TABLE OF CONTENTS
(JFD18:MPCS-A INDEX)

Section	Description	Page
1.0	MPCS-A PHYSICAL CONFIGURATION AND OVERVIEW	
	1.1 General Description of Machine Functions	1-1
	1.2 Machine Options, PROM Cards & Pallets	1-4
	1.3 Service Kit	1-8
	1.4 Operator Control Panel	1-9
	1.5 Machine Frame Switches & Valves	1-14
	1.6 Technical Data	1-14
2.0	PROM CARDS AND PALLETS	
	2.1 PROM Cards	2-1
	2.2 Join & Sew Stitch Pattern PROM Card Making	2-2
	2.3 Decorative Stitch Pattern PROM Card Making	2-3
	2.4 Reordering PROM Cards	2-3
	2.5 Copying EPROMs	2-3
	2.6 Pallets	2-6
3.0	INSTALLATION PROCEDURE	
	3.1 General	3-1
	3.2 Electrical Requirements	3-1
	3.3 Pneumatic Requirements	3-3
	3.4 Environmental Requirements	3-3
	3.5 Adjustments & Settings	3-3
	3.6 Pallet-Weight Headers (Compensation)	3-4
	3.7 Instructions	3-5
	3.8 Static-Sensitive Printed Circuit Boards	3-5
4.0	LUBRICATION	
	4.1 Lubrication Schedule & Notes	4-1
	4.2 Sewing Machine Lubrication System	4-2
	4.3 Adjusting the Oil Check Valve	4-2
	4.4 Regulating the Hook Lubrication	4-2
	4.5 Hook Lubrication	4-2
	4.6 Air Line Lubricator	4-2
	4.7 Thread Lubrication	4-3
5.0	MAINTENANCE	
	5.1 Control Enclosure Fan Filter	5-1
	5.2 Air Line Filter	5-1
	5.3 Bobbin & Hook	5-2
	5.4 Thread Detector	5-2
	5.5 Thread Lint Removal	5-2
	5.6 DC Motors & Tachometer	5-2
	5.7 Schedule of Preventative Maintenance, including Lubrication	5-3

Section	Description	Page
6.0	OPERATING INSTRUCTIONS	
	6.1 Safety Instructions	6-1
	6.2 Simplified Machine Operation	6-5
	6.3 Machine Startup	6-6
	6.4 Menu Access	6-8
	6.5 Language	6-8
	6.6 Calibration (Stitch Mode Types)	6-9
	6.7 PROM Card Reading	6-10
	6.8 Operating Mode	6-11
	6.9 Pallet Selection, Preparations & Loading Machine	6-13
	6.10 Pattern Assignment or Selection	6-14
	6.11 Speed and Run Edit	6-15
	6.12 Checking Patterns	6-19
	6.13 Checking Pallets & Stitch Optimization Modes	6-24
	6.14 Start	6-25
	6.15 Cycle Interruptions	6-26
	6.16 Cycle Completion	6-28
	6.17 Part Count	6-29
	6.18 Automatic File Incrementing	6-30
	6.19 High Work	6-32
	6.20 Machine Shutdown	6-34
	6.21 Automatic Diagnostics	6-34A
	6.22 Local Edit (requiring use of a digitized data file)	6-45
	6.23 Pallet Code & Size Edits (to stitch files)	6-46
	6.24 RAM Memory Contents Explanation	6-47
7.0	OPERATOR'S ADJUSTMENTS	
	7.1 Inserting the Needle	7-1
	7.2 Threading the Needle	7-1
	7.3 Installing & Adjusting the Bobbin	7-1
	7.4 Setting & Regulating the Thread Tensions	7-2
	7.5 Bobbin Monitor & Not Cut Sensitivity	7-2
	7.6 Presser Foot Height	7-4
	7.7 Presser Foot Spring Pressure	7-4
	7.8 Moving Throat Plate (Optional Equipment)	7-4
	7.9 Needle Cooling	7-4
	7.10 Bobbin Winding	7-5
	7.11 Pallet Calibration	7-5
8.0	SERVICEMAN'S ADJUSTMENTS (MECHANICAL SYSTEM - SETUP AND SERVICING	
	8.1 Machine (Factory) Calibration	8-1
	8.2 Setting the Degree Disk Pointer	8-2
	8.3 Needle to Throat Hole Adjustment	8-3
	8.4 Eccentric Hook Shaft Bearing	8-3
	8.5 Adjusting the Sewing Hook	8-4

Section	Description	Page
	8.6 Setting the Needle Bar Height	8-4
	8.7 Bobbin Case to Positioning Lug Clearance	8-5
	8.8 Adjusting the Bobbin Winder	8-5
	8.9 Presser Foot	8-5
	8.10 Moving Throat Plate (Optional Equipment)	8-6
	8.11 Thread Tension Devices	8-6
	8.12 Orientation of the Take-Up Lever Pivot Pin Eccentric	8-8
	8.13 Pneumatic Cutter - Catcher Adjustment	8-8
	8.14 Synchronizing & Reversing	8-9
	8.15 Belt Tension	8-10
	8.16 Pallet Clamping	8-10
	8.17 Automatic Pallet Transfer	8-10
	8.18 ACS & Abnormal Pallets	8-13
	8.19 Workshelf	8-14
	8.20 Summary Chart of Machine Timing	8-14
9.0	CONTROL SYSTEM - DESCRIPTION, SETUP AND SERVICING	
	9.1 General Description	9-1
	9.2 Main Control Enclosure (Lower Frame)	9-2
	9.3 Operator's Control Enclosure - Control Panel	9-8
	9.4 Thread Detector	9-9
	9.5 Limit Switches	9-10
	9.6 X-Y Positioning Table Servo Motors & Encoders	9-12
	9.7 Distribution Boards	9-13
10.0	PNEUMATIC SYSTEM	
	10.1 General	10-1
	10.2 Diagram & Component List	10-3
11.0	TROUBLESHOOTING	
	11.1 General	11-1
	11.2 General Purpose Diagnostics	11-2
	Table 1 (Diagnostics Tests)	11-4
	Test Procedures	11-5
	11.3 Servo Troubleshooting	11-11
	11.4 System Troubleshooting Chart	11-13
	11.5 Sewing Machine Drive Troubleshooting	11-19
	11.6 Sewing Machine Troubleshooting	11-20
12.0	RECOMMENDED SPARE PARTS	
	12.1 Electrical	12-1
	12.2 Pneumatic	12-1
	12.3 Fan Filters	12-2
	12.4 Mechanical	12-2
	12.5 Needles	12-3
	12.6 Replacement Printed Circuit Boards	12-4
	12.7 Pallet Sensing Targets	12-4

13.0 ELECTRICAL SCHEMATICS AND COMPONENT LIST 13-1
See List of Illustrations for Schematics Listing

14.0 ILLUSTRATIONS

15.0 PARTS CATALOG (MUST BE ORDERED SEPARATELY)

APPENDIX A - USM SPECIFICATION NUMBERS AND COMMERCIAL EQUIVALENTS - OIL AND GREASE

APPENDIX E - CARRIAGE (X-Y POSITIONER) ALIGNMENT

APPENDIX F - IN-MACHINE-PROM-MAKER
(SHIPPED UNDER SEPARATE COVER AT CUSTOMER'S REQUEST)

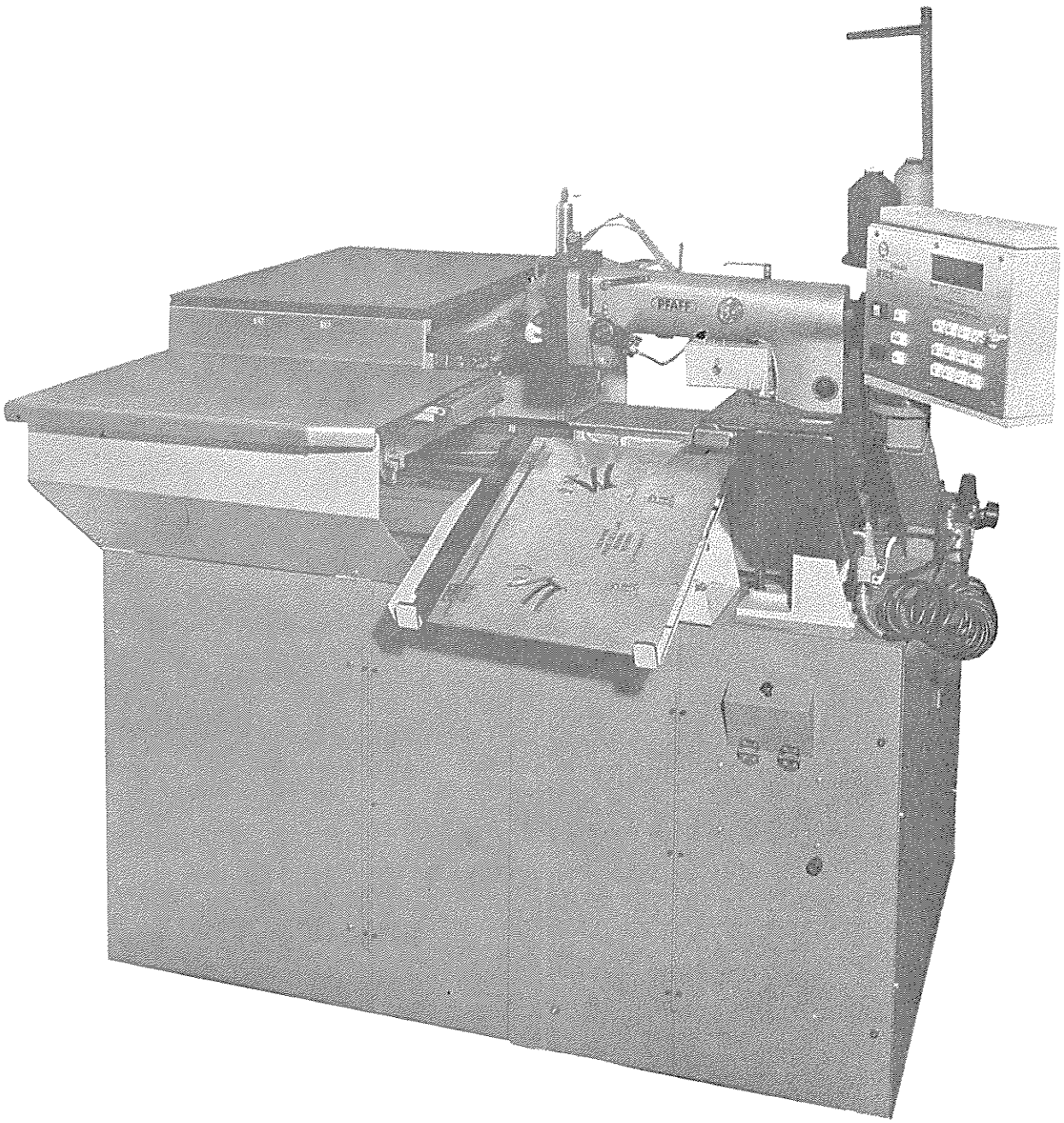
APPENDIX G - EXTENDED, 15-INCH THROAT SEWING HEAD
(INCLUDED WHEN THIS OPTION IS ORDERED)

LIST OF ILLUSTRATIONS

(Some figure numbers are purposely omitted in the listing below.)

Figure	Description	Page
Frontis		vii
1.1	Operator Control Panel	1-19
2.1	PROM Card	2-7
2.2	MPCS-A Stitch Area - Regular	2-9
4.1	Lubrication Chart	4-1
4.2	Positioning Oil Tube	4-3
4.3	Lubricator	4-3
5.1	Sample Maintenance Record	5-5
6.1	Main Menu Displays	6-35
6.2	Pallet Dimensions	6-37
6.3	Automatic File Incrementing	6-39
6.4	Speed Chart	6-41
6.5	Pallet-Code Targets	6-43
7.1	Top Thread Paths & Tensioners	7-7
7.2	Bobbin Threading	7-7
7.3	Bobbin Winder	7-7
8.2	Machine Timing Plate Holes	8-17
8.3	Needle to Throat Adjustment	8-17
8.4	Gear Alignment	8-19
8.5	Needle Bar Height	8-19
8.6	Needle to Hook Setting	8-19
8.7	Bobbin Case to Positioning Lug Clearance	8-21
8.8	Thread Tension Release - Upper	8-21
8.10	Take-Up Lever Adjustment	8-23
8.11	Knife Adjustments	8-23
8.12	Knife & Catcher Settings	8-23
8.13	Pallet Clamping & Unloading Parts	8-25
9.1	P.C. Boards	9-3
9.2	Photon Module	9-15
9.3	Presser Foot Limit Switch Connector	9-15
9.4	Limit Switch Adjustment	9-15
9.5	Encoder Connector	9-17
9.6	Sewing Machine Drive	9-19
10.1	Pneumatic Diagram & Component List	10-3
11.1	Software Identification/Calibration Card	11-23
11.2	Sewing Machine Drive	11-25
11.3	Power Supply/Power Panel	11-27
11.4	Digital Controller Board (B86)	11-29

Figure	Description	Page
13.1	System Elementary Diagram - Sheet 1	13-3
	Sheet 2	13-5
	Sheet 3	13-7
13.2	Electrical Power Distribution Elementary Diagram	13-9
	Electrical Component List	13-11
14.2	Needle Positioner - Cover Removed	14-3
14.3	Thread Tensioning Device	14-5
14.4	Sewing Head Timing - Cover Lifted	14-7
14.5	Left End of Sewing Head - Cover Lifted	14-9
14.6	Movable Throat Plate - Underneath	14-11
14.8	Reciprocating Presser Foot - Regular Lift	14-13
14.9	Reciprocating Presser Foot - High Lift	14-15
14.10	Sewing Machine - Bottom View	14-17
14.12	Air Solenoid Valves - Cover Removed	14-19
14.21	Power Panel - Rear Door Open	14-21
14.23	Electronic Panel - Front Door Open	14-23
14.27	Servo Heat Sink, Power Transistors, Fan - Cover & Front Baffle Removed	14-25
14.29	Sewing Machine Drive - Cover Removed	14-27
14.37	Pallet Sensor/Stop/Right Pallet Shelf/Ejection Parts	14-29
14.41	Left Pallet Shelf/Unloading/Ejection Parts	14-31
14.43	Pneumatic Cutter - Exploded View	14-33



frontis

USM MICROPROCESSOR CONTROLLED STITCHER - MODEL A
(JFD15:MPCS MANUAL)

1.0 MPCS-A PHYSICAL CONFIGURATION AND OVERVIEW

1.1 GENERAL DESCRIPTION OF MACHINE FUNCTIONS

The USM Microprocessor Controlled Stitcher - Model A (MPCS-A) consists of: (1) a modified Pfaff 483, single needle, lockstitch sewing machine driven by a non-contact magnetic clutch plus brake unit; (2) a servo-driven, X-Y positioning table which holds and guides the workpiece(s) in a pallet; (3) a PROM card reader; (4) an Intel "16 bit" 80186 microprocessor and associated electronics; and (5) an operator control enclosure with intelligent display for setup, monitoring operation and diagnostics. All the above are packaged in one unit.

The control system first transfers stitch pattern (style) data from a PROM card to computer memory, then takes it from there to perform the automatic sewing operation. The PROM card can be removed for use on another MPCS-A or for storage.

The machine stitches leather and imitation leather materials for fancy stitching and the assembly of shoe upper parts.

Sewing area, work material thickness, maximum stitches, and other specifications are given in the technical data section 1.6.

The MPCS-A utilizes an automatic stitch file selection process based on pallet coding (7 codes possible). This saves switchover time, prevents selection of the wrong stitch data file, and simplifies operation.

In the AUTOSIZE mode the MPCS display is used to show the permissible range of shoe sizes (USA/British, Paris Points, or Mondopoint) corresponding to the pallet code then sensed. The operator selects the size wanted. The PROM card directory is previously preprogrammed for the pallet codes and the size ranges corresponding to the stitch data files for that PROM card.

In the alternate AUTOFILE mode the MPCS display is used to show the permissible stitch data files corresponding to the pallet code then sensed. The operator selects the file wanted. The directory is previously preprogrammed for just codes and files in this case.

Earlier features of USM Automatic Stitchers have been retained, such as Auto File Incrementing. The machine may be used in a Manual File Assignment mode as the earlier AJS.

The MPCS-A is normally configured for automatic pallet transfer. Manual pallet loading operation is available on special order.

To operate the MPCS-A, the operator places a PROM card in the reader and closes the zero-insertion-force sockets. The controls automatically transfer all the stitch files to the computer memory.

Next, the operator places the work-holding pallet on loading shelves. The sensor then recognizes the pallet to which a specific size or file was previously preassigned and automatically fetches the proper stitch file from the computer memory. When START is depressed, the machine automatically sews the pattern, cuts the threads (needle and bobbin, utilizing a pneumatically-powered cylinder mechanism), returns the pallet to the load position for automatic ejection to chutes underneath, then loads the next pallet from above. The cycle count is increased by 1 (maximum value 9999). It can be easily displayed, reset or saved.

The machine automatically stops for preprogrammed thread (color) changes, if the needle breaks, or if the bobbin thread runs out. The machine also stops if the needle thread fails to be cut. The pallet can be pushed away for easier bobbin access if desired.

After rethreading the machine or replacing the bobbin as required and pressing a button, the pallet automatically returns to the stop point and the operator can backstep the machine to the last good stitch and continue sewing.

Whenever the sewing head stops, it also reverses to provide clearance for the slewing of thick join and sew pallets. Precise stopping at the reversal provides proper thread control.

File identification on the 8 alphanumeric character display shows pallet code number (1 to 7) and either file number (1 to 32) or size (if so programmed), depending on the mode selected.

Selective stitching can be done at any place by using forward pattern stepping which, like backstepping, has two speeds.

When sewing is taking place, the pallet (positioning table) comes to a stop before the needle enters the workpiece and normally starts moving just before the needle leaves the workpiece. This table "dwell" prevents needle bending, skipped stitches and broken threads. Dwell magnitude depends on the workpiece thickness as well as the flexibility of the workpiece, since motion can

resume sooner than the "normal" dwell if the material is flexible. Values of thickness and dwell can be established when the data PROMs are first made. Often the "normal" dwell is used without change. Larger thicknesses and dwells, also longer stitch lengths, decrease speed. Conversely, less thickness, shorter dwell and shorter stitch lengths each increase speed.

When the stitch pattern data is prepared, by either the In-Machine PROM Maker (IMPM) or in a Style Center; different thicknesses, dwells and speed limits, if needed due to sewing problems, can be preprogrammed for separate ("local") portions of the workpieces having different thicknesses or flexibilities. On the machine, changes can be made to these local thicknesses and dwells for the entire pattern (all being generally increased or decreased by the same increment), and speed limits can be reduced (100 spm increments) by making a "global" edit, following simple prompts displayed on the control panel, or changes can be made to only specific portions of the pattern by a "local" edit, using the digitized data file and reassigning stitches to it. (SPI can also be changed and programmed stops added.) The computer automatically selects the correct stitching speed anywhere in the pattern depending on local stitch lengths, thickness and dwell. Increased productivity results from this optimizing of speed to 10 spm increments and the capability to stitch reliably at speeds up to 2500 spm (stiches per minute) with short stitches in moderately thick assemblies.

The operator can also reduce all sewing speeds proportionately by rotating a knob. The stitching speed is displayed during operation.

The machine is primarily intended to use AJS-B pallets in the regular size or, using the extended throat sewing head option, the extended (long X) AJS pallet. However, the slightly narrower "regular" AJS-A pallet (228.6 mm or 9 inch x 406.4 mm or 16 inch) can be used by making a minor movement inward of the right pallet loading shelf and the right ejection slide. AJS data cassettes can be converted to the MPCS-A format by a USM Style Center.

ACS-A or ACS-B pallets can be used on the MPCS-A with a special optional adapter. The ACS cassette tapes must also be converted to the MPCS-A format.

Built-in diagnostics with acoustic signaling help isolate faults by displaying findings. The X-Y positioner has stall and drift protection and automatic calibration. The data (move and control) of any file may be displayed.

Calibration of the X-Y table, done before shipment, is easily checked and redone, if ever necessary, by using switches and the display of the control panel. To compensate for pallet errors or work material variations, a modifying "pallet cal" also can be done easily.

The MPCS-A is equipped with needle cooling - a flow of non-lubricated air through a tube and pneumatic valve parts which direct the flow of cooling air at the needle. It is used for high speed stitching of dense, thick workpieces.

A variety of foreign language displays (instantly changeable) and keycaps can be used.

Metric fasteners are used throughout except for mounting of a few very small limit switches and for most preassembled commercial parts.

1.2 MACHINE OPTIONS, PROM CARDS AND PALLETS

1.2.1 Machine Options

1.2.1.1 Movable Throat Parts - AJS-491

For join-and-sew type of work in join-and-sew type pallets, this moving throat plate is automatically lifted to compensate for the thickness of the pallet, thereby reducing the possibility of thread breaks due to material flagging. There are two alternate-size throat plate needle hole sizes for different sewing conditions (AJS-492 and AJS-493, replacing AJS-494.) See Section 7.8.

1.2.1.2 High-Lift Presser Foot - AJS-758

Mechanical modifications increase the presser foot stroke during stitching to 10 mm (3/8 inch) for sewing on various levels and handling compressible materials to 16 mm (5/8 inch).

1.2.1.3 Cable Stitch Parts - MPCS-560

Modified hook, knife support and other thread-handling parts enable the MPCS to use thread size 13 metric (207 nylon).

1.2.1.4 Extended Throat Sewing Head - MPCS-460

An extended 385 mm (15 inch) throat, 123 mm (5 inch) longer, version of the Pfaff 483 sewing head, for a corresponding increase in the stitching area. Other different parts used are: longer rails, X-racks, rack cover, head adapter and hinge; and Y-axis light-heavy-weight pallet

compensation header. Both X-axis limit stops are moved. Also, portions of the automatic pallet transfer are repositioned and the sync angle (middle disk) changes.

See Appendix G (included when this option is ordered).

1.2.1.5 Foreign Language Switch Keycaps

The following control panel assembly part number applies:

French	MPCS-860B81-2P1F
German	MPCS-860B81-2P1G
Italian	MPCS-860B81-2P1I
Spanish	MPCS-860B81-2P1S

The display is changed by selection from the menu. See Par. 6.5.

1.2.1.6 Thread Lubricator - AJS-797

A commercial sewing machine thread lubricator with felts moistened by a reservoir of silicone thread-lubricating fluid. Attaches to the sewing head by its integral magnetic base. One pair of replacement felts and a quart of fluid are supplied with the above number, and all can be ordered separately, as follows:

Lubricator	AJS-798
Fluid (1 quart)	AJS-799 (WICO #52324)
Felts (pair)	AJS-800

1.2.1.7 Manual Pallet Handling - MPCS-410

In place of all the various mechanisms which automatically identify and transfer pallets, the machine is equipped with only a pallet-support table. It is mounted on the same level as, and in front of, the sewing head base. The operator selects the proper file, manually loads and unloads each pallet, and presses the START button for each cycle.

1.2.1.8 In-Machine PROM Maker (IMPM) - MPCS-450, or MPCS-384 if no optics are included (digitizing done to the needle).

An illuminated optics attachable to the sewing head, joystick and multiple switchlamp assembly attachable to the right pallet shelf assembly, printed circuit board (B89) inserted in the digital controller board in place of the B84 board, and connecting cables. Permits digitizing and programming of EPROMs for stitch designs from a drawing or a premade pallet. A protective storage box is provided for the unit. See Appendix F (furnished when this option is ordered).

1.2.1.9 In-Machine PROM Programmer - MPCS-860B89 only

By using only this portion of the IMPM option, EPROMs containing stitch pattern style data, whether made by IMPM or a Style Center, may be copied (par. 2.5), and edited data files may be programmed onto EPROMs (par. 6.22 & 6.23).

1.2.1.10 Foreign Language Switch Keycaps for IMPM

The following keyboard assembly part number applies:

		Possible Alternate
French	AJS-860B55-2P1F	MPCS-860B94-1P1F
German	" G	" G
Italian	" I	" I
Spanish	" S	" S

1.2.2 Combination of Machine Options

● Required
◐ Normally equipped
O May be desirable

			Machine Usage: Join & Sew	Machine Usage: Decorative
1.	AJS-491	Movable Throat Parts	◐	
	AJS-492	Cablestitch Work, Alternate to AJS-494 within AJS-491	O	
	AJS-493	Close Edge Work, Alternate to AJS-494 within AJS-491	O	
2.	AJS-758	High-Lift Presser Foot	◐	
3.	MPCS-560	Cable Stitch Parts	O	O
4.	MPCS-460	Extended Throat Sewing Head	O	O
5.	AJS-797	Thread Lubricator	O	O
6.	Foreign Language Switch Keycaps		O	O
	MPCS-860B81-2P1F	French		
	" G	German		
	" L	Italian		
	" S	Spanish		
7.	MPCS-410	Manual Pallet Handling	O	O

AT EACH INSTALLATION

8. MPCS-450 In-Machine PROM Maker ● ●
or MPCS-384 without optics

9. MPCS-860B89 - In-Machine PROM Copier ○
and Programmer after edit

10. Foreign Language Keycaps for IMPM ○ ○

AJS-860B55-2P1F	French
" G	German
" I	Italian
" S	Spanish

NOTE: MPCS-860B94-1P1 may replace AJS-860B55-2P1.

11. MPCS-212 Service Kit (See Sec. 1.3) ● ●

1.2.3 Blank Style EPROMs and PROM cards

Blank style data EPROMs for use with the In-Machine PROM Maker (IMPM) MPCS-450 or MPCS-384, or In-Machine PROM Copying.

See Sec. 2.0 for part numbers.

1.2.4 Pallets

NOTE

For additional pallet sensing targets, order MPCS-509 (see Par. 12.7).

1.2.4.1 Stitch areas for all the following pallets are defined as follows:

Regular	254.0 x 406.4mm (10 x 16")
Extended (long X) head	355.6 x 406.4mm (14 x 16") option

1.2.4.2 Join and Sew Pallet Kit - AJS-1280 (Regular Size)

A two-cavity leaf pallet kit for join and sew stitching, consisting of the main (bottom layer) pallet, a guide piece for holding workpieces in cavities, attachable to the pallet, plus two hinged leaves - one for workpiece cavities.

1.2.4.3 Extended Join and Sew Pallet Kit - AJS-774 (Long X Option)

A Long X version of the join and sew pallet kit.

1.2.4.4 Decorative Pallet Kit - AJS-1275 (Regular Size)

A kit of pallet parts which can be modified and assembled into a custom pallet for decorative stitching only.

1.2.4.5 Extended Decorative Pallet Kit - AJS-772 (Long X Option)

A Long X version of the decorative pallet kit.

1.2.4.6 ACS Pallet Adapter Kit - AJS-755

A notched strap attached by special dowel screws, washers and lock nuts to an ACS pallet, which then fits in the AJS X-Y positioner. See Par. 8.18.

1.2.4.7 The adapter studs for both the ACS pallet adapters are available as replacement parts. Each adapter uses one of each.

Round Stud	AJS-282	Washer	MH616A12
Slabbed Stud	AJS-283	Nut	MH603A12

1.3 SERVICE KIT - MPCS-212

It is mandatory to have one service kit available at each site to do service and repair work. The service kit consists of the following:

1.3.1 Calibration Pallet - AJS-1157; Calibration Pin - ACS-483; Needle Bar Calibration Plate - ACS-5070

NOTE

AJS-1157 has a width of 342.9mm (13.5"), which is slightly less than the full width capability.

If the extended head (Long X) option MPCS-460 is ordered, its wider calibration pallet AJS-321 is substituted for AJS-1157.

1.3.2 Test Pallet - AJS-1156 (not sent unless ordered)

NOTE

AJS-1156 has the same width as the AJS-1157 calibration pallet.

This open-frame pallet can be used with taped-on materials to check out stitching and patterns. If the extended head (Long X) option is ordered, its wider test pallet AJS-200 is substituted.

1.3.3 Special Tools and Gauges - ACS-410

Gauges, etc. to make sewing machine adjustments easier and faster.

1.3.4 Blank EEPROM (Electrically Erasable/Programmable PROM) - XE870L21

Substitute in socket XU-64 on the B86 board if the I.C. should ever reach its maximum writing capability (ERR 82 displayed), also if the access passcode has been changed by the user and forgotten, in order to put a usable passcode on the EEPROM.

1.3.5 Anti-static Electricity Parts - XE869A1 (Wrist Strap), XE869B5 (Bag)

For handling static electricity-sensitive printed circuit boards or components.

1.3.6 Goldwipes - PC Board Contact Cleaning Pad - XE869D1

A disposable cleaner/lubricator pad for contacts on printed circuit boards.

1.3.7 Door Lock Tool - MPCS-228

1.4 OPERATOR CONTROL PANEL (See Fig. 1.1)

NOTE

Complete instructions for the use of machine functions, including those controlled by this control panel, are given in Sec. 6. Below are given abbreviated explanations of what the various controls do.

START (2A1S1)

When this switchlamp is depressed, its lamp lights and starts the sequence of events that comprise one workpiece stitch cycle, i.e.:

a. Slew from pallet transfer position to first stitch.

b. Lower presser foot.

c. Stitch pattern segments separated by slews.

d. Cut threads after each segment.

e. Return slew to pallet transfer position and, if another pallet is loaded, initiate the transfer and next cycle.

If this switchlamp is lit, it does not need to be pressed to initiate cycles after the first start, so long as the next pallet is loaded before the previous one has been ejected.

This switchlamp is also used to restart after a stop, backstep, forward step, or programmed pause for thread change.

The switchlamp stays lit while the machine is stitching.

STOP (2A1S9)

When this switchlamp is depressed, the machine stops, its indicator lamp flashes, and the display shows "PAUSE".

It is depressed if the operator wants to check the stitching quality. Depressing START allows stitching to resume from the stop point.

Every time the machine stops stitching, the threads are cut and the presser foot is lifted.

If the machine stops due to a programmed pause for thread change, this switchlamp flashes and the display shows, briefly, "THREAD" followed by "CHANGE". Similarly, it may stop for "PART CHANGE".

REV (Reverse) (2A1S20)

This switch provides several functions:

a. Enables operator to backstep to a preceding stitch following a thread break. When it is depressed, the pallet will traverse backwards until the switch is released (or the pallet reaches the load point). If the operator has pushed the pallet away for easier bobbin access, this switch will first move it back to where it had stopped.

b. Steps the workholding positioner backwards through the pattern following pause (from depressing STOP during stitching or pattern stepping).

c. Moves the pallet right in the calibration test.

FWD (Forward) (2A1S19)

This switch also provides several functions:

a. Enables operator, after a STOP, to forward step (pattern step without stitching) until the switch is released or the pallet reaches the load point.

b. Initiates the pallet load and inward slew action from the load (pallet transfer) position, one sequence action for each depression of the switch. Thereafter, enter into the pattern and start stepping.

c. Moves the pallet left in the calibration test.

FAST (2A1S21)

Whenever this switchlamp is lit (which occurs on power up), the forward or reverse stepping is at a faster rate. Depressing it alternates its on/off status and light condition.

EXIT (2A1S16)

Continuous forward motion, at speed set by "FAST" (it need not be held in). Depress "STOP" to stop motion.

UP (2A1S7)

This switch generally produces increasing displayed numbers, in several modes:

a. Assigns the first file or size when a pallet with an unassigned code is loaded and sensed, a single press displaying the first valid number.

b. Increments number displays of file, "bobsen", "cutsen", AFI sequences, test number and pass code; also thickness and dwell for editing - once for each push, or continuously if held in.

c. Advance to the next valid number for the display of size.

d. Increments by multiples of 100 the display of speed ("SPM") for editing.

e. Moves the pallet rearward in the calibration test.

DOWN (2A1S15)

This switch generally provides the opposite effects to the UP switch.

a. Unassigns (cancels) a file or size to the pallet loaded and sensed.

b. Decrements number displays of file, bobsen, cutsen, AFI sequences, test number, and pass code. For thickness and dwell, once past zero, increments the display of a negative number.

c. Returns size to the previous lower valid number.

d. Decrements speed by multiples of 100 for editing.

e. Moves the pallet forward in the calibration test.

MENU

The menu is the preprogrammed, ordered sequence of prompts (displays) used for setup, editing, PROM-making and utility functions. The NEXT, DO, and RESET keys change display location within the menu. See Fig. 6.1 and Sec. 6 for details.

NEXT (2A1S5)

This key permits operation of various control functions preprogrammed in the menu. In general, NEXT indexes down a list of items in the menu. Selects all but last files for AFI sequences.

