation lock rings to left (unlock).	
		25. Turn image rotation control rings. Check that images rotate through 360 degrees.	No image rotation.
		26. If stereoscope is not to be used immediately, cover to prevent dust or dirt from settling on optical surfaces.	

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

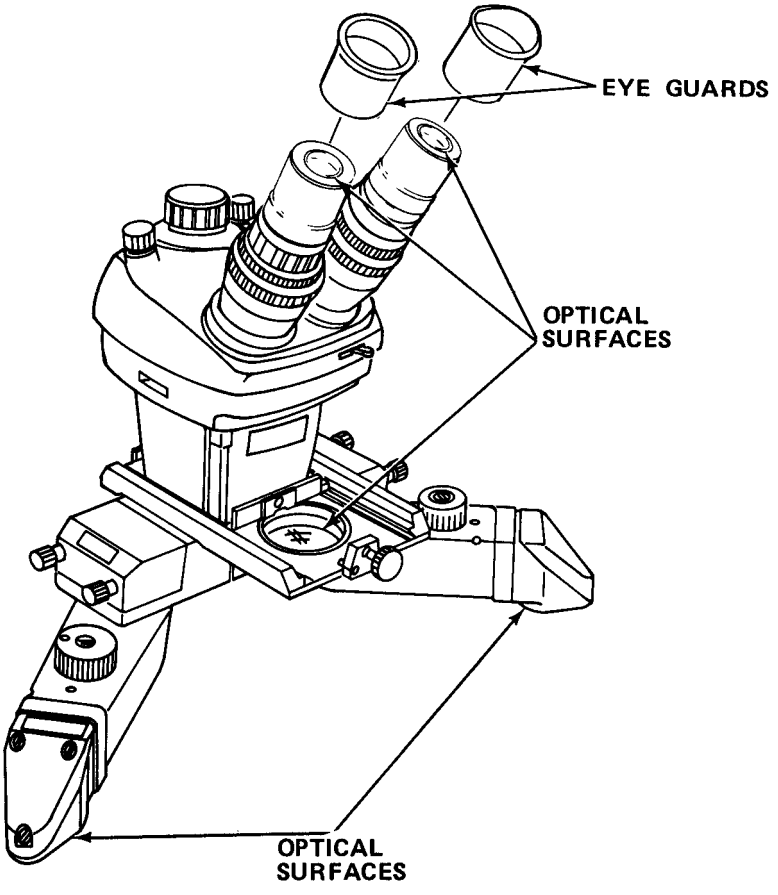
B - Before D - During A - After | W - Weekly M - Monthly Q . Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R - Cont	
2	B	Clean Optical Surfaces. **CAUTION** • Do not touch optical surfaces with fingers or wipe optical surfaces with dry cloth or tissue. Touching optical glass with fingers will smudge or etch glass. Wiping with dry cloth or tissue will scratch optical coatings. ● Do not wipe optical surfaces until dust and foreign matter have been removed. ● Do not use lens brush that has been used to clean other surfaces. ● Do not use lens tissue containing silicone to clean optical surfaces. Any residue left on optical surfaces will affect performance.	

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D . During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Number) - Hundreds of Hours

ITEN NO,	IN-TERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R - Cont	
2	B	Clean Optical Surfaces.	



1. Remove eyeguards by gently pulling from eyepiece lenses.

2. Carefully remove all dust, dirt, and foreign matter from exposed optical surfaces with watchmaker's blower or clean lens brush.

Table 5-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly O - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ZOOM STEREOSCOPE 240R - Cont	
2	B	Clean Optical Surfaces - Cont 3. Slightly dampen lens tissue with lens cleaner. 4. Gently wipe exposed optical surface with moistened lens tissue. Use circular motion starting from center and working to edge of glass. 5. Dispose of lens tissue after each optical surface is cleaned. 6. Prepare fresh lens tissue for each optical surface. 7. Dry optical surface with fresh lens tissue using circular motion starting at center and working toward edge. 8. Use fresh lens tissue for each optical surface.	

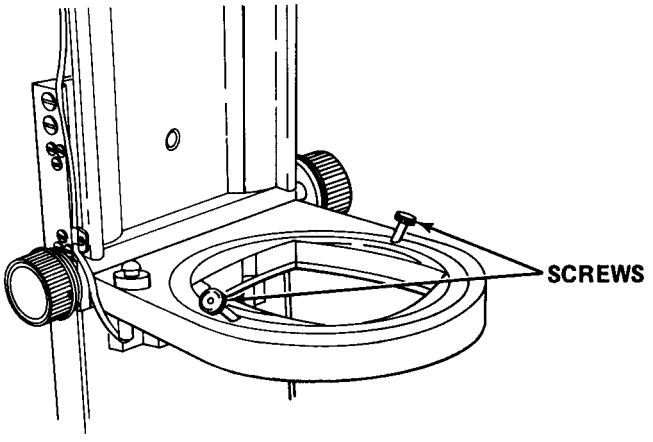
5-6. OPERATION UNDER USUAL CONDITIONS.

5-6.1 Assembly and Preparation for Use.

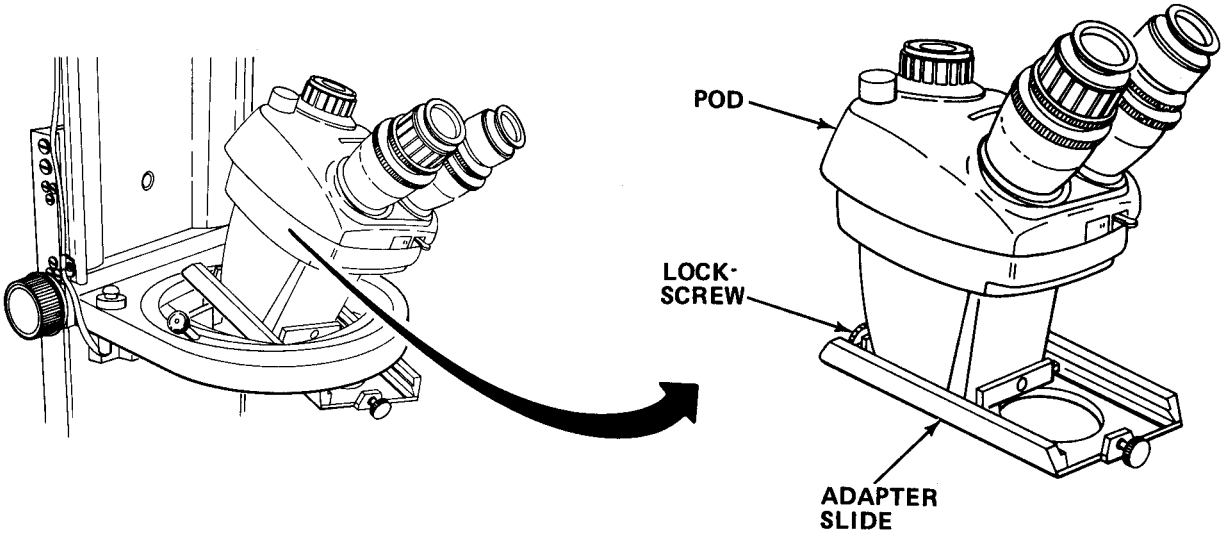
CAUTION

Do not touch optical surfaces with fingers. Fingerprints on optical glass will smudge glass and may etch coatings on glass surfaces.

a. Remove stereoscope from case.



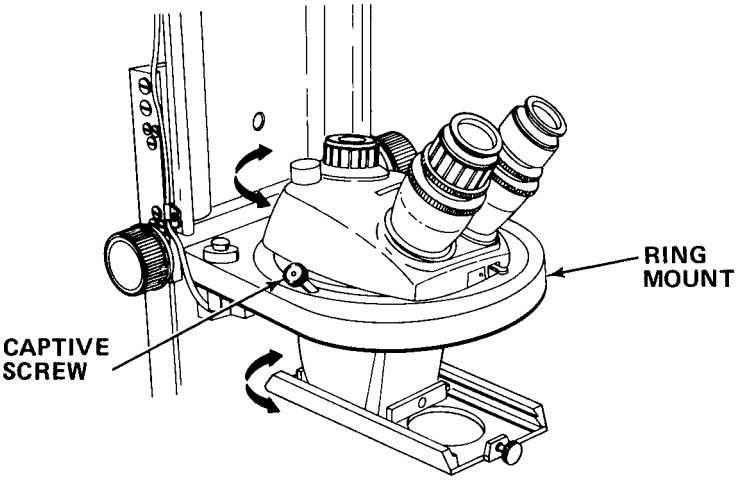
b. Loosen captive screw on light table ring mount until screws are clear of inside of ring.



NOTE

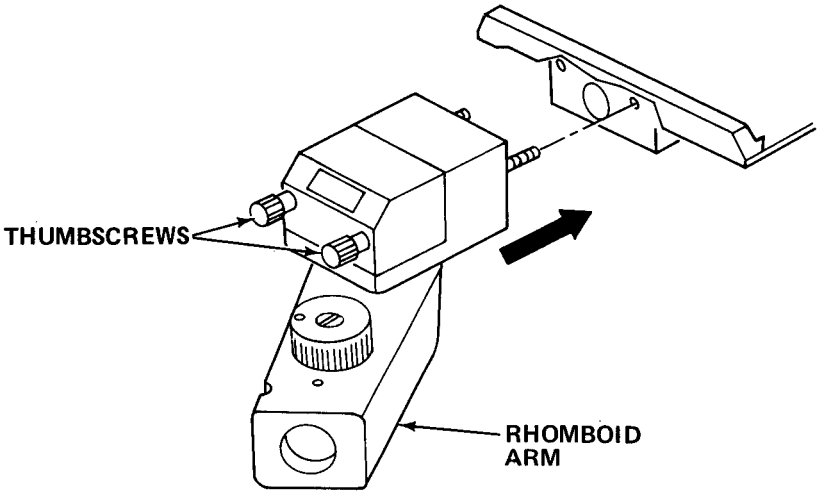
Adapter slide must be in forward position as shown and lockscrew tightened.

Insert pod in light table ring mount as shown and lower until shoulder is fully seated.



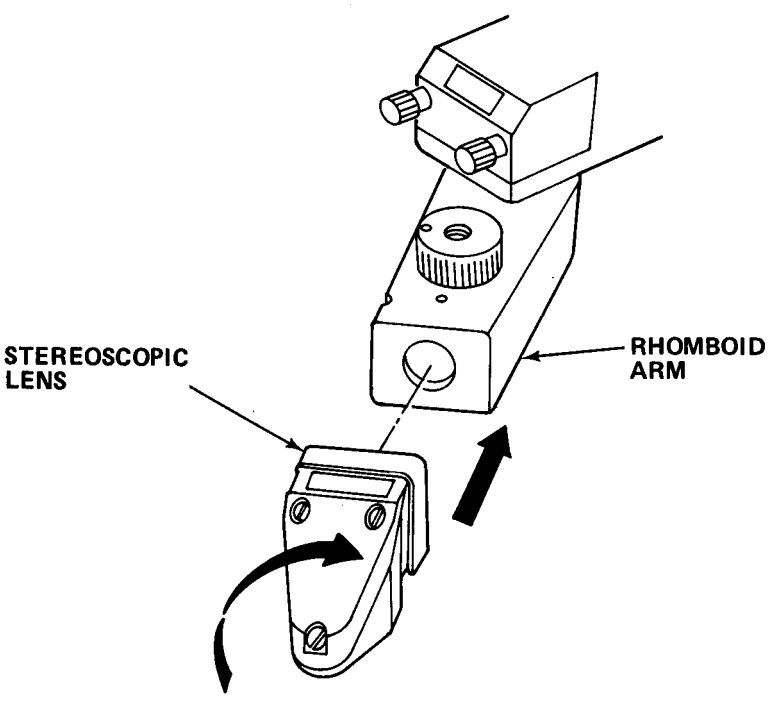
d. Tighten captive screws on light table ring mount finger tight.

Make certain stereoscope is firmly seated and will not rotate in ring mount base.

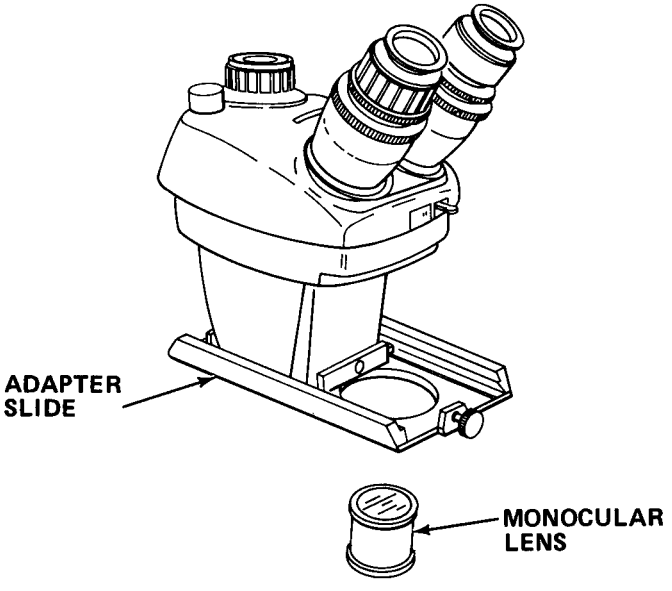


f. Install rhomboid arms on stereoscope.

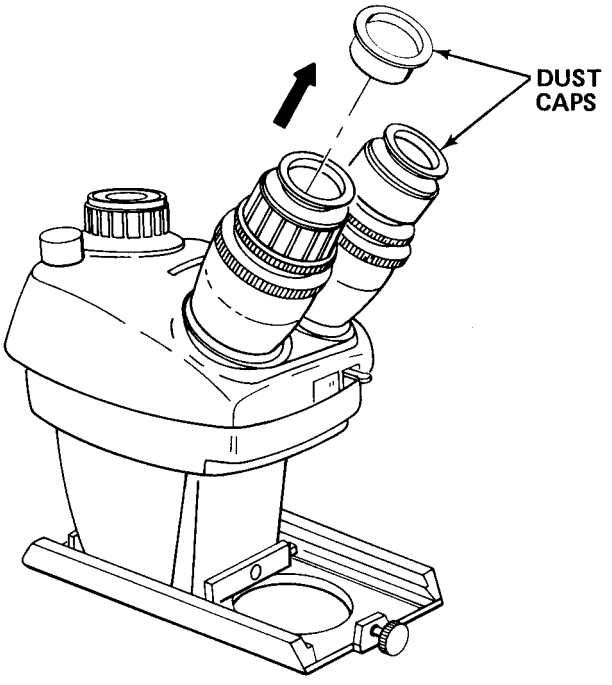
g. Tighten thumbscrews finger tight.



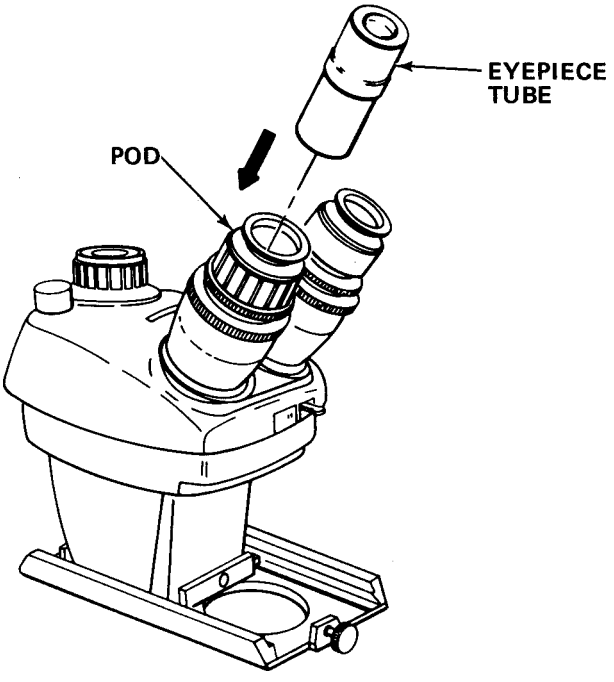
h. Install stereoscopic lens on rhomboid arms and twist to right to lock.



i. Install monocular lens into adapter slide. Screw lens in from the bottom.

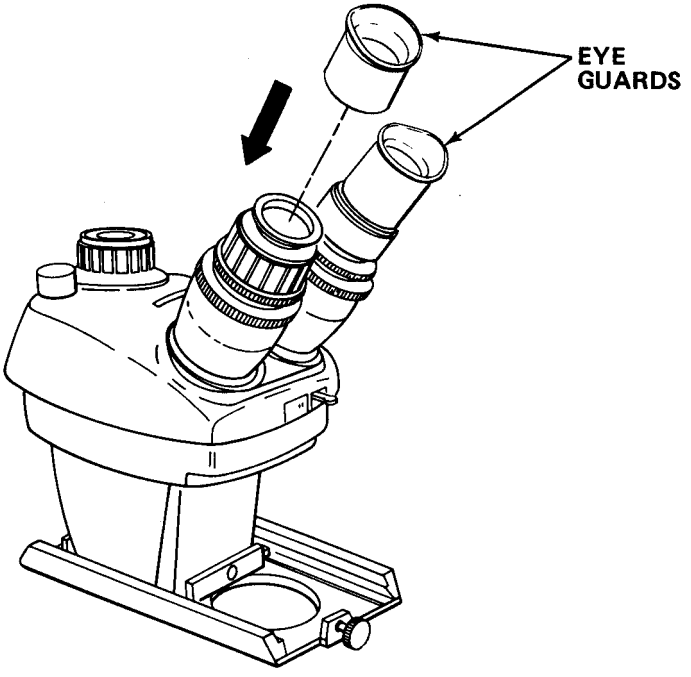


j. Remove protective dust caps from eyepiece holes.



k. Insert eyepiece tubes into pod.

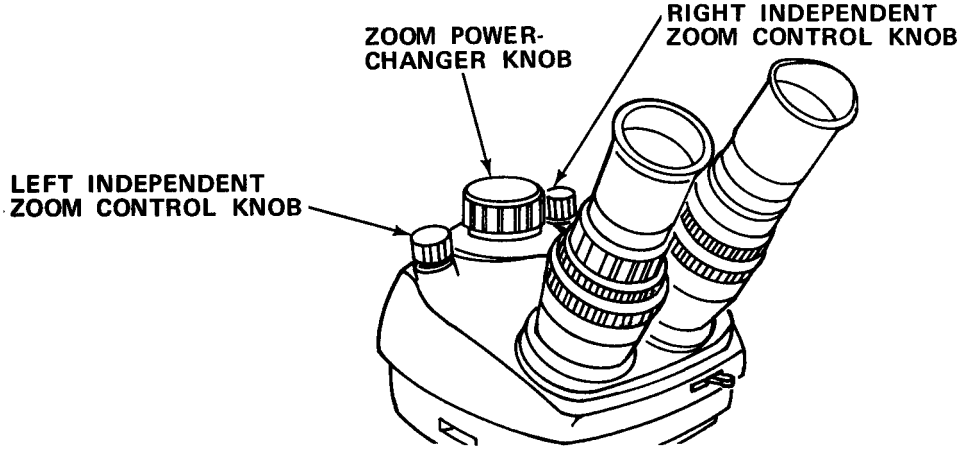
l. Press down gently until tubes are fully seated.



m. If required, install eye guards.

5-6.2 Operating Procedures.

a. Focus stereoscope.



(1) Place two photographs or film strips of same scale under stereoscope.

(2) Position photographs under rhomboid arms.

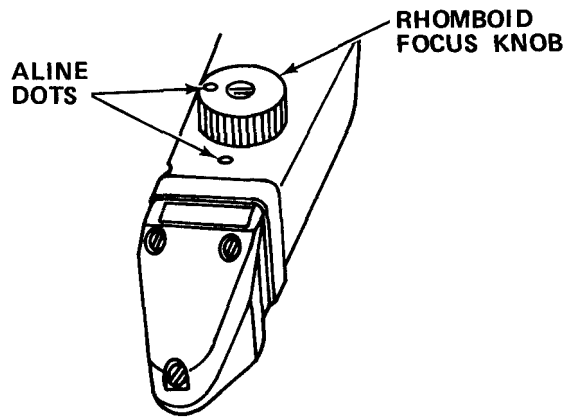
(3) Lift zoom power-changer until click is heard.

(4) Rotate left independent zoom control knob fully to right.

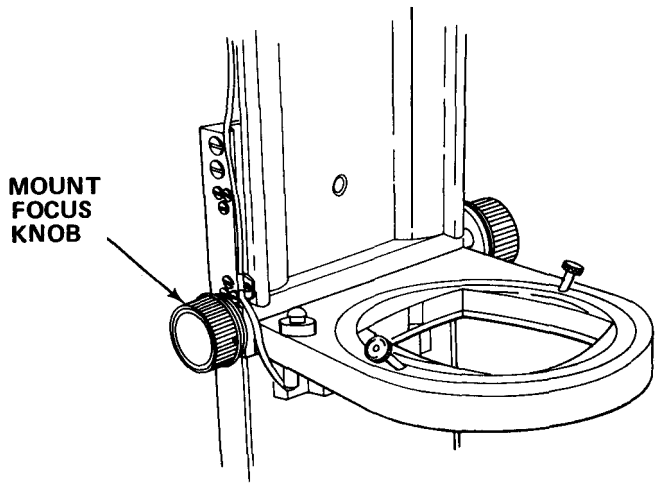
(5) Rotate right independent zoom control knob fully to left.

(6) Rotate zoom power-changer knob until 0.7 setting is alined with indicator mark.

(7) Push zoom power-changer knob down to engage right and left optical systems.

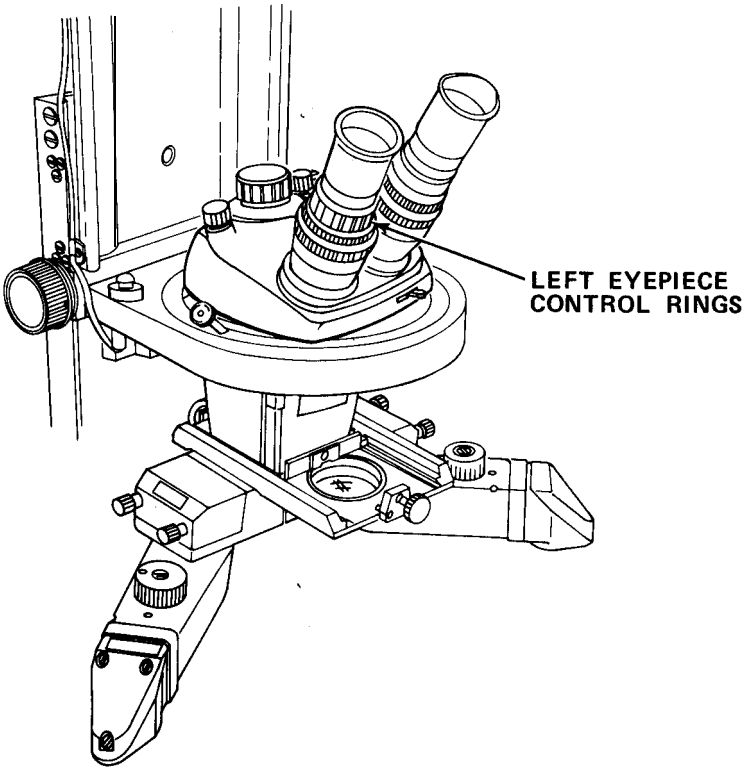


(8) Turn rhomboid focus knobs until black dots on knobs are alined with white dots on rhomboid arms.



(9) Close left eye and view right photograph.

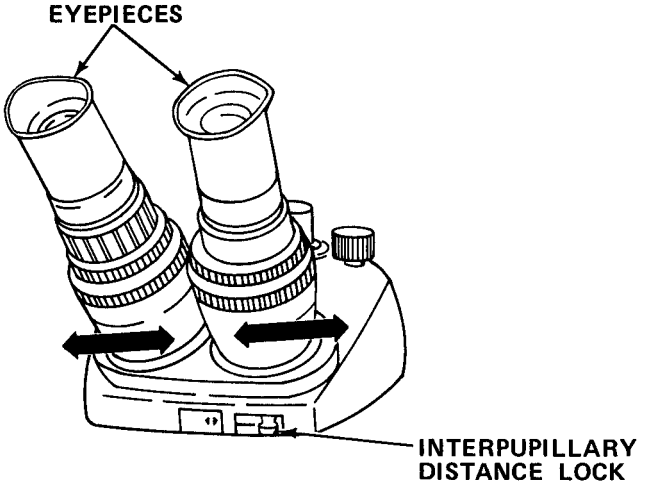
(10) Rotate mount focus knob until sharpest focus is obtained.



(11) Close right eye and view left photograph.

(12) Rotate left eyepiece focus control rings until sharpest image is obtained.

b. Set interpupillary distance.

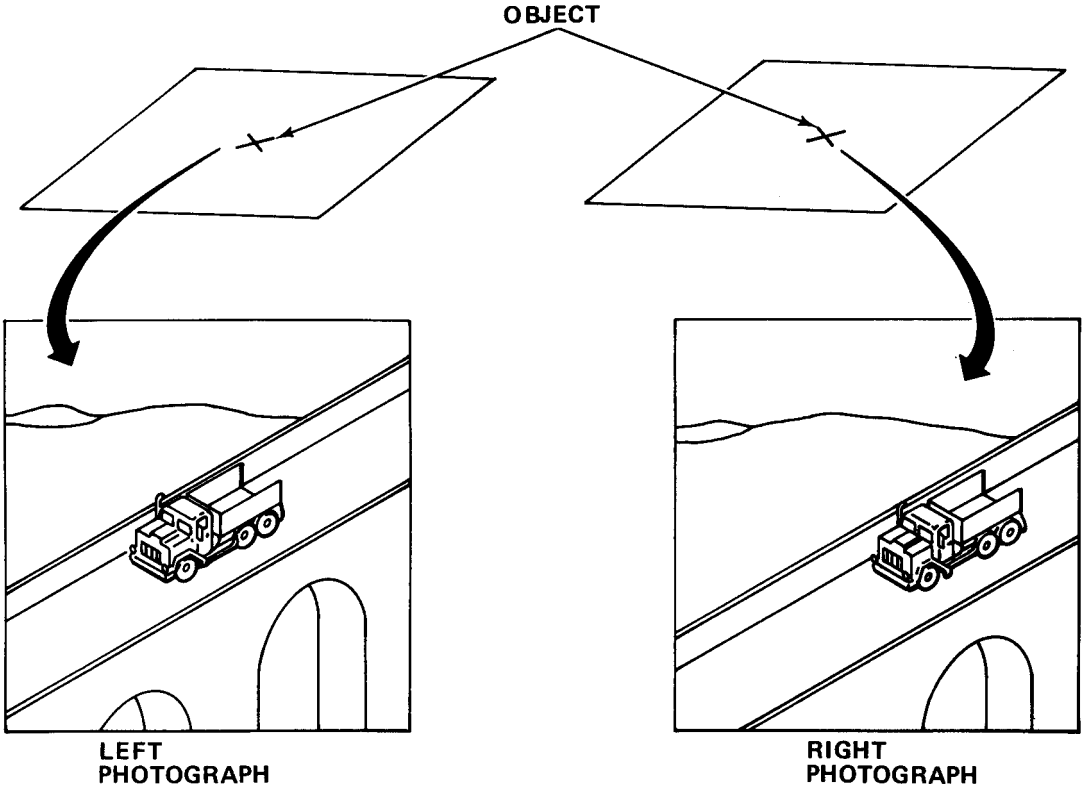


(1) Push interpupillary distance lock to right and release eyepieces.

(2) Move eyepieces toward or away from each other until full field of view can be seen in each eye without moving head.

(3) Push interpupillary distance lock to left to lock eyepieces.

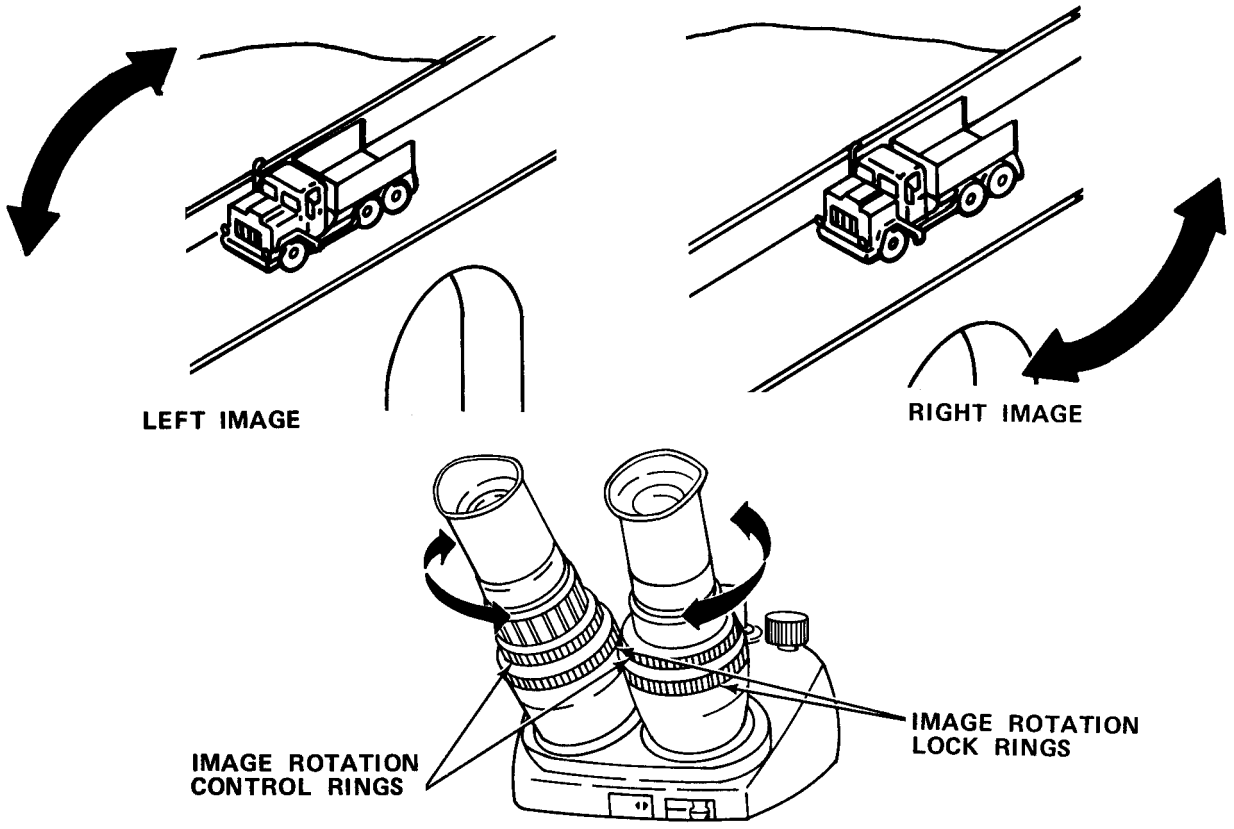
c. Adjust rhomboid arms.



(1) Move rhomboid arms so that:

(a) Object in left photograph is in center of left view field.

(b) Same object in right photograph is in center of right view field.



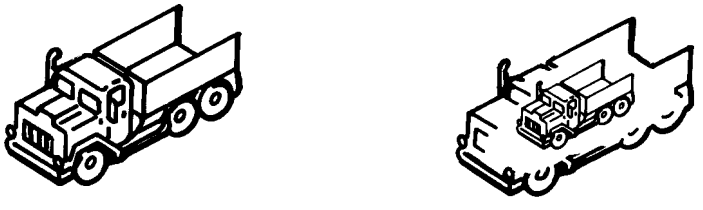
NOTE

Image rotation lock rings must be loosened to allow image rotation control rings to move.

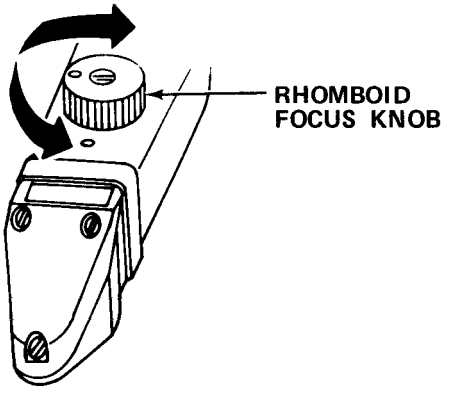
d. Rotate images until alined by turning image rotation control rings.

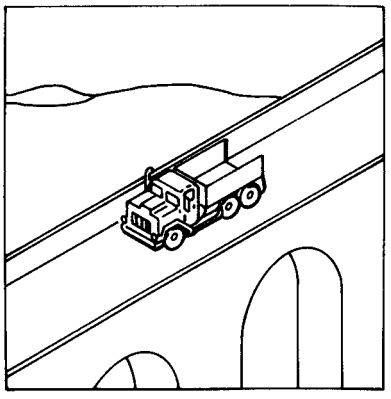
e. Change image size (if image sizes are different).

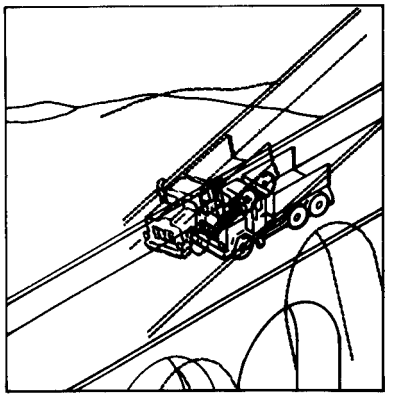
(1) Lift zoom power-changer knob.



(2) Adjust left and right independent zoom control knobs until right and left images are same size.

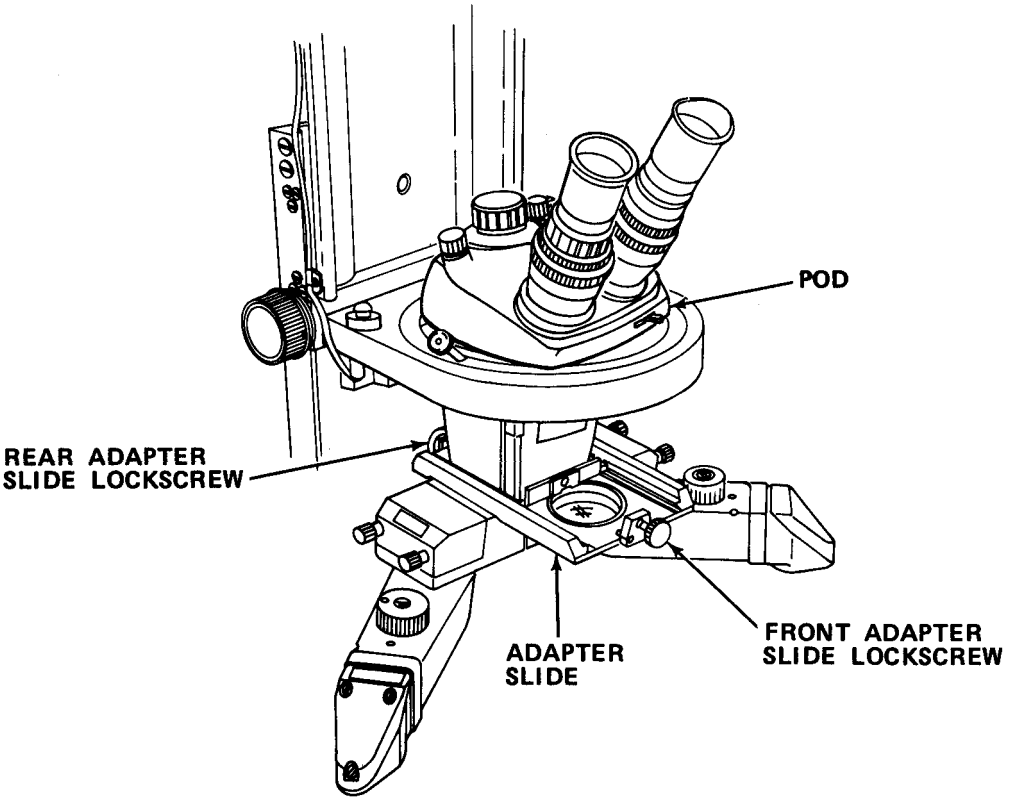






f. Merge images by adjusting rhomboid focus knobs to achieve optimum stereoscopic image.

g. Microscopic view of photograph.



(1) Loosen rear adapter slide lockscrew.

(2) Move adapter slide until front adapter slide lockscrew is alined with hole in pod.

(3) Tighten front adapter slide lockscrew with fingers.

(4) Operator's view will be of area directly under pod. Zoom power changer knob will vary magnification of image.

CAUTION

When stereoscope is not in use and is mounted on light table, it must be covered and mountings locked to prevent damage.

5-6.4 Prerparation for Movement.

CAUTION

- Internal components of stereoscope are precisely alined. Stereoscope must be protected from shock, jolting, and sudden or extreme temperature changes. When not in use, stereoscope should be stored in transport case.
- Do not touch optical glass surfaces with fingers. Fingerprints will smudge optical surfaces and may etch optical glass or glass coatings.

a. Remove rubber eye guards by pulling gently from eyepiece tubes.

b. Remove eyepiece tubes by pulling straight out from pod.

c. Place eyepiece tubes in storage containers.

d. Place plastic dust caps in eyepiece holes in pod.

e. Unscrew monocular lens and remove from adapter.

f. Store monocular lens in container.

g. Gently twist stereoscopic lenses to left and remove from rhomboid arms.

h. Store stereoscopic lenses in container.

CAUTION

To prevent dropping rhomboid arm on viewing surface, support each rhomboid arm with one hand as screws are loosened.

i. Unscrew two thumbscrews on each rhomboid arm, remove rhomboid arms and store.

j. Loosen mounting screws on mount until pod is free from mount.

k. Lift pod free from mount. and remove by tilting pod toward operator to clear adapter plate from mount as pod is removed.

1. Store pod in container.

5-7. OPERATION UNDER UNUSUAL CONDITIONS. Operation of the zoom stereoscope is limited to conditions that will not damage aerial roll film or the stereoscope.

Section III OPERATOR MAINTENANCE

5-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

5-9. TROUBLESHOOTING PROCEDURES.

a. The table lists the common malfunctions which you may find during the operation or maintenance of the zoom stereoscope, or its components. You should perform the test/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur nor all test or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective action, notify your supervisor.

Table 5-2. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. LEFT EYEPIECE FOCUSING SLEEVE IS NOT EFFECTIVE.
Step 1. Check to see if eyepiece is seated at bottom of eyepiece tube.
(a) If seated, proceed to step 2.
(b) Reseat eyepiece tube.
Step 2. Check to see if optical lenses are dirty.
(a) If lenses are dirty, clean.
(b) If lenses are clean, replace stereoscope.
2. STEREOPAIR CANNOT BE BROUGHT INTO FUSION.
Check to see if optical lenses are dirty.
(a) Clean optical lenses.
(b) Replace stereoscope.

5-10. MAINTENANCE PROCEDURES. There are no operator maintenance procedures assigned for this equipment.

Section IV ORGANIZATIONAL MAINTENANCE

5-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

5-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT. These items are not required at the organizational level of maintenance.

5-13. SERVICE UPON RECEIPT.

5-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

5-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

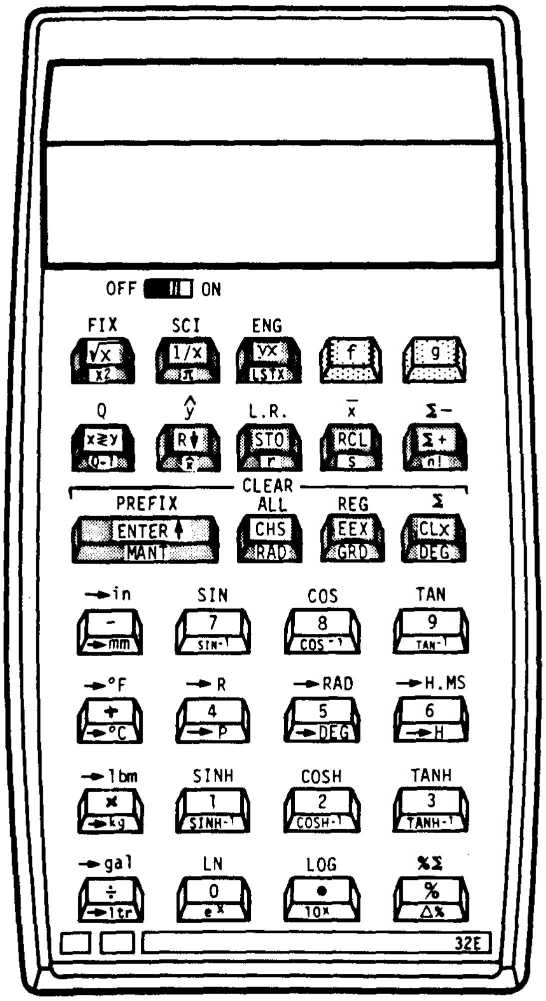
5-15. ORGANIZATIONAL TROUBLESHOOTING. There are no organizational troubleshooting procedures assigned for this equipment.

5-16. MAINTENANCE PROCEDURES. There are no organizational maintenance procedures assigned for this equipment

5-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing or shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

There are no direct/general support maintenance procedures assigned for this equipment.


OFF ON
FIX SCI ENG
f g
Q L.R. Σ-
x≷y R↓ STO RCL Σ+
CLEAR
PREFIX ALL REG Σ
ENTER↑ CHS EEX CLx
MANT RAD GRD DEG
→in SIN COS TAN
- 7 8 9
→mm
→°F →R →RAD →H.MS
+ 4 5 6
→°C →P →DEG →H
→lbm SINH COSH TANH
× 1 2 3
→kg
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÷ 0 • %
→ltr Δ%
32E

CHAPTER 6

POCKET CALCULATOR

Section I INTRODUCTION

6-1. GENERAL INFORMATION.

6-1.1 Scope.

a. Model Number and Equipment Name. Model HP-32E Pocket Calculator.

b. Purpose of Equipment. To perform mathematical calculations.

6-2. EQUIPMENT DESCRIPTION.

6-2.1 Equipment Characteristics, Capabilities, and Features. Performs mathematical calculations with the following capabilities and features.

a. Rechargeable battery pack,

b. AC operation.

c. Trigonometric functions.

d. Ten-digit display.

e. Automatic memory stack.

f. Fifteen storage registers.

g. Scientific notation.

h. Logarithmic functions.

i. Square root.

j. Fixed-point display.

k. Engineering display.

l. Automatic overflow and underflow.

m. Error display.

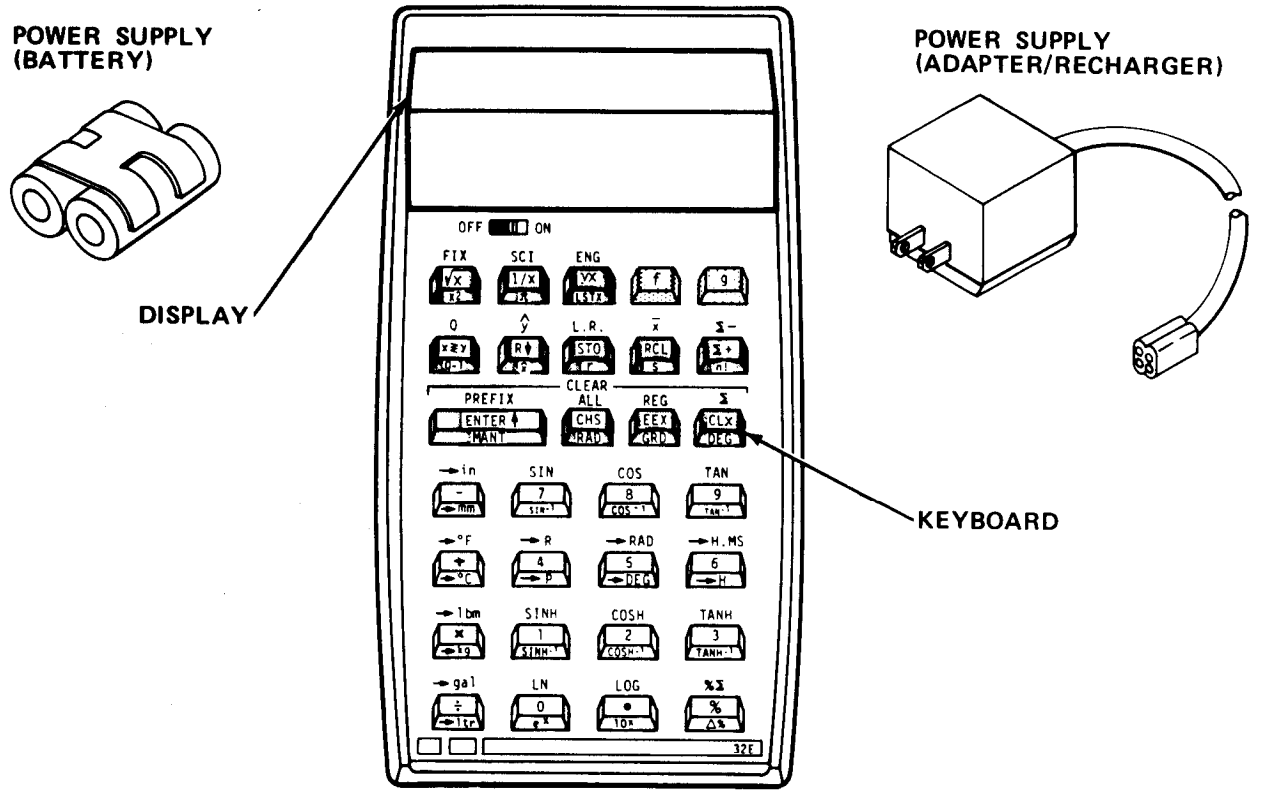
n. Key-selected metric conversions.

o. Self-Check.

6-2.2 Equipment Data.

Power Requirements	120 V, 60 Hz
Battery Pack:	
Recharge Time	9 hrs, maximum (calculator off)
	17 hrs, minimum (calculator on)
Operating Time	3 hrs, maximum

6-3. **TECHNICAL PRINCIPLES OF OPERATION.** The purpose of the HP-32E Calculator is to assist its user in the performance of complex or simple mathematics equations and consists of the following functional parts:



POWER SUPPLY. Power is provided to the calculator from either the battery pack or ac adapter/recharger. The battery pack consists of two rechargeable nickel cadmium batteries which give the calculator full portability. The adapter/recharger also provides power to the calculator when plugged into a power outlet. When battery pack is in need of recharging, raised decimal is turned on at the far left of the display. When raised decimal is displayed, there are 1 to 25 minutes of operating time left.

KEYBOARD. The keyboard is used to select functions and input numbers into the calculator. All keys, except ❑ and ❑ keys, perform three functions.

One function is indicated by the symbol on the flat surface of the key, a second by the symbol on the slanted key face, and a third by the symbol written above the key on the calculator case. Function printed on the flat face of the key is selected by pressing the key. Function printed above the key is selected by first pressing prefix key [f] and then the function key. The function printed on the slanted face of the key is selected by first pressing prefix key [❑] and then the function key.

DISPLAY, The display is the X-register of the automatic memory stack and provides a visual readout of latest numeric entry, operation result, or error messages.

MEMORY. Memory is divided into two parts; storage registers and automatic memory stack.

a. Storage registers. Storage registers are used to set aside numbers for recall in later calculations. Numbers are stored by first pressing [STO] followed by a number [0] thru [8] or a decimal point and a number [0] thru [5]. The number in displayed X-register is then copied into the selected register. Recalling a number is accomplished by first pressing [RCL] followed by a number [0] thru [8] or a decimal point and a number [0] thru [5]. The number that is in the selected register will be copied into the displayed X-register without any change to contents of that register. Storage registers R. through R. are used for accumulation of statistical data. Turning calculator off will clear (place zeros in) all storage registers.

b. Automatic memory stack. The automatic memory stack is used to store intermediate results during calculations. The stack consists of four registers designated X, Y, Z and T. The contents of X-register are constantly shown on the calculator display. Numbers are manually entered into the memory stack by pressing [ENTER↑] . During chain calculations (long equations), intermediate answers are automatically entered in the memory stack. Each new entry into the stack is first entered in the X-register and, with each additional entry, the stack rolls up one and the contents that were in the T-register before roll-up, are lost. The contents of the stack can be viewed by pressing [RCL] key four times. The contents of T-register are not lost because the stack forms a continuous loop, i.e., the contents of T-register are shifted to the Z-register; Z-register to Y-register; Y-register to X-register; and X-register to T-register. With intermediate answers stored in the stack, operations can be performed with these numbers by pressing the key of the desired operation.

Example: To calculate (3 x 5) + 2, press:

[3] (3 enters X-register.)

[ENTER↑] (3 is copied to Y-register.)

[5] (5 is entered in X-register; 3 stays in Y-register.)

[x] (5 is multiplied by 3; result, 15, is placed in X-register; Y-register becomes 0.)

[2] (15 moves to Y-register; 2 enters X-register.)

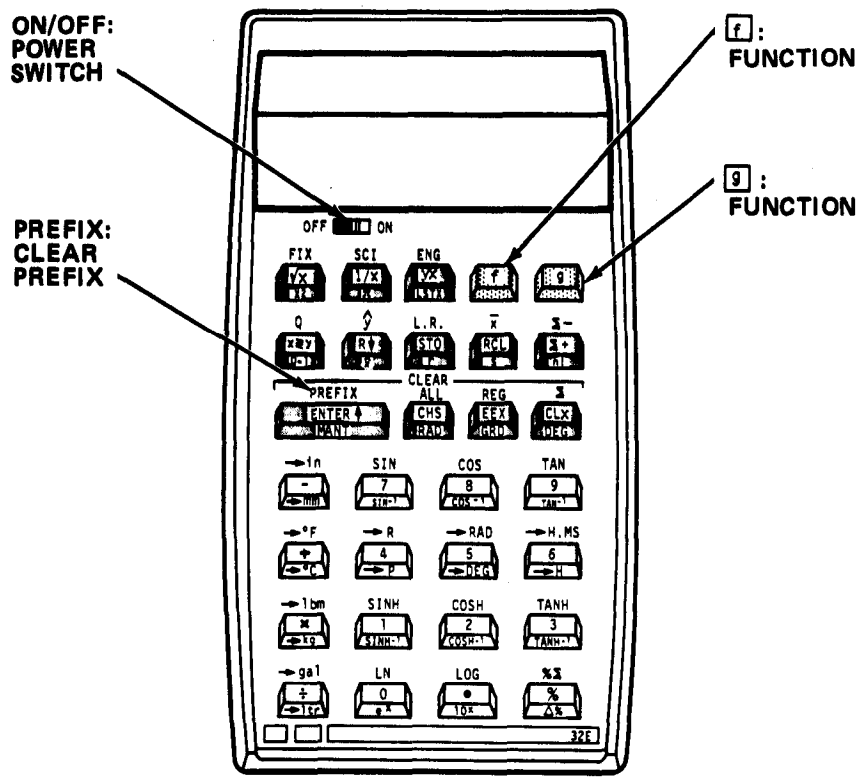
[+] (2 is added to 15; result, 17, is placed in X-register; Y-register becomes 0.)

Section II OPERATING INSTRUCTIONS

6-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.

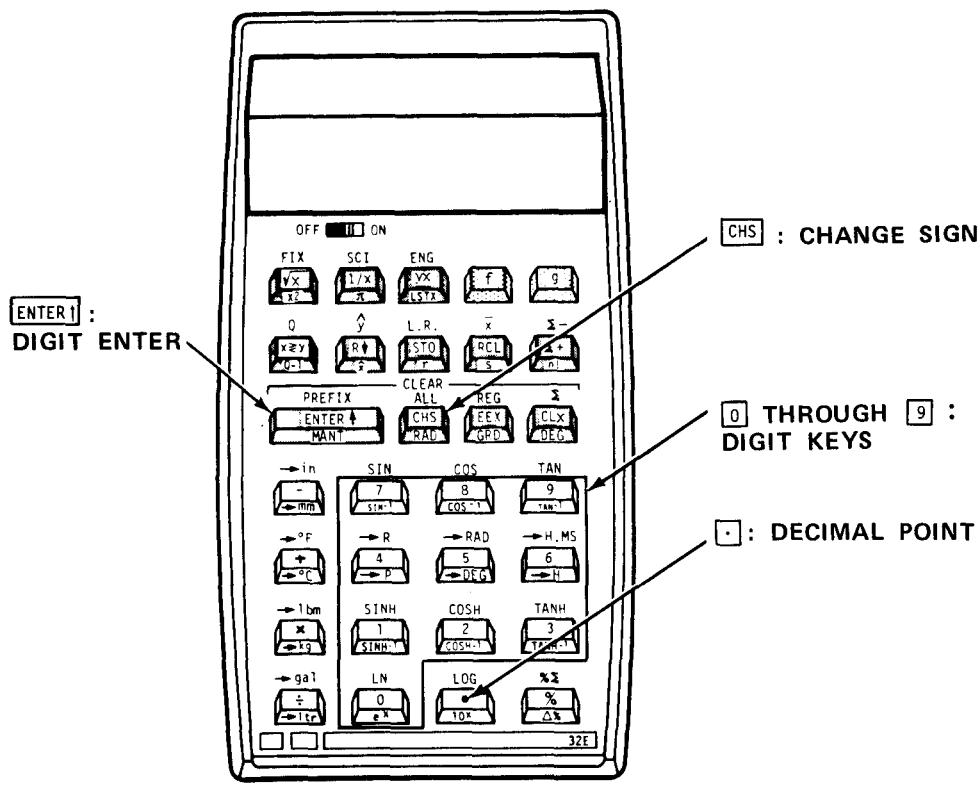
NOTE

Symbols on flat surface and slanted surface of keys are boxed. Symbols over keys are not boxed.



Key		Control or Indicator	Function
OFF	ON	Power Switch	Turns power on or off.
f		Function	Pressed before another key, it selects function printed above key.
g		Function	Pressed before another key, it selects function printed on slanted face of key.

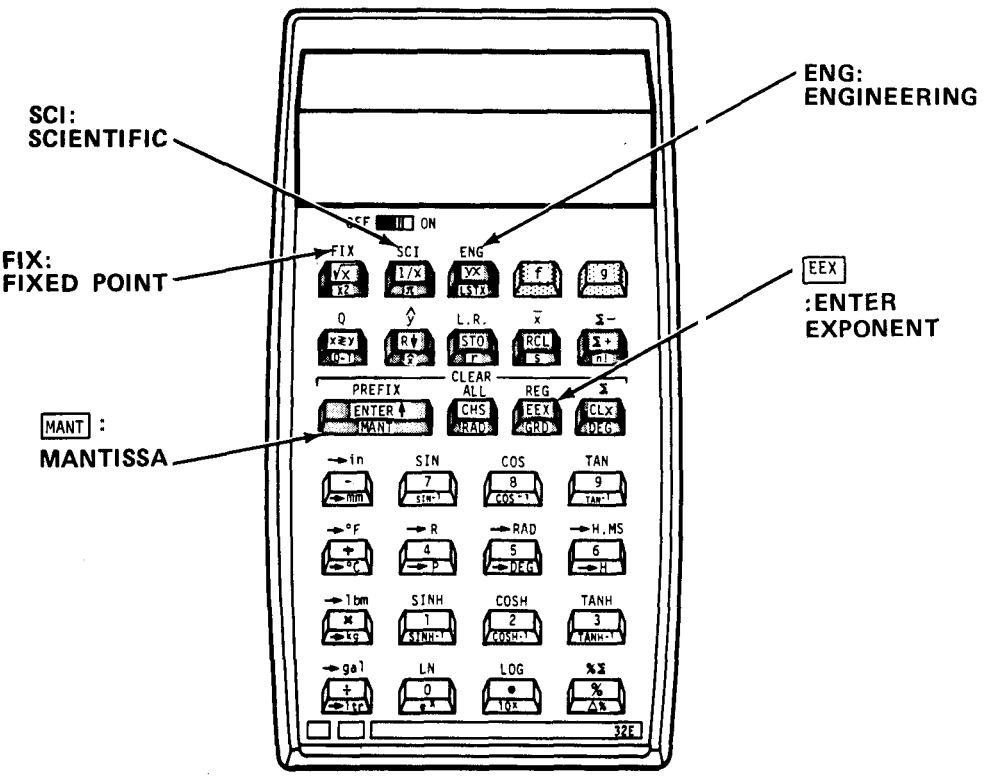
Key	Control or Indicator	Function
PREFIX	**Clear Prefix**	**Cancels the following key strokes or sequence of key strokes when pressed after each one:** [f], [g], [STO], [RCL], [STO] [.], [RCL] [.], [STO] [+], [STO] [-], [STO] [x], [STO] [÷], [STO] [+] [.], [STO] [-] [.], [STO] [x] [.], [STO] [÷] [.], FIX, SCI, ENG.



Digit Entry

[0] thru [9]	Digit Keys	Enters digits.
[.]	Decimal Point	Enters decimal point.

Key	Control or Indicator	Function
ENTER↑	**Digit ENTER**	Enters COPY of number displayed in X-register into Y-register of automatic memory stack. Pressing key also causes contents of Y-register to be shifted to Z-register and Z-register to the T-register. Contents of T-register are lost.
CHS	**Change Sign**	Changes sign of mantissa or exponent in display (X-register).

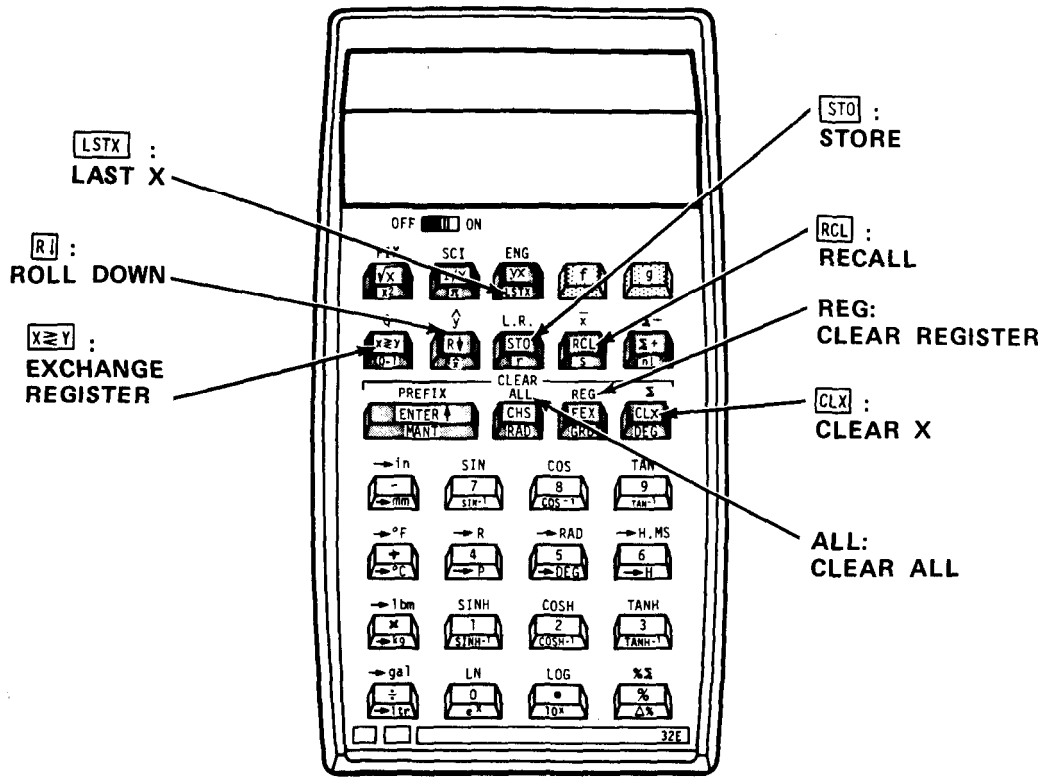


Display Control

EEX	**Enter Exponent**	After pressing, next numbers keyed in are exponents of 10.

Key	Control or Indicator	Function
FIX	Fixed Point	Followed by digit key, selects fixed point notation display. Digit entry designates number of digits to be displayed to the right of decimal point.
SCI	Scientific	Followed by the number key that specifies the number of decimal places the display will be rounded to.
ENG	Engineering	Followed by digit key, selects engineering notation display. Digit key specifies number of digits to be displayed to right of decimal point.
MANT	Mantissa	Temporarily displays all 10 digits of mantissa of number in X-register.

Key	Control or Indicator	Function

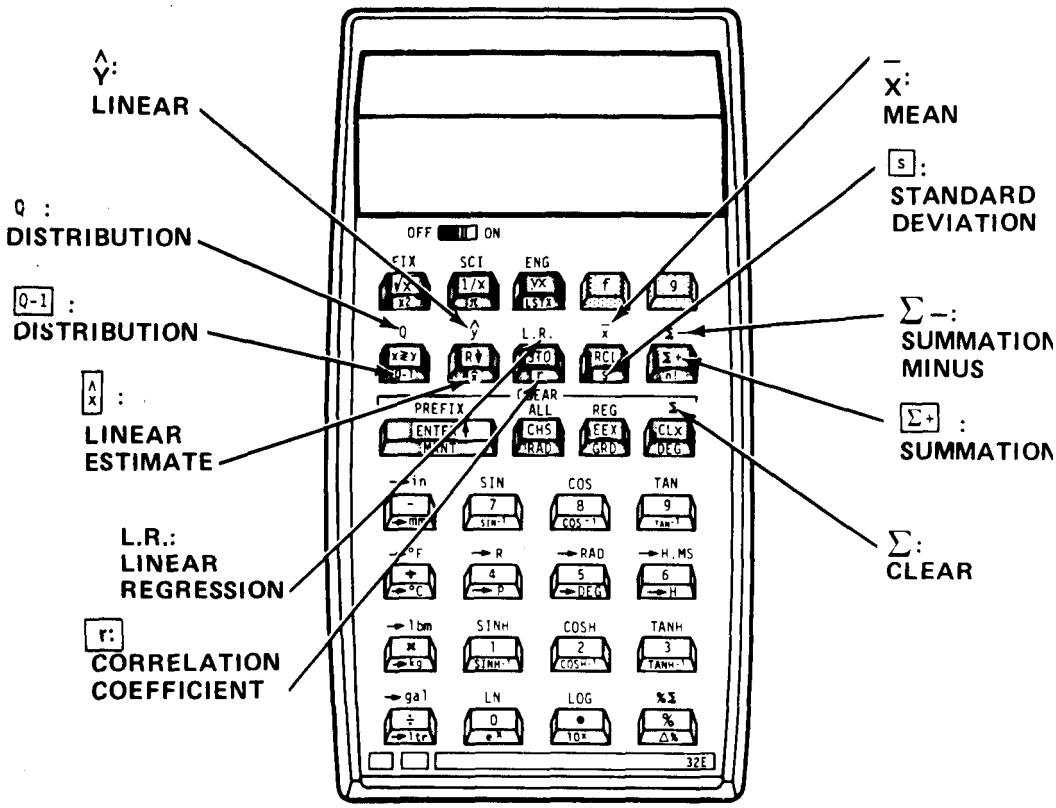


Number Manipulation

X≷Y	Exchange Register	Interchanges contents of X and Y-registers.
R↓	Roll Down	Rolls down contents of automatic memory stack for viewing in X-register without loss of data. When pressed, contents of X-register is shifted to T-register, T-register shifts to Z-register, Z-register shifts to Y-register, and Y-register advances to X-register for viewing.
CLX	CLEAR X	Clears contents of displayed X-register.

Key	Control or Indicator	Function
ALL	CLEAR ALL	Clears contents of memory stack and all storage registers.
STO	Store	Followed by digit key 0 through 8 or by a decimal point and a key ❑ through 5 , stores displayed number in that specified location. Al SO used to perform storage register arithmetic.
RCL	Recall	Followed by digit key ❑ thrumor by a decimal point and a digit key 0 thru 5, recalls value from specified storage register into the dis-displayed X-register.
REG	CLEAR Register	Clears contents of storage registers RO through R8. Contents of registers R.O thru R.5 are unaffected.
LSTX	LAST X	Recalls number displayed before previous operation back into displayed X-register.

Key	Control or Indicator	Function

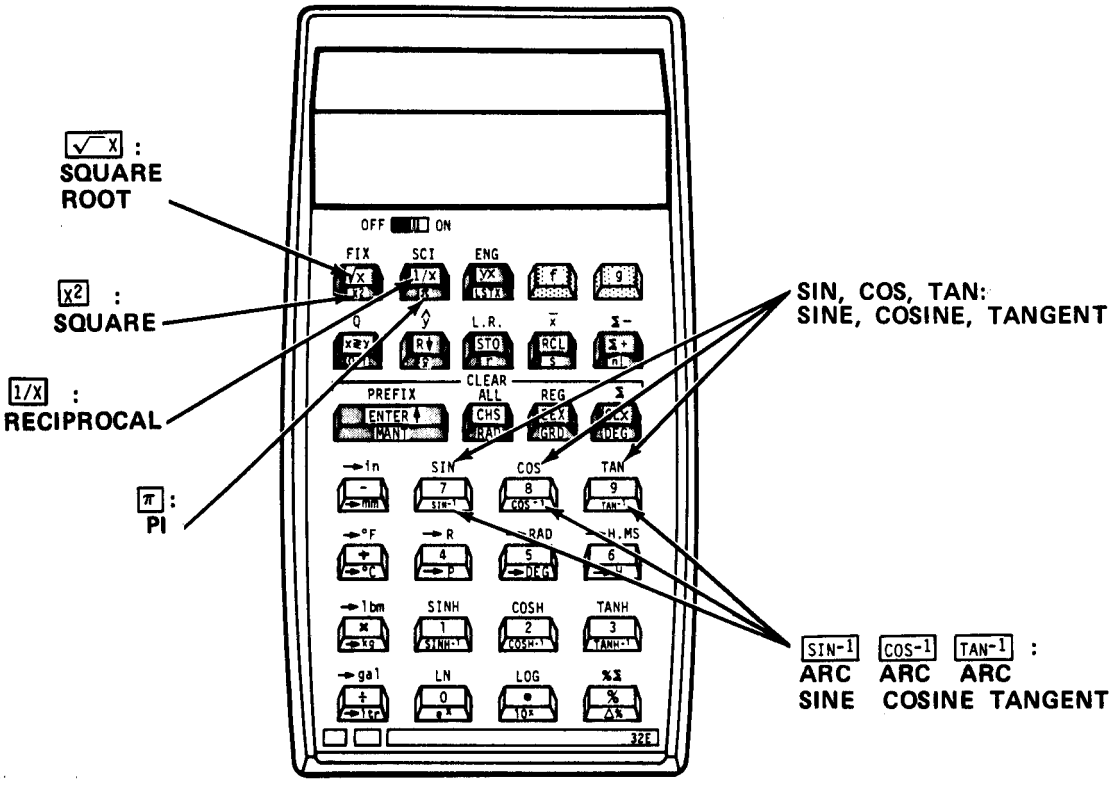


Statistical

Q	Distribution	Computes area under standard normal distribution curve to left of X.
Q-1	Distribution	Computes X, given area under standard normal distribution curve to left of X.
$\hat{Y}$	Linear Estimate	Computes estimated value of Y for a given value of X.
$\hat{X}$	Linear Estimate	Computes estimated value of X for a given value of Y.

Key	Control or Indicator	Function
L.R.	Linear Regression	Computes Y-intercept and slope for linear function approximated by X and Y values accumulated using Σ+. Value of slope is placed in Y-register.
r	Correlation Coefficient	Computes goodness of fit between X and Y values accumulated using Σ+ and linear function which they approximate.
$\bar{X}$	MEAN	Computes mean (average) of X and Y values accumulated using Σ+.
s	Standard Deviation	Computes standard deviations of X and Y values accumulated using Σ+.
Σ+	Summation	Accumulates statistical data in storage registers R.0 thru R.5 using numbers in X- and Y-registers.
Σ-	Summation Minus	Subtracts from statistical data in storage registers R.0 thru R.5 using numbers in X- and Y-registers.
Σ	CLEAR	Clears statistical storage registers R.0 thru R.5.

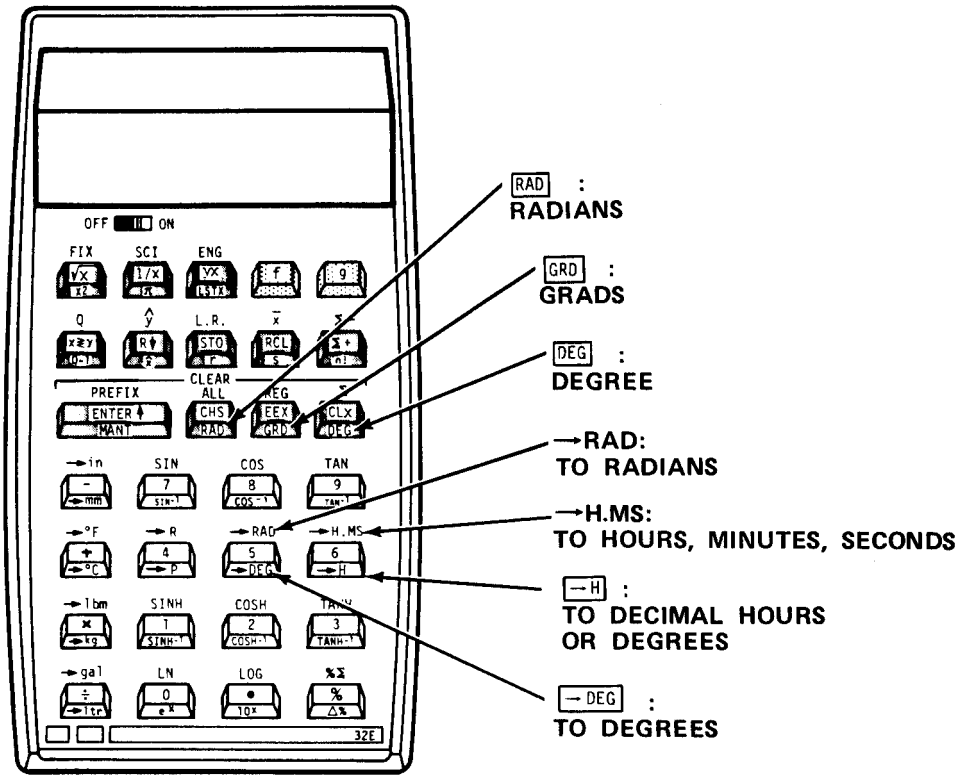
Key	Control or Indicator	Function



Mathematical

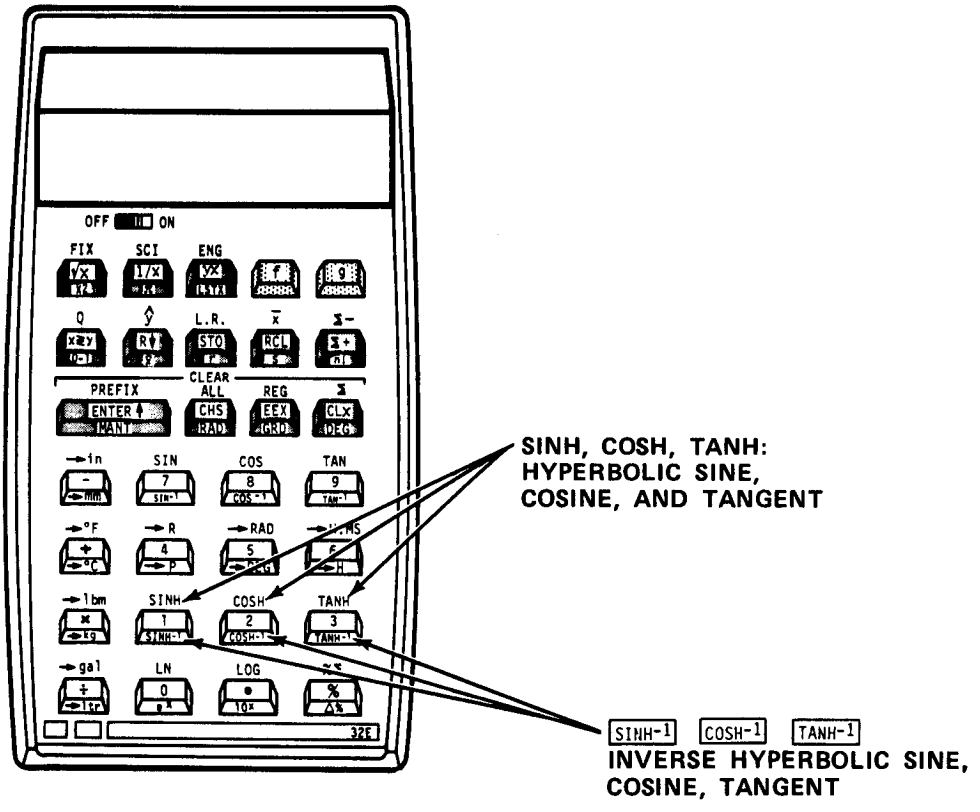
		Computes square root of number in displayed X-register.
x²	**Square**	Computes square of number in displayed X-register.
1/x	**Reciprocal**	Computes reciprocal of number in displayed X-register.
π	**pi**	Places value of pi (3.141592654) into X-register.
SIN, COS, TAN	**Sine, Cosine, Tangent**	Computes sine, cosine, or tangent of number in displayed X-register.