DO (2A1SS6)

In general DO initiates action of the selected item. Also selects last files for AFI sequences.

RESET (2A1SS4)

Each depressing of RESET, in general, raises the manu pointer back up to the previous level before DO or NEXT was depressed.

DISPLAY, UPPER

Eight 14-segment alphanumeric characters for use with selecting sizes or files, editing files, displaying stitching speed, changing setup conditions, diagnosing problems, etc. In autosize or autofile mode, the machine's "idle status" display is "P" plus the specific preprogrammed pallet codes 1 through 7. After assignment and when, for example, a "code-1" pallet is sensed, the display shows:

"P1 S 5" for size 5 in autosize mode.

"P1 F 1" for file 1 in autofile or manual file mode.

DISPLAY, LOWER

Eight light-emitting diodes (LEDs) have several uses:

- Indicate which pallet codes, 1 through 7 (see above) have been assigned (leftmost LED not used in this mode).
- File test.
- IMPM usage (leftmost one always on, others indicate status as shown in Fig. 1.1 and Appendix F).

BOB'N (THREAD DETECTOR) (2A1S14)

This switchlamp serves two functions:

a. Its light flashes when the bobbin runs out of thread, the bobbin thread is pulled too high in the material, the needle breaks, or there is a failure to form stitches. In each case the machine will stop, the STOP light will also flash, and the START light will extinguish. The display becomes "BOBBIN", and the buzzer sounds.

b. As the switchlamp is depressed it alternately disables the detector (lamp lit) and enables the detector (lamp out).

CAL (Calibrate) (2A1S22)

This switch initiates automatic table motions which synchronize the table position with the data on a pattern PROM. The calibrate button may be used at any time during the stitch cycle when the machine has been stopped to return quickly to the start of the pattern. However, care should be taken to assure that the presser foot will not be hit by a pallet clamp.

FOOT DOWN (2A1S12)

This switchlamp permits the operator to manually raise and lower the sewing machine presser foot independent of the computer controlled sequence. This switch function would be typically used when changing the needle or manually turning the handwheel, when the machine is in a stopped condition. It is lit whenever the presser foot is down.

CLAMP (2A1S13)

This switchlamp releases the pallet to permit the operator to lift it out and inspect the bottom of the workpiece or change pallets after a programmed or manual STOP. The light is on whenever the clamp is applied.

Second functions of certain switches - IMPM mode only:

As shown in Fig. 1.1 the sixteen switches at the right are designated as a 3 x 4 keypad for convenient, fast inputting of digits 0 through 9, and the ENTER and CLEAR functions. This usage only applies for IMPM and related edit uses.

SPEED ADJUST KNOB (2R1)

The potentiometer knob enables the operator to proportionately reduce by a counter-clockwise rotation all sewing machine speeds below the optimum values determined by the machine's computer.

BUZZER (LS1)

Sounds at various times to acknowledge completion of certain procedures (such as reading and digitizing), or to attract attention of the operator, such as for a bobbin monitor stop or an error.

POWER/READY (2S1)

Turns machine power on and gives an indication the machine is ready. If a table limit switch is actuated, the (lower) "ready" lamp will go out, but not the (upper) "power" lamp; then the POWER/READY button must be pushed once again to light the "ready" light and reset the controls.

POWER OFF/EMERGENCY STOP (Red Button) (2S2)

Turns the machine power off.

Causes immediate motion stop.

1.5 MACHINE FRAME SWITCHES AND VALVES

MAIN POWER ON/OFF CIRCUIT BREAKER (CB6):

This circuit breaker, located outside at the rear of the machine, disconnects all power to the machine. Any program in computer memory is lost.

NOTE

Other circuit breakers, located inside the machine, are covered in Par. 9.2.

AIR ON/OFF VALVE (25):

This 1/6-turn detented valve, located at the air inlet at the right end of the machine below the operator's control enclosure, feeds pressurized air to all pneumatic subsystems.

1.6 TECHNICAL DATA

Sewing Head	Modified Pfaff model 483-650/44 CL-900/99
Sewing Head Drive	Non-contact magnetic clutch plus brake
X-Y Positioner Drive Motors	Low inertia DC Servo type
Media (Data Input)	EPROM or EPROMs (4 maximum) on PROM card, all same type of EPROM
	See Par. 2.1 for part numbers and details.

Computer	Intel 80186; program in four 32K x 8 EPROMs.
Files	32 maximum - PROM card or computer memory
Sewing Area	254.0mm (10") X axis x 406.4mm (16") Y axis; 355.6mm (14") X axis x 406.4mm (16") Y axis with the extended sewing head option
Maximum No. of Stitches	In a File.....32,000 On a PROM Card or in Computer Memory...32,000
Stitch Length	1.27mm to 6.35mm (4 to 20 SPI).
Minimum Table Move	(determines resolution as sewing direction changes): .0635mm (.0025")
Sewing Speed	Up to 2500 stitches/min., automatically determined by the computer control, or programmable, and variable within any pattern.

Thread cutting is done at 180 rpm needle positioning speed.

Slew Speed	38 cm/sec. (15"/sec.)
Workpiece Materials	Normal shoe materials

Maximum Material Thickness:

4.5mm (0.18"); 10mm (0.38") and up to 16mm (0.62") for compressible materials with the high-lift eccentric presser foot option.

Maximum Variation within a Combined Piece:

1.5mm (0.06"); 5mm (0.20") with the high-lift eccentric presser foot option. NOTE: These maximum variations cannot occur with the maximum material thickness due to needle blade and presser foot extension limits.

Unique Pallet Codes: 7

Pallet Sensing Range: 6 mm (¼") to 18 mm (3/4")

Threads:

1. Cotton.....20/4 and Thinner
2. Silk.....B, C and D
3. Nylon, Polyester....80, 60, 40 and 30 metric (33, 46, 69 and 99) standard, up to 13 metric (207) with cable stitch option

Needles - Size and Point Types

Examples: 134D100, 134-35R90

Basic type required for the 483 machine:

134 or 134KK (regular length)
134-35, or 135x16 (long length)

Shape of Points:

Triangular point (1st preference for leather)	D (TRI for 135x16 length)
Small round	R
Round (for plastic materials)	RS
Narrow wedge, straight	Ps
Narrow wedge, right twist	PCr
Narrow wedge, left twist	PCl
Diamond point	Di
Others available	

Needle Size (diameter): 90, 100, 110 most commonly used; (50 through 200 available)

Bobbin Size: W (P, I, L optional)

Machine Height (Floor to Work Surface at Left Front): 99.7 to 108cm (39.2 to 42.9")

Floor Space (length & depth): 155 x 110cm (61" x 43")

Pallet Weight: Standard 0.7kg (1.5 lbs.) min. (With Work Material). 2.3kg (5 lbs.) max.

Extended Throat Sewing Head Option 2.7kg (6 lbs.) max., best accuracy; 3.0kg (6.6 lbs.) max. possible, accuracy may degrade slightly (see Appendix G)

Electrical Service (order must specify):
Regulated to with ±10%. See Fig. 13.2.

Standard:	230V, 1 phase, 15A, 50-60 Hz
	208V, 1 phase, 15A, 50-60 Hz
Other Taps:	240V, 220V
	195V (Low 208 Tap)
Optional:	380V, 1 phase, 7.5A, 50-60 Hz
	414V, 1 phase, 7.5A, 50-60 Hz
Other Tap:	400V

Pneumatic Requirements (filtered dry air): The air supply must not exceed 860 kPa (125 psi).

Up to 50 liters/min. (2 SCFM) using the needle cooling. If not, then 3 liters/min. (0.1 SCFM), or specifically, 0.7 liters/cycle (0.03 SCF/cycle) at 450 kPa (65 psi) with pallet transfer and movable throat plate.

Environmental Temperature: $10^{o}C$ to $32^{o}C$ ($50^{o}F$ to $90^{o}F$)

Relative Humidity: 30% to 90% without condensation

Shipping Weight: 700kg (1500 lbs.)

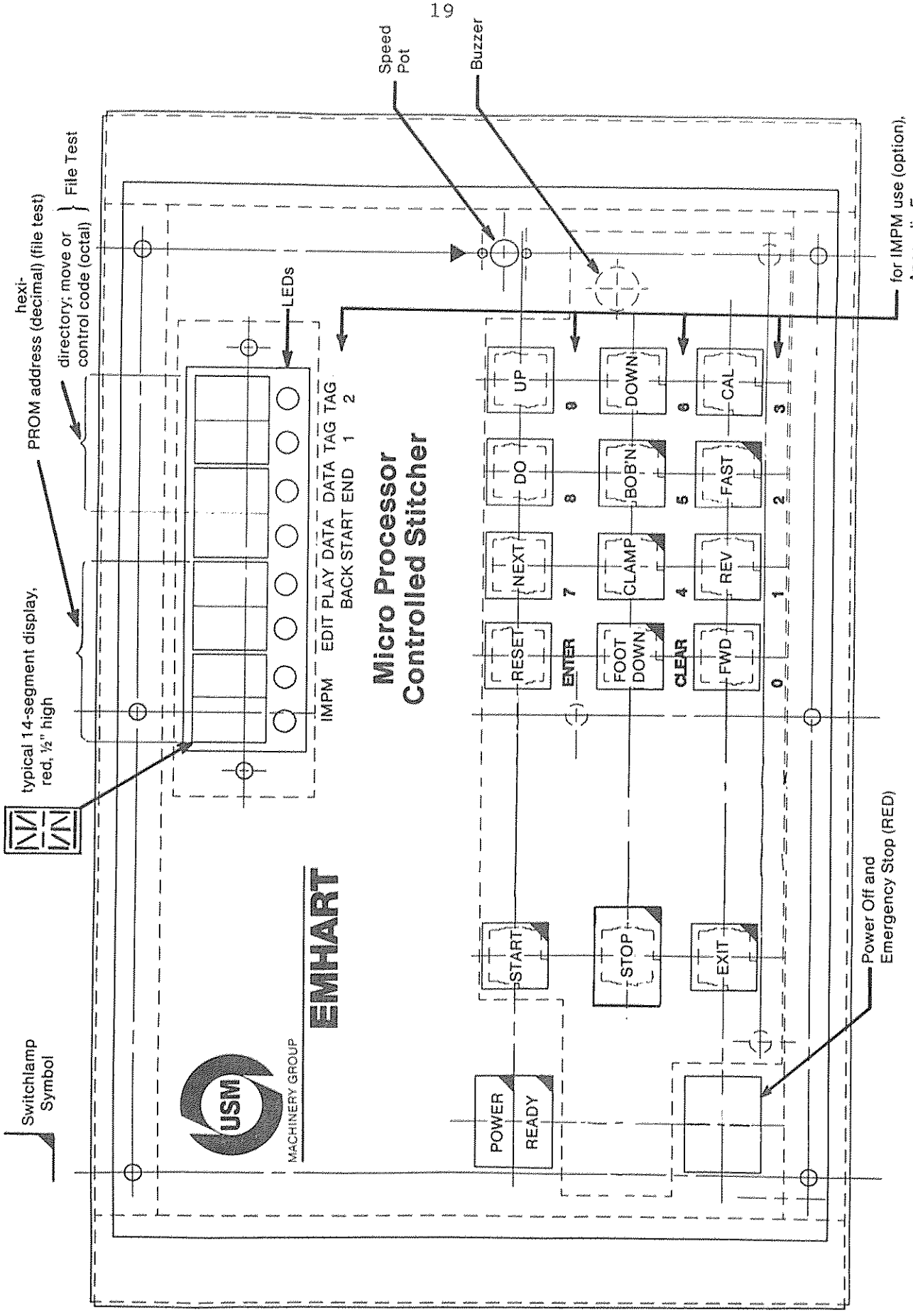


Figure 1.1

OPERATOR CONTROL PANEL

2.0 PROM CARDS AND PALLETS

2.1 PROM CARDS

2.1.1 Description

The stitch pattern style data for the MPCS-A are stored in EPROMs mounted on a printed circuit board ("PROM card"). A maximum of 32,000 stitches can be accommodated on one PROM card. The operator can select any one of up to 32 patterns (or files) from the PROM card, providing that the total number of stitches does not exceed 32,000.

Capacity of the regular four-EPROM-socket PROM card (P.N. MPCS-860B83-4) is as follows. This card does not contain EPROM blanks, which must be ordered separately as shown. EPROM types cannot be mixed on a card. The switches on the board must be set as shown in Fig. 2.1.

QTY	SIZE	EPROM P.N. INDUSTRY	EPROM P.N. USM	S1 SWITCH SEGMENT SETTINGS 1	2	3	4**	MAX NO. OF STITCHES
1	4K x 8	D2732	XE870L6	ON	OFF	OFF	OFF	2000
1		D2732A	XE870L13	ON	OFF	OFF	ON	2000
1	8K x 8	D2764	XE870L14	OFF	ON	OFF	OFF	4000
1		*D2764A	XE870L16	OFF	ON	OFF	ON	4000
1	16K x 8	D27128		OFF	OFF	ON	OFF	8000
1		*D27128A-2	XE870L19	OFF	OFF	ON	ON	8000
2	4K x 8	D2732	XE870L6	ON	OFF	OFF	OFF	4000
2		D2732A	XE870L13	ON	OFF	OFF	ON	4000
2	8K x 8	D2764	XE870L14	OFF	ON	OFF	OFF	8000
2		*D2764A	XE870L16	OFF	ON	OFF	ON	8000
2	16K x 8	D27128		OFF	OFF	ON	OFF	16000
2		*D27128A-2	XE870L19	OFF	OFF	ON	ON	16000
3	4K x 8	D2732	XE870L6	ON	OFF	OFF	OFF	6000
3		D2732A	XE870L13	ON	OFF	OFF	ON	6000
3	8K x 8	D2764	XE870L14	OFF	ON	OFF	OFF	12000
3		*D2764A	XE870L16	OFF	ON	OFF	ON	12000
3	16K x 8	D27128		OFF	OFF	ON	OFF	24000
3		*D27128A-2	XE870L19	OFF	OFF	ON	ON	24000
4	4K x 8	D2732	XE870L6	ON	OFF	OFF	OFF	8000
4		D2732A	XE870L13	ON	OFF	OFF	ON	8000
4	8K x 8	D2764	XE870L14	OFF	ON	OFF	OFF	16000
4		*D2764A	XE870L16	OFF	ON	OFF	ON	16000
4	16K x 8	D27128		OFF	OFF	ON	OFF	32000
4		*D27128A-2	XE870L19	OFF	OFF	ON	ON	32000

*PREFERRED DUE TO SIX TIMES FASTER PROGRAMMING CAPABILITY (18 SEC. PER 1000 STITCHES VS. 111 SEC. FOR THE OTHERS).
**ONLY NECESSARY WHEN PROGRAMMING. DO NOT MIX PROMS ON A BOARD.

The EPROMs listed are all UV erasable types.

The MPCS-860B83-4 card with one to four EPROMs is also used when programming in the IMPM process (Appendix F).

The AFS-860B54 PROM card, when containing D2732 or D2732A EPROMs, is also readable and can be used for stitching (but not for IMPM).

When a B83 PROM card is supplied with stitch pattern data recorded thereon by USM, its part number is an assigned number in a series starting with MPCS-M2000.

2.2 JOIN & SEW STITCH PATTERN PROM CARD MAKING

This procedure establishes the method by which a manufacturer may order join and sew stitch pattern PROM cards from USM Corporation. See Fig. 2.2 (back).

Where to Order:

USM CORPORATION
181 Elliott Street
Beverly, MA 01915

ATTN: Automatic Systems
Cassette Center

Stitch Design Data Package

1. Requisitioner - Company, date, style name or number - self-explanatory.

2. Size Tariff - The size run (tariff) must be divided into die breaks for MPCS stitching. For example:

   a. Assume size run 6-12.

   b. Assume MPCS stitching held for 6-9 and 9½-12. Therefore, this example is a two-die break specified as 6-9 with 8 as the model. It is important to realize that the stitch lines are held to the specified die grades.

3. Lasting margin - When programming the cassette, we generally start stitching in the last margin. Therefore, the lasting margin is required to establish the range of sizes to start/stop stitching.

4. Stitch length (the stitch density): mm/stitch or stitches/inch (SPI).

5. Stitch Margin - The distance from the edge of the part to the stitch line. For best MPCS operation, this should be a minimum of 2.15mm (0.085"). Optional narrow edge stitching is 1.5mm (0.060").

6. Spacing - additional rows. If more than one row, the spacing between the rows must be specified.

NOTES

General notes that should be made in the Join and Sew Drawing.

a. Backstitches at start and end of stitch lines.

b. Stitch direction and sequence - how the pattern should be sewn.

Also, paper patterns for each size are required for digitizing purposes. In the event USM is to customize pallets, we also require approximately twenty (20) pair from each die break to check pallets.

2.3 DECORATIVE STITCH PATTERN PROM CARD MAKING

A manufacturer may order decorative stitch pattern PROM cards from USM Corporation (address given in par. 2.2). A written form is available on request.

2.4 REORDERING STYLE DATA PROM CARDS

Reorder by USM Corporation's assigned number, starting with MPCS-M2000.

2.5 COPYING EPROMS

By substituting the optional MPCS-860B89 P.C. board (with power off) for the B84, being sure to attach both brackets by screws at top and bottom, it is possible to copy EPROMs. The IMPM joystick box and interconnecting cable W4 are not needed.

The procedure is as follows. (See App. F for the IMPM if further details are wanted.)

1. Put the EPROM(s) to be copied into the B83 card with the lock ON.

2. With the menu access set to FULL, use NEXT to select IMPM, then DO. All the 12 switches at the right end of the control panel have different functions as shown in Fig. 1.1; also shown on the control panel itself, below the switches.

3. Enter the appropriate one of the following 3 action code commands.

Purpose	Keys	Display
If copying a stitch PROM	2,8,ENTER	"READ AS" (all stitch files)
If copying a digitized file PROM	2,9,ENTER	"READ AD" (all digitized files)
If copying a specific digitized file	3,0,File #, ENTER	"READ _ _"

NOTE

In some cases when using code 28, at the end of reading, a non-existent extra file number and/or ERR 23 may be displayed. However, the true files should have been read properly. Also, table motion occurs with code 28.

4. Remove the card and put the EPROMs to be programmed in the same or another B83 PROM card. If more than one EPROM is used, the specific EPROM type must be the same, and the switch on the board must be set for the specific type, including the "A" designation when it applies (see par. 2.1.1), but the EPROM type need not be the same as the type copied from.

5. Be sure to lock the erased EPROMs in their sockets by sliding the locks to expose "ON".

6. The data may be written to blank EPROMs, or appended to partially written EPROMs provided that the directory allows for additional files. All IMPM-made PROMs allow for the maximum of 32, but Style-Center-made PROMs may have only a few or no empty files.

CAUTION

Do not append files with different size schemes than are already programmed for the PROM card files.

7. Enter the appropriate one of the following action code commands.

Purpose	Keys
Program all stitch files	20 ENTER, ENTER
Append all stitch files	21 ENTER, ENTER
Program the current stitch file	22 (File #), ENTER, ENTER
Append the current stitch file	23 (File #), ENTER, ENTER

Purpose	Keys
Program all data (digitized) files	24 ENTER, ENTER
Append all data (digitized) files	25 ENTER, ENTER
Program the current (digitized) file	26 (File #), ENTER, ENTER
Append the current (digitized) file	27 (File #), ENTER, ENTER

When ENTER is pressed the first time, the display shows the quantity of EPROMs needed (1 to 4) and the type of EPROM selected by the B83 switches. Make sure that all the required EPROMs are inserted. The second time ENTER is pressed programming begins with the display showing the specific EPROM (1-4) being programmed (at the left), and the ascending address of the byte within that EPROM being programmed. The buzzer will sound at the completion of programming.

When appending is commanded, the display is momentarily "READING" while the controls determine at what address to start writing the files which are appended.

If an error is detected, an error code will be displayed, and the buzzer sounds 3 times. The display is cleared by pressing the CLEAR key.

The most likely errors are:

20 EPROM blasting verification error
21 EPROM address out of range
22 EPROM type selection is invalid
23 File checksum error
24 Directory format error

a1 Invalid action code

b8 No available files
b9 Directive illegal in this mode
ba Digitized file empty
bb Record not found
bc Cannot go to record in this mode
bd Stitch file empty

c1 EPROM not erased
c2 Invalid stitch data EPROM
c3 No digitized data to write
c4 No stitch data to write
c5 Invalid digitized data EPROM
c6 EPROM erased

c7 No file to read
c8 Too many files for appending
c9 EPROM capacity exceeded

d0 Invalid stitch data EPROM
d1 Stitch data buffer full
d3 Stitch assignment checksum error
d4 Stitch length too long

If other error codes are displayed, see App. F.

8. When copying is complete, enter 0, 9, ENTER to return to normal machine operation.

CAUTION

If it is desired to connect the joystick enclosure to digitize, step 8 must be done to obtain the necessary recalibration.

2.6 PALLETS

Pallets may be ordered from USM Corporation or made by a manufacturer from standard parts supplied by USM Corporation in kit form. Part numbers for kits are given in Sec. 1.2.4.

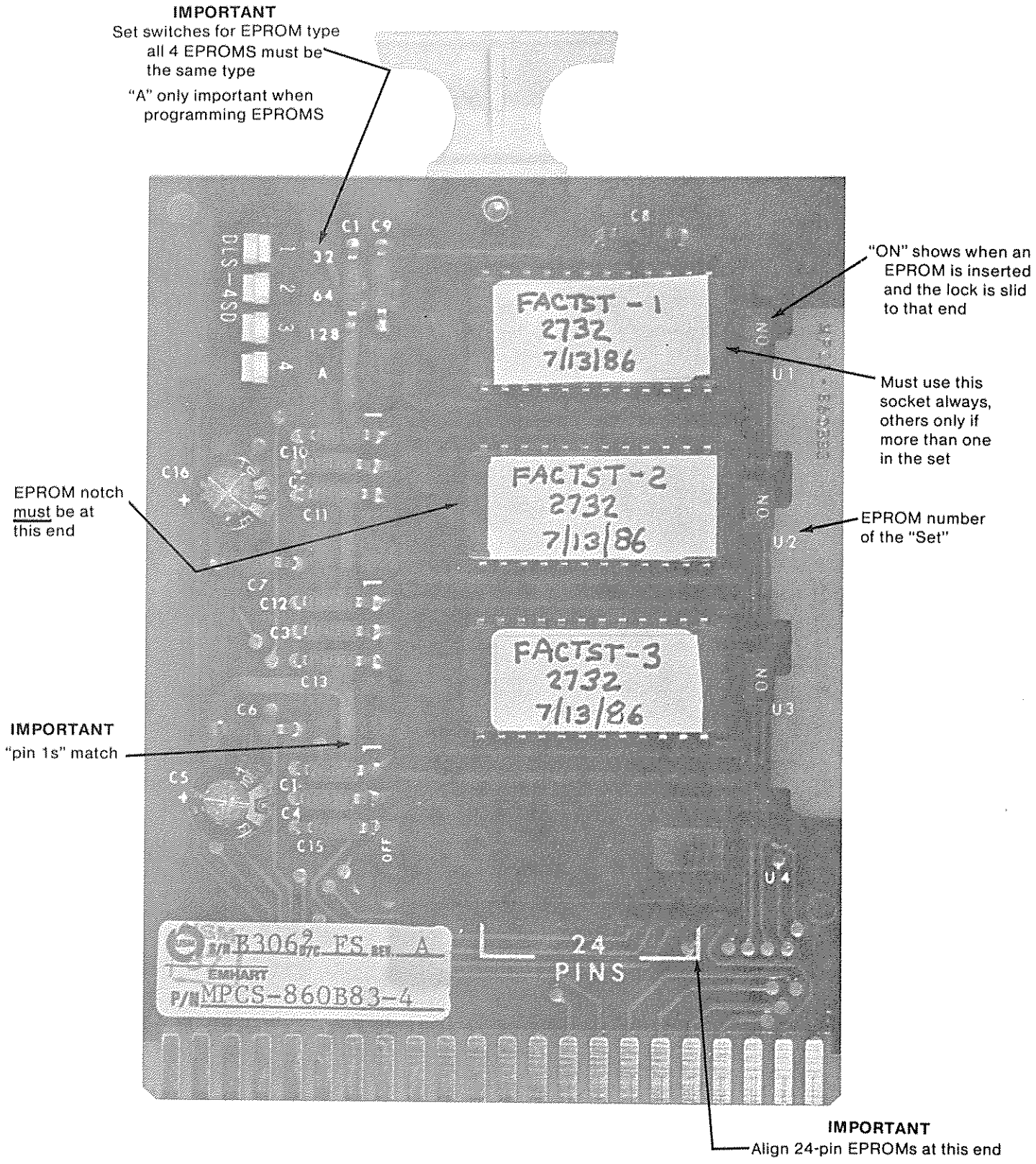


Figure 2.1 Prom card
MPCS-860B83-4

3.0 INSTALLATION PROCEDURE

3.1 GENERAL

SEE PARAGRAPH 6.1, SAFETY INSTRUCTIONS BEFORE INSTALLING.

The leveling screws may be extended to accept lifting forks which do not fit into the channels. The machine should be installed level and with adequate space provided on all sides for operation maintenance and service. In particular, leave 70 cm (27") on the rear, 15 cm (6") on the left side for air flow, and 20 cm (8") on the right side for air flow and access to the filter and the lubricator, and also to the air solenoid valves (behind the right cover). Some sewing head maintenance is more easily done from the rear of the machine, so a convenient passageway to the rear should be provided.

The filter/regulator/lubricator assembly may have been shipped non-assembled to the machine. If so, attach it to the right side of the pedestal underneath the operator's control enclosure, using the two screws in the mounting holes. The following reconnections of tubes to fittings may then be necessary. When done, the tube code numbers on both tubes and fittings should match. (See Fig. 10.1.)

Connect tube code #102 to the port at the lubricator outlet tee.

Connect tube code #124 to the straight fitting between the lubricator and the filter/regulator (thus supplying oil-free air to the needle cooler). The air blow gun should already be connected at this junction.

Rotate the operator's control enclosure 45^{o} to the right from the inward shipping position by first loosening the two locking screws underneath it, then tightening them again.

Later versions have a tilt bracket permitting the control panel to be tilted back up to 30^{o} for better visibility.

Attach the thread stand in its support.

Remove the X-Y table positioning shipping clamp and the four shipping spacers beneath the shock-mounted main base casting.

3.2 ELECTRICAL REQUIREMENTS - See Electrical Power Distribution Elementary Diagram (Fig. 13.2).

Since both the front and rear doors enclose high voltage electrical parts, they each have tamper-proof locks that require the use of a special tool for opening (supplied with each machine).

Electrical power requirements are 230 volts $\pm$10%, single

phase, 50-60 Hz, 15 amp service. Incoming power connects to CB6. There are two transformers following CB6:

Main T1 has, besides 230, alternate primary taps as follows:

208 volts for such service,
240, 220 and 195 volts for voltage variations.

Stitcher-drive transformer, T2. The regular T2 has a 230 volt primary tap plus 460 and 575 for those unusual services.

If 208 volt service is to be used, an alternate T2 transformer should have been specified and supplied. Its primary voltages are 208, 277 and 380 volts.

380/414 foreign voltage service alternate. When this alternate is ordered, the following part substitutions are made, providing 50-60 Hz, 7.5 amp service:

Main transformer, T1, has primary taps of 380, 400 and 416 volts.

Lower current, higher voltage main curcuit breaker.

For a 414 volt service, the T2 transformer secondary connection is changed from the normal 115 to the alternate 95 volt tap, and the 414 volt line is connected to the 380 volt primary tap.

Contactor coil 50 Hz alternate. When 50 Hz service will be used, the coil in the ED-11011 contactors are changed.

CAUTION

Electrical power supply must be maintained with ±10% of the nominal voltage.

The electrical supply connection to the machine should be made by a competent electrician.

CAUTION

Before connecting power to the machine, the rating on the rear door should be checked for requirements.

3.3 PNEUMATIC REQUIREMENTS

With all options approximately 60 liters/min. (2 SCFM) at 450 kPa (65 psig), filtered dry air is required. However, the largest part of this flow is for the needle cooling, and the value depends upon how much throttling is done with the integral needle valve. Without needle cooling, the flow requirement with the other options is no more than 3 liters/min. (0.1 SCFM).

Air supply pressure must not exceed 860 kPa (125 psig).

CAUTION

This machine should not be installed in an air system which has a compressor using fire-resistant lubricating oil. These oils can be harmful to pneumatic components in this machine.

3.4 ENVIRONMENTAL REQUIREMENTS

Temperature and humidity of the room should fall with 10 to 32°C (50 to 90°F) and 30 to 90% relative humidity without condensation.

3.5 ADJUSTMENTS AND SETTINGS

3.5.1 Various setting and statuses of machine functions are selectable via the menu and maintained by being stored in the EEPROM memory chip on the B86 digital controller board.

Some of these, relating to specific use of the machine (calibration mode, operating mode, bobbin and not-cut sensitivity, and part count), are covered later in Sec. 6.

The factory ("machine") calibration of the X and Y axes would also have been established during USM setup. This should not need changing unless a new servo motor-encoder is substituted or other parts added which could affect the calibration. A special "pallet calibration" feature is provided to handle pallet errors or work material variations. (See par. 7.9.)

Others relate to what options might be installed and should have been preset in the USM factory as follows:

- The moving throat plate, with its "anti-flag" bottom button, requires that the "button" status be set to "yes". If set to "no", the X-Y positioning table will not dwell long enough for the extra time that the needle must spend within the work material raised by the button.

- If manual pallet handling is substituted for the automatic pallet transfer, the "transfer" status must be set to "disabled".

- If In-Machine PROM making is supplied with optics (normal), the "optics" status is set to "yes", whereas it must be "no" if needle digitizing is used.

- The display language should have been set to agree with whatever language is supplied for the keycaps.

The menu should have been set for "full access" to display all statuses, etc., but the user may want to change it to "limited access".

If it is necessary or desired to change any of the above statuses, this is easily and rapidly done as explained in the next section.

3.5.2 Changing a status.

3.5.2.1 Turn on the machine. (Sec. 6.3)

3.5.2.2 Following Fig. 6.1, which diagrams the complete main menu, use the NEXT and DO switches in the proper sequence to display the desired status and change it as desired.

NOTE

Despite the "HIT CAL" display, it is not necessary to press the CAL switch in order to access the menu. Just press NEXT to go on.

If the machine should happen to be in the limited menu access mode in order to check or change statuses, it is necessary to change it to full menu access. The procedure is given in Sec. 6.4.

3.5.3 Dipswitch (S1) on the B86 board.

If the Extended Throat Sewing Head option is installed, the leftmost (#1) segment of the S1 dipswitch, located at the middle left side of the B86 board, must be set in the up position. If a regular-head machine, it must be set down. Totally incorrect operation will result if this is not done.

3.5.4 Lubricate the machine as instructed in Section 4.

3.5.5 Check all sewing machine adjustments. See Sections 7 and 8.

3.6 PALLET-WEIGHT HEADERS (Compensation)

Near the bottom right part of the B86 board are compensation parts involved with the servo controls of the X-Y positioner's two axes: two "pallet-weight headers". These are subassemblies of resistors and capacitors, different for each axis. The particular R-C components needed for the pallet

weight being moved are selected by the settings of the adjacent switch on each board. See Fig. 11.4.

Header		Pallet Weight Range (includes workpiece)		Intended Usages
Axis	Part No.	kgs.	lbs.	S3 Segment Settings
X Y	AJS-743 AJS-742	0.7-1.5 (light weight)	1.5-3.5	1+2 ON, 3+4 OFF for Decorative (Cowboy) Work
		1.5-2.3 (medium weight)	3.5-5.0	1+2 OFF, 3+4 ON for Join and Sew Work

Headers are factory installed, switches set according to intended usage (orders should specify) and the board fully tested in the machine.

The Y header for the extended throat sewing head option is different. See Appendix G.

If necessary to install a different header, gently pry up the displaced one from the socket. See that the number 1 pin of the header is aligned per Fig. 11.4. The arrows on the covers should point to pin 1.

3.7 INSTRUCTIONS

Instruct the operators in the safety instructions, Par. 6.1; also proper operation and operator's adjustments, Sections 6 and 7. Instruct the service personnel in their responsibilities. Serviceman's adjustments are given in Sections 8 and 9. However, many other sections of this manual are pertinent to their needs.

3.8 STATIC SENSITIVE PC BOARDS

CAUTION

Special precautions must be taken when handling the following printed circuit boards which are static electricity sensitive.

LOCATION

Inside front door	MPCS-860B86	Digital controller
	MPCS-860B84	PROM card interface
	MPCS-860B89	IMPM interface (option)
Inside sewing machine drive enclosure	MPCS-865B95	Logic
	MPCS-865B96	Speed control
On pallet identification mechanism	AJS-860B88	Sensor

NOTE

The complete part numbers are not included in the above list. When ordering printed circuit boards, the complete part number, including the dash number, must be used. Numbers should be verified by examination of the boards in the machine. Include any "REV" letter. See Fig. 11.1, Software Identification and Calibration Card.

4.0 LUBRICATION

4.1 LUBRICATION SCHEDULE

The lubrication requirements are also included in the Master Maintenance Record Sheet of Paragraph 5.9, Figure 5.1.

MECHANISM	8 HR.	50 HR.	200 HR.	1000 HR.	2000 HR.	NOTES
Pfaff Sewing Machine Automatic System	USM150B					1,2
Presser Foot Mechanism	USM150B					1,3
Racks & Pinions ("X" & "Y")		USM150B				1,4
Shaft, Linear Ball Bushing		USM150B				1,4
Rails, "X" Axis Guide		USM150B				1,4
Felts, Shaft & Rail Wipers		USM150B				1,5
Gears, "X" & "Y" Axes Gear Reducers					USM300SL36	1,6
Air Lubricator			USM100CKR			1,7
All Other Mechanisms	USM150B					1,8
Motor, Stitcher Drive						9
Motor, X-Y Positioner, Servo						9

Figure 4.1 Lubrication Chart

NOTES:

1. See Appendix A for commercial equivalents or Pfaff oil 280-1-120 110.

2. See Section 4.2, 4.3, 4.4 and 4.5,

3. Remove the presser foot linkage cover. Apply oil to all the pivots and joints inside as well as outside the cover area.

4. Clean and apply a light film of oil.

5. Saturate felts with oil.

6. Clean and apply grease to the flanks of the gear teeth.

7. Shut off line pressure when refilling or cleaning lubricator bowl.

   Use the instructions of Section 5.2 for cleaning instructions.

   Refill when the oil level drops to about 1/4 full.

   For adjustment of lubricator, see Paragraph 4.6.

8. Apply a few drops of oil to all the moving joints and sliding surfaces not covered above.

9. Lubricated for life of motor.

4.2 SEWING MACHINE LUBRICATION SYSTEM

The Pfaff sewing machine has an automatic lubricating system to lubricate critical machine items. It is supplied by a reservoir located on the post. Check the oil level and, if necessary, fill the reservoir through the hole until the oil level is in line with the upper mark. Do not allow the oil level to drop below the low level line. Use USM 150B, Pfaff #280 1-120 110 or equivalent oil. See Appendix A for commercial equivalents.

4.3 ADJUSTING THE OIL CHECK VALVE

1mm (0.040") gap between actuating pin A and valve rod B. (See Fig. 4.2.)

Adjusted by loosening screw D and moving valve C.

4.4 REGULATING THE HOOK LUBRICATION

After the machine has run at 1800 rpm for about ten seconds, a thin trace of oil should appear on a piece of paper held over the sewing hook.

Adjust by turning screw E. (See Fig. 4.2.) (Clockwise decreases amount of oil flow.)

4.5 HOOK LUBRICATION

Positioning the oil tube.

Oil tube F must be positioned exactly in the hole in the oil distributor ring. (See encircled view Fig. 4.2.)

Loosen screw B to re-position. (See Fig. 4.2.)

4.6 AIR LINE LUBRICATOR

The rate at which the oil is delivered to the pneumatic system depends upon the amount of porous bronze wick exposed to the air flow. This is set when the machine is assembled. Should it become necessary to adjust the oil delivery rate, the following procedure may be used. (See Fig. 4.3.)

There are three annular gauging rings machined on the wick. These are visible through the transparent bowl. The wick is inserted in a plastic packing nut whose bottom surface is used as a reference point. The wick should be inserted so that the reference point is within the length of wick marked by the three rings. Maximum lubrication is obtained when the lower ring is flush with the reference point. Minimum lubrication is obtained when the upper ring is flush with the reference point. The

machine is shipped with the middle ring flush with the reference point.

4.7 THREAD LUBRICATION

Some sewing conditions benefit from lubricating the top thread. This can be done by passing the thread through a commerical thread-lubricating felt box available as the AJS-797 option. It attaches magnetically to the top of the sewing head. Fill the reservoir as needed with WICO #52324 THREAD GUIDE or equivalent. To saturate the felts, occasionally vent the reservoir to permit air entry.

NOTE

Prelubricated thread should not be lubricated.

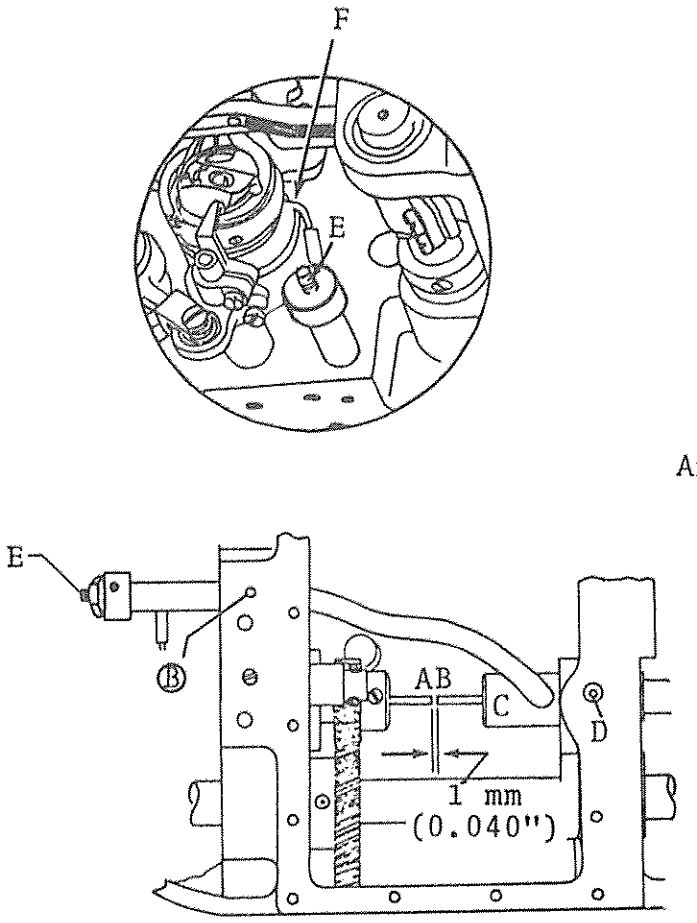


Figure 4.2 Positioning Oil Tube

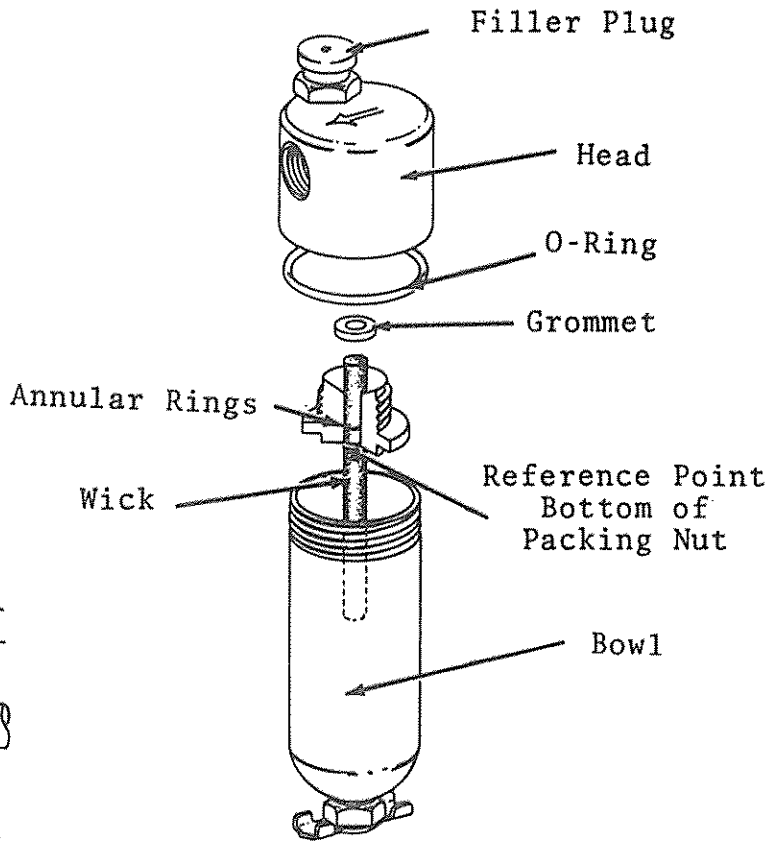


Figure 4.3 Lubricator

5.0 MAINTENANCE

5.1 CONTROL ENCLOSURE FAN FILTER

This filter prevents solid contamination from entering the electrical enclosures as cooling air is drawn in by the fan. It is located on the left side.

This filter must be cleaned before dirt impedes cooling air flow. Cleaning frequency depends on plant conditions.

Daily:

Clean the filter in place (without removal) with a vacuum cleaner.

Every 50 hours of operation:

Perform a more thorough cleaning as follows.

5.1.1 Turn off machine power.

5.1.2 Carefully remove the filter from its mounting.

5.1.3 Vacuum clean the frame to remove any dust dislodged by filter removal.

5.1.4 Clean filter with water and detergent; flush and dry before replacing.

5.1.5 Reposition the filter carefully to its original postion.

After 2,000 hours of operation:

Following water cleaning, the filter should be recoated with Research Products Corporation Super Filter Coat Adhesive.

5.2 AIR LINE FILTER

The air line filter removes water and solid contaminants.

To avoid filter clogging and assure proper operation, it should be drained and checked for solids collection at regular intervals. The frequency will depend upon environmental conditions of the particular air system.

After 50 hours of operation:

Drain collected liquid by turning the bottom knob with the air pressure still applied.

After 200 hours of operation:

Cleaning should be done more frequently (even weekly) if required by the condition of the plant air system. Clean the filter of collected solids, etc. as follows:

5.2.1 Turn off the air supply.

5.2.2 Remove the metal bowl guard.

5.2.3 Unscrew the bowl, remove and clean, using water and detergent. Do not use solvents which attack polycarbonate.

5.2.4 Inspect the filter element. If it appears necessary, remove and clean it with water and detergent.

5.3 BOBBIN AND HOOK

At least once per 8-hour work shift, remove the throat plate, then the hook assembly, and disassemble and clean the hook and bobbin parts. Use cleaning solvent, flush and dry. These parts need to be kept free of buildup of contaminants, mostly resulting from the work materials. In particular, the multi-layers of shoe parts are bonded together with a cement that could be carried into the hook assembly and impair proper sewing.

5.4 THREAD DETECTOR

Every 8-hour shift use a soft brush or air hose to remove lint, dust and oil from the photocell, wheel disk and other moving parts of the thread detector and tension assembly.

5.5 THREAD LINT REMOVAL

Every 8-hour shift, or as required, use the air hose to blow excessive thread lint from the sewing machine. Be careful to direct the air so that the lint will not be blown onto the X-Y rails or gears.

5.6 DC SERVO MOTORS

Every 1,000 hours, inspect the brushes and armatures of the X-Y positioner DC servo motors after removing dirt, carbon dust and all foreign material, preferably by a vacuum cleaner, to avoid blowing dirt, carbon dust or metal particles into the bearings and insulation.

These three motors each have four brushes, of which two are beneath the lead wire screws. After cap removal, the brushes are visible for inspection. Par. 9.5 covers the procedure for removing, inspecting and replacing brushes. Original brush

length is 12 mm (½"). A replacement is desirable when length is worn down to approximately half length (6 mm or ¼"). See Sec. 12.1 for brush part numbers.

If the brush wear rate increases noticeably after many years of sustained operation, it may be desirable to have the motors returned to the manufacturer for refinishing of the commutators.

Location of and access to motors:

Y (upper axis, moving) motor. Lift up the hinged cover.

Rear X (lower axis, fixed) motor. Some of its caps can be accessed by lifting the hinged cover; others require removal of the upper rear cover.

Front X motor. Remove the front work-surface table.

5.7 SCHEDULE OF PREVENTATIVE MAINTENANCE, INCLUDING LUBRICATION

The following summary list is also repeated in abbreviated form in the sample maintenance chart of Fig. 5.1. Pads of blank forms may be available from USM.

Every eight hours of operation:

1. Lubricate presser foot mechanism. (Par. 4.1, Note 3)
2. Check sewing machine oil level and fill if necessary. (Par. 4.2)
3. Lubricate all other mechanisms not covered elsewhere. (Par. 4.1, Note 8)
4. Remove the throat plate, and clean bobbin and hook with cleaning solvent. Flush, dry and lubricate. This is particularly necessary if the work materials cause cement buildup. (Par. 5.3)
5. Use air hose to remove dust, lint, and oil from thread detector and tension assembly. (Par. 5.4)
6. Use air hose to remove thread lint from sewing machine. (Par. 5.5)

Daily:

1. Vacuum clean the air filter located on the left of the main enclosure. (Par. 5.1)

Every 50 hours of operation:

1. Clean and lubricate the three racks and pinions. (Par. 4.1, Note 4)

2. Clean and lubricate the linear ball bushing shaft. (Par. 4.1, Note 4)

3. Clean and lubricate the two X axis cam roll guide rails. (Par. 4.1, Note 4)

4. Saturate the felt pads with oil. (Par. 4.1, Note 5)

5. Remove and wash clean the fan filter. (Par. 5.1)

6. Drain the air line filter and check for contamination (Par. 5.2). Clean at this time if necessary.

Every 200 hours of operation:

1. Refill the air line lubricator. (Par. 4.1, Note 7)

2. Remove and clean the air line filter. This should be done weekly if the plant air system requires it. (Par. 5.2)

Every 1,000 hours of operation:

1. Inspect the DC motor brushes of the three X-Y positioner servo motors. Vacuum clean carbon dust. Replace brushes if sufficiently worn. (Par. 5.6)

Every 2,000 hours of operation:

1. Clean and lubricate the flanks of the gear teeth. (Par. 4.1)

2. Position the backup roll of each of the X-Y positioner racks so that a slight drag can be felt when the roll is rotated by hand while holding the rack stationary. Check the backlash at several positions of the rack. There should be little to no backlash along the entire length of the rack. See Appendix E for procedure.

3. Remove and recoat the control enclosure's fan filters after water cleaning. (Par. 5.1)

4. Check the adjustments of speed and synchronization by performing General Diagnostics tests 11, 12 and 6. (Sec. 11.2)

USM AFS AND MPCS MAINTENANCE RECORD
Quarterly

WEEKS FOR A QUARTER (3 MONTHS)	MONDAY 1 2 3 4 5 6 7 8 9 10 11 12 13	TUESDAY 1 2 3 4 5 6 7 8 9 10 11 12 13	WEDNESDAY 1 2 3 4 5 6 7 8 9 10 11 12 13	THURSDAY 1 2 3 4 5 6 7 8 9 10 11 12 13	FRIDAY 1 2 3 4 5 6 7 8 9 10 11 12 13	SATURDAY 1 2 3 4 5 6 7 8 9 10 11 12 13
FIRST SHIFT						
SECOND SHIFT						
THIRD SHIFT						
8-HOUR TASKS						
1. CHECK AND FILL SEWING MACHINE OIL LEVEL (USM 150B)						
2. LUBRICATE PRESSER FOOT DRIVE NEEDLE BEARINGS AND LIFT LEVER AND ALL MECHANISMS NOT LISTED ELSEWHERE (USM 150B)						
3. USE AIR HOSE TO REMOVE DUST, LINT, AND OIL FROM THREAD DETECTOR, TENSION ASSEMBLY, AND SEWING MACHINE						
4. REMOVE THROAT PLATE, CLEAN HOOK PARTS, FLUSH DRY, AND LUBRICATE (USM 150B)						
5. VACUUM CLEAN THE FILTER IN THE REAR AND THE SMALLER FILTER IN THE CONTROL PANEL ENCLOSURE						
EVERY 50 HOURS OF OPERATION						
1. CLEAN AND OIL X & Y POSITIONER RACKS AND PINIONS (USM 150B)						
2. CLEAN X-Y TABLE SLIDES (LINEAR BALL BUSHING SHAFT, CAM ROLL GUIDE RAILS), AND LUBRICATE THEM AND THE FELT PADS (USM 150B)						
3. REMOVE AND CLEAN THE FAN FILTERS						
EVERY 200 HOURS OF OPERATION						
1. REFILL THE AIR LINE LUBRICATOR (USM 100 CKR OIL)						
2. REMOVE AND CLEAN THE AIR LINE FILTER *						
EVERY 1000 HOURS OF OPERATION						
1. INSPECT MOTOR BRUSHES, CLEAN, REPLACE IF NECESSARY						
EVERY 2000 HOURS OF OPERATION						
1. CLEAN AND LUBRICATE THE FLANKS OF THE GEAR TEETH OF ALL GEAR REDUCERS (USM 300SL36)						
2. READJUST THE BACKUP ROLLS OF ALL RACKS						

Figure 5.1 SAMPLE MAINTENANCE RECORDS

6.0 OPERATOR'S INSTRUCTIONS

6.1 SAFETY INSTRUCTIONS FOR THE MPCS-A MACHINE

IMPORTANT: Keep these instructions with your machine manual and/or records. Make sure all personnel involved in machine installation, operation and service read, understand, and are instructed to follow the rules given below and throughout the Operating and Service Instructions Manual.

6.1.1 Machine Installation

a. If an operator's platform is used for short operators, make sure it is large enough to prevent tripping at the edge during normal work movements.

b. Make sure machine is connected to the required electrical source (see Nameplate rating) by a competent electrician following all applicable National and Local codes. Also make sure the machine is properly connected to an approved grounding system in accordance with code requirements.

c. With regard to the compressed air system, make sure that harmful compressor oil systems are not connected and the proper pressures are set. (See Section 6.3.1.)

d. Before operating machine, make sure all covers and guards are in place, that the Needle Shield is properly installed, and that all operating personnel are thoroughly familiar with the instructions in this manual.

6.1.2 Operation of Machine

a. Make no attempt to alter or to use this machine for other than its intended purpose of sewing conventional leather or man-made materials within the machine's capability. Make no adjustments before reading and understanding the procedures outlined in this manual.

b. On power up and down, the sewing head may rotate. Keep fingers away from the needle area.

c. When machine is running and prior to depressing the START switch, always keep fingers away from the X-Y positioning table and pallet clamp, needle and presser foot and its lift mechanism, bobbin and hook, throat plate (and moving mechanism if equipped with this option), thread tension mechanism, sewing machine handwheel, pallet lowering mechanism (left and right), and ejecting mechanisms (left and beneath).

d. If equipped with manual pallet handling, keep fingers out of the gap between sewing machine base and the fixed support table in front of it.

e. When changing needles, thread or bobbin, lower the presser foot. Also make sure no one approaches the operator's control panel.

f. Shut off all power and air before leaving machine unattended for an extended period of time.

g. In tilting the machine sewing head for cleaning, adjusting or oiling the lower mechanisms, be sure power is off and be careful to keep fingers clear of pinch points as the head is lowered. The hold down screw should be refastened.

h. Shut off machine power (by placing CB6 OFF) when changing clamps, oiling or otherwise adjusting machine, unless the adjustment requires power to be on.

i. Adjust the Needle Shield for maximum protection and make no attempt to defeat its purpose. Also be sure to use eye protection as prescribed by Federal Regulations (Ref. OSHA 1910-133).

j. Do not operate machine without all guards being securely attached. These, too, are for your protection and must not be removed.

k. Check to be sure that the pallets agree with the PROM pattern and are properly inserted.

l. Check new pallets and PROMs without needle and presser foot before sewing.

m. Recalibration is mandatory if the servo motor with encoder is replaced. (See Section 8.1.)

n. The air blow nozzle supplied is designed to deliver low pressure air as an aid to safe usage. Use only for its intended purpose, being careful not to blow debris in the direction of yourself or others.

o. When using a punch for pallet marking, be sure the height of the punch is properly adjusted.

6.1.3 Machine Service

a. Use only qualified service technicians to repair or adjust machine, and be sure that they are thoroughly familiar with the service instructions in this manual.

b. On power up or down or when troubleshooting the drive system, the sewing head may rotate. Keep fingers away from the needle area.

c. Disconnect electrical and air supplies before attempting repairs or removing covers or guards unless power is required by the service to be performed, and then be sure no one approaches the controls. Close doors and replace covers or guards before starting machine.

d. When electrical servicing is required, place the Main Circuit Breaker (CB6, located in the rear door) in its OFF position to remove all electrical power beyond that switch.

NOTE

The doors have a tamper-proof lock that requires the use of a special tool (MPCS-228) to open.

e. Never leave machine unattended with full electric power turned on, or with covers removed unless power has been disconnected. Shut off all power and air before leaving machine unattended for an extended period of time.

f. To clean the Air Filter Bowl, disconnect air supply, remove bowl, and wipe out interior.

g. Examine the lubricator bowl for any contamination when it is refilled. Bowl must be removed for inspection. Disconnect air supply before removing bowl. Wipe out bowl with clean cloth if contamination exists.

h. Disconnect power to sewing machine before tipping up the sewing head for oiling the mechanisms. Keep hands clear of table as head is tipped back in order to avoid possible injury.

6.1.4 Safety Devices, Covers and Guards

Left End Top Front Cover	MPCS-420
Left End Top Rear Cover	MPCS-419
Left End Bottom Cover	MPCS-356
Front Cover Top	MPCS-371
Left Front Bottom Cover	MPCS-358
Right Front Bottom Cover	MPCS-347
Right End Bottom Cover	MPCS-355
Work Shelf	MPCS-375
Top Cover (hinged)	MPCS-376
Rack Cover	MPCS-374

Top Cover Switch	XE371E1
Rear Bottom Cover	MPCS-357
Rear Top Cover	MPCS-372
Front Door	MPCS-361
Left Rear Door	MPCS-360
Right Rear Door	MPCS-359
Belt Guard - main	MPCS-411
- upper	MPCS-413
- lower, assembled	MPCS-412+
- rear riveted	MPCS-424
- bottom (hinged)	MPCS-415
Needle Positioner Guard	Part of MPCS-407
Pallet Sensor Cover	MPCS-352
RH Pallet Shelf Cover	AJS-1573
LH Pallet Shelf Cylinder Cover	AJS-1243
Head Hold Down Screw	AJS-475
Head Center Rear Cover	PF91-171069-45
Head Right Rear Cover	PF91-069634-92
Presser Foot Lift Enclosure Cover	PF91-069518-45
Needle Shield	PF91-029684-05
Needle Shield Bracket	PF91-029959-91
Fan Panel (left end)	AJS-1551+
Fan Guard (inside)	XE981M10
Fan Filter (acts as guard)	ACS-435
Pneumatic Parts	
Air Supply Valve	PCI-323
Air Nozzle	XF699A1
Electrical Parts	
Ground Terminal	XE163B8
Rating Plate	ED-10655
Ground Plate	XE315C3
Caution Label - Turn Off Power	XE315E1
Caution Plate	XE315C4
Lightning Flash Decal	XE315C2
Electrostatic Sensitive Device Label	XE869C6
Wrist Strap Location Decal	XE869C10
Circuit Breakers	
Main Power (CB6) Domestic Service	XE763G106
Foreign Service	XE753G103
Stitcher Drive (CB3)	XE753F6
Main Control Branch (CB4)	XE753F5
Outlet Control Branch (CB5)	XE753F5
Fuse (F6)	ED-15004
Fuses (F2,F4,F5)	XE401A8
Fuse (F3)	XE409A9
Fuse (F1)	XE409C14
Servo X Axis (CB1)	XE753E6
Servo Y Axis (CB2)	XE753E5
Door Security Latch	XM399B10
Tool, Door Security Latch Opening	MPCS-228
Contactors/Power Relays	
Servo (K1)	ED11011
Stitcher (K6)	XE599A4
General	
Operating/Service Instructions Manual Safety Instructions - Section 6.1	

6.2 SIMPLIFIED MACHINE OPERATION (TYPICAL)

The following assumes preprogrammed files and the AUTOSIZE operating mode; several steps are somewhat different if AUTOFILE or MANFILE modes are selected and considerably different for MANUAL or AUTO INC mode.

6.2.1 Insert the proper PROM card, properly seated.

6.2.2 Turn on machine air by valve 25 at the right end, and power by first CB6 at the rear, then by the POWER/READY switch on the control panel.

6.2.3 Press the CAL switch (X-Y table calibration).

6.2.4 Press the NEXT switch once (display becomes "READ").

6.2.5 Press DO (PROM card is read to transfer stitch pattern data to computer RAM memory).

6.2.6 Look at the display in which the numbers following "P" show which pallet codes, 1 through 7, are preprogrammed into the files of the PROM card and can receive size selection by the operator.

6.2.7 Place in turn on the pallet shelves, back against the stop, each of the pallets with workpieces inserted, whose codes (as determined by attached black-white bars) correspond to the pallet code numbers in the display. After each one is inserted, press the UP switch once to make its display show the minimum size preprogrammed for that pallet code, thereby assigning that initial size to that pallet.

Example: "P1 S 85" for size 8½ assigned to pallet code 1.

With pallets removed, the LEDs beneath the numbers show which codes have been assigned.

6.2.8 Start production by selecting one of the pallets and placing it on the pallet transfer shelves fully back against the pallet stop.

6.2.9 Depress the START switchlamp to start the automatic cycle.

6.2.10 Place the next loaded pallet on the pallet transfer shelf before the stitch cycle is complete to have the machine automatically cycle.

6.2.11 Repeat step 6.2.10, alternating the pallets (the cycle consisting of automatic ejection, workpieces removed, new workpieces inserted, pallet placed on the shelves, etc.).

6.2.12 When the shoe size for any one of the pallets increases, wait until the previous pallet is ejected, then place the pallet on

the shelves and press the UP switch to display the next size. Check that it is the correct size, then press START to resume cycling.

6.2.13 As automatic operation continues, the proper stitch pattern data are automatically selected by the computer control for the pallet code sensed off each pallet.

6.3 INITIAL MACHINE TURN ON

6.3.1 Turn on the Air On/Off valve and check that air pressure is set to 450 kPa (65 psi).

6.3.2 Raise the main circuit breaker CB6 at the rear to ON.

CAUTION

Do not have a pallet in the X-Y positioner at this point since the calibration motion, which follows, could cause damage to the presser foot.

6.3.3 Depress the green POWER READY switchlamp on the operator's control panel. It will light and stay lit so long as power remains on.

6.3.4 The machine will immediately execute an automatic memory test.

Both RAM and EPROM memory (on B86) are tested. This lasts several seconds, during which display segments, LEDs on both the control panel and the B86 board and switchlamps are lit.

If a RAM failure occurs, LED DS2 on the B86 board remains lit, and the display may show one of two possible failure types.

Error	Failure
10	Pattern data, likely a RAM chip problem.
11	Address, likely a circuitry problem.

Should there be an EPROM failure, LED DS1 on the B86 lights, and, unless the error program has itself failed, the following display shows which EPROMs fail their checksum test:

Error	EPROM Socket No. (B86 Board) U65	U66	U67	U68
01		X		
02			X	
03		X	X	
04	X			
05	X	X		
06	X		X	
07	X	X	X	
08				X
09		X		X
0A			X	X
0B	X	X	X	
0C	X			X
0D	X	X		X
0E	X		X	X
0F	X	X	X	X

Regardless of which display language is selected, the display is "ERROR--" (English always for error action).

The computer will halt if an EPROM or RAM device fails. The tests should be repeated to be sure BEFORE replacing the B86 board.

6.3.5 When the memory test is completed, the display becomes "HIT CAL". Normally the next action would be to calibrate the X-Y table. However, for the initial time the machine is operated, it may be desirable to do one of the following at this point. Either one requires making a full access to the complete menu, explained in Section 6.4.

1. Change the language used by the display, covered in Section 6.5.

2. Change the type of calibration (right, center or left), covered in Section 6.6.

When the CAL switch is pressed, two conditions may occur.

If the air has not been applied, the display will become "AIR?/ERROR 60". Turn on the air and depress CAL again.

If the handwheel is not positioned within the "TDC" needle positioner disk window, the display will be "RESET HEAD TO 24 DEGREES". Do this, then depress CAL again.

6.3.6 After calibration, the idle status display becomes "NO DATA".

The next actions normally would be to read the PROM card (covered in Section 6.7), select and load on the shelves a prepared pallet (Section 6.9), assign the first size that the pallet is to hold for stitching (Section 6.10), and then start (Section 6.14).

The other pallet is then prepared and loaded onto the shelves before the first cycle is completed.

At the conclusion of each stitch cycle the pallets are automatically transferred (Section 6.16.1). Then the operator empties, again prepares and reloads the pallet not then active in the sewing operation.

6.4 MENU ACCESS

The full menu of displays and choices of various statuses and control features is shown in Fig. 6.1.

6.4.1 Limited Access Menu

When in limited access, only the following can be displayed and changed:

READ
PART (count)
ACCESS (in order to go to full access when needed)
SET UP
    BOBSEN 5
    CUTSEN 5

6.4.2 Changing to Full Access

With "ACCESS" displayed, press DO to display "LIMITED", then NEXT to display "FULL", then depress DO and use the UP and NEXT switches to enter the pass code and a final DO. For a new machine or unless the code is changed, this number should be as follows:

Passcode (as shipped) is 186. (999 STOP)

If the code has been changed by the user, then the new number must be entered to obtain full access status. If the changed number is not remembered, substitute a new EEPROM in the XU64 socket on the B86 board, after which, on power up, the normal 186 code is automatically entered. Important statuses, however, must be entered by the user. One spare EEPROM is provided in the MPCS service kit. Others may be ordered (USM Part Number XE870L21, Intel #D2817A).

6.5 LANGUAGE

6.5.1 Display

The displayed language can be changed as shown in Fig. 6.1 by

simply accessing the "LANGUAGE" item of the menu, pressing DO which displays the current language, pressing NEXT as desired to show another, then DO to select it.

6.5.2 Keycaps

Alternate keycaps in the other available languages can be obtained from USM if not ordered originally. The caps can be pulled off their switches and the alternates pushed on.

6.6 CALIBRATION (STITCH MODE)

CAUTION

No pallet should be left in the machine when it is depowered to prevent damage during calibration.

6.6.1 Normal Operation

Calibration is a routine which physically synchronizes the pallet and X-Y table with the data on the PROM. There are four modes selectable in the menu:

Display	Purpose	Main X-Y Table Motion
RIGHT	Normal join & sew	To the right limit, then to the front limit
CENTER	Normal decorative (when a high clamp is on both sides of the pallet)	To the X-axis center, then to the front limit, then to the right limit
LEFT	Special (when a high clamp is on the left side of the pallet)	To the left limit, then to the front limit, then to the right limit
GRID	Stitching setup (see Section 6.13.2)	None

For the first three (operating) modes after reaching the last stated limit and for the grid mode at its current position, the table finally moves simultaneously to its preselected calibration point. This is determined by adding to the "ZERO MARK" of the X and Y encoders the X and Y axis "MACHINE CAL" values as stored in the EEPROM (see par. 6.6.2).

NOTE

The procedure for checking, and changing if necessary, the machine calibration is given in Section 8.1.

For all modes, during calibration, the display is "CALIBRTE". The calibration is fully powered and automatic, the operator's hands not having to touch the X-Y positioner or pallet.

Calibration can also be done at any time by depressing the CAL switch. This could be done if there is any doubt of the sychronization. It is not normally required, since the servo mechanisms keep the table in synchronization.

After an automatic stop due to an error, the calibration switch is depressed to reset the computer after correcting the fault and then to return the table to the load position.

CAUTION

Proper calibration depends upon having the proper +X (right) -Y (forward) setting of the limit stops. If out of adjustment, the calibration can be off by 8 mm (5/16") in either axis. See par. 8.1 for additional information.

6.6.2 Adjusting for pallet errors or stitching shift.

Occasionally pallets are incorrectly made with offset errors. Also, some work materials might cause the stitching to shift to the side. Both of these problems might be overcome by utilizing the PALLET CAL feature which permits the calibration position of the table to be shifted (X and/or Y directions) to compensate for the offset. This procedure is explained in Section 7.11. The values remain effective until a READ operation is performed or power is shut off. The machine calibration, which is permanently stored, is not affected.