Key	Control or Indicator	Function
[SIN-1] , [COS-1] , [TAN-1]	Arc Sine, Arc Cosine, Arc Tangent	Computes arc sine, arc cosine, or arc tangent of number in displayed X-register.



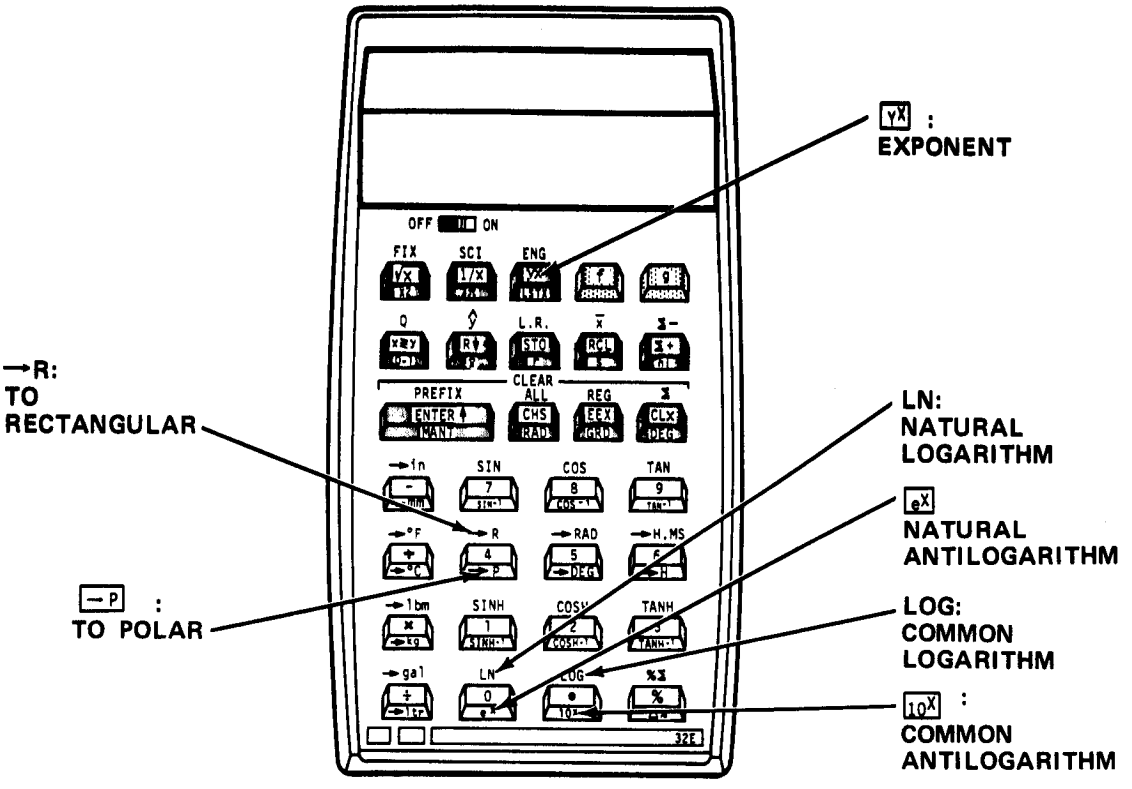
[RAD]	Radians	Sets radians mode for all trigonometric functions.
[GRD]	Grads	Sets grads mode for all trigonometric functions.
[DEG]	Degree	Sets decimal degrees mode for all trigonometric functions.
→RAD	To Radians	Converts decimal degrees to radians.
[→DEG]	To Degrees	Converts radians to decimal degrees.

Key	Control or Indicator	Function
→H.MS	To Hours. Minutes Seconds	Converts decimal hours or degrees to hours, minutes, seconds or degrees, minutes, seconds.
	To Decimal Hours or Degrees	Converts hours, minutes, seconds, or degrees, minutes, seconds to decimal hours or degrees.



Key	Control or Indicator	Function
	Hyperbolic	
SINH, COSH, TANH	Hyperbolic Sine, Cosine, and Tangent	Computes hyperbolic sine, hyperbolic cosine, or hyperbolic tangent of number in displayed X-register.
SINH-1 , COSH-1 , TANH-1	Inverse Hyperbolic Sine, Cosine, Tangent	Computes inverse hyperbolic sine, inverse hyperbolic cosine, or inverse hyperbolic tangent of number in displayed X-register.

Key	Control or Indicator	Function

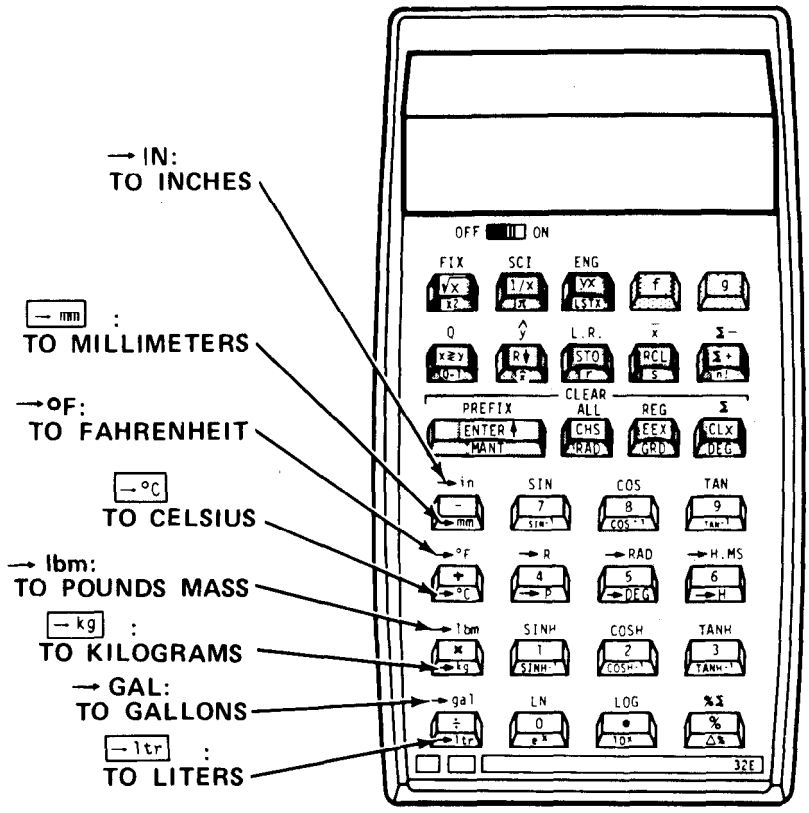


Logarithmic and Exponential

yX	Exponent	Raises number in Y-register to power of number in displayed X-register.
LN	Natural Logarithm	Computes natural logarithm (base e) of number in displayed X-register.
eX	Natural Antilogarithm	Raises e to power of number in displayed X-register.
LOG	Common Logarithm	Computes common logarithm (base 10) of number in displayed X-register.

Key	Control or Indicator	Function
10^X	Common Antilogarithm	Raises 10 to power of number in displayed X-register.
→P	To Polar	Converts rectangular (X,Y) or coordinates in X- and Y - registers into polar (R, θ) coordinates. Angle θ stored in Y-register.
→R	To Rectangular	Converts pol ar (R, θ) coordinates in X- and Y-registers into rectangular (x, Y) coordinates

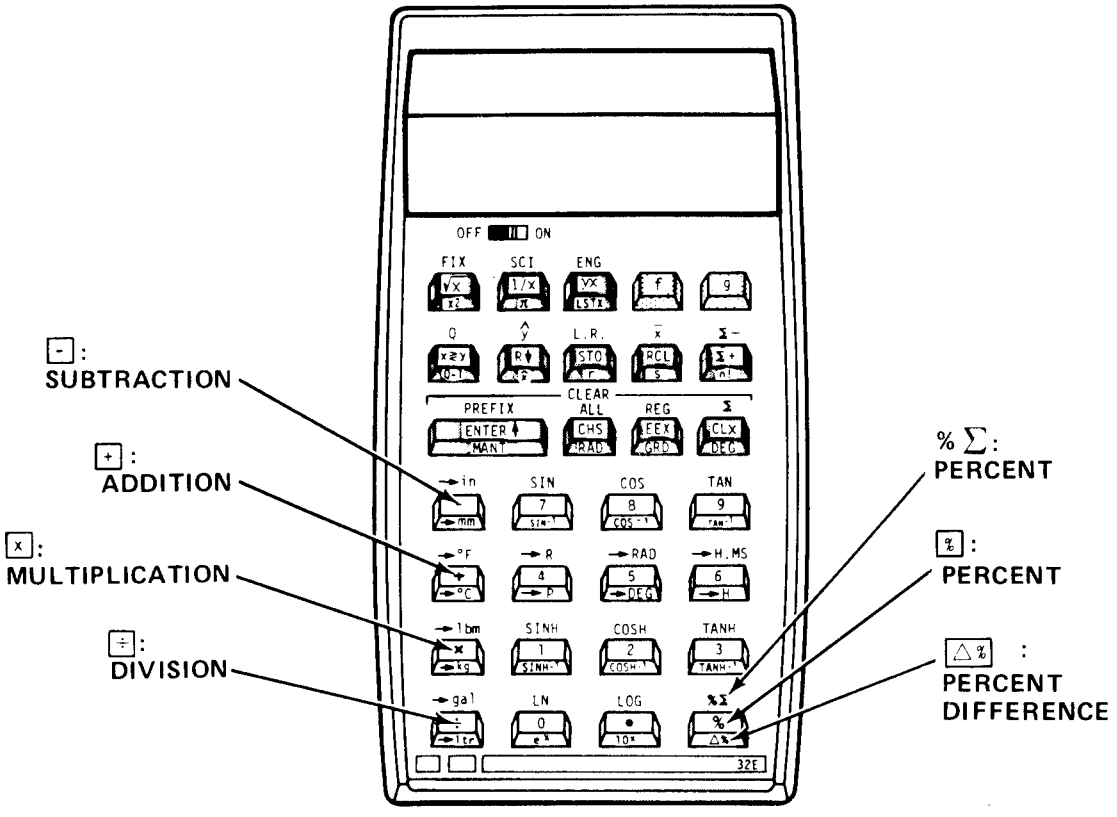
Key	Control or Indicator	Function



Metric Conversions

→in	To Inches	Converts millimeters to inches.
[→mm]	To Millimeters	Converts inches to millimeters.
→°F	To Fahrenheit	Converts degrees Celsius to degrees Fahrenheit.
[→°C]	To Celsius	Converts degrees Fahrenheit to degrees Celsius.
→lbm	To Pounds Mass	Converts kilograms to pounds mass.
[→kg]	To Kilograms	Converts pounds mass to kilograms.

Key	Control or Indicator	Function
→gal	To Gallons	Converts liters to gallons (U.S.).
−ltr	To Liters	Converts gallons (U.S.) to liters.



Percentage

%	Percent	Computes X-percent of Y.
△%	Percent Difference	Computes percent difference between number in Y-register and number in X-register.
%Σ	Percent	Computes percent that X is of the number (ΣX) in storage register $R_{.1}$.

Arithmetic Functions

+	Addition	Arithmetic functions
−	Subtraction	
×	Multiplication	
÷	Division	

6-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep) in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

6-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

g. Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows.

Item	Quantity
Cheesecloth (Item 6, Appendix E)	ar

Table 6-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

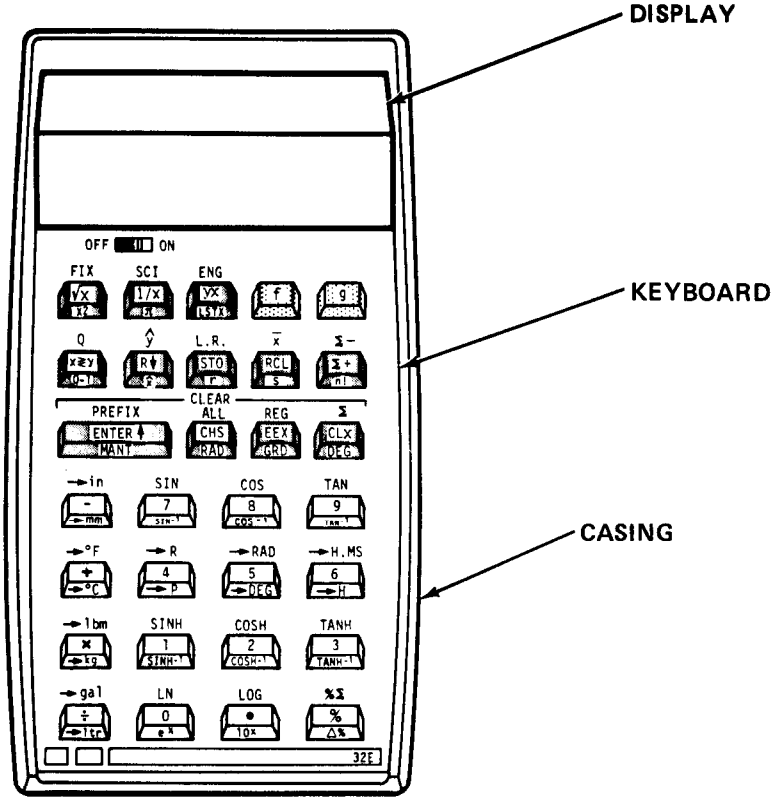
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED / PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		POCKET CALCULATOR	
1	B	INSPECT.	
			
		1. Check keyboard, display, and casing for cracks or breaks. Replace calculator if casing or display is cracked or broken.	Calculator keyboard, display, or casing is damaged.

Table 6-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before, D - During, A - After | W - Weekly, M - Monthly, Q - Quarterly | AN - Annually, S - Semiannually, BI - Biennially | (Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		POCKET CALCULATOR - Cont	
1	B	INSPECT. - Cont	
		2. Connect ac adapter/recharger to calculator and plug in. Turn calculator on. Press [STO] and [ENTER↑]. Display should indicate -8, 8, 8, 8, 8, 8, 8, 8, 8, 8.	Display does not show - 9, 8, 8, 8, B, 8, 8, 8, 8, 8.
		3. With battery pack in calculator, check operation to be sure calculator turns on. Remove battery pack and check for clean contacts. Wipe clean. Reinstall battery pack.	Battery pack is defective.
		4. Check power cord for kinks, frays or burns.	Power cord is damaged.

6-6. OPERATION UNDER USUAL CONDITIONS.

6-6.1 Operating Procedure.

a. Selecting a function.

NOTE

Most keys on the keyboard perform three functions. One function is indicated by symbol on top of key, second is above key, and third is on slanted face of key.

(1) To select a function printed on the key, press the key.

(2) To select a function printed above the key, press key ❑, then function key.

Example: To use LOG in calculation, enter number, ❑ then LOG.

(3) To select a function printed on slanted face of key, press [g] then function-key.

Example: To use [x^2] in calculations, enter number, ❑ then ❑.

b. Keying in numbers.

(1) Press keys corresponding to digits and decimal point in the order that they appear, reading from left to right.

(2) If needed, press [CHS] to make number negative.

c. One-number functions.

(1) Key in number on which operation is to be performed.

(2) Select desired function. Press key.

Example: To calculate square root of 5, press [5] and [√x].

Answer is 2.2361.

d. Two-number functions.

(1) Key in first number.

(2) Press [ENTER↑] to separate first number from second number.

(3) Key in second number.

(4) Select desired function. Press key.

Example: To calculate 5 percent of 35, press [3], [5], [ENTER↑], [5], and [%].

Answer is 1.75.

e. Exponent key [y^x].

NOTE

Exponent key is two-number function.

(1) Key in number for Y. Press I@ if it is negative.

(2) Press [ENTER↑] to send number to Y register in automatic memory stack.

(3) Key in number for X (exponent for Y).

(4) Press ❑ key.

Example: To calculate 5^3, press [5], [ENTER↑], [3], and [y^x].

Answer is 125.

f. Chain calculations.

NOTE

Calculator uses reverse polar notation (RPN) logic for chain calculations.

(1) If equation has parenthetical expressions, key in numbers and perform function in first parenthesis. Key in first number, press [ENTER↑] , key in second number, and press function key for that operation.

(2) Key in numbers and perform function in second parenthesis. Key in first number, press [ENTER↑] , key in second number, then press function key for that operation.

(3) Press function key for operation indicated between parentheses.

Example: To calculate (3 x 4) x (5 + 6), press

[3], [ENTER↑], [4], and [x]
[5], [ENTER↑], [6], and [+]
[x]; answer is 132.

9. Operations with powers of 10.

(1) Key in number being multipl ied by power of 10. Press [CHS] if number is negative.

(2) Press [EEX] .

(3) Key in exponent (power) of 10. Press [CHS] if exponent is negative.

(4) Press [ENTER↑] , and key in exponent.

(5) Press [x] .

Example: To multiply 15.6×10^{12} by 25 press

[1], [5], [.], [6], [EEX], and [12]
[ENTER], [25], and [x]; answer is 3.9000×10^{14}.

h. Storage (memory) register arithmetic.

NOTE

This procedure performs two-number arithmetic functions on number stored in storage register. The displayed X-register is the second number.

(1) Press [STO] .

(2) Press appropriate function key [+], [-], [x], or [÷] .

(3) Press [0] through [8] or, [.][0] through [.][5] , indicating on which register function will be performed.

Example: pressing STO , x , and ❑ multiplies value of (displayed) X-register by contents of storage (memory) register 1. The answer is placed into storage (memory) register 1.

NOTE

Value of X-register will not be changed.

i. Clearing storage (memory) register.

(1) To clear single storage (memory) register, press ❑ , STO , and location of register to be cleared.

Example: To clear register 2, press 0 , STO , and 2 .

(2) To clear registers 0 through 8, press f and REG. To clear registers 0 through 5, press f and . . to clear all registers (including the automatic memory stack) press f and ALL.

j. Trigonometric functions.

(1) Enter or calculate value of X, number on which trigonometric function is to be performed.

(2) Press g key.

(3) Press DEG , RAD , or GRD to select measurement for answer (degrees, radians, or grads).

(4) Press ❑ key.

(5) Press needed function (SIN, COS, TAN) key.

Example: To calculate sine 35 , press 3 , 5 , g , DEG , f , and SIN . Answer is 0.5736.

k. Polar/rectangular coordinate conversion.

(1) Convert from rectangular (X, Y) to polar coordinates.

NOTE

Value for Y is always keyed in first.

(a) Key in value of Y.

(b) Press ENTER↑ .

(c) Key in value of X.

(d) Press [g] then key in [DEG] , [RAD] , or [GRD] to select measurement for answer (degrees, radians, or grads).

(e) Press [g] and [→P] to get R (magnitude). Press [x≷y] to get angle in radians.

Example: To convert rectangular coordinates 4, 3 to polar with angle in radians, press

[3] , [ENTER↑] , and [4]
[g] and [RAD]
[g] and [→P] ;answer is 5.
[x≷y] ; answer is .64.

(2) Convert from polar to rectangular coordinates.

(a) Key in angle in radians.

(b) Press [ENTER↑] .

(c) Key in value of R (magnitude).

(d) Press [g] then key in [DEG] , [RAD] , or [GRD] to select measurement of angle (degrees, radians, or grads).

(e) Press [g] , R to get X. Press [x≷y] to get Y.

Example: To convert polar coordinates 5 and .64 to rectangular, press

[·] , [6] , [4] , [ENTER↑] , and [5]
[g] and [RAD]
[g] and [→R] : answer is 4.01.
[x≷y] : answer is 2.986.

1. Statistical functions.

(1) Accumulations.

(a) Pressing [Σ+] key computes sums and products of the values in the X- and Y-registers. Results are automatically accumulated in storage registers R_0 through R_5. Before starting to calculate accumulations with a new set of x and y values, clear registers by pressing [f] REG.

Key y value into X-register.

Press [ENTER↑] to raise y value into Y-register.

Key x value into X-register.

Press [Σ+] .

b. If statistical problem involves only one variable (x), clear storage registers R.0 through R.5 and Y-register. Press [f], [Σ], and [ENTER↑].

Key number into X-register.

Press [Σ+].

NOTE

Unlike storage register arithmetic, the accumulation operation allows over flows (i.e., number whose magnitudes are greater than 9.99999999 x 10) in storage registers R.0 through R.5 without indicating Error 1 in the display.

c* To use any of the accumulations, recall contents of desired storage register into displayed X-register by pressing [RCL] [.] followed by the number of the register. If this is done immediately after pressing [Σ+] or [Σ-], the accumulation recalled is written over the number of data pair entries (n) in the display. To use both Σx and Σy press [RCL] [Σ+]. This simultaneously copies Σx from R.1 into displayed X-register and Σy from R.3 into Y-register. If this is done immediately after pressing [Σ+], [Σ-], [CLX], or [ENTER↑], the number in the Y-register is first lifted into the Z-register. Otherwise, the numbers in the X- and Y-registers are first lifted into Z- and T- registers, respectively.

Example: To find Σx, Σx^2, Σy, Σy^2, and Σxy for the paired values of x and y listed below, press

y	7	5	9
x	5	3	8

Keystrokes	Display	
❑ CLEAR Σ	0.0000	Clear statistical storage registers. (Display shown assumes no results remain from previous calculations.)
[7] [ENTER↑]	7.0000	
[5] [Σ+]	1.0000	First pair is accumulated: n=1
[5] [ENTER↑]	5.0000	
[3] [Σ+]	2.0000	Second pair is accumulated: n=2
[9] [ENTER↑]	9.0000	
[8] [Σ+]	3.0000	Third pair is accumulated: n=3

Keystrokes	Display	
RCL . 1	16.0000	Sum of x values from register R.1
RCL . 2	98.0000	Sum of squares of x values from register R.2
RCL . 3	21.0000	Sum of y values from register
RCL . 4	155.0000	Sum of squares of y values from register R.4
RCL . 5	122.0000	Sum of products of x and y values from register R.5
RCL . 0	3.0000	Number of entries (n=3) from register R.O

(2) Deleting and correcting data.

(a) If an incorrect value is keyed in and Σ+ has not yet been pressed, press CLX and key in correct value.

(b) To change one of the values, or if after pressing ❑ one of the values was erroneous, correct the accumulations by using Σ- (summation minus) key as follows:

Key incorrect data pair into X- and Y-registers. LSTX can be used to return a single incorrect data value to displayed X-register.

Press f Σ- to delete incorrect data.

Key in correct values for x and y. If one value of an (X, Y) data pair is incorrect, both values must be deleted and reentered.
Press Σ+.

Example: If last data pair (8, 9) in previous example should have been (8, 6), correct the accumulation as follows, press

Keystrokes	Display	
9 ENTER↑	9.0000	Incorrect y value is entered again.
8	8.	Correct x value is entered again.
f Σ-	2.0000	Number of entries (n) is now TWO .

Keystrokes	Display	
6 ENTER↑	6.0000	Correct y value is entered.
8	8.	x value is entered again.
Σ+	3.0000	Number of entries is again three.

(3) Mean. Pressing $\hat{x}$ computes the arithmetic mean (average) of x and y values accumulated in registers R.1 and R.3 respectively.

Pressing f $\hat{x}$ causes the following operations to be performed.

The contents of the stack registers are lifted just as they are when pressing RCL .

The mean of the x values ($\hat{x}$) is calculated using data accumulated in registers R_1 (Σx) and R.0 (n). The resulting value for x appears in displayed X-register.

The mean of y values ($\hat{y}$) is calculated using data accumulated in registers R.3 (Σ y) and R.0 (n).

The resulting value for y is available in Y-register of stack.

Example: Below is a chart of daily high and low temperatures for a winter week. To find average high and low temperatures for week selected, press

	Sun	Mon	Tues	Wed	Thurs	Fri	Sat
High	6	11	14	12	5	-2	-9
Low	-22	-17	-15	-9	-24	-29	-35

Keystrokes	Display	
f CLEAR Σ+	0.0000	Statistical registers cleared. (Display shown assumes no results remain from previous calculations.)
6 ENTER↑ 22	22.	
CHS Σ+	1.0000	Number of data pairs (n) is now 1.
11 ENTER↑ 17	17.	
CHS Σ+	2.0000	Number of data pairs (n) is now 2.
14 ENTER↑ 15	15.	

Keystrokes	Display	
CHS Σ+	3 .0000	
12 ENTER↑ 9	9.	
CHS Σ+	4.0000	
5 ENTER↑ 24	24.	
CHS Σ+	5.0000	
2 CHS ENTER↑	-2.0000	
29 CHS Σ+	6.0000	
9 CHS ENTER↑	-9.0000	
35 CHS Σ+	7.0000	Number of data pairs (n) is now 7.
f x̂,ȳ	-21.5714	Average low temperature.
x≷y	5.2857	Average high temperature.

(4) Standard deviation.

(a) Pressing s computes the standard deviation (a measure of dispersion around the mean) of accumulated data.

(b) When g s is pressed:

The contents of stack registers are lifted just as they are when pressing RCL Σ+ .

The standard deviation of x values (s_x) is calculated using data accumulated in registers R.2 (2), R.1 ($\sum$), and R.0 (n). The result appears in displayed X-register.

The standard deviation of y values (s_y) is calculated using data accumulated in registers R.4 (y2), R.3 (y), and R.0 (n). The result appears in Y-register.

Example: To determine the standard deviation of the following test scores: 79, 94, 68, 86, 82, 78, 83, and 89, press

Keystrokes	Display	
❑ CLEAR ALL	0.0000	Clear statistical registers and Y-register for new, one-variable problem.

Keystrokes	Display	
79 Σ+	1.0000	First score is entered. Since this problem involves only one variable, y-value does not have to be entered into Y-register using the ENTER↑ key.
94 Σ+	2.0000	Display shows number of scores entered so far.
68 Σ+	3.0000	
86 Σ+	4.0000	
82 Σ+	5,0000	
78 Σ+	6.0000	
83 Σ+	7.0000	
89 Σ+	8.0000	Last score in sample.
g s	7.8365	Standard deviation of test scores.

(5) Linear regression. Linear regression is a statistical method for finding a straight line that best fits a set of data points, thus providing a relationship between two variables.

(a) To use the linear regression function, first key in a series of data points using the Σ+ key. Then press f L.R.

(b) When f L.R. if pressed:

The contents of the stack registers are lifted just as they are when you press RCL Σ+.

The slope (A) of the least squares line of the data is available in the Y-register of the stack.

The y-intercept (B) of the least squares line of the data appears in the displayed X-register of the stack.

(c) To use value for A or to bring it into displayed X-register, simply shift stack contents with the x≷y key.

Example: An oil company wishes to know the slope and y-intercept of a least squares line for the consumption of motor fuel in the United States against time since 1945. It knows the data given in the table.

Motor Fuel Demand (Millions of Barrels)	696	994	1330	1512	1750	2162	2243	2382	2484
Year	1945	1950	1955	1960	1965	1970	1971	1972	1973

Solution: Key the data into the calculator using the Σ+ key, then press f L.R.

Keystrokes	Display	
f CLEAR Σ+	0.0000	Clear statistical storage registers. (Display shown assumes no results remain from previous calculations).
696 ENTER↑	696.0000	
1945 Σ+	1.0000	
994 ENTER↑	994.0000	
1950 Σ+	2.0000	
1330 ENTER↑	1,330.0000	
1955 Σ+	3.0000	
1512 ENTER↑	1,512.0000	
1960 Σ+	4.0000	
1750 ENTER↑	1,750.0000	
1965 Σ+	5.0000	
2162 ENTER↑	2,162.0000	
1970 Σ+	6.0000	
2243 ENTER↑	2,243.0000	
1971 Σ+	7.0000	
2382 ENTER↑	2,382.0000	
1972 Σ+	8.0000	
2484 ENTER↑	2,484.0000	
1973 Σ+	9.0000	All data pairs have been keyed in.

Keystrokes	Display	
[f] L.R.	-118,290.6295	The y-intercept of the line.
[x≷y]	61.1612	Slope of the line.

(6) Linear estimation. With data accumulated in registers R.0 through R.5 a predicted value for y (denoted y) can be calculated by keying in a new value for x and pressing [f] $\hat{y}$. A predicted value for x (denoted x) can be calculated by keying in a new value for y and pressing [g] $\hat{x}$.

Example: With data intact from previous example in registers R.0 through R.5 to predict demand for motor fuel for the years 1980 and 2000, key in new x values and press [f] $\hat{y}$. To determine the year that the demand for motor fuel is expected to pass 3,500 million barrels, key in 3,500 (new value for y) and press [g] $\hat{x}$.

Keystroke	Display	
1980 [f] $\hat{y}$	2,808.6264	Predicted demand in millions of barrels for the year 1980.
2000 [f] $\hat{y}$	4,031.8512	Predicted demand in millions of barrels for the year 2000.
35 [g] $\hat{x}$	1,991.3041	The demand is expected to pass 3,500 million barrels during 1992.

(7) Correlation coefficient. Both linear regression and linear estimation presume that the relationship between x and y data values can be approximated, to some degree, by a linear function (a straight line). [r] (correlation coefficient) can be used to determine how closely the data "fits" a straight line. The correlation coefficient can range from r = + 1 to r = - 1. At r = + 1, data falls exactly onto a straight line with positive slope. While at r = -1, data falls exactly onto a straight line with negative slope. At r = 0, data cannot be approximated by a straight line.

Example: To calculate the correlation coefficient for previous example press:

Keystrokes	Display	
[g] [r]	0.9931	The data very closely approximates a straight line.

6-7. **OPERATION UNDER UNUSUAL CONDITIONS.** This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

6-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

6-9. TROUBLESHOOTING PROCEDURES.

The table lists the common malfunctions which you may find during the operation or maintenance of the pocket calculator or its components. You should perform the tests/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all tests and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 6-2. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. CALCULATOR DISPLAY IS BLANK.
Step 1. Plug in ac adapter/recharger. Turn calculator on.
(a) If display of zeros comes on, proceed to step 2.
(b) If display is blank, replace adapter/recharger.
(c) If problem remains, replace calculator.
Step 2. Check for raised decimal point at far left corner of display. Indicates low power condition.
(a) If indicator is on, proceed to step 3.
(b) If indicator is off, recharge battery pack.
Step 3. Check to see if contacts are dirty.
(a) Clean contacts on inside of calculator and battery pack with cotton swab (Item 6, Appendix E) moistened with alcohol (Item 3, Appendix E).
(b) Replace battery pack. Open battery pack door. Remove defective battery pack. Install new battery pack. Reinstall battery pack door.

Table 6-2. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
2. CALCULATIONS OR DISPLAY ERRATIC.	
Step 1. Check for raised decimal point at far left corner of display. Indicates low power condition.	
	(a) Recharge battery pack.
	(b) Replace battery pack.
	(c) Replace calculator.
Step 2. Press STO and ENTER↑ to see if display shows -8,8,8,8,8,8,8,8, not ERROR 9.	
	If ERROR 9 is displayed, replace calculator.
NOTE For error conditions refer to operator's instructions for the HP-32E provided with equipment.	

6-10. MAINTENANCE PROCEDURES. There are no operator maintenance procedures assigned for this equipment.

Section IV ORGANIZATIONAL MAINTENANCE

6-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

6-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT. These items are not required at the organizational level of maintenance.

6-13. SERVICE UPON RECEIPT.

6-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

6-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

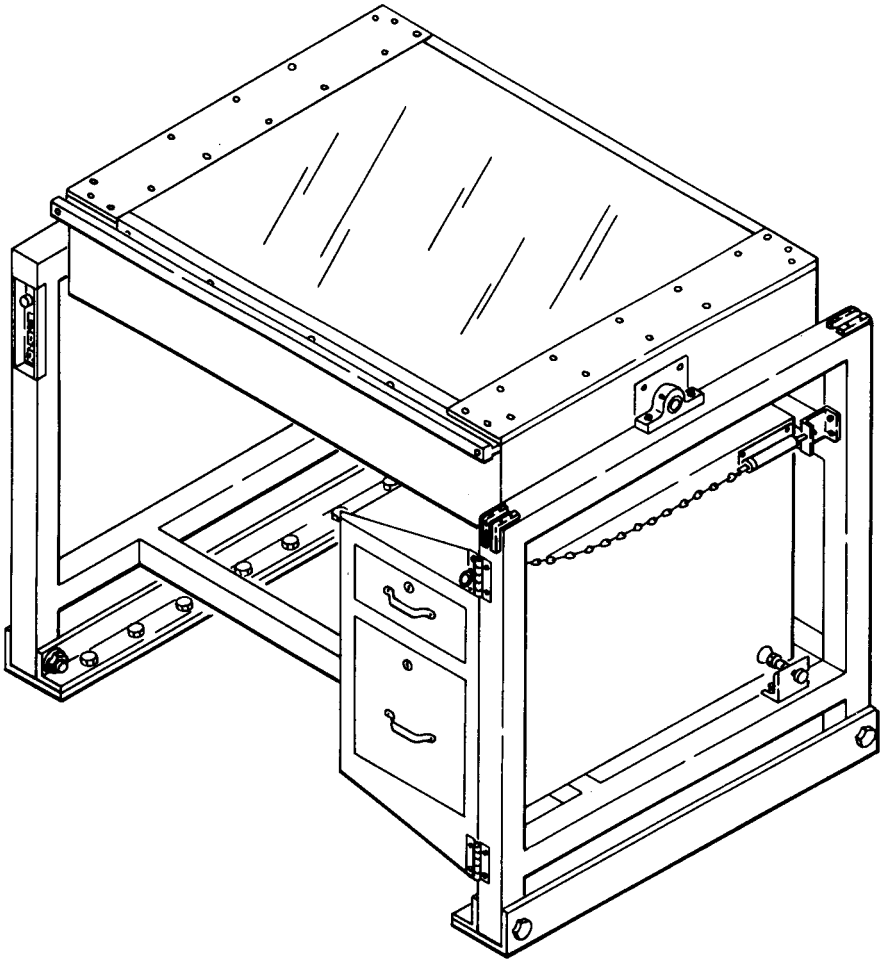
6-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES. There are no organizational troubleshooting procedures assigned for this equipment.

6-16. MAINTENANCE PROCEDURES. There are no organizational maintenance procedures assigned for this equipment.

6-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

There are no direct/general support maintenance procedures assigned for this equipment.



CHAPTER 7

DRAFTING, SCRIBING/TRACING TABLE

Section I INTRODUCTION

7-1. GENERAL INFORMATION.

7-1.1 Scope.

Model Number and Equipment Name. Model 99-9933 Drafting, Scribing/Tracing Table.

b. Purpose of Equipment. To provide user with drafting, scribing, or tracing table in compact unit.

7-2. EQUIPMENT DESCRIPTION.

7-2.1 Equipment Characteristics, Capabilities, and Features.

a. Rapid work surface selection.

b. Auxiliary electrical outlets.

c. Two drawer storage.

d. Tilting work surface (O, 5, and 10 degrees).

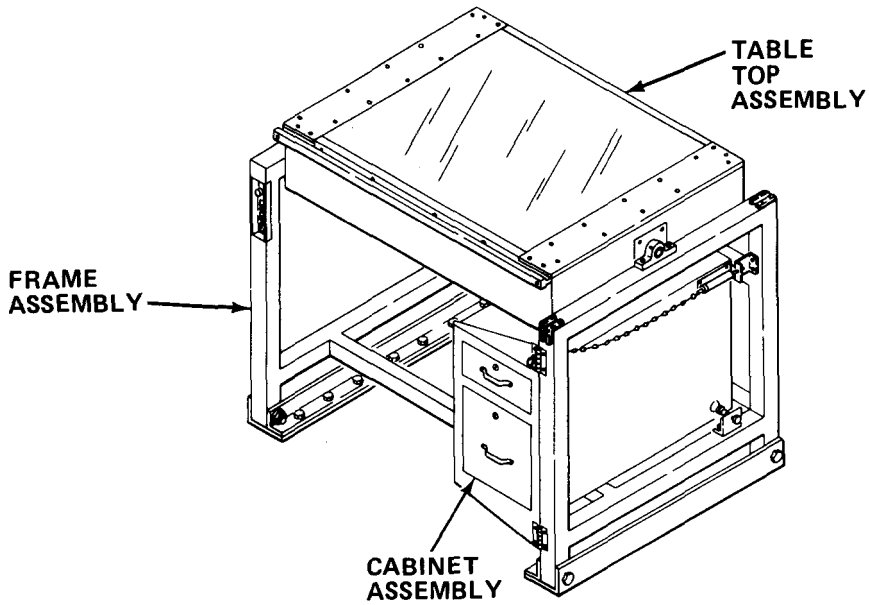
e. Easy access to all controls.

f. Diffused light source.

g. Drawing guard on front edge of drafting, scribing/tracing table.

h. Sturdy steel base.

7-2.2 Location and Description of Major Components.



FRAME ASSEMBLY . Supports table top assembly, drawer assembly, control panel, safety stops, and tilt lock.

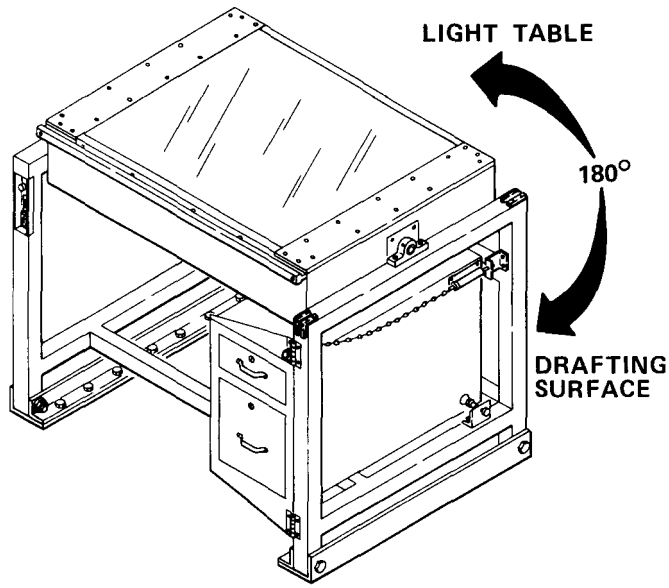
TABLE TOP ASSEMBLY. Consists of drafting board, light board, diffused lighting, and drawing guard.

CABINET ASSEMBLY. Consists of two drawers and drawer lock module.

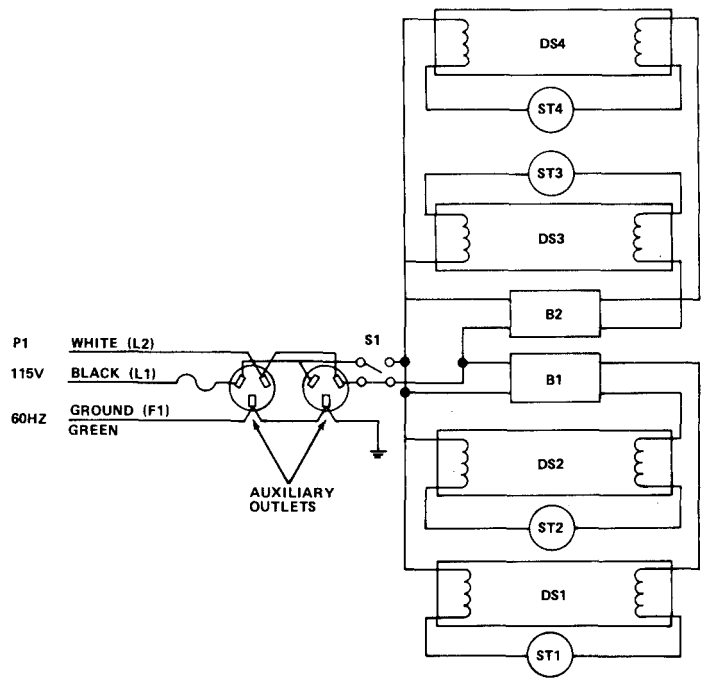
7-2.3 Equipment Data.

Power Requirements	115 V, 60 Hz, single-phase
Drafting Surface	42 in. X 31 in. (106.7 cm X 78.7 cm)
Light Table Surface	30 in. X 30 in. (76.2 cm X 76.2 cm)
Dimensions	
Width	47 in. (119.4 cm)
Depth	34 in. (86.4 cm)
Height (Table Flat)	42 in. (106.7 cm)

7-3. TECHNICAL PRINCIPLES OF OPERATION.



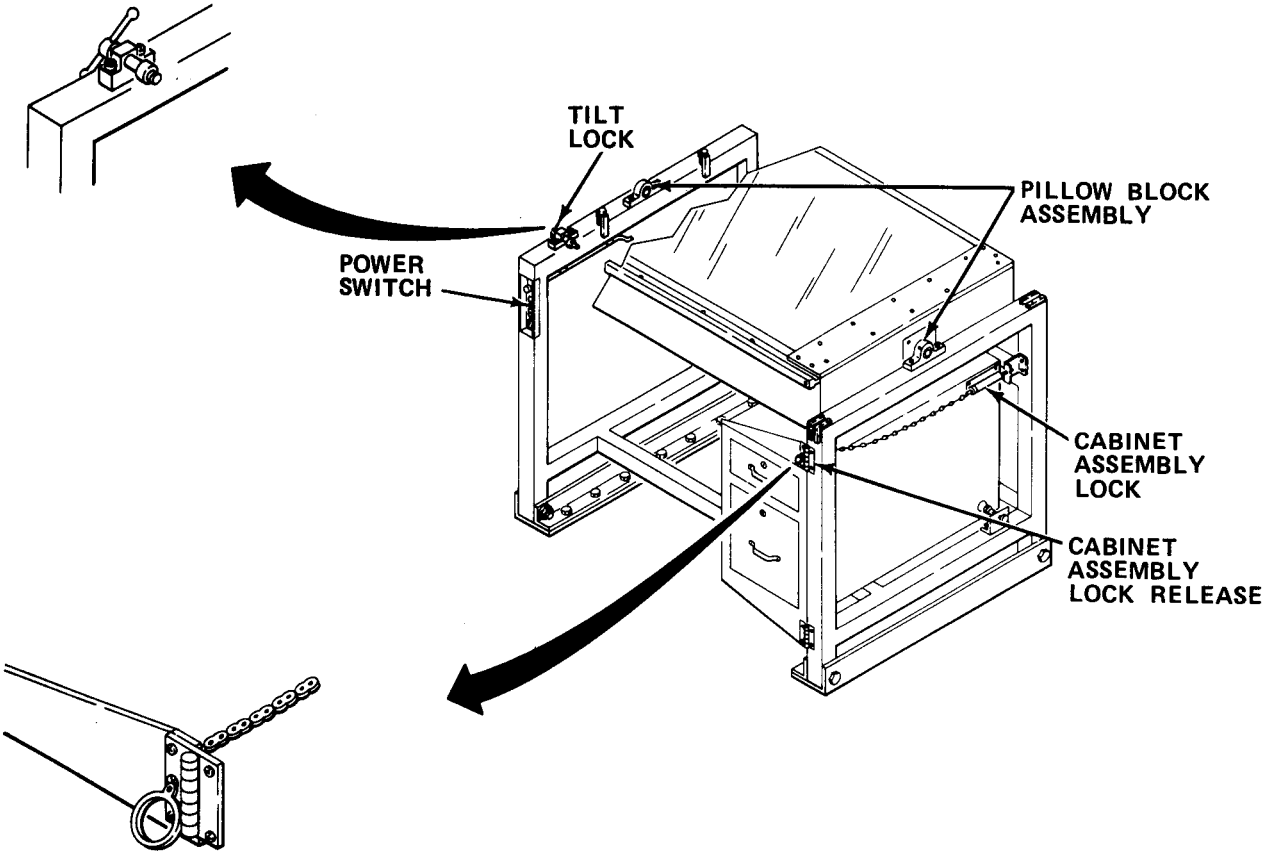
7-3.1 General. The movab le top permits selection of drafting surface or light table. Has safety stops so that table top will turn only 180 degrees to prevent damage to electrical wiring For drafting surface, rotate top away from operator. For light table, rotate top toward operator.



7-3.2 Electrical System. Provides power to the light table and two auxiliary outlets. The auxiliary outlets are located on the control panel. When plug P1 is connected, 120 V ac is applied to auxiliary outlets even if power switch S1 is off.

Section II **OPERATING INSTRUCTIONS**

7-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.



Control or Indicator	Function
Tilt Lock	Used to change angle of work surface or to change work surface. Loosen tilt lock to change work surface. Tighten to secure in position.
Pillow Block Assembly	Houses the bearing which allows easy rotation of the work surface.

Control or Indicator	Function
Cabinet Assembly Lock and Cabinet Assembly Lock Release	Located at upper c abinet assembly hinge on right front table leg. To open cabinet assembly, pull cabinet assembly l ock release and swing assembly out, so it is not under table.
Power Switch	Provides power to light table lamps only.

7-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

7-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The “Equipment is Not Ready/Available If” column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Item	Quantity
Liquid Detergent (Item 9, Appendix E)	ar
Cheesecloth (Item 6, Appendix E)	ar

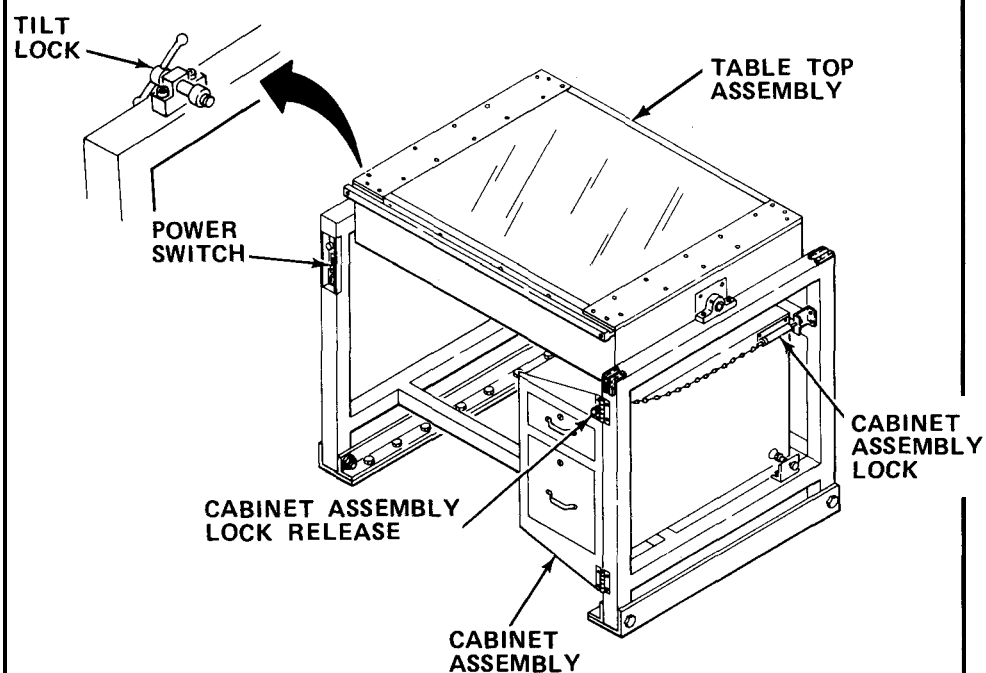
Table 7-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before	W - Weekly	AN - Annually	(Number) - Hundreds of Hours
D - During	M - Monthly	S - Semiannually	
A - After	Q - Quarterly	Bl - Biennially	

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment IS Not Ready/ Available If:
		DRAFTING, SCRIBING/TRACING TABLE	
1	B/A	Inspect.	
		1. Glass table surface.	Glass cracked or broken.



		2. Turn power switch OFF.	

Table 7-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D. During A- After | W - Weekly M - Monthly Q - Quarterly | AN . Annually S - Semiannually Bl - Biennially | (Number) - Hundreds of Hours

ITEM NO.	IN-TER-VA L	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		DRAFTING, SCRIBING/TRACING TABLE - Cont	
1	B/A	Inspect - Cont	
		3. Pull cabinet assembly lock release ring and swing out cabinet assembly.	
		4. Loosen tilt lock until it clears table top assembly.	Tilt lock is damaged.
		5. Rotate table top 180°.	Table top does not rotate.
		6. Tighten tilt lock to secure table top assembly in position.	Table top will not lock in position.
		7. Inspect wooden table top.	Table top has gouges, dents, or cuts.
		8. Rotate table top 180° and tighten tilt lock.	
		9. Return cabinet assembly to its normal position under table.	
		10. Press firmly on cabinet assembly front until cabinet assembly lock clicks.	
		11. Turn power switch ON. Be sure all table lights are on. Check surface for cracks or breaks.	Table lights do not illuminate. Glass is broken. Power switch is broken.
		12. Turn power switch OFF.	

Table 7-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

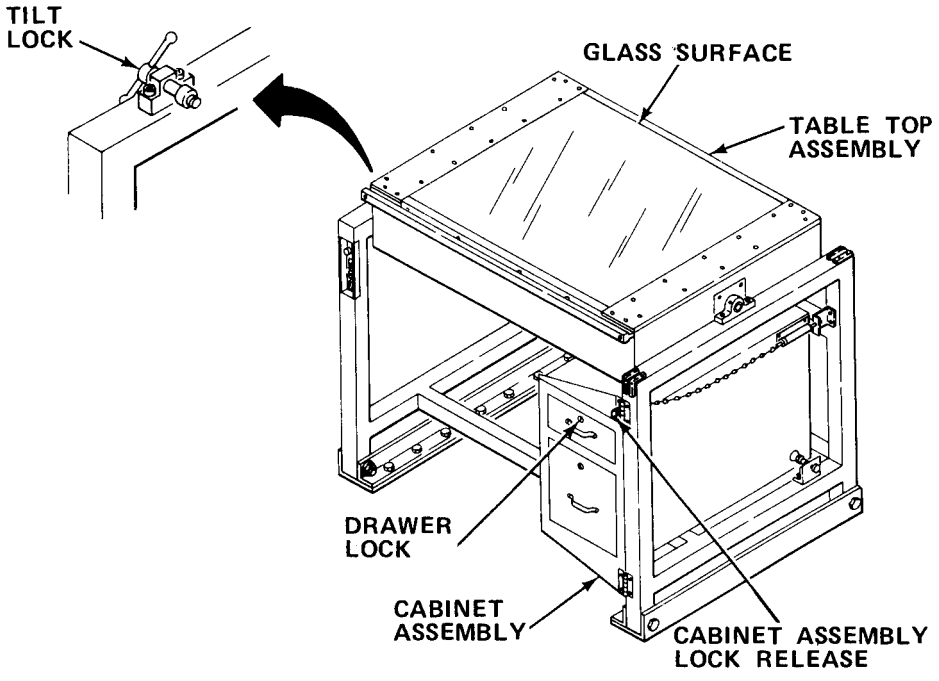
B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		DRAFTING, SCRIBING/TRACING TABLE - Cont	
2	B	Service.	



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

1. Unplug power cord.
2. Pull cabinet assembly lock release ring and swing out cabinet assembly.
3. Loosen tilt lock until it clears table top assembly.

Table 7-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A - After

W . Weekly
M - Monthly
Q . Quarterly

AN - Annually
S - Semiannually
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready! Available If:
		DRAFTING, SCRIBING/TRACING TABLE - Cont	
2	B	Service - Cont	
		4. Rotate table top assembly until gl ass surface is on top.	Table top does not rotate.
		5. Tighten tilt lock to secure table top assembly in position.	
		CAUTION Do not use abrasive cleaner on glass surface. Do not use running water or excessive water on cloth. Use moist cloth. Abrasive cleaner will scratch glass surface. Excessive water can cause equipment damage.	
		6. Wipe glass surface with cheesecloth moistened in mild solution of detergent and water.	
		7. Wipe glass surface with dry cheesecloth to remove streaks and smears.	
		8. Swing cabinet assembly to its normal position under table.	
		9. Plug in power cord.	

7-6. OPERATION UNDER USUAL CONDITIONS.

7-6.1 Assembly and Prerparation for Use.

a. Clean work surface.

b. Plug power cord into electrical receptacle.

c. Turn power switch on for light table use

7-6.2 Operating Procedures.

a. Changing Work Surface.

CAUTION

Safety stops have been included to prevent overtravel of table top and damage to electrical wiring. If drafting surface is in top position, swing front edge of table top down to change work surface. If light table is in top position, swing front edge up to change work surface. Table cannot be rotated until cabinet assembly is swung out.

(1) Pull cabinet assembly lock release ring and swing out cabinet assembly.

(2) Loosen tilt lock until it clears table top assembly.

(3) Tighten tilt lock to secure table top assembly in position.

(4) Return cabinet assembly to its normal position under table top assembly.

(5) Press firmly on cabinet assembly front until cabinet assembly lock clicks.

7-6.3 Preparation for Movement.

a. Turn off power.

b. Unplug power cord. Coil power cord and tape to table.

c. Rotate table top assembly, if necessary, to be sure glass surface faces upward.

d. Tighten tilt lock to secure table top assembly.

e. Press firmly on cabinet assembly front until cabinet assembly lock clicks.

f. Check cabinet drawers for open containers and loose items. Seal containers and secure all loose items.

g. Lock cabinet drawers.

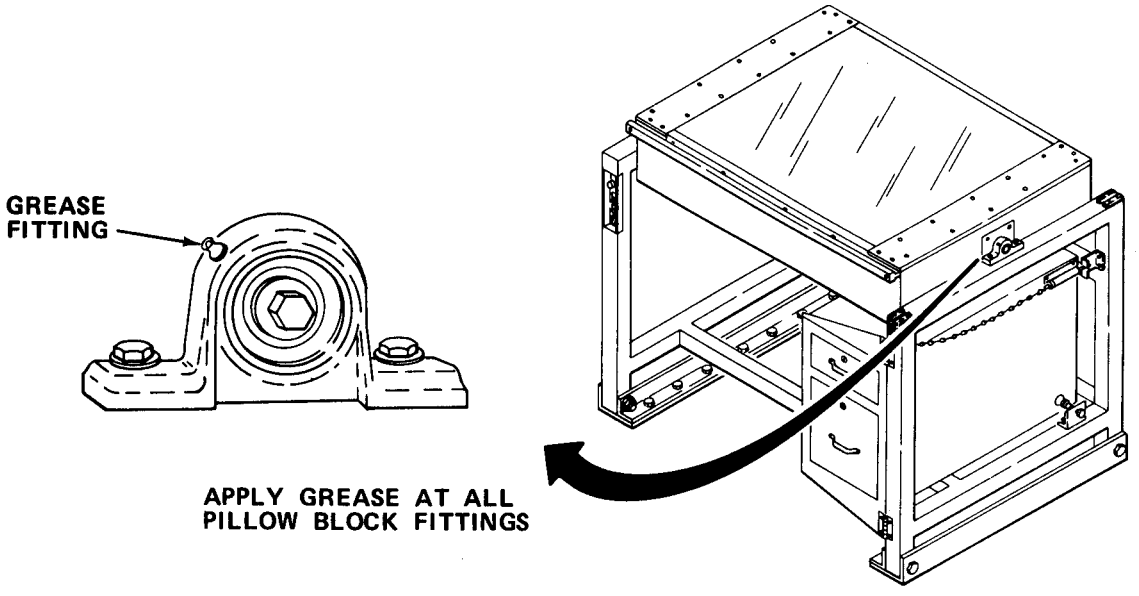
7-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

7-8. LUBRICATION INSTRUCTIONS.

NOTE

These lubrication instructions are mandatory.



7-8.1 Pillow Block Fittings. Apply ball and roller bearing grease (Item 12, Appendix E) to both pillow blocks annually.

a. Apply grease sparingly using grease gun.

b. Wipe grease fittings clean after application.

7-9. TROUBLESHOOTING PROCEDURES.

a. The table lists the common malfunctions which you may find during operation or maintenance of the drafting, scribing/tracing table, or its components. You should perform the test/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all test or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 7-2. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. LAMPS DO NOT LIGHT.	
Step 1. Check that power switch is ON.	(a) If power switch is ON, proceed to step 2. (b) Turn on power switch.
Step 2. Check that power cord is plugged in.	(a) If power cord is plugged in, proceed to step 3. (b) Plug in power cord.
Step 3. Visually check fuse for broken filament.	(a) Replace fuse (paragraphs 7-10. 1). (b) If filament is not broken, refer to organizational maintenance.
2. TABLE DOES NOT LOCK.	
Check for loose tilt lock.	(a) If loose, tighten. (b) If tight, refer to organizational maintenance.

7-10. MAINTENANCE PROCEDURES.

This section contains instructions covering operator/crew maintenance functions for the drafting, scribing/tracing table. Personnel required are listed only if the task requires more than one.

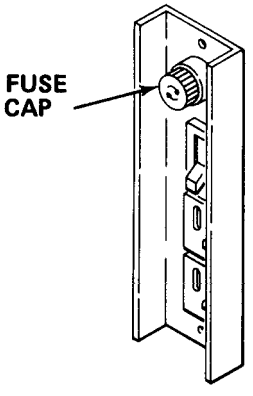
b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

7-10.1 Replace Fuse.

MOS: 81C, Cartographer

SUPPLIES: Fuse



a. Turn power switch OFF.

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

b. Unplug power cord.

c. Push in on cap and turn left.

d. Remove defective fuse.

e. Install new fuse, push in, and turn right.

f. Plug in power cord.

Section IV ORGANIZATIONAL MAINTENANCE

7-11. LUBRICATION INSTRUCTIONS.

7-11.1 Pillow Block Fittings. After replacement, apply ball and roller bearing grease (Item 9, Appendix E) to pillow blocks.

a. Apply grease sparingly using grease gun.

b. Wipe grease fittings clean after application.

7-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

7-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

7-12.2 Special Tools: Test. Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

7-12.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-316-24P covering organizational maintenance for this equipment.

7-13. SERVICE UPON RECEIPT. The drafting, scribing/tracing table may be received mounted in the section or in a shipping crate.

7-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

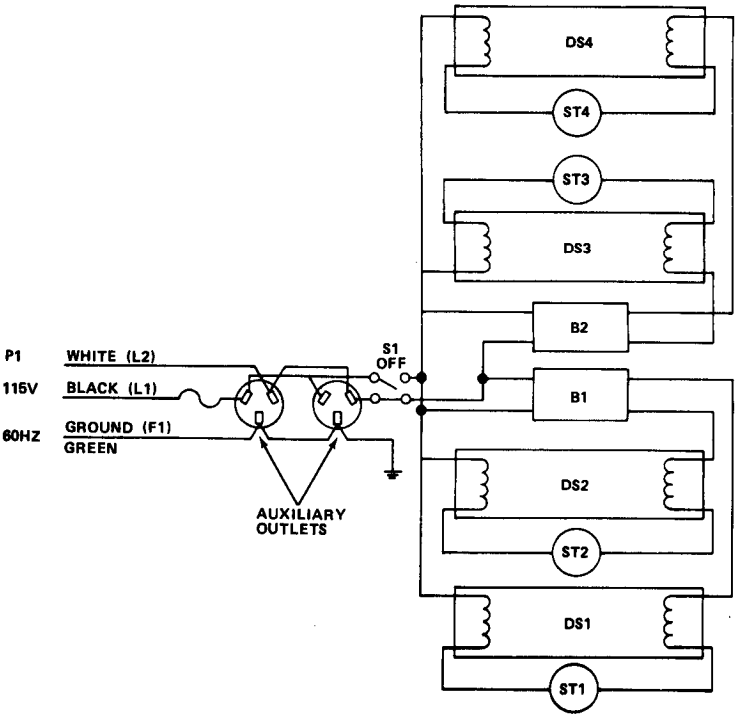
7-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

7-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES.

Organizational troubleshooting procedures cover the most common malfunctions that may be repaired at the organizational level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used by the operator should be conducted in addition to the organizational troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/inspection and corrective action. If a malfunction is not listed or corrected by a listed corrective action, notify your supervisor.

c. For unidentified malfunctions, use the following schematic or foldout located at the end of this manual for further fault analysis.



d. If the drafting, scribing/tracing table does not power-up when turned on, verify that 120 V ac is present at the receptacle. If voltage is not present, plug equipment into receptacle with power available and proceed with equipment trouble-shooting. Perform no-power procedures for dead receptacle (Table 1-4).

Table 7-3. ORGANIZATIONAL TROUBLESHOOTING

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
1. LAMPS DO NOT LIGHT.	Step 1. Check continuity of power switch.	(a) If continuity exists, proceed to step 2. (b) If no continuity exists, replace power switch (paragraph 7-16.1).
	Step 2. Check continuity of power cord.	(a) If no continuity exists, replace power cord (paragraph 7-16.2). (b) If continuity exists, replace tube starter (paragraph 7-16.5). (c) If lamps still do not light, replace ballast (paragraph 7-16.4).
2. POWER RECEPTACLES DO NOT WORK.	Step 1. Check continuity of power cord.	(a) If continuity exists, proceed to step 2. (b) If no continuity exists, replace power cord (paragraph 7-16.2).
	Step 2. Check continuity of receptacle.	Repair receptacle (paragraph 7-16.3).
3. TABLE DOES NOT LOCK.	Step 1. Check for loose tilt lock.	(a) If tight, proceed to step 2. (b) Tighten tilt lock.

Table 7-3. ORGANIZATIONAL TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
3. TABLE DOES NOT LOCK - Cont
Step 2. Check for defective tilt lock.
(a) If good, proceed to step 3.
(b) If defective, replace (paragraph 7-16.6).
Step 3. Check for loose tilt locking block.
(a) If tight, proceed to step 4.
(b) If loose, tighten.
Step 4. Check for defective tilt locking block.
(a) If good, proceed to step 5.
(b) If defective, replace (paragraph 7-16.6).
Step 5. Check for defective tilt lock plate.
If defective, replace (paragraph 7-16.6).

7-16. MAINTENANCE PROCEDURES.

This section contains instructions covering organizational maintenance functions for the drafting, scribing/tracing table. Personnel required are listed only if the task requires-more than-one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

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7-16.1 Replace Power Switch.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 5/64 in. Hex Head Key Wrench

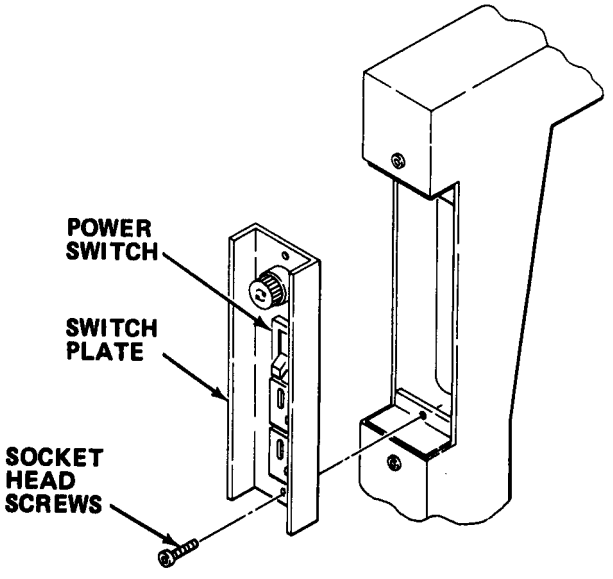
SUPPLIES: Power Switch

WARNING

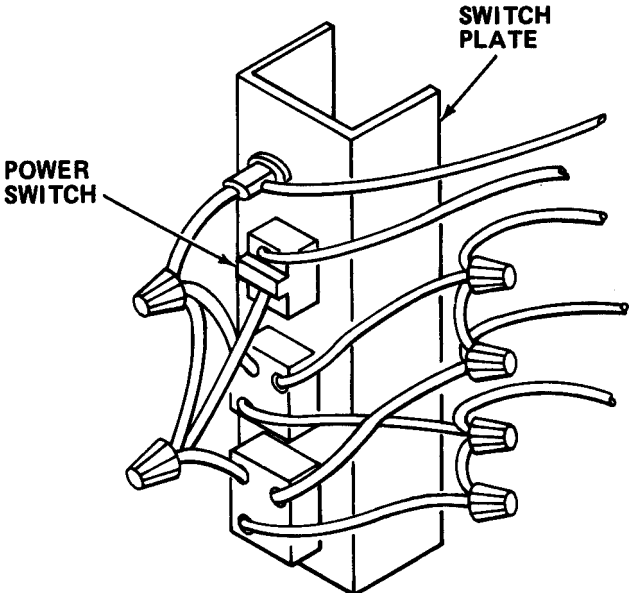
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF.

b. Unplug power cord.



c. Remove socket head screws and pull switch plate out.



d. Tag and disconnect wires from power switch.

e. Remove defective power switch from front of switch plate.

f. Install new power switch.

g. Reconnect wires to power switch and remove tags.

h. Reinstall switch plate and secure with socket head screws.

i. Plug in power cord.

7-16.2 Replace Power Cord.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS : Flat Tip Screwdriver
Soldering Iron
5/64 in. Hex Head Key Wrench

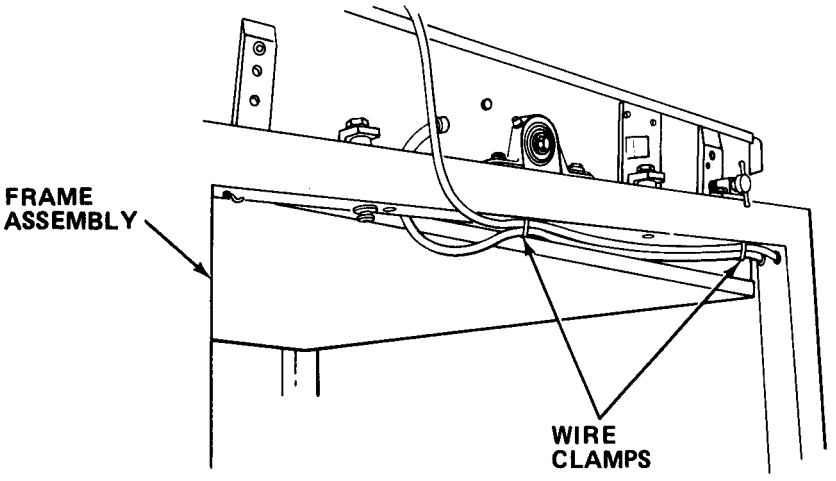
SUPPLIES: Power Cord
Solder (Item 23, Appendix E)

WARNING

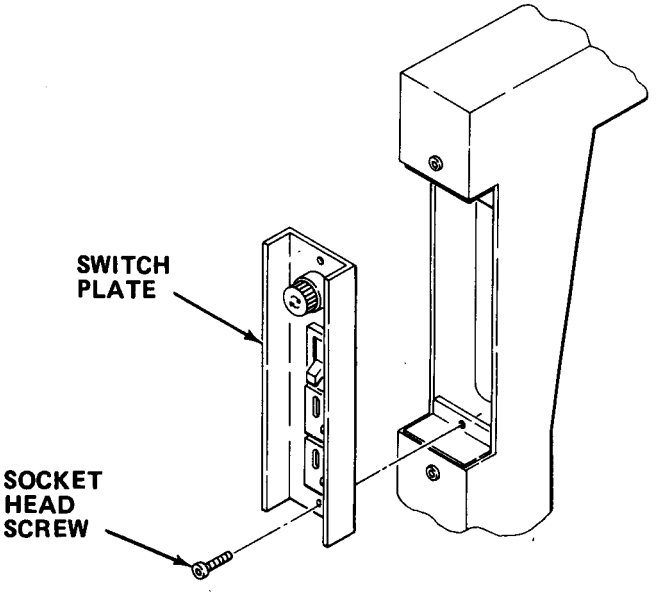
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF.

b. Unplug power cord.

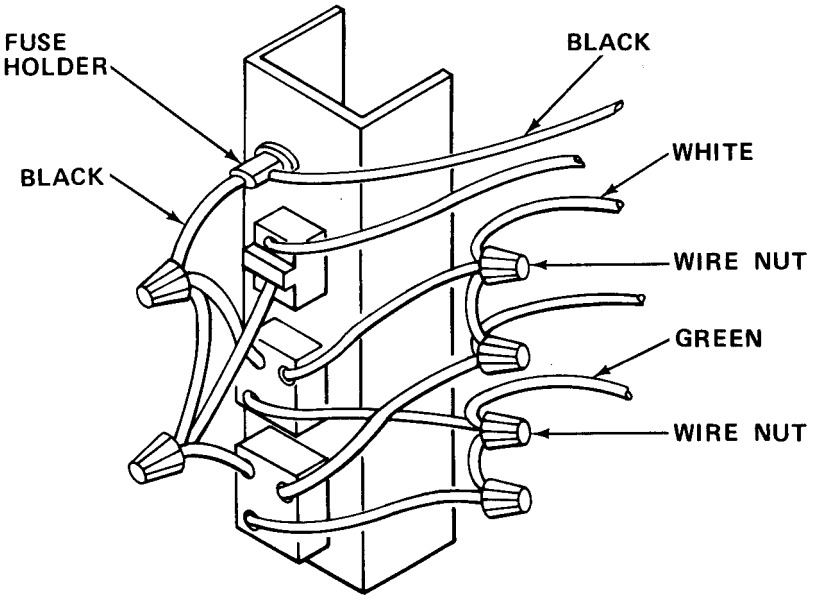


c. Remove wire clamps located on frame assembly.



d. Remove socket head screws and pull switch plate out.

e. Tag wire connections for proper reconnection of wires.



f. Desolder black power cord lead from fuse holder.

g. Disconnect white lead and green ground at wire nuts.

h. Remove power cord.

i. Insert new power cord through hole in back of leg.

j. Reconnect white lead and green ground; tighten wire nuts.

k. Solder black lead to fuse holder.

l. Reinstall wire clamps.

m. Reinstall switch plate and secure with socket head screws.

n. Plug in power cord.

7-16.3 Replace Receptacle

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
5/64 in. Hex Head Key Wrench

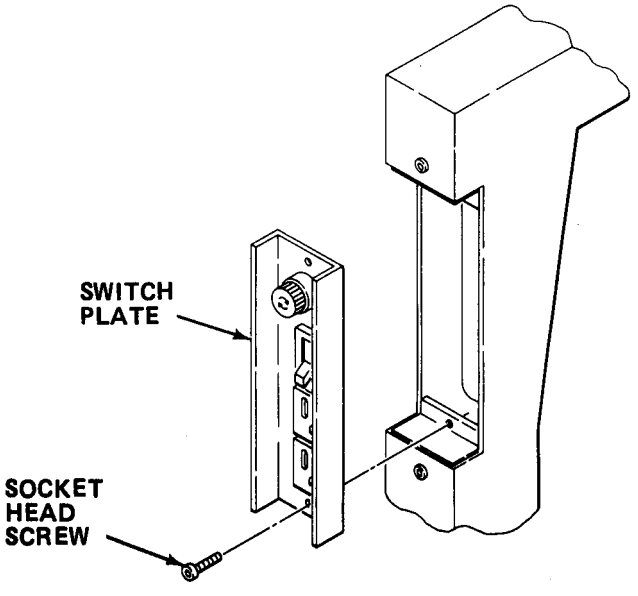
SUPPLIES: Receptacle

WARNING

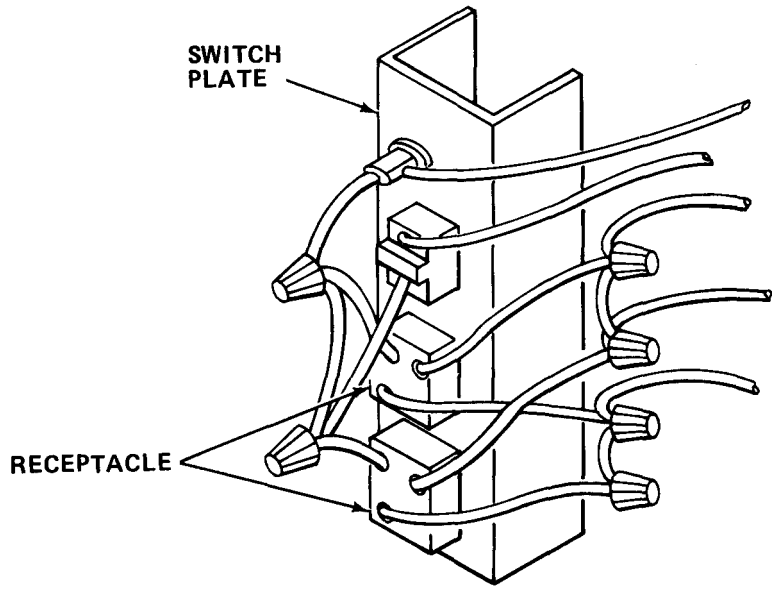
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF.

b. Unplug power cord.



c. Remove socket head screws and pull switch plate out.



d. Tag and disconnect wires from defective receptacle.

e. Remove defective receptacle from switch assembly.

f. Install new receptacle and reconnect wires.

g. Reinstall switch plate and secure with socket head screws.

h. Plug in power cord.

7-16.4 Replace Lamp Ballast.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 3/32 in. Hex Head Key Wrench
1/8 in. Hex Head Key Wrench
1/4 in. Nutdriver
3/8 in. Socket, 1/4 in. Drive
1/4 in. Drive Ratchet

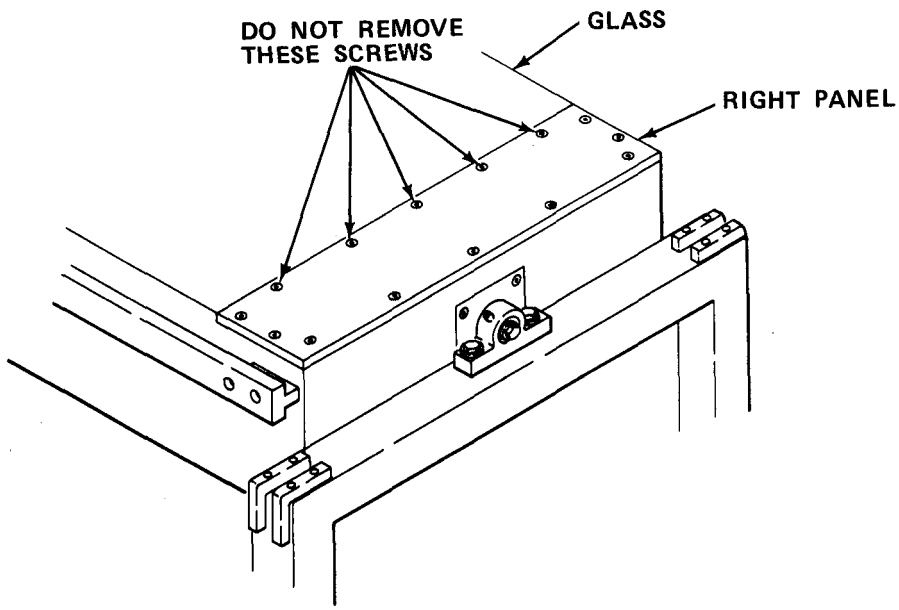
SUPPLIES: Lamp Ballast

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF.

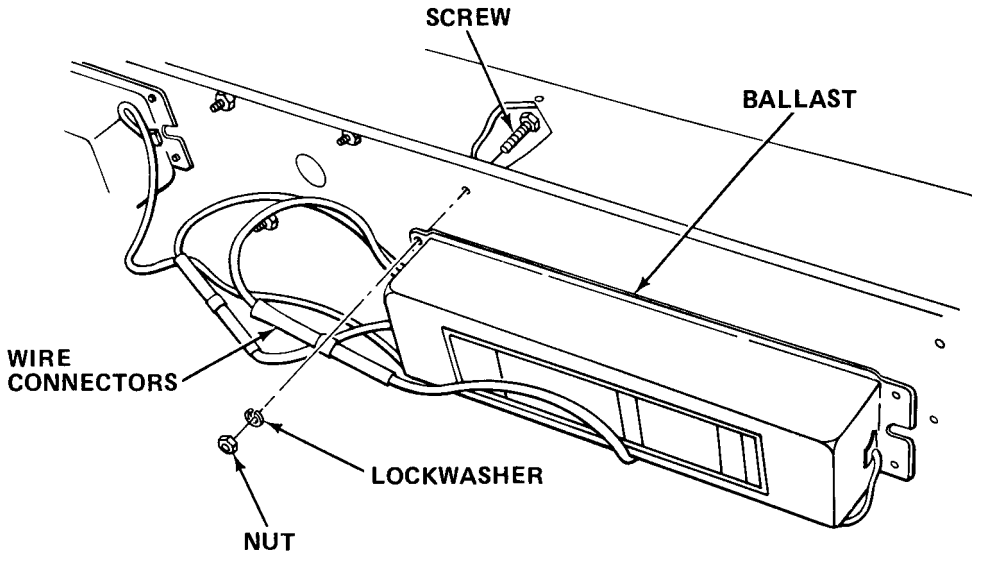
b. Unplug power cord.



CAUTION

Removal of five socket head screws located closest to glass surface may result in damage to equipment.

c. Remove nine socket head screws and right panel, but do not remove five socket head screws indicated in CAUTION and illustration.



d. Remove socket head screws, lockwashers, and nuts that secure ballast.

e. Lift ballast out of table to gain access to wire connectors.

f. Tag and disconnect all wires.

g. Install new ballast.

NOTE

Be sure wires are not kinked.

h. Reconnect all wires.

i. Secure ballast with nuts, lockwashers, and socket head screws.

j. Reinstall right panel and secure with socket head screws.

k. Plug in power cord.

7-16.5 Replace Fluorescent Lamp/Starter.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 3/32 in. Hex Head Key Wrench
Flat Tip Screwdriver.

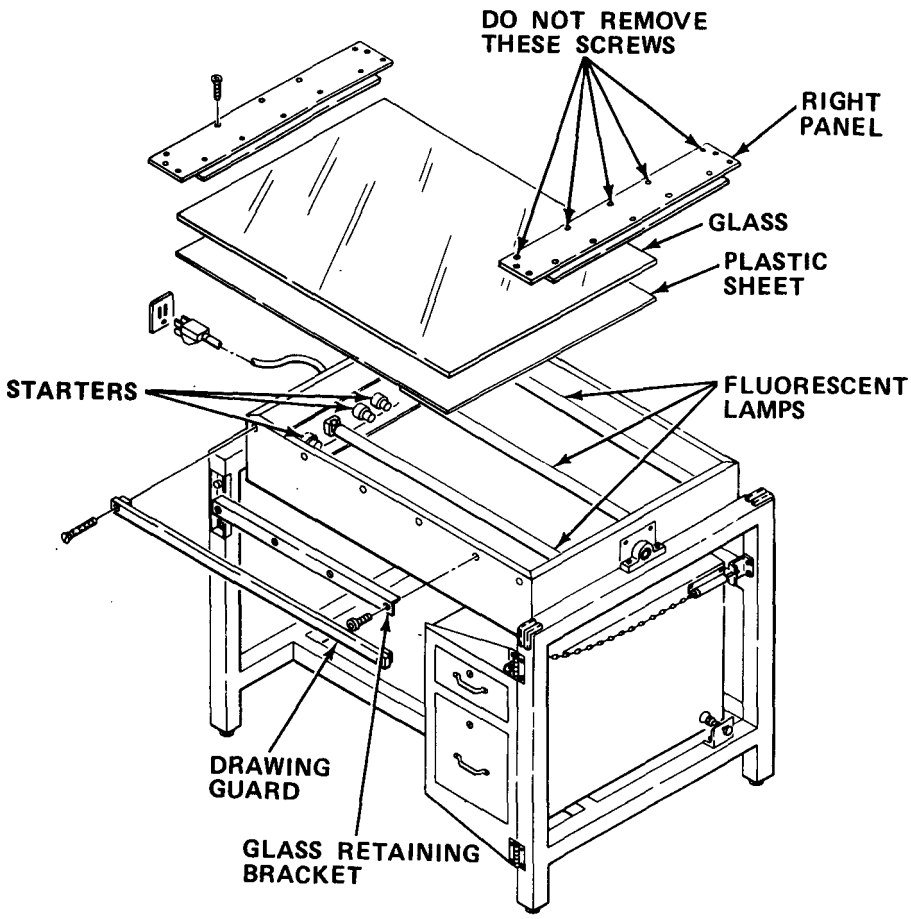
SUPPLIES: Fluorescent Lamp/Starter

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Place light surface up. Turn on power switch and note defective lamp.

b. Turn off power switch and unplug power cord.



CAUTION

Removal of five socket head screws located closest to glass surface may result in equipment damage.

c. Remove nine socket head screws and right panel, but do not remove five socket head screws indicated in CAUTION and illustration.

d. Remove socket head screws and drawing guard.

e. Remove socket head screws and glass retaining bracket.

f. Carefully slide glass and plastic sheet from retaining glass bracket and left panel.

9. Remove defective lamp/starter.

h. Install new lamp/starter.

i. Reinstall plastic sheet and glass.

j. Reinstall right panel and secure with socket head screws.

k. Reinstall glass retaining bracket and secure with socket head screws.

l. Reinstall drawing guard and secure with socket head screws.

m. Plug in power cord.

7-16.6 Repair Tilt Lock.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
7/16 in. Combination Wrench
9 mm Combination Wrench
3/32 in. Hex Head Key Wrench
3/16 in. Hex Head Key Wrench
5/32 in. Hex Head Key Wrench

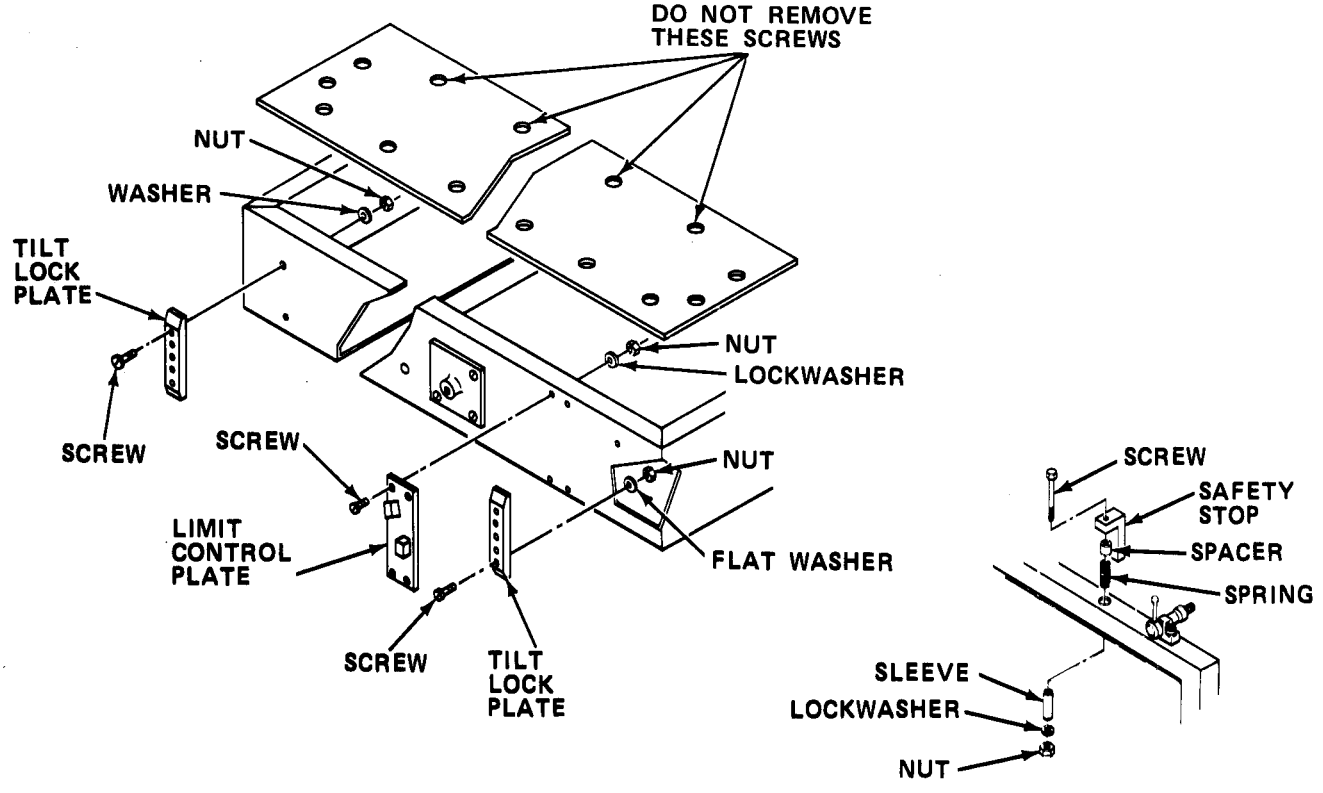
SUPPLIES: Tilt Lock Plate
Limit Control Plate
Safety Stop

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF.

b. Unplug power cord.



CAUTION

Removal of five socket head screws located closest to glass surface may result in damage to equipment.

c. Remove nine socket head screws and left panel, but do not remove five socket head screws indicated in CAUTION and illustration.

d. Pull cabinet assembly lock release and swing cabinet assembly out so that it is not under table.

NOTE

Tilt lock plates are not interchangeable and must be replaced in same positions.

e. Remove upper screws, nuts, and washers from defective tilt lock plate.

f. Tilt table top as necessary and remove defective tilt lock plate by removing lower screws, nuts, and washers.

g. Install new tilt lock plate and secure with washers, nuts, and screws.

h. Check position of tilt lock plate and readjust if required.

i. Remove defective limit control plate by removing screws, washers, and nuts.

j. Install new limit control plate. Secure with nuts, washers, and screws.

k. Reinstall left panel and secure with nine socket head screws.

NOTE

Use care in disassembly of safety stop to prevent spring from falling inside frame.

l. Remove defective safety stop by removing nut, lockwasher, sleeve, spring, spacer, and screw.

m. Install new safety stop. Secure with screw, spacer, spring, sleeve, lockwasher, and nut.

n. Swing cabinet assembly to its normal position under table.

o. Plug in power cord.

7-16.7 Replace Pillow Block Assemble.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 1/8 in. Hex Head Key Wrench.
9/16 in. Combination Wrench
1/2 in. Combination Wrench
Grease Gun

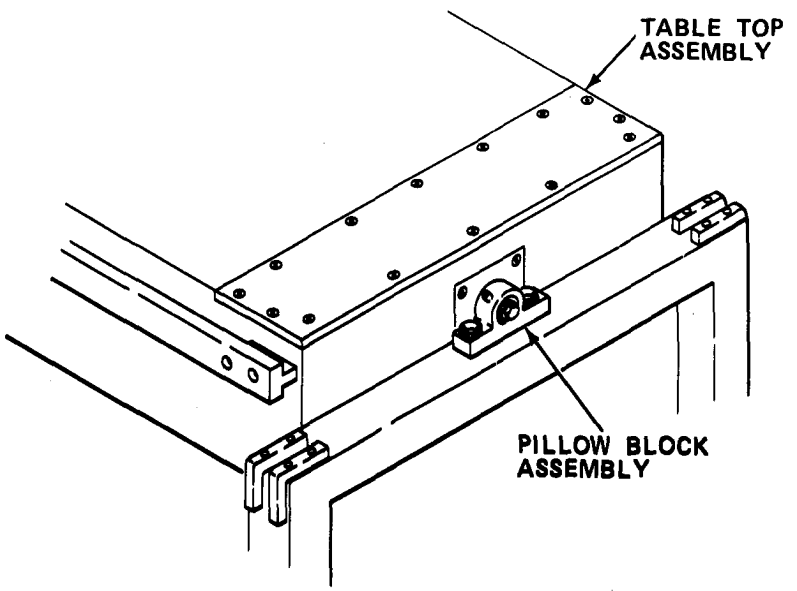
SUPPLIES: Pillow Block Assembly
GAA Grease (Item 12, Appendix E)

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF.

b. Unplug power cord.

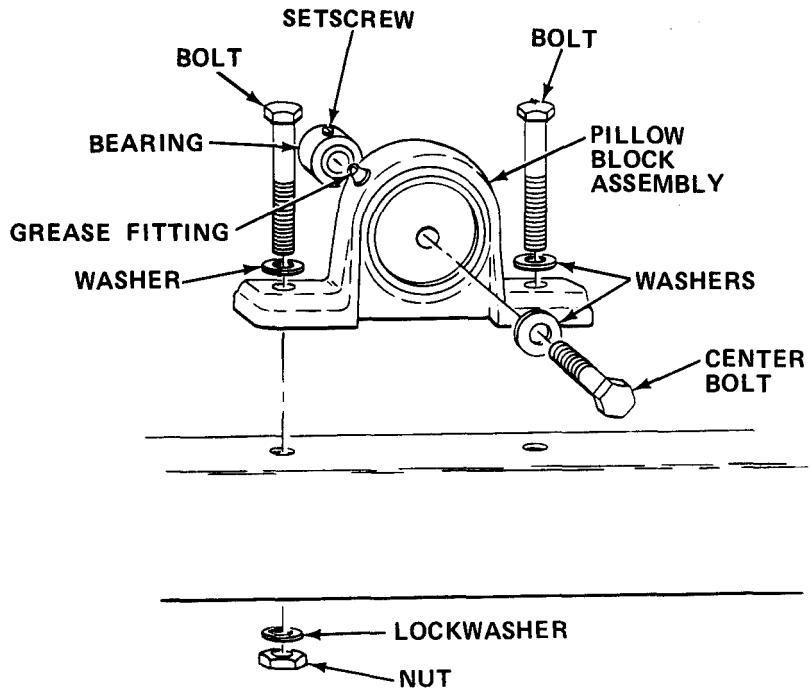


CAUTION

Table top assembly must be supported with drafting surface down to prevent table top from falling, causing equipment damage.

c. Support table top assembly.

d. Loosen, but do not remove socket head setscrew.



e. Remove center bolt and washer.

f. Remove bolts, washers, lockwashers, and nuts; remove defective pillow block assembly.

9. Install new pillow block assembly and secure with nuts, lockwashers, washers, and bolts.

h. Grease bearing (paragraph 7-11.1).

i. Reinstall washer and center bolt.

j. Tighten socket head setscrew.

k. Remove table top assembly supports.

7-16.8 Remove/Install Drafting, Scribing Tracing Table.

MOS: 83FJ6, Reproduction Equipment Repairer

PERSONNEL: Two persons are required to perform this procedure,

TOOLS : 1/2 in. Combination Wrench

SUPPLIES: Drafting, Scribing/Tracing Table

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

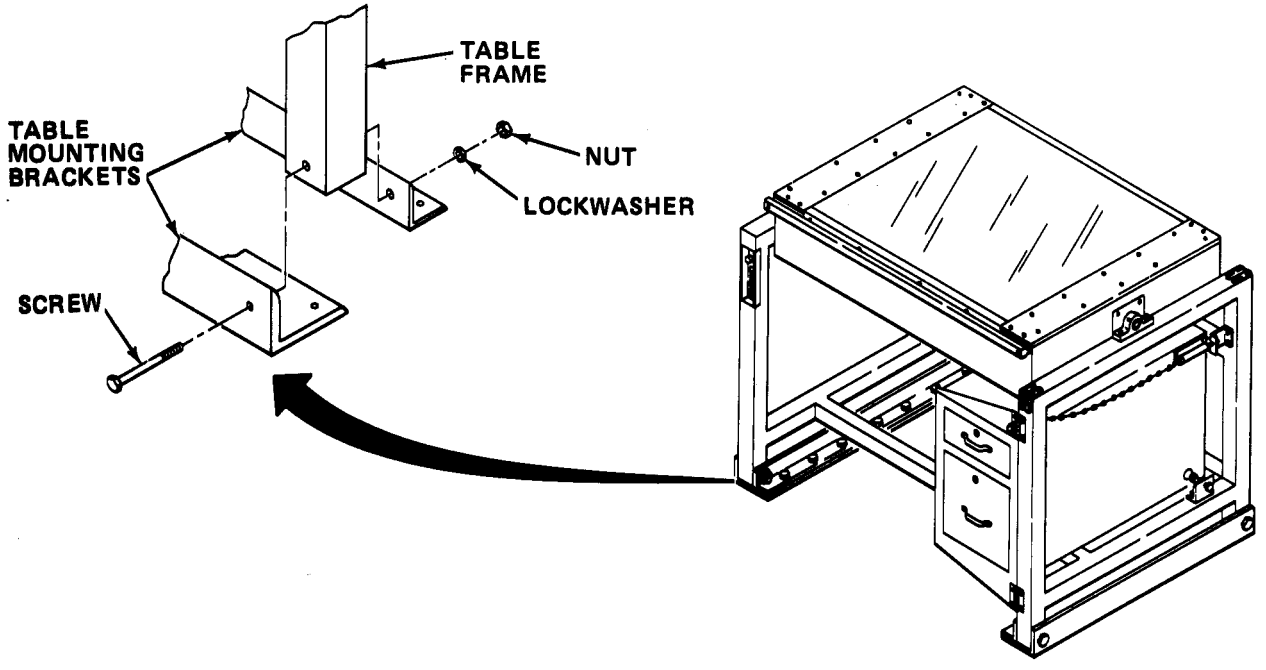
a. Unplug power cord.

b. Remove socket head screws, lockwashers, and nuts from table mounting brackets.

WARNING

To prevent personal injury, two persons are required to move the drafting, scribing/tracing table.

c. Carefully pull table away from wall until it clears table mounting brackets.



d. Remove defective table from section.

e. Position new drafting, scribing/tracing table in front of table mounting bracket.

f. Slide table between table mounting brackets until holes in table frame are alined with table mounting bracket holes.

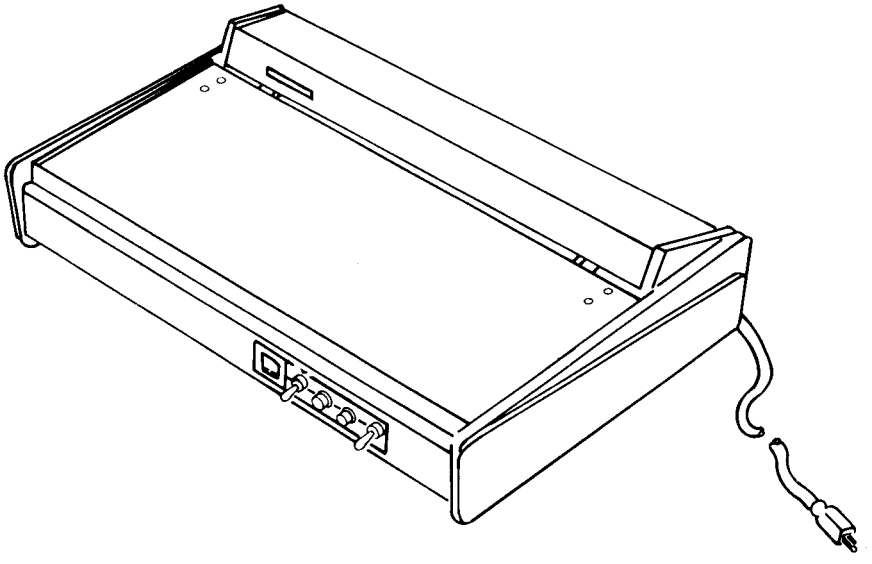
g. Reinstall socket head screws, lock washers, and nuts into table mounting brackets.

h. Plug in power cord.

7-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

There are no direct/general support maintenance procedures assigned for this equipment.



CHAPTER 8

ADHESIVE WAX COATER

Section I INTRODUCTION

8-1. GENERAL INFORMATION.

8-1.1 Scope.

a. Model Number and Equipment Name. Model 1215 Adhesive Wax Coater.

b. Purpose of Equipment. To lay adhesive wax coating on back of artwork and text to enable it to be mounted for copying.

8-2. EQUIPMENT DESCRIPTION.

8-2.1 Equipment Characteristics. Capabilities, and Features.

a. Coats only one surface.

b. Warms up in 15 min (average).

c. Controls temperature of wax during coating.

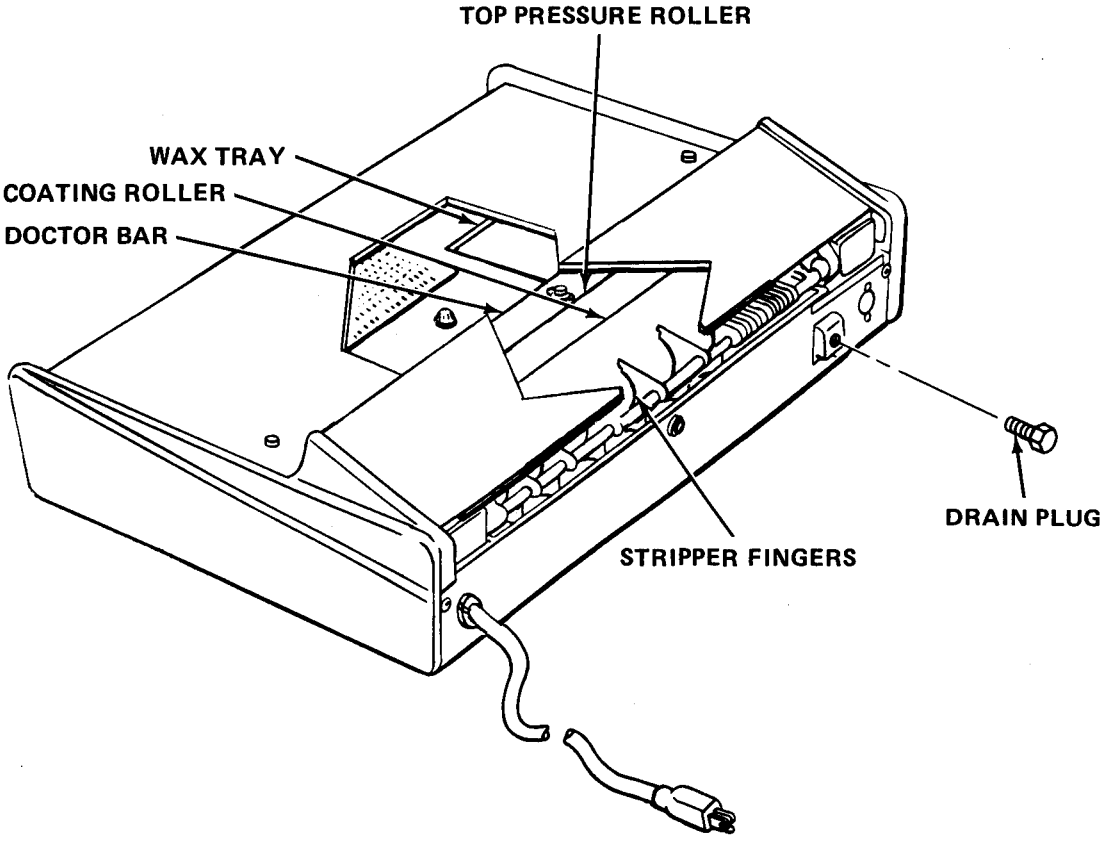
d. WAX LEVEL indicator tells with glance if reservoir is at proper level.

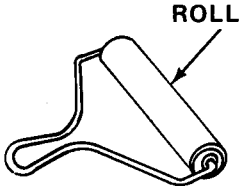
e. Feed rollers and controls are automatically held inoperative until proper operating temperature is reached.

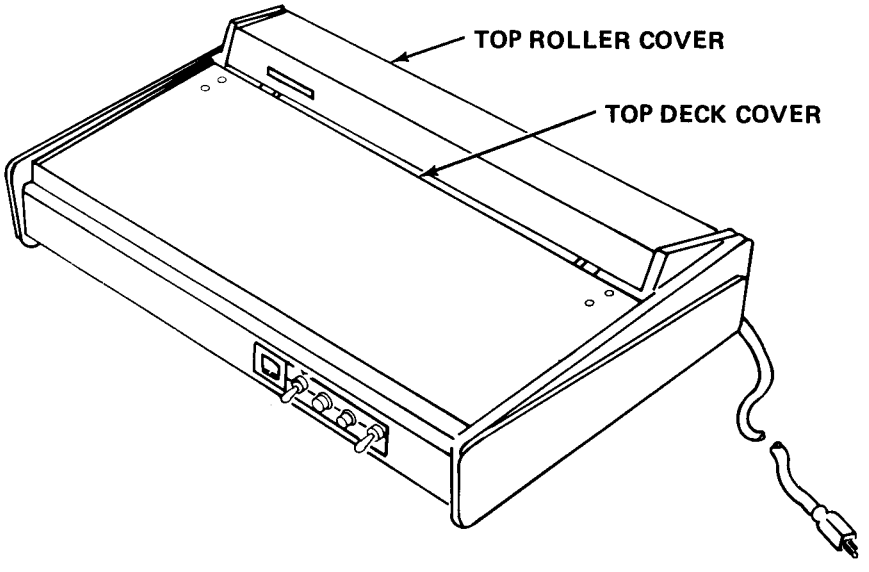
f. Floating top feed roller automatically adjusts for all thicknesses and types of paper.

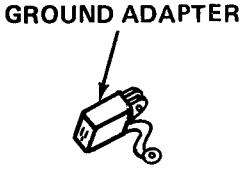
g. Drain plug allows wax to be drained without handling hot wax.

8-2.2 Location and Description of Major Components.









TOP ROLLER COVER. Metal dust cover prevents foreign matter from settling on top pressure roller when wax coater is not in use.

TOP DECK COVER. Metal cover provides smooth surface for feeding of stock. Its position controls stiffness or weight of stock being fed into wax coater.

GROUND ADAPTER. Converts three-pronged power plug into two-pronged.

ROLLER. Hand-held roller used when mounting coated material.

WAX TRAY. Heated tray melts and holds hot wax for use.

TOP PRESSURE ROLLER. Presses input material against coating roller.

DRAIN PLUG. Cold plug for draining of hot wax.

COATING ROLLER. Applies wax to material.

STRIPPER FINGERS. Strips coated material from coating roller.

DOCTOR BAR. Strips excess wax from coating roller.

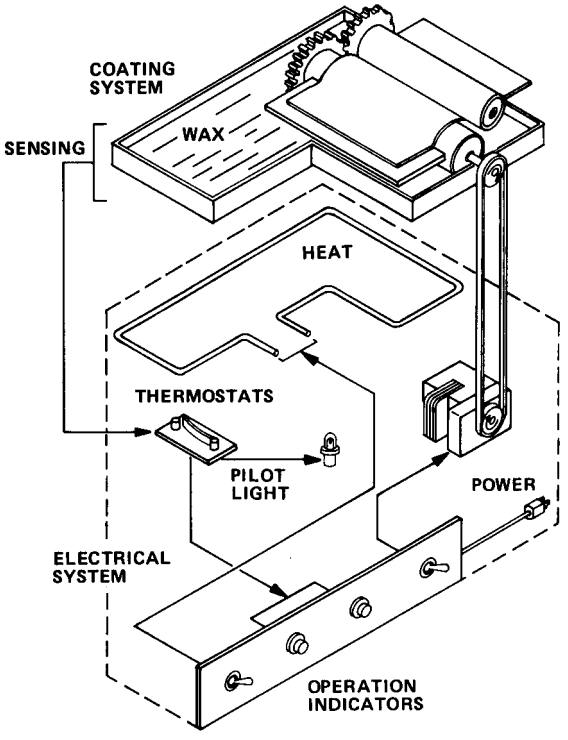
8-2.3 Equipment Data.

Manufacturer	Daige Products, Inc.
Weight	32 lbs (14.5 kg)
Power Requirements	120V, 60 Hz, 650 W, Max
Dimensions	
Width	19 in. (48.2 cm)
Depth	14 in. (35.6 cm)
Height	5 in. (12.7 cm)
Roller Width	12 in. (30.5 cm)
Coatable Material Thickness	1/4 in. (6 mm), Max
Warm-Up Period	18 Min, Max

8-3. TECHNICAL PRINCIPLES OF OPERATION. The wax coater applies a coat of adhesive wax to paste-up and layout material for hardboard mounting. It is composed of the following:

Electrical System

Coating System



8-3.1 Electrical System. Provides controlled heating and transports power to the coating system. It is composed of the following functional components:

Switches

HEAT ON Pilot Light

Heating Element

LOW/HIGH Thermostat

Inner Pilot Light

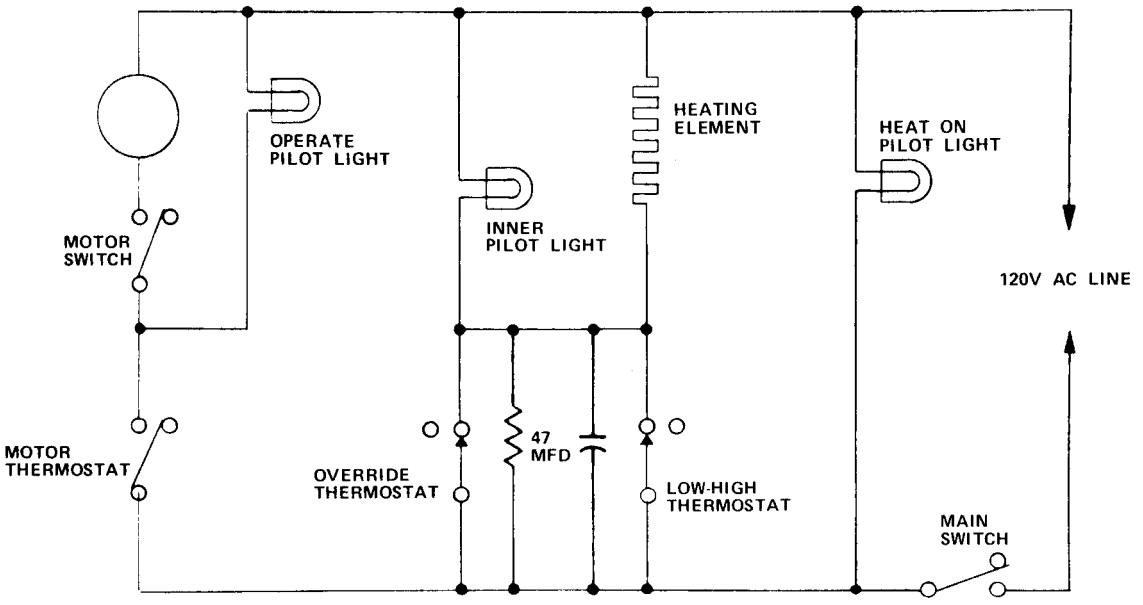
Coupled Resistor and Capacitor

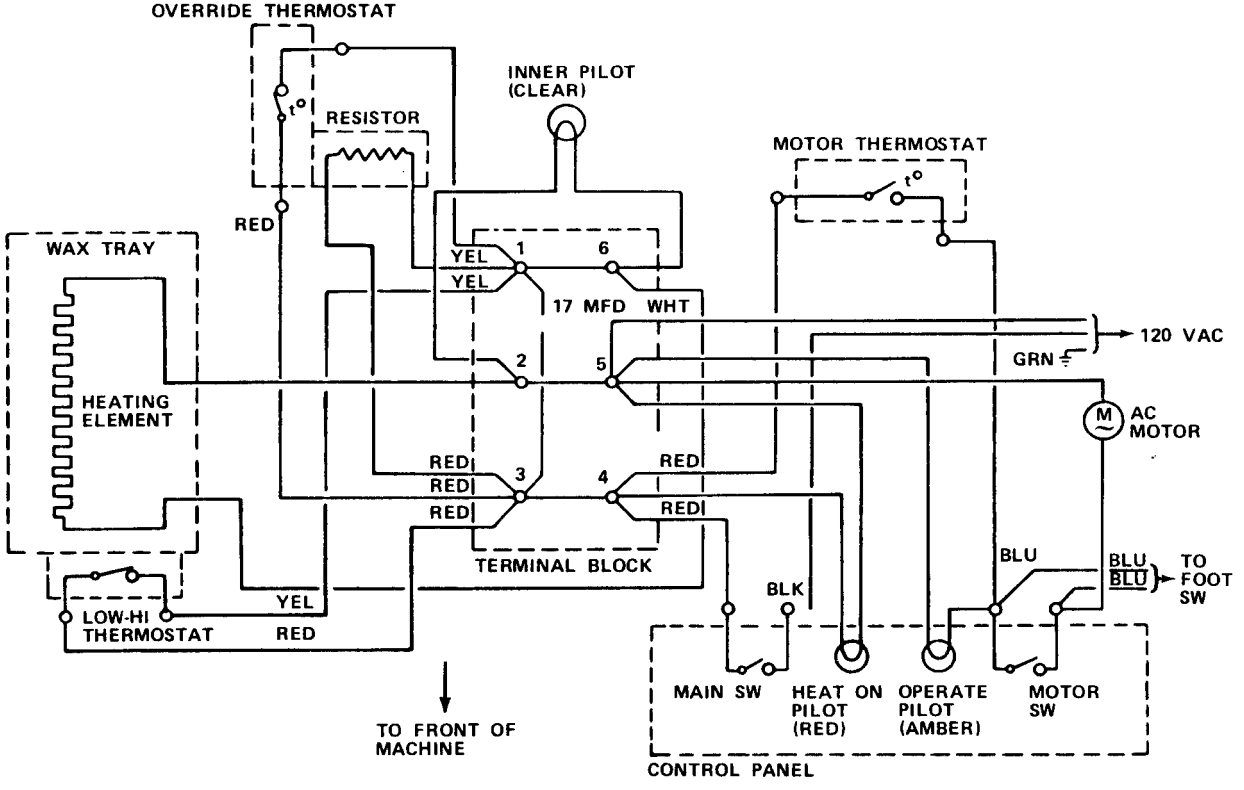
Override Thermostat

Motor Thermostat

OPERATE Pilot Light

AC Motor





a. Switches. Control input of power to wax coater. The MAIN switch is the primary control switch enabling power input to the rest of the system. The MOTOR switch controls power input to the ac motor.

b. HEAT ON pilot light. When MAIN switch is thrown, power is applied to the HEAT ON pilot light, heating element, and motor portions of the circuit. The HEAT ON pilot light remains on as long as the MAIN switch is closed and the power is being applied, to indicate the system is under power.

. Heating element. Input power is applied to the heating element via the LOW/HIGH thermostat, override thermostat, and the coupled resistor and capacitor. The heating element heats the wax tray and wax to the desired temperature.

d. LOW/HIGH thermostat. Limits the temperature reached by the heating element coils. It is normally closed. When the desired temperature is reached, the thermostat opens and cuts power to the element.

e. Inner pilot light. Indicates when power is being applied to the heating element. It is coupled in parallel with heating element.

f. Coupled resistor and capacitor. Coupled in parallel with LOW/HIGH thermostat and override thermostat, and provide an RC time delay to keep the temperature of the heating element from changing too fast when the LOW/HIGH thermostat setting is changed. They allow just enough power to reach the element to supply some heat but not enough to maintain the former temperature.

Override thermostat. Enables quick heat-up of wax coater by eliminating the effect of the coupled resistor and capacitor. It is closed during warm-up, providing a path for input of power to the element. It opens when minimum operating temperature has been reached and does not reclose.

h. Motor thermostat. Prevents power from being applied to the motor unless it senses the wax coater is at the proper temperature. It is normally open, but closes when the wax has reached proper operating temperature.

i. OPERATE pilot light. Coupled in parallel with the motor to indicate when the motor thermostat is closed and power can be applied to the motor.

j. AC motor. Turns coating roller via two gears and a toothed belt. Power is input to the motor via the motor thermostat and MOTOR switch.

8-3.2 Coating System. Transports material through the wax coater and coats one side with adhesive wax. It is composed of the following components:

Top Pressure Roller

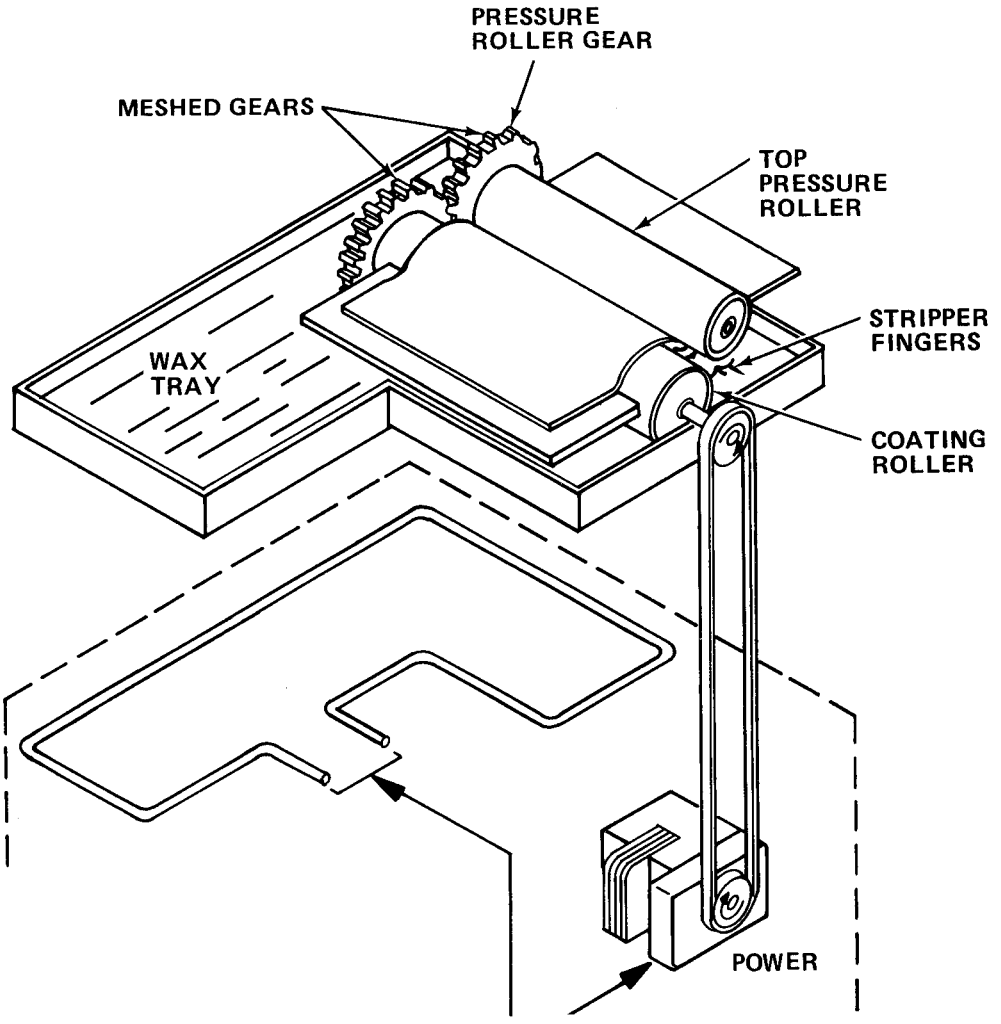
Coating Roller

Wax Tray

Stripper Fingers

Pressure Roller Gear

Meshed Gears



a. Top pressure roller. Main transport and drive roller. It applies pressure on material fed between the rollers so that frictional force will pull material through as the rollers turn.

b. Coating roller. Applies coating to the underside of the material as it goes by. Roller is partially submerged in wax.

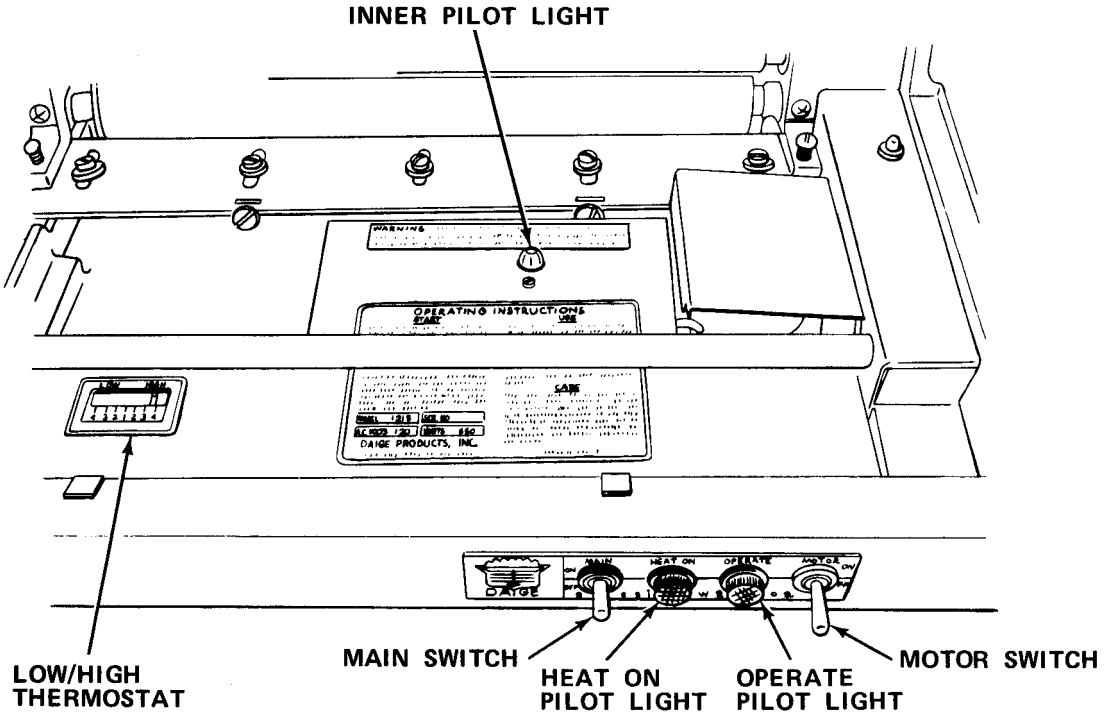
c. Wax tray. Holds wax and transfers heat from the heating element to the wax.

d. Stripper fingers. Rest against top of the coating roller to peel material and prevent it from wrapping around the coating roller.

Pressure roller gear. Connects to the ac motor via a toothed belt and drives the top pressure roller.

f. Meshed gears. Drives the coating roller through a small toothed gear mounted on the top rollers. Transmits rotation of the top pressure roller directly to a larger gear mounted on the coating roller.

8-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.



Control or Indicator	Function
Inner Pilot Light	Indicates when wax tray's heating element is on.
MOTOR switch	Applies power to roller motor. When wax coater has reached proper operating temperature, rollers rotate.
OPERATE Pilot Light	Amber light indicates wax coater has reached proper operating temperature and MOTOR switch can be turned ON.

Control or Indicator	Function
HEAT ON Pilot Light	Red light indicates that MAIN switch has been turned ON.
MAIN switch	Controls main power input.
LOW/HIGH Thermostat	Adjusts temperature of wax.

8-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

8-5.1 PMCS Procedures.

a. PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Item	Quantity
Adhesive Wax, (Item 31, Appendix E)	5 bars
Wax Solvent, (Item 32, Appendix E)	ar
Plastic Utility Pail	1 ea
Cheesecloth, (Item 6, Appendix E)	ar
Rubber Hand Scraper	1 ea
Flat Tip Screwdriver	1 ea

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number) . Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER	
1	B	Inspect.	

WARNING

Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.

CAUTION

Do not attempt to move machine when wax is melted and machine is on or damage to machine may result.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

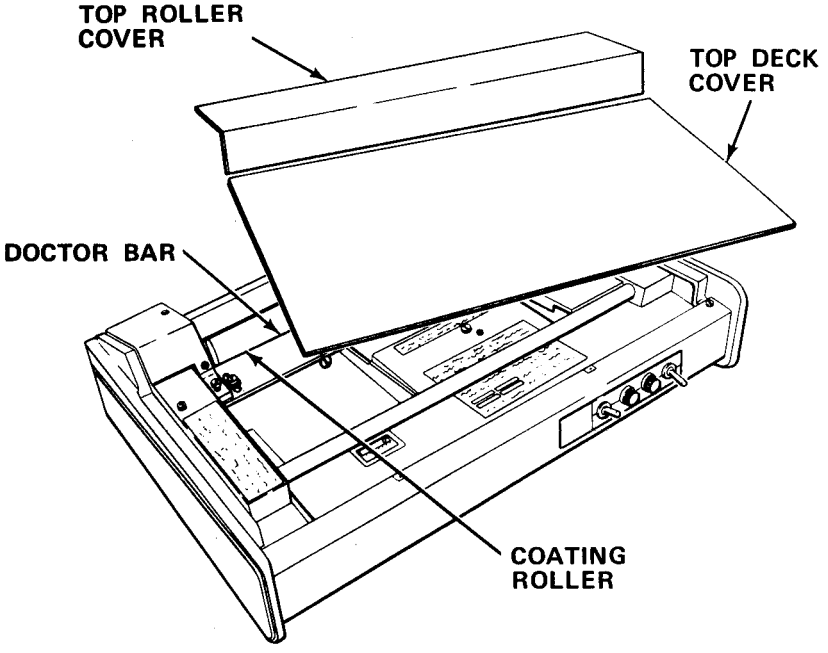
B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Sl - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
1	B	Inspect - cont	



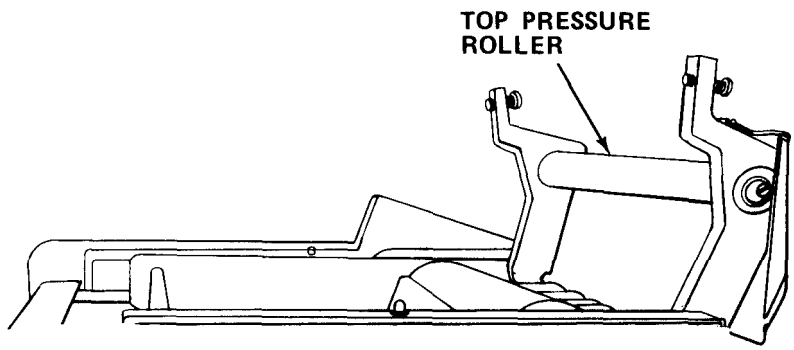
1. Unplug machine and remove top roller cover and top deck cover.

2. Inspect doctor bar and coating roller for dust, dirt, or foreign particles. If dirty, clean with wax solvent.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually - Semiannually BI - Biennially | (Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
1	B	Inspect - Cont	



3. Lift top pressure roller. Inspect for dust, dirt, or foreign particles. If dirty, clean with wax solvent.

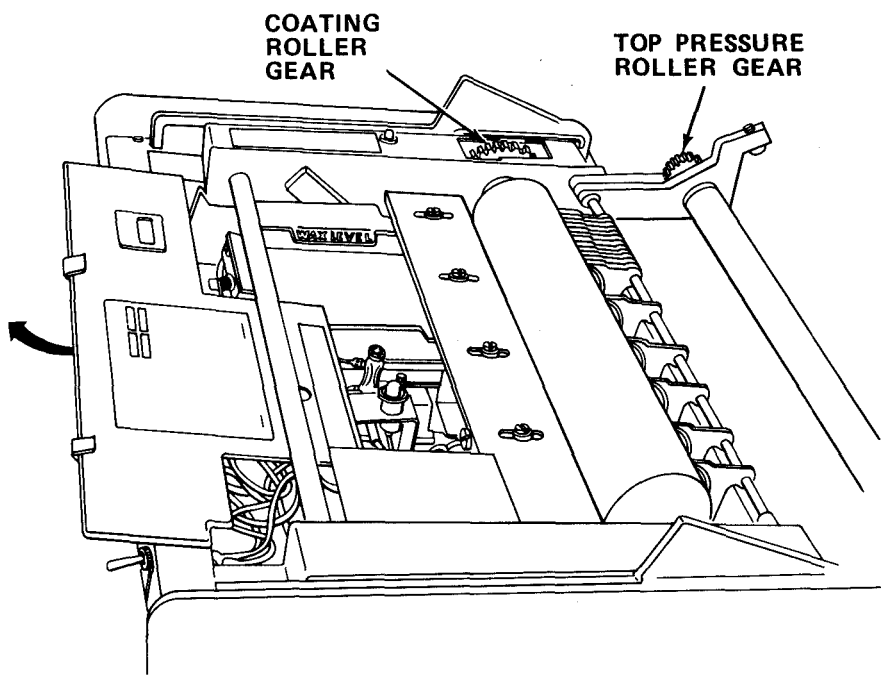


Table 8-1. OPERATOR preventive MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A - After
W - Weekly
M - Monthly
Q - Quarterly
AN - Annually
S - Semiannually
BI - Biennially
(Number) - Hundreds of Hours

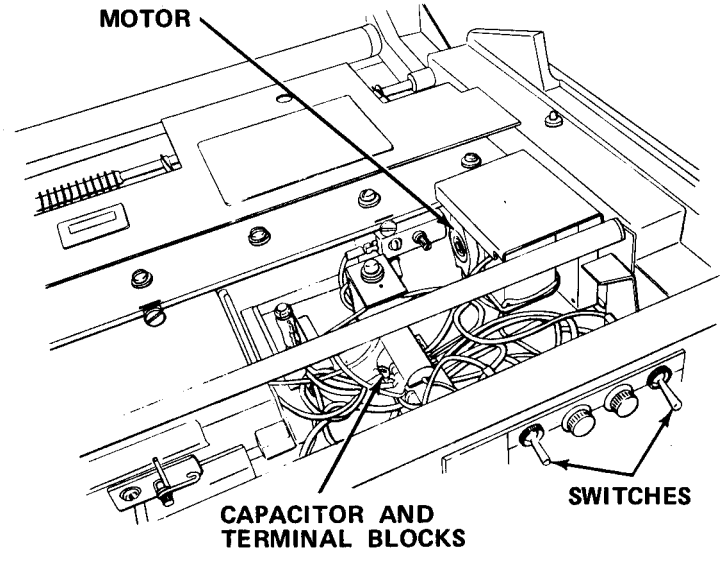
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
1	B	Inspect - Cont	
		4. Inspect pressure roller gear and coating roller gear for chipped or broken teeth.	Damaged gears.
		CAUTION When moving inner panel, keep back end lifted so it does not catch on pilot light, or damage to light can result.	
		5. Remove screw holding inner panel . Grasp back of inner panel, lift, and pull-it toward rollers. When inner panel is free of mounting brackets, lift its back above pilot light and slide inner panel out front of wax coater.	
			
		6. Inspect electrical components for loose connections. Tighten if necessary.	

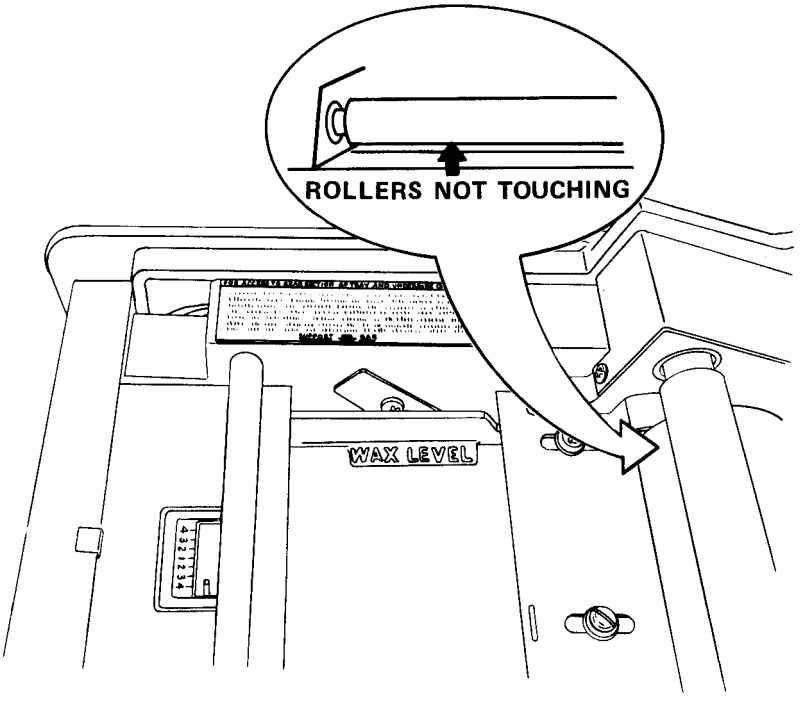
Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Number) - Hundreds of Hours

ITEN NO.	INTER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
1	B	Inspect - Cont	

7. Inspect wax in wax tray for suspended dust, dirt, or foreign matter.

8. Reinstall inner panel.



9. Reinstall top pressure roller. Examine gap between top pressure roller and coating roller to be sure they are not touching at any point. Adjust as necessary (Paragraph 8-10.2).

10. Reinstall top roller cover and top deck cover, and plug in power cord.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Reediness Reporting. Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
2	W	Clean Coating Roller.	

WARNING

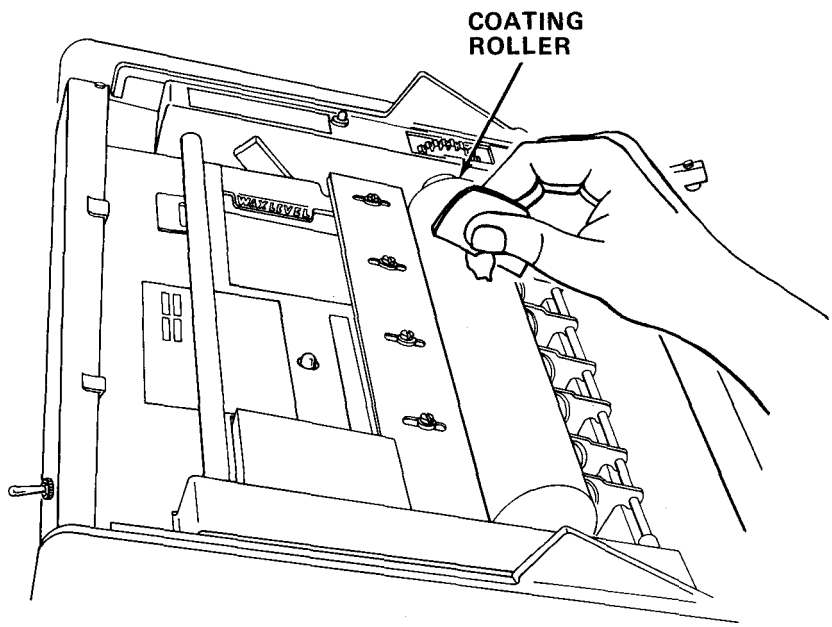
Serious injury may result if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.

1. Remove top roller cover and top deck cover.
2. Turn MAIN switch ON.
3. Grasp top pressure roller and lift back. Check that top pressure roller is clean.
4. When OPERATE pilot light comes on, turn MOTOR switch ON.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
2	W	Clean Coating Roller - Cont	



5. Press scraper on top of coating roller at one end, and scrape across top of roller as it rotates. Repeat until only clean, clear wax is collected. Check that wax in tray is at correct level.

6. Reinstall top pressure roller.

7. Reinstall top deck cover. If wax coater is not to be operated, reinstall top roller cover.

8. Turn MAIN switch and MOTOR switch OFF if machine is not to be used immediately.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

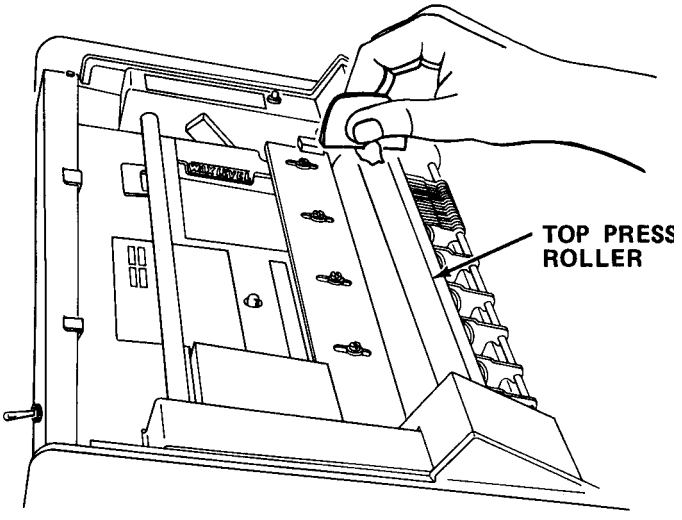
B . Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Reediness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
3	D	Clean Top Pressure Roller.	

WARNING

Serious injury may result if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.

1. Remove top roller cover and top deck cover.



2. Turn roller motor ON.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B . Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

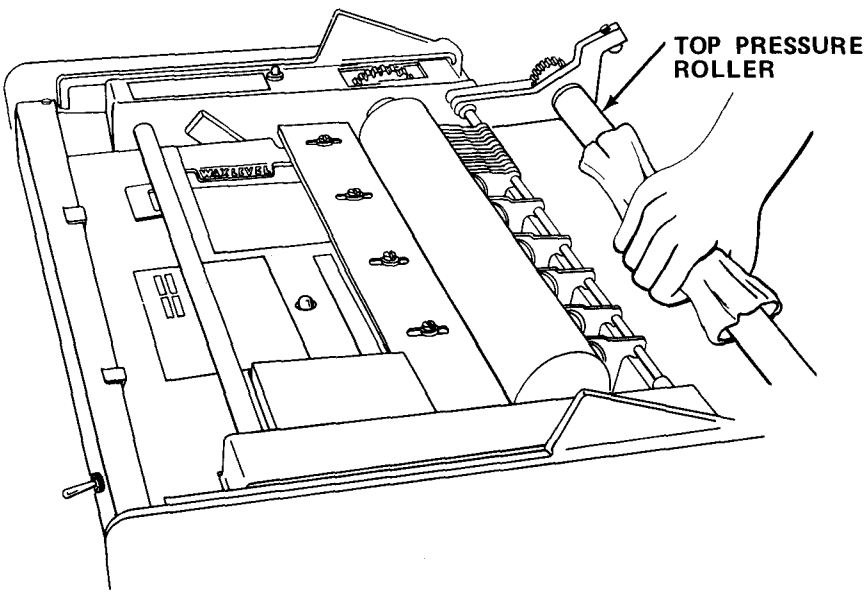
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
3	D	Clean Top Pressure Roller - Cont	
		3. Scrape off wax from top pressure roller with scraper.	
		4. Turn roller motor OFF, and place top pressure roller in rear position.	
			
		5. Soak cheesecloth with wax solvent and wipe down surface of top pressure roller. Repeat until all wax and dirt has been removed. Allow roller to dry.	
		6. Place top pressure roller in original position. Check that it is not touching coating roller at any point. Adjust if necessary (Paragraph 8-10.2)	
		7. Reinstall top deck cover. Reinstall top roll er cover if machine is not to be operated immediately.	

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Numbed - Hundreds of Hours

ITEM NO.	IN-TER-I/AL	ITEM TO BE INSPECTED PROCEDURE	For Reediness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
4	W	Drain Wax and Clean.	

WARNING

Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.

CAUTION

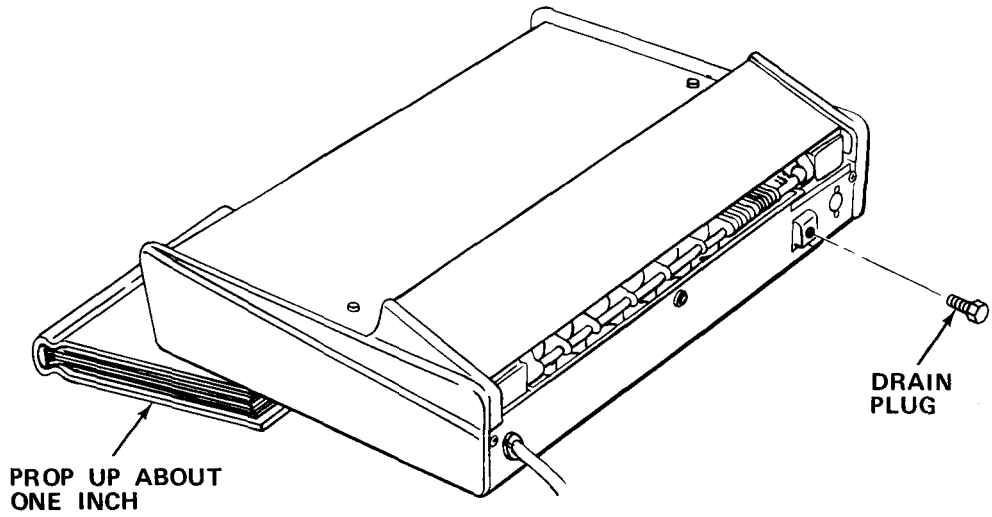
When draining, do not lift front of wax coater more than 1 in. or liquid wax will spill inside of machine.

1. Plug ac power cord into electrical outlet. Turn MAIN switch ON.
2. Remove top deck cover and top roller cover.

Table 8-1, OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Numbed - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Reediness Reporting, Equipment Is Not Reedy/ Available If:
		ADHESIVE WAX COATER - Cont	
4	w	Drain Wax and Clean - Cont	



3. When wax is completely liquid (melted), place disposable pail, with capacity of at least 1 qt, beneath drain hole.

4. Remove drain plug at rear of wax coater. Raise front of wax coater slightly and let wax drain completely.

5. Turn MAIN switch OFF while wax is draining. When all wax has drained, replace drain plug.

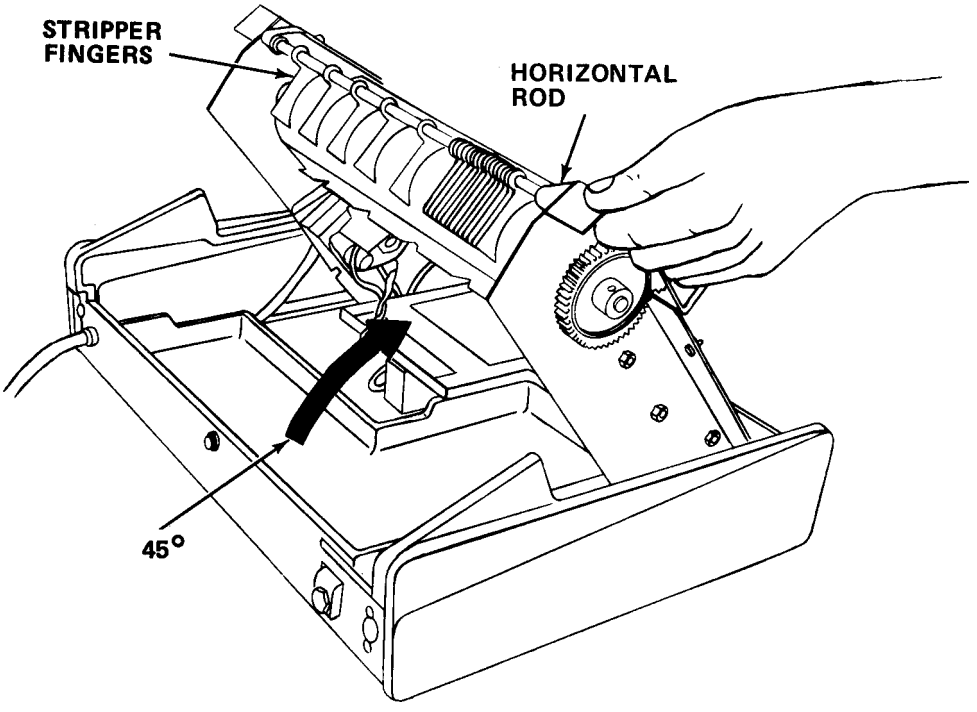
6. Restore wax coater to level position.

7. Remove ac power cord from outlet.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before W - Weekly AN - Annually (Number) . Hundreds of Hours
D - During M - Monthly S - Semiannually
A - After Q - Quarterly BI - Biennially

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Reediness Reporting.. Equipment Is Not Reedy/ Available If:
		ADHESIVE WAX COATER - Cont	
4	W	Drain Wax and Clean - Cont	



8. Grasp horizontal rod that supports stripper fingers, and pull entire roller carriage assembly upward until carriage is at approximate 45 degree angle with base.