6.7 PROM CARD READING AND REMOVAL

6.7.1 Explanation

The machine performs its stitching function only by taking stitch pattern (style) data from its computer RAM memory, not from the EPROM(s) on the PROM card. Thus the data must first be transferred from the PROM card to computer memory before stitching can be done. The PROM card can then be removed for use elsewhere or storage, although it may also be kept in the reader. For copying of EPROMs, see par. 2.5. The data reside in separate files, with one directory to all files. All files are read.

6.7.2 Operation

With "NO DATA" displayed, press NEXT to display "READ", then DO to execute the command.

After the reading is completed, the display moves to the idle status of the menu, the specific display depending upon the

operating mode that has been set. This is covered in the next section.

6.8 OPERATING MODE

Five modes are possible, being displayed and changed as shown in Fig. 6.1. Each of these provides a different method of selecting the stitch pattern data, the more automatic ones requiring that preprogrammed information has previously been put into the files' directory located in the first EPROM on the PROM card.

6.8.1 Pallet Sensing and Coding

This applies to all except the MANUAL mode.

During cycling the operator will sequentially position the pallets into the automatic load position (on the shelves, back against the pallet stop). This permits three retro-reflective light and sensor devices, 25 mm (1") apart and located over the right rear corner of the pallets (see Fig. 6.2), to sense the pallet's presence.

A total of seven unique pallet codes can be established as shown in Fig. 6.5. A quantity of these adhesive-backed targets are included with the machine, and more are readily available as part number MPCS-509. (See par. 12.7.)

6.8.2 AUTOSIZE Mode

This new method automatically assures that the correct stitch pattern data are used for the shoe size of the upper parts that the operator puts into the pallet. The actual stitch pattern file number is not used. Instead the shoe size is selected from the ones that are valid for the specific pallet inserted under the sensor.

The directory must have been preprogrammed for the following information for each file: pallet code (1 to 7), minimum size, maximum size, and the size "scheme" which is one of the following, with two "ranges" for US/British.

No.	Size Scheme	Size Range	Half Sizes?
1	US/British*	0-13½ child, 1-17 adult	yes
2	Paris Points	0 through 53	no
3	Mondopoint**	0 through 350	no

Half sizes are denoted by a last digit of "5".

*Two "ranges": When so programmed, the child range whose maximum size is 13½ becomes adult size 1 as UP is pressed, and DOWN changes from 1 adult to 13½ child.

**Sizes displayed are in multiples of "5".

When in this mode the idle status display is "P" plus whatever pallet code numbers have been preprogrammed in the directory. After a size has been assigned to one or more of these pallet codes (as explained later in Par. 6.10.1), the LED underneath each of those pallet code numbers is lit.

6.8.3 AUTOFILE Mode

This method is very similar to the procedure used for USM's AJS machine, but it adds a new feature restricting the file selection to only those files which have been predetermined as correct for the specific pallet. The directory must have been preprogrammed for the pallet code (1 to 7) for each file.

In this mode the idle status display is the same as for the AUTOSIZE mode. Again the LEDs show file assignments made (Par. 6.10.2).

6.8.4 MAN FILE Mode

This method is exactly the same as the AJS procedure. It is also the same as the new AUTOFILE mode, except that any file existing on the PROM card that was read may be selected. There are no preprogrammed pallet codes in the directory (or if there are any, they are ignored). This method can introduce some risk of incorrect file selection.

6.8.5 AUTO INC Mode

This Automatic File Incrementer (referred to as AFI) mode is a feature designed to allow a user to stitch a pattern in sections, rather than all at once. An example of where this might be useful is when a decorative or functional stitch must continue up underneath another functional stitch (such as a tip and eyestay). The AFI allows the first section to be stitched, the pallet removed from the machine, reloaded with the additional part, put back into the machine, and the next section stitched without the operator selecting the next stitch file needed. Up to 16 sections could possibly be stitched, allowing for an equal number in the second pallet.

Details are given in Section 6.18.

6.8.6 MANUAL Mode

This method is used for machines which do not have automatic pallet transfers or where, for some reason, the user prefers not to use the transfer option. The START switch must be pressed for each cycle. The idle status display is:

"FILE *"

Pressing UP selects a file number from those on the PROM card.

6.9 PALLET SELECTION PREPARATIONS AND LOADING

6.9.1 Preliminary Steps

6.9.1.1 First determine which width and type of pallet is to be used.

The width of the pallet for the normal regular-head machine is 358.6 mm (14.12"), but the older AJS-A and ACS pallets with a slightly narrower width may also be used after making a machine width adjustment. (See Fig. 6.2.)

6.9.1.2 Right Shelf and Ejection Chute Rail Positions

The left/right positions of the right loading shelf and the right ejection chute slide may have to be adjusted to accommodate irregular-width pallets. (See par. 8.17.1 and 8.17.5.)

6.9.1.3 Pallet Stop/Sensor Position

Prior to operation, the pallet stop/sensor location may have to be adjusted in the in/out direction so that the pallet drops properly into the X-Y positioner (see Par. 8.17.1) and/or in the up/down direction so that the back edge of the top of the pallet properly lines up with the machined part of the casting that aligns the inserted pallet. The sensor has a wide operating range, approximately 9 to 19 mm (3/8 to 3/4") so sensing should not be a problem (see Par. 8.17.3).

6.9.1.4 ACS-Pallet Operation Preparations

Each ACS pallet must be mounted in an ACS adapter and mechanical system (serviceman's) adjustments are necessary, (see par. 8.18 for details).

6.9.1.5 High Work Handling

See Section 6.21 in case of high work such as large boot vamps.

6.9.2 Select the correct pallet as specified on the work schedule.

Check the pallet for existance of black and white code reflecting target strips by which the sensors identify the pallet.

Pallets for AUTOSIZE or AUTOFILE modes should have had targets attached when they were made with specific codes that match their EPROM directories.

Normally, targets for MAN FILE mode are attached at this time, as their codes do not appear in the file directory, as opposed to AUTOSIZE and AUTOFILE mode. Following Figs. 6.2 and 6.5,

place one of the black-and-white coded bars onto the pallet at the far right corner such that the bars are beneath the sensors.

By using more than one code, it may be possible that alternate pallet types or sizes could be mixed in a run, with the advantage of having only one pallet for each pattern, thus reducing pallet investment for modest-sized runs.

More targets are supplied with the machine and can be ordered (MPCS-509; see par. 12.7).

6.9.3 Insert the proper workpieces into the pallets. For join and sew pallets, after opening the pallet's hinged upper leaves, carefully locate the workpieces in the proper cavities, progressively close the pallet leaves, and finally, fasten the clamps.

For decorative pallets, after opening the pallet's work clamps, carefully locate the workpieces and close the work clamps, keeping the workpiece stretched tightly during the process.

6.9.4 Place the pallet onto the shelves back against the pallet stop.

CAUTION

Be sure that the pallet is fully back against the pallet stop. Otherwise, the pallet may not properly drop over the wedges.

6.10 PATTERN ASSIGNMENT (TO A PALLET CODE) OR SELECTION (FOR MANUAL OPERATION)

This step depends upon the operating mode selected (as explained in Section 6.8). It is explained for one pallet, but each different pallet must be checked and/or assigned.

6.10.1 AUTOSIZE Mode

When the coded pallet is sensed, the display becomes:

"P (code number for the pallet) S *"

Press the UP switch once; the asterisk changes to the minimum size preprogrammed for that pallet. Subsequent presses of UP change the display (and selection) to the next valid size for the particular size scheme selected (i.e., half sizes except for PARIS and Mondopoint and child/adult transition for US/BRIT if used) until the maximum size for that pallet is reached. Pressing DOWN goes the other way.

6.10.2 AUTOFILE Mode

This is the same as AUTOSIZE except that "F" is displayed instead of "S", and the asterisk is replaced by the lowest to the highest file that is valid for that pallet.

6.10.3 MAN FILE Mode

This is the same as AUTOFILE except that the asterisk is replaced by the lowest number for any file in the PROM card directory and can be incremented to the highest such number.

It is up to the operator to select the file which is correct for the pallet; there is no safeguard.

6.10.4 AUTO INC Mode

See Section 6.18.

6.10.5 MANUAL Mode

The idle status display is "FILE *".

The asterisk is replaced in the same way as for the MAN FILE mode.

6.10.6 Changing Assignment or Selection

This cannot be done while the X-Y table is in motion or in a pause, but only at the pallet load position, after a cycle is completed. For all modes except AUTOSIZE, the correct file number is absolutely required.

For AUTOSIZE, when the workpiece sizes change, it is not absolutely necessary to change the display if the same file applies to more than one size. However, this information is not displayable. Therefore, it is considered proper practice to be safe and always make the displayed size agree with the workpiece's size.

6.11 SPEEDS AND RUN EDIT

6.11.1 General. The sewing speed for each pattern depends upon the stitch length, material thickness, plus moving throat plate button thickness if used ("BUTTON" set to "YES"), and material flexibility. The flexibility factor is referred to by the word "dwell", a term that has long been used for USM automatic stitching machines. Dwell is proportional to how long the X-Y table is stopped while the needle enters the work, interacts with the hook and bobbin, and rises as the take-up lever starts to pull up the stitch.

Fig. 6.4 shows the sewing speeds that result. In using this, be sure to add 1.5 mm (.06") if using the button.

For flexible material, the needle need not rise clear of the work before the table starts, so a higher sewing speed is possible.

This edit feature permits making adjustments for the thickness and flexibility of the actual workpieces, in case they differ from what was expected when the PROM media was made. It is called "RUN EDIT" to distinguish it from IMPM or Style Center editing. The pattern might have been made without attempting to predict the thickness and dwell, in which case "default" values of 4.5 mm (0.18") thickness and "normal" dwell (slight "pretravel", explained below) are programmed in. The thickness in particular could be incorrect, usually too thick due to the generous default value, which was purposely selected to be "safer".

Another possibly desirable edit is to limit speed. Experience teaches that certain directions of sewing or combinations of materials (some of which may be more difficult to stitch), thickness, needles, threads, finishes, etc. may be better sewn without incurring thread-handling, needle, hook or other problems by temporarily slowing down below the speed otherwise selected by the machine's controls.

6.11.2 Types of Edits

Three types of edits are possible:

1. "Global" edits, which permit changing thickness, dwell or maximum speed for the entire file, but not SPI. They can't be saved and are described in detail below.

2. A convenient type of "local" edit requiring use of the digitized file. It permits changing thickness, dwell, speed limits, or SPI for different segments of the file (bounded by corner points or slews), adding/removing thread or part change command, and adding/changing pallet code and size identification information. It does not permit changing digitized point locations, which requires the IMPM option with the joystick enclosure. Using only the optional MPCS-860B89 P.C. board (also used for copying, par. 2.5, and for IMPM), locally edited stitch files, produced after stitch assigning the locally edited digitized file, can be saved on EPROMs, either erased ones or appended to existing stitch files if the PROM set directory provides for it. (IMPM-made PROM sets do; Style Center sets may not.) This procedure is described in detail in par. 6.22, following the illustrations of Sec. 6.

3. Pallet code or size edits only. Like 2, except not local and the stitch file may be used (no reassigning is required). See Par. 6.23.

6.11.3 Saving of Global Edits

Global edits are saved in computer RAM memory, not in the EEPROM. Therefore, they are lost when the machine is powered down. The edits are also lost whenever the READ function is done to transfer new PROM data to RAM, and whenever entering the IMPM mode.

6.11.4 Global Edit Procedures

Enter the RUN EDIT mode as shown in Fig. 6.1. All edits that are made apply to all files in computer memory.

Whenever any one of the edits is displayed it can be individually eliminated by pressing DO to display "RESET?", then pressing DO again.

6.11.4.1 Thickness

The initial display of "THICK +0" can be changed by the UP or DOWN switches to become any desired value between +33 and -33. The final value set when the RESET switch is pressed to return to the idle display is the resulting edit.

The effect of the edit is to change every thickness value throughout the pattern by the amount displayed, except that the maximum and minimum resulting thicknesses are 0.37" and .04". Each digit represents .01", approximately ¼ mm. Examples:

From the PROM Card	Example 1 Edit +2	Example 1 Result	Example 2 Edit -3	Example 2 Result
Portion 1 0.10"		0.12"		0.07"
Portion 2 0.15"		0.17"		0.12"
Portion 3 0.05"		0.07"		0.04"

As the default value of thickness is 0.180", to obtain a thickness of .06" (which might be typical for unbacked decorative work), make an edit of -12 to a PROM card without preprogrammed thickness.

Be sure that the "button" status is properly set.

A thickness caliper-type gauge is very useful in measuring the combined thickness of the workpiece, repeated for all variations. If an inch-unit type is used, the values can be directly inputted into the machine without mm/inch conversion.

6.11.4.2 Dwell

The initial display of "DWELL +0" can be changed by the UP and DOWN switches to become any desired value between +5 and -5. The final value set, when the RESET switch is pressed to return to the idle display, is the resulting edit.

The effect of the edit is to change every dwell value throughout the pattern by the amount displayed, except that the maximum and minimum resulting dwells are 6 and 1. The meaning of the resulting absolute values are as follows:

	Dwell	Pretravel *	Servo Steps	AJS Dwell (reference)
	6	0	0	16
	5	.0025"	1	15
**	4	.005"	2	14
	3	.010"	4	12
	2	.015"	6	10
	1	.020"	8	8

* The distance the X-Y table moves before the needle rises clear from the work.

** "Normal", default value.

Examples:

		Example 1		Example 2	
From the PROM Card	Dwell	Edit +2	Result	Edit -1	Result
Portion 1	4		6		3
Portion 2	5		6		4

Interpret the dwell in relation to either the angle during which the work material is not moving or the "pretravel" (workpiece motion before the needle rises clear). The more flexible the material, the shorter the allowable dwell, thereby increasing the speed.

For leather or stiff imitation leather materials, generally use a dwell of 4, which is the "normal" or "default" value. For extremely stiff materials or multiple layers of less stiff materials, 5 or even the maximum of 6 (no pretravel) may be needed. Values to dwell of "1" (0.5 mm or .02" pretravel) may be reasonable for some soft imitation leathers, even when backed with foam or mesh-type linings, as well as for cloth. Values should be determined through experimentation.

6.11.4.3 Maximum Speed

The initial display of "SPM 2500" can be changed by the DOWN switch to become any desired value in multiples of 100 down to "SPM 200" (and raised again by the UP switch). The final value set when the RESET switch is pressed to return to the idle display is the resulting edit.

The machine speed will then never exceed the set value.

2500 is the maximum machine speed.

6.12 CHECKING PATTERNS

6.12.1 Pattern Step Operation

This permits a pallet in the X-Y table to be moved without sewing through the pattern with normal fast slews plus each individual stitch at 16 steps/second for the FAST speed which is automatically set on power up (FAST switchlamp lit), or with slow slews at 10 steps/second for the SLOW speed selected by pressing the FAST switch (light goes out).

When FWD is briefly pressed the first time in the load position, the pallet transfer shelves operate normally to drop the pallet, after which it is clamped. At the second press of FWD, the table slews to the data interface point and each succeeding press takes it through one slew or stitch. The display is "PAUSE".

The REV switch moves backward through the pattern that has already been entered, with the final press of REV operating the pallet unload mechanism to eject the pallet if desired.

To step forward continuously, press the EXIT switch and press the STOP switch to stop. To step backwards continuously, hold in the REV switch. Notice that whenever FWD or REV is pressed, there is a slight pause after the first step to easily obtain a single step without getting a second one if the switch is not released immediately.

6.12.2 PROM Data Checking ("FILE TST" Mode)

This mode permits checking the data transferred from the PROM card to computer memory (the card may then be removed), as modified by RUN EDIT, pallet code/size edit, or by local edit after reassigning IMPM files in RAM memory. The data can be compared against a listing of what the contents of the EPROMs should be, or the data can be examined in general. For example, if the pattern was thought to have had a slew at a particular place and it isn't slewing, the data can be checked to see if it contains a slew.

Display Format: (see Fig. 1.1)

1. Leftmost Four Digits. These digits show the PROM card address of the byte presently being examined. This address is in hexidecimal. (A=10, B=11, up to F=16, etc.)

   If a file is selected, the address is where its specific data for that file start.

   If no file is selected either indirectly by size or directly, the address is the start of the directory to all files (address = 0).

2. Rightmost Three Digits. These digits show the octal value of the eight LEDs (see 3 for meaning).

3. LEDs (eight) below the display characters.

   These show the content of the memory location addressed, in binary code. They represent a control word or some directory data if the leftmost LED is lit; otherwise, the other seven LEDs represent the data for either movement (stitch or slew) or some other directory data.

Control Word Codes

Binary	Octal	Meaning
10000001	201	"Speed 1" (55% of optimum speed)
10	202	"Speed 2" (70% " " ")
11	203	"Speed 3" (85% " " ")
100	204	"Speed 4" (full optimum speed)
111	207	Start of file
10001000	210	Start slew
1	211	Stop motor & cut thread
10	212	End of file
11	213	Pause & cut thread
100	214	End of slew
111	217	Pause, cut thread & open clamp
10010000	220	Start double resolution
1	221	End double resolution

Speed Limit

Octal	SPM	Octal	SPM	Octal	SPM
240	200	250	1000	260	1800
241	300	251	1100	261	1900
242	400	252	1200	262	2000
243	500	253	1300	263	2100
244	600	254	1400	264	2200
245	700	255	1500	265	2300
246	800	256	1600	266	2400
247	900	257	1700	267	2500

SPI

Octal	SPI	Octal	SPI	Octal	SPI
		300	11	310	19
271	4	301	12	311	20
272	5	302	13		
273	6	303	14		
274	7	304	15		
275	8	305	16		
276	9	306	17		
277	10	307	18		

Material Thickness

Octal	"	Octal	"	Octal	"	Octal	"	Octal	"
		320	.090	330	.170	340	.250	350	.330
		321	.100	331	.180	341	.260	351	.340
		322	.110	332	.190	342	.270	352	.350
313	.040	323	.120	333	.200	343	.280	353	.360
314	.050	324	.130	334	.210	344	.290	354	.370
315	.060	325	.140	335	.220	345	.300		
316	.070	326	.150	336	.230	346	.310		
317	.080	327	.160	337	.240	347	.320		

Dwell

Octal	Meaning	
360	6 dwell	(0 pretravel, 0 servo steps)
361	5 "	(.0025" pretravel, 1 servo step)
362	4 "	(.005" pretravel, 2 servo steps)
363	3 "	(.010" pretravel, 4 servo steps)
364	2 "	(.015" pretravel, 6 servo steps)
365	1 "	(.020" pretravel, 8 servo steps)

NOTE: 371 through 376 define directory header bytes.

Stitch Data

First X, then after pressing UP, Y is shown (two bytes total). The second-from-left LED shows the direction: + if off, - if on. The values are the number of servo steps, each being .0025", except for double resolution (4, 5 and 6 SPI) for which each value is doubled to obtain the number of servo steps.

The binary number values start from the right LED, as follows.

LED # (left)	8	7	6	5	4	3	2	1	(right)
Values		sign	32	16	8	4	2	1	

Example:

X Axis		off	on	off	on	off	off	on
		+	32		8			1

32+8+1 = 41 x .0025 = 0.1025"

Y Axis		on	off	off	off	on	on	off
		-				4	2	

-(4+2) = -6 x .0025 = -0.015"

The square root of $X^2 + Y^2$ is 0.103", representing an SPI of 10 in the +X, -Y direction.

Use UP or DOWN to examine the next or previous stitch, pressing two times for each, and even more times if control words are encountered.

Slew Data

This requires four bytes of data plus a byte each for the start of slew control word (210) and the end of slew control word (214). Use UP to display each byte. X values are in bytes one and two, Y values in three and four. The binary number values for each axis have the same format:

LED # (left)	8	7	6	5	4	3	2	1
Values:								
1st Byte		64	32	16	8	4	2	1
2nd Byte		sign	4096	2048	1024	512	256	128

Example: (one axis only)

	8	7	6	5	4	3	2	1
1st Byte		off	off	on	on	off	on	off
2nd Byte		off	off	off	on	off	off	on

2+8+16+128+1024 = 1178 x .0025 = 2.945"

Directory Data

The directory, which is located at the beginning of the first EPROM of the PROM card, has two parts: directory header, followed by the file descriptor array (data for each file).

Header

The directory header is always two bytes.

	LED Pattern	Display Octal	Meaning
1st Byte	11111001	371	Stitch file, MONDO
	11111010	372	Stitch file, PARIS
	11111011	373	Stitch file, US/BRITISH
	11111100	374	Data file, MONDO
	11111101	375	Data file, PARIS
	11111110	376	Data file, US/BRITISH
2nd Byte			
Vary from	00000001	1	One file
to	00100000	40	32 files

NOTE

PROM sets made by IMPM always have the maximum 32 files allowed ("empty" if not yet created) , to permit appending files; but files made by Style Centers may have only a few or no empty files.

Descriptor

Each descriptor (one for each file) has eight bytes. IMPM-made PROM sets always have 32 descriptors, occupying 256 bytes total.

Byte	LED Pattern	Meaning
1 & 2	File address	Offset from the start of the EPROM set. Byte 1, lower order bits; byte 2, high
3 & 4	File size	No. of bytes in the file (3, lower order; 4, higher order)
5	Checksum	Proves validity of the data
6	Pallet code	1 to 7; 0 = not assigned
7	Minimum size	See below
8	Maximum size	See below

Address Example

LED # (left)	8	7	6	5	4	3	2	1
Values:								
1st Byte	128	64	32	16	8	4	2	1
2nd Byte	32768	16384	8192	4096	2048	1024	512	256
1st Byte	off	on	on	on	off	on	on	off
2nd Byte	off	off	off	off	off	off	off	on

2+4+16+32+64+256 = 374, which is 236 in hex. (Use a table of equivalences or a converting calculator.)

The displays are:

Directory (right 3 digits) 1st Byte: 166 (octal for 01110110)
2nd Byte: 1 (octal for 00000001)

Start of File (left 4 digits) 236 (hex for 374)

NOTE: The starting address of the first file for IMPM-made PROM sets is always 258 decimal, or 102 hex. "Empty" files have all zeros for header descriptors and data.

Size Explanation

Size for US/British child range, Paris and Mondo =
$\frac{\text{(decimal value - 1}}{2}$

Size for US/British adult range =
$\frac{\text{(decimal value -27}}{2}$

Size Example: Octal code 105 = binary 01 000 101
= 64+4+1 = 69;
69-1 = 68; 68/2 = 34 (Paris size)

Moving between Files and the Directory

Besides exiting FILE TST and selecting the desired file, or none for the directory, the UP or DOWN can be held in. The display will stop and the buzzer sound at each boundary.

6.13 MODES FOR CHECKING NEW PALLETS AND STITCHING ADJUSTMENTS

Several special modes are provided.

6.13.1 Stepping with the Foot Down

This procedure permits checking the correspondence of presser foot to pallet cutouts. Normally, slow speed is desirable (press the FAST switchlamp to reverse its status).

1. Load the pallet.
2. Assign or select the file (or size) if not yet done.
3. Press and hold FWD until in the first slew.
4. Press FOOT DOWN switch.
5. Press EXIT to resume pallet motion. The foot is automatically raised during slews and lowered for pattern stepping.
6. Press STOP to permit close examination. Resume by either EXIT or, if desired, FWD for frequent stopping.
7. In case interferences are found, the foot may be raised for the completion of the check cycle; it will not lower.

6.13.2 Grid Mode

This procedure permits trial stitching of the pattern on a piece of material taped into an open-window test pallet (see Par. 1.3.2), and repeating it many times by making a small shift in the starting point for a parallel pattern.

Adjustments can be made between runs to compare varying thread tension, edits of dwell or maximum speed, or reducing speed by the knob on the panel. Sometimes a direction of stitching may be seen to be a problem, indicating a need for a revision by IMPM or Style Center.

1. In the menu press DO to select the GRID calibration mode. Then use RESET to return to the idle status.

2. Load the test pallet on the sewing head level. Press CLAMP.

3. Position the pallet by hand to the initial desired starting point.

4. Press the CAL switch. The table will move to the closest "grid calibration point".

5. Press START to sew one cycle.

6. Move the pallet to one side (left/right and/or front/rear) a minimum distance of approximately 7 mm (5/16") and press CAL. The table should move a small amount and stop exactly one or more multiples of the following amount from its position in Y):

   7.9375 mm (0.3125")

7. To return to normal operation, press DO to select in the menu one of three operating calibration modes.

6.14 START

6.14.1 General

After pallet and pattern data are believed to be correct, operation may begin.

First check that the proper needle, top thread and bobbin are in place and that the top thread has proper slack and tail length (approximately 32 mm or 1¼").

6.14.2 Automatic Pallet Transfer Cycle

Start the cycle by depressing START. The left shelf will swing down, letting the pallet's left side be lowered 50 mm (2") to the active position, aligning its notches over the clamp wedges. The pallet clamp will be applied to lock the pallet. The left shelf resets upward immediately, while the right shelf swings down to drop the right side of the pallet, then rises. On subsequent cycles the START switchlamp need not be depressed provided that the next pallet is loaded into position before the previous pallet's work has been stitched.

After a directly rearward slew of 75 mm (3"), the pallet will be slewed to the start of the first segment. The foot will be lowered and, simultaneously, the throat plate button of the moving throat plate, if installed, will be raised. Then the stitching will begin.

The first and last two stitches of each segment are made at slow speed (200 stitches/minute), dropping to a lower value (180 spm) during the cutting cycle at the end of each segment. The optional IMPM or other means of making PROM data must be used to increase the number of slow speed stitches.

While stitching, the display shows the speed. For example:

"1800 SPM"

All sewing speeds may be reduced proportionately below the optimum speeds determined by the computer (shown in Fig. 6.4) by turning the SPEED knob. Turning the knob counterclockwise decreases the speeds. The true speed still shows in the display. (Minimum: 180 SPM)

When using the automatic pallet transfer, the display briefly interrupts the speed display to show the pallet code with either the size or the file assigned to the pallet just loaded onto the shelves.

6.14.3 Non-Automatic-Pallet-Transfer Cycle

Place the selected decorative-type pallet into the X-Y positioner by putting the pallet's rear vee notch down against the positioner's rear clamping wedge and aligning the pallet's front notch with the positioner's front wedge.

Select the proper calibration mode for the type of work. Use center cal for decorative, in which case the pallet clamp remins closed at the end of the cycle. Use right or left cal for join and sew, in which case the pallet clamp opens at the cycle end to permit changing pallets. (See Par. 6.16.2.2.)

Press START (must be done for <u>every</u> cycle).

6.15 CYCLE INTERRUPTIONS

<u>NOTE</u>

For all cycle interruptions power is removed from the X-Y table for safety. If it is moved, it will return automatically to the correct position before sewing resumes.

6.15.1 Programmed Interruptions

1. Thread Change - The X-Y table stops, the thread is cut, and the display alternates between "THREAD" and "CHANGE".

   After changing the thread, press START to resume.

2. Part Change - The X-Y table stops, the thread is cut, the pallet clamp opens, and the display alternates between "PART" and "CHANGE".

   After removing the pallet, removing and/or adding shoe parts and replacing the pallet, press START to resume. The clamp will be applied automatically.

6.15.2 Non-Programmed Interruptions

1. Bobbin Monitor (Thread Runout/Break Detection) - Unless the bobbin is purposely replaced before it runs out, eventually it will run out. Also, either the bobbin or top thread may break occasionally. Either case is detected by the slotted disk failing to rotate. The machine stops, the STOP and BOB'N switchlamps will flash and the buzzer sound. The display becomes "BOB'N". The thread trimmer cuts the remaining unbroken thread. The presser foot will rise and the moving throat plate, if so equipped, will move down.

   The table may be pushed away for better access to the bobbin. It will automatically return. Normally, after inserting a new bobbin or rethreading the machine, the operator will backstep to the last good stitch by pressing and holding in the REV switch. Then press START. The STOP and BOB'N lights go out, and the machine resumes sewing.

   If it is desired to disable the bobbin monitor, press the BOB'N switch, which will light.

2. No-Cut Detection - If the thread trimmer fails to cut the thread, this should be detected during the slew, unless it is too short a distance, by rotation of the slotted disk. The machine stops, the STOP switchlamp flashes, and the display becomes "NO CUT".

   Operation may be resumed by pressing START.

   If it is desired to disable the no-cut detection feature, set its sensitivity to "0". (See next paragraph.)

3. Sensitivity or Run-Edit Change While Paused - If desired at this time, the menu may be accessed to examine the values of bobbin monitor sensitivity (display "BOBSEN")

or no-cut sensitivity (display "CUTSEN"). Use the UP or DOWN to increase or decrease sensitivity. "CUTSEN 0" disables that feature.

Similarly, a thickness, dwell, or maximum speed edit may be made or changed at this time if felt desirable.

4. Early Termination - If the workpiece appears unsatisfactory, press STOP, then CAL, to more easily pick up the pallet. If there appears to be a possible interference, the table may be first pulled to beyond that point.

6.16 CYCLE COMPLETION

6.16.1 Machines with Automatic Pallet Transfer

On completion of the final segment of stitching, the threads are cut and the pallet returns rapidly towards the transfer position. Just before reaching it, the pallet clamp opens, and the unloading cylinder on the Y carriage opens the front pallet support.

The front of the pallet drops onto the left/right chute slides with much of its energy being absorbed by the left and right shock absorbers.

The pallet slides toward the front, tripping the pallet switch on the left chute.

The unloading cylinder resets, permitting the front pallet support to return to its support position.

Lowering of the next pallet begins.

The time during which the X-Y positioner remains stationary for the entire pallet transfer cycle is 2 to 2½ seconds, depending on the air flow control valve adjustments.

The operator does not need to depress START unless the next pallet has not been loaded in time.

If the previously ejected pallet has not been removed by the operator (thereby not releasing the pallet-sense switch), the just-completed pallet will not be ejected, and the automatic cycle stops. The display is "REMOVE OLD PALLET". After the ejected pallet is removed, depress START to complete the ejection cycle. This will also resume the automatic cycling if another pallet is loaded on the upper shelves.

If the next pallet has a different pallet code to which a file or size has not yet been assigned, the automatic cycling stops.

6.16.2 Machines without Automatic Pallet Transfer

6.16.2.1 Decorative ("Cowboy") Cycle (pallet not removed)

Provided the calibration mode is set for "center", the pallet clamp remains closed. The operator opens the pallet's work clamps, replaces the workpiece, closes the work clamps, changes the file number only if changing files, then depresses START.

Sometimes the stitch pattern data for one file is designed to stitch two workpieces in sequence:

a. One color "A" pattern, a programmed pause for thread change, followed by the color "B" pattern on the first workpiece.

b. Pause to change workpieces.

c. Then color "B" pattern is followed by a programmed pause for thread change, and then the color "A" pattern on the second workpiece is stitched.

To accomplish this, at the end of the first workpiece the pallet will move to and stop with the needle above the upper left corner of the maximum stitching area if using the regular 406 mm (16") Y axis pallet.
If necessary to improve the capability for changing workpieces at that point, the pallet can be easily pulled forward a short distance. It will return automatically when START is depressed.

If a shorter ACS pallet is used, the needle's position at pause will be beyond the pallet, thus permitting easy workpiece change.

6.16.2.2 Manually Transferred Pallets Cycle (pallet removed for join and sew)

Provided the calibration mode is set for "left" or "right", the pallet clamp opens during the last 75 mm (3") forward slew.

The operator removes the pallet, replaces it with the next pallet, change the file number only if changing files, then depresses START.

6.17 PART COUNT

Each completed cycle (stitching or stepping) increases by one the part count number which is displayed by pressing NEXT (see Fig. 6.1). The maximum is 9999 which, when reached, holds there.

The count may be reset to 0 or saved in EEPROM as follows:

Act	First Display	Press Key	Next Display	Press Key	Next Display	Press Key
Reset	PART(number)	DO	RESET?	DO	PART 0	RESET
Save	PART(number)	DO	RESET?	NEXT	SAVE?	DO, RESET

6.18 AUTOMATIC FILE INCREMENTING

6.18.1 Description

The Automatic File Incrementer (referred to as AFI) allows a user to stitch a pattern in sections, rather than all at once. An example of where this might be useful is when a decorative or functional stitch must continue up underneath another functional stitch (such as a tip and eyestay). The AFI allows the first section to be stitched, the pallet removed from the machine, reloaded with the additional part (while the parts in another pallet are being stitched), put back into the machine and the next section stitched. Up to 16 sections maximum could be stitched in the pallet (and in the second pallet also).