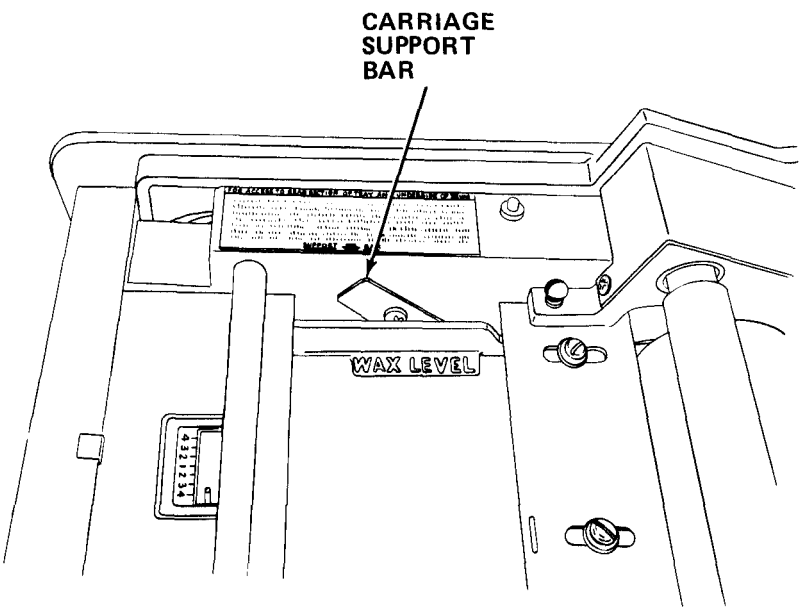
NOTE

Carriage assembly is hinged at front.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
4	W	Drain Wax and Clean - Cont	



9. Lower carriage slowly until carriage support bar on left side engages.

10. Clean out paper and foreign matter from wax tray, coating roller, stripper fingers, and between doctor bar and coating roller.

11. Soak piece of cheesecloth in wax solvent, and clean out wax tray, coating roller, pressure roller, and doctor bar.

12. Break up five bars of new wax and place in wax tray.

13. Grasp horizontal rod and lift slightly to disengage carriage support bar. Tilt support bar out of way and gently lower carriage on top of wax.

Table 8-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D . During A . After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually Bl - Biennially | (Numbed - Hundreds of Hours

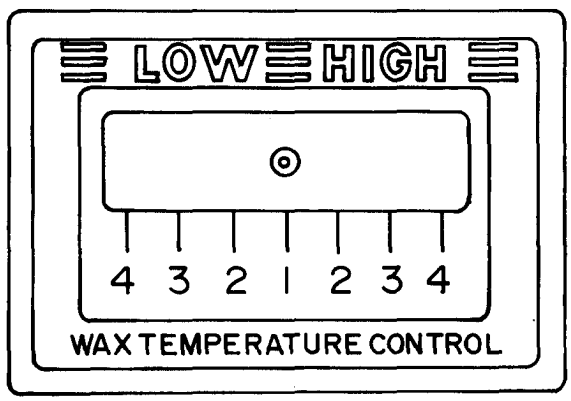
ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting. Equipment Is Not Ready/ Available If:
		ADHESIVE WAX COATER - Cont	
4	W	Drain Wax and Clean - Cont 14. Plug in ac power cord and turn MAIN switch ON. Allow wax to melt and roller assembly to seat itself. Press down firmly on roller assembly when wax has melted to seat roller. 15. Reinstall top deck cover. If wax coater is not to be used, reinstall top roller cover.	

8-6. OPERATION UNDER USUAL CONDITIONS.

8-6.1 Operating Procedures.

a. Place wax coater on firm, level surface. Plug power cord into grounded ac outlet.

b. Lift up top deck cover.



NOTE

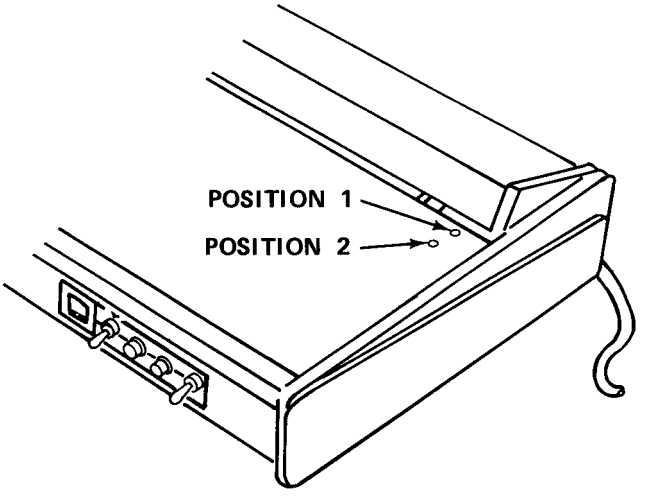
The lighter the material, the lower the temperature should be set to prevent bleed-through. The higher the temperature, the greater the possibility of bleed-through.

c. Set LOW/HIGH thermostat to 1 position if material to be coated is normal-weight stock. If material is lightweight, set thermostat lower.

CAUTION

If wax level is allowed to fall below mark, damage to machine may result.

d. Check wax level in tray. Add piece of wax if below level indicator.



e. Position top deck cover on wax coater by placing cover holes over pins. If coating lightweight or normal weight stock, place cover all the way forward (position 1). For heavier materials, place cover back one hole (position 2).

f. Turn MAIN switch ON. If HEAT ON pilot light does not come on, refer to troubleshooting procedures.

9. Allow time for wax to melt, approximately 15 to 18 min.

8-6.2 Operating Instructions on Decals and Instruction Plates.

OPERATING INSTRUCTIONS

START

MACHINE MUST BE ON A LEVEL SURFACE. PLUG THE POWER LINE CORD INTO AN A.C. GROUNDED OUTLET. THE SWITCH ON THE LEFT HAND SIDE CONTROLS THE HEATER TO MELT THE WAX. THE RED, ADJACENT PILOT LIGHT WILL GLOW WHEN THIS SWITCH IS ON. IN APPROXIMATELY 20 MINUTES THE AMBER LIGHT WILL GLOW, INDICATING THAT THE WAX IS AT OPERATING TEMPERATURE, THE MACHINE IS THEN READY FOR USE. THROW THE RIGHT HAND SWITCH ''ON" TO ACTIVATE THE MOTOR AND COATING ROLLER. (NOTE: MOTOR WILL NOT OPERATE UNTIL THE AMBER LIGHT GOES ON.

MODEL 1215	SER. NO. IZ 787
A.C. VOLTS 120	WATTS 650

USE

WITH MOTOR RUNNING, PLACE MATERIAL TO BE COATED ON THE DECK OF THE MACHINE WITH PRINTED MATTER FACE UP GENTLY PUSH MATERIAL FORWARD UNTIL IT IS CAUGHT BY THE ROLLERS. ADHESIVE WAX COAT WILL BE APPLIED AS MATERIAL PASSES THROUGH THE MACHINE. TURN OFF MOTOR SWITCH AFTER PROCESSING MATERIAL. HEATER SWITCH SHOULD BE LEFT ON DURING THE DAY WHILE MACHINE IS IN USE.

CARE

KEEP WAX LEVEL UP TO THE MARKER ADD WAX WHEN NECESSARY. DO NOT MOVE MACHINE WHILE WAX IS HOT. SET Hi-LO THERMOSTAT CONTROL AT MID-POINT UNLESS IT IS DESIRED TO HAVE WAX AT HIGHER OR LOWER TEMPERATURE. FOR ADJUSTMENTS AND FURTHER INSTRUCTIONS SEE MANUAL.

WARNING: MACHINE WILL NOT OPERATE PROPERLY
UNLESS WAX LEVEL IS UP TO THE MARKER IN TRAY
•DO NOT MOVE MACHINE WHILE WAX IS LIQUIDž

FOR ACCESS TO REAR SECTION OF TRAY AND UNDERSIDE OF DRUM

CARRIAGE MAY BE TILTED UPWARD WHEN WAX IS MELTED BY GRASPING ROD RUNNING ACROSS REAR OF MACHINE (USE GLOVE) AND PULLING UPWARD SEVERAL INCHES. THE CARRIAGE SUPPORT BAR, INDICATED BY ARROW BELOW, WILL SWIVEL INTO A VERTICAL POSITION TO HOLD THE CARRIAGE UPRIGHT AT AN ANGLE. TO RETURN CARRIAGE TO THE OPERATING POSITION, GRASP REAR ROD, ROTATE SUPPORT BAR TO ITS ORIGINAL ANGULAR POSITION AND SLOWLY LOWER CARRIAGE INTO TRAY.

SUPPORT BAR

8-7. **OPERATION UNDER UNUSUAL CONDITIONS.** This equipment is designed for operation only in a controlled environment.

Section II OPERATOR MAINTENANCE

8-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

8-9. TROUBLESHOOTING PROCEDURES.

a. The table lists the common malfunctions which may occur during the operation or maintenance of the adhesive wax coater, or its components. You should perform the test/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all test or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 8-2. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. WAX COATER DOES NOT WORK; WAX REMAINS COLD.
Step 1. Check to see if ac power cord is plugged into wall outlet.
(a) If cord is plugged in, proceed to step 2.
(b) Plug cord into ac electrical outlet.
Step 2. Check to see if outlet circuit breaker is tripped.
(a) If circuit breaker is on, refer to organizational maintenance.
(b) Reset circuit breaker.
2. WAX COATING APPEARS FLAT AND DULL.
Step 1. Check wax level.
(a) If wax level is correct, proceed to step 2.
(b) Break up new wax into small cubes. When OPERATE pilot light is lit, place wax cubes into tray until wax is at operating level.

Table 8-2. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
2. WAX COATING APPEARS FLAT AND DULL - Cont	
Step 2. Check LOW/HIGH thermostat setting.	If in HIGH range, reduce setting one notch. Allow time for temperature to adjust. Repeat if mal function persists.
3. WAX BLEEDS THROUGH SHEET.	
Step 1. Check setting of LOW/HIGH thermostat.	(a) If in HIGH range, reduce setting one notch. Allow time for temperature to adjust.
	NOTE If thermostat is set too low, machine will not operate correctly.
	(b) Run scrap piece of material through wax coater. If mal-function persists, repeat step (a) above until wax has stopped bleeding.
	(c) If unable to correct malfunction, proceed to step 2.
Step 2. Check to see if wax is too thick.	Refer to malfunction 4, steps 1 and 2.
4. COATING LAYER IS TOO THICK OR TOO THIN.	
Step 1. Visually examine clearance between doctor bar and coating roller to see if gap appears uneven, too small, or too large.	(a) If gap appears correct, proceed to step 2.
	(b) Adjust doctor bar gap (paragraph 8-10.1).

Table 8-2. TROUBLESHOOTING - Cont

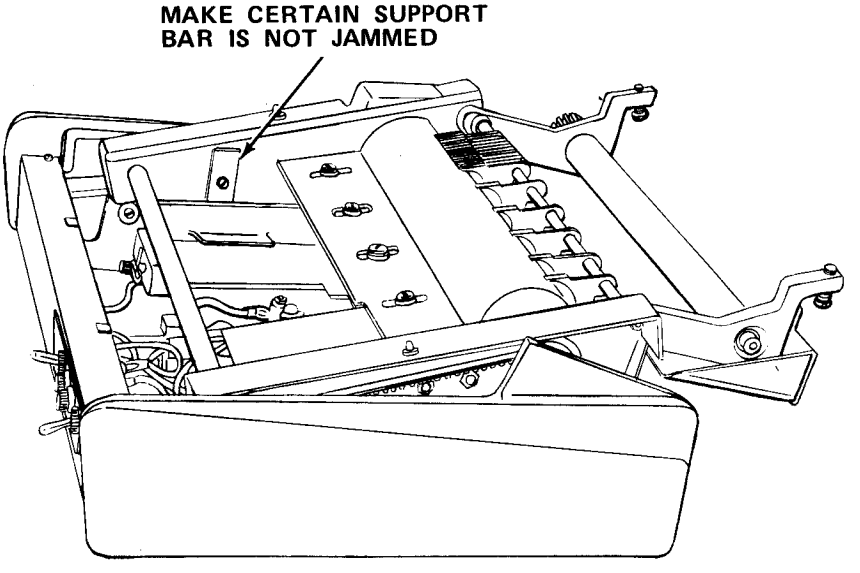
MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION
4. COATING LAYER IS TOO THICK OR TOO THIN - Cent	Step 2. Check that coating roller is seated properly in wax and carriage support bar is not jammed.	 Push down on both ends of coating roller. Free carriage support bar if jammed.
5. WAX COATING CONTAINS DUST PARTICLES OR DIRT.	Step 1. Check that wax in tray is clear and has no suspended matter.	(a) If wax is clear, proceed to step 2. (b) Drain and replace wax.
	Step 2. Check that wax on coating roller is clear with no foreign particles.	Clean coating roller.

Table 8-2. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
6. WAX COATING IS ROUGH, BUMPY, AND WAX FILAMENTS TRAIL FROM EDGE OF SHEET.
Step 1. Check setting of LOW/HIGH thermostat.
(a) If in LOW range, increase setting one notch.
(b) Allow time for temperature to adjust. Feed scrap piece of material through wax coater. Repeat this procedure until malfunction is corrected.
(c) If unable to correct malfunction, proceed to step 2.
Step 2. Check that wax coater is level.
(a) If wax coater is level, proceed to step 3.
(b) Level wax coater.
Step 3. Check that carriage roller is seated firmly in wax tray and carriage support bar is not jammed.
(a) If carriage support bar is free, proceed to step 4.
(b) Free carriage support bar. Press down gently on both sides of carriage roller to seat firmly.
Step 4. Visually check gap between coating roller and doctor bar to be sure it is even.
Adjust gap clearance (paragraph 8-10.2).
7. WAX BUILDS UPON TOP ROLLER, STRIPPER FINGERS, OR DOCTOR BAR.
Step 1. Check wax level in tray.
(a) If wax level is correct, proceed to step 2.
(b) Break up pieces of new wax into small cubes and drop into tray when OPERATE pilot light is on.
Step 2. Visually check gap between top pressure roller and coating roller to see if gap is too small or rollers are touching.
Adjust gap (paragraph 8-10.2).

Table 8-2. TROUBLESHOOTING - Cont

MALFUNCTION / TEST OR INSPECTION / CORRECTIVE ACTION

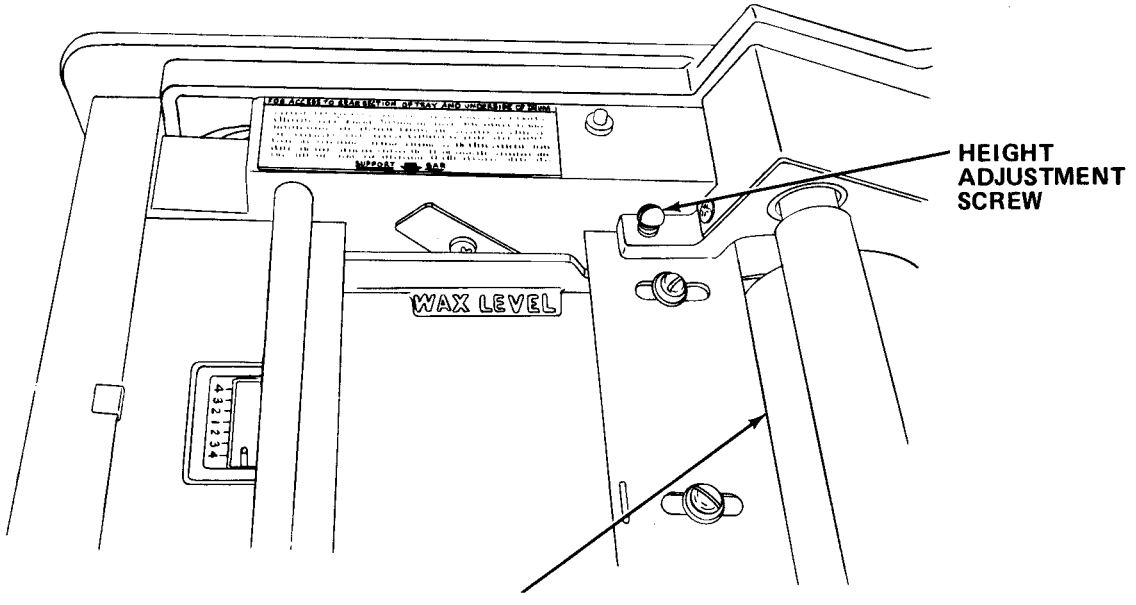
8. MOTOR OR ROLLERS SHUT DOWN; MOTOR SWITCH IS ON.

Check to see if pilot lights are on.

If not, refer to malfunction 1, step 1.

9. ROTATION OF TOP ROLLER IS NOT UNIFORM.

Step 1. Check that top pressure roller is seated and side supports are resting on doctor bar.



(a) If roller is seated, proceed to step 2.

(b) Lift roller and clear any objects under side supports. Seat top pressure roller.

Step 2. Check that pressure roller gap is not excessive.

If too great, adjust roller gap (paragraph 8-10.2).

8-10. MAINTENANCE PROCEDURES.

This section contains instructions covering operator maintenance functions for the adhesive wax coater. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

8-10.1 Adjust Doctor Bar.

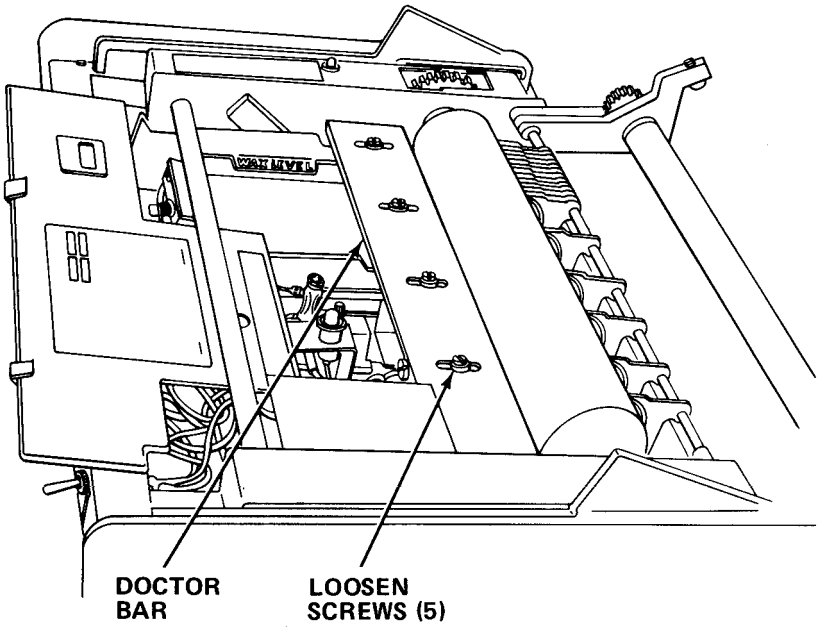
MOS: 81C, Cartographer

TOOLS: Thickness Gages 0.006 in. (2 required)
Flat Tip Screwdriver
Cross Tip Screwdriver

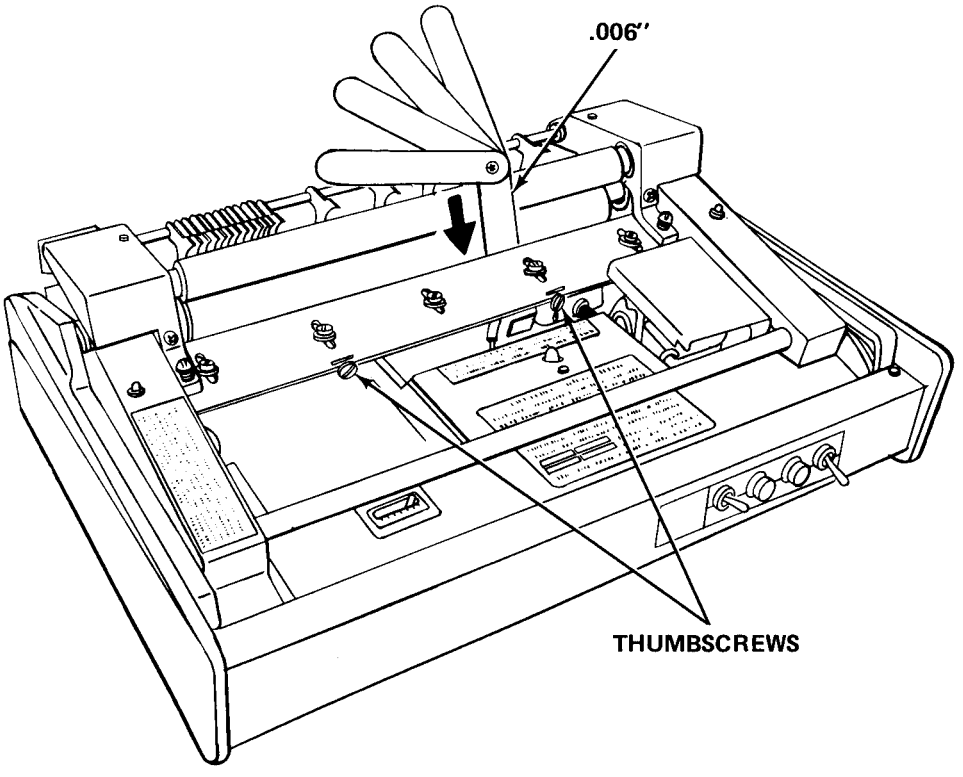
WARNING

Serious injury may result if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.

a. Lift off top deck cover and top roller cover.



b. Slightly loosen screws holding doctor bar.



c. Turn two brass, knurled thumbscrews at rear of doctor bar until blade moves away from drum slightly.

NOTE

If larger thickness of wax coating is desired, insert larger gage.

d. Insert two 0.006 in. (0.150 mm) thickness gages between coating roller and doctor bar, approximately same distance apart as knurled adjusting screws.

e. Slowly turn two knurled screws alternately until two thickness gages are pressed firmly against coating roller.

NOTE

Adjust doctor bar so that thickness gages are just snug against doctor bar and cooling roller.

f. Pull thickness gages from between coating roller and doctor bar.

g. Tighten doctor bar holding screws.

h. Insert a thickness gage between coating roller and doctor bar.

i. Move thickness gage across entire length of doctor bar to be sure gap is uniform and correct.

j. Reinstall top deck cover and top roller cover.

8-10.2 Adjust Roller Gap.

MOS: 81C, Cartographer

TOOLS: Thickness Gage 0.040 in.
Flat Tip Screwdriver
Rubber Hand Scraper

WARNING

Serious injury may result if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.

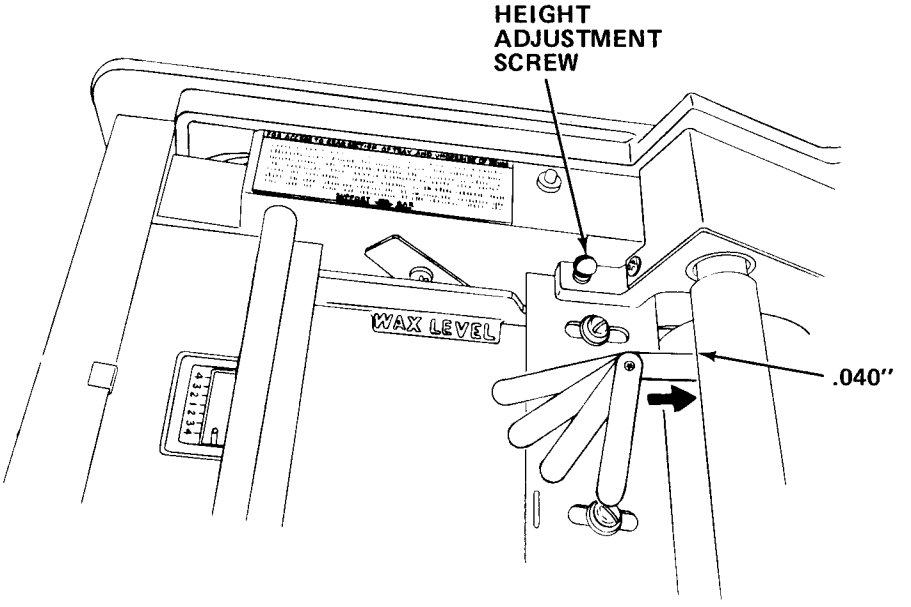
a. Remove top roller cover and top deck cover.

b. Check that top pressure roller is clean.

c. Lift top pressure roller from wax machine.

d. Scrape dry wax from top of roller.

e. Reinstall top pressure roller.



f. Insert 0.040 in. (1.02 mm) thickness gage between coating roller and top pressure roller at one end.

NOTE

Turning pressure screws to the right will raise top pressure roller.

g. Turn height adjustment screw at that end until top pressure roller touches gage.

h. Check that moving thickness gage in and out will turn top pressure roller.

i. Check that thickness gage can be inserted easily.

j. Insert thickness gage at other end and repeat steps g through i.

k. Check uniformity of gap by inserting thickness gage between rollers at middle and moving in and out.

l. If thickness gage cannot be inserted easily or top pressure roller does not move, repeat steps f. through k.

m. Reinstall covers.

Section IV ORGANIZATIONAL MAINTENANCE

8-11. **LUBRICATION PROCEDURES.** This equipment does not require lubrication.

8-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT. These items are not used at the organizational level of maintenance.

8-13. SERVICE UPON RECEIPT.

8-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with DA Pam 738-750.

c. Check to see if the equipment has been modified.

8-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

8-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES. If the adhesive wax coater does not power up when turned on, verify that 120 V ac is present at the receptacle. If voltage is not present, plug equipment into receptacle with power available and proceed with equipment troubleshooting. Perform no-power procedures for dead receptacle (Table 1-4). If power is present replace the adhesive wax coater.

8-16. MAINTENANCE PROCEDURES. There are no organizational maintenance procedures assigned for this equipment.

8-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

8-18. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

8-18.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

8-18.2 Special Tools: Test, Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

8-18.3 Repair Parts. Repair parts for this equipment are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-316-24P covering direct/general support maintenance for this equipment.

8-19. DIRECT/GENERAL SUPPORT TROUBLESHOOTING PROCEDURES.

a. Direct/general support troubleshooting procedures cover the most common malfunctions that may be repaired at the direct/general support level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used at lower levels should be conducted in addition to the direct/general support troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/inspection and corrective action. If a malfunction is not listed or is not corrected by a listed corrective action, notify your supervisor.

For unidentified malfunctions, use the facing schematic or the foldout located at the end of this manual for further fault analysis,

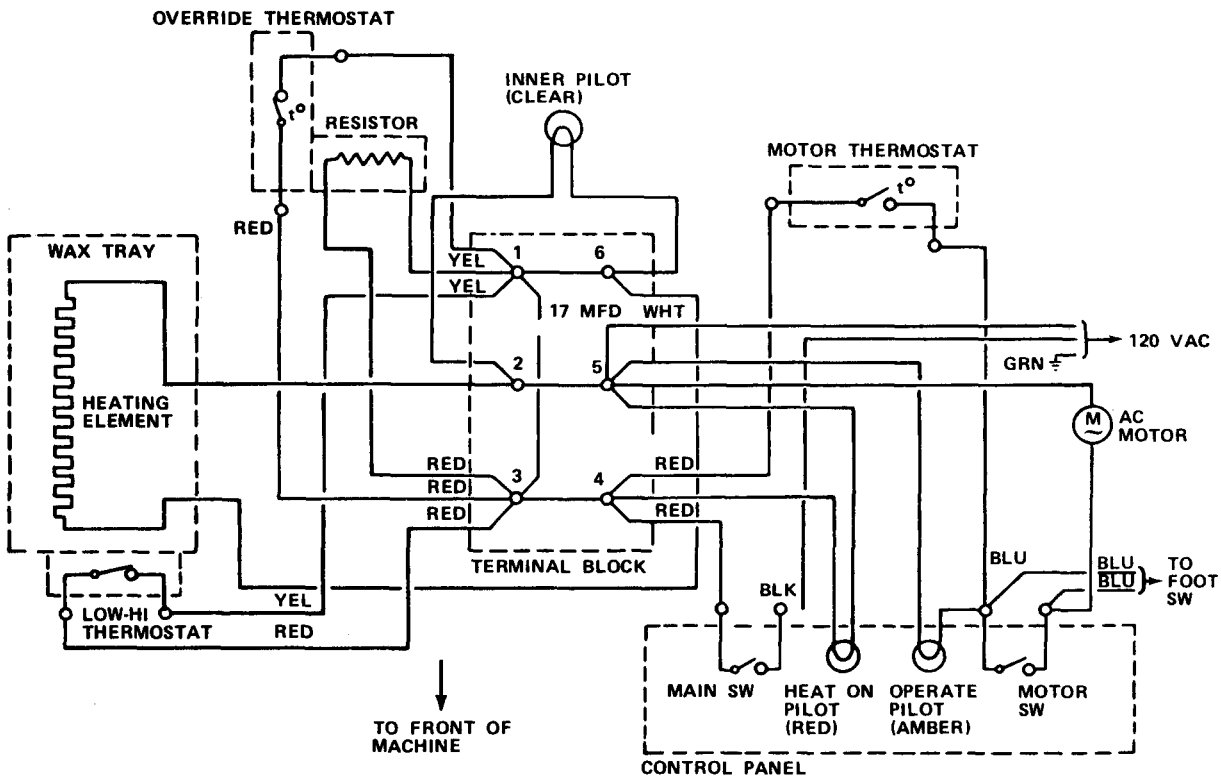


Table 8-3. DIRECT/GENERAL SUPPORT TROUBLESHOOTING

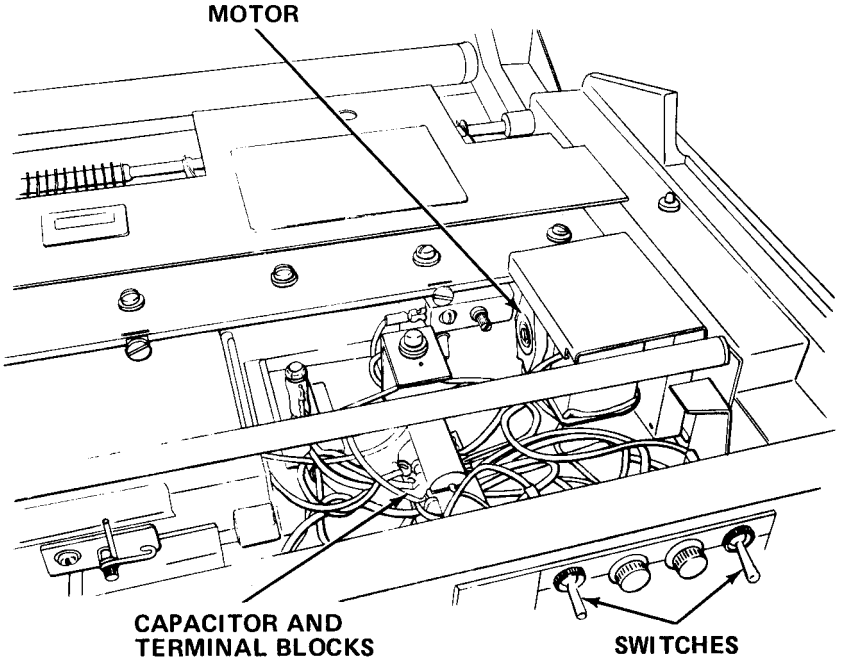
MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

1. WAX COATER IS INOPERATIVE.

Step 1. Remove covers and inner panel. Check visually for any loose electrical connections.



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

(a) If all wiring connections are tight, proceed to step 2.

(b) Reconnect/repair any loose/damaged wiring according to wiring schematic.

(c) Tighten any loose screws or nuts.

Table 8-3. DIRECT/GENERAL SUPPORT TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

1. WAX COATER IS INOPERATIVE - Cont

CAUTION

Be sure that wax coater is unplugged before performing any continuity checks, or damage to meter may result.

Step 2. Check continuity through power cable.

(a) If continuity exists, proceed to step 3.

(b) If there is no continuity or continuity is intermittent, replace power cable (paragraph 8-20.9).

Step 3. Turn HEAT ON switch ON. Check for continuity across switch terminals.

Replace switch (paragraph 8-20.5).

Table 8-3. DIRECT/GENERAL SUPPORT TROUBLESHOOTING - Cont

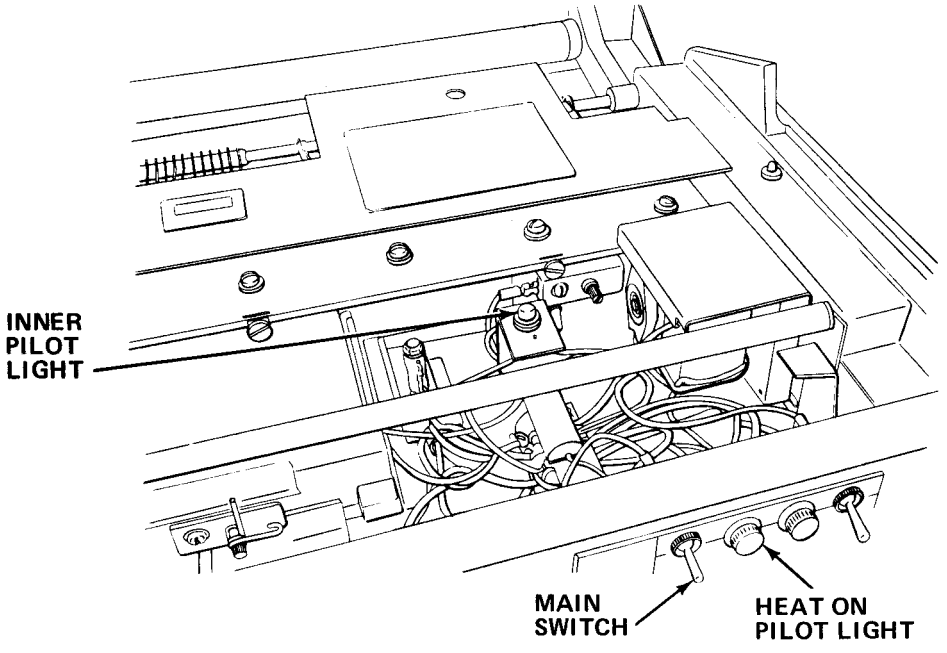
MALFUNCTION

TEST OR INSPECTION

CORRECTIVE ACTION

2. MAIN SWITCH, INNER PILOT LIGHT, AND HEAT ON PILOT LIGHT ARE ON; WAX REMAINS COLD.

Step 1. Remove covers and inner panel. Check visually for any loose electrical connections.



(a) If wiring connections are good, proceed to step 2.

(b) Reconnect/replace any loose or damaged wiring according to wiring schematic.

(c) Tighten any loose screws and nuts.

Table 8-3. **DIRECT/GENERAL SUPPORT TROUBLESHOOTING - Cont**

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

2. MAIN SWITCH, INNER PILOT LIGHT, AND HEAT ON PILOT LIGHT ARE ON; WAX REMAINS COLD - Cont

CAUTION

Be sure that wax coater is unplugged before performing any continuity checks, or damage to meter may result.

Step 2. Adjust override thermostat to 210°- 220°F.

If wax does not heat, proceed to step 3.

Step 3. Turn override thermostat fully to the right. Check for continuity across thermostat.

(a) If continuity is present, proceed to step 4.

(b) If there is no continuity across override thermostat, replace override thermostat (paragraph 8-20.6).

Step 4. Check for continuity through heating element.

If there is no continuity, replace heating element (paragraph 8-20.10).

3. WAX COATING APPEARS FLAT AND DULL.

Step 1. Turn override thermostat fully to the right. Check for continuity across thermostat.

(a) If continuity is not present, proceed to step 2.

(b) If there is continuity, replace LOW/HIGH thermostat (paragraph 8-20.6).

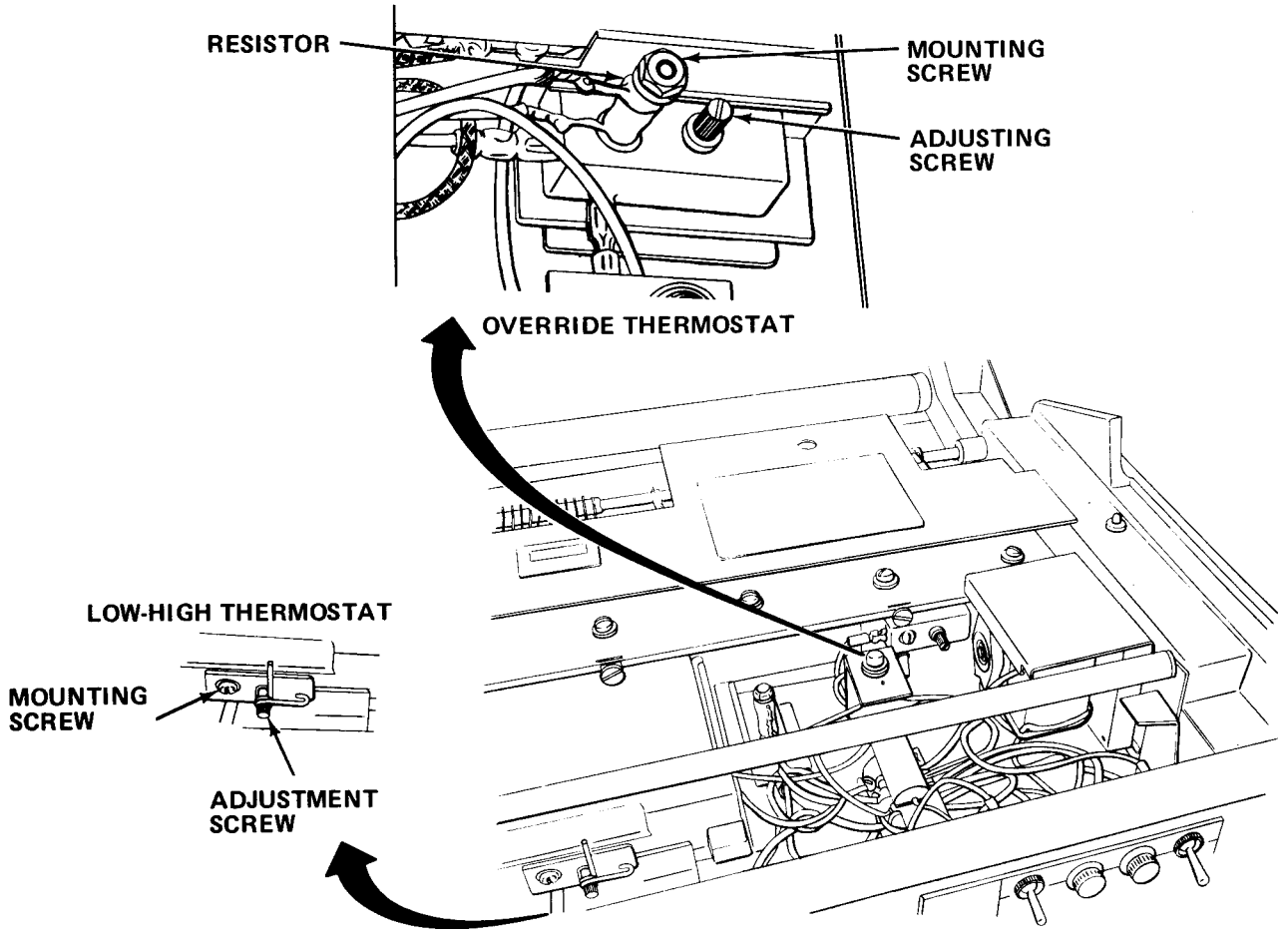
CAUTION

Do not attempt to move machine when wax is melted and machine is on or damage to machine may result.

Table 8-3. DIRECT/GENERAL SUPPORT TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

3. WAX COATING APPEARS FLAT AND DULL Cont



Step 2. Turn HEAT ON switch OFF. Allow wax to cool. Turn HEAT ON switch back ON to see if inner pilot light comes on after normal warm-up period.

If light comes on, adjust override thermostat to 210°- 220°F (paragraph 8-20.7).

Table 8-3. DIRECT/GENERAL SUPPORT TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION

4. WAX COATING IS TOO THICK OR TOO THIN.

   Refer to malfunction 3, steps 1 and 2.

5. WAX WILL NOT HEAT COMPLETELY OR TAKES OVER 30 MIN TO MELT.

   Refer to malfunction 3, steps 1 and 2.

6. WAX COATING IS ROUGH AND BUMPY. WAX FILAMENTS TRAIL FROM EDGE OF SHEET.

   Refer to malfunction 3, steps 1 and 2.

7. WAX IS MELTED, BUT AMBER OPERATE PILOT LIGHT WILL NOT COME ON.

   Step 1. Turn MOTOR switch ON. Check to see if rollers rotate.

   (a) If rollers rotate, lamp is bad. Replace lamp (paragraph 8-20.4).

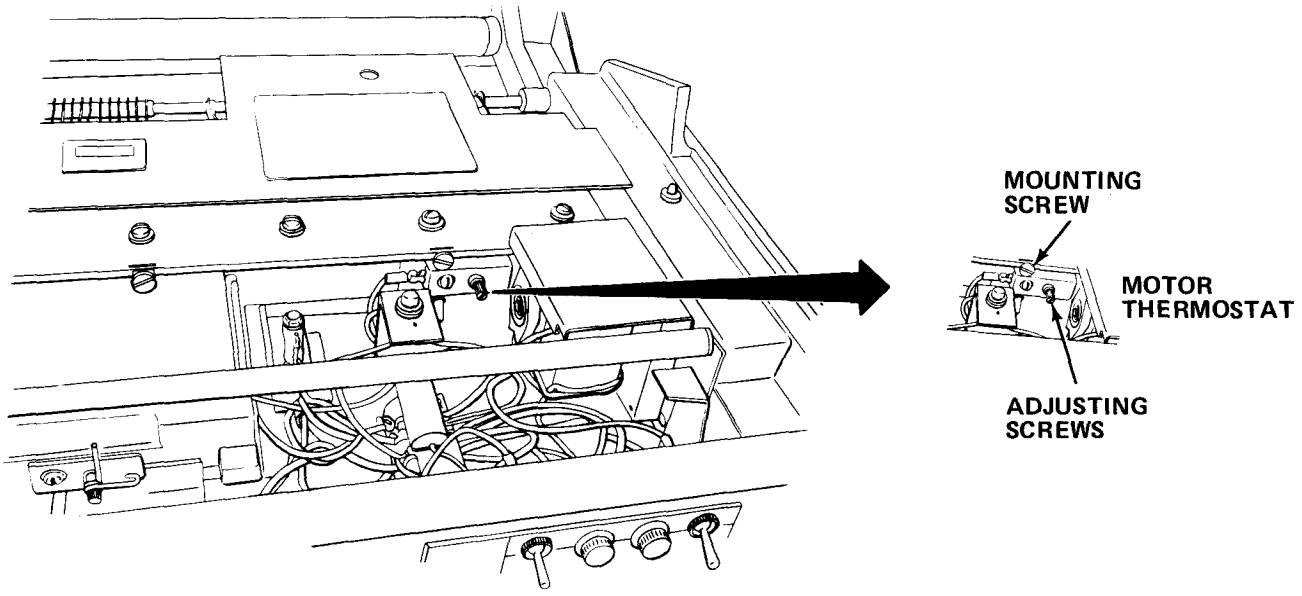
   (b) If rollers do not rotate, replace motor thermostat (paragraph 8-20.6).

   (c) If malfunction is not corrected, proceed to step 2.

Table 8-3. DIRECT/GENERAL SUPPORT TROUBLESHOOTING - **Cont**

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION

7. WAX IS MELTED, BUT AMBER OPERATE PILOT LIGHT WILL NOT COME ON - Cont



Step 2. Check for continuity through amber OPERATE pilot light.

(a) If continuity is present, proceed to step 3.

(b) Replace operate pilot light (paragraph 8-20.4).

Step 3. See malfunction 3, step 2.

8. AMBER OPERATE PILOT LIGHT AND MOTOR SWITCH ARE ON, BUT ROLLERS DO NOT TURN<

Step 1. Check for continuity through MOTOR switch.

(a) If there is no continuity, replace MOTOR switch (paragraph 8-20.5).

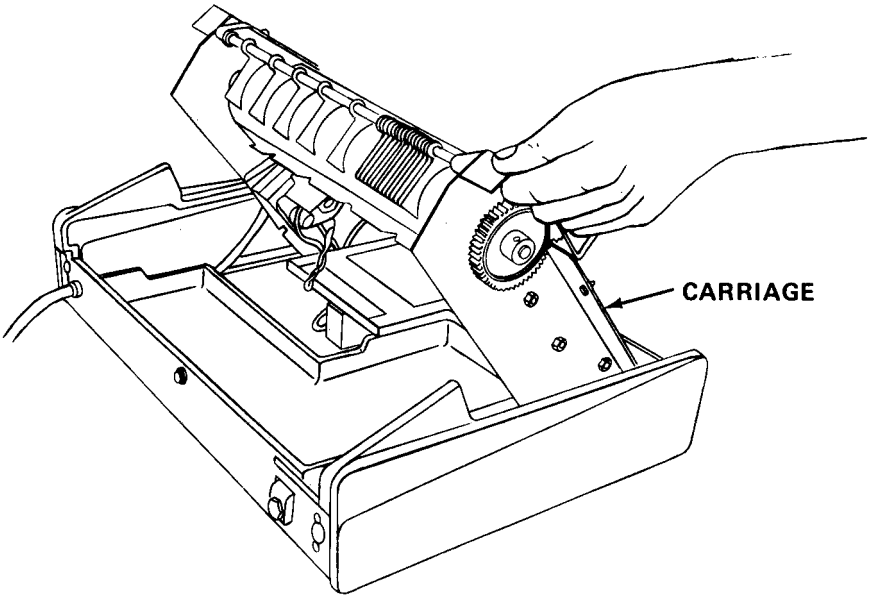
(b) If there is continuity through MOTOR switch, replace motor (paragraph 8-20.1).

(c) If malfunction is not corrected, proceed to step 2.

Table 8-3. DIRECT/GENERAL SUPPORT TROUBLESHOOTING - Cont

MALFUNCTION	TEST OR INSPECTION	CORRECTIVE ACTION

8. AMBER OPERATE PILOT LIGHT AND MOTOR SWITCH ARE ON, BUT ROLLERS DO NOT TURN - Cont



Step 2. Turn wax coater ON. When wax has melted, raise coating carriage and check tightness of drive belt.

(a) If belt tension is correct, proceed to step 3.

(b) If belt is broken or defective, replace drive belt. If loose, tighten drive belt (paragraph 8-20.8).

Step 3. Check pressure roller gear for damage or looseness.

Replace faulty pressure roller gear (paragraph 8-20.11).

Table 8-3. DIRECT/GENERAL SUPPORT TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
9. MOTOR OR ROLLERS SHUT DOWN WITH MOTOR SWITCH ON.
Step 1. Check for vibration or humming of motor.
(a) If motor is vibrating or humming, proceed to step 2.
(b) If no vibration or humming is present, replace motor (paragraph 8-20. 1).
(c) If malfunction is not corrected, proceed to step 3.
Step 2. Raise carriage. Check to see if main gear, secondary gear, or pressure roller are jammed or stuck.
(a) If free and clear of obstructions, proceed to step 3.
(b) Remove obstacle.
Step 3. Check to see if gears are riding free.
(a) If gears are free, proceed to step 4.
(b) Replace gear (paragraph 8-20. 11).
Step 4. Turn motor thermostat fully to the right, and check to see if motor comes on.
Adjust motor thermostat (paragraph 8-20.7).
10. ROTATION OF TOP PRESSURE ROLLER IS NOT UNIFORM.
Refer to malfunction 8, step 3.

8-20. MAINTENANCE PROCEDURES.

a. This section contains instructions covering direct/general support maintenance functions for the adhesive wax coater. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

8-20.1 Replace Motor.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS : Flat Tip Screwdriver
Cross Tip Screwdriver
Ball Peen Hammer
Pin Punch

SUPPLIES: AC Motor

WARNING

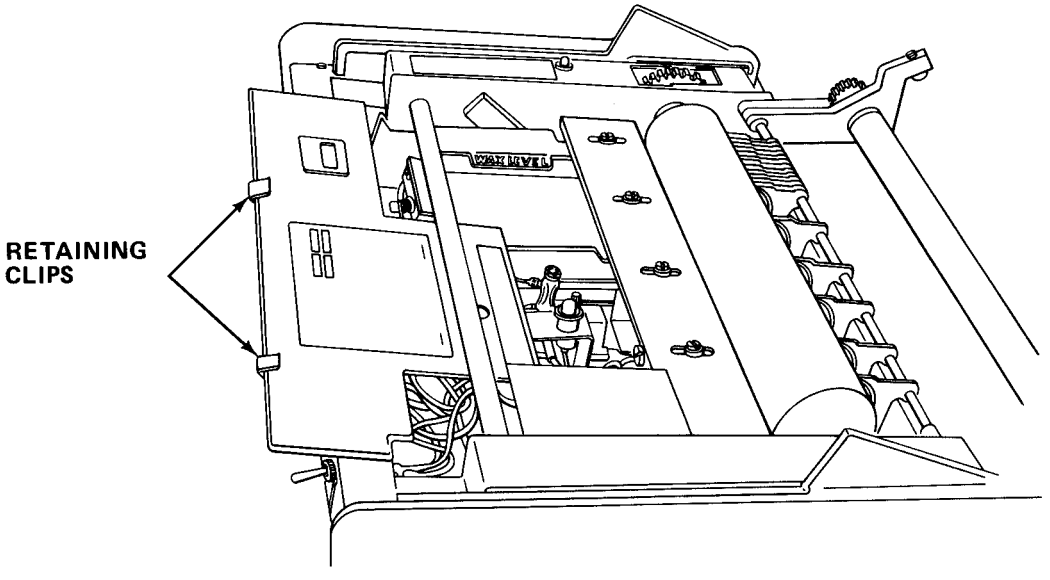
- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before-servicing.

a. Unplug power cord.

b. Remove top deck cover and top roller cover.

CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light, or damage to light may result.

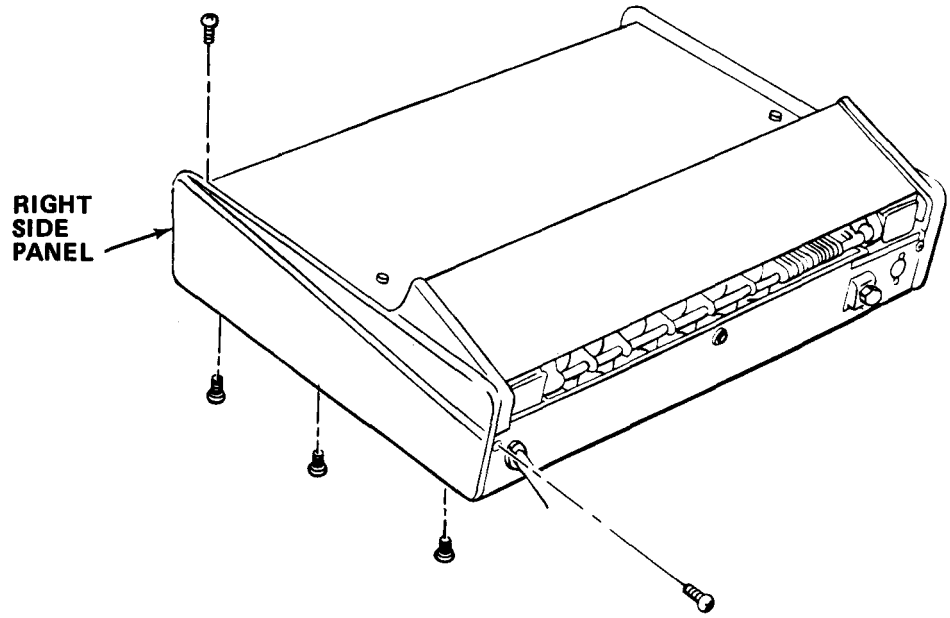


c. Remove screw holding inner panel.

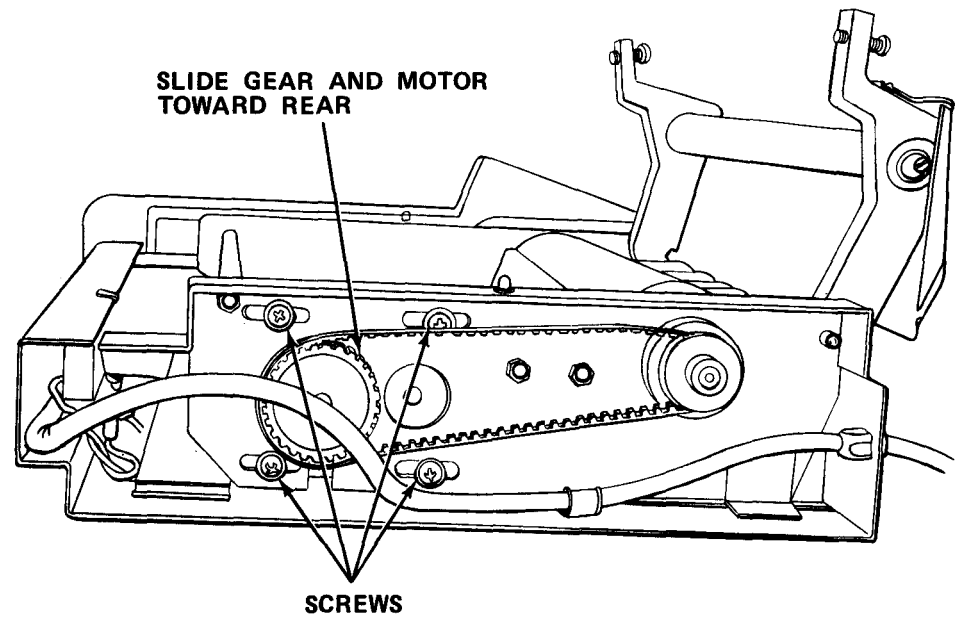
d. With screwdriver, push retai ning clips toward rollers to loosen inner

e. Lift back of inner panel to clear pilot light.

f. Slide panel to rear of machine and remove.

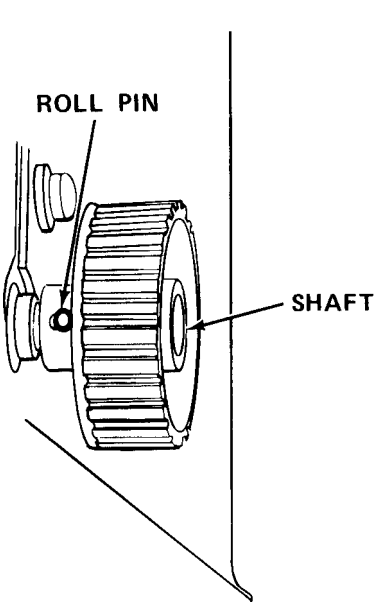


9. Remove screws and right side panel.



h. Loosen screws and remove drive belt.

i. Tighten screws.

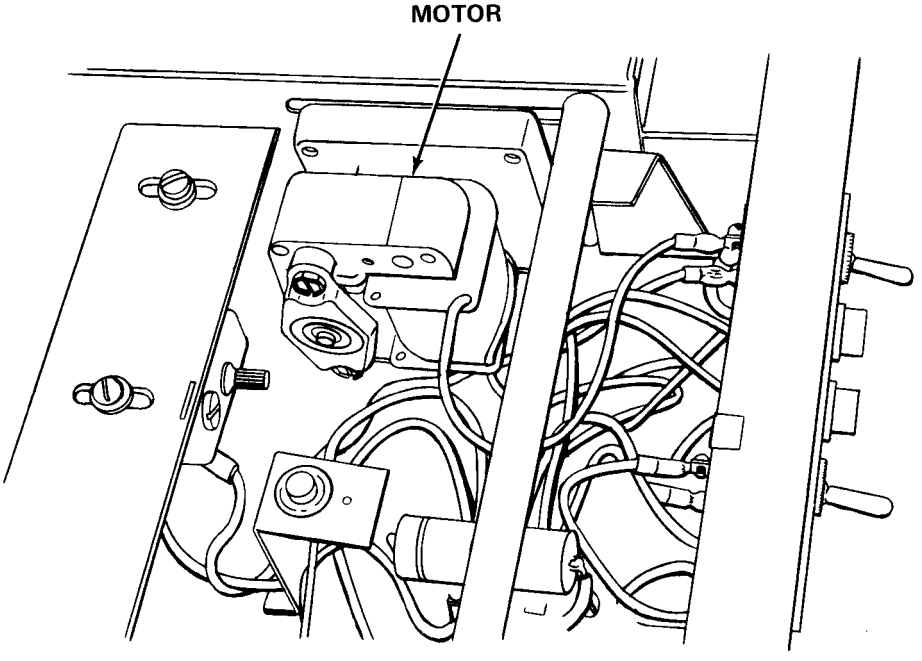


j. Remove roll pin attaching main gear to shaft. Slide main gear off shaft.

k. Remove cover plate from top of motor.

l. Tag and disconnect wires from terminal block.

m. Remove mounting bolts and defective motor.



n. Install new motor and secure with mounting bolts.

o. Reconnect wires.

p. Reinstall cover plate on top of motor.

q. Slide main drive gear on shaft and insert roll pin.

r. Loosen screws and reinstall drive belt. Tighten screws.

CAUTION

Do not tighten belt so tight that sudden stop by one of gears will stretch or snap belt.

s. Slide motor away from secondary gear with one hand until belt is taut. Tighten one mounting screw.

t. Check belt for tightness by trying to turn main gear while turning secondary gear.

u. If belt slips over teeth, it is too loose. Repeat step s.

v. Tighten remaining motor mounting screws.

w. Reinstall right side panel.

x. Reinstall inner panel.

y. Reinstall top deck cover and top roller cover.

8-20.2 Replace Capacitor.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver

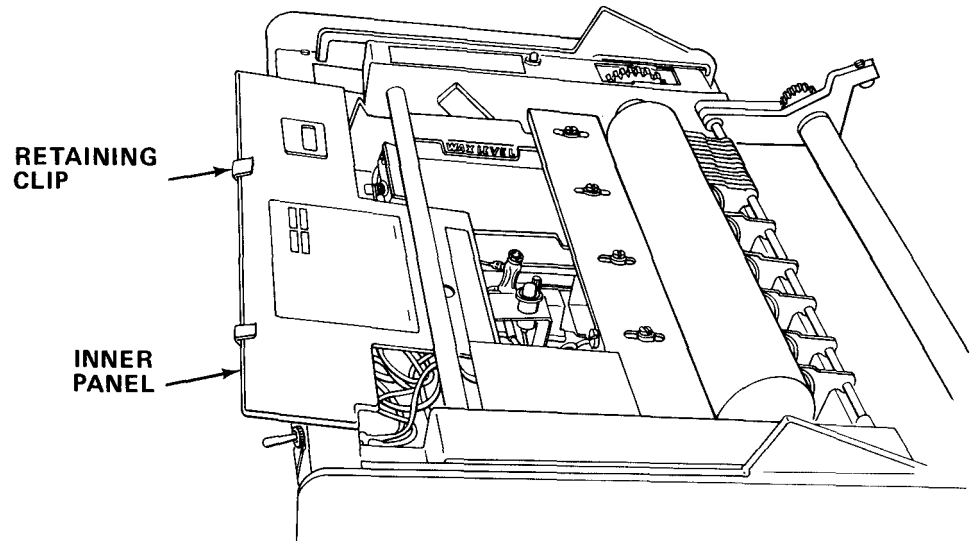
SUPPLIES: 47 MFD Capacitor (120 V)
Insulation Sleeving

WARNING

- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug power cord.

b. Remove top deck cover and top roller cover.



c. Remove screw holding inner panel.

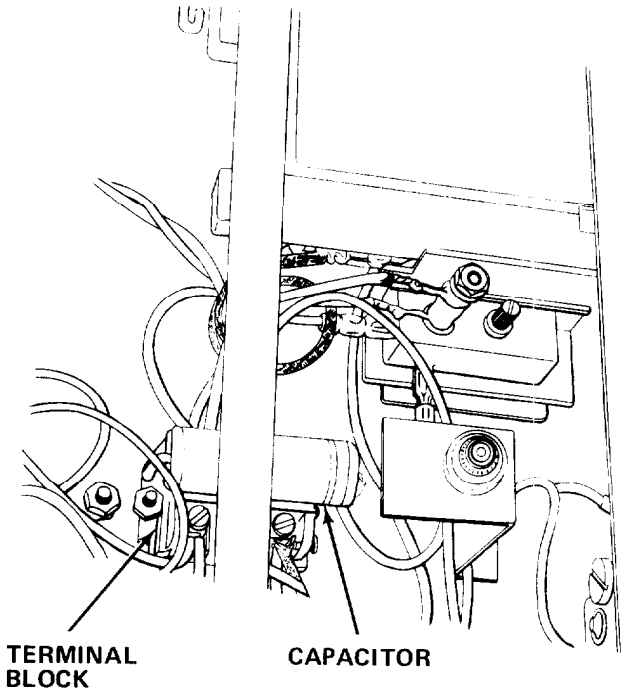
d. With screwdriver, push retaining clips toward rollers to loosen inner panel.

CAUTION

When moving inner panel, keep back end lifted so it does not catch on pilot light, or damage to light may result.

e. Lift back of inner panel to clear pilot light.

f. Slide panel to rear of machine and remove.



WARNING

High voltages that are capable of causing death may be stored in capacitor after power is removed. Be sure capacitor is discharged and reduced to zero volts.

CAUTION

When attaching wires to terminal block, be sure that, existing connections are not displaced.

g. Move capacitor to one side and loosen screws in terminal block holding capacitor leads.

h. Note position and polarity of capacitor.

i. Remove defective capacitor.

j. Place new capacitor in same position.

k. Slip insulation sleeving over capacitor leads.

l. Insert lead ends into terminal positions 1 and 3 on terminal block.

m. Tighten screws.

CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light, or damage to light may result.

n. Reinstall inner panel.

o. Reinstall top deck cover and top roller cover.

8-20.3 Replace Resistor.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
Slip Joint Pliers
Soldering Iron
Multimeter

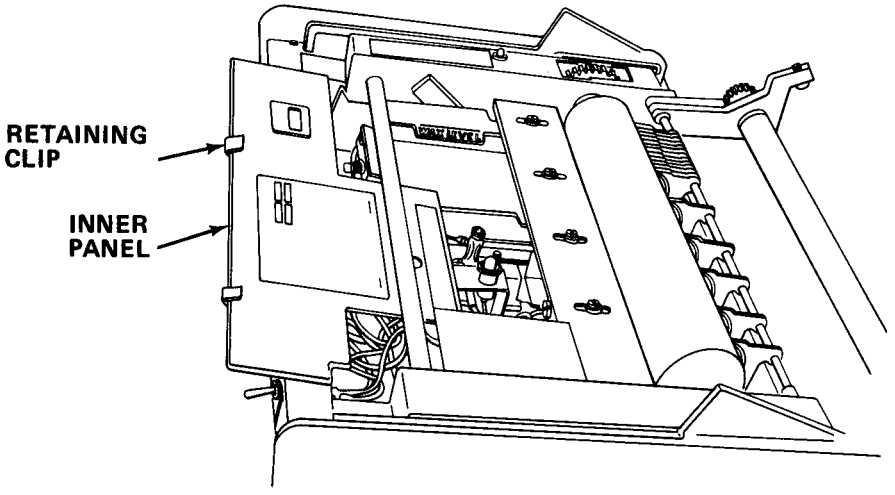
SUPPLIES: Resistor
Solder (Item 23, Appendix E)

WARNING

- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug power cord.

b. Remove top deck cover and top roller cover.



c. Remove screws holding inner panel.

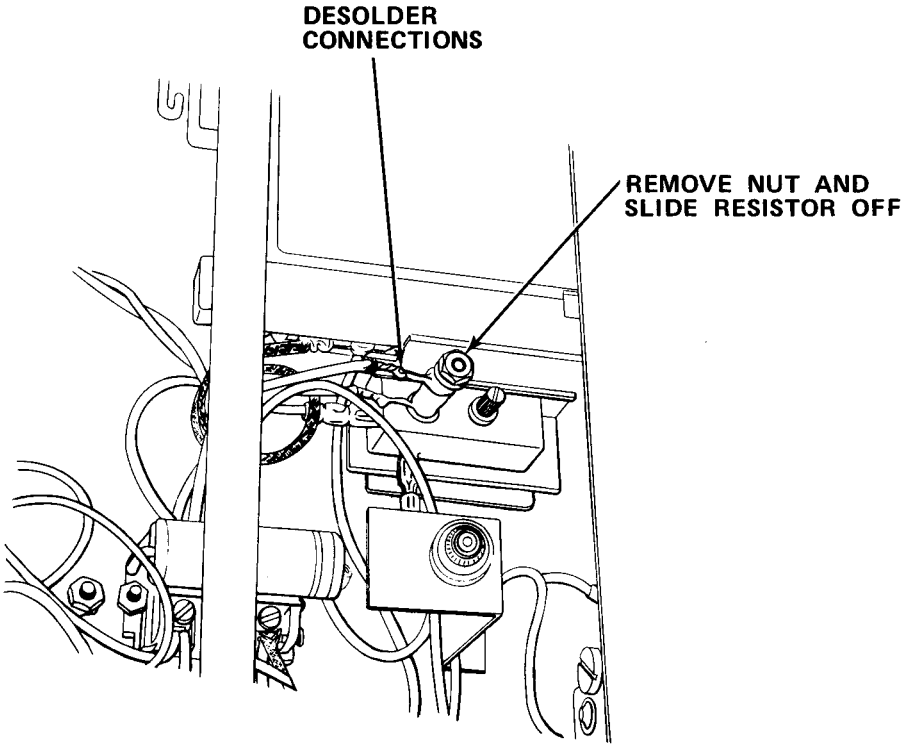
d. With screwdriver, push retaining clips toward rollers to loosen inner panel.

CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light, or damage to light may result.

e. Lift back of inner panel to clear pilot light.

f. Slide panel to rear of machine and remove.



9. Desolder leads from resistor.

NOTE

Be careful not to damage insulation or resistor mounting stud.

h. Remove nut, washer, and defective resistor.

i. Install new resistor and secure with washer and nut.

j. Solder leads in same manner as original resistor.

k. Check continuity through resistor at terminal blocks 1 and 3.

l. Reinstall inner panel.

m. Reinstall top deck cover and top roller cover.

8-20.4 Replace Pilot Light.

MOS: 83FJ6, Reproduction Equipment Repairer

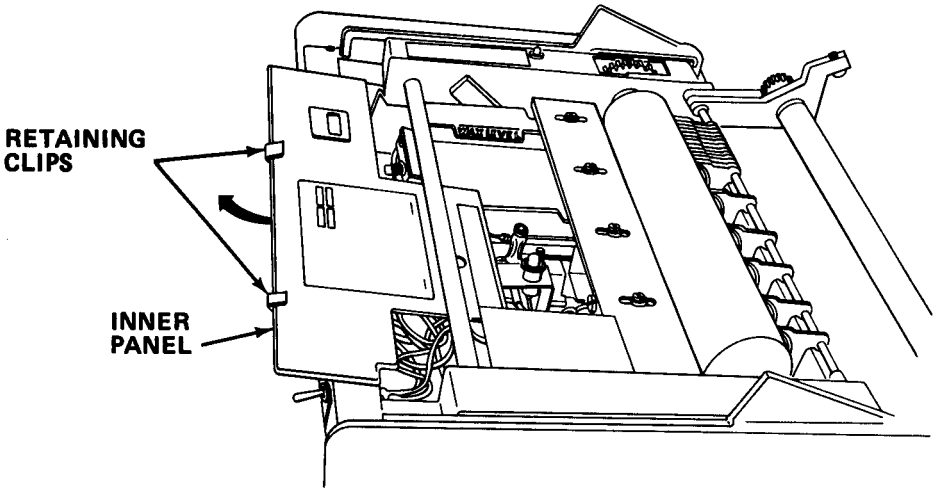
TOOLS: Flat Tip Screwdriver
Bent Nose Pliers

SUPPLIES: Clear Pilot Light
Amber Pilot Light
Red Pilot Light

WARNING

- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug power cord.



b. Remove top deck cover and top roller cover.

c. Remove screw holding inner panel.

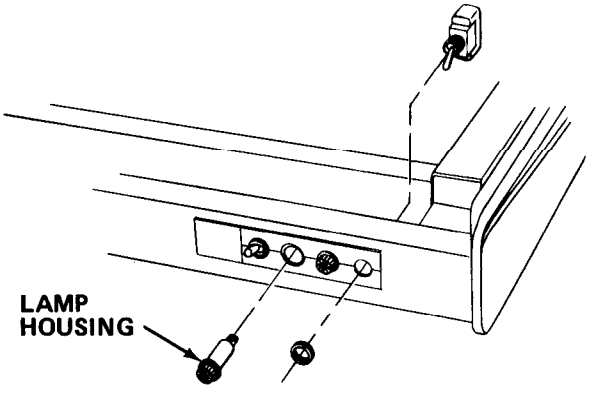
d. With screwdriver, push retaining clips toward rollers to loosen inner panel.

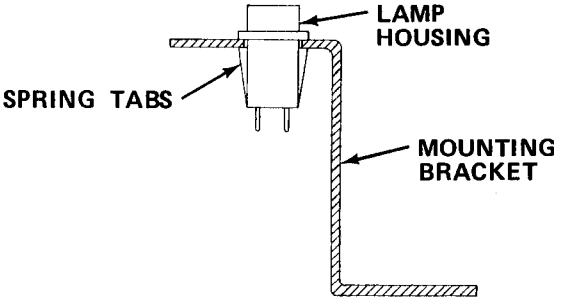
CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light, or damage to light may result.

e. Lift back of inner panel to clear pilot light.

f. Slide panel to rear of machine and remove.





g. Press spring tabs on side of lamp housing flat with pliers and push housing up through mounting hole until tabs are clear.

h. Pull out defective lamp.

i. Tag and disconnect wiring.

NOTE

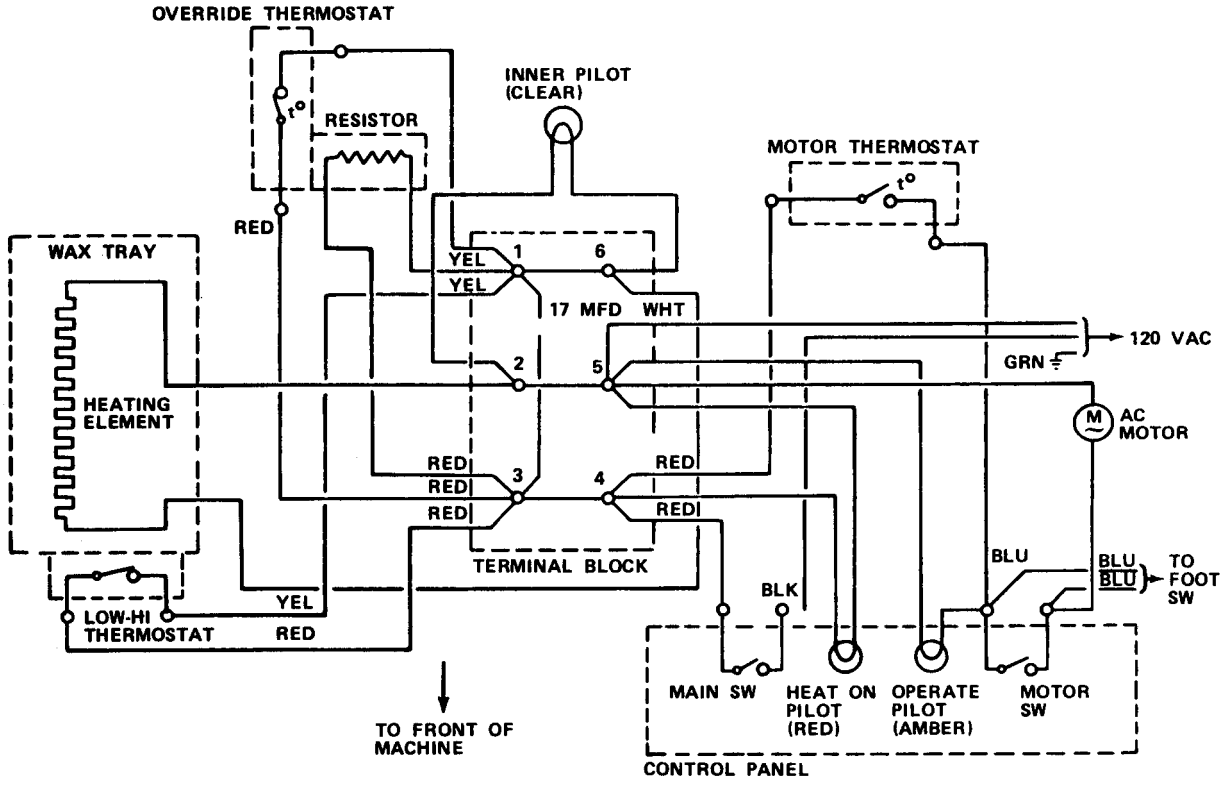
Pilot light housing, lamp, and wiring are one unit. They can only be removed from the top.

j. Feed wiring of new lamp down through hole.

k. Push lamp housing down into hole until it snaps in place.

CAUTION

When attaching wires to terminal block, be sure that existing connections are not displaced or damage to equipment may result.



l. Strip 1/2 in (12.7 mm) of insulation from end of pilot light wires.

CAUTION

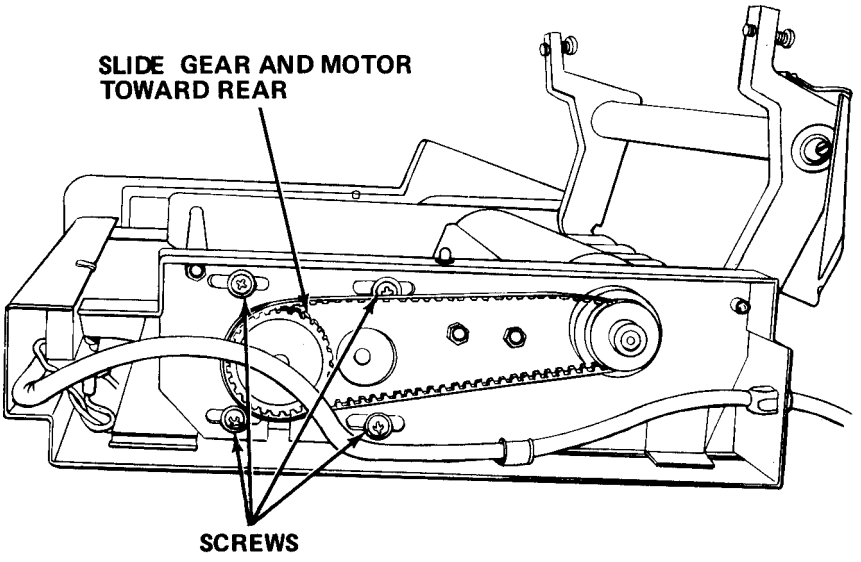
When moving inner panel, keep rear of machine lifted so it does not catch on pilot light or damage to light may result.

m. Connect wires to terminals of terminal block.

n. Reinstall inner panel.

o. Reinstall top deck cover and top roller cover.

d. Grasp edges and pull right side panel away from wax coater.



e. Loosen four screws holding main drive motor.

f. Check belt for signs of damage. If not damaged, check to see if it is loose. If loose, perform the following steps:

(1) Grasp the main gear and slide it and motor away from secondary gear until belt pulls taut.

(2) Go to step j.

g. Grasp main drive gear and slide toward secondary gear (rear).

h. Remove defective belt. Slip new belt on gears.

NOTE

Be sure that teeth of belt lie in grooves of gears.

i. With one hand, grasp main gear and slide it away from secondary gear until belt is taut.

NOTE

Do not make belt so tight that sudden stopping of secondary gear will snap or stretch belt.

8-20.8 Replace/Adjust Drive Belt.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
Cross Tip Screwdriver

SUPPLIES: Belt

WARNING

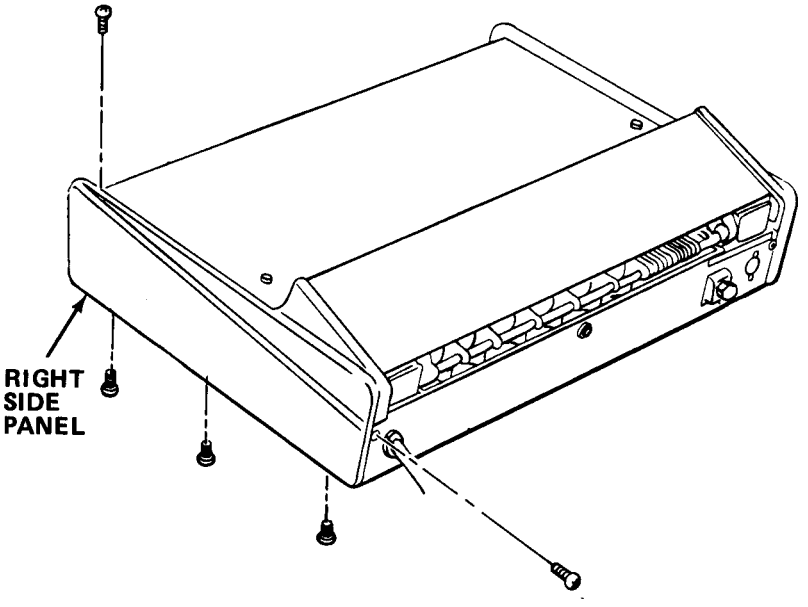
- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

NOTE

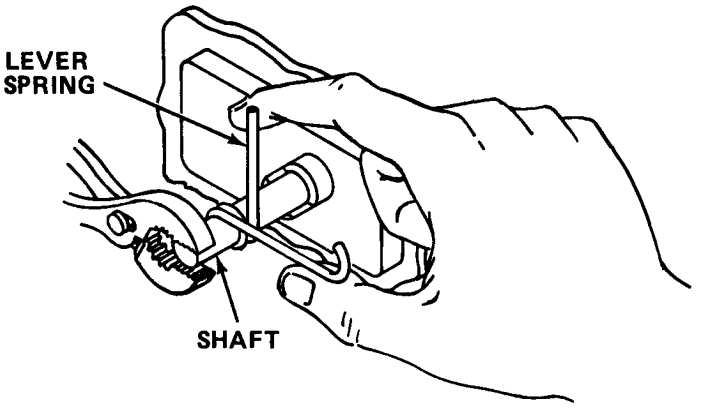
This procedure must begin with wax coater completely cool. If it has been used, allow machine to cool for at least two hours with power OFF.

a. Unplug power cord.

b. Remove top roller cover and top deck cover.



c. Remove screws holding right side panel.



u. Note thermometer reading. If it is not between 175° and 178° F, adjust as follows:

(1) If temperature is below 175° F.

(a) Hold shaft of thermostat steady with pliers.

(b) Squeeze spring lever and move to the left a few degrees.

(2) If temperature indicated is above 128° F.

(a) Hold shaft steady with pliers.

(b) Squeeze lever spring and move to the right a few degrees.

(3) After adjusting thermostat lever:

(a) Move lever to position in normal fashion.

(b) Allow time for temperature to adjust (approximately ten minutes).

(c) Note thermometer reading. If too low or too high, repeat steps as necessary.

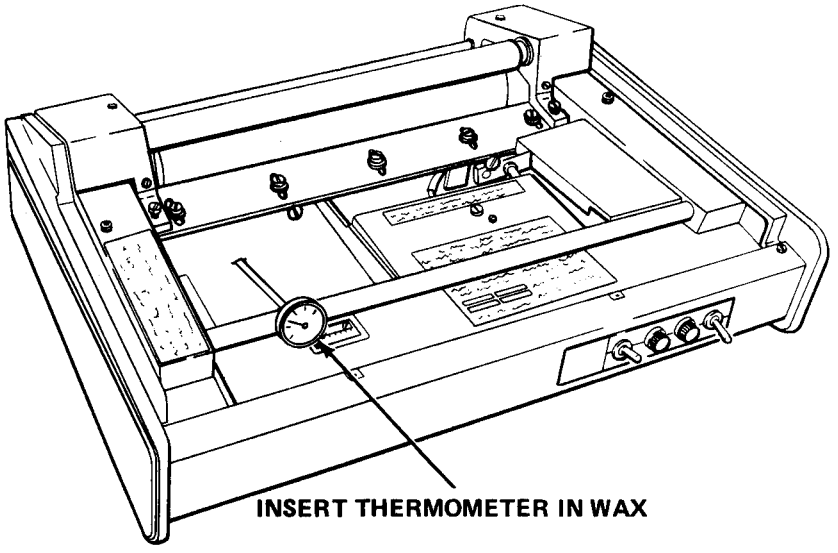
CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light or damage to light may result.

q. Reinstall inner panel by sliding it back into retaining clips.

r. Reinstall top deck cover and top roller cover.

s. Turn MAIN switch OFF if wax coater is not to be used.



n. As soon as wax is soft enough, insert dial thermometer into wax tray. Push stem as far under coating as it will go.

o. Rest dial thermometer on edge of wax tray.

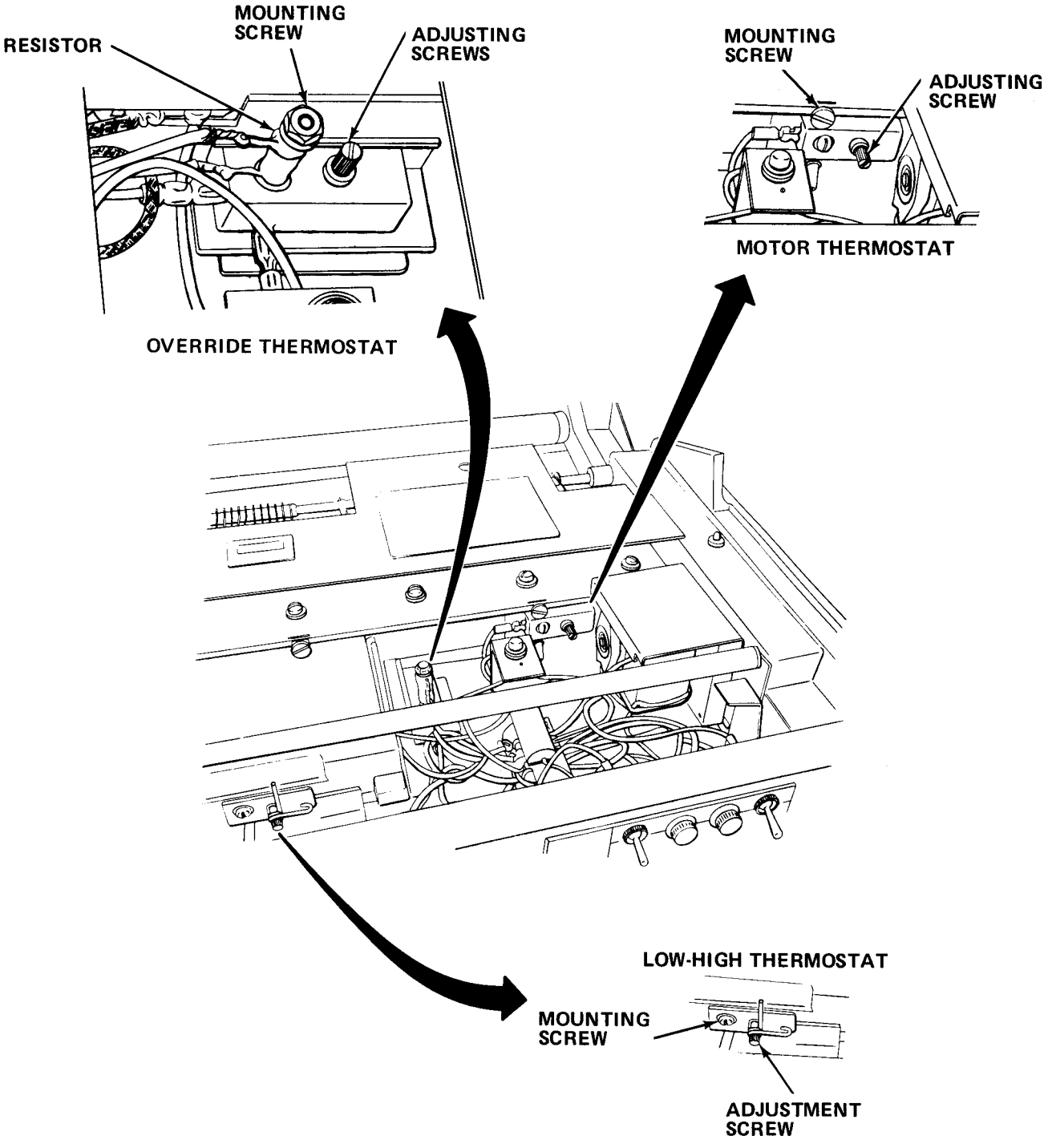
p. Stem should rest approximately in center of tray.

q. When thermometer reaches 210°- 220° F (approximately 10 rein), immediately turn override thermostat adjusting screw to the right slowly until inner pilot light goes out.

r. Override thermostat is now set.

s. When wax on coating roller appears melted (approximately 10 min from start), slowly turn motor adjusting screw to the right until amber OPERATE pilot light on front panel lights.

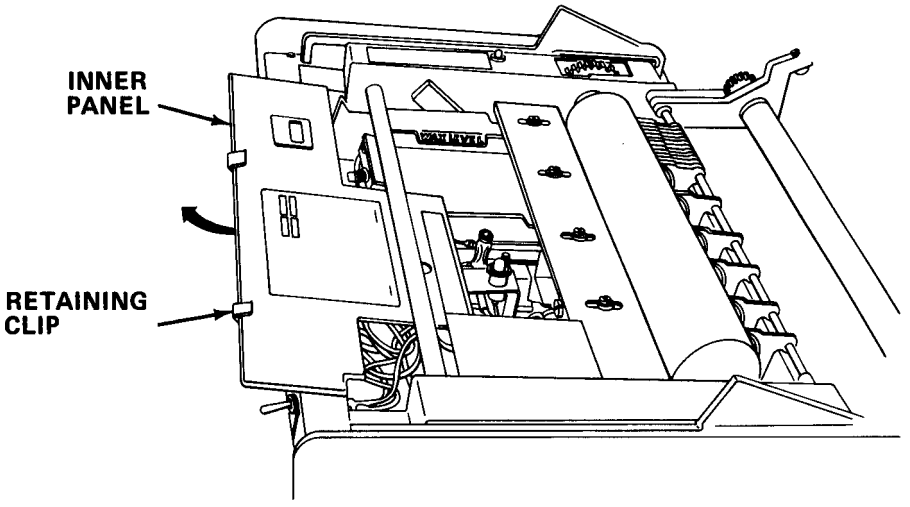
t. After motor thermostat is set, wait approximately 15 min for temperature to stabilize.



k. Plug power cord into an outlet.

l. Turn MAIN switch ON.

m. Immediately record starting time.



d. Remove screws holding inner panel.

e. With screwdriver, push retaining clips toward rollers to loosen inner panel.

CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light or damage to light may result.

f. Lift back of inner panel to clear pilot light.

g. Slide panel to rear of machine and remove.

h. Turn override thermostat adjusting screw fully to the right until it hits stop .

i. Note position of motor thermostat.

j. Turn thermostat adjusting screw approximately one-half turn to the left.

8-20.7 Adjust Thermostats.

MOS : 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
Dial Thermometer

WARNING

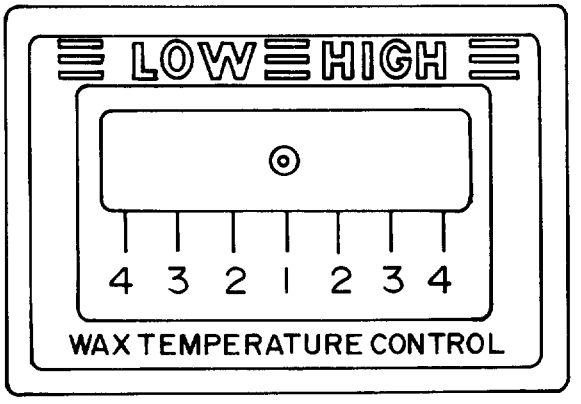
- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

NOTE

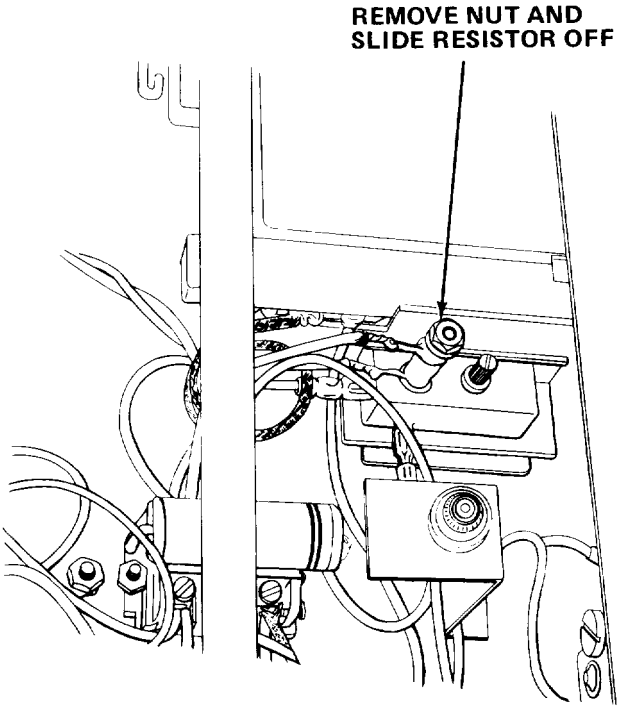
This procedure must begin with wax coater completely cool. If it has been used, allow machine to cool for at least two hours with power OFF.

a. Unplug power cord.

b. Remove top deck cover and top roller cover.



c. Set LOW/HIGH thermostat to position 1.



NOTE

The following additional step is required when replacing override thermostat.

i. Remove resistor from override thermostat. Attach to new thermostat.

j. Remove defective thermostat.

k. Insert new thermostat in wax coater in same manner as original.

l. Tighten mounting nut.

m. Reconnect wires according to wiring diagram.

n. Reinstall inner panel.

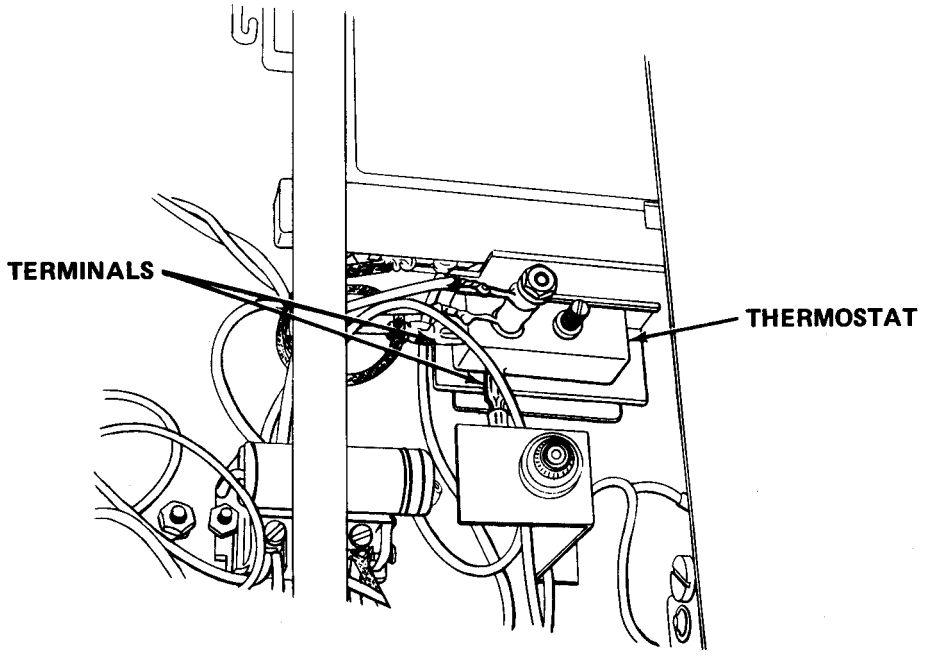
o. Reinstall top deck cover and top roller cover.

CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light or damage to light may result.

e. Lift back of inner panel to clear pilot light.

f. Slide panel to rear of machine and remove.



g. Tag and disconnect wires from terminals of defective thermostat.

h. Remove thermostat mounting screw.

8-20.6 Replace Thermostat(s).

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
Slip Joint Pliers
9 mm Combination Wrench

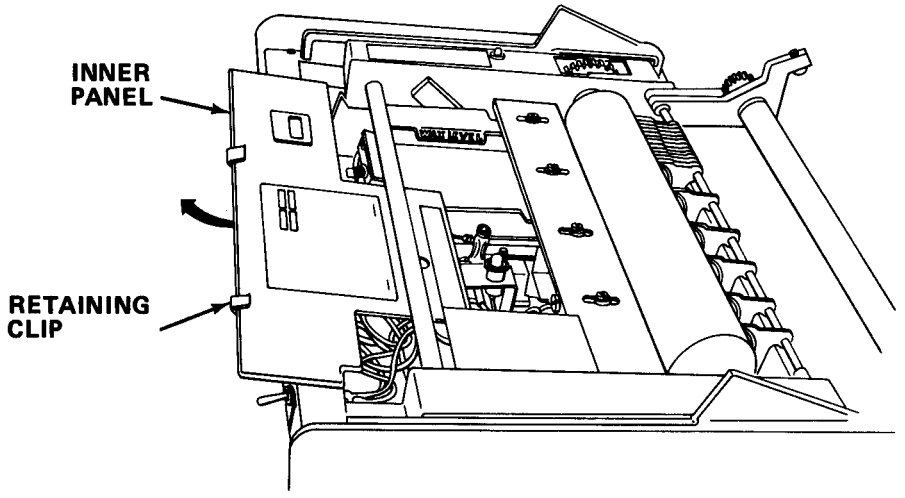
SUPPLIES: Override Thermostat
Low/High Thermostat
Motor Thermostat

WARNING

- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug power cord.

b. Remove top deck cover and top roller cover.



c. Remove screws holding inner panel.

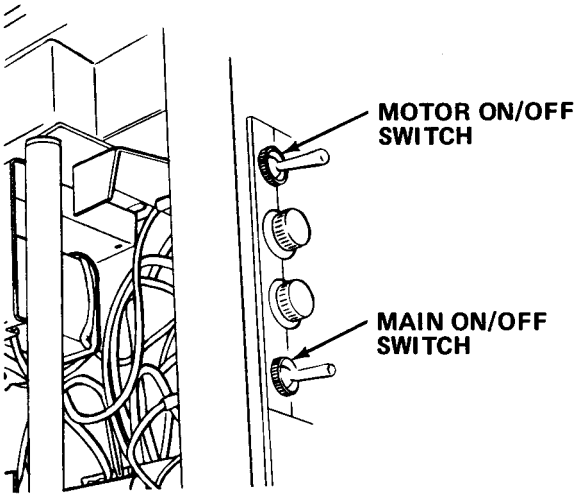
d. With screwdriver, push retaining clips toward rollers to loosen inner panel.

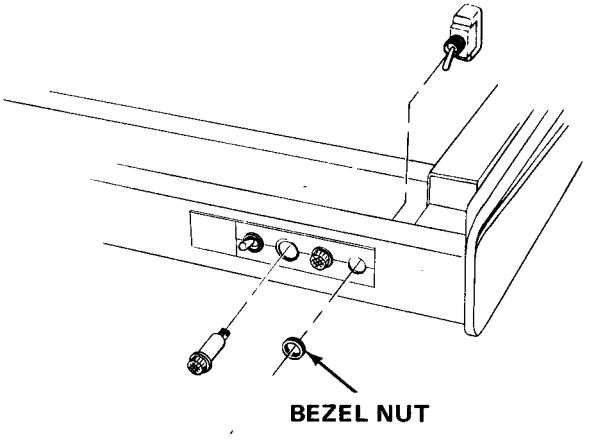
CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light, or damage to light may result.

e. Lift back of inner panel to clear pilot li ght.

f. Slide panel to rear of machine and remove





g. Remove bezel nut on front panel.

h. Pull switch from rear of panel.

i. Tag and disconnect wires from switch terminals.

j. Remove defective switch.

k. Reconnect wires on terminals of new switch.

l. Install new switch and secure with bezel nut.

m. Reinstall inner panel.

n. Reinstall top deck cover and top roller cover.

8-20.5 Replace Control Panel, Switch(es).

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
Slip Joint Pliers

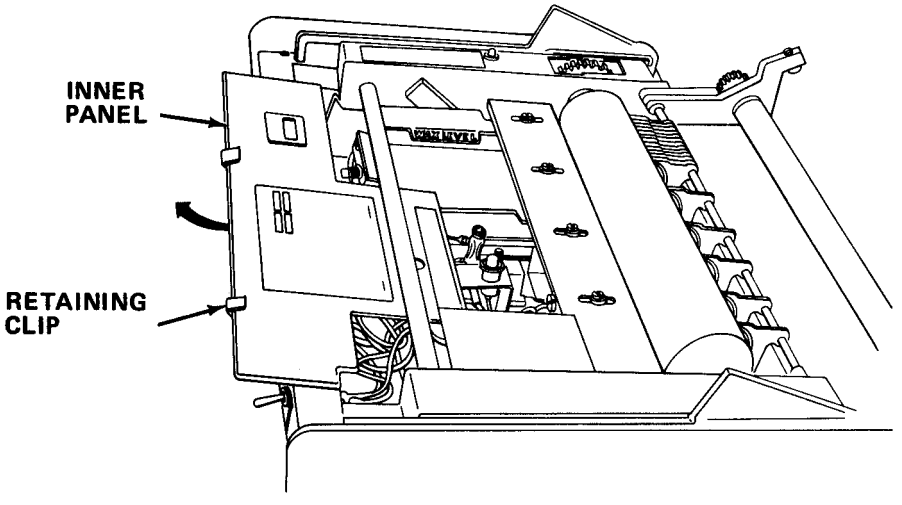
SUPPLIES: Heater Switch
Motor Switch

WARNING

- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug power cord.

b. Remove top deck cover and top roller cover.



c. Remove screw holding inner panel.

d. With screwdriver, push retaining clips toward rollers to loosen inner panel.

j. While holding main gear in place:

(a) Tighten one of motor mounting screws.

(b) Release main gear and tighten remaining motor mounting screws.

(c) Check that belt will not slip by trying to turn main gear while holding secondary gear still.

(d) If belt slips over gear, it is too loose.

k. Reinstall right side panel.

l. Make certain that power cable is not hung up.

m. Reinstall and tighten right side panel screws.

n. Reinstall top deck cover and roller cover.

o. While holding main gear in place, tighten one of motor mounting screws. Release main gear and tighten remaining motor mounting screws. Check that belt will not slip by trying to turn main gear while holding secondary gear still. If belt slips over gear, it is too loose.

p. Reinstall right side panel. Check that power cable is not hung up. Reinstall and tighten right side panel screws.

q. Reinstall top deck cover and roller cover.

8-20.9 Replace Power Cable.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
Cross Tip Screwdriver
Wire Stripper/Crimper
9 mm Combination Wrench

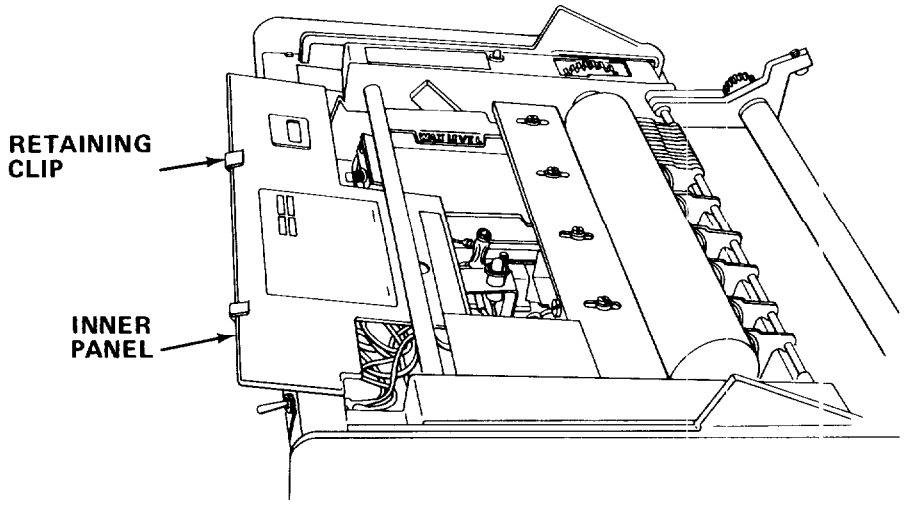
SUPPLIES: Power Cable
Open End Terminal Connectors

WARNING

- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug power cord.

b. Remove top deck cover and top roller cover.



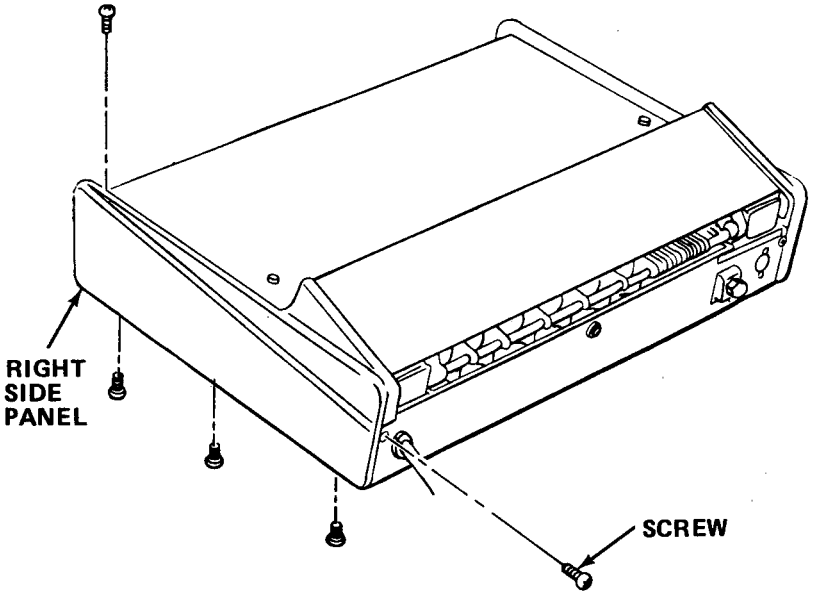
c. Remove screw holding inner panel.

d. Grasp back of inner panel, lift, and pull it toward rollers.

CAUTION

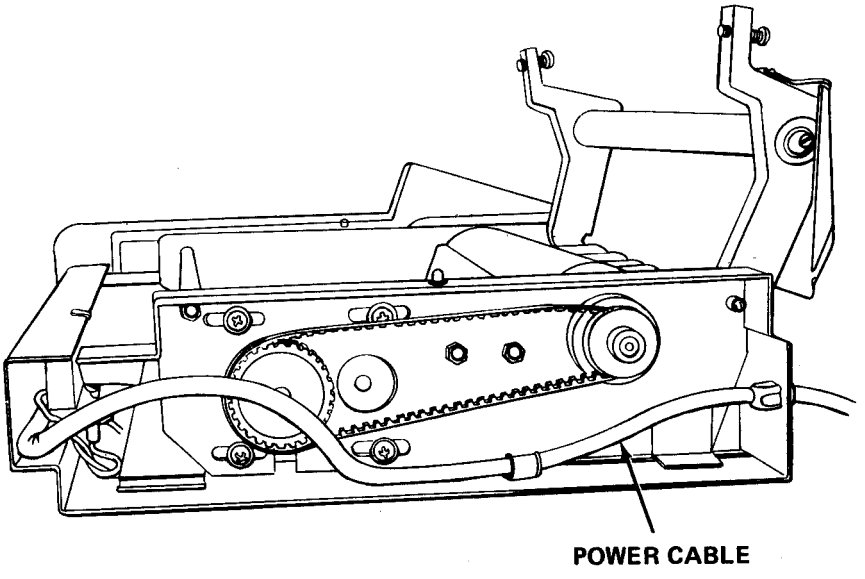
When moving inner panel, keep rear of machine lifted so it does not catch on pilot light or damage to light may result.

e. When it is free of mounting brackets, lift back and above pilot light and slide it out front of wax coater.



f. Remove screws holding right side panel.

g. Grasp edges of right side panel and pull away from wax coater.



h. Loosen cable holding brackets.

i. Remove cable wires from ground terminal, HEAT ON switch, and terminal block.

j. Pull cable out of wax coater through hole in rear panel.

k. Feed new cable through hole in rear panel and through cable holding brackets.

l. Strip insulation from ends of wires and crimp on terminal connectors.

m. Attach wires to ground, HEAT ON switch, and terminal block per wiring schematic.

n. Tighten cable holding brackets.

o. Reinstall right side panel.

CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light or damage to light may result.

p. Reinstall inner panel.

q. Reinstall top deck cover and top roller cover.

8-20.10 Replace Heating Element.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Flat Tip Screwdriver
Cross Tip Screwdriver
Wire Stripper/Crimper
Heat Shrink Gun

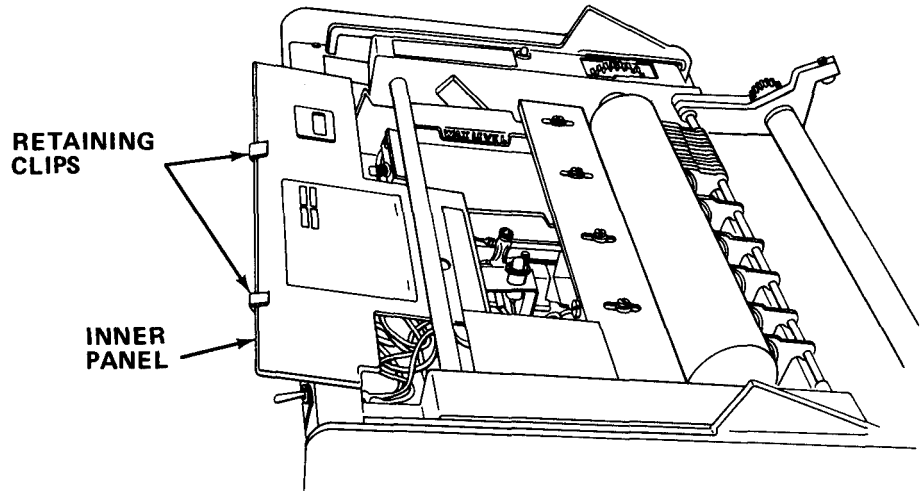
SUPPLIES: Heating Element

WARNING

- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Unplug power cord.

b. Remove top deck cover and top roller cover.



c. Remove screws holding inner panel.

d. With screwdriver, push retaining clips toward rollers to loosen inner panel.

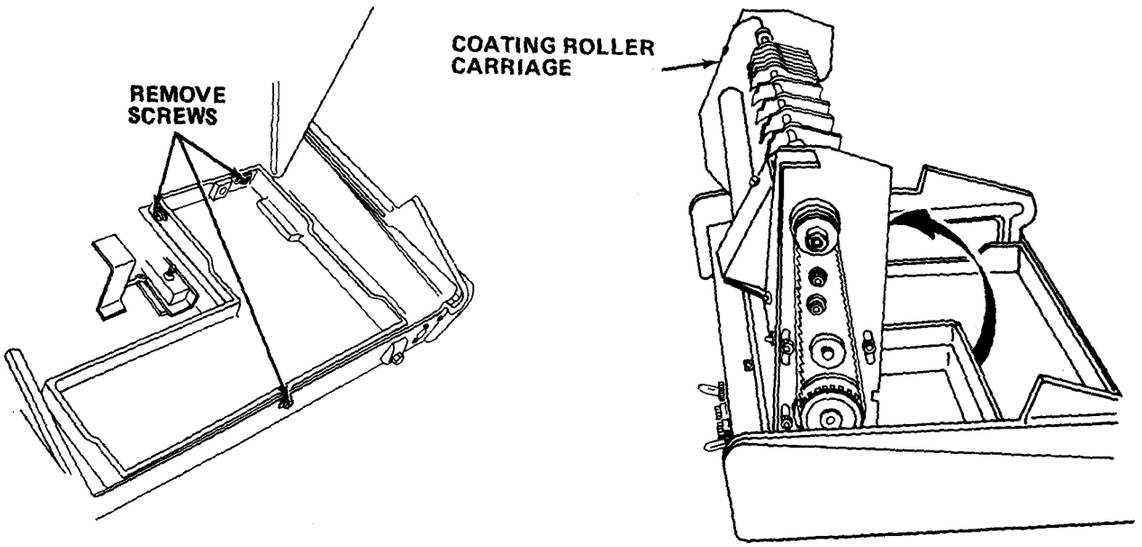
CAUTION

When moving inner panel, keep rear of machine lifted so it does not catch on pilot light or damage to light may result.

e. Lift back of inner panel to clear pilot light.

f. Slide panel to rear of machine and remove.

g. Melt wax in tray with heat shrink gun.



h. Using top pressure roller as handle, lift coating roller carriage until it stands straight up.

i. Allow time for wax tray to cool and wax to harden.

j. Remove screws holding wax tray.

k. Tag and disconnect heater element wires.

l. Lift out wax tray.

m. Pop out defective element from recess underneath tray.

n. Insert new element in recess and reinstall wax tray and secure with screws.

o. Reconnect heater element wires.

p. Heat wax and when melted lower roller carriage gently in place.

q. Press gently on both sides to be sure of seating.

r. Reinstall inner panel.

s. Reinstall top deck cover and top roller cover.

8-20.11 Replace Gear.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Ball Peen Hammer
Pin Punch
Cross Tip Screwdriver

SUPPLIES: Gear

a. Turn off power and allow wax to harden.

WARNING

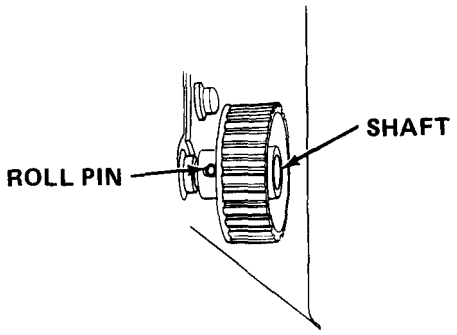
- Serious injury may occur if internal components are touched when heat is on. Remove heat source and allow to cool, or wear protective clothing before servicing.
- Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

b. Unplug power cord.

c. Remove top deck cover.

d. If damaged gear is on pressure roller, remove cover panel.

e. Remove roll pin attaching gear to shaft.



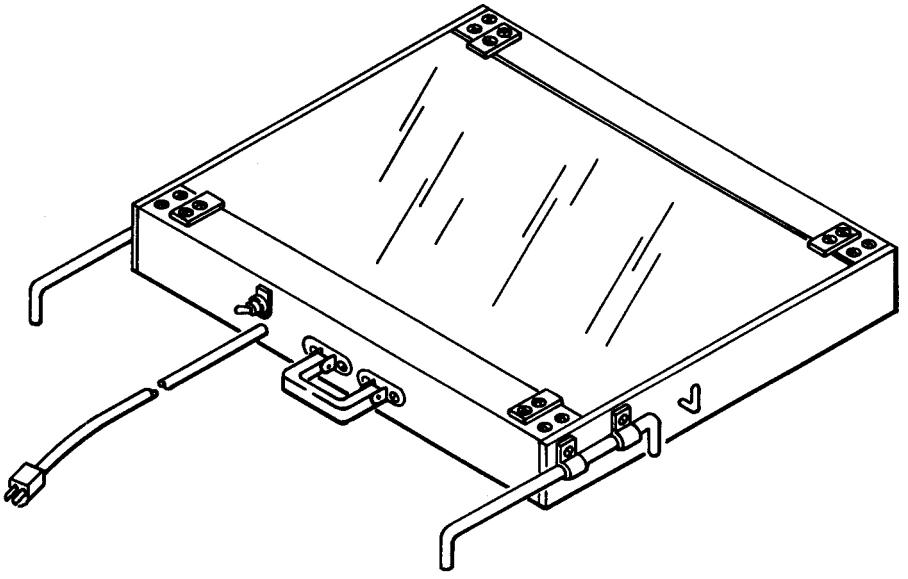
f. Slide defective gear from shaft.

g. Slide new gear on shaft.

h. Reinstall roll pin.

i. Reinstall cover.

j. Plug in power cord.



CHAPTER 9

PORTABLE TRACING/SCRIBING BOARD

Section I INTRODUCTION

9-1. GENERAL INFORMATION.

9-1.1 Scope.

a. Model Number and Equipment Name. Model 51J3 Portable Tracing/Scribing Board.

b. Purpose of Equipment. To provide illuminated work surface for tracing or scribing.

9-2. EQUIPMENT DESCRIPTION.

9-2.1 Equipment Characteristics, Capabilities, and Features. Provides lightweight, portable, and diffused light source. Used as work surface for tracing or scribing.

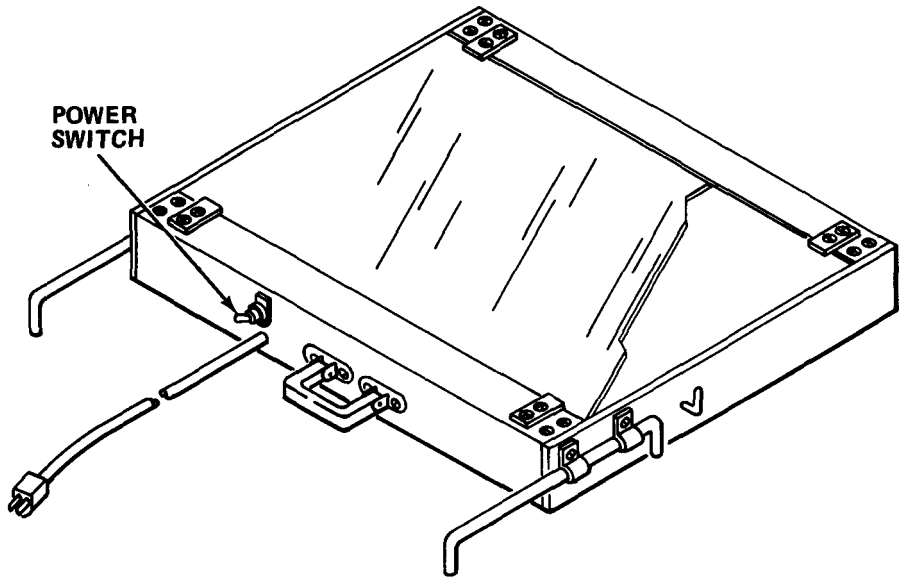
9-2.2 Equipment Data.

Power Requirements	110 V, 60 Hz
Illumination	Two 30W fluorescent lamps
Work Surface	36.0 in. X 23.5 in. (91.4 cm X 59.7 cm)

9-3. TECHNICAL PRINCIPALS OF OPERATION. Principles of Operation are combined with operator's controls and indicators for this equipment.

Section II OPERATING INSTRUCTIONS

9-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.



Control or Indicator	Function
POWER SWITCH	Two-position toggle switch to control illumination.

9 - 5 . OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If your equipment fails to operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

9-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The “Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number” column on DA Form 2404, Equipment Inspection and Maintenance Worksheet, in recording results of PMCS.

g. Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows.

Item	Quantity
Cheesecloth (Item 6, Appendix E)	ar

Table 9-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make complete checks and services when the equipment can be shut down.

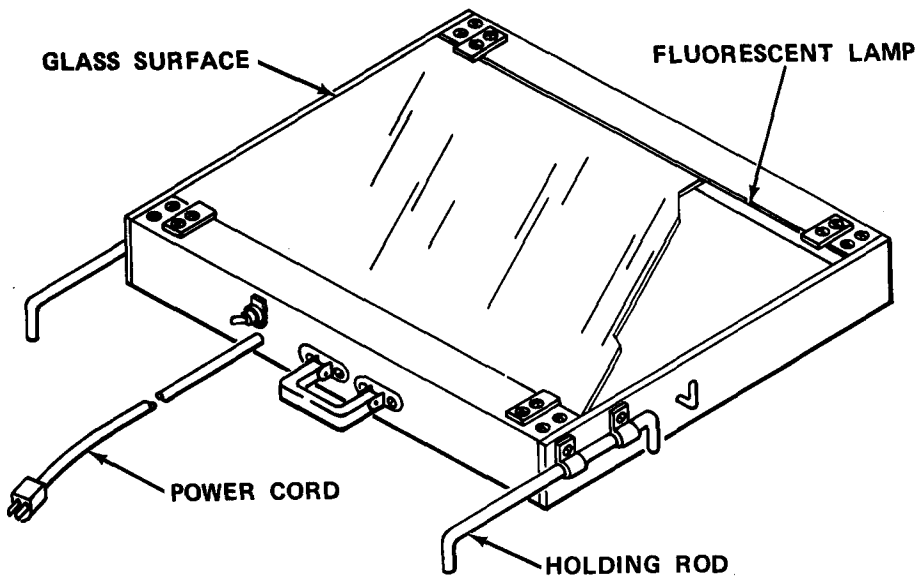
B - Before
D - During
A - After

W . Weekly
M . Monthly
Q - Quarterly

AN . Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

ITEM	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Reediness Reporting, Equipment Is Not Ready/ Available If:
		PORTABLE TRACING/SCRIBING BOARD	
1	B	Inspect/Clean.	



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

1. Rotate each holding rod to check for freedom of movement.

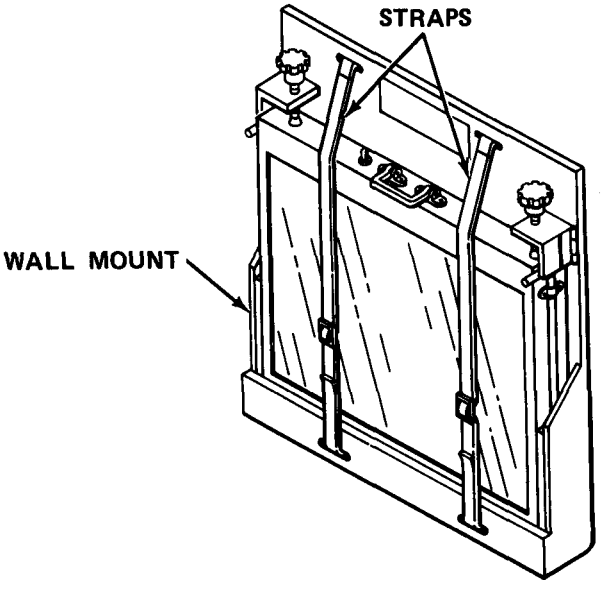
Table 9-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before W - Weekly AN - Annually (Number) . Hundreds of Hours
D - During M - Monthly S - Semiannually
A - After Q - Quarterly Bl - Biennially

ITEM NO.	ITEM	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		PORTABLE TRACING/SCRIBING BOARD - Cont	
l	B	Inspect/Clean - Cont	
		2. Check power cord for kinks, frays, or burns. If power cord is defective, notify organizational maintenance.	Power cord is damaged.
		3. Check fluorescent lamps for partial lighting. Replace as needed (paragraph 9-10.2).	Fluorescent lamp is defective.
		4. Check glass surface for dust and dirt. Wipe glass surface with moistened cheesecloth. Wipe surface with clean dry cheesecloth to remove smears or streaks. Check glass surface for cracks or scratches. Replace as needed (paragraph 9-10.4).	Glass surface is cracked or scratched.

9-6. OPERATION UNDER USUAL CONDITIONS.

9-6.1 Assembly and Preparation for Use.



a. Remove portable tracing/scribing board from wall mount by loosening straps. Place board on work surface.

b. Plug in power cord, and turn power switch ON.

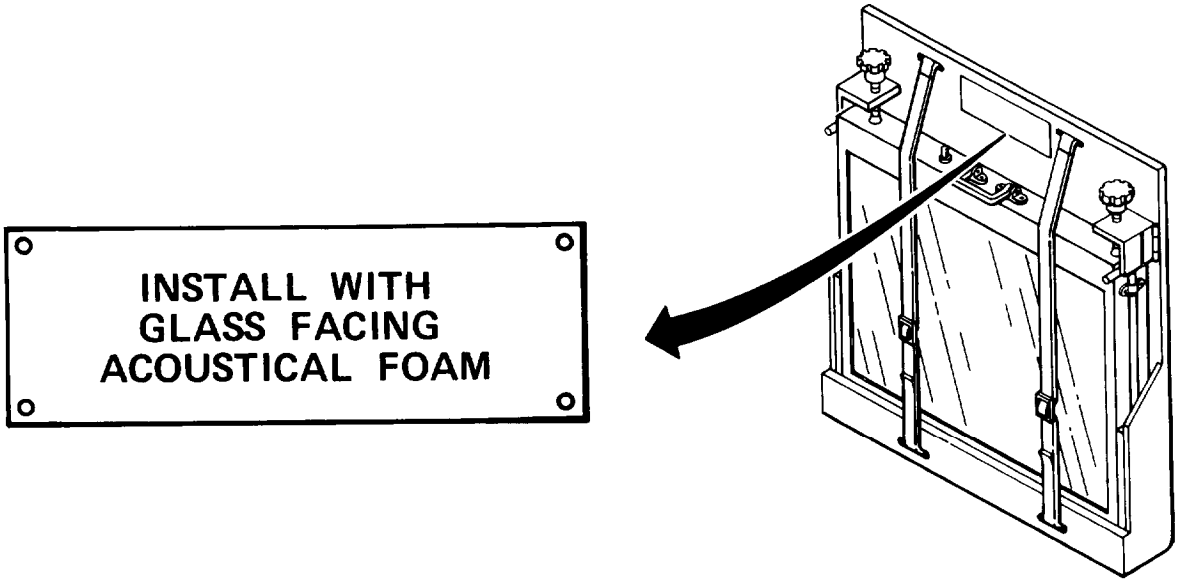
9-6.2 Preparation for Movement.

a. Turn power switch OFF, and unplug power cord.

b. Place board in wall mount with glass surface facing padded mount.

c. Secure board in wall mount with straps.

9-6.3 Operating Instructions on Decals and Instruction Plates.



9-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

9-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

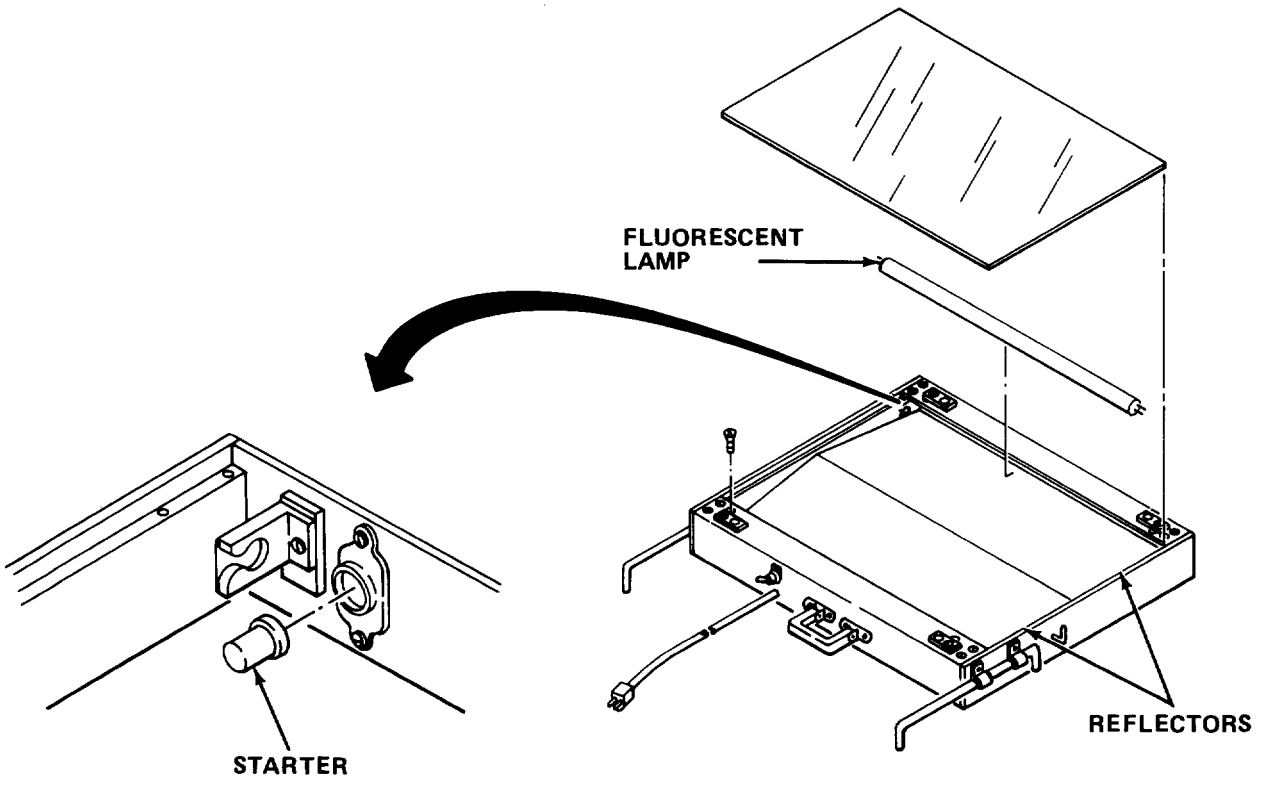
9-9. TROUBLESHOOTING PROCEDURES.

a. The table lists the common malfunctions which you may find during operation or maintenance of the portable tracing/scribing board, or its components. You should perform the test/inspections and corrective actions in the order listed.

b. This manual cannot list all malfunctions that may occur, nor all test or inspections and corrective actions. If a malfunction is not listed or is not corrected by listed corrective actions, notify your supervisor.

Table 9-2. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. ILLUMINATION UNEVEN.



WARNING

Use care when power is connected during inspections or corrective actions. Death or serious injury may result.

Step 1. Check to see if reflector behind fluorescent lamps is dirty.

Clean reflector (paragraph 9-10.1).

Table 9-2. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. ILLUMINATION UNEVEN - Cont	
Step 2. Check to see if one fluorescent lamp is partially lighted or is dark.	Replace fluorescent lamp (paragraph 9-10.2).
Step 3. Check to see if either fluorescent lamp is partially lighted.	Replace defective starter (paragraph 9-10.3).

9-10. MAINTENANCE PROCEDURES.

a. This section contains instructions covering operator maintenance functions for the portable tracing/scribing board. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

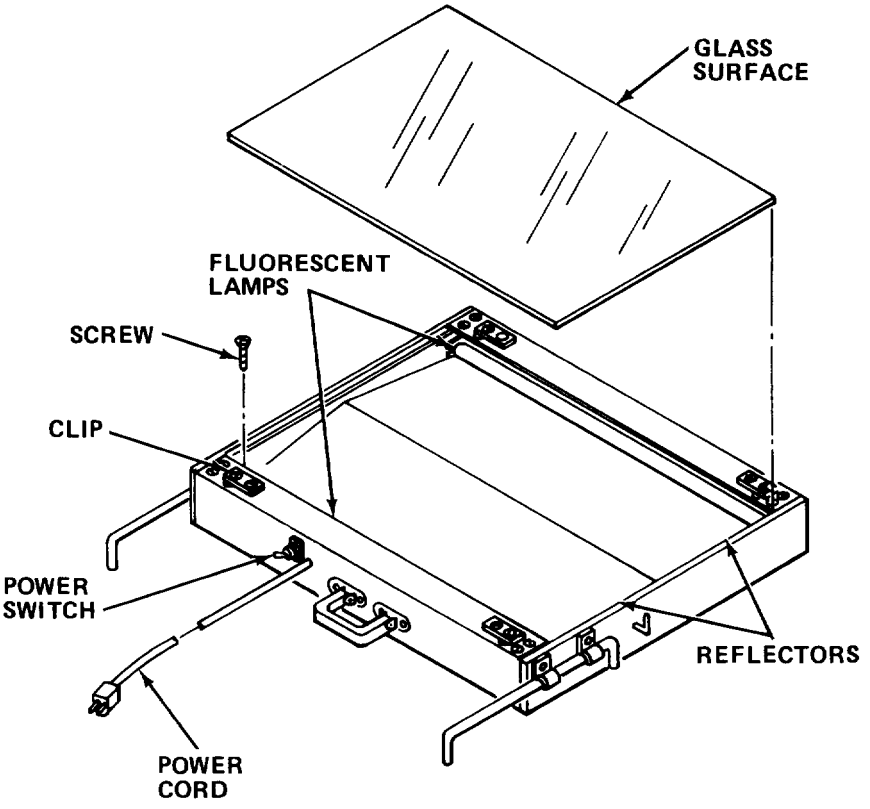
INDEX

9-10.1 Clean Reflector.

MOS: 81C, Cartographer

TOOLS: Cross Tip Screwdriver
Vacuum Cleaner

SUPPLIES: Cheesecloth (Item 6, Appendix E)



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF, and unplug power cord.

b. Remove one screw from each of four clips. Loosen other screws.

c. Turn clips 90° to right or left.

CAUTION

Glass surface must be handled with care to avoid chipping or breaking.

d. Remove glass surface.

e. Vacuum reflector surface and fluorescent lamps with brush attachment on vacuum cleaner.

NOTE

Be sure fluorescent lamps are secure in their sockets.

f. Wipe reflector and lamps with moistened cheesecloth.

g. Wipe or vacuum both sides of glass surface.

h. Reinstall glass surface.

i. Turn clips to secure glass surface. Aline holes and reinstall screws. Tighten all screws.

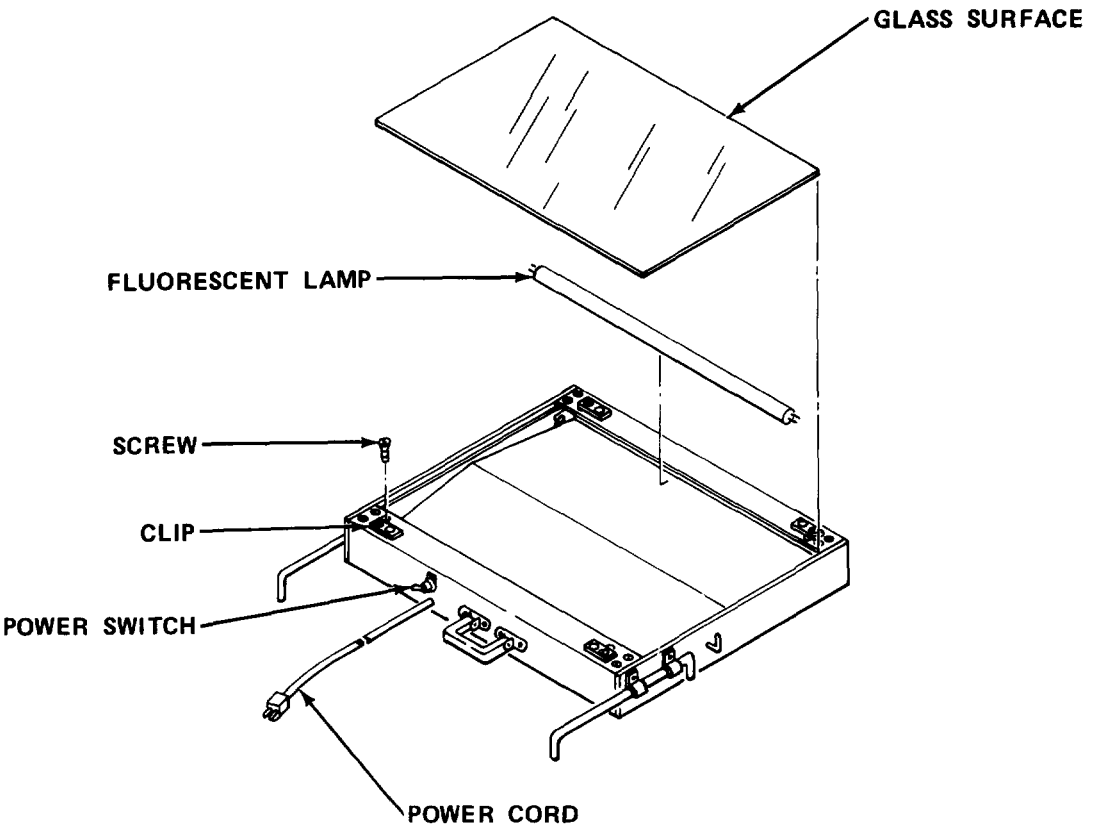
j. Plug in power cord and turn power switch ON.

9-10.2 Replace Fluorescent Lamp.

MOS: 81C, Cartographer

TOOLS: Cross Tip Screwdriver

SUPPLIES: Fluorescent Lamp (30 W)



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF and unplug power cord.

b. Remove one screw from each of four clips. Loosen other screws.

c. Turn clips 90° to right or left.

CAUTION

Glass surface must be handled with care to avoid chipping or breaking.

d. Remove glass surface.

e. Remove defective fluorescent lamp.

f. Install new fluorescent lamp.

g. Reinstall glass surface.

h. Turn clips to secure glass surface. Aline holes and reinstall screws. Tighten all screws.

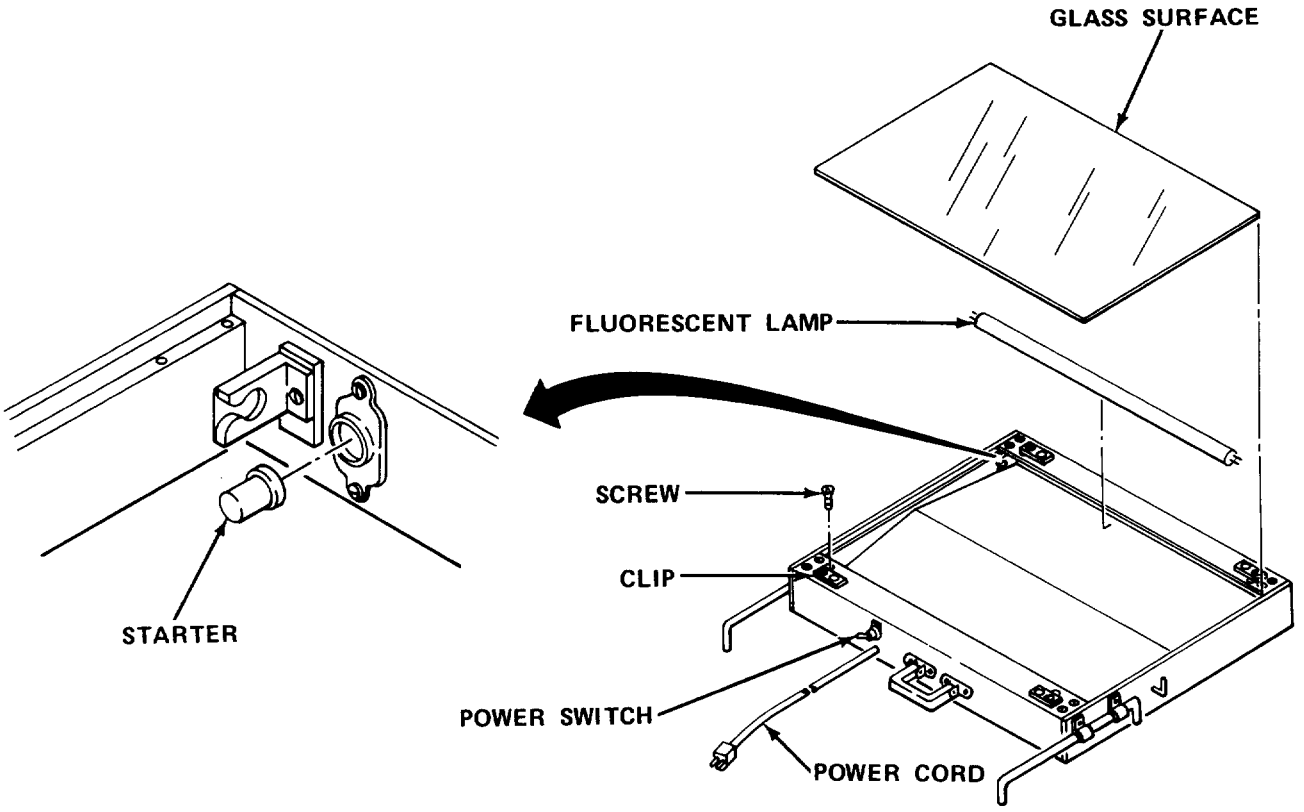
i. Plug in power cord and turn power switch ON.

9-10.3 Replace Starter.

MOS: 81C, Cartographer

TOOLS: Cross Tip Screwdriver

SUPPLIES: Starter



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF and unplug power cord.

b. Remove one screw from each of four clips. Loosen other screws.

c. Turn clips 90° to right or left.

CAUTION

Glass surface must be handled with care to avoid chipping or breaking.

d. Remove glass surface.

e. Remove fluorescent lamp in front of starter.

f. Remove starter by pushing in and turning left until free.

g. Install new starter in socket by pushing in and turning right until locked.

h. Reinstall fluorescent lamp.

i. Reinstall glass surface.

j. Turn clips to secure glass surface. Aline holes and reinstall screws. Tighten all screws.

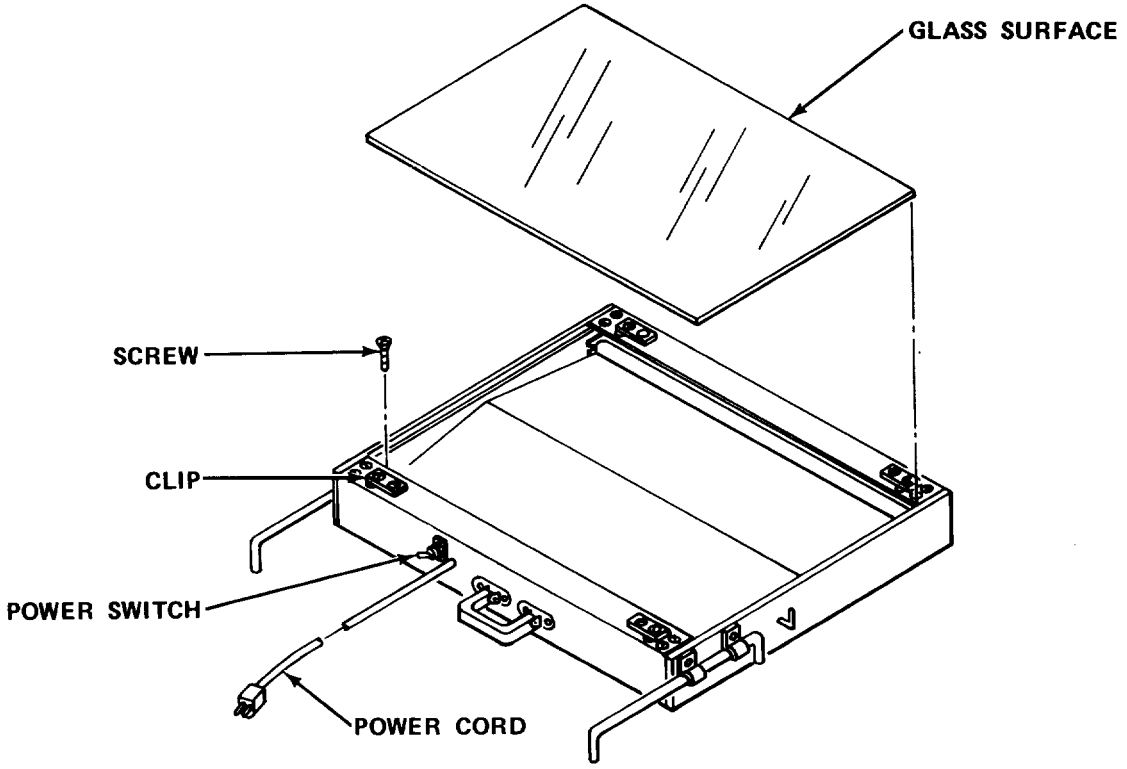
k. Plug in power cord and turn power switch ON.

9-10.4 Replace Glass Surface.

MOS: 81C, Cartographer

TOOLS: Cross Tip Screwdriver

SUPPLIES: Glass Surface



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF and unplug power cord.

b. Remove one screw from each of four clips. Loosen other screws.

c. Turn clips 90° to left or right.

WARNING

Use care when handling damaged glass. Failure to do so may result in serious cuts.

d. Remove damaged glass surface.

CAUTION

Glass surface must be handled with care to avoid chipping or breaking.

e. Install new glass surface.

f. Turn clips to secure glass surface. Aline holes and reinstall screws. Tighten all screws.

g. Plug in power cord and turn power switch ON.

Section IV ORGANIZATIONAL MAINTENANCE

9-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

9-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

9-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

9-12.2 Special Tools; Test, Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

9-12.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-316-24P covering organizational maintenance for this equipment.

9-13. SERVICE UPON RECEIPT.

9-13.1 Checking Unpacked Equipment.

a. Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

9-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

9-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES. There are no organizational troubleshooting procedures assigned for this equipment.

9-16. ORGANIZATIONAL MAINTENANCE PROCEDURES.

a. This section contains instructions covering organizational maintenance functions for the portable tracing/scribing board. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

NOTE

The maintenance procedures for the portable tracing/scribing board consist of replacing three different electrical components. A multimeter is needed to determine which component is defective and needs replacement.