The AFI requires that each section be in a separate file, and they all be located on the active PROM card in numerically increasing order. They need not be consecutive; files may be passed over. For example, either 1, 2, 3, 4 or 1, 2, 5, 6 are acceptable sequences. The machine starts stitching with the first file in a sequence, increments through the desired files in turn each time a pallet is loaded, and then at the end of the sequence resets back to the first file to start another sequence without operator need to select any files.

The AFI will work on both automatic pallet transfer machines using the center and right sensors, or non-automatic transfer machines.

On automatic transfer machines the left and right pallets can increment independently so it is possible for repairs, etc. to step through just a left shoe or just a right shoe, the machine incrementing just the left files, or just the right. However, normally left and right pallets are alternated and operation continues automatically until a pallet fails to be in place when a transfer is needed.

On non-automatic transfer machines, the files are incremented in straight numerical order.

To facilitate repairs, it is also possible to start at any particular file and complete the sequence from there. The sequence can also be reset to the beginning by manually selecting the first file.

It is possible that a particular PROM card contain many possible sequences, but the AFI requires that only those files to be stitched be assigned. Normally, the files used will be the first ones. As an example, the following might be a typical sequence:

File	Pattern Data
1	Left tip in pallet A
2	Right tip in pallet B
3	Saddle in pallet A
3 (again)	Saddle in pallet B

This sequence is shown in Fig. 6-3. As you can see, the tips are different, but the saddle is common. But it is not necessary that the common portion of pallet A and B have the same pattern. In fact, one of the benefits is that the AFI will allow both the same or different patterns to be used for each pallet.

6.18.2 Pallet Coding (Machines with Auto Pallet Transfer)

Code the left pallet 010(2), the right pallet 001(4). This makes the left pallet illuminate the middle light, the right pallet, the light to the right.

6.18.3 Setup

To set the MPCS-A for this AFI mode, call the "OP-MODE" menu display, press DO, then NEXT as many times as required to display "AUTO INC", then DO to return to "OP-MODE", then NEXT to display "SEQUENCE".

6.18.4 File Sequence Assigning

Press DO to display "LEFT". All of the files that are to be sequenced using the left pallet are assigned to its sequence before doing the same for the right pallet, but if it is desired to assign the right one first, press NEXT to display "RIGHT", then do the left sequence afterwards. For easier recognition of the sequence being created, the letters of the alphabet: A, B, C, etc. are shown next to the file and remain with the specific file when it is selected for the sequence.

To assign files to the sequence, the NEXT switch is pressed when the desired file number is displayed or the DO switch for the last file wanted, whereas if the file is not to be assigned, the UP switch is pressed, or alternately, the DOWN switch if it is desired later on in the assigning process to return to a lower file number so that it can be assigned to the sequence at that point.

Following are the specific switch entries and results, including displays for the example given earlier.

	Switch	Result	Display
1.	DO		"1(LA"
2.	NEXT	1 assigned as "A"	"2(LB"
3.	UP	2 not assigned	"3(LB"
4.	DO	3 assigned as "B"	"LEFT"
5.	Press NEXT to display "RIGHT".		

NOTE: This right sequence is also the one created for machines without auto pallet transfer.

6.	DO		"AR) 1"
7.	UP	1 not assigned	"AR) 2"
8.	NEXT	2 assigned as "A"	"BR) 3"
9.	DO	3 assigned as "B"	"RIGHT"

10. Press RESET several times to return the display to the idle "run" status which, for this example, would be "1 LR 2", the files being the first (left and right) for each of the sequences which are:

    1st (A) 1 LR 2
    2nd (B) 3 LR 3

NOTE: For machine without auto pallet transfer, the display is:

    1st (A) ++ (first file)
    2nd (B) ++ (second file)
    etc.

11. Insert the left pallet to actuate the center sensor and press UP to review the sequence, leaving it at the first file.

12. Insert the right pallet to actuate the right sensor and press UP to review its sequence, again leaving it at its first file.

NOTE: If no sequence is assigned before resetting to the idle status, the display is "* LR *".

In summary, up to 16 files may be selected for each sequence, identified by letters, and each selection may be any of the 32 possible files, using repetitions of the same file even consecutively, or files not in ascending order.

6.18.5 Cycling (Operation)

Insert the left pallet. An arrow shows between "L" and the first file to be run. Depress START. Stitching will begin normally.

Use of the calibration switch function, pausing, editing, etc. are all permissible in the normal way. Once a file is slewed past the data interface point at its beginning, the next cycle will use an incremented file.

When during stitching, the right pallet is inserted, the display interrupts its speed display to show an arrow between "R" and the first file for that pallet; and the left file is also the next to be run.

For non-pallet transfer machines the pallet, of course, has no left/right identification, and the "++ (next file)" display occurs at the completion of the first cycle.

When the left pallet is again inserted in the Auto Pallet machine, the display briefly shows an arrow next to "L" and the next file for both left and right.

Left and right pallets need not follow each other. The system simply senses the code of the pallet in place and runs the next file from its sequence.

6.18.6 Resetting Files

While not cycling, to reset either left, right or both pallets for the next file, simply hold in the appropriate center or right pallet switch and press UP or DOWN until the desired file number shows.

6.18.7 Pallet File Sequence Changes

To make changes, either to correct an error in programming or for a new job setup, the complete assignment process must be redone.

6.19 HIGH WORK

6.19.1 Using Automatic Pallet Transfer

To handle high work such as large boot vamps, it may not be possible due to vertical interferences to put the next pallet on the shelves until after the previous one is ejected, requiring that START be pressed each time. Or perhaps the shelves can't be used at all because of interference between the left shelf and the work. The left shelf must be removed in this case and sometimes the workshelf must be moved (see Par. 6.19.2).

6.19.2 Workshelf Interference

In some cases the workshelf may interfere with high work. It can be repositioned to the left (Sec. 8.19).

6.20 MACHINE SHUTDOWN

The power should be shut off for the night. Otherwise, the sewing machine drive motor will continue to run.

6.20.1 Press the EMERG. STOP (big red) switch.

NOTE

In an emergency situation, press the same switch immediately to stop the machine. Problems self-detected by the controls (ERR displays) also cause stoppage. The current cycle is terminated in these cases.

6.20.2 Rotate the air on/off valve CCW to "off".

6.20.3 Place the main circuit breaker CB6 down to the "off" position.

6.21 AUTOMATIC DIAGNOSTICS

6.21.1 General

There may be some automatic stoppages of operation for various conditions detected by the computer. The displayed message will be one of two types:

1. Warnings. Indicate status or needed corrective action by displayed messages.

2. Errors. Displays an error code number.

The complete list is given in Sec. 11.4. However, several for which the operator might be able to make the correction are listed below.

In some cases, the fault may be transitory and will not repeat, at least not immediately. In other cases, the cause of the problem must be found and corrected.

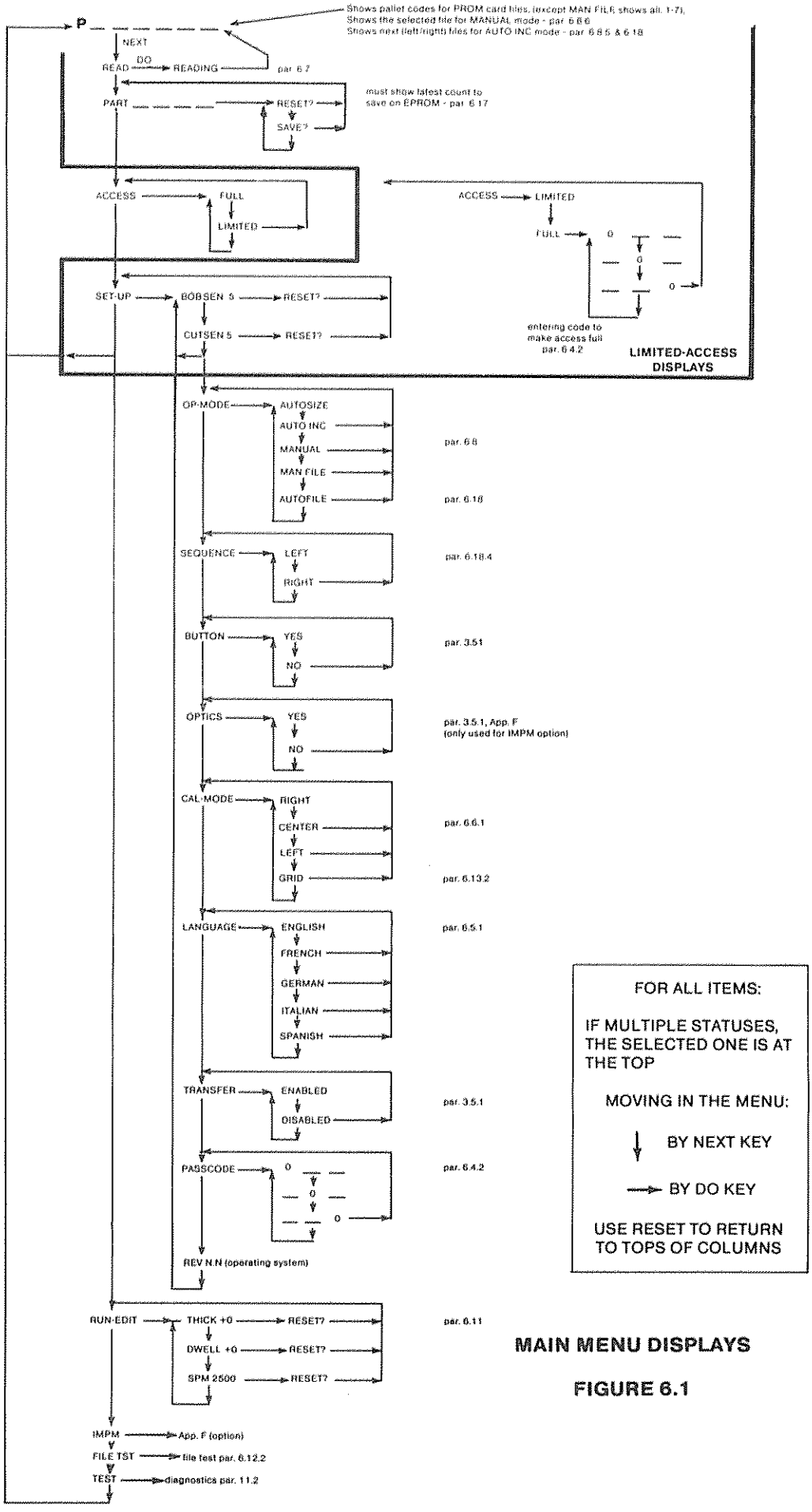
The procedure for continuing with machine operation depends on the type of error stop. If the table has moved from the load position, the CAL switch is pressed - first observing the normal precaution of removing the pallet if there is any possibility of the presser foot colliding with work clamps.

Other types of error stops are normally cleared away by pressing the RESET switch.

6.21.2 List of Operator-Involved Errors

Warning &/or Error Number	Meaning	Remedy
AIR?/ERROR 60	Air not turned on	Turn on air
NO CARD	PROM card not in place	Insert & properly seat PROM card
NO DATA	PROM card not read	Press DO
ERROR 22	Wrong EPROM size selection on PROM card	Set correct switches - see Sec. 2
ERROR 24	2732-size (smaller) EPROM not in proper socket holes	Insert as shown on the PROM card
ERROR C2	Invalid stitch data EPROM	Need correct media
NO FILE	PROM card lacks file	Select correct PROM card

Warning &/or Error Number	Meaning	Remedy
NO PALL	No pallet sensed when trying to assign/start	Insert pallet under sensor
COVER	Top cover is open	Close the cover
HIT CAL	Need to calibrate table	Press CAL
RESET HEAD to 24 DEG	Head is at the wrong position	Rotate the handwheel
DIRECTORY LACKS SIZE OR PALLET INFO	PROM card information is lacking	Get proper PROM card, or use AUTOFILE or MAN FILE mode
REMOVE OLD PALLET	Previous pallet is still in the ejected position	Remove it
X STALL/ ERROR 30	X axis servo stall	Find & eliminate excessive drag of parts or interference
Y STALL/ ERROR 31	Y axis servo stall	Same as above



MAIN MENU DISPLAYS

FIGURE 6.1

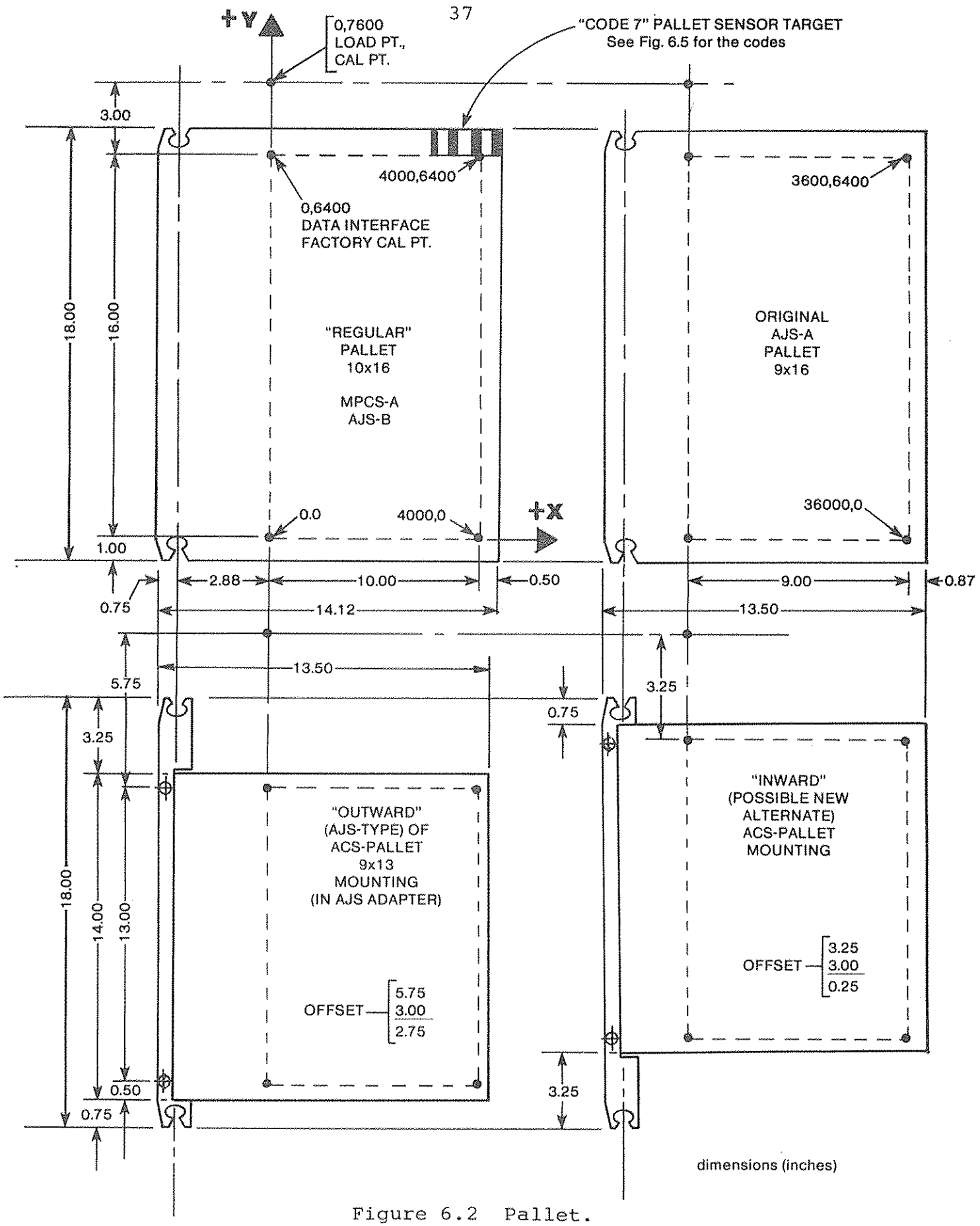
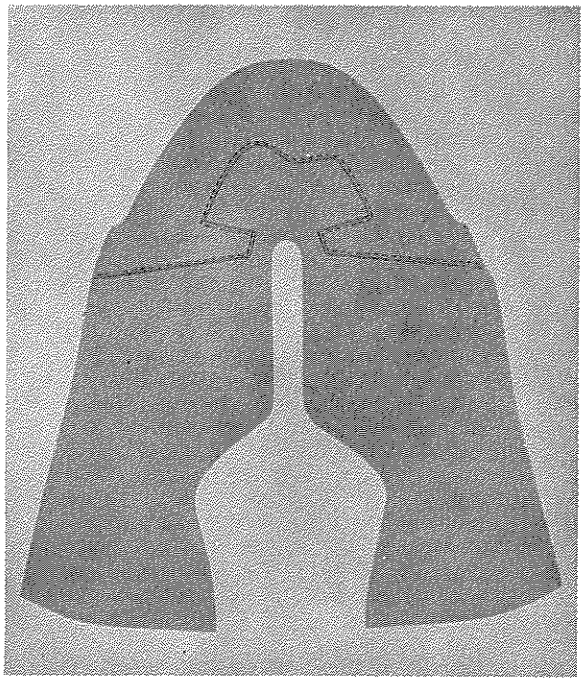
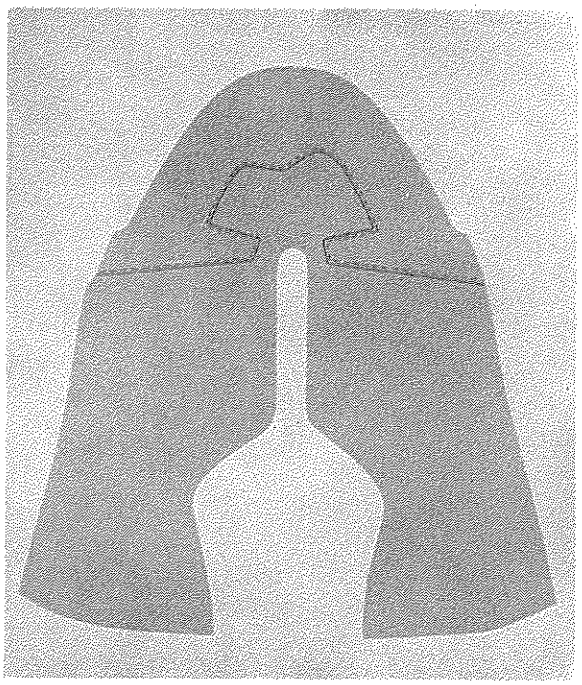


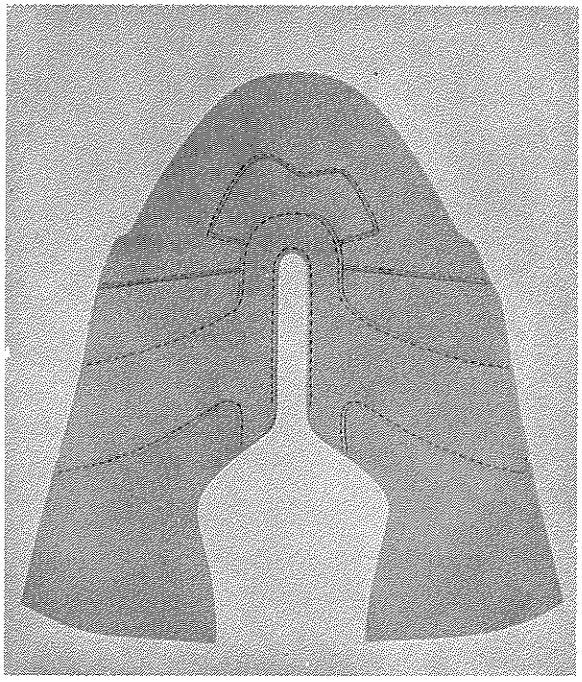
Figure 6.2 Pallet.



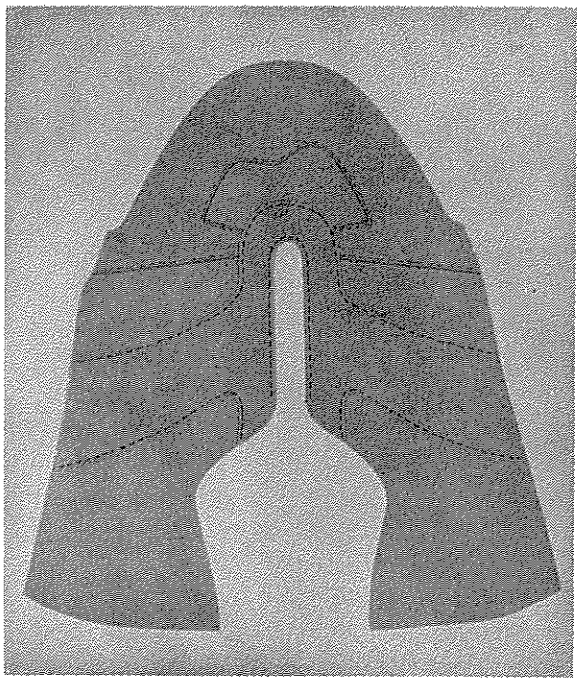
File 1
First Section Pallet A



File 2
First Section Pallet B



File 3
Second Section Pallet A



File 3
Second Section Pallet B

Figure 6.3
Automatic File Incrementing

4 Dwell Average for Leather

	SPI	DWELL	Stitching Speed (SPM) (Note 1) Total Thickness (Note 2) 1.8 mm (0.07")	3.3 mm (0.13")	4.8 mm (0.19")	6.4 mm (0.25")	8.9 mm (0.35")
Longest	4	6	900	815	735	650	515
		4	1020	930	840	750	600
		2	1115	1035	935	835	675
	7	6	1585	1475	1365	1260	1080
		4	1810	1685	1560	1395	1230
		2	1970	1865	1745	1560	1375
Typical Join & Sew	8	6	1695	1580	1460	1345	1155
		4	1950	1820	1685	1555	1330
		2	2135	2025	1900	1750	1500
	9	6	1795	1675	1550	1430	1225
		4	2085	1950	1805	1665	1425
		2	2295	2175	2055	1890	1620
	10	6	1895	1765	1635	1505	1290
		4	2210	2075	1920	1770	1515
		2	2450	2325	2195	2030	1735
	12	6	2075	1930	1790	1650	1410
		4	2455	2310	2140	1970	1685
		2	2500	2500	2465	2300	1970
Typical Decora-tive	14	6	2240	2085	1935	1780	1525
		4	2500	2500	2350	2160	1850
		2	2500	2500	2500	2500	2195
	16	6	2395	2230	1065	1905	1630
		4	2500	2500	2500	2345	2010
		2	2500	2500	2500	2500	2420
Shortest	20	6	2500	2495	2310	2130	1820
		4	2500	2500	2500	2500	2310
		2	2500	2500	2500	2500	2500

NOTES: (1) The display drops any 4th place "5".

(2) These thicknesses assume the regular flat throat plate. If the movable throat plate button option is used ("BUTTON" set to "YES"), its 1.5 mm (.06") thickness must be added to the workpiece thickness before using this chart.

Figure 6.4 Speed Chart

JFD15:FIGURE 6.4

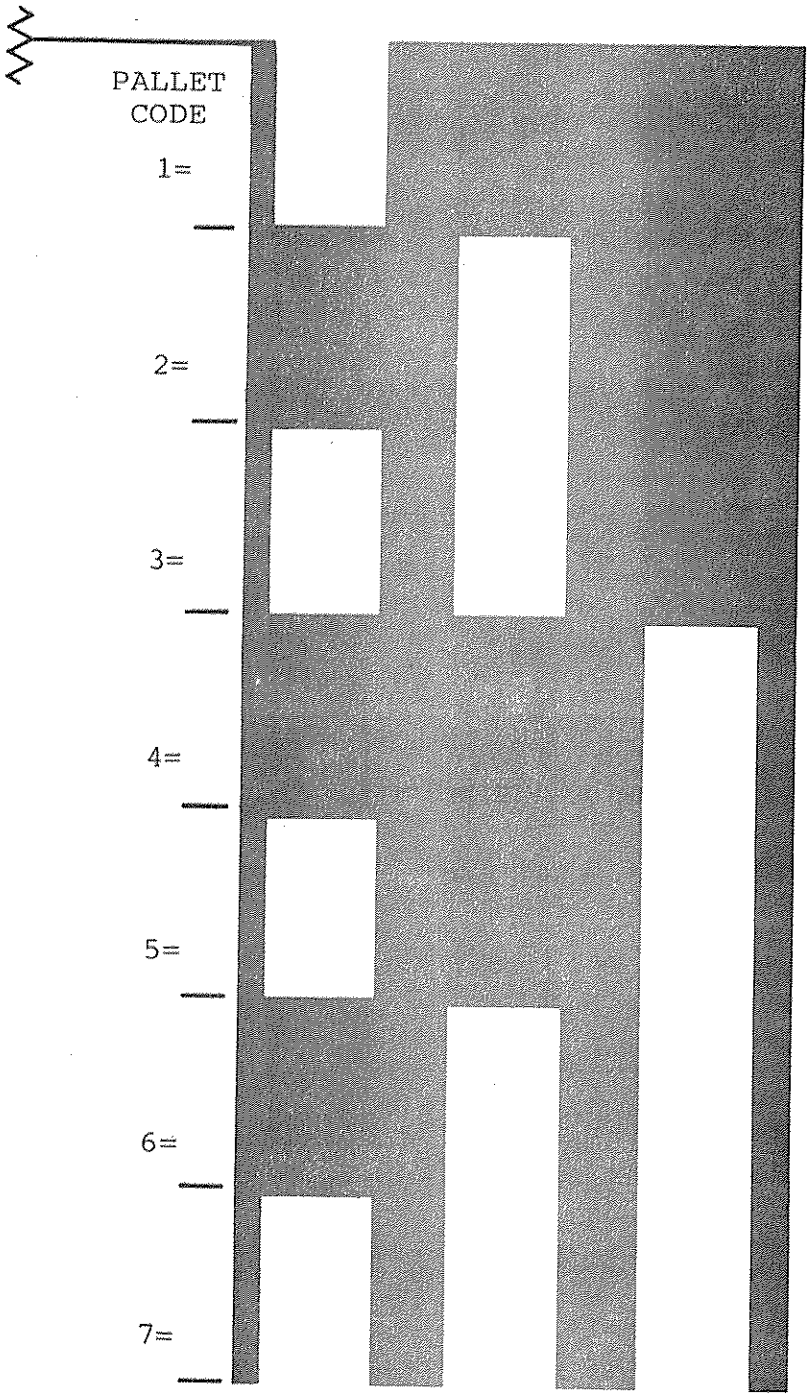


Figure 6.5 Pallet-Code Targets - Coding

6.22 Local Edit (Requiring Use of Digitized Data File)

6.22.1 General

As introduced in par. 6.11.2, this feature permits local additions and changes at CPTs or SLEW points only to control directives for thickness, dwell, speed limits, SPI, thread or part change, pallet code and size information, but not digitized point locations.

6.22.2 Saving of Edited Files

Edited files can be saved on EPROMs. Substitute the optional MPCS-860B89 P.C. board (with power off) for the B84, being sure to attach both brackets by screws at top and bottom. Follow the instructions in par. 2.5 or in App. F (IMPM) to do the saving.

6.22.3 Local Edit Procedures

1. Put the digitized file EPROM(s), held in the B83 PROM card, into the machine.

2. Enter the IMPM mode as shown in Fig. 6.1. The FWD and REV switches' functions are changed and cannot be used to step the pattern. Indeed all the 12 switches at the right end of the control panel have different functions as shown in Fig. 1.1, also shown on the control panel itself, below the switches.

3. Enter the appropriate action code commands.

Purpose	Keys	Display
Only one file of interest	3,0	"READ "
	file #,ENTER	"READ (file #)"
All files may be wanted	2,9,ENTER	"READ AD"
		(all digitized files)
Select one of them	0,2,	"FILE "
	file #,ENTER	"FILE (file #)"

4. Enter the "INDEX" (code 51) action code, followed by the record no. of the specific CPT or SLEW where an edit is to start, and ENTER. Any existing directives ("THICK 12", for example) at that CPT or SLEW, otherwise the X/Y coordinates, are displayed for 1 second.

5. Enter the appropriate one of the following action code commands. (These are explained in further detail in App. F.)

10, Display current file's pallet code
11, Display current file's min shoe size
12, Display current file's max shoe size
13, Display shoe size scheme
14, Display current file number
15, Display current record number
16, Display the current position
17, Display number of available records
18, Display current file's available stitches
19, Display US/British shoe size range (not applicable for Paris or Mondo)
31, Thickness directive
32, SPI directive
33, Stitch count directive
34, Dwell directive
35, Speed limit directive
36, Speed factor directive
37, Thread change directive
38, Part change directive
40, Assign pallet code to current file
41, Assign min shoe size to current file
42, Assign max shoe size to current file
43, Select shoe size scheme
44, Select the adult shoe size range (applies only to US/British)
45, Select the child shoe size range (applies only to US/British)
46, Calibrate the X/Y table
47, Open the clamp
48, Close the clamp
49, Alternate the foot position (up/down)

6. Repeat Step 4, except for the specific CPT or SLEW where the edit is to end.

7. After making all desired changes and checking them if desired (again using "INDEX" to move through the pattern), assign the file by using action code 05.

8. If desired to edit a different file that was read in at Step 3, use action code 02 plus file number to select it.

9. If desired to save now, see par. 2.5 or App. F. This step can be done after Step 8 (to review the edited file, and even stitch with it) by reentering IMPM mode.

10. Use action code 09 and ENTER to return to normal machine operation and check the pattern by normal FWD, REV switch pattern stepping.

6.23 Pallet Code and Size Edits (to Stitch Files)

The procedure is the same as 6.22 except:

1. Use the stitch file.
2. (Same)
3. Use action code 28 and ENTER to read all stitch files, then select the desired one.
4. Not used. This is not a "local" edit; no table motion.
5. Use applicable commands.
6. Not used.
7. Not used.
8. (Same)
9. (Same)
10. (Same)

6.24 RAM Memory Contents Explanation

There can be up to 32 stitch files and 32 digitized data files in RAM memory. Normally, each stitch file is the stitch-assigned version of the data file with the same file number, but this need not be true always. They will be different after one of the following actions.

1. A normal READ of a PROM card (must be stitch files) first erases all the stitch files, then puts all of its stitch files into RAM. Data files are not affected.

2. A "READ AS" (all stitch files) of a PROM card (must be stitch files) using code 28 of IMPM (or the local edit usage of IMPM) has the same result as 1.

3. A "READ AD" (all data-digitized-files) of a PROM card (must be data files) using code 29 first erases all the data files, then puts all of its data files into RAM. Stitch files are not affected.

4. Edits to any data file without reassigning.

5. RUN EDIT (global) or pallet code or size edits to any stitch file.

Contrary to the above, a "READ __" (specified data file) from the files of a PROM card (must be data files) using code 30 does not erase any files, but rather appends the files as the first free ("empty") data file. Existing data files as well as stitch files are not affected, so they maintain the same relationship they had.

7.0 OPERATOR'S ADJUSTMENTS

7.1 INSERTING THE NEEDLE

The screw which secures the needle will have either a slotted head or an Allen (hex) socket head. The long groove of the needle should face away from the machine post. Loosen the needle screw, insert the needle and push it up as far as it will go. Make sure its long groove faces toward the left. Tighten needle securely.

7.2 THREADING THE NEEDLE

The top thread must take the following path, illustrated in Fig. 7.2:

A. Through several of the holes of the top post.

B. Back and forth through several of the holes of the guide.

C. Inside the spring-loaded disk of the initial tensioner, passing to the left of its stem.

D. Two clockwise turns around the main rotary tensioner, between its disks.

E. Up behind the thread check spring.

F. Left through the adjacent loop attached to the head.

G. Up through the takeup lever (right to left).

H. Behind the guide bar just above the needle bar.

I. Down through the front hole of the needle bar.

J. If the needle eye is below the presser foot when threading, down through the presser foot.

K. Left to right through the needle eye.

7.3 INSTALLING AND ADJUSTING THE BOBBIN

When the bobbin is to be changed, leave the presser foot in the raised position and turn the handwheel in the opposite direction of normal rotation until resistance is felt (approximately 350^0 on the degree disk). The bobbin can now be removed by lifting the lock lever and pulling the bobbin from the cavity in the hook assembly.

To install a bobbin, insert the full bobbin into the bobbin case so that when you pull the thread, the bobbin turns in the direction indicated by an arrow in Fig. 7.2. Thread the bobbin case, as illustrated in Fig. 7.2. (Hold the bobbin

fast and pull the thread into slot A and under the tension spring until it emerges at its rear tip B.) Place the bobbin case into the sewing hook assembly. Press against the bobbin case until you hear it snap into place.