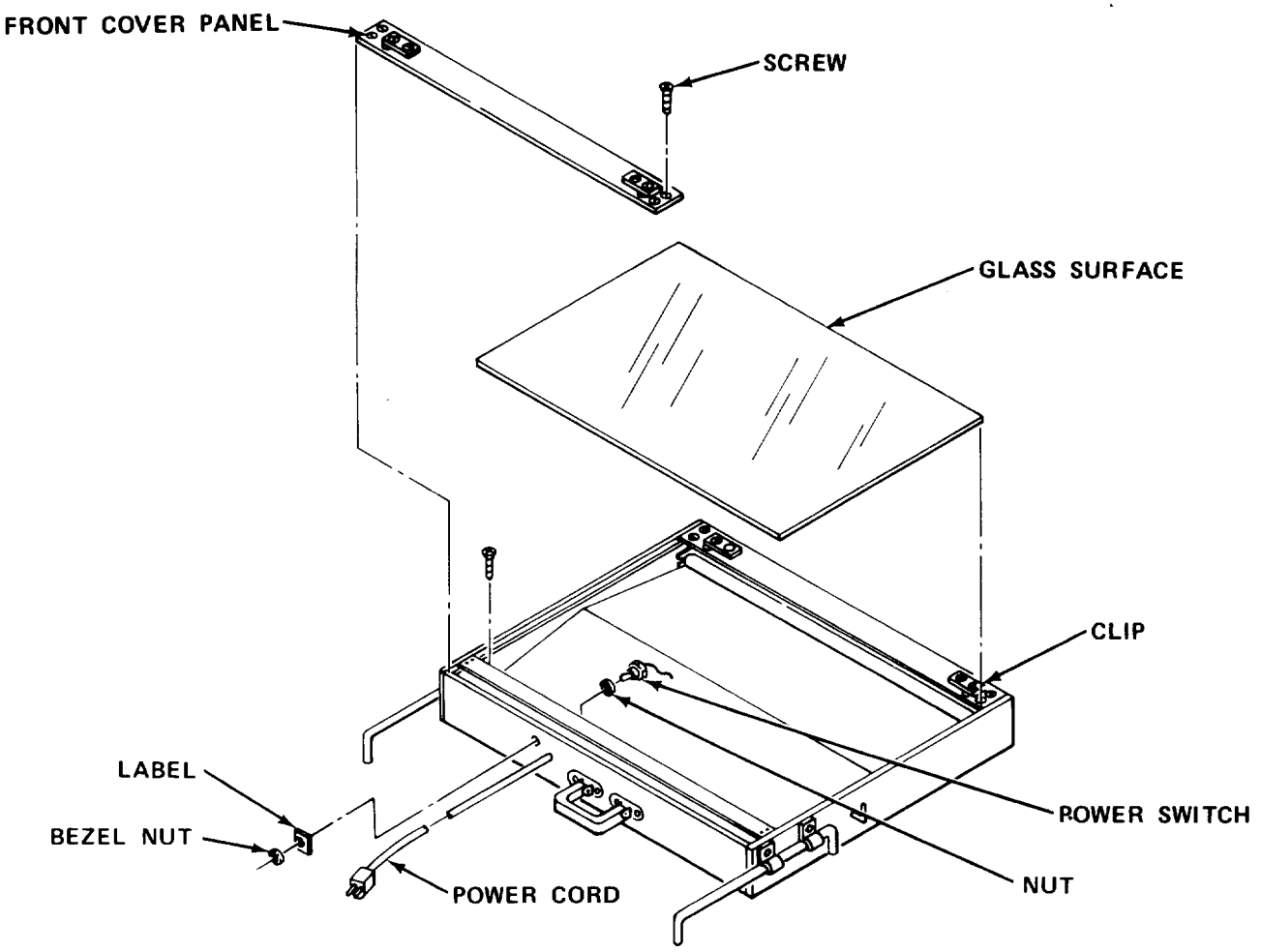
INDEX

9-16.1 Replace Power Switch.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Multimeter
Cross Tip Screwdriver

SUPPLIES: Power Switch



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a . Turn power switch OFF and unplug power cord.

b. Remove one screw from each of four clips. Loosen other screws.

c. Turn clips 90° to left or right.

CAUTION

Glass surface must be handled with care to avoid chipping or breaking.

d. Remove glass surface and set aside.

e. Remove screws and front cover panel.

f. Remove washers and bezel nut from power switch.

NOTE

Ground wire is not connected to switch. Mark position for reinstallation.

g. To remove defective power switch, pull to inside of board. Tag and disconnect wires.

h. Remove defective switch.

i. Connect wiring to new power switch and remove tags.

j. Reinstall washers and bezel nut. Adjust for proper positioning of power switch.

k. Reinstall front cover panel and secure with screws.

l. Reinstall glass surface.

m. Turn clips 90° to secure glass surface.

n. Reinstall screws on clips. Tighten all screws.

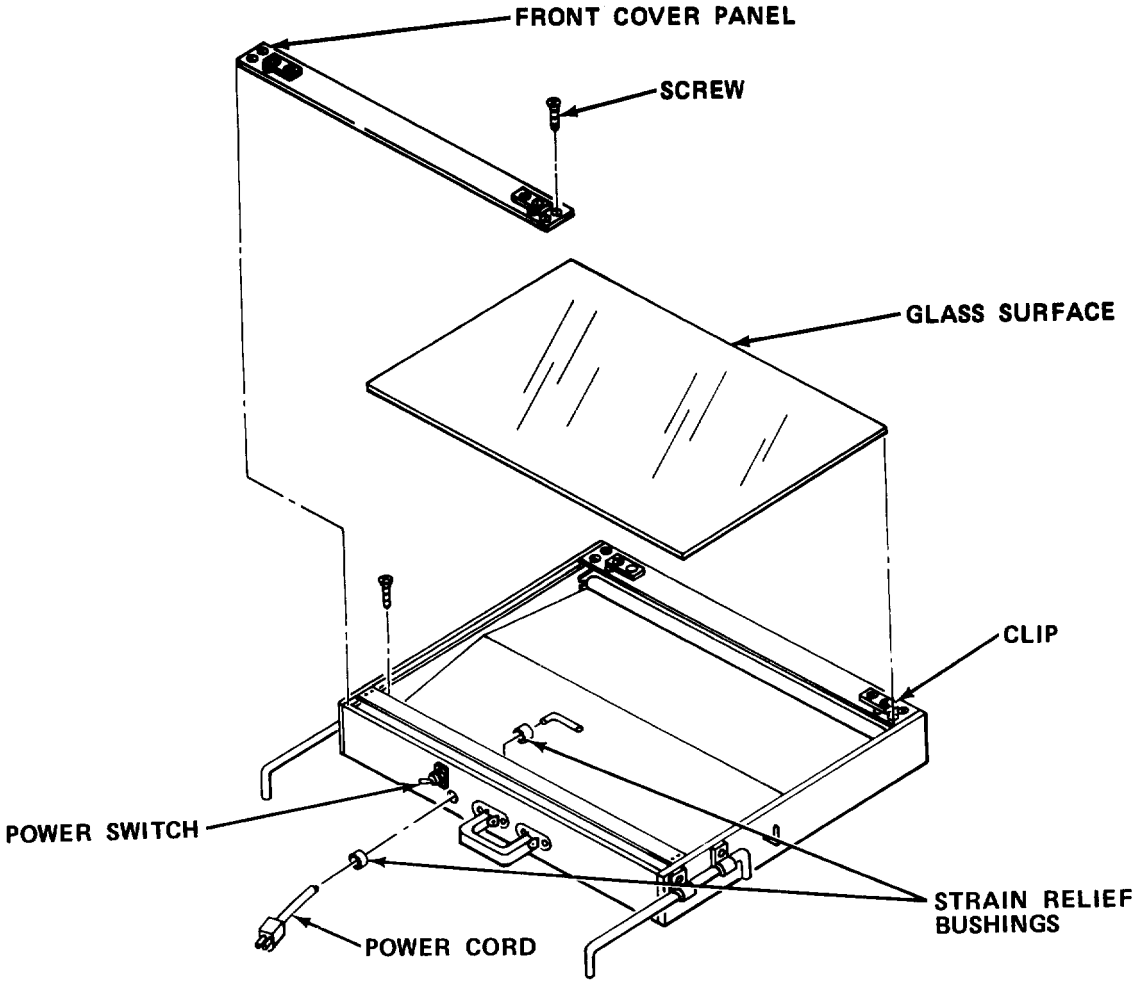
o. Plug in power cord and turn power switch ON.

9-16.2 Replace Power Cord.

MOS : 83FJ6, Reproduction Equipment Repairer

TOOLS : Cross Tip Screwdriver
Needle Nose Pliers

SUPPLIES: Power Cord



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF and unplug power cord.

b. Remove one screw from each of four clips. Loosen other screws.

c. Turn clips 90° to left or right.

CAUTION

Glass surface must be handled with care to avoid chipping or breaking.

d. Remove glass surface and set aside.

e. Remove screws and front cover panel.

f. Tag and disconnect wires.

g. Remove inner and outer strain relief bushings and remove defective power cord.

h. Reinstall inner and outer strain relief bushings on new power cord.

i. To install, connect wires to power cord and remove tags.

j. Reinstall front cover panel and secure with screws.

k. Reinstall glass surface.

l. Turn clips 90° to secure glass surface.

m. Reinstall screws on clips. Tighten all screws.

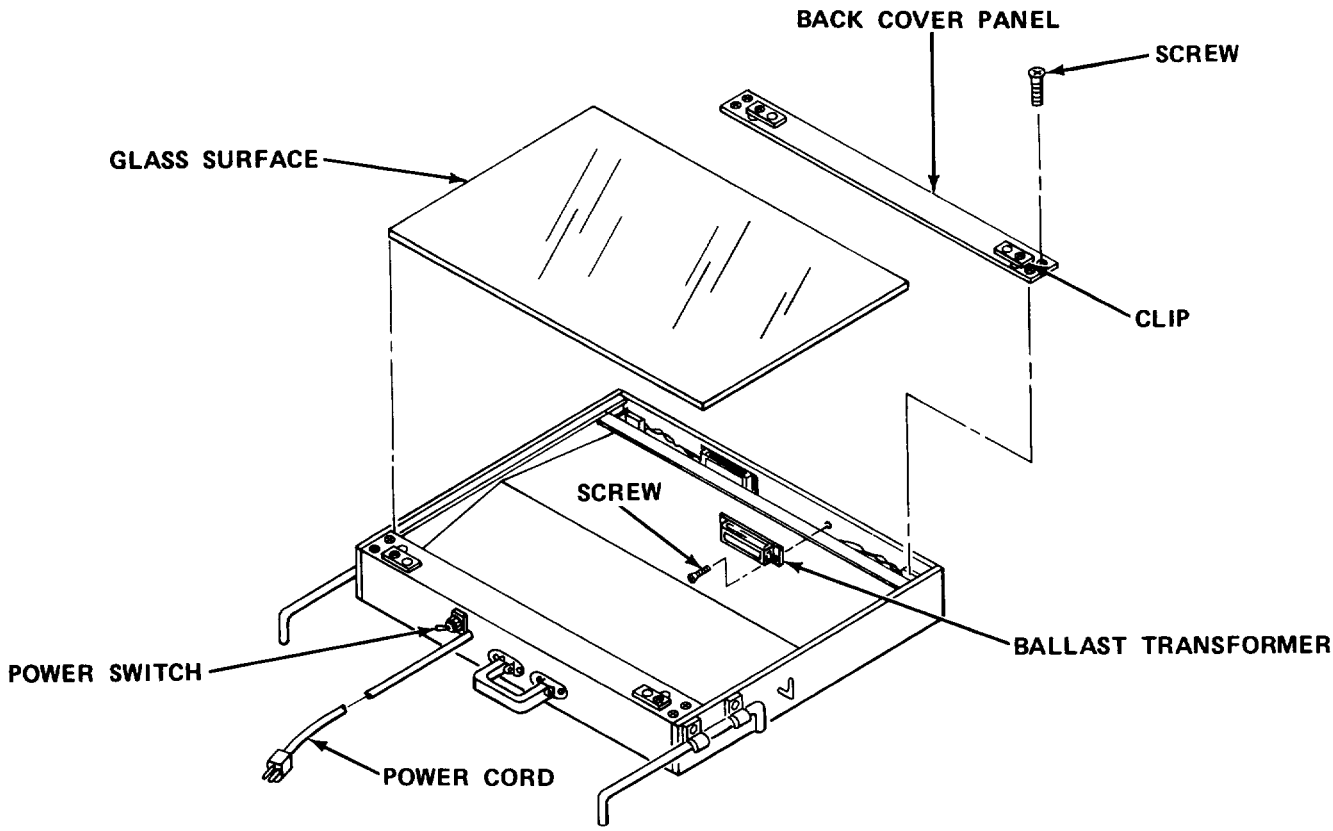
n. Plug in power cord and turn power switch ON.

9-16.3 Replace Ballast Transformer.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: Cross Tip Screwdriver

SUPPLIES: Ballast Transformer



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power switch OFF and unplug power cord.

b. Remove one screw from each of four clips. Loosen other screws.

c. Turn clips 90° to left or right.

CAUTION

Glass surface must be handled with care to avoid chipping or breaking.

d. Remove glass surface and set aside.

e. Remove screws and back cover panel.

f. Remove screws and defective ballast transformer.

g. Disconnect and tag wires from ballast transformer.

h. Connect wiring on new ballast transformer and remove tags.

i. Install new ballast transformer and secure with screws.

j. Reinstall back cover panel and secure with screws.

k. Reinstall glass surface.

l. Turn clips 90° to secure glass surface.

m. Reinstall screws on clips. Tighten all screws.

n. Plug in power cord and turn power switch ON.

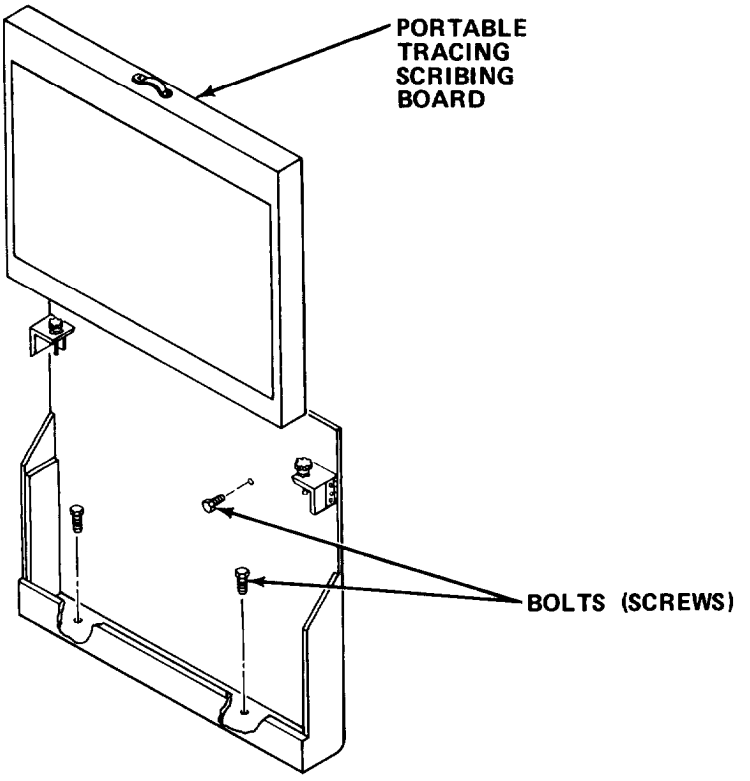
9-16.4 Remove/Install Mounting Bracket.

MOS: 83FJ6, Reproduction Equipment Repairer

TOOLS: 1/4 in. Socket Set/Cross Tip Screwdriver

SUPPLIES: Mounting Bracket

a. Remove portable tracing/scribing board from mounting bracket.



b. Remove attaching hardware securing defective mounting bracket to wall.

c. Remove attaching hardware securing defective mounting bracket to floor.

d. Remove defective mounting bracket.

e. Secure new mounting bracket to wall with attaching hardware.

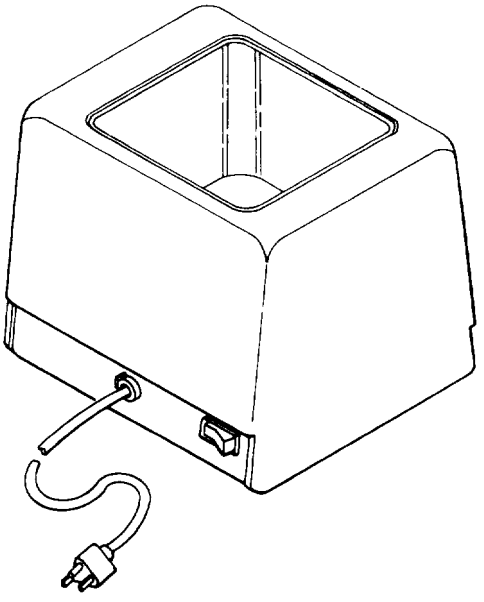
f. Secure new mounting bracket to floor with attaching hardware.

g. Reinstall portable tracing/scribing board.

9-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

There are no direct/ general support maintenance procedures assigned for this equipment.



CHAPTER 10

ULTRASONIC CLEANER

Section I INTRODUCTION

10-1. GENERAL INFORMATION.

10-1.1 Scope.

a. Model Number and Equipment Name. Model 3069USC3 Ultrasonic Cleaner

b. Purpose of Equipment. To clean drafting/drawing pens.

10-2. EQUIPMENT DESCRIPTION.

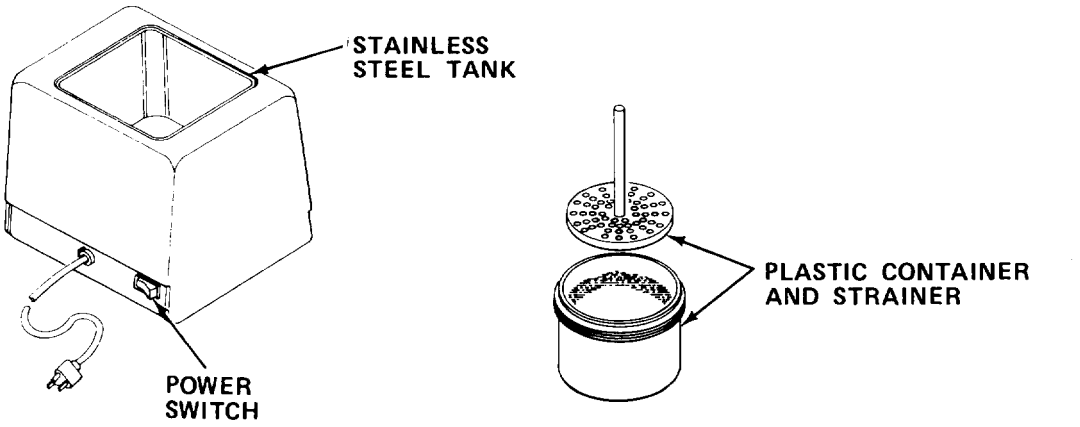
10-2.1 Equipment Characteristics, Capabilities, and Features.

a. Cleans without disassembly.

b. Removes dried ink.

c. Portable.

10-2.2 Location and Description of Major Components.



STAINLESS STEEL TANK. Holds water.

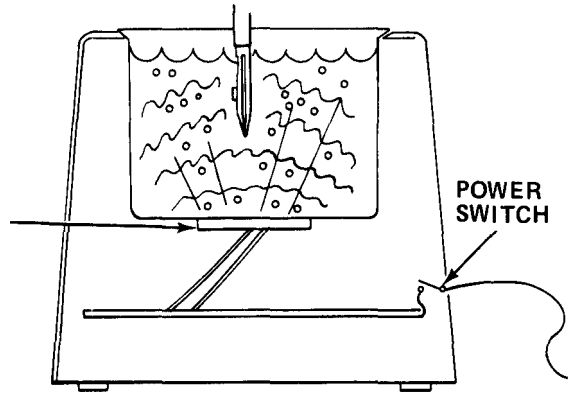
PLASTIC CONTAINER AND STRAINER. Holds small parts in solution for cleaning.

POWER SWITCH. Turns machine ON or OFF.

10-2.3 Equipment Data.

Weight	5.51 lbs (2.5 kg)
Power Requirements	115 V, 60 Hz, 60 W

10-3. TECHNICAL PRINCIPLES OF OPERATION.

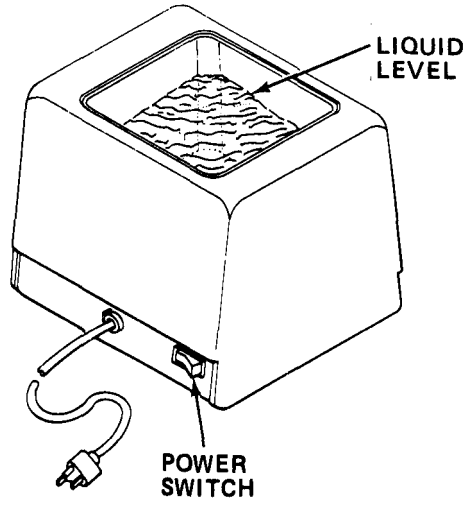


POWER SWITCH. When turned ON, provides power to the transducer.

TRANSDUCER. Generates ultrahigh frequency sound waves.

Section II OPERATING INSTRUCTIONS

10-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS.



Control or Indicator	Function
Liquid Level	Level of liquid in stainless steel tank must be 1/3 full .
Power Switch	Turns power on or off.

10-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES.

a. Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails to Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

10-5.1 PMCS Procedures.

PMCS are designed to keep the equipment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform specified service tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if YOU are the assigned operator and have not operated the item since the-last weekly-or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbers are used for your "TM Number" Column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

Interval columns. This column determines the time period designated to perform your PMCS.

h. Item to be inspected and procedures column. This column lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Item	Quantity
Cheesecloth (Item 6, Appendix E)	ar

Table 10-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can safely be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Reediness Reporting, Equipment Is Not Ready/ Available If:
		ULTRASONIC CLEANER	
1	B	Inspect Cleaner.	

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

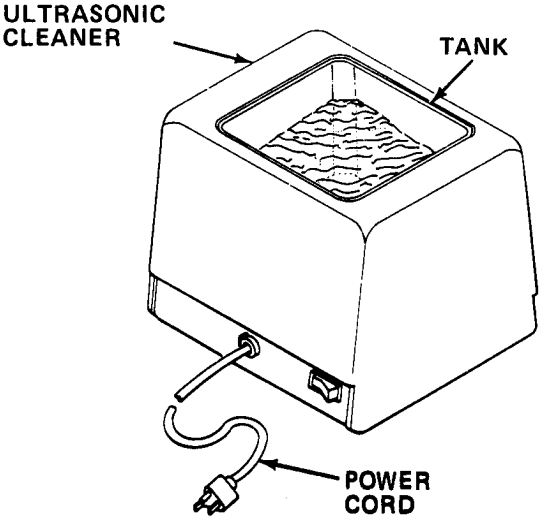


Table 10-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A . After

W - Weekly
M - Monthly
Q . Quarterly

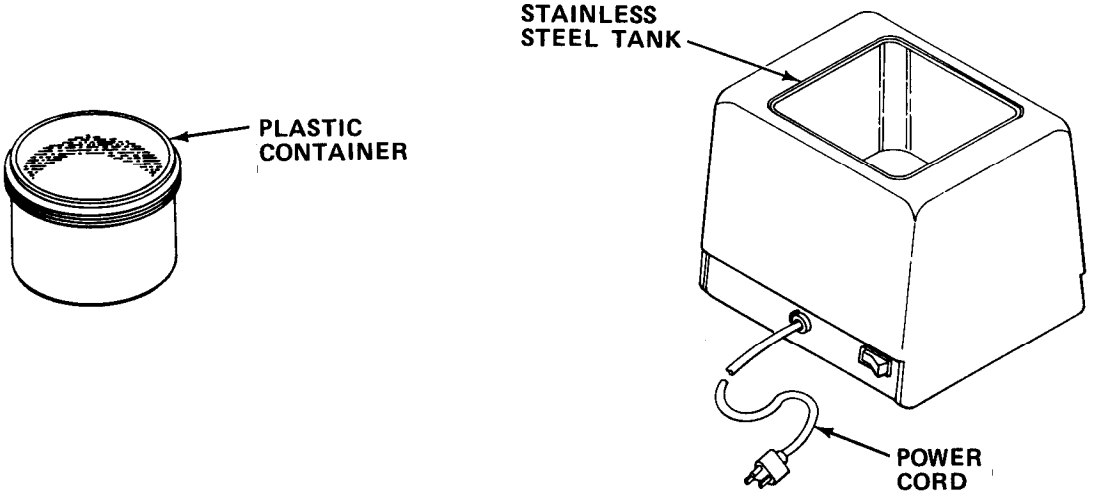
AN - Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

Item NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		ULTRASONIC CLEANER - Cont	
1	B	Inspect cleaner - Cont	
		1. Check power cord for kinks, frays, or burns If power cord is defective, notify organ zational maintenance.	Power cord is damaged.
		2. Check tank for dirt or chemical residue. Clean tank by wiping with cheesecloth moiste ned with water.	
		3. Check for agitation of water surface.	Water surface is not agitat-ing.

10-6. OPERATION UNDER USUAL CONDITIONS.

10-6.1 Operation Procedure.



Fill stainless steel tank 1/3 full with fresh, clean water. Fill plastic container with water to within 1/2 in. (12.7 mm) of top.

b. Add .135 oz (4 ml) of cleaning solution to plastic container.

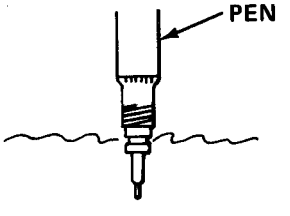
c. Plug in power cord to 120 V, 60 Hz grounded outlet.

d. Turn power on. Be sure water surface in stainless steel tank is agitating.

WARNING

Do not place fingers in stainless steel tank when ultrasonic cleaner is operating. Cleaning solution may be driven through skin or ultrasonic waves may cause injury to body tissue.

e. Prepare cleaning solution by operating ultrasonic cleaner for one minute before cleaning pen tips.



CAUTION

Do not immerse pen beyond cap threads. Damage to pen may result.

f. Dip pen about 3/4 in. (19 mm) in cleaning solution.

Lift pen from cleaning solution. Keeping point downward, shake solution from pen onto cheesecloth (Item 6, Appendix E).

h. wipe pen.

i. Draw pen over scrap paper until ink fl ows frely and shows uniform color.

j. Turn power off. Unplug power cord.

k. Dispose of cleaning solution when dirty.

CAUTION

Avoid getting water into body of ultrasonic cleaner. Damage to circuit board can result.

l. Carefully rinse stainless steel tank.

m. Wipe stainless steel tank dry with cheesecloth (Item 5, Appendix E).

10-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

10-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

10-9. TROUBLESHOOTING PROCEDURES. There are no operator troubleshooting procedures assigned for this equipment.

10-10. MAINTENANCE PROCEDURES. Operator maintenance is limited to performance of regular preventive maintenance checks and services and replenishment of cleaning solution.

Section IV ORGANIZATIONAL MAINTENANCE

10-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

10-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

10-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

10-12.2 Special Tools: Test. Measurement, and Diagnostic Equipment: and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

10-12.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-316-24P covering organizational maintenance for this equipment.

10-13. SERVICE UPON RECEIPT.

10-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

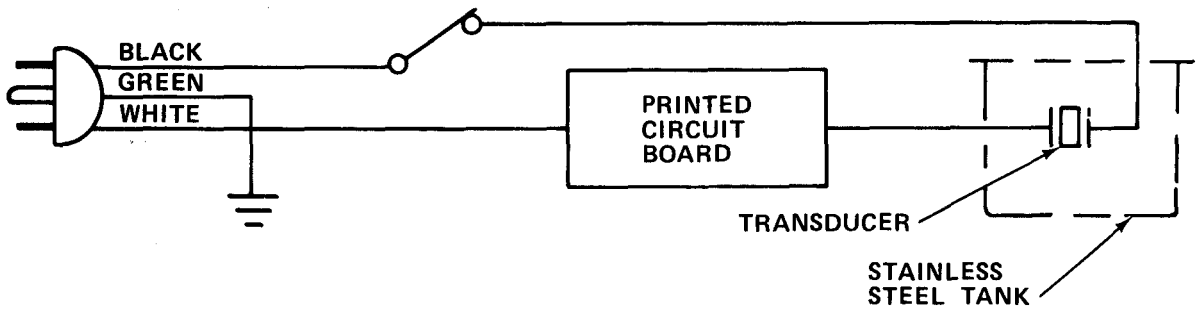
10-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

10-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES.

Organizational troubleshooting procedures cover the most common malfunctions that may be repaired at the organizational level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used by the operator should be conducted in addition to the organizational troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/ inspection and corrective action. If a malfunction is not listed or corrected by a listed corrective action, notify your supervisor.

For unidentified malfunctions, use the following schematic or the foldout located at the end of this manual for further fault analysis.



d. If the ultrasonic cleaner does not power up when turned on, verify that 120 V ac is present at the receptacle. If voltage is not present, plug equipment into receptacle with power available and proceed with equipment troubleshooting. Perform no-power procedure for dead receptacle (Table 1-4).

Table 10-2. ORGANIZATIONAL TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
1. NO CLEANING ACTION, WATER AGITATES. Check cleaning action using fresh cleaning solution. (a) If test was satisfactory, instruct operator to change cleaning solution when dirty. (b) If test was not satisfactory, replace circuit board (paragraph 10-16.3
2. NO WATER AGITATION. Step 1. Using multimeter, check for continuity of power cord. (a) If continuity exists, proceed to step 2. (b) If continuity does not exist, replace power cord (paragraph 10-16.1).

Table 10-2. ORGANIZATIONAL TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION	
2. NO WATER AGITATION - Cont	
Step 2. Check continuity of power switch.	
(a) If continuity does not exist, replace power switch (paragraph 10-16.2).	
(b) If continuity does exist, replace circuit board (paragraph 10-16.3).	

10-16. MAINTENANCE PROCEDURES.

This section contains instructions covering organizational maintenance functions for the ultrasonic cleaner. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is-properly functioning.

INDEX

10-16.1 Replace Power Cord.

MOS: 41B, Topographic Instrument Repair Specialist

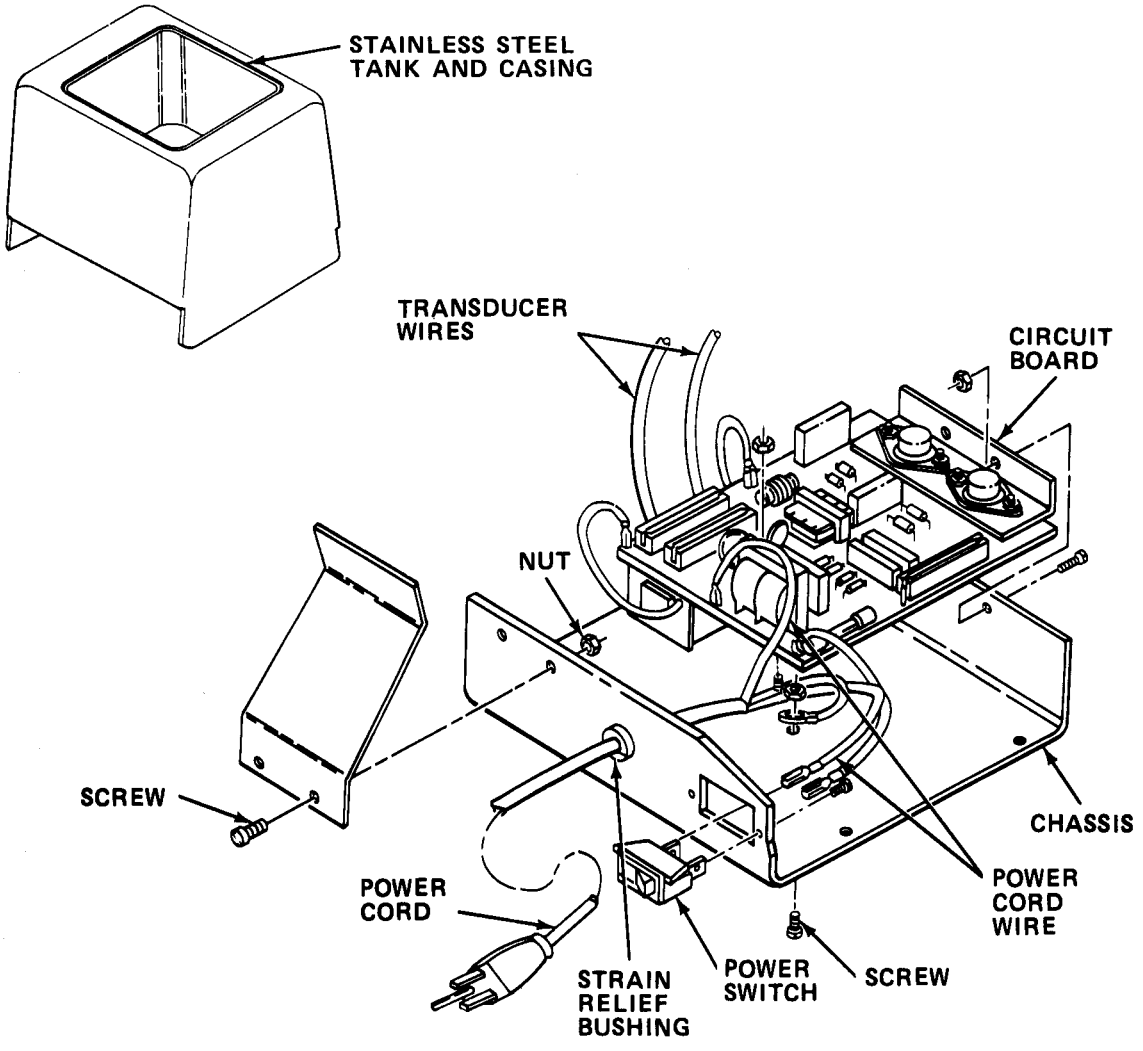
TOOLS: Flat Tip Screwdriver

SUPPLIES: Power Cord
Wire Clips

WARNING

Death or serious injury may occur if power cord is not unplugged before servicing.

a. Turn power off. Unplug power cord.



b. Remove screws and washers holding stainless steel tank and casing to chassis.

c. Lift stainless steel tank and casing free. Set aside.

NOTE

Do not disconnect wires to transducer.

d. Remove three screws, one nut, and one washer holding circuit board to chassis.

e. Disconnect power cord wire from power switch, chassis ground, and circuit board.

f. Loosen strain relief bushing from chassis and remove defective power cord.

g. Install strain relief bushing on new power cord. Insert terminal ends of cord into chassis.

h. Fit strain relief bushing into chassis.

i. Reconnect power cord wire to circuit board, chassis, and power switch.

j. Reinstall circuit board into chassis and secure with one washer, one nut, and three screws.

k. Reinstall stainless steel tank and casing. Secure with screws and washers.

l. Fill stainless steel tank 1/3 full with water.

m. Plug in power cord and turn power on. Check that water surface agitates.

10-16.2 Replace Power Switch.

MOS: 41B, Topographic Instrument Repair Specialist

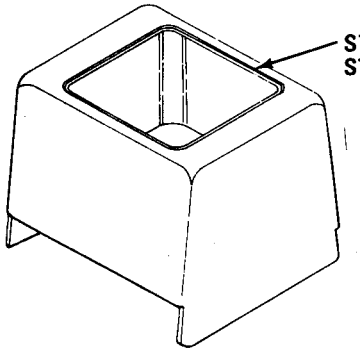
TOOLS: Flat Tip Screwdriver

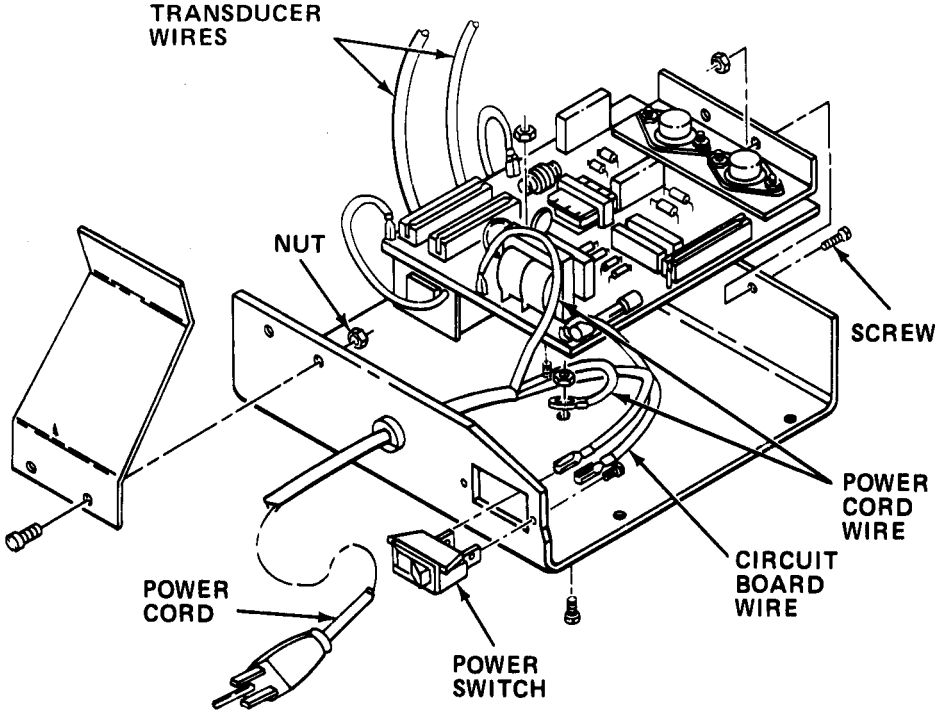
SUPPLIES: Switch

WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power off and unplug power cord.





b. Remove screws and washers holding stainless steel tank and casing to chassis.

c. Lift stainless steel tank and casing free. Set aside.

NOTE

Do not disconnect wires to transducer.

d. Tag and disconnect power cord wire from power switch.

e. Press sides of defective power switch and remove from chassis.

f. Install new power switch in chassis. Push power switch until tabs lock into hole.

g. Reconnect power cord wires to power switch.

h. Reinstall stainless steel tank and casing. Secure with screws and washers.

i. Fill stainless steel tank 1/3 full with water.

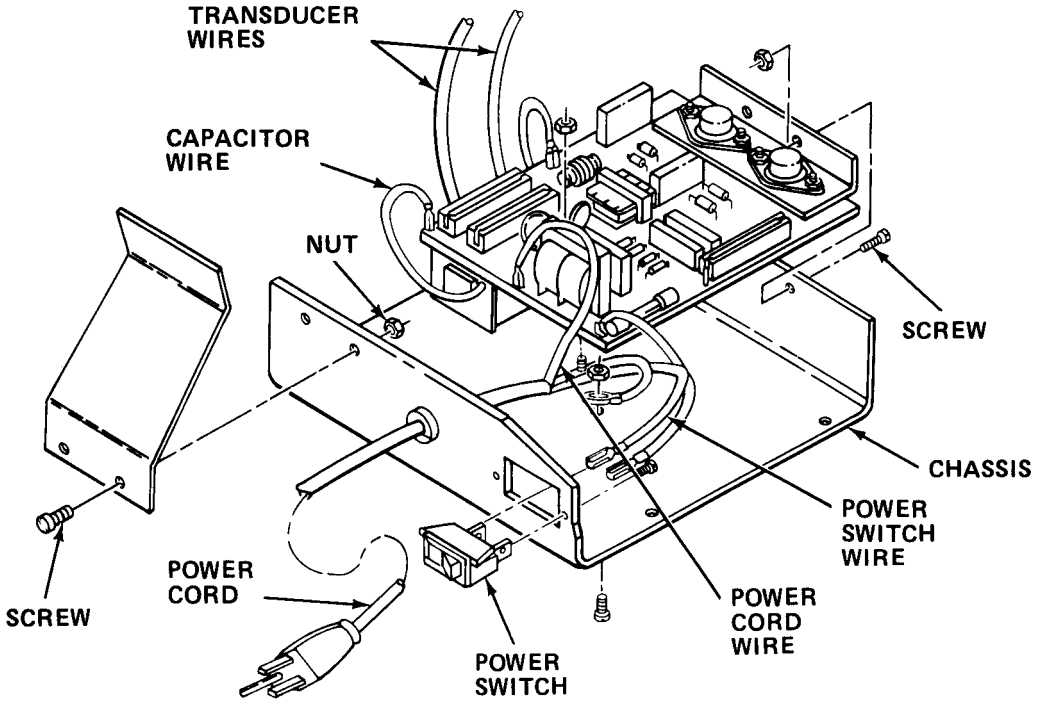
j. Plug in power cord and turn power on. Check that water surface agitates.

10-16.3 Replace Circuit Board.

MOS: 416, Topographic Instrument Repair Specialist

TOOLS: Flat Tip Screwdriver

SUPPLIES: Circuit Board



WARNING

Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.

a. Turn power off and unplug power cord.

b. Remove screws and washers holding stainless steel tank and casing to chassis.

c. Lift stainless steel tank and casing free. Set aside.

NOTE

Do not disconnect wires to transducer.

d. Remove three screws, one nut, and one washer holding circuit board to chassis.

e. Tag and disconnect power cord wires and power switch wires from circuit board.

f. Disconnect capacitor wires from circuit board.

g. Tag and disconnect two transducer wires from circuit board.

h. Remove defective circuit board.

i. Install new circuit board.

j. Reconnect two transducer wires to circuit board.

k. Reconnect capacitor wires to circuit board.

l. Reconnect power switch wires and power cord wires to circuit board.

m. Reinstall one washer, one nut, and three screws holding circuit board to chassis.

n. Reinstall stainless steel tank and casing. Secure with screws and washers.

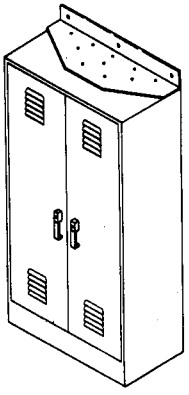
o. Fill stainless steel tank 1/3 full with water.

p. Plug in power cord and turn power on. Check that water surface agitates.

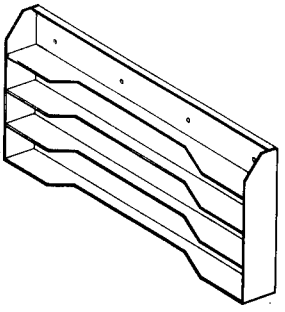
10-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

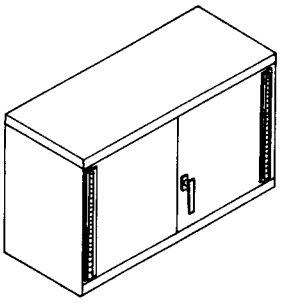
There are no direct/general support maintenance procedures assigned for this equipment.



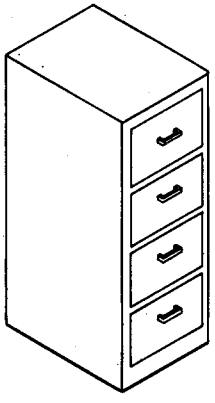
SUPPLY CABINET



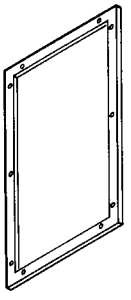
PAPER RACK



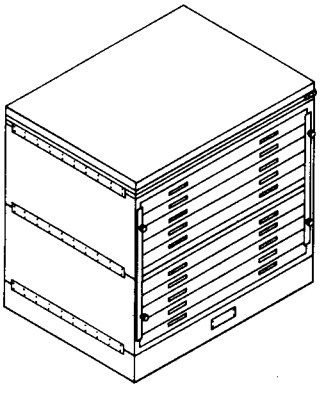
WALL STORAGE CABINET



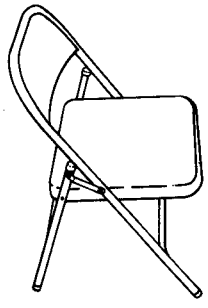
FILING CABINET



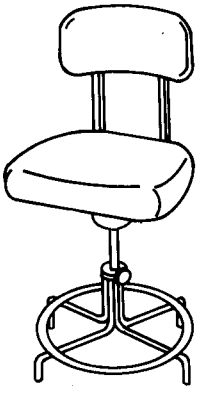
CORKBOARD



MAP AND PLAN FILING CABINET



FOLDING CHAIR



ROTARY DRAFTING CHAIR

ROTARY DESK CHAIR

CHAPTER 11

FURNITURE AND CABINETS

Section I INTRODUCTION

11-1. GENERAL INFORMATION.

11-1.1 Scope. This chapter contains the description of all furniture and cabinets contained in this section.

11-2. EQUIPMENT DESCRIPTION.

Supply cabinet. Provides storage for miscellaneous items. Cabinet has two louvered doors with a built-in latch and five shelves. Dimensions:

Width	36 in. (91.4 cm)
Depth	18 in. (45.7 cm)
Height	72 in. (182.8 cm)

b. Wall storage cabinet. Used for miscellaneous storage. There are two shelves. The two doors are held shut by a handle-type latch. Dimensions:

Width	30 in. (76.2 cm)
Depth	12 in. (30.5 cm)
Height	18 in. (45.7 cm)

c. Filing cabinet. Used for the storage of legal-sized documents, correspondence and office supplies. There are four drawers. Dimensions:

Width	18.25 in. (46.3 cm)
Depth	26.63 in. (67.6 cm)
Height	52 in. (132.1 cm)

d. Map and plan filing cabinet. Used for flat, horizontal storage of maps, blueprints, charts and plans of various sizes. The ten drawers are held shut by two locking bars located on either side of the front of the cabinet. Dimensions:

Width	40.75 in. (103.5 cm)
Depth	28.62 in. (72.7 cm)
Height	41.68 in. (105.7 cm)

e. Rotary drafting chair. Provides seating for drafting personnel. It has adjustable seat height and back position. Dimensions:

Width	17.12 in. (43.5 cm)
Depth	17.12 in. (43.5 cm)
Height	42 in. (107 cm), Max 36 in. (91.4 cm), Min

f. Folding chair. Provides general seating. Folds flat for storage. Dimensions:

Width	18 in. (45.7 cm)
Depth	20 in. (50.8 cm)
Height	32 in. (81.3 cm)

Rotary desk chair. Provides seating for personnel working at desk. It has a 3-3/4 in. (9.53 cm) seat height adjustment, ball bearing casters, tilt movement tension adjustment and adjustable back height. Dimensions:

Width	20 in. (50.8 cm)
Depth	21 in. (53.3 cm)
Height	32 in. (81.3 cm)

h. Corkboard. Wall mounted. Dimensions:

Width	30.0 in. (76.2 cm)
Height	18.0 in. (45.7 cm)

i. Paper rack. Provides storage for teletype paper. Dimensions:

Width	43 in. (109.22 cm)
Depth	5 in. (12.7 cm)
Height	22 in. (55.9 cm)

11-3. TECHNICAL PRINCIPLES OF OPERATION. There are no specific principles of operation for this equipment.

Section II OPERATING INSTRUCTIONS

11-4. DESCRIPTION AND USE OF OPERATOR'S CONTROLS AND INDICATORS. This equipment has no operator's controls or indicators.

11-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no operator PMCS procedures assigned for this equipment.

11-6. OPERATION UNDER USUAL CONDITIONS.

11-6.1 Preparation for Movement. Ensure that portable equipment is properly secured with tiedowns provided.

11-7. OPERATION UNDER UNUSUAL CONDITIONS. This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

11-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

11-9. TROUBLESHOOTING PROCEDURES. There are no operator troubleshooting procedures assigned for this equipment.

11-10. MAINTENANCE PROCEDURES.

a. This section contains instructions covering operator maintenance functions for the furniture and cabinets. Personnel requir~d are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

11-10.1 Inspect Cabinets and Furniture. Inspect furniture and cabinets for structural damage, rust and proper operation of all latches, hinges, drawer slides and adjustment mechanisms.

Section IV ORGANIZATIONAL MAINTENANCE

11-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

11-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

11-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

11-12.2 Special Tools; Test, Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

11-12.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-316-24P covering organizational maintenance for this equipment.

11-13. SERVICE UPON RECEIPT.

11-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

11-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

11-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES. There are no organizational troubleshooting procedures assigned for this equipment.

11-16. MAINTENANCE PROCEDURES.

This section contains instructions covering organizational maintenance functions for the furniture and cabinets. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

11-16.1 Replace Door Hinge (Piano Hinge).

MOS: 41B, Topographic Instrument Repair Specialist
or
83FJ6, Reproduction Equipment Repairer

TOOLS : 1/4 in. Electric Drill
5/32 in. Drill Bit
Pop Rivet Gun

SUPPLIES: Piano Hinge
5/32 in. Pop Rivets
8-32 x 1/2 in. Screws (4 required)
8-32 Nuts (4 required)

a. Drill out rivets holding hinge to cabinet and remove hinge.

b. Install new hinge and temporarily secure with four screws and nuts.

c. Close and latch cabinet door and install pop rivets

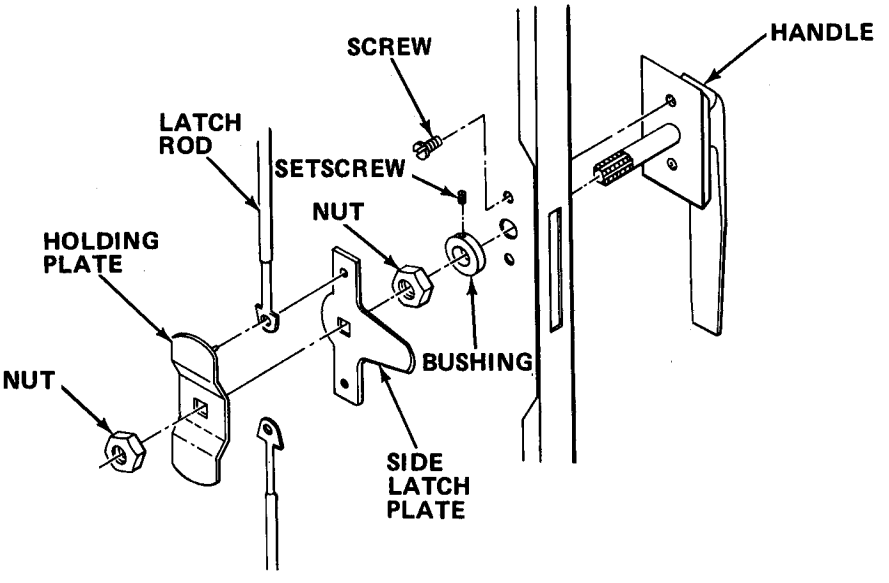
d. Remove temporarily installed screws and nuts, and install remaining pop rivets.

11-16.2 Replace Door Latch (Wall storage Cabinet).

MOS: 41B, Topographic Instrument Repair Specialist
or
83FJ6, Reproduction Equipment Repairer

TOOLS: 9/16 in. Combination Wrench
Flat Tip Screwdriver

SUPPLIES: Handle Type Latch



a. Remove holding plate retaining nut.

b. Remove holding plate and latch rods.

c. Remove side latch plate.

d. Remove handle retaining nut.

e. Loosen setscrew and remove bushing from handle shaft.

f. Remove two handle retaining screws and remove handle.

g. Install new handle and secure with two screws.

h. Reinstall bushing on handle shaft and tighten setscrew.

i. Reinstall handle retaining nut.

j. Reinstall side latch plate.

k. Reinstall latch rod holding plate and latch rods.

l. Reinstall holding plate retaining nut.

11-16.3 Remove/Install Map and Plan Filing Cabinet/Portable Drawig Board Assembly.

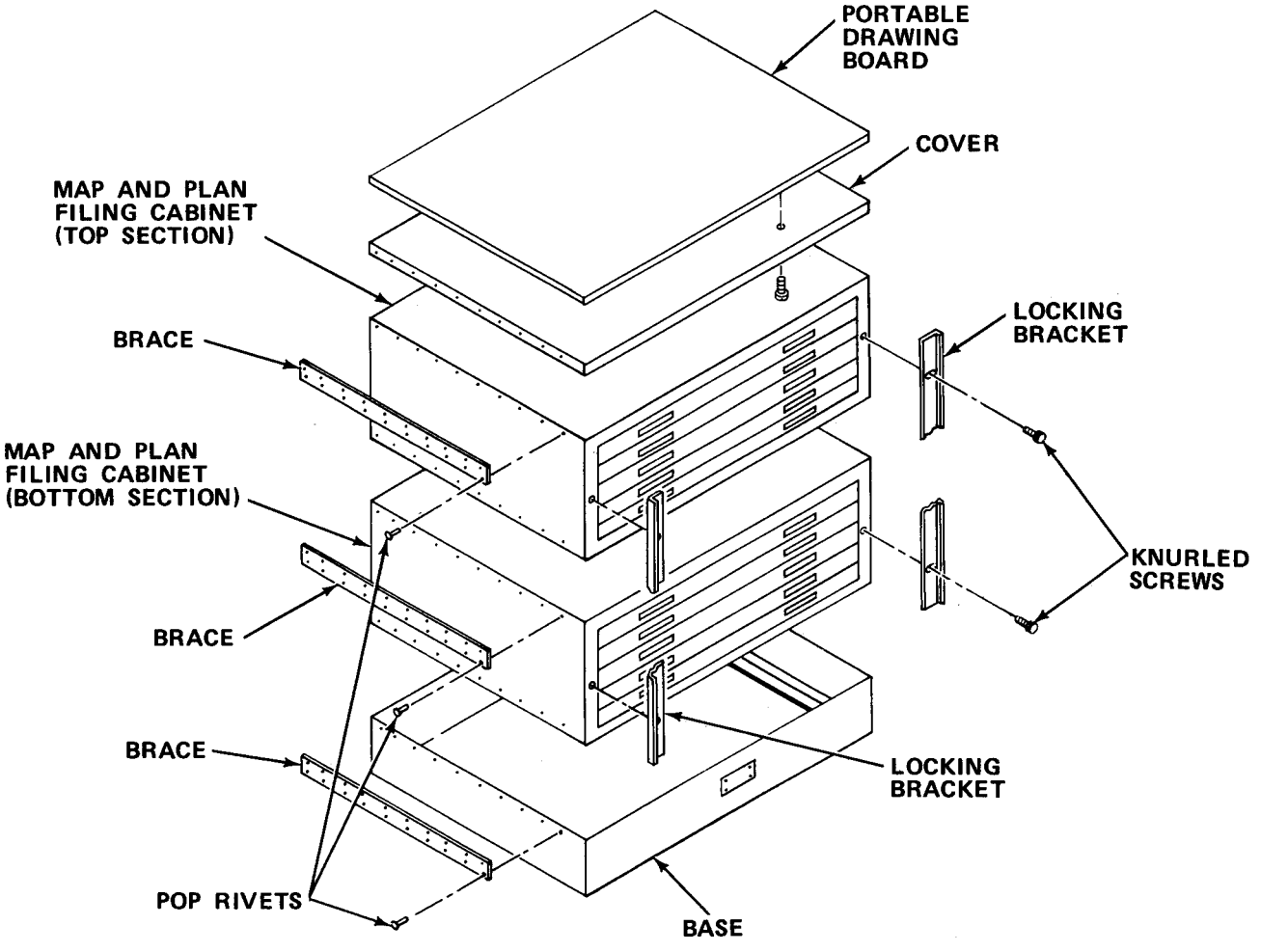
MOS: 41B, Topographic Instrument Repair Specialist

83FJ6, Reproduction Equipment Repairer

PERSONNEL: Two persons are required to perform this procedure.

TOOLS : Rivet Gun
Drill and Bits
Flat Tip Screwdriver

SUPPLIES: Portable Drawing Board
Map and Plan Filing Cabinet
Rivets (2 bx)



a. Drill rivets from braces and remove braces.

b. Remove map and plan filing cabinet cover, turn cover over, remove screws and portable drawing board from cover. Retain screws for reuse.

c. Remove knurled screws from locking bracket on each side of front. Then remove locking bracket.

WARNING

Serious personal injury can result if an inadequate number of personnel are used to move the map and plan filing cabinet.

d. Lift top and bottom sections free from base.

e. Remove screws and base from floor. Retain screws for reuse.

f. Install new base, top or bottom, map and plan filing cabinet, or drawing board as required.

g. Reinstall base to floor and secure with screws.

h. Reinstall bottom section to base and rivet braces to base and bottom sections.

i. Reinstall top section on bottom section and rivet braces to both top and bottom sections.

j. Reinstall portable drawing board on cover and secure with screws.

k. Reinstall cover on top section and rivet braces to both the cover and top section.

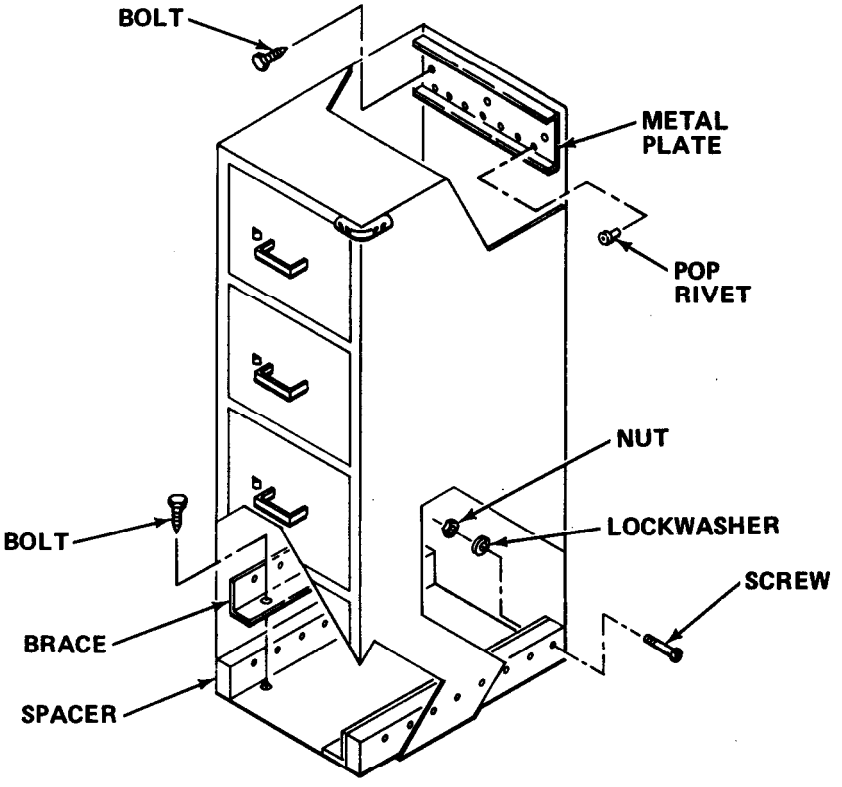
l. Reinstall locking brackets, and secure with knurled screws.

11-16.4 Remove/Install Filing Cabinet.

MOS: 41B, Topographic Instrument Repair Specialist
or
83FJ6, Reproduction Equipment Repairer

TOOLS: Pop Rivet Gun
Electric Drill
Flat Tip Screwdriver
1/4 in. Drive Socket Set
Drill Index

SUPPLIES: Filing Cabinet
Pop Rivets



a. Remove drawers from defective filing cabinet.

b. Remove bolts holding defective cabinet to wall.

c. Remove bolts holding defective cabinet to floor.

d. Remove screws, lockwashers, and nuts holding spacer and braces to defective cabinet.

e. Remove pop rivets holding metal plate to back of defective filing cabinet.

f. Remove defective filing cabinet.

g. Remove drawers from new filing cabinet.

h. Drill holes in back of new filing cabinet for installation of metal plate.

i. Install metal plate on back of new filing cabinet with pop rivets.

j. Drill holes in sides of new filing cabinet for installation of spacers and braces.

k. Install spacers and braces using nuts, lockwashers, and screws.

l. Secure new filing cabinet to floor with bolts.

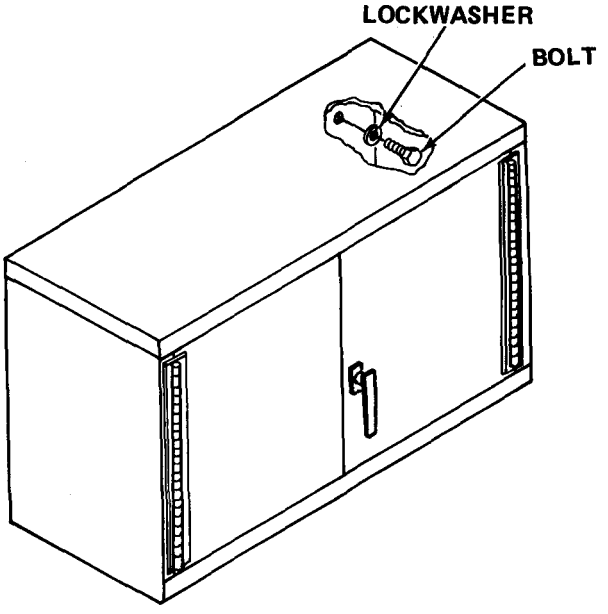
m. Secure new filing cabinet to wall with bolts.

n. Install drawers in new filing cabinet.

11-16.5 Remove/Install Wall Storage Cabinet.

MOS: 418, Topographic Instrument Repair Specialist
or
83FJ6, Reproduction Equipment Repairer

TOOLS: 1/2 in. Socket 1/2 in. Drive
1/2 in. Drive Ratchet
1/2 in. Socket Extension, 2 in. long



a. Remove bolts and lockwashers which secure cabinet to wall.

b. Remove defective cabinet.

c. Install new cabinet and secure to wall with lockwashers and bolts.

11-16.6 Remove/Install Supply Cabinet.

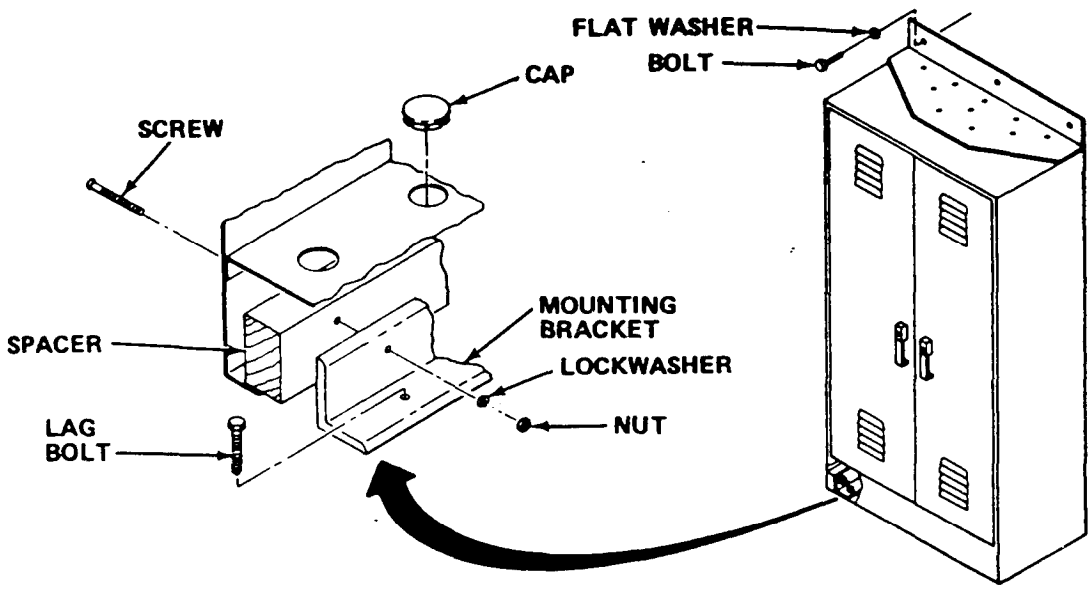
MOS: 41 B, Topographic Instrument Repair Specialist

or

83FJ6, Reproduction Equipment Repairer

TOOLS: 1/4 in. Socket Set
1/4 in. Socket Extension, 6 in. long
11/32 in. Combination Wrench
Cross Tip Screwdriver

SUPPLIES: Supply Cabinet



a. Remove bolts and flat washers holding cabinet to wall.

b. Remove caps and lag bolts holding mounting bracket to floor, and remove defective cabinet.

c. Remove nuts, lockwashers, and screws and remove mounting bracket and spacer from cabinet. Retain mounting bracket and spacers for use on new cabinet.

d. Position spacers and mounting bracket on new cabinet, and install but do not tighten screws, lockwashers, and nuts.

e. Place new cabinet in position, and install but do not tighten lag bolts.

f. Secure cabinet to wall with flat washers and bolts.

g. Tighten the bracket retaining bolts and nuts.

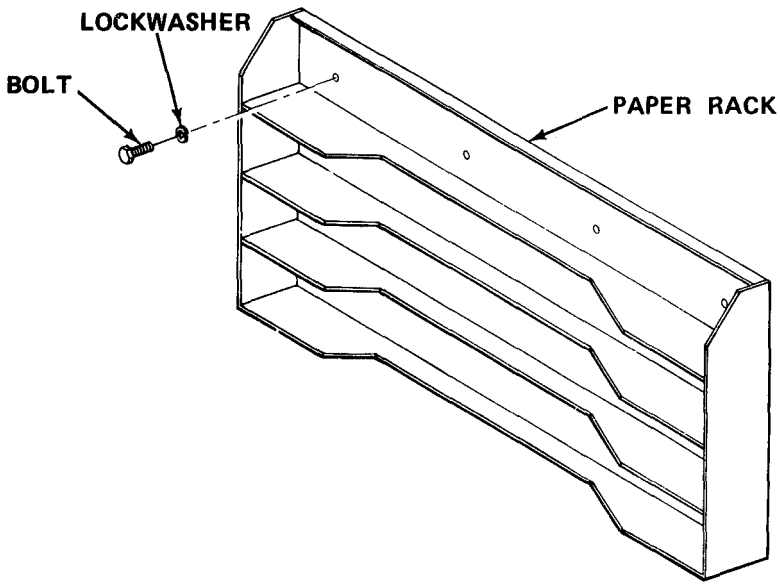
h. Tighten the bolts holding the mounting bracket to the floor, and install the caps.

11-16.7 Remove/Install Paper Rack.

MOS: 41B, Topographic Instrument Repair Specialist
or
83FJ6, Reproduction Equipment Repairer

TOOLS : 1/4 in. Drive Socket Set

SUPPLIES: Paper Rack



a. Remove attaching hardware securing defective paper rack to wall.

b. Remove defective paper rack.

c. Position new paper rack and aline mounting holes.

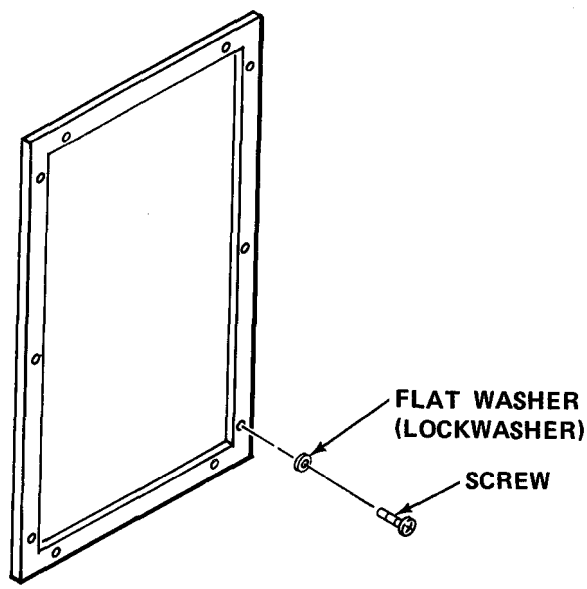
d. Secure new paper rack to wall with attaching hardware.

11-16.8 Remove/Install Corkboard.

MOS: 41B, Topographic Instrument Repair Specialist
or
83FJ6, Reproduction Equipment Repairer

TOOLS: Cross Tip Screwdriver

SUPPLIES: Corkboard



a. Remove attaching hardware securing defective corkboard to wall.

b. Remove defective corkboard.

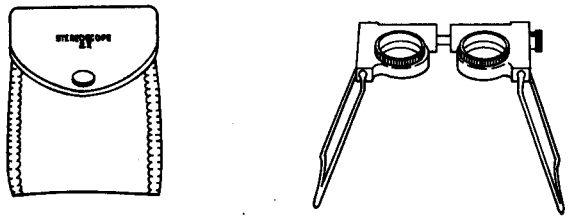
c. Position new corkboard and aline mounting holes.

d. Secure new corkboard to wall with attaching hardware.

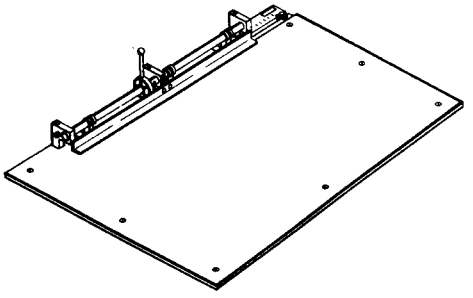
11-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

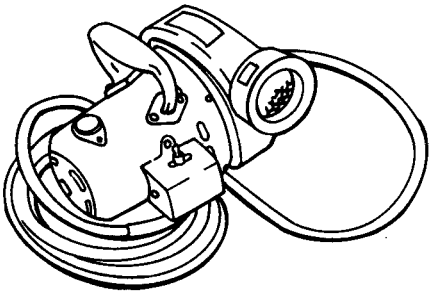
There are no direct/general support maintenance procedures assigned for this equipment.



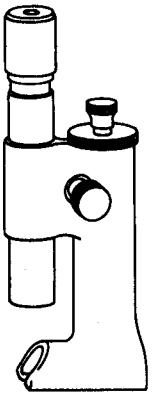
POCKET STEREOSCOPE



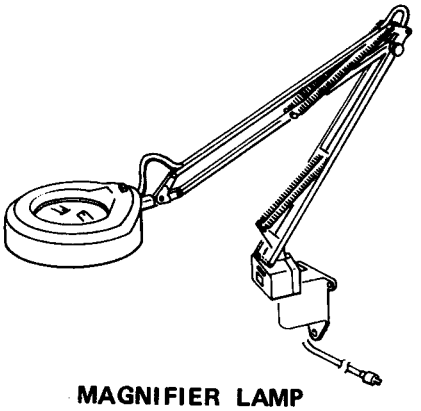
PIN REGISTER BOARD



VACUUM CLEANER



OPTICAL MACROSCOPE



MAGNIFIER LAMP

CHAPTER 12

SUPPORT ITEMS

Section I INTRODUCTION

12-1. GENERAL INFORMATION,

12-1.1 Scope. This chapter covers the support items contained in this section. The support items consist of the following equipment:

a. Model LFM1BX5 Magnifier Lamp.

b. Model 3400 Vacuum Cleaner.

c. Type 1 Pocket 2X Stereoscope.

d. Model 31-29-33-35 Optical Microscope.

e. Special Model Pin Punch Register.

12-2. EQUIPMENT DESCRIPTION.

12-2.1 Equipment Characteristics. Capabilities and Features.

a. Magnifier Lamp. Adjustable for accurate positioning to provide illuminated magnification of precision work. Provision for both wall and bench mounting.

b. Vacuum Cleaner. High speed, heavy duty, used for general cleaning.

c. Pocket Stereoscope. Optically matches and gives operator an apparent single image of two maps or photographs.

d. Optical Microscope. Provides wide field low power, for use in making observations which require working distances and magnifications beyond the range of conventional magnifiers. Provides image which is right side up and not reversed.

e. Pin Punch Register. Heavy duty hole punch that provides operator with a large flat surface for punching holes in paper maps and charts of different sizes.

12-2.2 Equipment Data.

a. Magnifier lamp. Replaceable 120 V ac lamp and diffuser.

b. Vacuum Cleaner. Packed in storage box containing hose, various vacuum and blowing attachments, liquid spray attachments, and motor repair kit containing motor bearings and brushes.

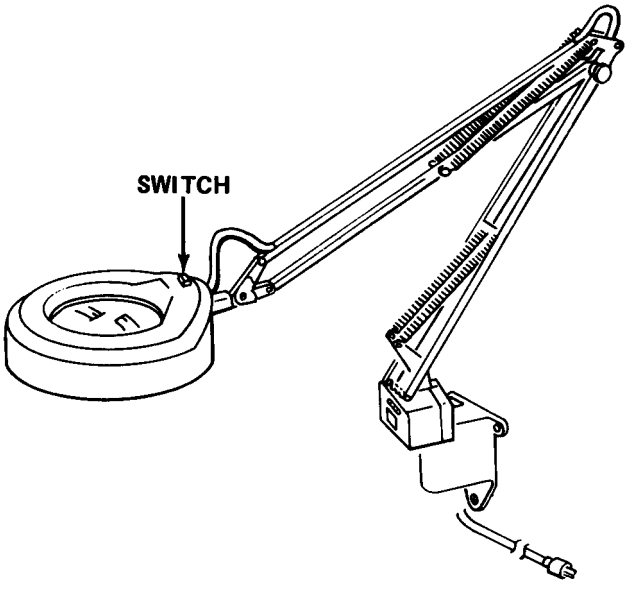
c. Optical Microscope. Received completely assembled with storage case. Two C-cell batteries are included.

12-3. TECHNICAL PRINCIPLES OF OPERATION. Principles of operation are combined with operator's controls and indicators.

Section II OPERATING INSTRUCTIONS

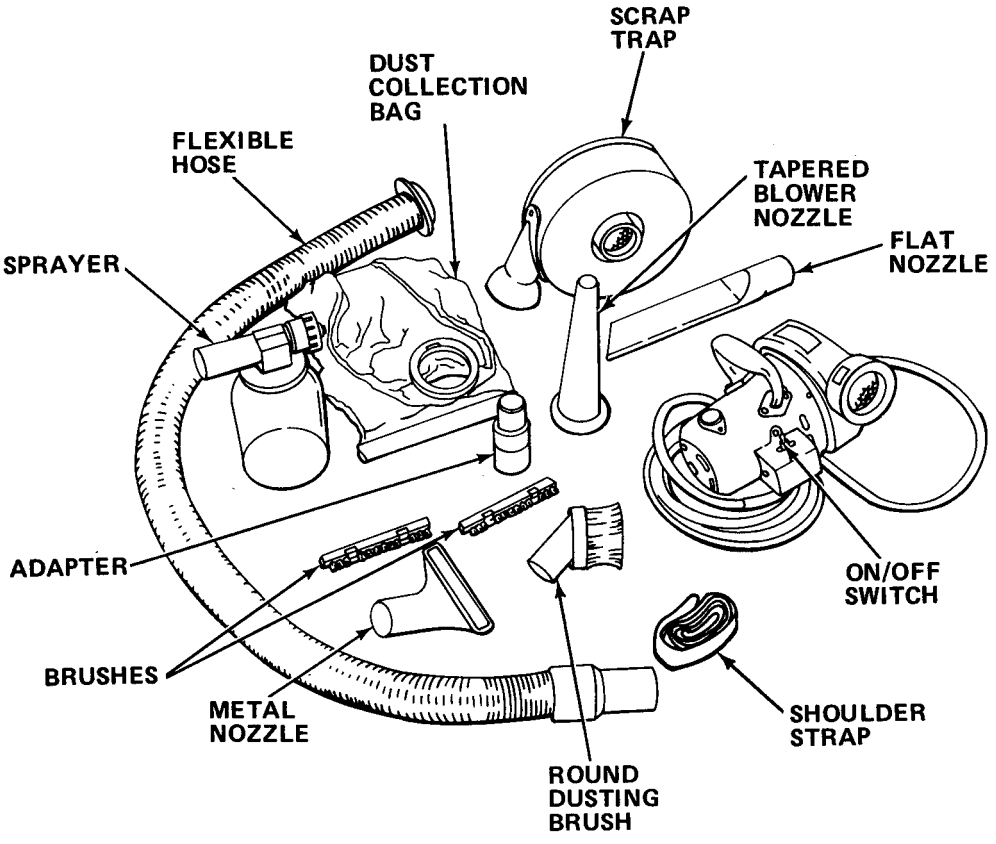
12-4. DESCRIPTION **AND USE OF OPERATOR'S CONTROLS AND INDICATORS.**

12-4.1 Magnifier Lamp)



Control or Indicator	Function
Switch	Turns lamp on/off.

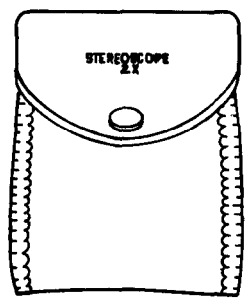
12-4.2 Vacuum Cleaner.

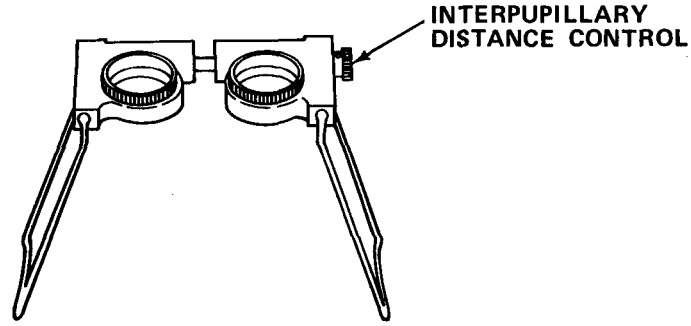


Control or Indicator	Function
Sprayer	Sprays liquids when hooked to blower side of vacuum cleaner.
Flexible Hose	Directs airflow in hard-to-reach areas.
Dust Collection Bag	Collects and holds dust and dirt.
Scrap Trap	Traps large particles before they enter fan.
Flat Nozzle	Used for hard-to-reach areas.
Tapered Blower Nozzle	Directs airflow.

Control or Indicator	Function
On/off Switch	Turns power on or off.
Shoulder Strap	Attaches to vacuum cleaner for easier carrying.
Round Dusting Brush	Used for dust and dirt.
Metal Nozzle	
Brushes	Used on metal nozzle.
Adapter	Connects various attachments to hose.

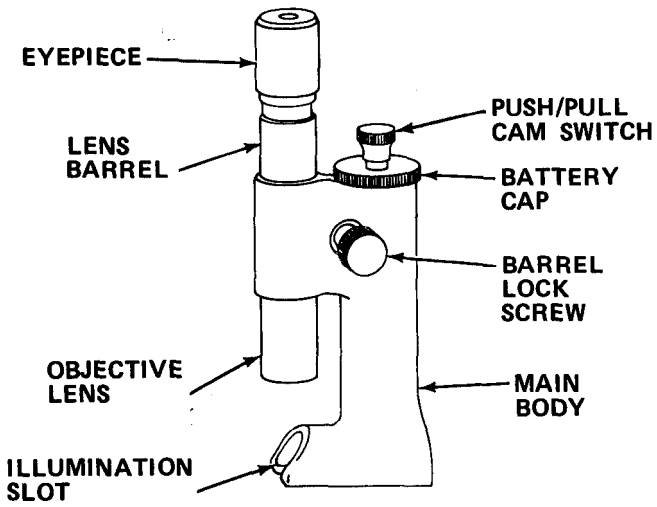
12-4.3 Pocket Stereoscope.





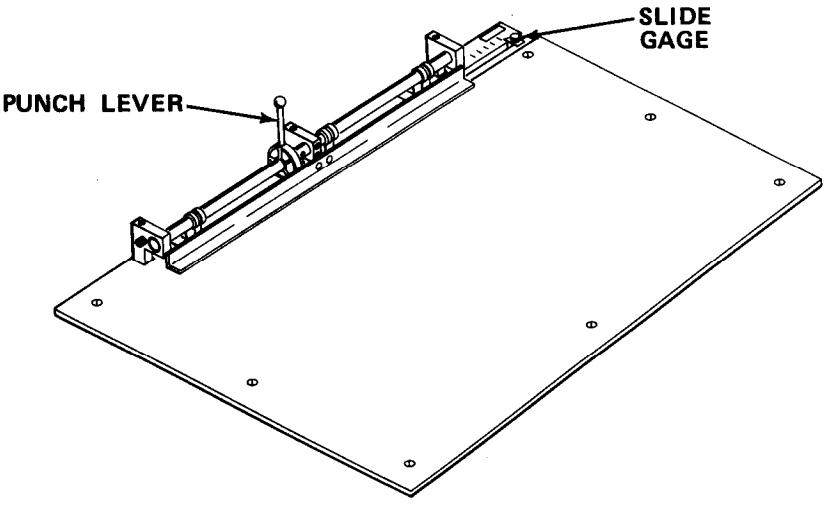
Control or Indicator	Function
Interpupillary Distance Control	Adjusts interpupillary distance of lenses to match that of viewer.

12-4.4 Optical Macrosope.



Control or Indicator	Function
Push-Pull Cam Switch	Switches lights on and off.
Battery Cap	Removable cap allows two C-cell batteries to be replaced.
Barrel Lock Screw	Locks lens barrel in position when tightened.
Main Body	Battery housing, lens barrel holder, and optical microscope stand.
Illumination Slot	Light cfrom2.5 V bulb is directed through this slot.
Objective Lens	Fixed lens part of magnifying optics.
Lens Barrel	Provides focusing movement for objective and eyepiece lens assembly.
Eyepiece	Removable eyepiece for observing image.

12-4.5 Pin Punch Register.



Control or Indicator	Function
Punch Lever	Operates eccentric which presses down on punch pin and forces it through material.
Slide Gage	Positions material for proper positioning of punch holes.

12-5. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

Before You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your before (B) PMCS.

b. While You Operate. Always keep in mind the WARNINGS and CAUTIONS. Perform your during (D) PMCS.

c. After You Operate. Be sure to perform your after (A) PMCS.

d. If Your Equipment Fails To Operate. Troubleshoot with proper equipment. Report any deficiencies using the proper forms. See DA Pam 738-750.

12-5.1 PMCS Procedures.

a. PMCS are designed to keep the equi pment in good working condition by performing periodic service tasks.

b. Service intervals provide you, the operator, with time schedules that determine when to perform-specified service-tasks.

c. The "Equipment is Not Ready/Available If" column is used for identification of conditions-that make the equipment not ready/available for readiness reporting purposes or denies use of the equipment until corrective maintenance is performed.

d. If your equipment fails to operate after PMCS is performed, immediately report this condition to your supervisor.

e. Perform weekly as well as before operation if you are the assigned operator and have not operated the item since the last weekly or if you are operating the item for the first time.

f. Item number column. Item numbers are assigned in chronological ascending sequence regardless of interval designation. These numbe rs are used for your "TM Number" column on DA Form 2404, Equipment Inspection and Maintenance Worksheet in recording results of PMCS.

g. Interval columns. This column determines the time period desiccated to perform your PMCS.

h. Item to be inspected and procedures column. This col umn lists functional groups and their respective assemblies and subassemblies as shown in the Maintenance Allocation Chart (Appendix B). The appropriate check or service procedure follows the specific item to be inspected.

i. Equipment is not ready/available if: column. This column indicates the reason or cause why your equipment is not ready/available to perform its primary mission.

j. List of tools and materials required for PMCS is as follows:

Equipment	Items	Quantity
Magnifier Lamp	Liquid Lens Cleaner (Item 5, Appendix E)	ar
	Cheesecloth (Item 6, Appendix E)	ar
Pocket Stereoscope	Lens Tissue (Item 29, Appendix E)	ar
Optical Microscope	Lens Brush	1 ea
	Cheesecloth (Item 6, Appendix E)	ar
	Lens Tissue (Item 29, Appendix E)	ar

Table 12-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES

NOTE

If the equipment must be kept in continuous operation, check and service only those items that can be checked and serviced without disturbing operation. Make the complete checks and services when the equipment can be shut down.

B - Before D . During A- After	W - Weekly M - Monthly Q - Quarterly	AN - Annually S . Semiannually Bl - Biennially	(Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAI.	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS	
1	B	Inspect Magnifier Lamp.	
		1. Inspect lens for cracks, breaks, or dirt. Clean as required.	Lens cracked or broken.
		2. Inspect arms and base for cracks or breaks. Replace as required.	Arms or base racked or broken.
2	B	Service Magnifier Lamp.	
		1. Turn off magnifier lamp.	
		2. Apply small amount of liquid lens cleaner on lens and wipe clean with cheesecloth.	
		3. Turn on magnifier lamp.	
3	Q	Inspect Vacuum Cleaner.	
		Inspect vacuum cleaner for damage to housing, frayed or worn power cord, and proper operation of motor.	racked or broen housing. rayed, worn or damaged power cord or plug. Noisy or improer motor operation.

Table 12-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A . After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

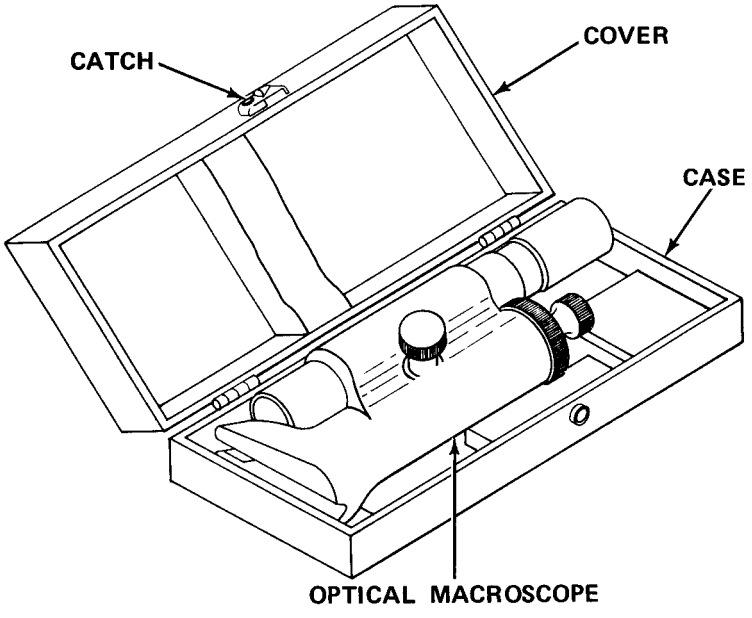
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS - Cont	
4	B	Clean Pocket Stereoscope. **1.** Inspect lenses for dust, dirt, cracks, or breaks. 2. Clean lenses with lens tissue. 3. Inspect housing and legs for cracks or breaks.	
5	B	Inspect Optical Macroscope.  **1.** Inspect exterior of carrying case for scratches or dents. 2. Release catch and open cover.	

Table 12-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

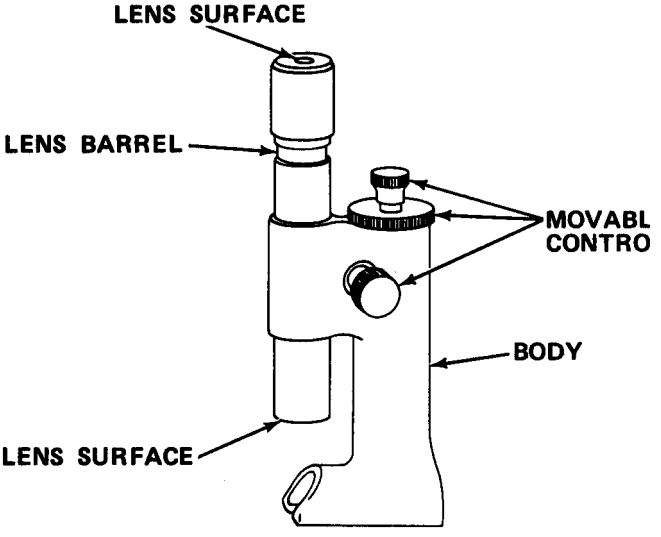
B - Before W - Weekly AN - Annually (Number) - Hundreds of Hours
D - During M - Monthly S - Semiannually
A - After Q - Quarterly BI - Biennially

ITEM NO	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS - Cont	
5	B	Inspect Optical Macroscope - Cont	

CAUTION

- Always place optical microscope on level and stable surface when not in use.
- Do not touch lens surfaces with bare hands. Fingerprints can damage lens surfaces. Clean lenses immediately if touched.

3. Remove optical microscope from case.



4. Inspect optical microscope for broken, damaged, or missing parts.

5. Inspect lens surfaces for cleanliness.

Table 12-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before
D - During
A - After

W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
Bl - Biennially

(Number) - Hundreds of Hours

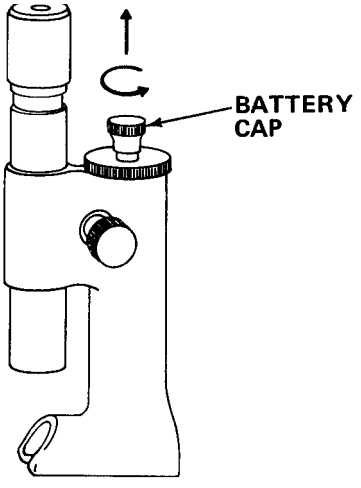
ITEM NO.	INTERVAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS - Cont	
5	B	Inspect Optical Macroscope Cont	
		6. Inspect movable controls for security.	
		7. Inspect main body and lens barrel for scratches or dents.	
		CAUTION Leaking or damaged batteries can discharge corrosive and mildly toxic substance which can damage equipment.	
			
		8. Unscrew and remove battery cap.	

Table 12-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

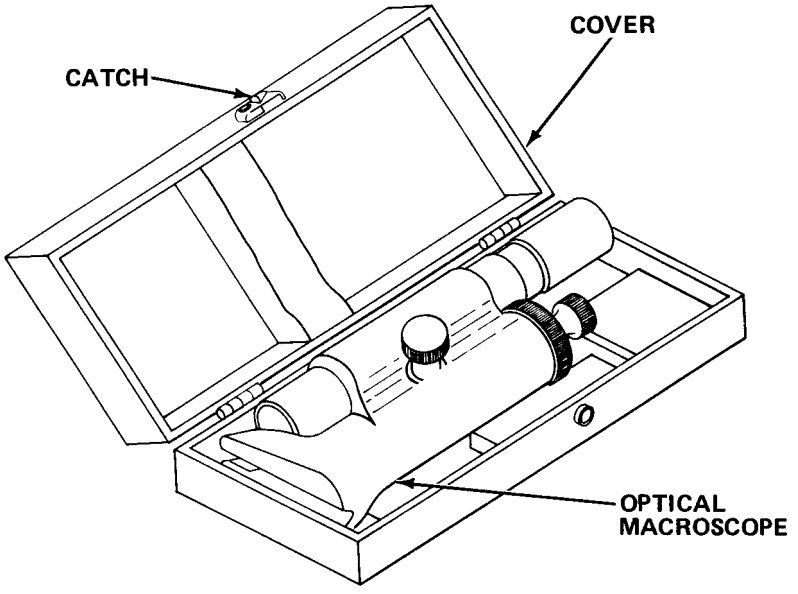
B - Before D - During A - After | W - Weekly M - Monthly Q . Quarterly | AN . Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS - Cont	
5	B	Inspect Optical Macroscope Cont 9. Place one hand in position to catch batteries, and turn optical microscope upside down to remove batteries. 10. Examine batteries for damage or signs of leakage. 11. Inspect inside of battery housing for damage or corrosion. **NOTE** Observe correct polarity when replacing batteries. 12. Replace batteries. 13. Replace battery cap.	

Table 12-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) - Hundreds of Hours

ITEM NO.	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS - Cont	
6	B	Service Optical Macroscope	



1. Release catch and open cover.

CAUTION

- Always place optical microscope in case when not in use.
- Do not touch lens surfaces with bare hands. Fingermarks can damage lens surfaces. Clean lens immediately if touched.
- Use only approved lens cleaner and materials for cleaning lenses.

Table 12-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cent

B - Before
D - During
A - After

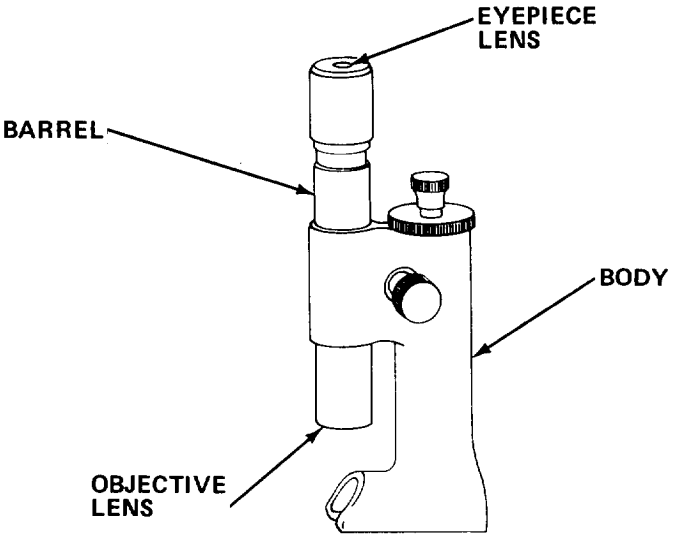
W - Weekly
M - Monthly
Q - Quarterly

AN - Annually
S - Semiannually
BI - Biennially

(Number) - Hundreds of Hours

ITEM NO	IN-TER VA L	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS - Cont	
6	B	Service Optical Macroscope - Cont	

2. Remove Optical Microscope from case.



CAUTION

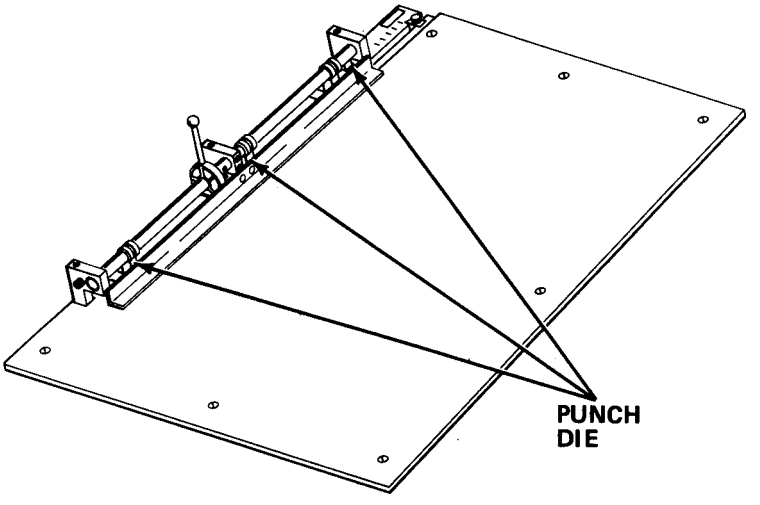
Use only a mild detergent for cleaning body. Strong solvents will damage parts.

3. Using lens brush, remove any dust and dirt from objective lens and eyepiece lens.

4. Remove any remaining dirt using lens tissue and liquid lens cleaner.

Table 12-1. OPERATOR PREVENTIVE MAINTENANCE CHECKS AND SERVICES - Cont

B - Before D - During A - After | W - Weekly M - Monthly Q - Quarterly | AN - Annually S - Semiannually BI - Biennially | (Number) . Hundreds of Hours

ITEM NO,	IN-TER-VAL	ITEM TO BE INSPECTED PROCEDURE	For Readiness Reporting, Equipment Is Not Ready/ Available If:
		SUPPORT ITEMS - Cont	
7	B	Inspect Pin Punch Register.  Check punch die for buildup of punched out material and clean as required.	

12-6. OPERATION UNDER USUAL CONDITIONS.

12-6.1 Magnifier Lamp.

a. Move magnifier lamp from mounting bracket and position over object to be examined.

b. Plug in power cord.

c. Turn on fluorescent lamp.

d. Examine object through lens.

12-6.2 Vacuum Cleaner.

a. Using as vacuum.

(1) Attach dust collection bag to air discharge opening.

(2) Remove protective screen lock from air intake opening and attach scrap trap to that opening.

(3) Attach swivel end of hose to scrap trap by turning lock to right until secure.

(4) Attach required tool to other end of hose.

(5) Insert plug into 120 V ac wall outlet and turn on/off switch to on.

b. Using as blower.

(1) Attach tapered rubber nozzle to discharge opening.

(2) Attach protective screen lock to air intake opening.

(3) Insert plug into 120 V ac wall outlet and turn on/off switch to on.

c. Using as sprayer.

(1) Attach protective screen lock to air intake opening.

(2) Attach swivel end of hose to air discharge opening by turning lock to right until secure.

(3) Attach sprayer to other end of hose.

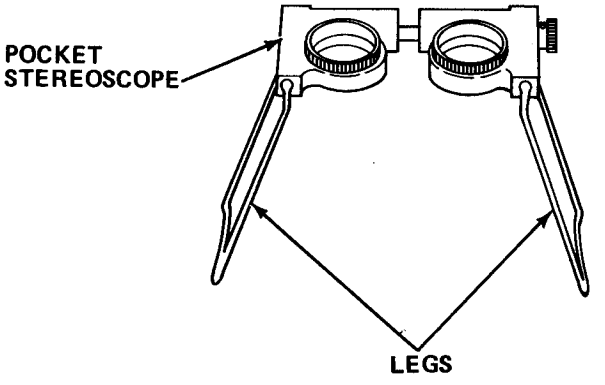
NOTE

Size of spray pattern s determined by adjusting screw located on top of sprayer.

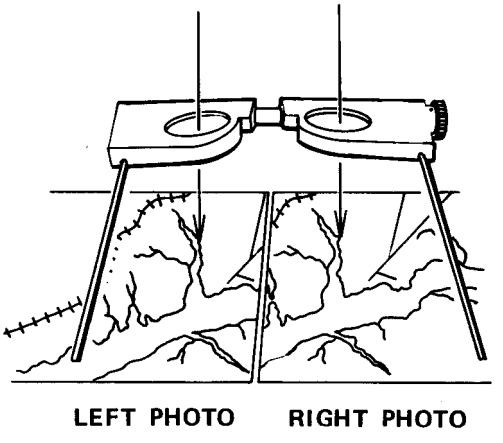
(4) Insert plug into 120 V ac wall outlet and turn on/off switch to on.

12-6.3 Pocket Stereoscope.

a. Position photographs for viewing in stereo.



b. Remove pocket stereoscope from case and unfold legs.



c. Set pocket stereoscope on photos so that left lens is over left photograph and right lens is over right photograph.

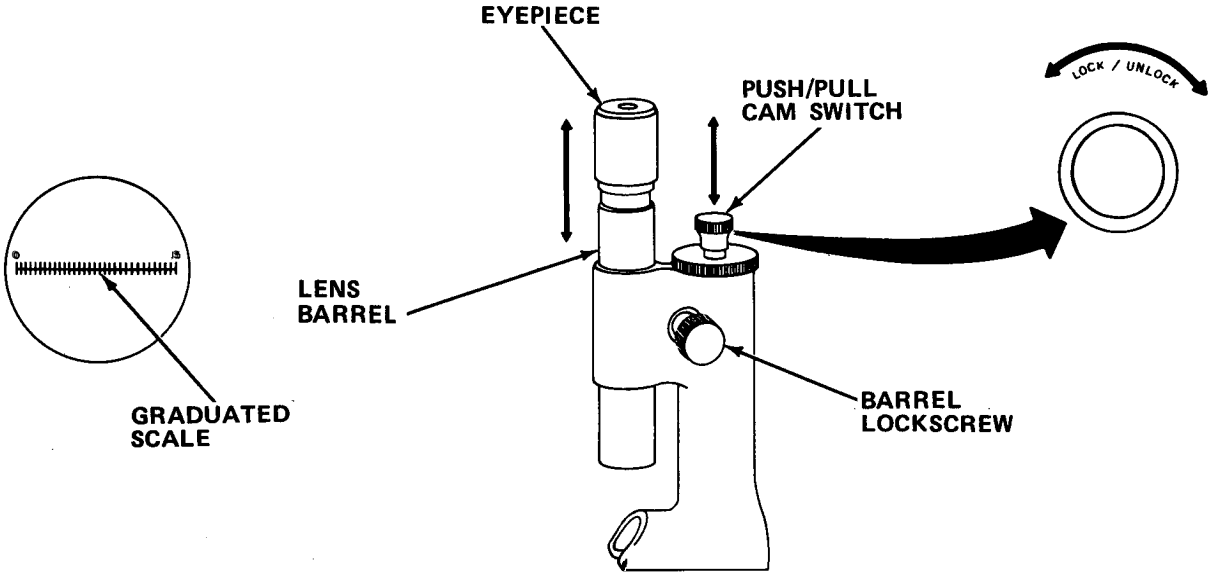
d. Adjust interpupillary distance between lenses until it matches that of viewer.

e. Locate detail to be viewed on left photograph and center left lens over it.

f. Move right photograph until the same detail is centered under right lens. When viewed simultaneously, two details should merge into one. Adjust photographs until this effect is achieved.

12-6.4 Optical Macroscope.

a. Place optical macroscope over area to be viewed with illumination slot close to specific area required.



b. Loosen barrel lockscrew.

c. Look through eyepiece and depress push/pull cam switch.

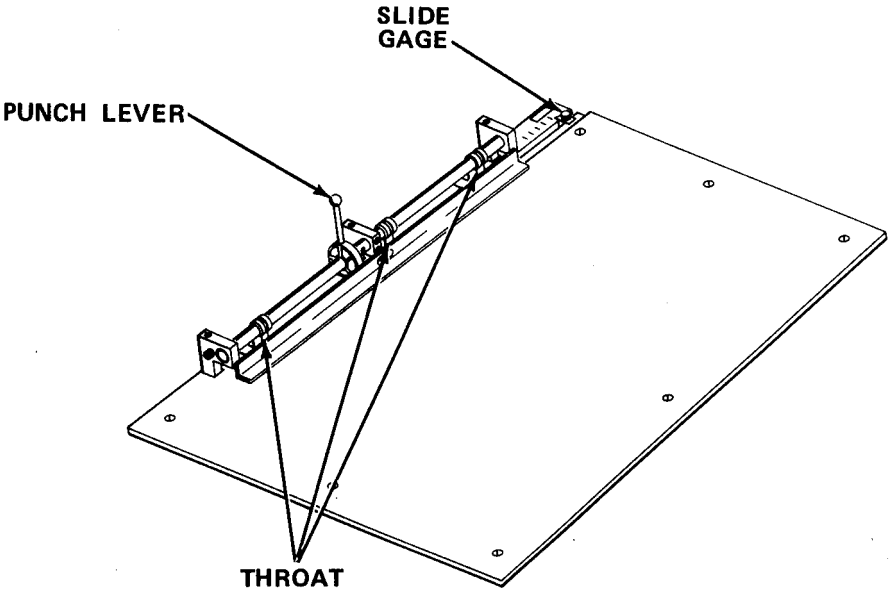
d. Grasp lens barrel and move it slowly up and down until area to be viewed is seen clearly and sharply together with graduated scale.

When target and graduated scale appear simultaneously sharp and clear, clamp barrel lock screw.

f. To provide light without keeping push/pull cam switch depressed, turn push/pull cam switch in either direction through 90 degrees to lock it. Rotation in opposite direction will unlock it.

To make measurement, read size of object or target directly from scale. Scale is 0.150 in. in length and is divided into intervals of 0.001 in. With care, estimations of down to 0.0005 in. are possible.

12-6.5 Pin Punch Register.



a. Remove from wall mount to working surface and attach punch lever.

b. Set slide gage to proper position.

c. Insert material into throat.

d. Press punch lever down and punch register holes.

12-6.6 Operating Instructions on Decals and Instruction Plates.

WARNING

THIS DEVICE IS NOT TO BE USED IN "HAZARDOUS LOCATIONS" AS DEFINED BY UNDERWRITERS LABORATORIES. IT SHOULD BE GROUNDED IN ACCORDANCE WITH PROVISIONS OF THE NATIONAL ELECTRIC CODE, OR ANY APPLICABLE LOCAL CODE, AND MAINTAINED IN ACCORDANCE WITH MANUFACTURER'S RECOMMENDATIONS.

WARNING!

ELECTRIC SHOCK COULD OCCUR IF USED ON WET SURFACES. DO NOT EXPOSE TO RAIN– STORE INDOORS.

12-7. **OPERATION UNDER UNUSUAL CONDITIONS.** This equipment is designed for operation only in a controlled environment.

Section III OPERATOR MAINTENANCE

12-8. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

12-9. TROUBLESHOOTING PROCEDURES.

a. The table lists the common malfunctions which you may find during the operator maintenance of the support equipment. You should perform the test/inspection and corrective actions in the order listed.

b. This manual cannot list all the possible malfunctions or every possible test/inspection and corrective action. If a malfunction is not listed or corrected by a listed corrective action, notify your supervisor.

Table 12-2. TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION	CORRECTIVE ACTION
1. MAGNIFIER LAMP WILL NOT LIGHT. Check that magnifier lamp is plugged into active power outlet. Press switch OFF then ON.	(a) If lamp still does not come on, replace lamp. (b) If new lamp does not light, refer to organizational maintenance.

Table 12-2. TROUBLESHOOTING - Cont

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
2. VACUUM CLEANER MOTOR DOES NOT OPERATE .
Step 1. Check power cord.
(a) If plugged in, proceed to step 2.
(b) Plug in power cord.
Step 2. Check position of power switch.
(a) If turned on, proceed to step 3.
(b) Turn power switch on.
Step 3. Check circuit breaker position in circuit breaker box.
(a) If turned off or tripped, turn circuit breaker on.
(b) If turned on refer to organizational maintenance.

12-10. MAINTENANCE PROCEDURES.

This section contains instructions covering operator maintenance functions for the support items. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

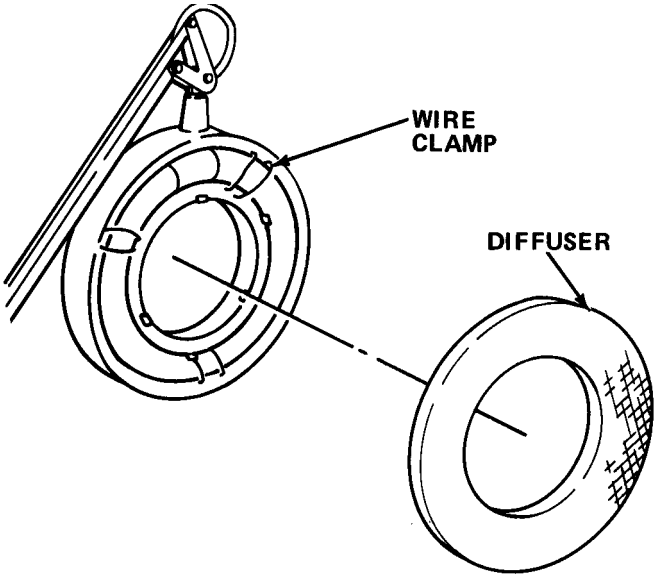
12-10.1 Replace Lamp in Magnifier Lamp.

MOS: 81C, Cartographer

SUPPLIES: Fluorescent Lamp (22 W)

WARNING

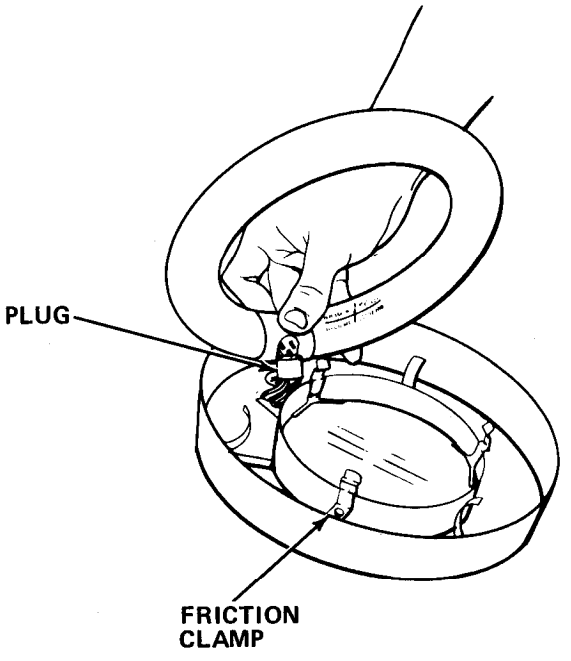
Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.



a. Unplug magnifier lamp and remove diffuser.

NOTE

On some magnifier lamp models, lamp is held in place with friction clamps.



b. Release wire clamps, pull out lamp, and disconnect plug from lamp.

c. Connect plug to new lamp and retain lamp with wire clamps.

d. Reinstall diffuser.

Section IV ORGANIZATIONAL MAINTENANCE

12-11. LUBRICATION INSTRUCTIONS. This equipment does not require lubrication.

12-12. REPAIR PARTS, SPECIAL TOOLS; TEST, MEASUREMENT, AND DIAGNOSTIC EQUIPMENT (TMDE); AND SUPPORT EQUIPMENT.

12-12.1 Common Tools and Equipment. For authorized common tools and equipment, refer to the Modified Table of Organization and Equipment (MTOE) applicable to your unit.

12-12.2 Special Tools: Test, Measurement, and Diagnostic Equipment; and Support Equipment. Special Tools, TMDE, and Support Equipment is listed in the applicable repair parts and special tools list and in Appendix B of this manual.

12-12.3 Repair Parts. Repair parts are listed and illustrated in the Repair Parts and Special Tools List, TM 5-6675-316-24P covering organizational maintenance for this equipment.

12-13. SERVICE UPON RECEIPT.

12-13.1 Checking Unpacked Equipment.

Inspect the equipment for damage incurred during shipment. If equipment has been damaged, report the damage on DD Form 6, Packing Improvement Report.

b. Check the equipment against the packing list to see if the shipment is complete. Report all discrepancies in accordance with the instructions of DA Pam 738-750.

c. Check to see whether the equipment has been modified.

12-14. ORGANIZATIONAL PREVENTIVE MAINTENANCE CHECKS AND SERVICES. There are no organizational PMCS procedures assigned for this equipment.

12-15. ORGANIZATIONAL TROUBLESHOOTING PROCEDURES.

Organizational troubleshooting procedures cover the most common malfunctions that may be repaired at the organizational level. Repair or adjustment requiring specialized equipment is not authorized unless such equipment is available. Troubleshooting procedures used by lower level maintenance should be conducted in addition to the organizational troubleshooting procedures.

b. This manual cannot list all the possible malfunctions or every possible test/inspection and corrective action. If a malfunction is not listed or corrected by a listed corrective action, notify your supervisor.

c. If the support item does not power up when turned on, verify that 120 V ac is present at the receptacle. If voltage is not present, plug equipment into receptacle with power available and proceed with equipment troubleshooting. Perform no-power procedure for dead receptacle (Table 1-4).

Table 12-3. ORGANIZATIONAL TROUBLESHOOTING

MALFUNCTION TEST OR INSPECTION CORRECTIVE ACTION
WARNING Death or serious injury may occur from electrical shock unless power cord is unplugged before servicing.
1. VACUUM CLEANER MOTOR DOES NOT OPERATE. Check that the vacuum cleaner is plugged into active outlet. Turn switch on. If motor does not operate, replace vacuum cleaner.
2. MAGNIFIER LAMP WILL NOT LIGHT. Check that magnifier lamp is plugged into active power outlet. Press switch off then on. Replace magnifier lamp assembly (paragraph 12-16.1).

12-16. MAINTENANCE PROCEDURES.

This section contains instructions covering organizational maintenance functions for the support items. Personnel required are listed only if the task requires more than one.

b. After completing each maintenance procedure, perform operational check to be sure that equipment is properly functioning.

INDEX

12-16.1 Replace Magnifier Lamp Assembly.

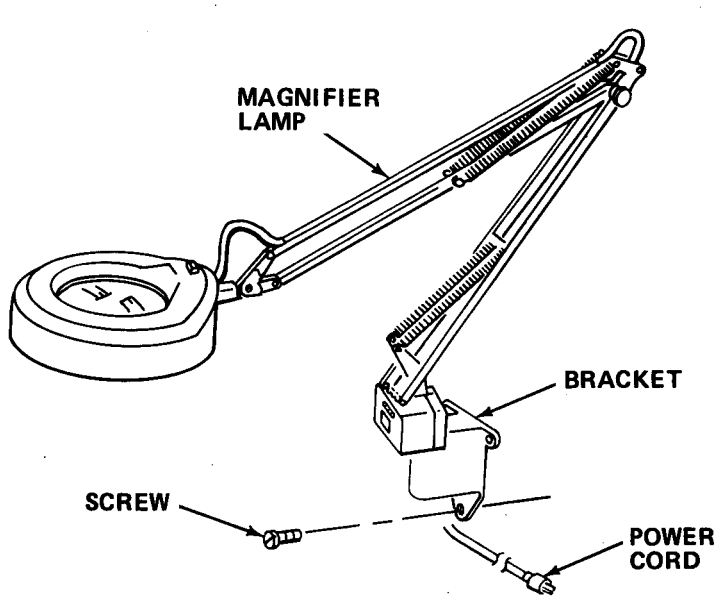
MOS: 41B, Topographic Instrument Repair Specialist

TOOLS: Flat Tip Screwdriver

SUPPLIES: Magnifier Lamp Assembly

WARNING

Death or serious injury may occur from electrical shock if power cord is not unplugged before servicing.



a. Unplug power cord and remove magnifier lamp assembly from bracket.

b. Remove screws, flat washers, and bracket from wall.

c. Reinstall bracket and secure with screws and flat washers.

d. Install new magnifier lamp assembly on bracket and plug in power cord.

12-17. PREPARATION FOR STORAGE OR SHIPMENT. Contact your battalion for packing and shipping instructions.

Section V DIRECT/GENERAL SUPPORT MAINTENANCE

There are no direct/general support maintenance procedures assigned for this equipment.

APPENDIX A

REFERENCES

A-1 . SCOPE.

This appendix lists all forms, field manuals, technical manuals and miscellaneous publications referenced in this manual.

A-2. FORMS.

Recommended Changes to Publications and Blank Forms . . . . . DA Form 2028

Recommended Changes to Equipment Technical Publications . . . . . DA Form 2028-2

Equipment Inspection and Maintenance Worksheet . . . . . DA Form 2404

The Army Maintenance Management System (TAMMS). . . . . DA Pam 738-750

Quality Deficiency Report... . . . . ..SF 368

A-3. FIELD MANUALS.

Camouflage. FM5-20

Nuclear, Biological and Chemical (NBC)
Defense (Reprinted w/Basic Incl C1) FM21-40

Basic Cold Weather Manual FM31-70

Northern Operations FM31-71

Metal Body Repair and Related Operations FM43-2

First Aid for Soldiers. . . . . FM 21-11

A-4. TECHNICAL MANUALS.

Administrative Storage of Equipment . . . . . TM 740-90-1

Chemical, Biological and Radiological (CBR)
Decontamination . . . . . TM 3-220

Operator, Organizational, Direct Support and General
Support Maintenance Manual: Air Conditioner, Horizontal,
Compact, 208-Volt, 3-Phase, 18,000 Btu Cooling, 12,000
Btu Heating. . . . . .TM 5-4120-367-14

Operator, Organizational, Direct Support and General Support Maintenance Manual for Chassis, Semi-Trailer, Container Transporter (ADCOR) . . . . . TM 5-2330-305-14

Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Air Conditioner/Heater . . . . . TM 5-4120-367-24P

Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List (Including Depot Maintenance Repair Parts and Special Tools) for Chassis, Semi-Trailer, container Transporter (ADCOR) . . . . . TM 5-2330-305-24P

Organizational, Direct Support and General Support Maintenance Repair Parts and Special Tools List (RPSTL) (Including Depot Maintenance Repair Parts and Special Tools) for Drafting Support Section , ... TM 5-6675-316-24P

Painting Instructions for Field Use . . . . . TM 43-0139

Procedure for the Destruction of Equipment to Prevent Enemy Use..... . . . . TM 750-244-3

Use and Care of Hand Tools and Measuring Tools . . . . . TM 9-243

A-5. MISCELLANEOUS PUBLICATIONS.

Lubrication Order: Topographic Support System Drafting Support Section, Model ADC-TSS-4 . . . . . LO 5-6675-316-12

Lubrication Order: Topographic Support System, Chassis, Semi-Trailer, Container Transporter (ADCOR) . . . . . LO 5-2330-305-12

APPENDIX B

MAINTENANCE ALLOCATION CHART (MAC)

INTRODUCTION

The Army Maintenance System MAC

This introduction provides a general explanation of all maintenance and repair functions authorized at the two maintenance levels under the Two-Level Maintenance System concept.

This MAC (immediately following the introduction) designates overall authority and responsibility for the performance of maintenance functions on the identified end item or component. The application of the maintenance functions to the end item or component levels, which are shown on the MAC in column (4) as:

Field – includes two columns, Unit maintenance and Direct Support maintenance. The Unit maintenance column is divided again into two more subcolumns, C for Operator or Crew and O for Unit maintenance.

Sustainment – includes two subcolumns, General Support (H) and Depot (D)

The tools and test equipment requirements (immediately following the MAC) list the tools and test equipment (both special tools and common tool sets) required for each maintenance function as referenced from the MAC.

The remarks (immediately following the tools and test equipment requirements) contain supplemental instructions and explanatory notes for a particular maintenance function.

Maintenance Functions

Maintenance functions are limited to and defined as follows:

1. Inspect. To determine the serviceability of an item by comparing its physical, mechanical, and/or electrical characteristics with established standards through examination (e.g., by sight, sound, or feel). This includes scheduled inspection and gagings and evaluation of cannon tubes.

2. Test. To verify serviceability by measuring the mechanical, pneumatic, hydraulic, or electrical characteristics of an item and comparing those characteristics with prescribed standards on a scheduled basis, i.e., load testing of lift devices and hydrostatic testing of pressure hoses.

3. Service. Operations required periodically to keep an item in proper operating condition; e.g., to clean (includes decontaminate, when required), to preserve, to drain, to paint, or to replenish fuel, lubricants, chemical fluids, or gases. This includes scheduled exercising and purging of recoil mechanisms. The following are examples of service functions:

   a. Unpack. To remove from packing box for service or when required for the performance of maintenance operations.

   b. Repack. To return item to packing box after service and other maintenance operations.

   c. Clean. To rid the item of contamination.

d. Touch up. To spot paint scratched or blistered surfaces.

e. Mark. To restore obliterated identification.

4. Adjust. To maintain or regulate, within prescribed limits, by bringing into proper position, or by setting the operating characteristics to specified parameters.

5. Align. To adjust specified variable elements of an item to bring about optimum or desired performance.

6. Calibrate. To determine and cause corrections to be made or to be adjusted on instruments of test, measuring, and diagnostic equipment used in precision measurement. Consists of comparisons of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared.

7. Remove/Install. To remove and install the same item when required to perform service or other maintenance functions. Install may be the act of emplacing, seating, or fixing into position a spare, repair part, or module (component or assembly) in a manner to allow the proper functioning of an equipment or system.

8. Paint. To prepare and spray color coats of paint so that the ammunition can be identified and protected. The color indicating primary use is applied, preferably, to the entire exterior surface as the background color of the item. Other markings are to be repainted as original so as to retain proper ammunition identification.

9. Replace. To remove an unserviceable item and install a serviceable counterpart in its place. "Replace" is authorized by the MAC and assigned maintenance level is shown as the third position code of the Source, Maintenance and Recoverability (SMR) code.

10. Repair. The application of maintenance services, including fault location/troubleshooting, removal/installation, disassembly/assembly procedures, and maintenance actions to identify troubles and restore serviceability to an item by correcting specific damage, fault, malfunction, or failure in a part, subassembly, module (component or assembly), end item, or system.

NOTE

The following definitions are applicable to the "repair" maintenance function:
Services. Inspect, test, service, adjust, align, calibrate, and/or replace.

Fault location/troubleshooting. The process of investigating and detecting the cause of equipment malfunctioning; the act of isolating a fault within a system or Unit Under Test (UUT).

Disassembly/assembly. The step-by-step breakdown (taking apart) of a spare/functional group coded item to the level of its least component, and that is assigned an SMR code for the level of maintenance under consideration (i.e., identified as maintenance significant).

Actions. Welding, grinding, riveting, straightening, facing, machining, and/or resurfacing.

11. Overhaul. That maintenance effort (service/action) prescribed to restore an item to a completely serviceable/operational condition as required by maintenance standards in appropriate technical publications. Overhaul is normally the highest degree of maintenance performed by the Army. Overhaul does not normally return an item to like new condition.

12. Rebuild. Consists of those services/actions necessary for the restoration of unserviceable equipment to a like new condition in accordance with original manufacturing standards. Rebuild is the highest degree of materiel maintenance applied to Army equipment. The rebuild operation includes the act of returning to zero those age measurements (e.g., hours/miles) considered in classifying Army equipment/components.

Explanation of Columns in the MAC

Column (1) Group Number. Column (1) lists FGC numbers, the purpose of which is to identify maintenance significant components, assemblies, subassemblies, and modules with the Next Higher Assembly (NHA).

Column (2) Component/Assembly. Column (2) contains the item names of components, assemblies, subassemblies, and modules for which maintenance is authorized. Column (3) Maintenance Function.

Column (3) lists the functions to be performed on the item listed in column (2). (For a detailed explanation of these functions refer to “Maintenance Functions” outlined above). Column (4) Maintenance Level.

Column (4) specifies each level of maintenance authorized to perform each function listed in column (3), by indicating work time required (expressed as manhours in whole hours or decimals) in the appropriate subcolumn. This work time figure represents the active time required to perform that maintenance function at the indicated level of maintenance. If the number or complexity of the tasks within the listed maintenance function varies at different maintenance levels, appropriate work time figures are to be shown for each level. The work time figure represents the average time required to restore an item (assembly, subassembly, component, module, end item, or system) to a serviceable condition under typical field operating conditions. This time includes preparation time (including any necessary disassembly/assembly time), troubleshooting/fault location time, and quality assurance time in addition to the time required to perform the specific tasks identified for the maintenance functions authorized in the MAC. The symbol designations for the various maintenance levels are as follows:

Field: C Operator or Crew maintenance
O Unit maintenance
F Direct Support maintenance

Sustainment:

L Specialized Repair Activity
H General Support maintenance
D Depot maintenance

NOTE

The “L” maintenance level is not included in column (4) of the MAC. Functions to this level of maintenance are identified by work time figure in the “H” column of column (4), and an associated reference code is used in the REMARKS column (6). This code is keyed to the remarks and the SRA complete repair application is explained there.

Column (5) Tools and Equipment Reference Code. Column (5) specifies, by code, those common tool sets (not individual tools), common Test, Measurement and Diagnostic Equipment (TMDE), and special tools, special TMDE and special support equipment required to perform the designated function. Codes are keyed to the entries in the tools and test equipment table.

Column (6) Remarks Code. When applicable, this column contains a letter code, in alphabetical order, which is keyed to the remarks table entries.

Table 1. MAC for Drafting Support Section

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT-ENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
00	Drafting Support Section	Overhaul					**		
01	Van Body	Inspect	0.8						
	(ISO Container)	Service	0.9	0.5				3,8,12,14,15	
		Repair		1.0	1.5		2.0	1,3,6,19	C
	Fluorescent Light Assy	Repair	0.1	0.7				1	
	Blackout/Dome Light Assy	Repair	0.2						
	Exhaust Fan Assy	Repair		0.5				1	
	Air Conditioner/Heater Assy	Replace					2.0	1	B
	Electrical Assy	Inspect		0.5				1	
		Repair		0.9	1.0			1, 3	
	Telephone Binding Post Assy	Repair		0.7				1	
	Emergency Light Assy	Replace		0.3				1	
	Tiedown Socket Assy	Replace		0.3				6	
	Level Indicator Assy	Replace		0.6				2, 6	
	Blackout Curtain Assy	Repair		1.0				6	
	Personnel Ladder Assy	Repair		0.8				6, 19	C
	Personnel/Cargo Door	Replace			1.5			6	
	Assy	Repair			2.0			6	

** Depot Team will determine work times.

Table 1. MAC for Drafting Support Section (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT-ENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
02	Composing Machine	Inspect	0.1						
		Test			1.0			5	
		Service	0.2					16	
		Adjust			0.3			5, 17, 18	
		Aline			0.2			5	
		Remove/ Install		1.75				3	
		Repair	0.7	2.5	7.0			1, 5	
	Electrical Assembly	Inspect		0.2					
		Repair	0.2	0.5				1	
	Transformer Assembly	Replace		0.2				1	
	Flash Power Supply	Replace		0.2				1	
		Repair		0.2					
	Loudspeaker Assembly	Replace		0.2				1	
	Disk Track LED and Cable Assembly	Replace			0.2			5	
	Fan Assembly	Replace		0.2				1	
	Electronics Assembly	Inspect			0.1				
		Repair			4.5			5	
	Carriage Escapement Board	Replace			0.1			5	A
	8k x 8 RAM Assembly	Replace			0.1			5	A
	32K x ROM Assembly	Replace			0.7			5	A
	Font Interface Board III	Replace			0.2			5	A
	LVC Stepper Board	Replace			0.1			5	A
	D/A Stepper Board 2	Replace			0.1			5	A
	Character Generator Board	Replace			0.1			5	A
	CPU Data PC Card	Replace			0.1			5	A

Table 1. MAC for Drafting Support Section (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT-ENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
02	Composing Machine (Continued)								
	CPU Control PC Card	Replace			0.1			5	A
	Keyboard Interface III Board	Replace			0.1			5	A
	Driver Supply Board	Replace			0.1			5	A
	Bridge Rectifier Assembly	Replace			0.2			5	A
	Font Pickup PC Board	Replace			0.2			5	A
	Filter PC Board	Replace			0.2			5	A
	Leading Motor Assembly	Replace			0.3			5	
	Shutter Assembly	Replace			0.4			5	
	Carriage Escapement Motor Assembly	Replace			0.3			5	
	Row Shift Motor Assembly	Replace			0.3			5	
	Paper Feed Magazine Assembly	Replace			0.5			5	
	Collimator Motor Assembly	Replace			0.2			5	
	Variator Motor Assembly	Replace			0.2			5	
	Input/Monitor Unit	Adjust			0.5			5	
	Display Assembly	Repair			0.2				
03	Drafting and Measuring Machine	Inspect	0.2						
		Test			0.7			5	
		Service	0.7					14, 16, 21	
		Remove/ Install			4.0			5	
		Repair			6.0			5, 17	

Table 1. MAC for Drafting Support Section (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT-ENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
03	Drafting and Measuring Machine (Continued)								
	Drafting Table Assembly	Inspect	0.3						
	X or Y Drive Drive Motor	Replace			0.5			4	
	Ventilation Fan	Replace			1.0			4	
	ROM Board	Replace			0.3			5	
	6800 CPU Board	Replace			0.3			5	
	Encoder Board (2)	Replace			0.3			5	
	Keyboard Interface	Replace			0.3			5	
	TTY Interface	Replace			0.3			5	
	X or Y Encoder	Replace			0.3			5	
	Digitizer Keyboard	Replace			0.3			5	
	X Y Display Circuit Card	Replace			0.2			5	
	Machine Controller	Inspect	0.2					5	
		Replace			0.5			5, 17	
		Repair			2.8				
	Pen Drive/Tangential Tool Control Board	Replace			0.1				
	Operator Console Processor Board	Replace			0.2			5	
	Motor Drive Control Board	Replace			0.1				
	Tape Reader	Replace			0.5			4	
	DSP - Machine Controller Board	Replace			0.3			5	

Table 1. MAC for Drafting Support Section (Continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT-ENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
03	Drafting and Measuring Machine (Continued)								
	Power Supply Assembly	Repair			1.4			5	
	5 V Switch Power Supply	Replace			0.2			4	
	24 V Power Supply	Replace			0.4			5	
	15 V Switching Power Supply	Replace			0.4			5	
04	Split-Stage Light Table	Inspect	0.2						
		Service	0.2		0.3			5, 22	C
		Adjust			1.5			5	
		Remove/ Install		1.0				3	
		Repair	0.8	1.0	2.0			2, 5, 7	C
	Electrical Assembly	Inspect	0.2	0.2				5	
		Repair			1.75				
	Light Grid Assembly	Adjust			0.3			23	C
		Replace			0.2			5	
	Dimmer Circuit Assembly	Replace			0.2			5	
	Grid Intensity Control Potentiometer Assembly	Replace		0.3				5	C
	Fan Assembly	Replace			0.5			3	
05	Zoom Stereoscope 240R	Inspect	0.2						
		Service	0.2					16, 20	
06	Pocket Calculator	Inspect	0.3						
		Repair	0.2						
07	Drafting, Scribing, Tracing Table	Inspect	0.2						
		Service	0.4					13	
		Remove/ Install		1.0				1	
	Electrical System	Repair		0.2	0.6			1	

Table 1. MAC for
Drafting Support Section
(Continued)

(1) GROUP NUMBER	(2) COMPONENT/ ASSEMBLY	(3) MAINT-ENANCE FUNCTION	(4) MAINTENANCE LEVEL					(5) TOOLS AND EQUIPMENT REF CODE	(6) REMARKS CODE
			FIELD			SUSTAINMENT			
			UNIT		DIRECT SUPPORT	GENERAL SUPPORT	DEPOT		
			C	O	F	H	D		
07	Drafting, Scribing, Tracing Table (Continued)								
	Table Top Tilt Locking Assembly	Repair		0.7				1	
	Pillow Block Assembly	Replace		0.5				1	
08	Adhesive Wax Coater	Inspect	0.2						
		Service	0.5					10, 14	
		Adjust	0.3					9, 10, 11, 14	
		Repair	0.7		2.5			5	
09	Portable Tracing/Scribing Board	Inspect	0.2						
		Service	0.2						
		Remove/ Install		0.3				1	
		Repair	0.3	0.5				1, 5, 11	
10	Ultrasonic Cleaner	Inspect	0.2						
		Repair		0.7				1	
	Circuit Board	Replace		0.6				1	
11	Furniture and Cabinets	Inspect	0.5						
		Remove/ Install		0.9				1, 13, 19	
		Repair		0.7				1	
12	Support Items	Inspect	0.8						
		Service	0.5					16	
		Remove/ Install		0.3				1	

Table 2. Tool and Test Equipment for Drafting Support Section

Tool or Test Equipment	Maintenance Level	Nomenclature	National Stock Number	Tool Number
1	O	Shop Equipment, Automotive Maintenance and Repair Common Plus Metric Option	4910-00-754-0654	
2	O	Tool Kit, Carpenter's Engineer Squad	5180-00-293-2875	
3	O	Tool Kit, General Mechanic's Automotive Plus Metric Option	5180-00-177-7033	
4	F, D	Tool Kit, Electronic Equipment	5180-00-605-0079	
5	O, F, D	Tool Kit, Electronic Equipment	5180-00-610-8177	
6	F, D	Tool Kit, Light Machine Repair	5180-00-596-1540	
7	C	Screwdriver, Flat Tip, 9/16 in. wide	5120-00-287-2504	
8	C	Brush, Wire	7920-00-291-5815	
9	C	Gage, Thickness	5210-00-619-7680	
10	C	Scraper, Rubber	7330-00-680-2636	
11	C	Screwdriver, Cross-Tip No. 2	5120-00-234-8913	
12	C	Wrench, Adjustable	5120-00-264-3795	
13	C	Grease Gun	4930-00-965-0288	
14	C	Screwdriver, Flat Tip, 6 in. Long	5120-00-234-8910	
15	O	Spring Scale	6670-00-238-9777	
16	C	Brush, Lens	5920-00-205-0565	
17	F, D	Multimeter	6625-01-118-9914	(28480) 3466A-115
18	F, D	Oscilloscope		(28480) HP180C

Table 2. Tool and Test Equipment for Drafting Support Section (Continued)

Tool or Test Equipment	Maintenance Level	Nomenclature	National Stock Number	Tool Number
19	O, F, D	Rivet Gun	5120-00-017-2849	
20	C	Blower, Watchmaker's	5120-00-254-4612	
21	C	Brush, Inking	7920-00-234-9318	
22	F, D	Autocollimator	6760-00-161-2532	(02145) 930303
23	F, D	Photometer, Digital		(80009) J16TV, Opt 2

Table 3. Remarks for Drafting Support Section

REFERENCE CODE	REMARKS
A	Printed circuit boards will be repaired at the depot maintenance level to the maximum extent possible as required by AR 750-1
B	See TM 9-4120-367-14 for maintenance procedures.
C	Maintenance personnel and TSS Section 7 maintenance van (which carries the required tools) are authorized by HHC TOE 05336 H600.

APPENDIX C

COMPONENTS OF END ITEM AND BASIC ISSUE ITEMS LISTS

Section I INTRODUCTION

C-1 . SCOPE.

This appendix lists components of end item and basic issue items for the Drafting Support Section to help you inventory items required for safe and efficient operation.

C-2. GENERAL.

The Components of End Item and Basic Issue Items Lists are divided into the following sections:

a. Section //: Components *of End Itern.* This listing is for informational purposes only, and is not authority to requisition replacements. As part of the end item, these items must be with the end item whenever it is issued or transferred between property accounts. Illustrations are furnished to assist you in identifying the items.

b. Section III: Basic /ssue Iterns. These are the minimum essential items required to place the Drafting Support Section in operation, to operate it, and to perform emergency repairs. Bll must be with the Drafting Support Section during operation and whenever it is transferred between property accounts. The illustrations will assist you with hard-to-identify items. This manual is your authority to request/requisition replacement Bll based on TOE/MTOE authorization of the end item.

C-3. EXPLANATION OF COLUMNS.

The following provides an explanation of columns found in the tabular listings:

a. Co/umn (1): Illustration Number (///us A/umber). This column indicates the number of the illustration in which the item is shown.

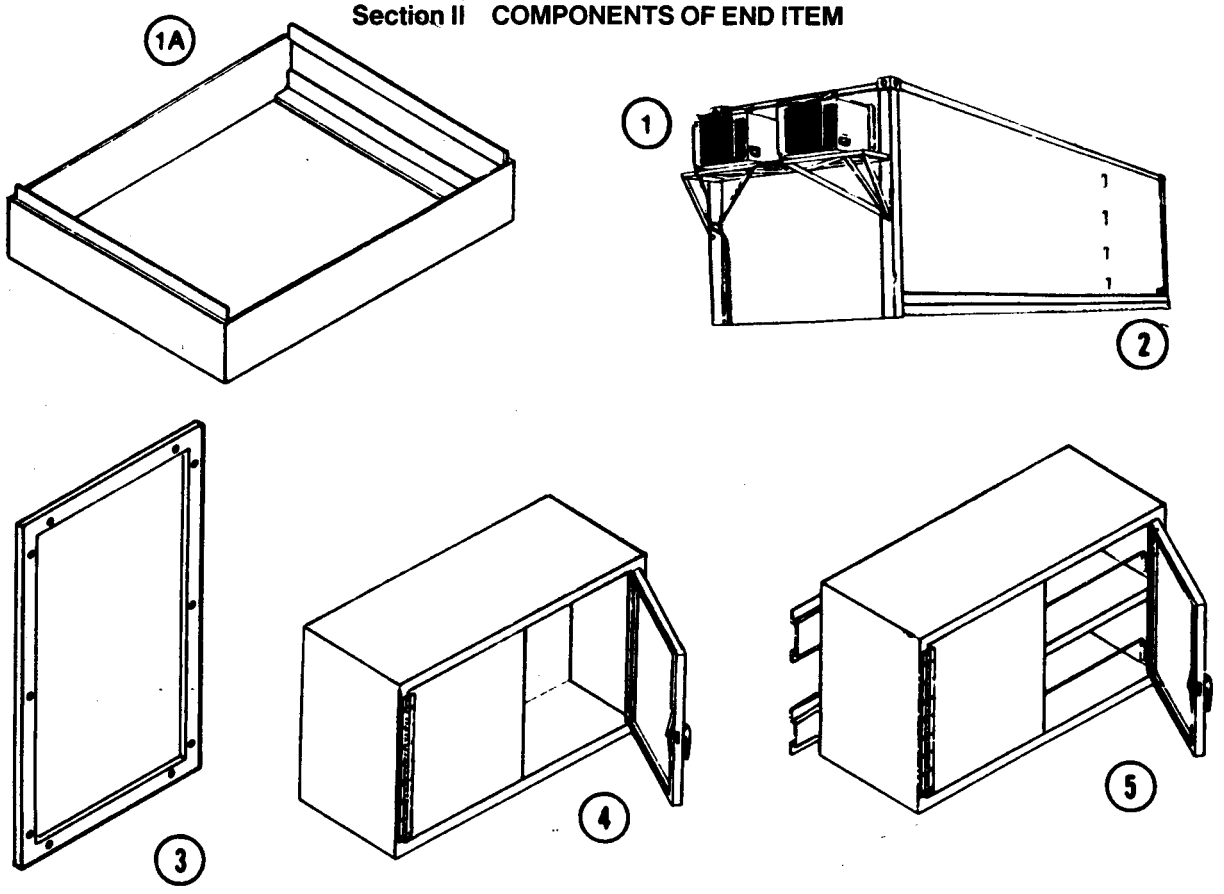
b. Co/urnn (2): /Vationa/ Stock Number. Indicates the National stock number assigned to the item and will be used for requisitioning purposes.

c. Colurnn (3): Description. Indicates the Federal item name and, if required, a minimum description to identify and locate the item. The last line for each item indicates the FSCM (in parentheses) followed by the part number.

d. Co/urnn (4): Unit of Measure (U/M). Indicates the measure used in performing the actual operational/maintenance function. This measure is expressed by a two-character alphabetical abbreviation (e.g., ea, in, pr).

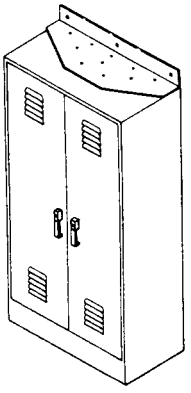
e. Column (5): Quantity Required (Qty Rqr). Indicates the quantity of the item authorized to be used with/on the equipment.