7.4 SETTING AND REGULATING THE THREAD TENSIONS

The main rotary disk tensions for the top thread and the bobbin leafspring tensioner are jointly set, and thereafter regulate the tension so that the needle and bobbin threads interlock in the center of the material, and the stitches are tightly set.

Nominal tensions:

a. Bobbin..... 2 oz. nominal
b. Top thread-low.....16 oz. nominal*
c. Top thread-high.....19 oz. nominal*

* Measured at the output side of the takeup lever.

The initial top thread tension disk (B of Par. 7.2) in general should provide less tension than the main disk C but may be increased, if necessary, to pull the cut tail below the workpiece.

However, this may reduce the length of the tail remaining in the needle so much that it pulls out on the first stitch of the next segment. If this happens, the final stop angle can be increased from the normal value of approximately 24 degrees to approximately 30 degrees. This is done by resetting the left needle positioner disk, taking care not to change the settings of the other two disks. Sections 8.14 and 11.2, test 6, cover the adjustment procedures.

7.5 BOBBIN MONITOR AND NOT CUT SENSITIVITY

These both use the rotating slotted encoder disk and can be individually adjusted for best sensitivity or operating point.

7.5.1 Bobbin Monitor (Bobbin Runout/Thread Break Detection)

Proper adjustment should permit the automatic stop to occur within 8 to 10 stitch locations in all cases. However, this requires that the stitch pattern data be prepared or edited for the proper thicknesses. If this is not done or if there are unusual workpiece flexibilities or thread tension conditions, the bobbin monitor may stop the sewing when there is no runout or thread break if the monitor setting is too sensitive. Or it may stop it late or not at all after a runout or thread break if the monitor setting is too insensitive. The monitor's sensitivity can be changed by the following procedure.

1. Depress the NEXT key to display "SET-UP".

2. Depress the DO key to display "BOBSEN 5" (the normal sensitivity).

3. Depress DOWN to reduce the number, down to 0 if necessary, to decrease the monitor's sensitivity. Depress UP, increasing to 9 if necessary, to increase its sensitivity. This new value will remain set even at power off because it is saved in the EEPROM.

4. Depress RESET twice.

5. If the monitor still can't be made to work right, it can be disabled by depressing the BOB'N switchlamp which lights, reminding the operator of the disabled condition. Pressing the BOB'N switchlamp alternately enables and disables the monitor (light goes off and on respectively). The monitor is always enabled after being powered up.

7.5.2 Not Cut

If the top thread fails to be cut at the end of a segment, the machine should stop after the slew (unless it is very short), the display becoming "NOT CUT". After cutting the thread with scissors, depress START to resume stitching.

Sensitivity of the NOT CUT feature can be adjusted in a similar manner as for the BOBBIN monitor feature:

1. Depress NEXT to display CUTSEN 5 following BOBSEN 5.

2. Use UP or DOWN to change sensitivity.

   - above 5 makes it more sensitive, 9 maximum
   - below 5 makes it less sensitive, 1 minimum

3. If it still doesn't work right, it can be disabled by repeating the above procedure and setting it to "CUTSEN 0". (Use of the BOB'N switchlamp to disable the bobbin monitor feature does <u>not</u> disable the "not cut" feature.)

A "NOT CUT" stop can be caused by the pulling out of long tails, in which case a lower sensitivity should be tried.

This function does not check for failure to cut the bobbin thread.

7.5.3 Rapid Reset to "Normal" 5 Setting

Either the bobbin or not cut can be rapidly reset to 5 by

pressing the DO switch when the function is displayed (Fig. 6.1). The display becomes "RESET?". Press DO again to reset it to 5, or press RESET to retain the present values.

7.6 PRESSER FOOT HEIGHT

When the presser foot reaches the bottom of its stroke, there should be approximately 0.4 mm (1/64") clearance to the leather workpiece. For soft materials, the presser foot may touch or even slightly compress the workpiece.

For the high lift option, with the presser foot at the bottom of its stroke, there should be 1.588 mm (1/16") clearance between the presser foot and the throat plate.

To adjust the presser foot, loosen the binding screw and either lift or lower the foot. Retighten the screw.

See Par. 8.9 for serviceman's adjustments of the reciprocating presser foot, including the high lift option.

7.7 PRESSER FOOT SPRING PRESSURE

The presser foot is pushed downward by a spring which can be regulated by a screw on top of the arm. The nominal spring setting is attained when a force of 2 lbs. is required to initially lift the foot from its lowest position.

7.8 MOVING THROAT PLATE (Optional Equipment)

For proper operation, this needs to be adjusted to be concentric around the needle. Tighten the two screws and check alignment occasionally. Three sizes of the antiflag "button" are available. Select as follows:

Needle Hole Dia.	Part No.	Selection Criteria
3.0 mm (0.120")	AJS-492**	Cable stitch work
2.0 mm (0.078")	AJS-494*	Regular with soft work material
1.7 mm (0.067")	AJS-493	Close edge work

*Supplied as regular with this unit assembly option.
**Also supplied with this option if the MPCS-560 Cable Stitch Option is ordered.

The smallest hole size has a smaller outside diameter of 3.5 mm (0.137") vs. 5.0 mm (0.198") for the other two. This permits having pallet parts closer to the stitch line.

7.9 NEEDLE COOLING

Non-lubricated air is blown at the needle during stitching and slewing. The adjustments are:

7.9.1 Air flow is adjustable by the needle valve located on the solenoid valve panel inside the right frame cover. The needle cooling valve is on the upper left of the panel (see Fig. 14.12). A hex socket wrench may be needed. To turn on the air for setting of the flow while the table is stationary, depress and lock (by a ¼ turn) the solenoid valve's manual override.

7.9.2 Position of the air jet tube can be adjusted by first loosening the clamp screw holding it.

7.10 BOBBIN WINDING

Thread the machine as illustrated in Fig. 7.3. Place an empty bobbin on the bobbin winder spindle and press the spindle in with your thumb (see arrow). Wind a few turns of thread on the bobbin. (When you start the machine, the bobbin will then be wound automatically.) The amount of thread to be wound on the bobbin is regulated by loosening screw D and adjusting stud E. If the thread should pile up on one side, adjust the thread guide on the machine arm accordingly. The thread tension is regulated by turning disk F.

7.11 PALLET CALIBRATION

This special procedure is intended to overcome a stitching problem resulting from an incorrectly made pallet or materials which are difficult to hold or sew.

It provides a correction to the normal factory (machine) calibration in the X and/or Y direction. The correction is automatically cancelled by either a PROM card reading or power down/up operation, so that the wrong correction will not be applied by mistake. The correction is displayed and can be written down for future use.

7.11.1 The menu access must be set to "FULL" (see Sec. 6.4).

7.11.2 Use NEXT and DO to call "PALL CAL", test 2, of the TEST (diagnostics) menu.

7.11.3 Press DO to display "+0 +0".

7.11.4 Press the following switches to move the pallet as desired:

Pallet Direction	Switch	Display
Left (+X)	FWD	Left values go more positive
Right (-X)	REV	Left values go more negative
Outward (toward) (+Y)	DOWN	Right values go more positive
Inward (away) (-Y)	UP	Right values go more negative

Each unit is one servo step (.0635 mm; .0025").

7.11.5 To try out the correction, press RESET to display "SAVE?", then press DO and RESET several times to return to the idle status. However, if the correction is not wanted, any displayed values can be rapidly reset to zero by not pressing DO, just RESET, when "SAVE?" is displayed.

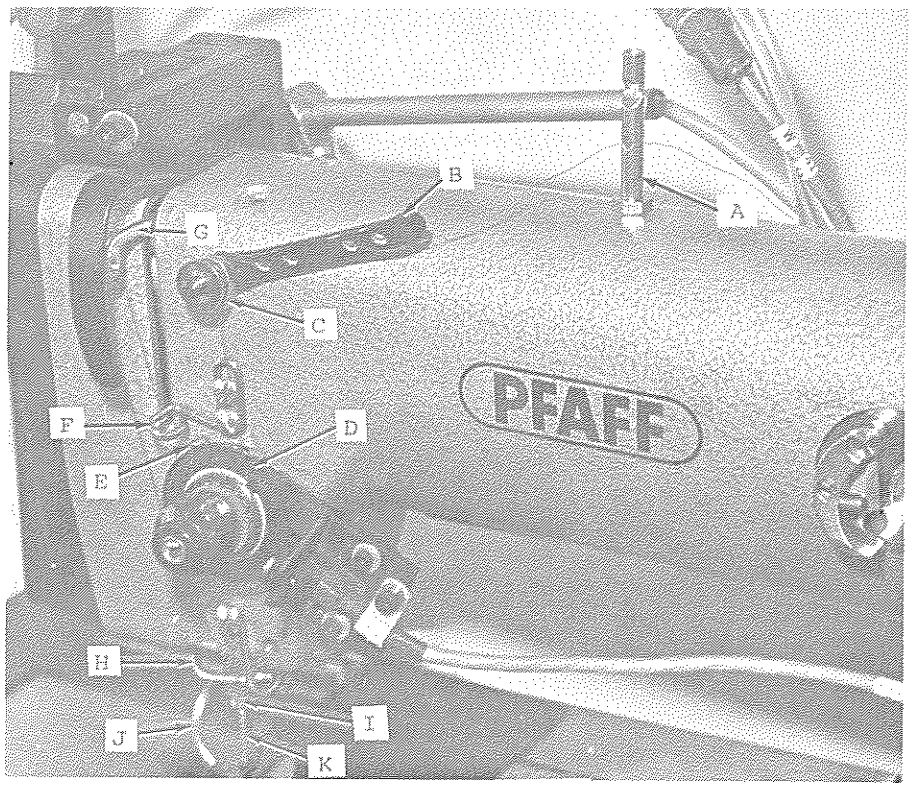


Figure 7.1

Top Thread Paths and Tensioners

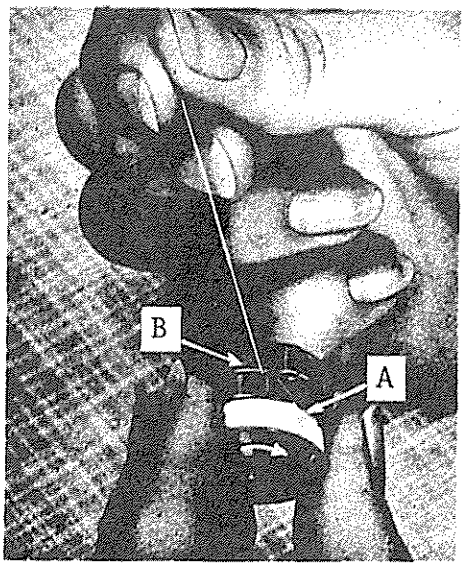


Figure 7.2

Bobbin Threading

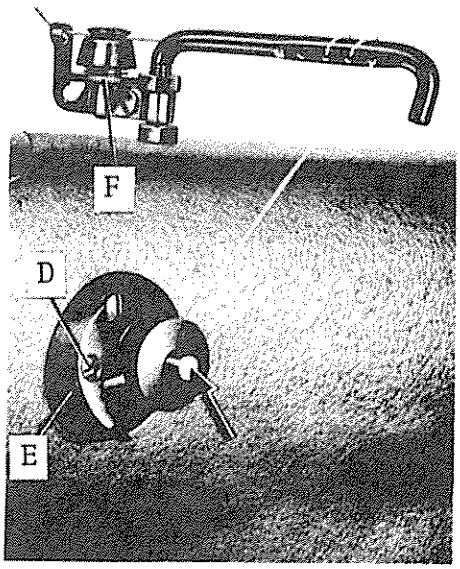


Figure 7.3

Bobbin Winder

8.0 SERVICEMAN'S ADJUSTMENTS (Mechanical System - Setup/Servicing)

NOTES

Several of the procedures require tipping back the sewing head. Steps are: (1) disengage the head holddown screw; (2) for earlier model machines with the pallet stop/sensor attached to the rear of the right pallet shelf parts, disengage its holddown screws and rotate it forward.

For greatest access, the right ejection chute may also be removed.

Most of the screw fasteners of this machine have metric threads. Exceptions are a few small limit switch mounting screws and most commercial component screws.

8.1 MACHINE (FACTORY) CALIBRATION

NOTES

If the needle bar is not in alignment (check if not sure), first do procedure 8.3.

Should a change be made to one of the servo motors which has an integral encoder (only the front X axis motor does not) or gears, the calibration procedure described below must be used.

If necessary to adjust the X or Y axis calibration or simply to check on the values that were established by USM during factory calibration and test, proceed as follows:

8.1.1 The menu access must be set to "FULL" (see Sec. 6.4).

8.1.2 Remove the needle and presser foot; then insert the ACS-483 calibration pin into the needle bar.

8.1.3 Insert the AJS-1157 calibration pallet within the clamp wedges.

8.1.4 Use NEXT and DO to call "MACH CAL", test 1, of the TEST (diagnostics) menu.

8.1.5 Press DO to clamp the pallet and move it inward and to display the previously established factory calibration values.

For example, "-76 +117" is interpreted as follows (table direction is relative to the zero track of the servo motor encoder as assembled for that specific machine):

Axis	Table Direction	Servo Steps	MM	Inches
X	right	76	4.826	0.190
Y	outward (towards)	117	7.430	0.2925

NOTE

One revolution of the encoder represents 125 servo steps (7.9375 mm, 0.3125").

8.1.6 To check present calibration, use the FOOT DOWN switch to lower the foot. Then turn the handwheel to place the calibration pin just above the pallet.

8.1.7 If the pin can be inserted into the pallet's hole, the MACH CAL is still correct. Press RESET several times to return the machine to the idle status. It is not necessary in this case to press DO when "SAVE?" is displayed. If the calibration settings are not changed, they will remain saved in the EEPROM.

8.1.8 If the pin does not line up with the hole in the pallet, press the following switches to obtain the proper alignment.

Pallet Direction	Switch	Display
Left (+X)	FWD	Left values go more positive
Right (-X)	REV	Left values go more negative
Outward (towards) (+Y)	DOWN	Right values go more positive
Inward (away) (-Y)	UP	Right values go more negative

Each unit is one servo step (.0635 mm; .0025").

8.1.9 When believed lined up, check by repeating step 8.1.7 and try to insert the pin into the hole. Readjust as necessary.

8.1.10 Press RESET once to display "SAVE?", then DO to save these new values in the EEPROM. (If it is decided to not save the change, press RESET instead.) Finally, press RESET several times until the idle status is reached.

8.2 SETTING THE DEGREE DISK POINTER

The sewing machine has two unique devices which simplify the task of timing the machine: the numbered plate under the presser foot lifter bracket and the 360^{0} dial on the handwheel.

Remove the lower screw on the presser foot lifter bracket, raise the bracket and lock it in the UP position with the spring-loaded detent pin.

Insert a 5 mm (0.197") pin (ACS-473) in hole number 5 of the bearing plate. See Figs. 8.2 and 14.4. If the pointer doesn't point to 0^0, loosen the pointer retaining screw and relocate the pointer to 0^0. (See Fig. 14.2 for the degree dial.)

8.3 NEEDLE TO THROAT HOLE ADJUSTMENT

A straight needle or preferably the calibration pin ACS-483 must enter exactly in the middle of the needle hole of the special calibration throat plate ACS-5070. To make this adjustment, first substitute this throat plate and remove the presser foot.

8.3.1 Remove screw A. (See Fig. 8.3.)

8.3.2 Loosen screws B and C.

8.3.3 Adjust the needle position in the "to or away from the operator" position direction by turning the eccentric behind screw A.

8.3.4 Adjust the needle position in the "to or from the sewing machine post" direction by repositioning the needle bar frame. (Item D)

8.3.5 Tighten screw C.

8.3.6 Move the eccentric stud behind screw A until it touches the needle bar frame and tighten screw B securely.

8.3.7 Replace and fully tighten screw A.

8.3.8 Loosen screw B a second time so that any tension in the needle bar frame may be released. (If the latter is subjected to tension, excessive wear of needle bar and its frame will result.)

8.3.9 Tighten screw B again securely.

8.4 ECCENTRIC HOOK SHAFT BEARING

8.4.1 Gear Play: The gears should have the least possible play, but they must not bind.

Adjust by loosening Allen screw B, Fig. 8.4, to the right of the needle plate, and turning the eccentric hook shaft bearing. The clearance between the hook shaft and the needle plate should be as small as possible.

8.4.2 Lateral Positioning of the Bearing

When the sewing hook is pushed onto its shaft and back as far as it will go, there should be a clearance of 0.4 mm (0.016") between the point of the sewing hook and a size 90 needle.

Adjust by lateral repositioning of hook shaft bearing A (loosen screw F), Fig. 8.4, making sure that the bearing itself is not turned. Screw D, Fig. 8.4, must be loosened, and the oil tube of oil regulation valve C pulled out of oil distributor ring E before repositioning the hook shaft bearing.

8.4.3 Gear Alignment

The gears should be perfectly in line with each other. The screws holding the gears must be easily accessible.

8.5 ADJUSTING THE SEWING HOOK

CAUTION

Do not use a C-clamp when timing the sewing hook as the protective coating of the needle bar will be damaged.

The hook point must be at the centerline of the needle when the needle bar is 1.8 mm (0.072") past the bottom of its stroke.

NOTE

For this adjustment, it is not necessary to raise the presser foot lifter bracket. The ACS-473 pin can be inserted through the clearance hole in the bracket and into the #4 hole (204^{o}).

8.5.1 When the machine is blocked by the pin in hole #4 (204^{o}), the hook point is adjusted to coincide with the centerline of the needle. Screw B, Fig. 8.4, is used for this.

8.5.2 Hook to needle clearance should be between 0.025 mm (0.001") to 0.1 mm (0.004").

8.6 SETTING THE NEEDLE BAR HEIGHT

8.6.1 The machine should be blocked with a pin in hole #4 (204^{o}).

8.6.2 Loosen the two screws A, Fig. 8.5, and adjust the needle bar so that the distance from the bottom surface of the hook point to the top of the needle eye is 0.8 mm (0.032"). (See Fig. 8.6.)

8.7 BOBBIN CASE TO POSITIONING LUG CLEARANCE

The clearance between the positioning lug A and the bobbin case should be 1.15 mm (0.045") to 1.2 mm (0.049"). If a correction is required, the hardened positioning lug should be carefully bent. (See Fig. 8.7.)

8.8 ADJUSTING THE BOBBIN WINDER

The bobbin winder is driven by a conical collar screwed onto the drive shaft. If the drive is not positive or does not release, loosen the collar screws through the access hole on the back of the arm and reposition the collar.

8.9 PRESSER FOOT

8.9.1 Presser Foot Lift

When the presser foot lift cylinder is retracted, three things happen: (1) the presser foot is lifted, (2) the thread tension is released, and (3) the sewing head is returned to its nominal 24° setting.

The cylinder lifts a dovetail slide which comes against a fixed stop and is non-adjustable. The presser foot lift, therefore, is also fixed. The bottom of the dovetail stroke can be adjusted by advancing or retracting the piston rod in the clevis. This does not change the presser foot lift.

The velocity of the slide can be varied by adjusting the flow control valves located on the air cylinder above the presser foot. Closing the valve (by a clockwise rotation) at the top of the cylinder decreases the speed in the upward direction. Closing the other valve decreases the velocity in the downward direction.

8.9.2 Reciprocating Presser Foot Action - Regular Lift

An eccentric cam mounted on the drive shaft oscillates a connecting rod which, in turn, oscillates a countershaft. (See Fig. 14.8.) A lever fastened to the countershaft lifts the presser foot upward, and a spring pushes the foot downward.

To time the presser foot:

8.9.2.1 Remove the access cover at the rear of the arm.

8.9.2.2 Insert an Allen wrench, in turn, into the two holes in the counterweight and loosen the two eccentric cam lockscrews.

NOTE

The two screws which fasten the counterweight need not be loosened.

8.9.2.3 Reposition the cam to obtain the desired timing. When the handwheel is 217° (nominal), the presser foot should be at the point of reversal from bottom dead center.

8.9.2.4 Tighten the cam lockscrews.

8.9.2.5 Replace the cover.

8.9.3 Reciprocating Presser Foot Action - High Lift Option

This option (see Fig. 14.9) greatly increases the capability to stitch on a combination of thicker and thin workpieces within the same pallet. To time this optional foot, repeat the procedure of 8.9.2, substituting 230° for the handwheel angle at which the presser foot is at the point of reversal from bottom dead center. THIS IS A VERY IMPORTANT ADJUSTMENT.

8.10 MOVING THROAT PLATE - OPTION

There are several possible adjustments. See Fig. 14.6.

8.10.1 Vertical

The maximum upward motion is adjusted by screw A, Fig. 14.6.

8.10.2 Horizontal

As discussed in Sec. 7.8, the position of the anti-flag "button" part is established by the settings of the two screws which hold it to the moving throat plate mechanism. Be sure that these are tightened fully.

8.10.3 Cylinder Extension

When the throat plate is raised, the pivot marked by letter B should not quite move to the vertical (toggle) position.

8.11 THREAD TENSION DEVICES

8.11.1 Thread Check Spring (See Fig. 7.1, Item D; also Fig. 14.3.)

The stoke of the check spring should be approximately 1.5 mm (1/16"). The exact length of the stroke depends on the material and thread, and must be altered accordingly.

8.11.1.1 Insert an Allen wrench, in turn, through the two holes in the disc and loosen the two binding screws.

8.11.1.2 Set the degree wheel at 64° to align the thread in the stitch setting position. Adjust the spring to deflect the thread clockwise 1.5 mm (1/16").

8.11.1.3 Lock the binding screws.

8.11.2 The adjustments to release thread tension by the presser foot lift cylinder follows:

NOTE

When making this adjustment, it is imperative that the tension discs are not separated more than 0.8 mm (1/32"). Excess motion could bend the rib of the spring actuator disc

8.11.2.1 Lift the presser foot lifting bracket and latch it in its upward position.

8.11.2.2 Loosen the checknut of the set screw which contacts the bell crank. See Fig. 14.5.

8.11.2.3 Advance the set screw until approximately 3 mm (1/8") of the opposite end protrudes beyond the surface of the casting.

8.11.2.4 Lower the presser foot lifting bracket and tighten the lockscrew.

8.11.2.5 Lif the presser foot. The tension discs should separate approximately 0.55 mm (0.020"). If the separation is greater than 0.8 mm (1/32"), readjust the set screw.

8.11.2.6 Tighten the locknut.

8.11.3 Thread Tension Release

The thread tension is released by the thread cutting mechanism during the cut cycle and by the presser foot lift cylinder whenever the foot is lifted.

The tension release by the thread cut mechanism is adjusted as follows:

8.11.3.1 Lift the presser foot lift cylinder bracket and latch it in its upward position.

8.11.3.2 Loosen the shoulder screw (Item 1, Fig. 8.8) and rotate the upper section of the two-piece lever in the counterclockwise direction and retighten the screw.

8.11.3.3 Tilt the sewing head on its side, advance the handwheel to 308° and operate the pneumatic cut solenoid valve (11) by its manual override button, rotating it 90° to lock it in that position.

8.11.3.4 Loosen the screw which secures the tension-release wire (Item 1, Fig. 14.10) and adjust the wire length until the thread disks begin to separate. Retighten the screw.

8.11.3.5 Readjust the shoulder screw (Item 1, Fig. 8.8) if necessary.

8.12 ORIENTATION OF THE TAKEUP LEVER PIVOT PIN ECCENTRIC

8.12.1 Loosen the eccentric screw.

8.12.2 Remove the bearing plate which contains the blocking holes.

8.12.3 Turn the handwheel to 180^{o}.

8.12.4 Position the eccentric in the position shown in Fig. 8.10 with the slot on the eccentric stud in the horizontal plane.

8.12.5 Replace the bearing plate and tighten the lock screw. The machine should turn over easily. When the takeup lever is at the top of its stroke, the blocking pin (ACS-473) can be inserted in hole #2 and the degree sheel should read 64^{o}.

8.13 PNEUMATIC CUTTER - CATCHER ADJUSTMENT

(See Figs. 10.1, 14.10 and 14.43.)

Operation of the thread catcher is controlled by a pneumatic air cyclinder 65 pressurized by solenoid valve 11 with speed control by flow control valve 46 (right end of cylinder) carefully set by USM at test to prevent bobbin overrun. If necessary to adjust valve 46, open it (turn CCW), which increases catcher return speed, until bobbin overrun occurs. Then close it slightly (turn CW), which decreases catcher return speed until overrun stops.

Mechanical adjustment of the thread catcher to the knife is done by the connecting rod (Item 3, Fig. 14.10) by rotation within its LH and RH balljoint ends to obtain the setting shown in Fig. 8.12b when the CUT solenoid valve 11 is set ON. The adjustment is very critical to proper cutting and to prevent lockup or falling off of the part.

Tension-release adjustment is described in Sec. 8.11.3.

Control of the catcher extend motion results from the signal produced by the "CUT" photocell sensor interruptor disk of the needle positioner (described in Sec. 8.14 and adjusted by Test 6 of par. 11.2.4). But check knife sharpness and knife-catcher adjustments first.

When the heel of thread pull-off flange 45 (Fig. 8.11) is positioned 2 mm (0.079") past the centerline of positioning finger 46 (as seen in feed direction), there should be a clearance of 2 mm (0.079") between the tip of thread catcher 16 and the centerline of the positioning finger.

Fig. 8.12a shows further adjustment information for knife and catcher left-right centering setting.

8.14 SYNCHRONIZING AND REVERSING

8.14.1 General

The needle positioning mechanism attached to the handwheel end of the sewing machine has hardware to provide several functions.

1. A slotted-disk encoder provides a sewing speed reference and a synchronization of the X-Y positioner motion to the sewing machine.

2. Three photocell sensors, operated by adjustable interruptor disks, provide once-per-revolution synchronization of the encoder, control of the cut, and also stopping and reversing after thread cut. The presser foot air cylinder mechanism reverses the sewing machine by pulling up on a portion of the crank, after the sewing machine drive has stopped the shaft. The brake is controlled to act for a short time just before completion of the cylinder stroke, preventing overshoot but still permitting the final position to be determined by the mechanism.

8.14.2 Encoder Signal Processing

The pulses from the encoder are processed by the B93 board in the sewing machine drive enclosure to establish the needed number of pulses per revolution of the sewing machine shaft.

8.14.3 Photocell Disk Settings - Needle Positioning Unit - Fig. 14.2.

The procedure to check and adjust, if necessary, is given in Par. 11.2, under Test 6, "NEEDLPS".

Location	Purpose (angle is leading edge)
(relative to the head)	
Closest	First stop*, reversal stop at 24^{o} (350^{o}) ("STOP")
Middle	Synchronize X-Y table to the encoder (157^{o} + 0^{o} - 1^{o}) ("SYNC")**
Farthest	Signal the catcher motion ("CUT")*** (See Par. 11.2, Test 6 for Values) for the cut which follows ("CUT")

* After counting encoder pulses to signal at 75^{o}.
** Different for extended head - see App. G.
*** Return stroke control at a later angle, which performs the cut, is triggered by the trailing edge of the STOP disk.

8.15 BELT TENSION

The belt tension should be kept snug. Adjustment, if needed, is made by rotating the upper and lower nuts on the stud portion of the swingable sewing machine drive motor mounting.

8.16 PALLET CLAMPING

8.16.1 Pallet Clamp Wedges

As instructed in Par. 16, Appendix E, both the front and rear wedges can be adjusted by loosening their mounting screws. This should be rare, but if done, they must be reset to be parallel to the Y axis. Otherwise, incorrect skewing of the pallet will result. The machine (factory) calibration procedure must also be used to assure that alignment to the needle is obtained. See Fig. 8.13 for clamping parts.

8.16.2 Pallet Height

As instructed in Par. 15 of Appendix E, should the pallet ride too high or low over the sewing machine's throat plate and base, adjust the vertical position of the supports (flat surfaces adjacent to the wedges). Four screws each hold the front and rear support brackets. There is sufficient clearance in the screw holes through the brackets for the adjustment that would be needed. To get at the front screws, it is necessary to first remove the two moving mechanisms by pulling the fulcrum pin.

8.17 AUTOMATIC PALLET TRANSFER

A number of adjustments are involved with the various mechanisms.

8.17.1 Pallet Loading

This involves adjustment primarily of the right shelf, the stop at the rear, and the sensors vertically. However, the left shelf also has an adjustment in case that might be necessary; its two screws are accessed by removing the workshelf.

An adjustment can be made to the right shelf to accommodate pallets which might be wider or narrower than the AJS-B regular-width standard, including the older AJS-A regular-width pallets. The adjustment is made by the two screws which hold the right shelf bracket. The clearance

between pallet edges and shelf ridges should be no more than is necessary to permit easy sliding; if too much, the pallet may not engage the wedges when it drops.

The adjustment for the in-and-out location of the pallet against the pallet stop is accomplished by the position of the pallet stop and sensor bracket, which is then tightened with its two screws. The mechanism does not require an exacting position in order for the pallet to engage the wedges when it drops; considerable variation is possible. The sensors require even less precise alignment with their targets. However, it is important that the pallet always be loaded fully back against the stop.

The horizontal level of both loading shelves can be adjusted by the rod nuts and the mounted positions of their actuating cylinders. There are also adjustments for the limit switch of the left shelf which may require adjustment.

8.17.2 Pallet Sensors

The sensing circuit has a unique design to provide a wide operating variation between the sensors and the target bars attached to the pallet (see Par. 6.9.3).

	Bars to Sensor	Bars to Mounting Plate
Minimum	9.5 mm (3/8")	6.4 mm (1/4")
Maximum	19 mm (3/4")	15.8 mm (5/8")

This range should permit handling abnormally thick pallets, and even bent or warped pallets, without having to raise the sensors. It should also handle decorative pallets (single leaf) without having to lower the sensors. However, the sensors' position can be easily adjusted by the single screw on the front.

If the above range is not obtainable, the sensitivity of any one of the sensing circuits can be checked and adjusted as follows, after running diagnostic test 9 (switches) and checking operation of the three sensors:

1. Check to make sure that the two lights that establish a consistent level of target illumination are still shining. They are necessary for proper operation.

2. Load a pallet which has white target bars.

3. Adjust the distance from bars to sensors to the maximum value (see above).

4. Remove the cover from the back of the AJS-860B88 sensor board. Set each potentiometer independently to the point

where the LED for its sensor just lights (where turning if back and forth makes it go on and off). This is the maximum practical sensing range.

5. Lay a strip of only black target bars over the white-bar strip (making the LEDs go off). Slowly raise the pallet. The LEDs should not go on until the pallet approximately reaches the minimum distance (see above). Do not try to adjust to work closer than this, where even a black target can return enough light to switch on the circuit. If one of the LEDs should go on at a greater distance than the minimum, slightly adjust its potentiometer so that it does not go on. then remove the black targets, lower the pallet, and recheck the white-targe at maximum distance. If necessary, select a slightly compromise adjustment. If this procedure still does not achieve the stated performance, the B88 board or possibly the B99 must be replaced.

Finally, set the approximate distance as follows for the thickness of pallet to be used.

Bars to Sensor	Bars to Mounting Plate
12 mm (1/2")	9.5 mm (3/8")

8.17.3 Unloading Mechanism

There are no adjustments. See Fig. 8.13 for the unloading parts.

8.17.4 Ejection

After being unloaded, the pallet drops by gravity onto the left and right slanting slides. The two shock absorbers should remove most of the bounce and noise, but not all. The resulting bounce is normal and has been engineered and tested to not cause operating or maintenance problems.

There are two force levels of shock absorbers that can be used, depending on the commonly-used pallet (see Par. 12.4).

Top Color	Pallet	USM Part #
Black (regular)	Join and Sew (heavier), but will work with Decorative	XF470F4
White (optional)	Decorative (lighter) only	XF470F3

After experimentation, the right slide's left/right position can be adjusted by its screws to improve alignment for pallet width variations if necessary.

The position of the forward stops can be adjusted if needed.

8.17.5 Limit Switches

Adjustment of the limit switches (loading shelf and ejector) for proper, but not excessive, overtravel is covered in Par. 9.5.4.

8.18 ACS AND ABNORMAL PALLETS

8.18.1 ACS Pallets

As shown in Fig. 6.2, there are two possible mountings which require different preparations.

"Outward" (AJS type)

The right shelf support must be positioned in a forward set of added holes, which is 6.35 cm (2.5") more forward than for the regular pallet. These holes will be added before shipment by USM if requested or could be added in the field.

The stop and sensor bracket must be repositioned toward the forward end of its travel by 1.90 cm (0.75"), making a total of 8.25 cm (3.25"), the amount required. If the pallet stop is attached to the sewing head adapter (expected design improvement), the bracket is slid forward on the adapter by the above amount.

The right ejection chute must be positioned higher to prevent the shorter pallet from hitting the sewing head base as it slews inward.

One of the adapters, which comes when AJS-755 is ordered, must be attached to each ACS pallet for mounting in the MPCS-A. The adapters are easily removable so they can be switched between pallets. The part number is AJS-1152+.

The mounting hardware is supplied with each adapter, being special high-accuracy adapter studs. Use first the round stud AJS-282 (plus washer MH616A12 and nut MH603A12) in the front holes, keeping the nut fairly loose. (Be sure to use the washers.) Then assemble the rear slots with the slabbed stud AJS-283, washer and nut. Do not overtighten the nuts as the screws, being fairly hard, can be broken.

The media preparation can use the ACS-AJS conversion program (which gives the required 2.75" offset), followed by normal AJS-MPCS conversion.

"Inward" (Possible New Alternate)

The offset is only 1.90 cm (0.75") which is provided by the same second step as for the outward type. The right shelf parts are not moved (so no holes need be added).

The right ejection chute need not be raised.

IMPM digitizing should be used to make the media. If a conversion of ACS media is wanted, the smaller offset of 0.25" requires a minor media software variation.

A different adapter bar would be needed, which is the "mirror image" of the regular one, as shown in Fig. 6.2.

8.18.2 Abnormal Pallet Designs

Occasionally the pallet design might be different from the standard supplied by USM. As an example, the pallet-mounting "ear" pieces might be attached to the non-hinged work-locating guide piece, the bottom piece containing the needle groove being attached beneath the guide piece. This construction may require use of a special adapter strap which has two spacers brazed to it. These compensate for the thickness of the bottom piece. For help in handling pallets, refer to USM during planning stages.

8.19 WORKSHELF

Mounting of the workshelf can be shifted to the left in an alternate set of fastener holes, to provide vertical clearance for high work. In this case the pallet transfer loading feature cannot be used, and the left shelf must be removed.

8.20 SUMMARY CHART OF MACHINE TIMING

SEE FIG. 8.2 FOR PLATE HOLE NUMBERS.	Degree Disk	Plate Hole No.
Top dead center of needle bar	0^{o}	5
Machine stop position with presser foot lifting bracket up	24^{o}	-
High point of take-up lever	64^{o}	2
Machine stop position with presser foot lifting bracket down	85^{o}	-
Needle point touches flat throat plate	100^{o}	-
Sync disk (middle) leading edge at sensor (regular head)	157^{o}	-
Hook at centerline of needle	204^{o}	4

Hole may be accessed through the housing.

	Degree Disk	Hole No.
Point of reversal of presser foot		
Regular lift	217^{o}	-
High lift option	230^{o}	-
Cut disk (farthest from encoder) leading edge at sensor (see par. 11.2.4, Test 6)		-
Tension disc starts to open	312^{o}	-
Stop disk (closest to encoder) leading edge at sensor	350^{o}	-

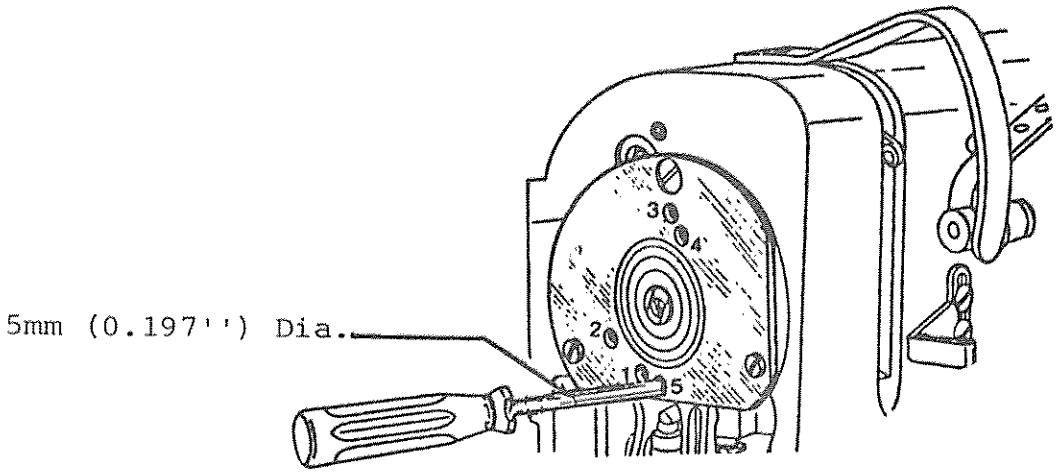


Figure 8.2

Machine Timing Plate Holes

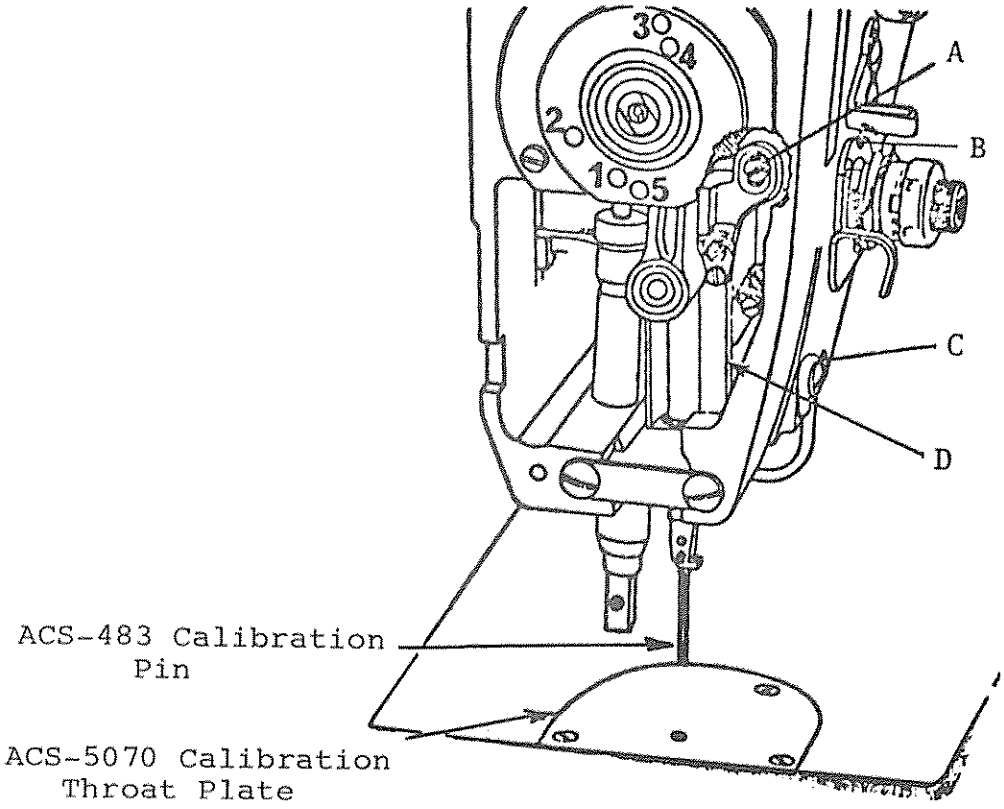


Figure 8.3

Needle to Throat Adjustment

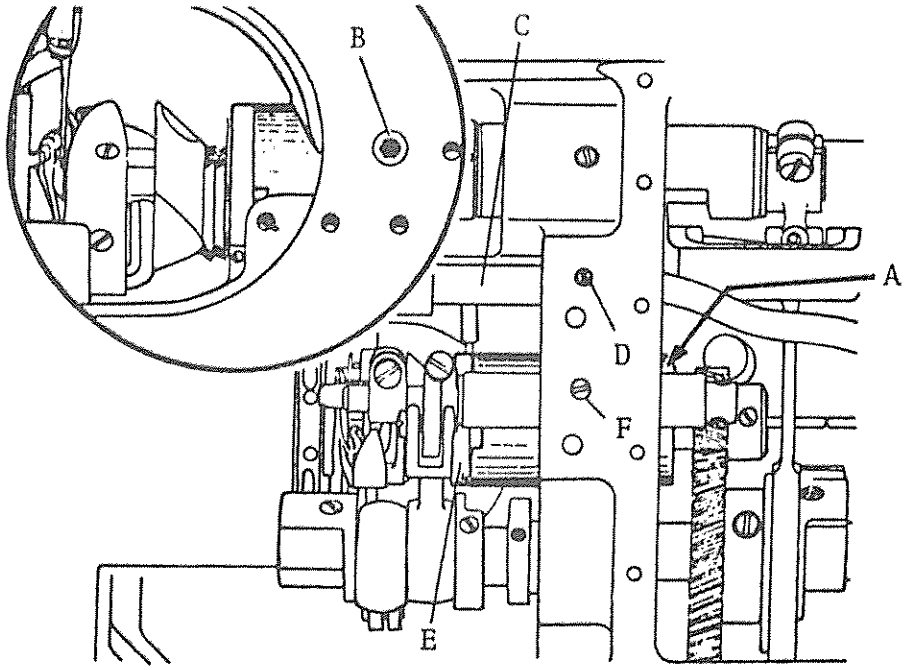


Figure 8.4
Gear Alignment

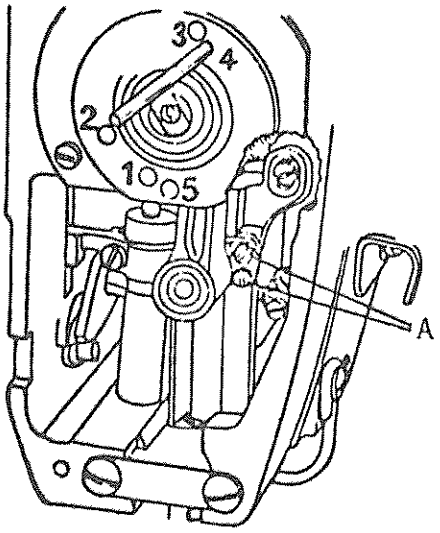


Figure 8.5
Needle Bar Height

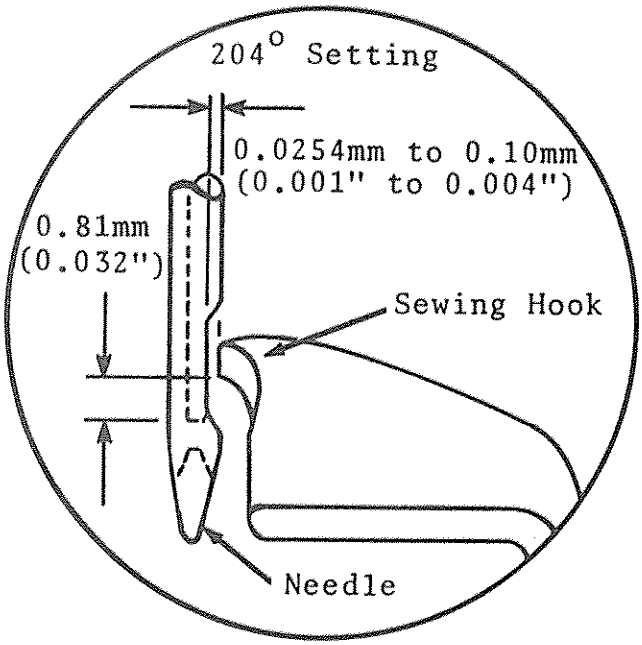


Figure 8.6
Needle to Hook Setting

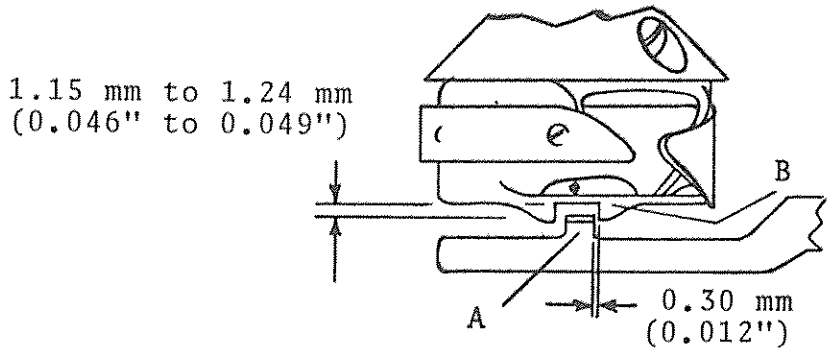


Figure 8.7
Bobbin Case to Positioning Lug Clearance

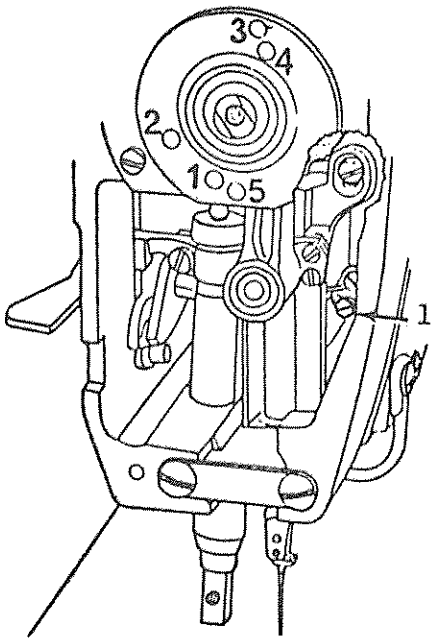


Figure 8.8

Thread Tension Release - Upper

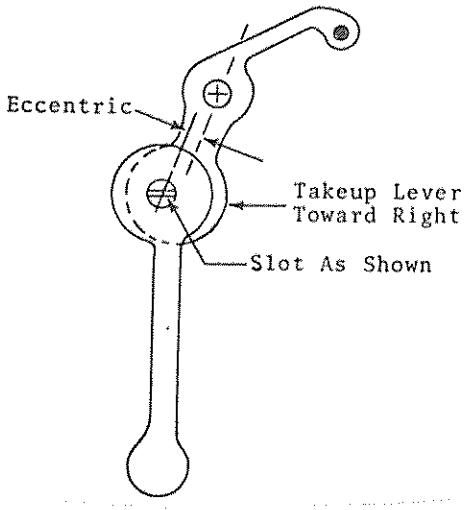


Figure 8.10
Take-up Lever Adjustment

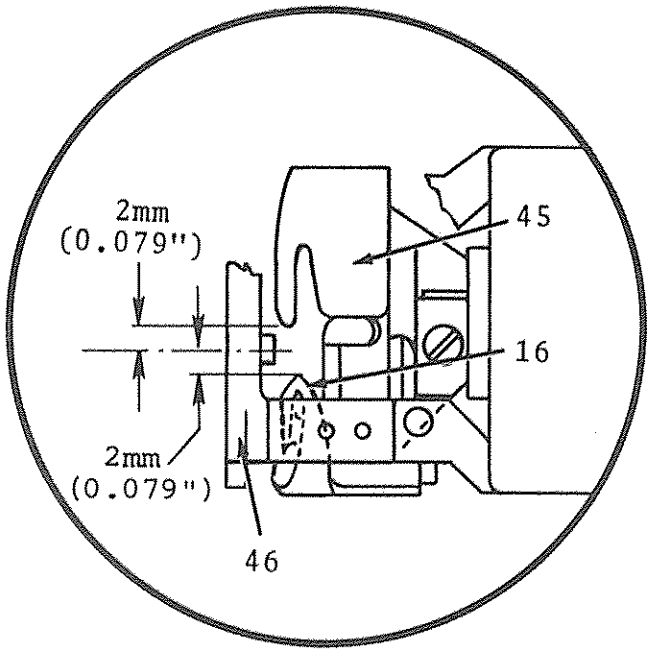


Figure 8.11
Knife Adjustments

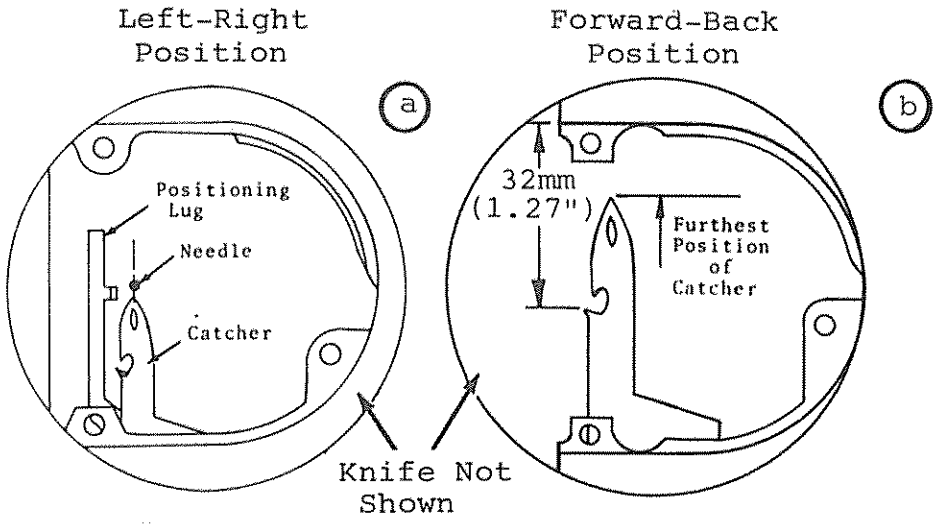
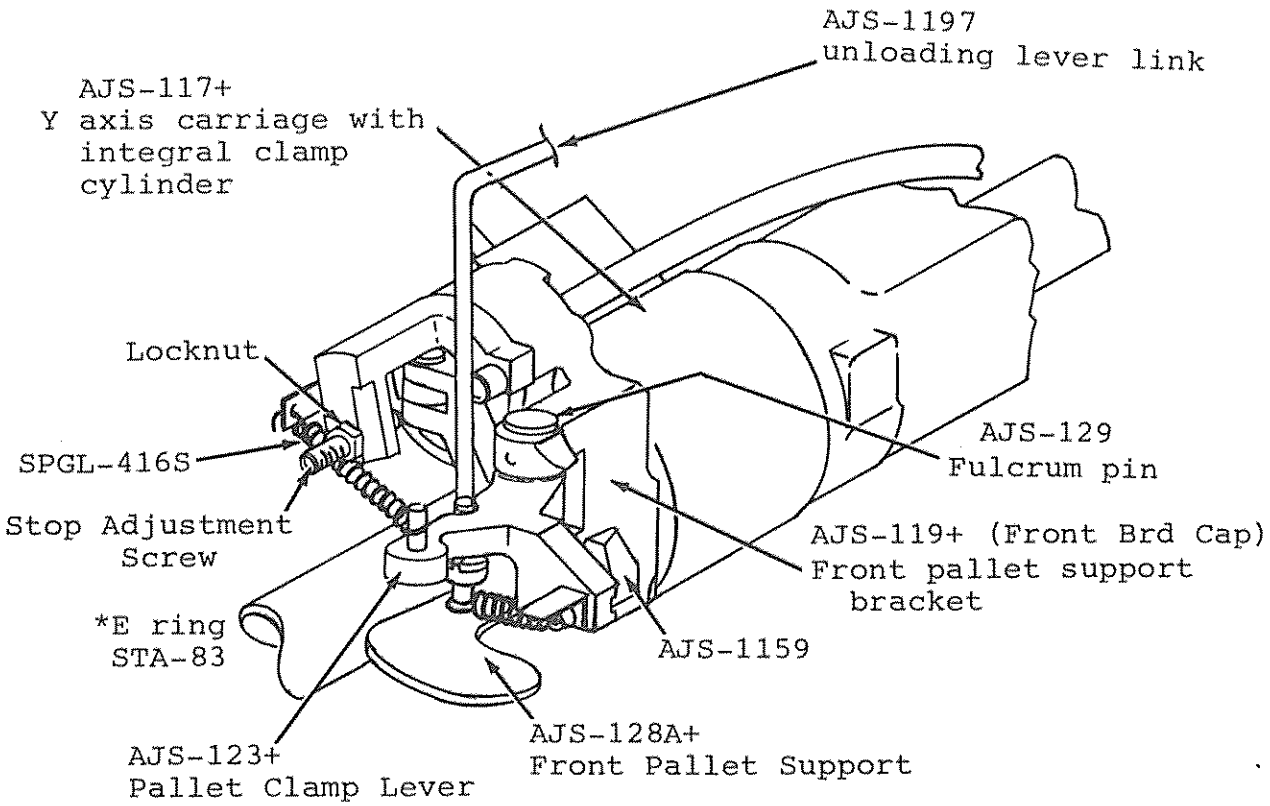


Figure 8.12 - Knife and Catcher Settings



*holds AJS-1197 to AJS-128A

Figure 8.13

Pallet Clamping and Unloading Parts

9.0 CONTROL SYSTEM - DESCRIPTION, SETUP, AND SERVICING

9.1 GENERAL DESCRIPTION (SEE SYSTEM ELEMENTARY DIAGRAM, FIG. 13.1)

The following is an abbreviated description of the control system from the viewpoint of the control's hardware. It is provided to aid service personnel in understanding and troubleshooting. Section 6.0 covers the control system from the viewpoint of the operating system, which is implemented in computer code contained with EPROM and, therefore, not designed for service.

The control computer and the various programmable digital devices and other electronics which interface it to the actuators, solenoid valves, displays, lights, buzzer, PROM card, switches, keys, encoders, pallet sensors, thread monitor, etc. are all contained on the B86 digital controller printed circuit board. Other PC boards are used for the operator control board and display, PROM card interface, sewing machine drive, pallet sensing, and input/output distribution. The optional in-machine PROM maker also uses two PC boards. The locations, names and part numbers of the printed circuit boards are summaried in Fig. 9.1.

The operator places a PROM card into the reader and depresses switches, causing data to pass into the computer's RAM memory. The desired data file is selected directly or by size of the shoe, and START is depressed. The pallet is transferred from the upper "load" shelves to the active level below, clamped to the X-Y table by the pneumatic clamp, and slewed to the start of stitching. The foot is lowered and the throat plate raised if equipped with this option. If not equipped with the pallet transfer device, the operator places the pallet into the table before pressing START, but clamping is still automatic when the slew starts.

The sewing machine starts. Its upper shaft rotates an encoder (needle positioner unit) whose output is processed to transmit to the B86's computer, 96 pulses per revolution. These pulses time the servo-driven X-Y table to the sewing head. The main computer sends speed commands to the stitcher control unit.

The middle disk of the three photocell-disk-control's unit synchronizes the pulses.

The pneumatic thread cut operation is initiated by the right (outer) photocell-disk-control unit. Thread cutting is preceded by two stitches at 200 spm.

The left (inner) disk determines the end of the forward rotation of the head at the completion of the cut, and initiates head reversal by the rising of the presser foot air

cylinder, raising needle and foot for the next slew plus extracting cut ends. The presser foot cylinder also releases the thread tension.

The thread detector (bobbin monitor) stops actions as needed.

The machine has built-in monitoring action to guard against improper movements of its X-Y table or any of its mechanisms.

Pallet release and ejection downward occurs after the last slew, immediately followed by loading of the next pallet from the upper shelves, where it has been sensed by the B88 board sensors.

NOTE

Most cable connectors have keying pins. Nevertheless, when disconnecting cables, notice their orientation since some could be reconnected incorrectly with the opposite orientation unless the orientation is obvious by the paths which the cables take. Some mating connectors have arrows which should face upwards. Others require a match of small triangles.

9.2 MAIN CONTROL ENCLOSURE (LOWER FRAME)

Most of the control hardware is packaged within the bottom main frame of the machine. Access is provided by two hinged doors plus removable covers.

The major control component units, covered in the following paragraphs, are power supplies, computer and interfaces, the X-Y table servos, and the stitcher drive.

Since the lower frame doors enclose high voltage parts, each door has one tamper-proof lock that requires use of a special tool, (MPCS-228) supplied with the service kit, to be opened.

A large-flow fan at the left end forces cooling air flow inward (fed through a filter).

PC Board (Note 4)	Location	Function	Static Sensitive (Note 5)
VCD-860N25	Power compartment	Switch distribution	
XE860B52	Left front of frame	Servo power (one for each axis)	
AJS-860B55	IMPM enclosure	IMPM keyboard/ joystick (Note 1)	
MPCS-860B81	Control enclosure	Keyboard	
AJS-860B82	Control enclosure	Display	
MPCS-860B83	PROM card holder	Pattern data (Note 2)	
MPCS-860B84	Control compartment	PROM card interface	*
MPCS-860B85	PROM card holder	PROM card connector	
MPCS-860B86	Control compartment	CPU, memory control	*
MPCS-860B87	Right end of frame	Solenoid distribution	
AJS-860B88	Front of stitcher	Pallet sensing	*
MPCS-860B89	Control compartment	IMPM interface (Note 3)	*
MPCS-860B93	Stitcher drive unit	B86 interface	
MPCS-865B95	Stitcher drive unit	Stitcher drive logic	*
MPCS-865B96	Stitcher drive unit	Stitcher drive speed control	*
MPCS-860B99	Control compartment	Pallet sensing interface	

Note 1: Part of MPCS-450 or MPCS-384 option; MPCS-860B94 later substitute.

Note 2: Not included with machine; order separately.

Note 3: Part of IMPM option, also performs the functions of B84.

Note 4: When ordering printed circuit boards, the complete part number, including the dash number, must be used. Numbers should be verified by examination of the boards in the machine. Include "REV" letter. See Fig. 11.1, Software Identification and Calibration Card.

Note 5: Certain electronic components and assemblies are sensitive to static electricity and require special handling. The printed circuit board assemblies containing these devices can be identified by a caution label attached to the board. These procedures must be followed:

1. Static sensitive printed circuit boards are to be kept in the anti-static packaging provided. Do not remove from this packaging until ready for use.

2. The printed circuit board shall be handled only by the handle, or by the edges if it has not handle, and be returned to the anti-static bag for storage.

3. A wrist strap (USM part number XE869A1 provided with machine's service kit), properly worn and connected to ground at a point provided within the machine, must be worn at all times when handling static sensitive printed circuit boards that are not within protective packaging material.

4. Static sensitive printed circuit boards that are returned for repair must be returned within the protective packaging material.

Figure 9.1

9.2.1 Power Supplies and Circuit Breakers (See the Electrical Power Distribution Elementary Diagram Fig. 13.2)

Single phase power enters at the left rear and is fed through a junction box, then a switchable circuit breaker, CB6, to two transformers located on the machine's floor behind the left cover: main, T1, nearer the inside, and the stitcher drive unit T2, farther outside.

The 115V T1 secondary feeds the regulated DC power supply, PS1, that is used for the machine computer and its systems. This supply is adjustable and accessible behind the rear door. (See Fig. 11.3.) It produces +5VDC, +15VDC, and -15VDC.

Adjustments of the voltages must be in accordance with the procedures in Par. 11.1.7 and be precise for the particular voltage. Fig. 11.3 shows the potentiometers.

Another T1 secondary is used to produce the following DC and AC control voltages. There are no adjustments.

24VDC for the solenoid valves, limit switches, and control relays (protected by fuses F3 and F5)

12VAC for the sewing lamp (protected by fuses F3 and F4)

Still another T1 secondary is used to produce ±30VDC, unregulated and non-adjustable, for the servo system.

Power from the T2 secondary (115V) is used to produce +45VDC for the brake (non-adjustable), as well as power for the sewing machine motor and non-contact magnetic clutch. The sewing machine drive components are located behind the rear cover (see Fig. 14.29).

Power is distributed through various circuit breakers of two types, switchable and non-switchable, all being summarized below.

CIRCUIT BREAKERS (see Fig. 11.3, also 14.21 for part numbers):

Switchable Circuit Breakers

Main Power (CB6)	Magnetic, 15 amp for input line 190-240 volts (optional 7.5 amp for 380-416 volts). Feeds power to the entire machine.

Besides providing overload protection, the following switches on the power panel can be manually operated to isolate subsystems for service work.

X Servo Axis (CB1)	Magnetic 20 amp, ±35 volt DC
Y Servo Axis (CB2)	Magnetic 10 amp, ±35 volt DC

Non-Switchable Circuit Breakers

Stitcher Drive (CB3)	Thermal, 15 amp, 115 volt. Feeds power to the stitcher drive.
Main Control (CB4)	Thermal, 3 amp, 115 volt. Feeds power to the regulated power supply, fan and contactors.
Aux. Outlet (CB5)	Thermal, 3 amp, 115 volt. Feeds power to the dual convenience outlet located inside the front door.

9.2.2 Computer and Interfaces - See the System Elementary Diagram Fig. 13.1; also Figs. 11.4, 13.1, and 14.23.

The MPCS-860B86 digital controller PC board at the center front performs all the computer and electronic functions except for the stitcher drive functions handled by the drive unit. The B86 board contains the Intel 80186 microprocessor, 128 bytes of dynamic RAM memory for stitch data read in from the PROM card, 128 bytes of EPROM memory allocated to the operating system, 2K bytes of EEPROM memory, programmable input/output ports and timers, keyboard/display controllers, buffers/drives for solenoid valves and relays, optical couplers for switches and sensors (pallet, thread detector, needle positioner), plus the servo analog/digital controls for each axis of the X-Y table. Each axis has a different "header" containing the proper resistors and capacitors for either of two pallet weights being positioned by that axis motor drive unit. Switch S3 on each board is used to select the proper R-C values for the pallet weight in use, as shown in Par. 3.6.

See Appendix G for other headers if the extended head option is used.

Potentiometer R81 is used to adjust the servo reference voltage (+10VDC, TP1 to TP2), which should have been done at USM test, and then sealed. R9 and R15 are not used.

Small PC board B99 at the left of the B86 has optical couplers to process the signals from B88 pallet sensors.

The extreme right expansion slot of the B86 board holds the B84 PROM interface board. When using the machine for IMPM, the B89 board is substituted for the B84 board whose functions can be performed by the B89 board. Its IMPM functions are control of the joystick, switches, and lamps.

Either the B84 or B89 board must be secured by their brackets to prevent loosening the connections.

9.2.3 PROM Card Holder

This unit at the right front, accessed by pulling down on the spring-closed door, has a zero-insertion-force connector for the PROM card which it contacts to receive style pattern data; also to hold the EPROMs programmed in IMPM.

9.2.4 X-Y Table Servo Power (see Fig. 14.27)

These parts are located in a unit at the left front, just inside the cooling fan, with the X-axis facing the front and the Y-axis facing the rear.

Power transistors are mounted on a pair of symmetrical heat sink plates. Power connections to the transistors come through the XE860B52 boards (one for each axis), and control signals from the B86 board. The power transistors drive the servo motors. Encoders on two of the motors (the front X-axis motor runs as a torque producer only; it has no encoder) feed back the motor shaft position to the "closed loop" control function on the B86 board. There are no analog adjustments.

The XE860B52 board is not a field replacement part. It should be ordered as part of the MPCS-368 Heat Sink assembly.

9.2.5 Fan Cooling

This fan (see Fig. 14.27) forces in outside air to carry the internal heat out through the louver at the right end of the machine. See Par. 5.1 for filter maintenance.

9.2.6 Sewing Machine Drive System

The drive unit, located behind the right rear panel (see Fig. 14.29) drives and controls the sewing machine through an AC motor, non-contact clutch, and DC brake (see Fig. 9.6), the speed-sensing encoder, and three synchronizing photocell sensors (see Par. 8.14 for adjustment). The latter devices are located in the needle positioner connected to the right end of the sewing machine.

The cut solenoid valve is controlled by the B86 board, using an initiating signal from the CUT sensor disk after the 180 rpm positioning speed command has been given which, in turn, requires that the proper 200 rpm speed for the final stitch has been measured. Control of the cut cylinder return utilizes the STOP disk. X-Y table control uses the SYNC disk.

The possible field adjustments for this unit are as follows:

- 3 photocell disks (STOP, SYNC, CUT) covered in Sec. 8.14.

- 180 rpm positioning speed for cutting and reversing, controlled by pots C1 and G1 on the B96 board inside the drive enclosure, also covered in Par. 11.2 as the diagnostic POS SPD test no. 11.

- 680 rpm set by potentiometer R22 on the B93 board just inside the enclosure and 2500 rpm set by pot R1 on the drive enclosure, covered in Par. 11.2 as the diagnostic SPEED test, no. 12.

The motor is a 110 volt, single phase, 50/60 Hz type with two alternate pulleys.