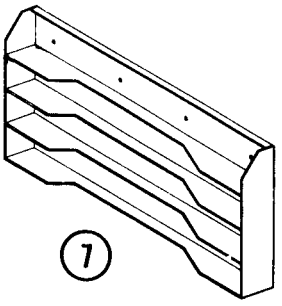
Section II COMPONENTS OF END ITEM

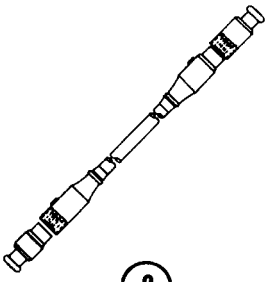


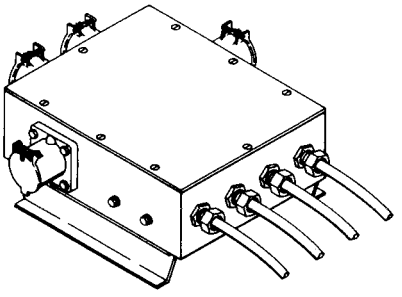
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
1	4120-00-974-7906	AIR CONDITIONER (81349) MIL-A-52767	ea	2
1A		BASE, FILING CABINET: (88915) S4634	ea	1
2	6675-01-220-8162	VAN ASSEMBLY, MODIFIED: (97403) 13225E3029	ea	1
3		BOX, VEHICULAR ACCESSORIES: for vacuum cleaner (97403) 13225E3490	ea	1
4	7195-00-105-7941	BULLETIN BOARD, CORK: (79819) T5-2303	ea	
5		CABINET, STORAGE, TECH MANUAL: (97403) 13225E4648	ea	1

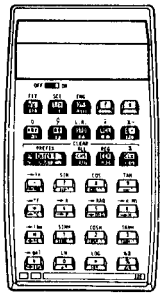
Section II COMPONENTS OF END ITEM - Cont





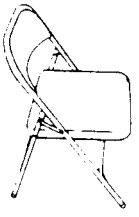






(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
6		CABINET, STORAGE, SUPPLY: (97403) 13225 E3792	ea	1
7		CABINET, STORAGE, PAPER: (97403) 13225 E4185	ea	1
8	6150-00-134-0847	CABLE ASSEMBLY, POWER ELECTRICAL: (90129) RC 1736-5, 50 ft lg	ea	3
9	6150-01-081-9264	CABLE TERMINAL BOX ASSEMBLY, ELECTRICAL, SPECIAL PURPOSE: (51745) TL/TA 13222 E6250	ea	1
10	7420-01-139-7441	CALCULATING MACHINE: (28480) HP-32E	ea	1

Section II COMPONENTS OF END ITEM



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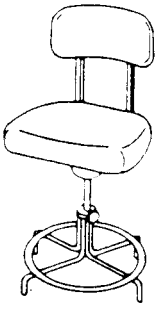

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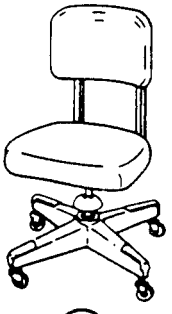

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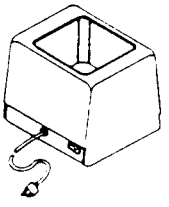

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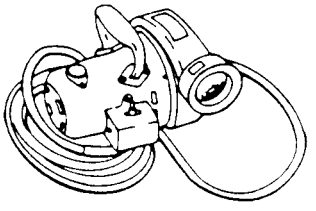

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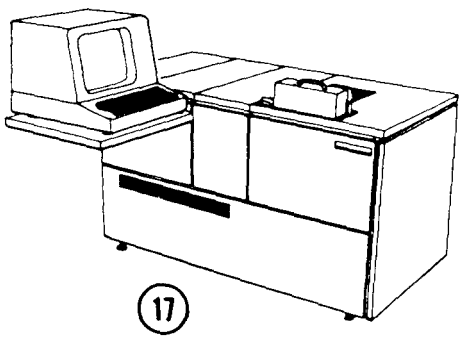
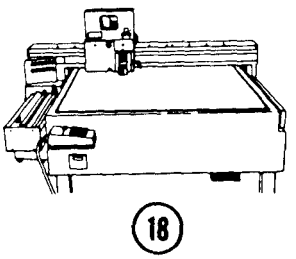
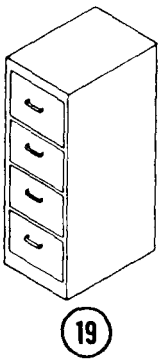
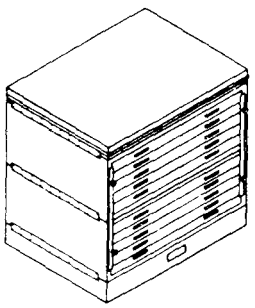
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
11	Deleted			
12	7105-00-269-8463	CHAIR, FOLDING: (04718) 42-699/9DL	ea	1
13	7110-00-273-8791	CHAIR, ROTARY: (9D461) S-17	ea	1
14	7110-00-281-4472	CHAIR, ROTARY: (9D461) D42L	ea	2
15	4940-00-195-7251	CLEANER, ULTRASONIC: (75364) 3069 USC 3	ea	1
16	7910-00-205-3400	CLEANER, VACUUM, ELECTRIC: (51745) MVV3400	ea	1

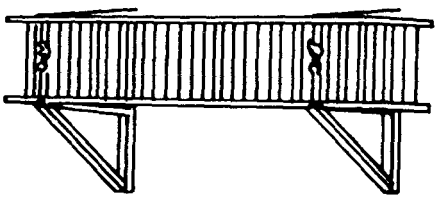
Section II COMPONENTS OF END ITEM - Cont

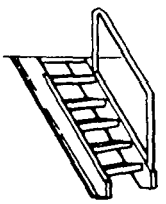






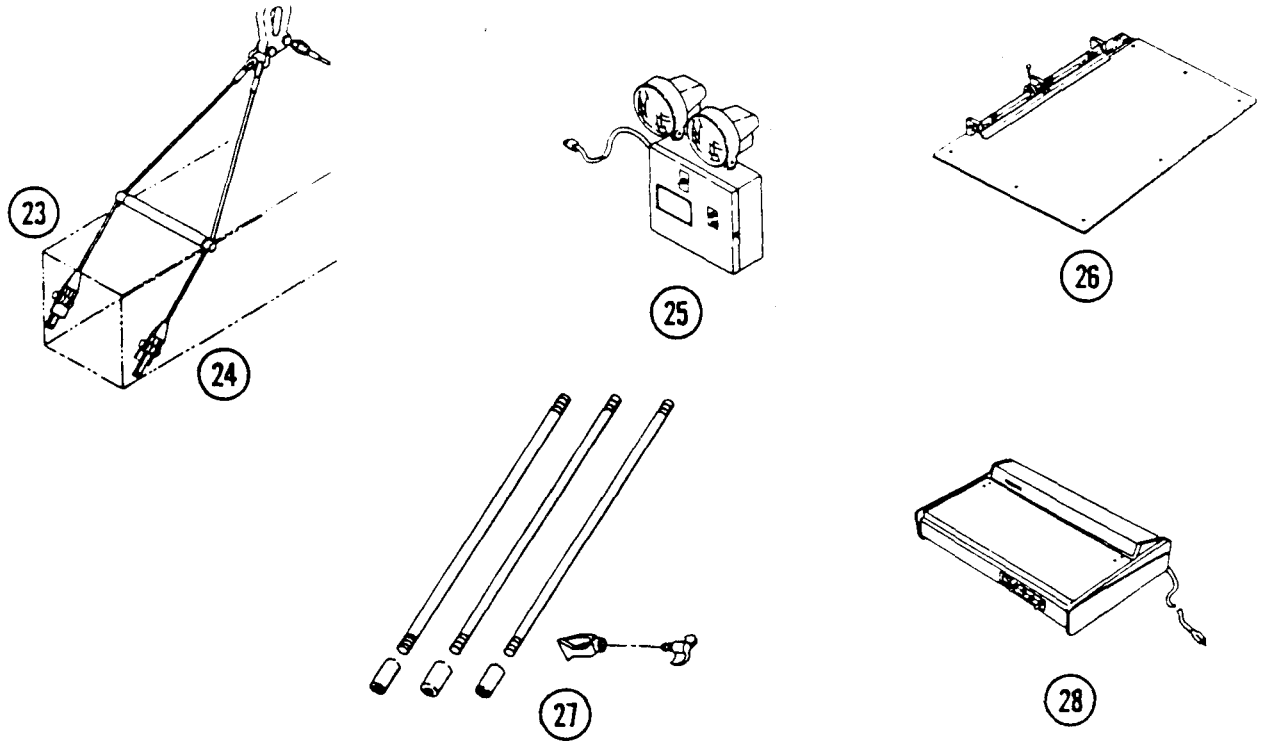






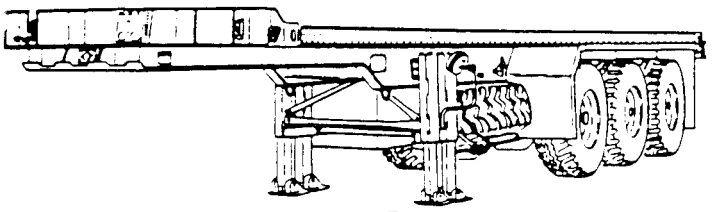
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
17	7430-01-036-7573	COMPOSING MACHINE, DIRECT ENTRY PHOTOTYPESETTER: (62812) 3510	ea	1
18	6675-01-171-7746	DRAFTING AND MEASURING MACHINE AUTOMATED AND MANUAL ORTHOGONAL COORDINATE SYSTEM: (52488) 102-K	ea	1
19	7125-01-210-5701	FILING CABINET, 4-DRAWER: (97403) 13225E3710	ea	2
20		FILING ASSEMBLY, MAP/PLAN: (97403) 13225E3138	ea	2
21	5440-01-152-7751	LADDER, EXTENSION, FOLDING: (39428) 8028T16	ea	1
22	2540-01-133-9726	LADDER, VEHICLE BOARDING: (97403) 13225E3074	ea	2

Section II COMPONENTS OF END ITEM - Cont



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
23		LIFTING AND TIEDOWN DEVICE, TRANSPORTABLE SHELTER: left hand (52555) 1390-4	ea	2
24		LIFTING AND TIEDOWN DEVICE, TRANSPORTABLE SHELTER: right hand (52555) 1390-3	ea	2
25		LIGHT, EMERGENCY: (97403) 13225E3396	ea	1
26	6675-01-175-5914	PIN REGISTER BOARD, CARTOGRAPHIC: (25042) 0510247	ea	1
27	5975-00-878-3791	ROD, GROUND: (05643) 20P41	ea	1
28	3540-01-045-9202	WAX COATER, ADHESIVE: (33887) 1215	ea	1

Section II COMPONENTS OF END ITEM - Cont



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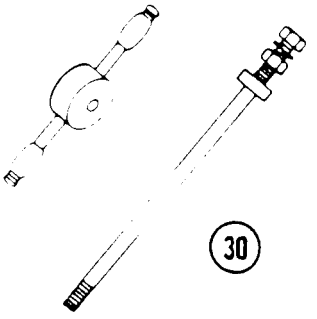

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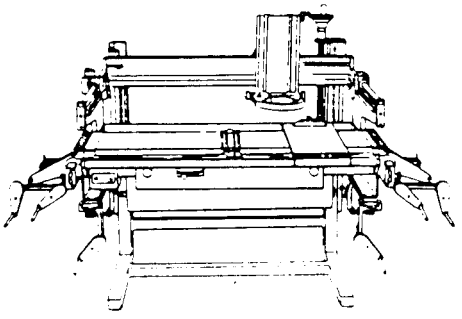

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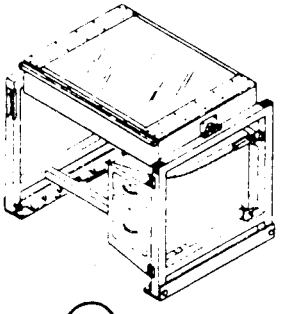
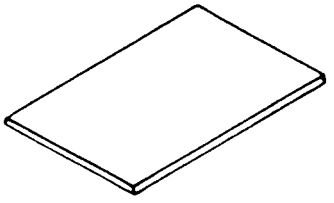


33

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
29	2330-01-076-4797	SEMITRAILER, FLATBED: (97403) MERADCOM TL/MIL-B-13207, par. 3.11 fig 12, tables III and IV.	ea	1
30	5120-01-013-1676	SLIDE HAMMER, GROUND ROD EMPLACEMENT: (45225) P74-144	ea	1
31	Deleted			
32	6740-00-165-7267	TABLE, ILLUMINATED, SPLIT STAGE: (02145) MIM335100	ea	1
33	6675-01-203-1049	TABLE, SCRIBING, TRACING, DRAFTING: (33363) 72-0421	ea	1

Section II COMPONENTS OF END ITEM - Cont



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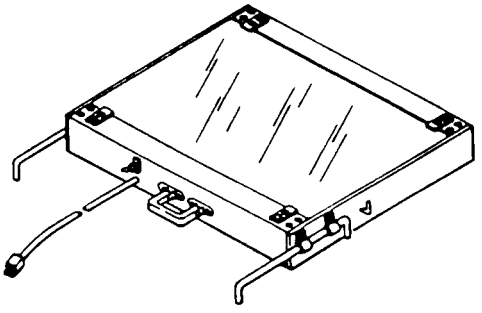

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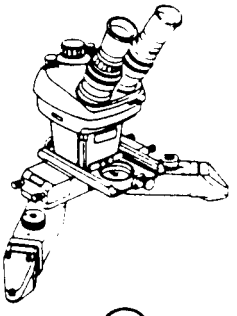
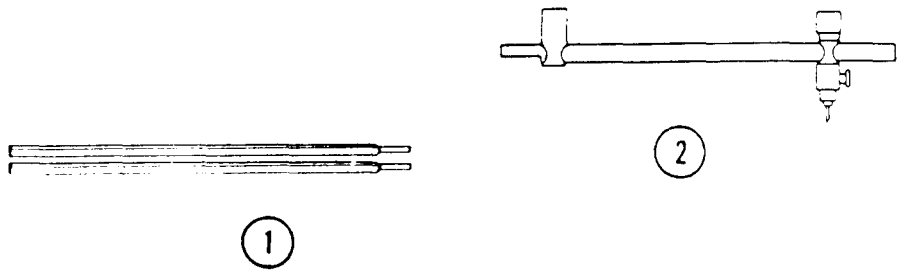


38

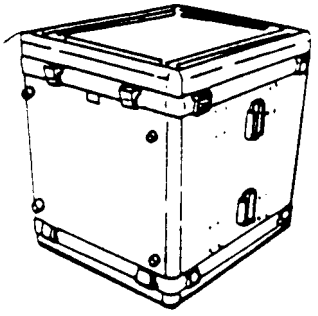
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
34	Deleted			
35	Deleted			
36		TOP, FILING CABINET: (88915) T3445	ea	1
37	6675-00-221-7121	TRACING BOARD, PORTABLE: (26954) 51J3	ea	1
38	6675-01-171-0327	VIEWER, STEREOSCOPE: (06175) 240R/15AA	ea	1

Section III BASIC ISSUE ITEMS



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
1	6675-01-114-7226	BAR, EXTENSION BEAM, COMPASS: (33363) 55-1818	ea	1
2	6675-01-071-8913	BEAM, ATTACHMENT, DRAFTING COMPASS: (75364) 3175B	ea	2
	5120-00-754-4612	BLOWER, WATCHMAKERS (64959) K8950	ea	1
	8020-00-224-8022	BRUSH, ARTIST'S: squirrel (75364) 9382, size 6	ea	3
	8020-00-262-9099	BRUSH, ARTIST'S: squirrel (75364) 9382, size 8	ea	3
	8020-00-264-3883	BRUSH, ARTIST'S: squirrel (75364) 9382, size 12	ea	3
	8020-00-598-5907	BRUSH, ARTIST'S: sable (75364) 9355, size 6	ea	3
	8020-00-224-8027	BRUSH, ARTIST'S: sable (75364) 9355, size 8	ea	3
		BRUSH, ARTIST'S: opaquing, sable (75364) 9390, size 3	ea	10
	8020-00-053-5727	BRUSH, ARTIST'S: opaquing, sable (75364) 9390, size 4	ea	1

Section III BASIC ISSUE ITEMS - Cont

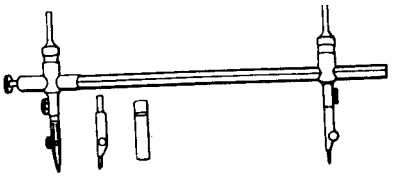


3

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
		BRUSH, ARTIST'S: opaquing, sable (75364) 9390, size 5	ea	1
		BRUSH, ARTISTS'S: opaquing, sable (75364) 9390, size 6	ea	1
		BRUSH, ARTIST'S: opaquing, sable (75364) 9390, size 8	ea	1
	7920-00-291-5812	BRUSH, DUSTING, DRAFTSMAN'S: (79819) Q6-38NB-010	ea	6
	7920-00-234-9318	BRUSH, INKING (61957) PT-572	ea	1
	5920-00-205-0565	BRUSH, LENS (17866) R698	ea	1
	7920-00-291-5815	BRUSH, WIRE, SCRATCH: (10670) 10	ea	1
	5120-01-083-6724	BURNISHER, PAPER, HAND: (06608) 8554900	ea	6
3		CASE, STORAGE AND TRANSPORT: used for stereoscope 240R (30562) M91-232		

Section III BASIC ISSUE ITEMS - Cont

8



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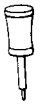

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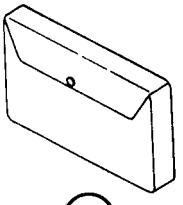
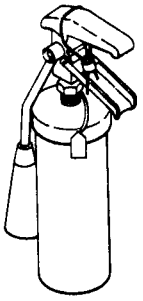


11

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
4 thru 7	Deleted			
8	6675-00-459-8935	COMPASS, DRAFTING BEAM, ADJUSTABLE: (75364) 3175	ea	1
9	6675-00-904-1947	COMPASS, DRAFTING BEAM; 24.0 IN: (33363) 55-1806	ea	1
10	6675-01-071-8912	COMPASS, DRAFTING LEAD ATTACHMENT: (75364) 3175LA	ea	1
	6675-00-244-0445	CURVE, DRAFTING IRREGULAR: (33363) 57-1008-28	ea	6
	6675-00-641-3512	DIVIDERS, DRAFTING, PLAIN: (33363) 55-2910	ea	1
11	6675-00-526-7323	DRAFTING EQUIPMENT SET, SUPPLEMENTARY: SC 6675-90-CL-NO6	se	3

Section III BASIC ISSUE ITEMS - Cont



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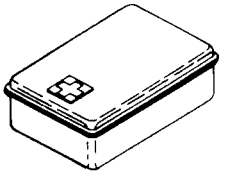

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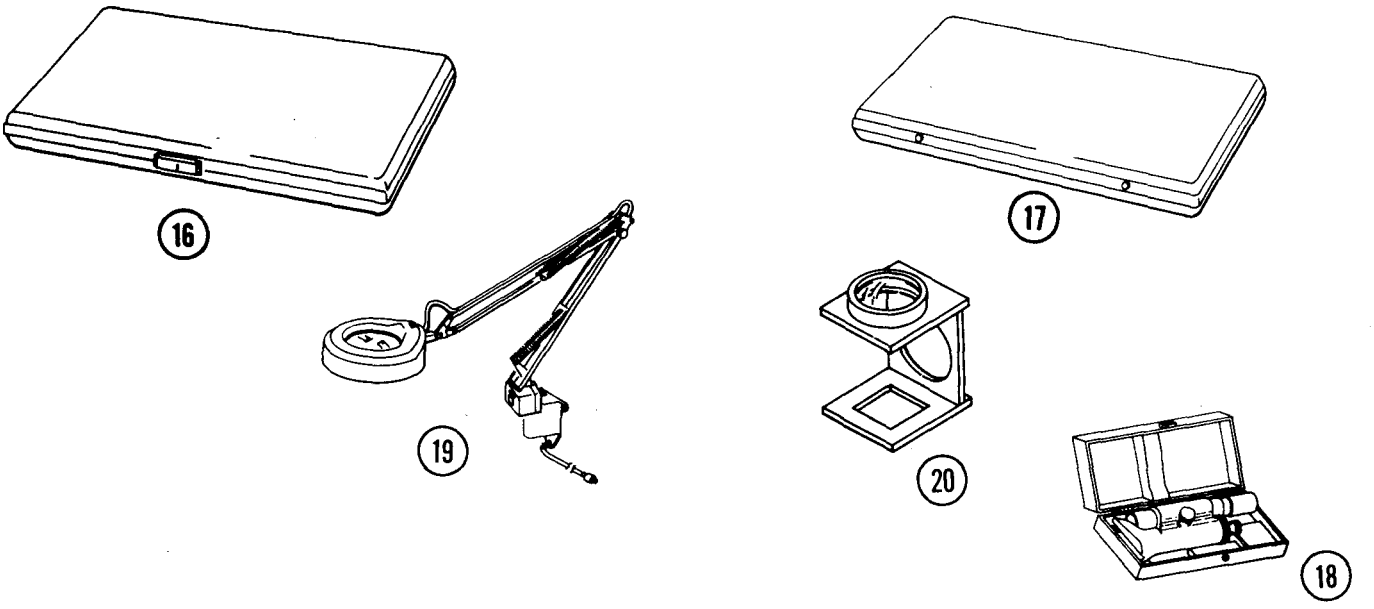
15

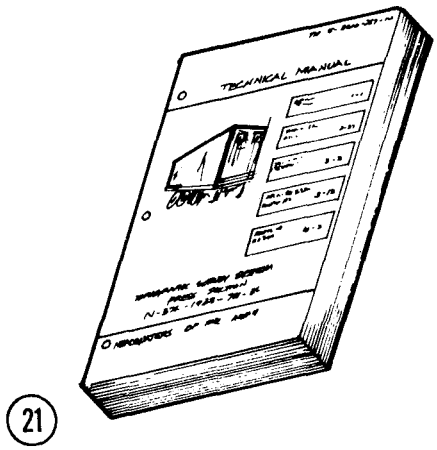
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
	7510-01-035-1317	ERASER KIT: (75364) 290-K	kt	3
		ETCHING BLOCK: (33363) 58-2371	ea	2
12	4210-00-555-8837	EXTINGUISHER, FIRE, MONOBROMOTRIFLUOROMETHANE: (33525) T2	ea	2
13	6545-00-922-1200	FIRST AID KIT, GENERAL PURPOSE: (89875) SC C-6545-IL Vol 2	ea	1
	5210-00-619-7680	GAGE, THICKNESS (80244) GGG-G-17 TY8CL1STA	ea	2
	4930-00-965-0288	GUN, GREASE (77335) 550	ea	1
14	5110-00-595-8400	KNIFE, CRAFTSMAN: (06608) 251200	ea	12
15	5110-00-595-8406	KNIFE, CRAFTSMAN: (06608) 254200	ea	12

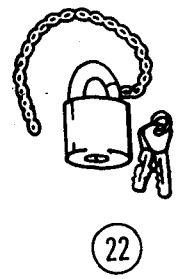
Section III BASIC ISSUE ITEMS - Cont



(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
	7520-01-008-7640	LEAD REPOINTER, PENCIL: blade design (75364) 992WB	ea	1
	7520-00-295-6170	LEAD REPOINTER, PENCIL: removable cover (76364) 234	ea	6
16	6675-01-034-3110	LETTERING SET: rapidometric, (scribes, pens, ink) (75364) 3001JS9	ea	1
17		LETTERING SET: rapidometric, guide set (33363) 99-9973	se	1
	6675-00-190-5854	LINE GUIDE, LETTERING, NONADJUSTABLE: (17866) 2030B6	ea	10
18	6650-0-299-9681	MACROSCOPE, OPTICAL: (06175) 31-29-33-35	ea	3
19	6650-00-477-9613	MAGNIFIER: monocular, lamp type (15607) KFM1BX5	ea	2
20	6650-00-255-8268	MAGNIFIER: monocular, linen tester (22527) 12-064-10	ea	6

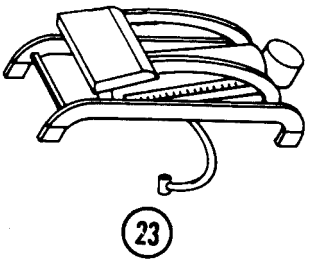
Section III BASIC ISSUE ITEMS - Cont

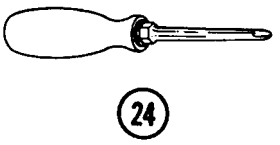


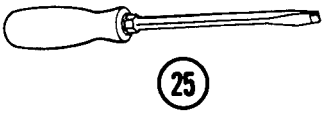


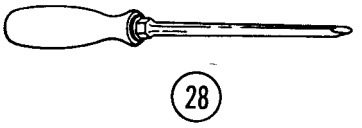
(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
21		MANUALS, TECHNICAL		
	TM 5-6675-316-14	OPERATOR'S, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL, TSS DRAFTING SUPPORT SECTION	ea	
	TM 5-6675-316-24P	REPAIR PARTS AND SPECIAL TOOLS LIST (INCLUDING DEPOT) TSS, DRAFTING SECTION	ea	1
	LO 5-6675-316-12	LUBRICATION ORDER, TSS, DRAFTING SECTION	ea	1
	TM 5-412-367-14	OPERATOR'S, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL, AIR CONDITIONER	ea	1
	TM 5-2330-305-14	OPERATOR'S, ORGANIZATIONAL, DIRECT AND GENERAL SUPPORT MAINTENANCE MANUAL, TSS CHASSIS, SEMITRAILER	ea	1
	LO 5-2330-305-12	LUBRICATION ORDER, TS CHASSIS, SEMITRAILER	ea	1
22	5340-00-682-1505	PADLOCK SET: (38797) MS21313-52	se	1

Section III BASIC ISSUE ITEMS - Cont









(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
23		PUMP, INFLATING, MANUAL: (53800) 6 A 49454	ea	1
	6675-00-641-5727	SCALE, DRAFTING: 30.0 cm (33363) 56-3280	ea	6
	6675-00-238-3498	SCALE, DRAFING: 12.0 in. (75364) 8230-E12	ea	6
	6675-00-641-5724	SCALE, DRAFTING: 50 cm (75364) 8228-20	ea	6
	6675-00-580-5077	SCALE, PLOTTING: (97403) TL/MIL-S-20197	ea	2
	7330-00-680-2635	SCRAPER, RUBBER (58536) A-A-277	ea	1
24	5120-00-234-8913	SCREWDRIVER, CROSS TIP: size 2 (81348) GGG-S-121	ea	1
25	5120-00-287-2504	SCREWDRIVER, FLAT TIP: 9/64 in. tip (81348) GGG-S-121 TY1, CL1	ea	1
26	5120-00-234-8910	SCREWDRIVER, FLAT TIP: 0.313 in. tip (78525) 1006	ea	1
	7520-00-162-6178	SHARPENER, PENCIL: (13499) 015-1212-00	ea	1
27	5110-00-161-6912	SHEARS, STRAIGHT TRIMMERS: (90137) 509-59	ea	6
	7510-00-224-7242	SHIELD, ERASING: (79819) 03-605	dz	1

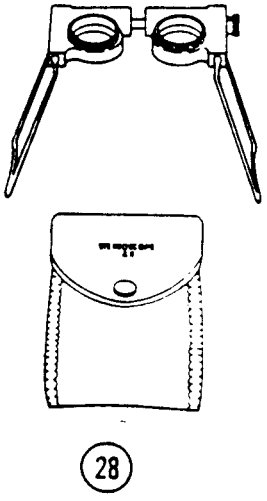
Section III BASIC ISSUE ITEMS - Cont

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
	6675-00-641-5752	STRAIGHTEDGE: 30 in. (09177) 70-285, 30.0 in. lg	ea	2
		STRAP ASSEMBLY, BUCKLE-END: 6.0 in. (15.2 cm) (51745) 1844-104	ea	8
		STRAP ASSEMBLY, BUCKLE-END: 8.0 in. (20.3 cm) (51745) 1844-101	ea	2
		STRAP ASSEMBLY, BUCKLE-END: 9.0 in. (22.8 cm) (51745) 1844-103	ea	4
		STRAP ASSEMBLY, BUCKLE-END: 15.0 in. (38.1 cm) (51745) 1844-105	ea	1
		STRAP ASSEMBLY, TIP-END: 8.0 in. (20.3 cm) (51745) 1845-107	ea	2
		STRAP ASSEMBLY, TIP-END: 20.0 in. (50.8 cm) (82820) 1845-102	ea	4
		STRAP ASSEMBLY, TIP-END: 23.0 in. (58.4 cm) (82820) 1845-103	ea	2
		STRAP ASSEMBLY, TIP-END: 36.0 in. (91.4 cm) (82820) 1845-106	ea	1
		STRAP ASSEMBLY, TIP-END: 40.0 in. (101.6 cm) (82820) 1845-101	ea	10
		STRAP ASSEMBLY, TIP-END: 58.0 in. (147.3 cm) (82820) 1845-105	ea	2

Section III BASIC ISSUE ITEMS - Cont

(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
		STRAP ASSEMBLY, WEBBING: (82820) 13225 E3695-8	ea	6
		STRAP ASSEMBLY, WEBBING: (82820) 13225 E3695-7	ea	6
		STRAP ASSEMBLY, WEBBING: (82820) 13225 E3695-3	ea	1
		STRAP ASSEMBLY, WEBBING: (82820) 13225 E3695-6	ea	5
		STRAP ASSEMBLY, WEBBING: (82820) 13225 E3695-13	ea	2
		STRAP ASSEMBLY, WEBBING: (82820) NAS1212R10DJ38	ea	3
		STRAP ASSEMBLY, WEBBING: (82820) ADC2058-101	ea	2
		STRAP ASSEMBLY, WEBBING: (82820) NAS1213R10D030	ea	3
	6675-00-183-6487	T-SQUARE: (33363) 56-3900	ea	1
	6675-00-190-5867	TRIANGLE, DRAFTING: 30-60 degree (33363) 57-0220, size 10	ea	6
	6675-00-190-5862	TRIANGLE, DRAFTING: 45 degree (33363) 57-0292, size 8	ea	6

Section III BASIC ISSUE ITEMS - Cont



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(1) Illus Number	(2) National Stock Number	(3) Description FSCM and Part Number	(4) U/M	(5) Qty Rqr
28	6675-00-641-3561	STEREOSCOPE, LENS, AERIAL PHOTOGRAPH INTERPRETATION: (88997) 2 POWERXSTEREOSCOPE	ea	6
29	5120-00-224-7271	VISE, PIN: (18037) PVDE	ea	6
30	5120-00-264-3795	WRENCH, ADJUSTABLE: 8 in. (80244) GGG-W-631-TY1, CL1	ea	1

APPENDIX D

ADDITIONAL AUTHORIZATION LIST

Section 1 INTRODUCTION

D-1. SCOPE.

This appendix lists additional items you are authorized for the support of the Drafting Support Section.

D-2. GENERAL.

This list identifies items that do not have to accompany the Drafting Support Section and that do not have to be turned in with it. These items are all authorized to you by CTA, MTOE, TDA or JTA.

D-3. EXPLANATION OF LISTING.

National stock numbers, descriptions and quantities are provided to help you identify and request the additional items you require to support this equipment. The items are listed in alphabetical sequence by item name under the type document (i.e., CTA, MTOE, TDA, or JTA) which authorizes the item(s) to you.

Section II ADDITIONAL AUTHORIZATION LIST

(1) National Stock Number	(2) Description FSCM and Part Number	(3) U/M	(4) Qty Auth
	TOE AUTHORIZED ITEMS		
6115-00-258-1622	Generator Set, DSL Eng TM:60 kW	ea	1
5805-00-543-0012	Telephone Set: TA-312/PT	ea	1

APPENDIX E

EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

Section I INTRODUCTION

E-1. SCOPE.

This appendix lists expendable/durable supplies and materials you will need to operate and maintain the Drafting Support Section. This listing is for information purposes only and is not authority to requisition the listed items. These items are authorized to you by CTA 50-970, Expendable/Durable Items (except Medical, Class V, Repair Parts and Heraldic Items), or CTA 8-100, Army Medical Department Expendable/Durable Items.

E-2. EXPLANATION OF COLUMNS.

a. Column (1) - Item Number. This number is assigned to the entry in the listing and is referenced in the narrative instructions to identify the material (e.g., “Use cleaning compound, Items 5, Appendix E.”).

b. Column (2) - Level. This column identifies the lowest level of maintenance that requires the listed item.

C - Operator/Crew

0- Organizational Maintenance

F - Direct Support Maintenance

H - General Support Maintenance

c. Column (3) - National Stock Number. This is the National stock number assigned to the item; use it to request or requisition the item.

d. Column (4) - Description. Indicates the Federal item name and, if required, a description to identify the item. The last line for each item indicates the part number followed by Federal Supply Code for Manufacturer (FSCM) in parentheses followed by part number.

e. Column (5) - Unit of Measure (U/M). Indicates the measure used in performing the actual maintenance function. This measure is expressed by two-character alphabetical abbreviations (e.g., ea, in, pr). If the unit of measure differs from the unit of issue, requisition the lowest unit of issue that will satisfy your requirements.

Section II EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
1	O	8040-00-174-2610	Adhesive, Rubber	cn
2	F	8040-00-152-0063	Adhesive, Waterproof	cn
3	C	6810-00-205-6786	Alcohol, Denatured	qt
	C	6510-01-097-3905	Ball, Absorbent Cotton	pg
	C	7520-00-935-7136	Ball Point Pen, Pocket Type	dz
	C	7520-00-281-5911	Basket, Wastepaper	ea
	C	5110-00-359-6478	Blade, Craftsman's Knife: beveled	pg
	C	5110-00-542-2043	Blade, Craftsman's Knife: curved	pg
	C	5110-00-542-2044	Blade, Craftsman's Knife: square	pg
	C	5110-00-765-4144	Blade, Craftsman's Knife: stencil	pg
	C	5110-00-355-6138	Blade, Craftsman's Knife: swivel	ea
3A	C	8330-00-965-1722	Chamois Leather, Sheepskin	ea
4	F	6810-00-930-6311	Cleaner, Bearing (TRICH)	cn
5	C	6850-00-592-3283	Cleaner, Lens	bk
	C	6850-01-007-8073	Cleaning Concentrate, Pen	bt
	C	7510-00-161-4291	Clip, Paper	bx
6	C	8305-00-222-2423	Cloth, Cheesecloth	yd
7	C	8320-00-299-0625	Cotton Pads	pg
8	C	6515-00-303-8250	Cotton Swabs	bg
9	C	7930-00-530-8067	Detergent, General Purpose	gl
	C	6750-00-044-3226	Developer, Photographic	bx
	C	7520-00-285-1772	Dispenser, Pressure Sensitive Adhesive Tape	ea
	C	7510-01-099-3953	Eraser: liquid	bt
	C	7510-01-034-1278	Eraser: film	bt
	C	7510-00-634-3513	Eraser, Rubber: soft	gr

Section II EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	M
	C	7510-00-264-3672	Eraser, Rubber: gritty matl.	
	C	7510-00-634-5034	Eraser, Rubber: ink w/brush	
	C	6750-00-032-0551	Etching Solution	
	C	6750-01-025-0541	Film, Photographic	
	C		Film Phototypesetting: 6 in. w, 8593 (191 39) 127-8084	
	C		Film, Phototypesetting: 8 in. w, 8593 (19139) 124-2544	
	C		Film, Phototypesetting: 8591 (33363) 44-5547	
10	F	5610-00-618-0258	Floor Patch	
11	C	7930-00-664-9610	Glass Cleaner	
12	O	9150-00-190-0904	Grease, GAA	
13	O	6850-00-702-4297	Grease, Silicone	
	C	7510-01-028-2877	Ink, Drawing: opaque, black, torfilm	
	C	7510-01-070-8947	Ink, Drawing: opaque, black, for paper	
	C	7510-01-039-5075	Ink, Drawing: technical pen, carmine	
	C	7510-01-035-8133	Ink, Drawing: technical pen, blue	
	C	7510-01-035-8131	Ink, Drawing: technical pen, brown	
	C	7510-0 -035-8132	Ink, Drawing: technical pen, green	
	C	7510-0 -036-3726	Ink, Drawing: technical pen, orange	
	C	7510-0 -080-1481	Ink, Drawing: technical pen, red	
	C	7510-01-036-3725	Ink, Drawing: technical pen, violet	
	C	7510-01-035-8130	Ink, Drawing: technical pen, yellow	
	C		Jar, Screw Cap: mason type (20005) 1.0 gal, polypropylene	

Section II EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
	C	7510-00-281-2143	Lead, Pencil, Graphite: HB, artists	bx
	C	7510-00-285-5865	Lead, Pencil, Graphite: F, artists	bx
	C	7510-00-285-5866	Lead, Pencil, Graphite: H, artists	pg
	C	7510-00-285-5863	Lead, Pencil, Graphite: 2H, artists	pg
	C	7510-00-272-9820	Lead, Pencil, Graphite: 3H, artists	pg
	C	7510-00-285-5864	Lead, Pencil, Graphite: 4H, artists	pg
	C	7510-00-285-5862	Lead, Pencil, Graphite: HB, writing	pg
	C	7510-00-285-5847	Lead, Pencil, Graphite: 2H, writing	pg
	C	9150-00-273-2389	Lubricating Oil, General Purpose	cn
14	C	6810-00-223-9069	Naphtha	gl
	C	8315-00-163-1556	Needle, Dressmaker's	pg
15	F	9150-00-273-2389	Oil, Lubricating, General Purpose	cn
16	C	9150-00-235-5590	Oil, Mineral	bt
	C	6750-00-264-6764	Opaque, Photographic Film-Plate Retouching	jr
	C	7530-00-285-3083	Pad, Writing Paper	pg
	C	7510-00-286-6985	Paperweight	ea
	C	7520-00-724-5664	Pencil, Mechanical: automatic	ea
	C	7520-01-083-6734	Pencil, Mechanical: non-automatic	ea
17	O	8010-01-162-5578	Paint, Green	kt
17A	O	8010-01-131-6254	Paint, Black	kt
17B	O	8010-01-160-6745	Paint, Brown	kt
17C	O	8010-01-193-0520	Primer	kt
18	O	8010-00-298-3859	Paint, Light Green, INT.	gl
19	C	5350-00-619-9166	Paper, Abrasive	pk

Section II EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
	C	6640-00-559-1384	Paper, Lens	pg
	C	6750-01-079-9089	Paper, Photographic: 3510 composing machine, 4.0 in. x 150.0 ft	ro
	C	6750-01-081-4791	Paper, Photographic: 3510 composing machine, 6.0 in. x 150.0 ft	ro
	C	6750-01-081-4792	Paper, Photographic: 3510 composing machine, 8.0 in. x 150.0 ft	ro
	C		Paper, Tracing	pg
	C		Pen, Felt-Tip, Opaque: for film and plate	bx
	C	7510-00-030-7427	Pen Point Assortment and Penholder	se
	C	7510-00-233-2027	Pencil: wood, blue	dz
	C	7510-00-264-4610	Pencil: wood, green	dz
	C	7510-00-233-2021	Pencil: wood, red	dz
	C	7510-00-264-4608	Pencil: wood, yellow	dz
	C	7510-00-240-1526	Pencil: wood, black	dz
	C	7510-00-436-5210	Pencil: wood, blue	dz
	C	7510-00-275-7212	Pencil: wood, green	dz
	C	7510-00-174-3205	Pencil: wood, red	dz
	C	6675-01-107-9678	Pen Points: 0.13 mm, pink (12)	ea
	C	6675-01-098-1219	Pen Points: 0.18 mm, lavender (12)	ea
	C	6675-01-098-1220	Pen Points: 0.24 mm, beige (12)	ea
	C	6675-01-107-9679	Pen Points: 0.35 mm, grey (12)	ea
	C	6675-01-098-1221	Pen Points: 0.50 mm, red	ea
	C	6675-01-099-3440	Pen Points: 0.70 mm, light blue (12)	ea
	C	6675-01-098-0308	Pen Points: 1.00 mm, orange (12)	ea

Section II **EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont**

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
	C	6675-01-098-1222	Pen Points: 1.40 mm, cordovan brown (12)	ea
	C	6675-01-097-4516	Pen Points: 2.00 mm, cerise red (12)	ea
	C	7510-00-174-7343	Pin, Straight	bx
			Plastic Sheet: clear surface (33363) 44-1037	pg
	C	9330-01-106-3387	Plastic Sheet: matte one side	pg
	C	9330-00-579-6216	Plastic Sheet; scribe coat, rust	sh
	C		Plastic Sheet: for ink and pencil (33363) 44-1057	pg
	C	7510-00-545-6792	Refill, Ball Point Pen: medium, black, 12 per box	dz
20	F	8010-01-030-7254	Resin, Epoxy	kt
		7510-00-243-3435	Rubber Band	bx
21	O		Screen, Nylon (39428) (1017A31)	ro
22	O	8040-00-851-0211	Sealant, Silicone	tu
23	O	3439-00-273-3722	Solder, Rosin Core	sl
24	O	6850-00-274-5421	Solvent, P-D-680	cn
25	C	6850-00-880-1013	Spray, Silicone	cn
26	O		Sprayfoam Sealant (39428) 7627T1	cn
	C	7510-00-272-9662	Staples, Paper Fastening, Office Type	bx
	C	7520-00-281-5895	Stapler, Paper Fastening, Office	ea
	C	5345-00-265-3126	Stone, Sharpening	ea
27	O	5640-00-103-2254	Tape, Cloth, Duct Sealing, 2 in.	ro
28	C	5970-00-926-7218	Tape, Insulating, Electrical	ro
	C	7510-00-550-7126	Tape, Pressure Sensitive Adhesive: red, 0.50 in. w	ro

Section II **EXPENDABLE/DURABLE SUPPLIES AND MATERIALS LIST - Cont**

(1) Item Number	(2) Level	(3) National Stock Number	(4) Description	(5) U/M
	C	7510-00-234-7960	Tape, Pressure Sensitive Adhesive: clear, 2.0 in. w	ro
	C	7510-00-551-9824	Tape, Pressure Sensitive Adhesive: clear, 0.75 in. w	ro
	C	7510-00-285-6403	Tape, Pressure Sensitive Adhesive: red, 0.5 in. w	ro
	C	7510-00-198-5831	Tape, Pressure Sensitive Adhesive: paper basic matl, opaque, 1.0 in. w (76381) 230	ro
	C	7510-00-038-1266	Tape, Pressure Sensitive Adhesive: paper backing, opaque, 2.0 in. w (76381) 202	ro
	C	75 0-00-995-0455	Tape, Pressure Sensitive Adhesive: vinyl film backing, clear, 1.0 in. w (76381) 681, 1.0 in w	ro
	C	75 0-00-634-1549	Tape, Pressure Sensitive Adhesive: transparent, adhesive both sides, 1.0 in. w	ro
	C	80 0-01-031-9181	Thinner, Opaque (33363) 58-2188	cn
	C	75 0-00-272-6887	Thumbtack	hd
29	C	6640-00-597-6745	Tissue, Lens Cleaning	bk
	C	7920-00-823-9772	Towel, Paper	mx
30	O		Versilube (01139) G/E-G330M	ea
	C	7510-01-066-2866	Watercolor Set, Artist's	ea
31	C	7510-01-042-7402	Wax, Adhesive, Refills	bx
32	C	8040-00-853-8913	Wax, Solvent	gl
33	C	7510-01-042-7402	Wax Refills: used w/sealing machine (33887) speedcote wax	bx

GLOSSARY

Abbreviation/Term	Definition
ACL	Accumulated Leading.
ALU	Arithmetic Logic Unit.
ASCII	American National Standard for Information Interchange.
ASR	Automatic Send-Receive.
BCD	Binary Coded Decimal.
BDE	BUS DRIVER ENABLE .
Bus.	Transmits information or signals grouped by function.
CE	CHIP ENABLE.
Center Command	Copy is centered between left and right margins.
CHEQ	CHARACTER EQUALITY .
CLK	Clock.
Collimation. ,	To make light rays parallel by adjustment of optical/mechanical system.
COMP	Comparator.
CPU	Control Unit.
CRRDY.	Carriage Ready.
CU	Control Unit.
Cursor	Rectangular block of light which indicates point at which action takes place on monitor screen.
D/A	Digital to Analog.
Digitizing	Defining geometric shapes, lines and points by using numeric characters to express or represent data.
Default Conditions	Factory preset or automatic parameters and conditions used by machine in its operation if not ordered to change.

GLOSSARY - Cont

Abbreviation/Term	Definition
DSCCL	Disc Clear.
DTATRK	Data Track.
EM Space	Fixed space 28 units wide.
EN Space	Fixed space 9 units wide.
EOF	End-of-File.
EOL	End-of-Line.
EOT	End-of-Transmission.
FCH	FETCH CONTROL .
FEQ	FONT EQUALITY .
FF	Flip Flop.
Fit	Overall appearance of word. On some of larger type sizes, it may be necessary to remove some of white space to improve readability of word.
Flush Left	Copy is set flush against left margin.
Flush Right	Copy is set flush against right margin.
FLXD	Flex Data.
Font	Set of printing type of one style or size.
FP	Flash Pulse.
IC	Integrated Circuit.
Interpupillary Distance	Distance between center of operator’s eyes.
I/0	Input/Output.
Justified Copy	All lines of type are same length so that there are even margins on left- and right-hand sides.
Leading.	Spacing between lines of type. (Pronounced as for the metal, lead).
LED	Light Emitting Diode.

GLOSSARY - Cont

Abbreviation/Term	Definition
LVC	Low Voltage Control.
MASCLK	Master Clock.
Mortise	Method of removing white space between characters to improve their fit.
MP	Missing Pulse.
MPU	Microprocessing Unit.
MR	Motor Release.
NC	Numeric Control.
Overwrite/Overstrike	Positioning cursor over character and replacing it with next character keyboarded.
PC	Printed Circuit.
Pica	Measurement of type size, approximately 1/6 in.
Point	Measurement of type size. (There are 12 points to 1 pica. A point on composing machine = 0.01384 in.)
Primary Leading	Instruction given to composing machine which will determine primary spacing between lines of type.
PROM	Programmable Read Only Memory.
Quadding	Setting flush left, right or center.
R.	Register.
RAM	Random Access Memory.
RI	Read Instruction.
ROM	Read Only Memory.
R/W	Read/Write.
Scale Factor	A number used as a multiplier, so chosen that it will cause a set of quantities to fall within a given range of values.

GLOSSARY - Cont

Abbreviation/Term	Definition
Scale Factor Magnification	Dimensional scale of drawn object is larger than unit scale of DKA display and machine surface.
Scale Factor Reduction	Dimensional scale of drawn object is smaller than unit scale of DKA display and machine surface. Example: 100 x reduction is 1 in. (on drawing) = 100 in. (of physical object).
SD	Stepping Direction.
Secondary Leading	Additional leading function available for use between paragraphs, after headings or at other times which require spacing different from primary leading.
SEDG+MP	SINGLE-EDGE PLUS MISSING PULSE.
Set Solid	When leading space, measured in points, is same as type size.
SPDREF	Speed Reference.
STBEDG	Strobe Edge.
STBTRK	Strobe Track.
STD	Strobe Data Track.
Stereo-Pair Photograph	Photographs taken of same object or area from two different positions.
Stereoscope	Optical device to apparently superimpose two separate photographs.
Stereoscopic	An apparent three-dimensional image obtained when 2 two-dimensional photographs are viewed through stereoscope.
Super Shift	Method of accessing additional 26 characters available on type disc.
IDLY	Time Delay.
TTY	Teletype.
WDTHALW	WIDTH ALLOWED.

GLOSSARY - Cont

Abbreviation/Term	Definition
White Space	Space built into type design so that characters do not touch.
WRT	WRITE.
X-Axis	Horizontal or left-right direction.
Y-Axis	90° from X-axis in same plane or front-back direction.
Z-Axis	Vertical direction or up/down.

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By Order of the Secretary of the Army:

JOHN A. WICKHAM, JR.
General, United States Army
Chief of Staff

Official:

DONALD J. DELANDRO
Brigadier General, United States Army
The Adjutant General

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TM 5-6675-316-14-2	7 June 1985	Topographic Support System, Drafting Support Section

BE EXACT. . . PIN-POINT WHERE IT IS

PAGE NO	PARAGRAPH	FIGURE NO	TABLE NO
6	2-1 a		
B1		4-3	
125	line 20		

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

In line 6 of paragraph 2-1a the manual states the engine has 6 Cylenders. The engine on my set only has 4 Cylenders. Change the manual to show 4 Cylenders.

Callout 16 on figure 4-3 is pointing at a bolt. In key to figure 4-3, item 16 is called a shim - Please correct one or the other.

I ordered a gasket, item 19 on figure B-16 by NSN 2910-00-762-3001. I got a gasket but it doesn't fit. Supply says I got what I ordered, so the NSN is Wrong. Please give me a good NSN

PRINTED NAME, GRADE OR TITLE, AND TELEPHONE NUMBER
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SOMETHING WRONG WITH THIS PUBLICATION?

FROM: (PRINT YOUR UNIT'S COMPLETE ADDRESS)

DATE SENT

PUBLICATION NUMBER	PUBLICATION DATE	PUBLICATION TITLE
TM 5-6675-316-14-2	7 June 1985	Topographic Support System, Drafting Support Section

BE EXACT. . .PIN-POINT WHERE IT IS

PAGE NO.	PARA-GRAPH	FIGURE NO.	TABLE NO

IN THIS SPACE TELL WHAT IS WRONG AND WHAT SHOULD BE DONE ABOUT IT:

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DRSTS-M Overprint 2, 1 Nov 80.

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REVERSE OF DA FORM 2028-2 Reverse of DRSTS-M Overprint 2, 1 Nov 80

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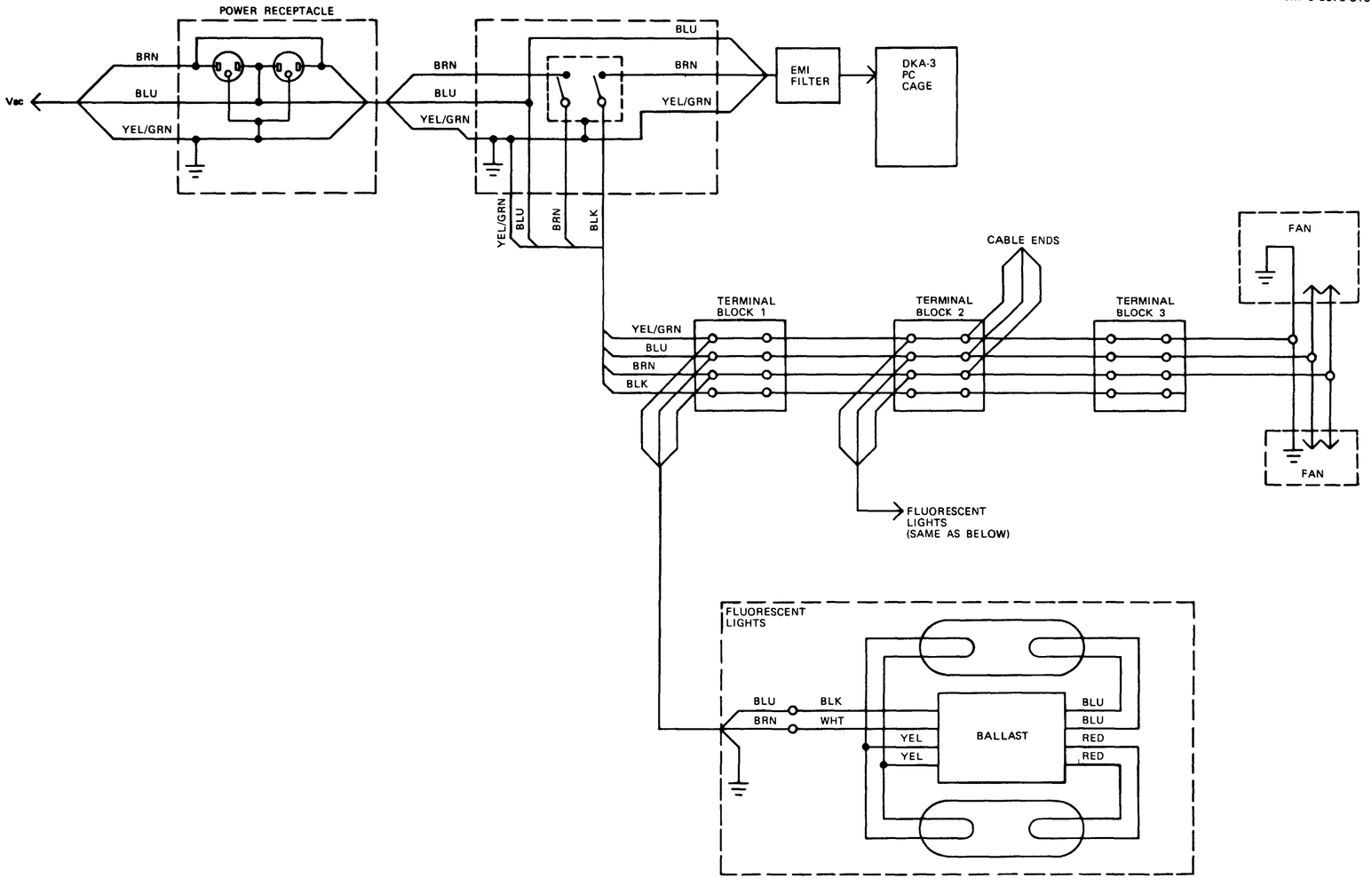
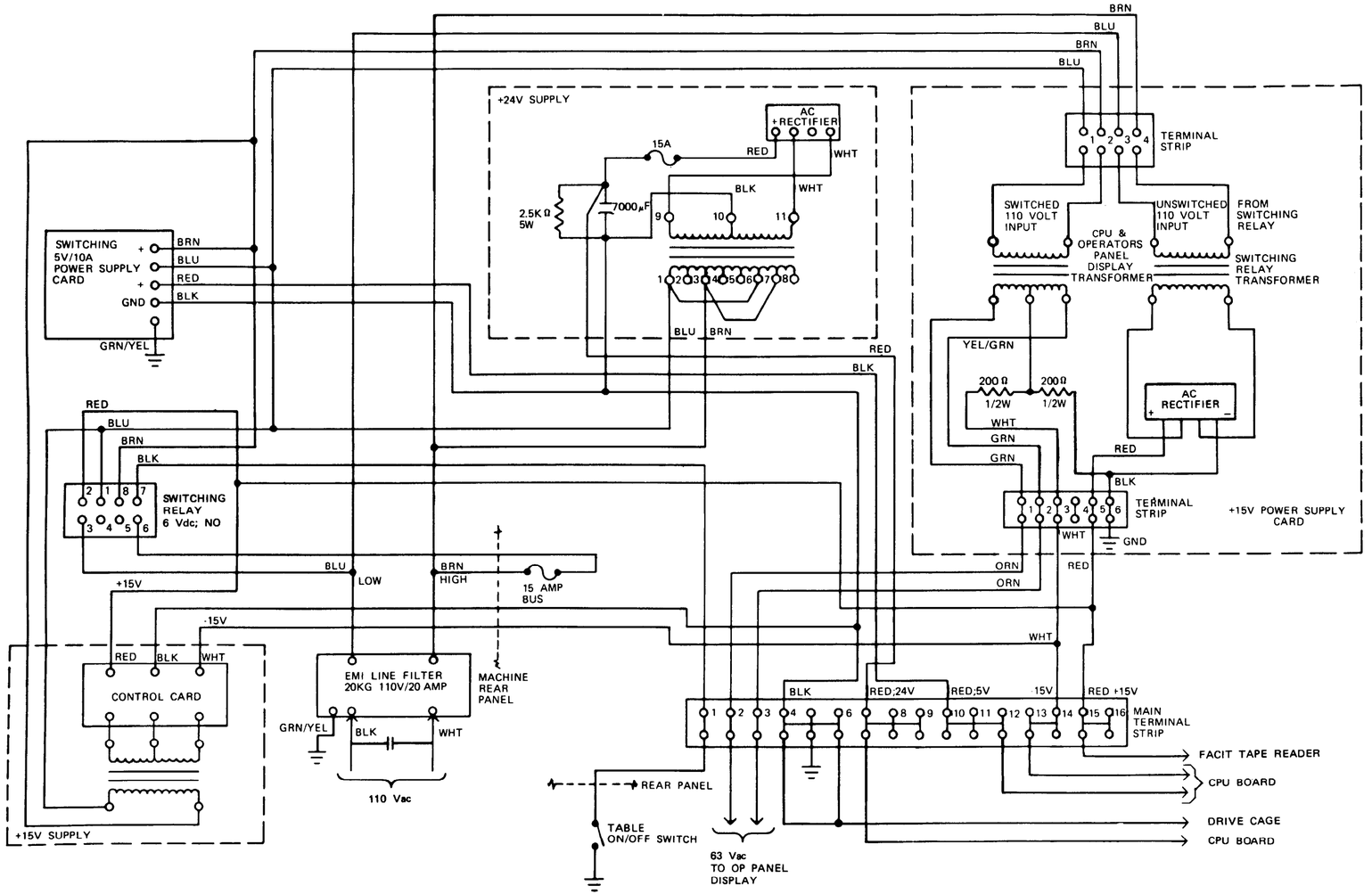
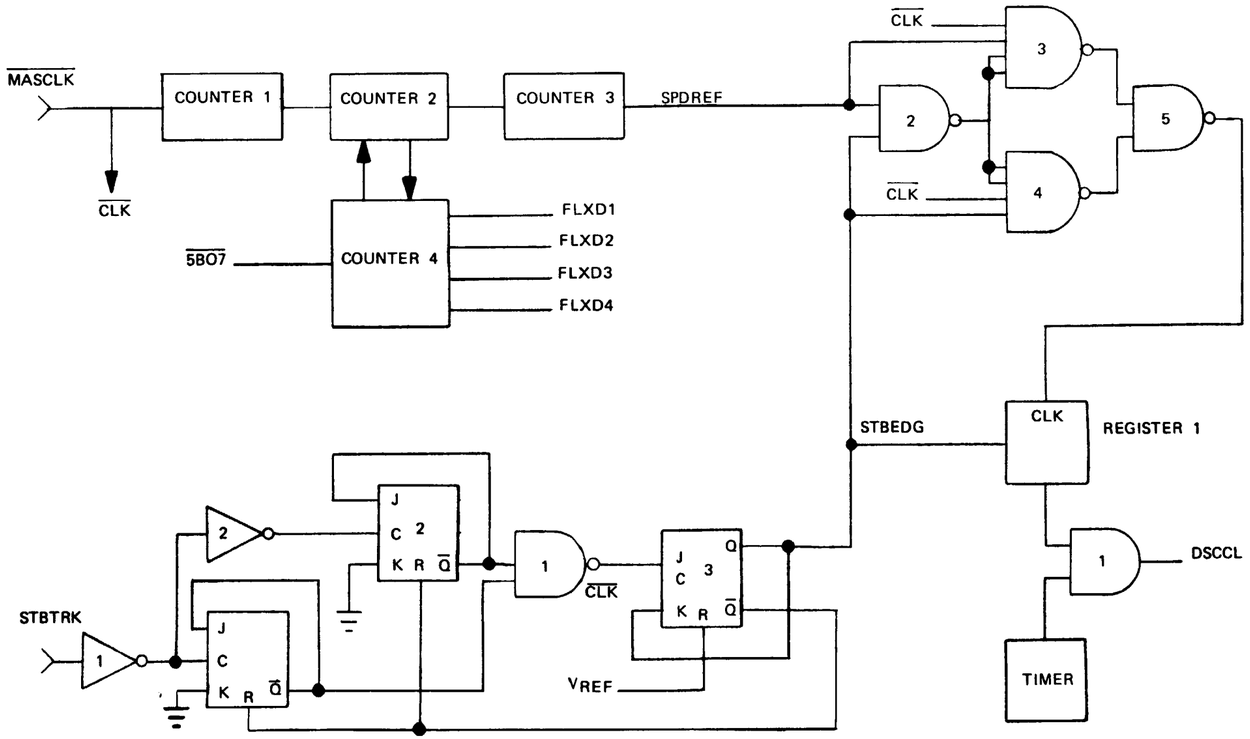


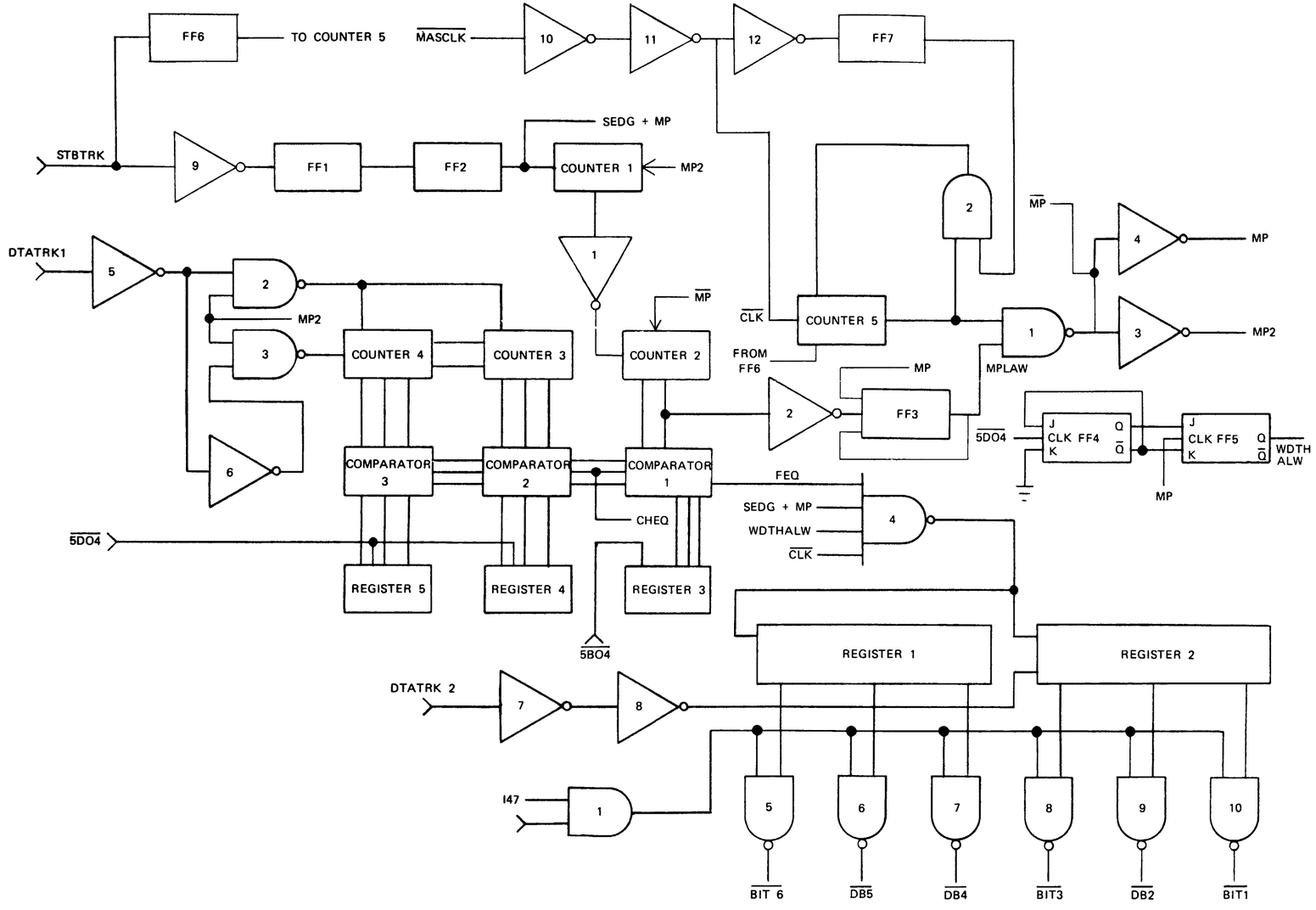
FO-1. Table Frame Wiring



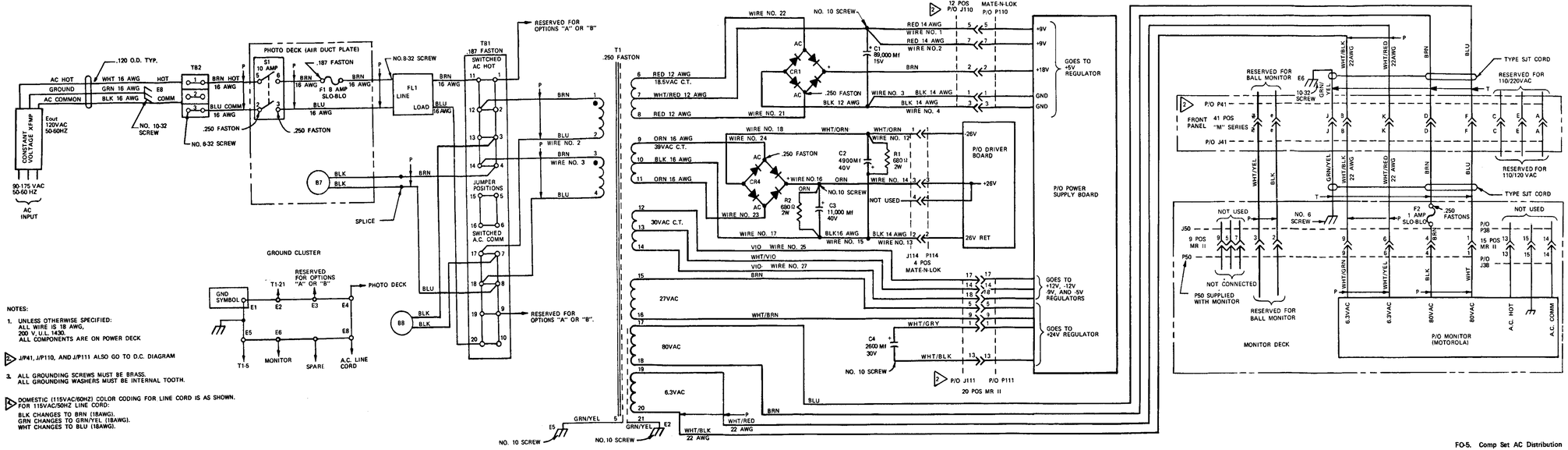
FO-2. Wiring Diagram - DSP Power Supply



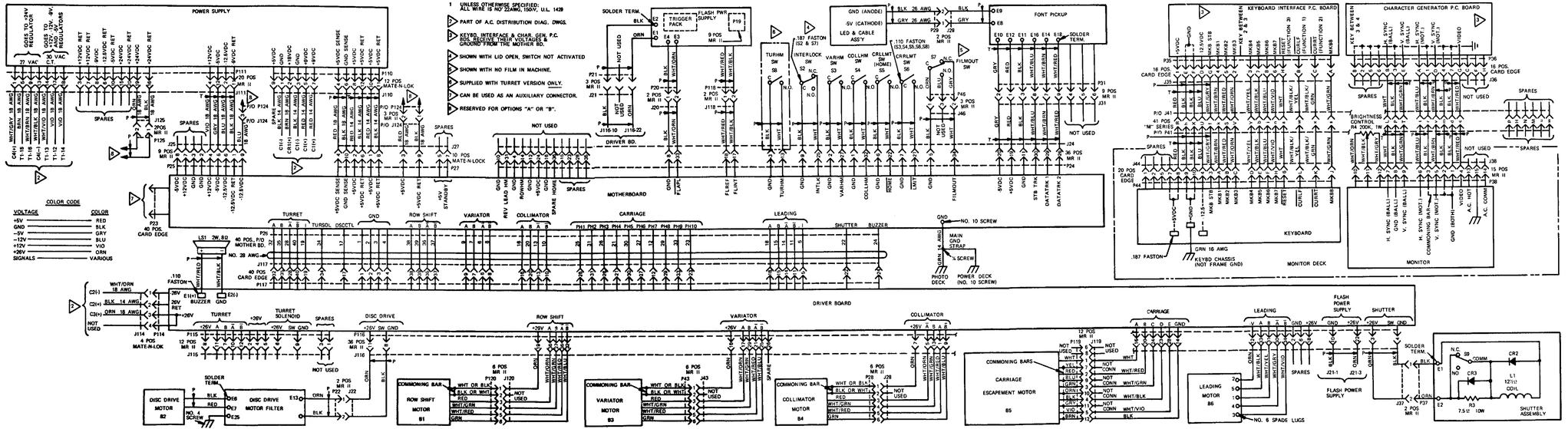
FO-3. Disc Speed Control Diagram



FO-4. Strobe Track Width Diagram



FO-5. Comp Set AC Distribution



1 UNLESS OTHERWISE SPECIFIED: ALL WIRE IS NO 22AWG, 150V, U.L. 1429

A PART OF A.C. DISTRIBUTION DIAG. DWGS.

B KEYBD. INTERFACE & CHAR. GEN. P.C. BDS. RECEIVE THEIR VOLTAGES & GROUND FROM THE MOTHER BD.

C SHOWN WITH LID OPEN, SWITCH NOT ACTIVATED

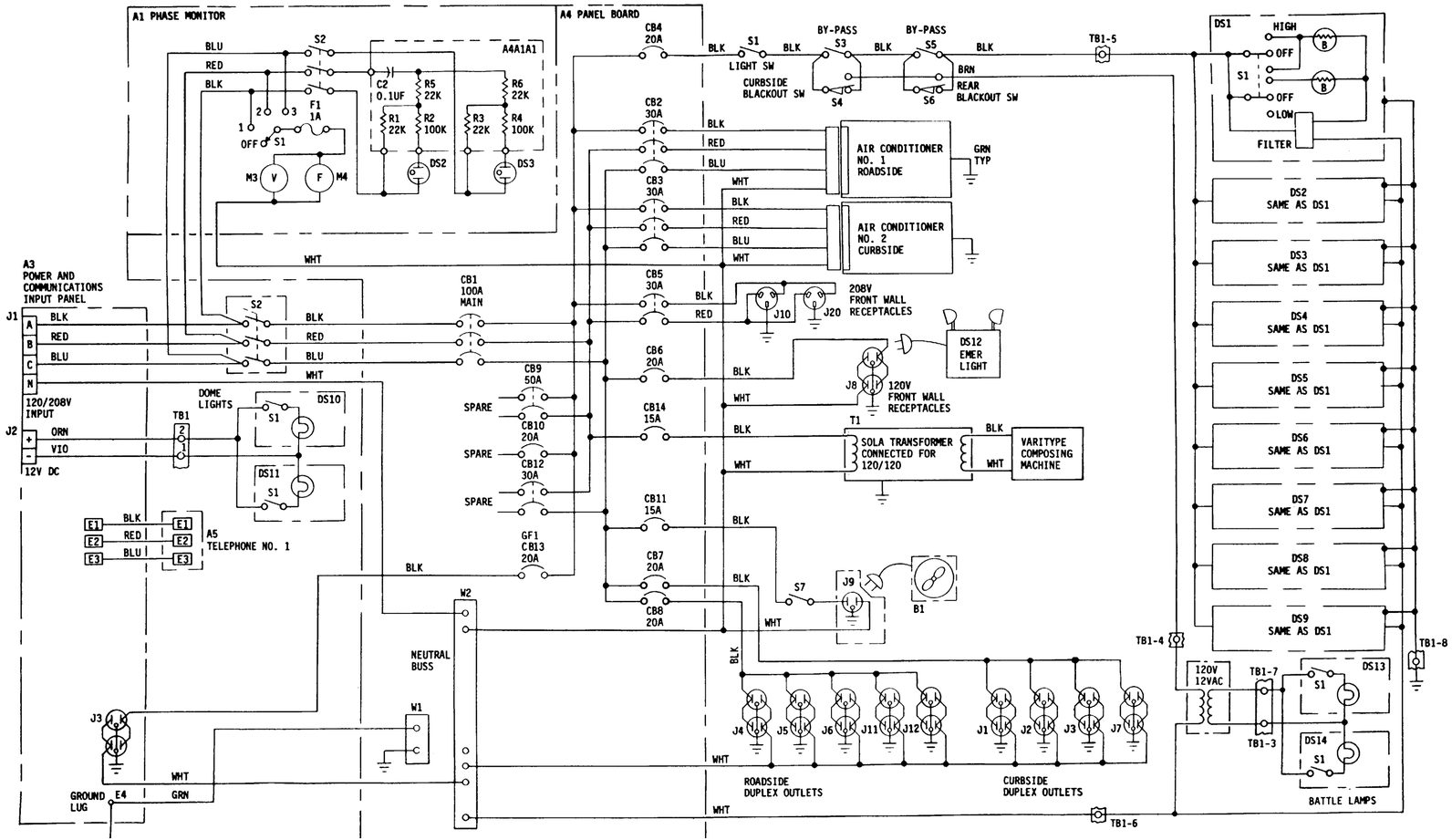
D SHOWN WITH NO FILM IN MACHINE.

E SUPPLIED WITH TURRET VERSION ONLY.

F CAN BE USED AS AN AUXILIARY CONNECTOR.

G RESERVED FOR OPTIONS "A" OR "B".

FO-6. DC Interconnection



FO-7. Drafting Support Section Electrical Schematic

The Metric System and Equivalents

Linear Measure

1 centimeter = 10 millimeters = .39 inch
1 decimeter = 10 centimeters = 3.94 inches
1 meter = 10 decimeters = 39.37 inches
1 dekameter = 10 meters = 32.8 feet
1 hectometer = 10 dekameters = 328.08 feet
1 kilometer = 10 hectometers = 3,280.8 feet

Weights

1 centigram = 10 milligrams = .15 grain
1 decigram = 10 centigrams = 1.54 grains
1 gram = 10 decigram = .035 ounce
1 dekagram = 10 grams = .35 ounce
1 hectogram = 10 dekagrams = 3.52 ounces
1 kilogram = 10 hectograms = 2.2 pounds
1 quintal = 100 kilograms = 220.46 pounds
1 metric ton = 10 quintals = 1.1 short tons

Liquid Measure

1 centiliter = 10 milliliters = .34 fl. ounce
1 deciliter = 10 centiliters = 3.38 fl. ounces
1 liter = 10 deciliters = 33.81 fl. ounces
1 dekaliter = 10 liters = 2.64 gallons
1 hectoliter = 10 dekaliters = 26.42 gallons
1 kiloliter = 10 hectoliters = 264.18 gallons

Square Measure

1 sq. centimeter = 100 sq. millimeters = .155 sq. inch
1 sq. decimeter = 100 sq. centimeters = 15.5 sq. inches
1 sq. meter (centare) = 100 sq. decimeters = 10.76 sq. feet
1 sq. dekameter (are) = 100 sq. meters = 1,076.4 sq. feet
1 sq. hectometer (hectare) = 100 sq. dekameters = 2.47 acres
1 sq. kilometer = 100 sq. hectometers = .386 sq. mile

Cubic Measure

1 cu. centimeter = 1000 cu. millimeters = .06 cu. inch
1 cu. decimeter = 1000 cu. centimeters = 61.02 cu. inches
1 cu. meter = 1000 cu. decimeters = 35.31 cu. feet

Approximate Conversion Factors

To change	*To*	*Multiply by*	*To change*	*To*	*Multiply by*
inches	centimeters	2.540	ounce-inches	newton-meters	.007062
feet	meters	.305	centimeters	inches	.394
yards	meters	.914	meters	feet	3.280
miles	kilometers	1.609	meters	yards	1.094
square inches	square centimeters	6.451	kilometers	miles	.621
square feet	square meters	.093	square centimeters	square inches	.155
square yards	square meters	.836	square meters	square feet	10.764
square miles	square kilometers	2.590	square meters	square yards	1.196
acres	square hectometers	.405	square kilometers	square miles	.386
cubic feet	cubic meters	.028	square hectometers	acres	2.471
cubic yards	cubic meters	.765	cubic meters	cubic feet	35.315
fluid ounces	milliliters	29,573	cubic meters	cubic yards	1.308
pints	liters	.473	milliliters	fluid ounces	.034
quarts	liters	.946	liters	pints	2.113
gallons	liters	3.785	liters	quarts	1.057
ounces	grams	28.349	liters	gallons	.264
pounds	kilograms	.454	grams	ounces	.035
short tons	metric tons	.907	kilograms	pounds	2.205
pound-feet	newton-meters	1.356	metric tons	short tons	1.102
pound-inches	newton-meters	.11296			

Temperature (Exact)

°F	Fahrenheit temperature	5/9 (after subtracting 32)	Celsius temperature	°C