Hz	Pulley	O.D. mm	O.D. in.
60	MPCS-408	63	2.48
50	MPCS-409	76	2.99

The unit contains two internal fuses:

F1: 10A slow blow XE409C14
F2: 3A slow blow XE401A8

CAUTION

On power up or down or when troubleshooting the drive system, the sewing head may rotate. Keep fingers away from the needle area.

Access to the enclosure is accomplished by removing the two machine screws securing the cover which is then hinged downward.

To obtain greater access, if necessary, without removing the entire unit, it is possible to disconnect the belt, carefully support the weight of the drive unit by some sort of wooden blocks, remove the nut on the bottom of the stud, then carefully swing the unit outward around its support pivot.

To remove the entire unit, loosen the two inner mounting screws (opposite the pulley end) just far enough to permit disengagement, and using two men slide the unit outward until its U-shaped ends are clear. To replace a unit, first be sure that the two inner screws are not hung up so that the unit will freely slide in.

9.2.7 Pneumatic Solenoid Valves

Located at the right end, these (24 VDC types) are covered in Sec. 10.

9.3 OPERATOR'S CONTROL ENCLOSURE - CONTROL PANEL

This contains a number of major control devices, covered in the following paragraphs: operator's control switches, lamps, buzzer, speed control knob, alphanumeric display, and LEDs.

9.3.1 Control Panel Board

This board (MPCS-860B81) contains switches and switchlamps, plus the interfacing circuitry needed to interface them, and displays and LEDs to the microcontroller. All of the buttons, displays and LEDs are controlled by the keyboard/display controller (type 8279 I.C.) located on the B86 microcontroller board.

9.3.2 Alphanumeric Display

The alphanumeric display, located at the upper right of the operator control panel, is an eight (8) character, fourteen (14) segment, LED display. It is used to give the operator various messages, such as: size or file selected, stitching speed, menu functions, etc. The display is soldered to the AJS-860B82 board. Below each character is a single LED used for various functions of pattern assignment, IMPM, file test, etc.

9.3.3 Power/Ready Button

This button serves two functions. First, power on for the system. When the button is pushed, full power is turned on, and the machine is ready to run. Second, it is a visual indication of the status of the servo $\pm$30VDC supply.

The table limit switches (S9, S10, S11 and S12) are hardwired into the control relay circuit so that if a table limit switch is activated, the servo $\pm$30VDC supply is disconnected from the servo power boards (B52) by dropping out K1 contactor. If this happens, the READY lamp will go out. To reset the circuit, the table must be pushed away from the limit switch, and then the power/ready button must be pushed once again.

9.3.4 Power/Off Emergency Stop Button

The large red button is used to turn machine power off and also should be used in an emergency stop situation.

9.3.5 Speed Control Knob

The speed control is used to control the speed of the machine. With the knob rotated fully counterclockwise, the speed of the machine will be approximately 180 rpm. With the knob rotated fully clockwise, the speed of the machine will be either the calculated speed based on values of SPI, thickness and dwell,

a reduced percentage of that if a "speed factor" is set, a maximum limit if that is set, or 200 for the last two stitches of a segment.

9.3.6 Buzzer

The buzzer, located within the operator's control enclosure, is used to alert the operator of machine malfunctions and/or improper procedures.

9.4 THREAD DETECTOR

The thread detector consists of a slotted metallic disk attached to a rotary tension device on the sewing head. Its primary function is to monitor the existence of thread in the bobbin. As top thread is consumed, the disk rotates and interrupts a light beam causing the photocell to emit pulses. The number of pulses generated over four (4) stitches is compared with a preset number, the theoretical number representing proper thread consumption (based on stitch length and work thickness), and if favorable, the machine continues to sew.

Whenever the bobbin thread runs out, the top thread is not locked, disk rotation is reduced or stops, and the machine stops within 8 to 10 stitch movements. Reduced disk rotation and machine stoppage also occurs if the top thread breaks or if stitching fails to start. At stoppage:

- The display becomes "BOBBIN".
- The STOP switchlamp flashes.
- The BOB'N switchlamp flashes.
- The buzzer sounds.

The bobbin monitor sensitivity can be changed, or the function can be made inoperative by depressing the BOB'N switchlamp. The BOB'N lamp lights under this condition.

The second function of the thread detector is to monitor thread cutting. During the slew which follows each cut the disk should not rotate; however, it will rotate if the threads were not cut. If the pulse rate exceeds a certain preset number, the machine stops. The display becomes "NO CUT". The switchlamp and buzzer actions are the same as for the bobbin monitor.

The no cut sensitivity can be changed, or the function can be made inoperative by setting the sensitivity to 0.

9.4.1 Optical Sensor

The "photon module" sensor is a one-piece molded unit which houses both the lamp and the photocell. It is mounted on a

bracket which is slotted to facilitate alignment of the end of the photon module flush with the inner ends of the slots in the encoder plate, as shown in Fig. 9.2. This places the sensor aperture at approximately the center of the slots.

If the cable is disconnected, alignment at reassembly is assured by having the dot on the connector facing upward. The keying notch in the molded lamp/cell unit should also face upward.

9.4.2 Servicing

It is not advisable to repair the sensor or the associated logic circuits in the field. Both are readily addessible for replacement.

NOTE

The slotted disk is mounted to the rotary tension disk and must be properly adjusted for good sewing. See Par. 7.4. Further, in order to have proper tensions on the thread to assure rotation of the slotted disk, the thread retainer, Fig. 7.1, must be adjusted properly. See Par. 7.2.

9.5 LIMIT SWITCHES

The machine has limit switches for various functions described in the following paragraphs: X-Y table motion, presser foot position, and automatic pallet transfer sequencing.

9.5.1 X-Y Table Limit Switches

These switches are not normally operated, rather serving to disconnect power to the table motors should the table reach one of the limits due to some control malfunction. The switches are located at the ends-of-motion of each axis. A U-shaped steel spring is located with each limit switch to absorb energy if the table runs away and moves to one of the limits. The limit switches are positioned to be operated by excessive deflection of the springs.

In the calibration mode the table is purposely moved into the right and sometimes the left X axis limit, then the front Y axis limit at low speed. The springs do not reflect far enough to operate their associated switches. However, if the switches are out of adjustment, they could operate during calibration. See Appendix E for adjustment procedure.

Opening the limit switches gives a display message "ERROR 34", shuts off the "READY" lamp, and interrupts normal operation. To reset the table limit circuit, depress the green POWER/READY switch.

To access the left X axis switch, remove the top cover. Access to the right X axis and rear Y axis switches is provided simply by hinging back the top cover. Access to the front Y axis switch requires removal of the stainless steel workshelf. See Par. 9.5.5 for adjustments of these switches.

9.5.2 Cover Safety Switch

If the cover is lifted or the switch opens due to maladjustment, the display is "COVER".

9.5.3 Presser Foot Limit Switches

When the presser foot is down, the lower switch is actuated. This permits the start of sewing.

The upper switch is actuated when the presser foot is up. This condition also means that the thread cut cycle is complete and the presser foot can be lowered again for the rest of the sewing cycle.

If the presser foot drops, but the machine does not sew, the lower switch could be improperly adjusted or defective.

If, after raising the presser foot, there is no slew, the upper switch could be improperly adjusted or defective.

Servicing:

If there is a suspicion of a defective switch, trace the wire leading from the switches, disconnect the connector at the rear of the head and make a continuity check with an ohmmeter. The pin locations are shown in Fig. 9.3.

Access to the switches is obtained by removing the lower screw of the presser foot-lifting bracket, lifting it on its hinge and locking it in its upward position with a spring pin. See 9.5.5 for adjustment.

9.5.4 Automatic Pallet Transfer Limit Switches

These two switches (left shelf down and pallet eject) control sequencing of this mechanism. They are described in Sec. 8.17.

9.5.5 Limit Switch Adjustment

All limit switches of either the leaf or roller actuator type should be adjusted so that, when actuated, the clearance between the actuator and the switch body is 1 mm (0.04") to 1.2 mm (0.05"). See Fig. 9.4.

The longer-leaf types used for the pallet eject and cover have a greater distance between the ends of their leaves and their bodies.

CAUTION

Clearance of less than 1 mm (0.04") will result in greatly reduced life of the actuator and a clearance of greater than 1.2 mm (0.05") may result in erratic or intermittent operation of the switch.

9.6 X-Y POSITIONING TABLE SERVO MOTORS AND ENCODERS: AJS-747 (INCLUDES ENCODER) AND AJS-125 (NO ENCODER)

Three (3) identical DC servo motors of the low inertia, high response type are used to position the X-Y table in a closed loop control. Two (2) of these motors have integral incremental encoders with 500 lines plus a zero track. The motor without an encoder is the front motor of the lower "X" axis. This motor is driven in parallel with the rear "X" axis motor, with their outputs synchronized by means of the cross shaft connecting their rack-drive pinion gears.

Access to these motors for service is as follows:

Y axis: raise the hinged cover.
Rear X axis: remove the upper left cover.
Front X axis: remove the stainless steel workshelf.

Servicing or disassembly of the encoder from the motor is not recommended except by the manufacturer for AJS-747. Thus, failure of a motor or encoder requires replacement of the complete assembly. The procedure is as follows:

9.6.1 Motor Replacement

9.6.1.1 Depower.

9.6.1.2 Remove the two armature wires, being careful to note the proper polarity.

9.6.1.3 Disconnect the encoder connector (if AJS-747).

9.6.1.4 Remove the four mounting screws.

9.6.1.5 When inserting the new motor, properly engage the alignment pin, then rotate the motor around this pin for proper gearing mesh. Refer to Appendix E for guidance in obtaining backlash control.

9.6.1.6 Tighten screws.

9.6.1.7 Reconnect motor leads (tightening screws securely) and encoder leads (if AJS-747).

9.6.1.8 If a motor with encoder was replaced, power up and perform a machine (factory) calibration (Par. 8.1) to establish the new correction for the axis involved.

9.6.2 Associated Components

Appendix E covers replacement and realignment procedures involved with the gear box, racks, guide rails and cam followers (X axis), ball bushing (Y axis), and the X and Y axis limit switches.

9.6.3 Motor Brushes - Replace when worn to 6 mm (¼").

Each motor has four brushes. (See Par. 5.8.2.) For the two beneath the armature wires, remove the terminal screws. Then unscrew all brush caps. Pull out the brush, spring and contact-wire assembly. Vacuuming out dirt, debris and carbon dust is desirable. Replace with the old assemble if length is adequate, or new part. Insert the two tabs of the contact member in the mating grooves. Put a small diameter tool (such as the needle wrench) through the cap to hold in the contact member against the spring while screwing back the cap. Replace the terminal screw, being sure to get the proper polarity. Tighten screws securely.

NOTE

After brushes are replaced, the motor should be "run in" for a minimum of two hours to fully seat the brushes on the commutator. Failure to "run in" the motor could result in erratic operation. The servo slew of diagnostics test 10, Par. 11.2, may be used to run the motor in.

9.6.4 Encoder Wiring

Fig. 9.5 shows the wiring connections for the X-Y table encoder connectors. Several different wire color combinations may be supplied, so carefully note the proper combination.

CAUTION

Should field rewiring be necessary, the +5VDC and common wire connections must be correct or serious encoder damage will result.

9.7 DISTRIBUTION BOARDS

Two printed circuit boards serve to interconnect to the computer various output devices (air valve solenoids and

power-interlock relay K2) and various input switches. The devices' leads are connected to terminal strips on each board, which then connect by ribbon cables to the B86 board.

In case of trouble with the connected devices, first check for loose wires at the terminal strips.

9.7.1 Input Board VCD-860N25

This board is located on the electrical power panel.

9.7.2 Output Board MPCS-860B87

This board is located on the pneumatic solenoid valve panel.

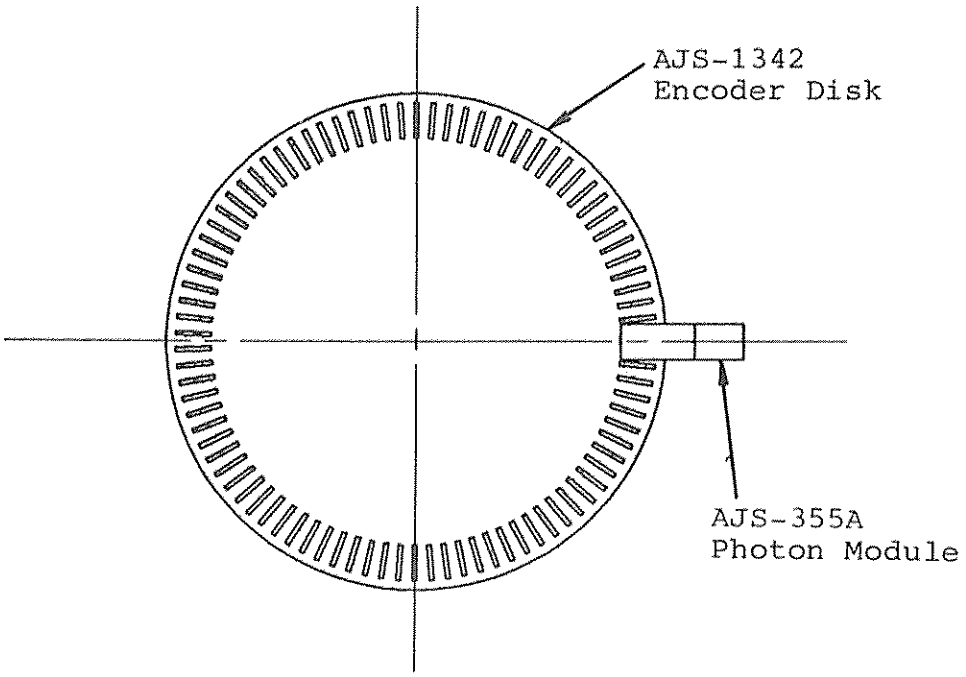


Figure 9.2
Photon Module

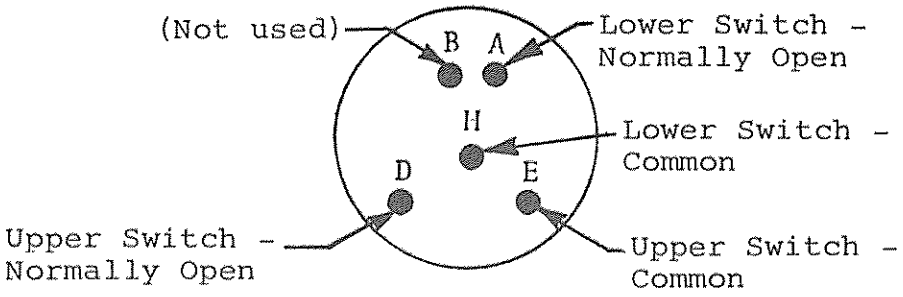


Figure 9.3
Presser Foot Limit Switch Connector

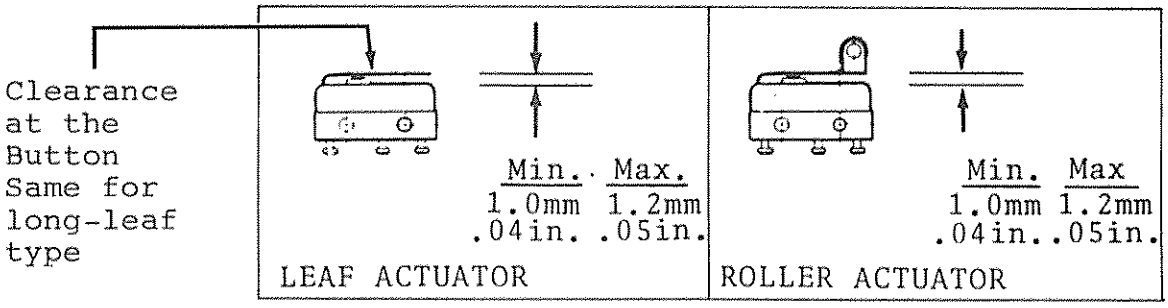
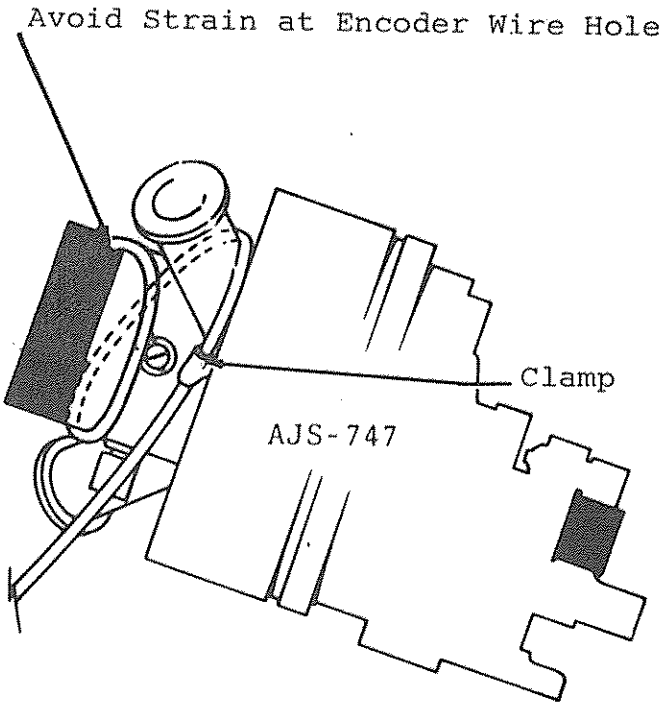
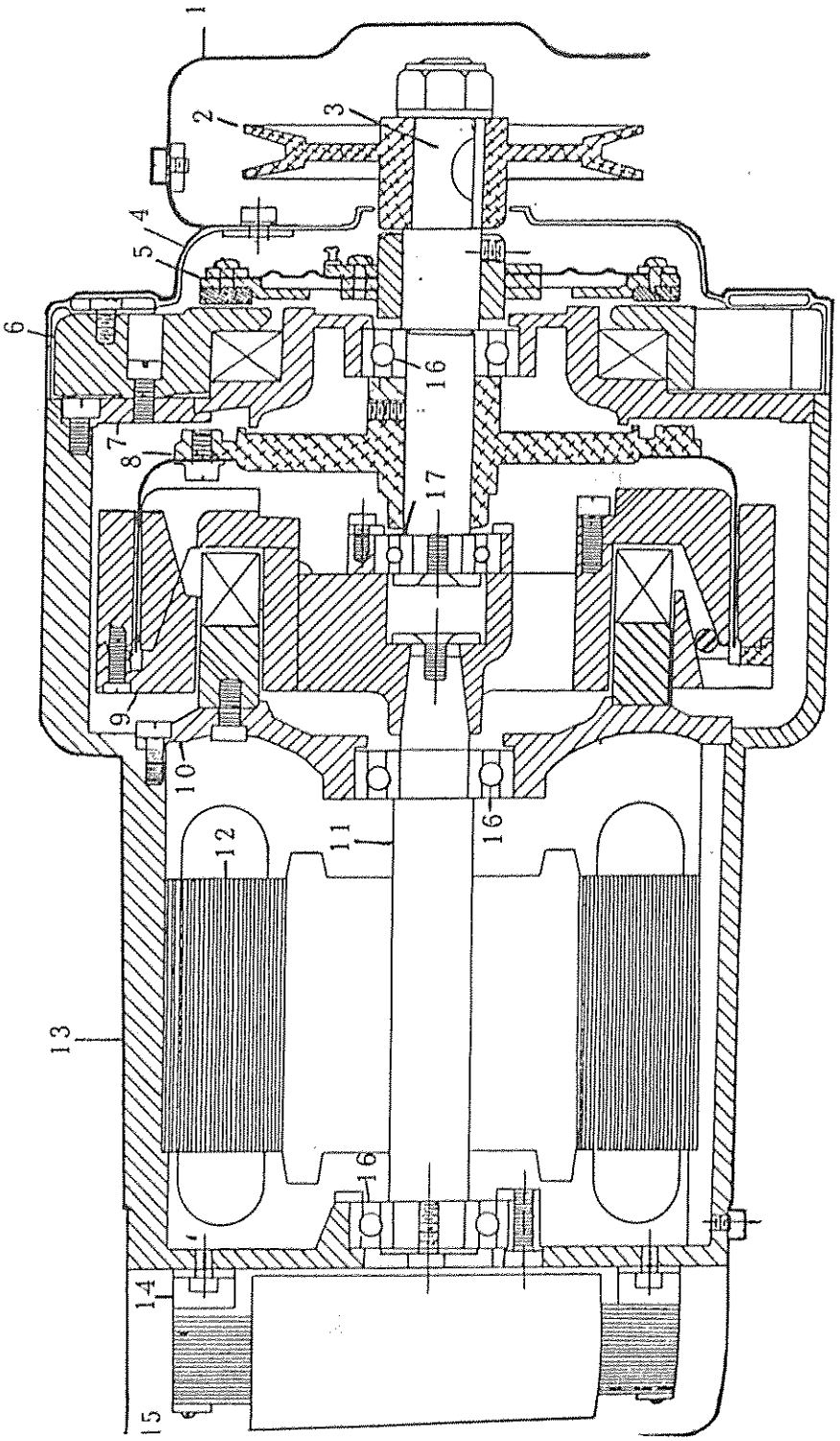


Figure 9.4
Limit Switch Adjustment



B A H D E		Various Possible Color Combinations		
Function	Pin Letter	1	2	3
+5 VDC	E	Red →		
Common	D	Black →		
Channel A	A	White →		
Channel B	B	Green	Blue	Blue
Zero Index	H	Orange	Orange	Green

Figure 9.5
Encoder Connector



1- Pulley Guard
2- V Belt Pulley
3- Pulley Shaft
4- Clutch End Cover
5- Brake Disc
6- Brake Housing
7- Brake Coil Assembly
8- Non-Contact Clutch Assembly
9- Fly Wheel
10- Clutch Coil Assembly
11- Rotor
12- Stator
13- Stator Housing
14- Transformer
15- Motor And Cover
16- Bearing (6203)
17- Bearing (6201)

Figure 9.6
Sewing Machine Drive

10.0 PNEUMATIC SYSTEM

10.1 GENERAL

Refer to Fig. 10.1 for the control circuit and for the component list. The functions of this pneumatic system are as follows:

Regular Machine:

The sewing machine head cylinder has three functions:

1. Raises the presser foot.
2. Releases the thread tension.
3. Reverses the sewing machine to the proper needle height for slewing.

NOTE

This cylinder and its solenoid valve are purposely connected so as to raise the foot whenever the machine power is shut off. The purpose is to prevent an unwanted extra rotation of the sewing machine.

One cylinder, built into the Y carrier, clamps the pallet to the carrier.

Three cylinders operate the automatic pallet transfer system: one left shelf, one right shelf, and one unloading (located on the Y carrier).

One cylinder, in the base of the sewing machine, operates the pneumatic thread cut mechanism.

If equipped, a cylinder lowers the optional moving throat plate button to clear join and sew pallet grooves for slewing.

Another pneumatic function is air-jet needle cooling, which is controlled by a solenoid valve and a flow control valve (off when the head is not stitching or slewing).

The controlling air solenoid valves are all located on a panel within the frame at the right end (Fig. 14.12).

The solenoid valves can be operated manually for trouble-shooting by pushing in their buttons; most can further be locked by rotating them ¼ turn.

Par. 11.2.4, Test 8 can also be used to test the functions of the solenoids.

The blow gun's nozzle (fed by non-lubricated air) is OSHA approved, but caution should be exercised in its use. It is hung at the front right of the machine.

Some air flow control valves are mounted with various cylinders, others at solenoid valves for speed control. These may be adjusted by using a hex socket head (Allen) type wrench or a slotted screw driver (different types possible).

NOTE

The air shutoff, filter, regulator, gauge, and lubricator may be removed for shipping and require installing. See Par. 3.1.

The air shutoff is located at the right end below the control panel, ahead of the filter.

Incoming air is cleaned and has water removed by a filter, regulated to the proper working pressure, then lubricated for the cylinders and their valves. The pressure gauge is located with the above filter, regulator, and lubricator at the right end of the machine.

The nominal pressure setting for the system is 450 kPa (65 psi).

11.0 TROUBLESHOOTING

11.1 GENERAL

CAUTION

On power up or down or when troubleshooting the drive system, the sewing head may rotate. Keep fingers away from the needle area.

If the machine fails to start or function properly, make the following preliminary checks before undertaking one of the several types of tests available.

11.1.1 See that both the POWER and READY lights are on, also that air pressure is on and set to approximately 450 kPa (65 psi).

11.1.2 Automatic Memory Test

This is explained in Par. 6.3.4.

As mentioned there, it is possible that a failure exists in the part of the program which runs the memory test, so no meaningful display could occur. In such a case, it would be difficult to distinguish an EPROM failure from a general hardware/CPU failure. A change of the B86 board should be tried.

11.1.3 Run the comprehensive diagnostics tests (Sec. 11.2), the most important ones in the absence of specific symptoms being "NEEDLPS" (test 6), "SERVO" (test 10), "POS SPD" (test 11), and "SPEED" (test 12).

11.1.4 Check that the B84 board's bracket is firmly installed by its screw to the B86 board. Check that neither the B84 board inserted in the B86 board or any of the cable connectors are loose (and need seating). It might be necessary to remove the B84 board and edge connectors to it and other boards in order to clean the connection fingers. Goldwipe cleaner/lubricator pad (XE869D1) in the service kit may be used.

NOTES

1. Machine must be depowered before removing the B84 board.

2. The B89 board may be used in place of the B84 board; for it, both top and bottom brackets should be installed.

11.1.5 If the operator control panel display is not normal, check the DC voltages from the power supply PS1 on the power panel.

Connections		Set to	Permissible Range
TB5-16(+)	TB5-14(common)	+5 ±1%	4.75 to 5.25
TB5-12(+)	TB5-11(common)	+15 ±1%	14.25 to 15.75
TB5-10(-)	TB5-11(common)	-15 ±1%	-14.25 to -15.75

If these voltages are not at the proper settings and can't be adjusted (see Fig. 11.3 for potentiometers), the power supply needs to be replaced.

11.1.6 Calibration in either axis can become incorrect by one revolution of the encoder for that axis, approximately 8 mm (5/16"). This can cause serious mispositioning of the pallet, failure to transfer when using the automatic pallet transfer etc. The cause is a change in the adjustment of the right X axis or forward Y axis limit switch and its associated protective U-shaped spring. If these elements somehow get moved too far, an error of the above amount (never less) can occur in the same direction as the movement if the new position is enough to make the controls sense the zero pulse one revolution too early or too late during the calibration procedure. The remedy is to adjust the offending elements so that the proper revolution of the zero pulse is sensed. Par. 6.6 explains how the calibrations works.

11.1.7 Before replacing the B86 board, be aware that it retains the MACH CAL values, various statuses, and the customer's PASSCODE if changed, in its EEPROM. The CAL values and PASSCODE if changed, in particular, and important statuses must be reentered if a new B86 is to be used.

11.1.8 Check that the drive belt is on both pulleys and properly tensioned. Listen for air leaks from possibly loose fittings. Try the presser foot action both ways. Try the pallet clamping action both on and off.

11.1.9 With the foot down, verify that the sewing machine turns over freely by hand.

11.1.10 If the problem appears to be sewing-related, see the Sewing Machine Troubleshooting Guide of Section 11.6.

11.1.11 An item in the menu provides the OS REV (operating system revision) number of the software installed for use by USM service personnel.

11.2 GENERAL PURPOSE DIAGNOSTICS (See the System Elementary Diagram, Fig. 13.1.)

11.2.1 General

These diagnostics directly check out control functions provided by the computer, memory, and interface circuitry of

the B86, B99 and B84 boards and indirectly check out the keyboard and display functions in the operator's control enclosure, solenoids, switches, sensors, the IMPM hardware and the B89 circuitry if that option is installed.

These tests assist in locating faults with electromechanical devices, or P.C. boards for which they are primarily designed, to indicate that the complete board has a fault but not individual components on the boards, since such components are not expected to be replaced in the field.

To run diagnostics tests in the menu, select the "TEST" item, then press DO to display "TEST**".

11.2.2 Random Selection of Tests

Whenever "TEST**" is displayed, the operator can make a random selection of any test by its number. See Table 1 for these tests and their numbers.

To do this, first press DO again to display "TEST 01", then press the UP key to reach the desired test number.

Use of these tests is covered below in 11.2.4.

11.2.3 Sequential Selection of Tests

To follow this route, without selecting a test number when "TEST **" is displayed, press NEXT to display the first test which is "MACH CAL", then NEXT again to the test desired.

11.2.4 Use of Tests

Tests are listed in Table 1, with detailed procedures following it.

In general, once the desired test is displayed, press DO to start and when finished, press RESET one or more times as the specific test may require.

If an error occurs, press RESET to clear it.

If desired to repeat a test following an error or for more test information, press RESET to return to the display the name of the test which was being executed when the error occurred. Then depress DO to repeat the test.

TABLE 1

Diagnostics Tests

Test No.	Displayed Test Name	Subsequent Keystroke(s)	Resulting Display
1	MACH CAL	DO	+/-XXX+/-YYY
2	PALL CAL	DO	+0 +0
3	KEYBOARD	DO	PRESSKEY
4	LAMPS	DO	PRESSKEY
5	LEDS	DO	LED 0 ON
6	NEEDL PS	DO	STOP
		NEXT	SYNC
		NEXT	CUT
7	BOBN MON	DO	BOBIN 91
8	SOLENOID	DO	FOOT 0
9	SWITCHES	DO	PRESS SW
10	SERVO	DO	POSITION XY AXIS
11	POS SPD	DO	TURN SPEED KNOB FULLY CCW
		DO	ADJUST POT C1 FOR 180 SPM
		START	"NNN" SPM (SHOULD BE 180)
12	SPEED	DO	TURN SPEED KNOB FULLY CW
		DO	ADJUST POT R22 FOR 680 SPM
		START	"NNN" SPM (SHOULD BE 680)
		STOP	ADJUST POT R1 FOR 2500 SPM
		START	"NNNN" SPM (SHOULD BE 2500)
13	IMPM	DO	KEYS
		NEXT	JOYSTICK
14	CORNERS	DO	CORNERS
15	CYCLE	DO	DISABLED

TEST PROCEDURES (By Test Number)

1. MACH CAL

   This is covered in Par. 8.1 of this manual.

2. PALL CAL

   This is covered in Par. 7.11 of this manual.

3. KEYBOARD

   Pressing DO to start the test displays "PRESSKEY". Pressing any switch or key should result in displaying its identification. When all the desired switches or data keys have been checked, press RESET twice to return the display to the test name, signifying the end of the keyboard test.

4. LAMPS

   Pressing DO displays "PRESSKEY". The result of pressing any switch or key should either light its lamp and display "LAMP ON" (if pressed again, display is "LAMP OFF") or if the switch lacks a lamp, display "NO LAMP". Press RESET twice to return to the test name.

5. LEDS

   Pressing DO starts an automatic test sequence of all eight LEDs, starting with the rightmost LED being lit and a display of "LED 0 ON", advancing to the leftmost LED "7", then repeating until RESET is pressed.

6. NEEDLPS (needle positioner)

   Pressing DO lowers the foot and prepares for the first of the three disks that are tested, the display being "STOP" (the name of the left disk). Pressing DO again displays "SET LEFT DISK to 350-30". Manually turn the handwheel to verify the setting by the buzzer sounding whenever the sensor path is completed through the window (cutout portion) of the disk.

   If necessary to adjust the stop disk, remove the needle positioner cover and loosen the end screw plus the set screw in the left collar, holding the encoder (48 slots) and STOP disks' assembly. After deciding the direction and approximately how much change is required, hold the handwheel from turning and turn the collar to the required angle. Check to see what angle the disk is set for now (by noticing what angle the buzzer comes on).

   Tighten the end and collar screws.

NOTE

Verification of actual stop position by running a short pattern should be done. Variation of stop positions set with the buzzer can occur due to braking variation. (However, amount of overshoot should be consistent.) If machine does not stop at required degree setting, adjust the disk until final stop position in the range of 20^{o} to 25^{o} is obtained. This angle is more important than the first stop of approximately 85^{o}.

To test the next disk press RESET, then NEXT to display "SYNC", then DO to display "SET MIDDLE DISK TO 157-197". Adjustment is similar except there is no collar screw. The sync disk is at the left side of the right collar. The 157 setting is very important; do not vary it. (Extended head option sync is 125^{o}; see App. G.)

To test the final disk, press RESET, then NEXT to display "CUT", then press DO to display "SET RIGHT DISK".

Variations in the response of pneumatic and mechanical parts between machines may cause the actual CUT disk setting to be slightly different between such machines; however, once initially set (in the USM factory test), only minor adjustment should ever be needed as time passes if cutting problems occur. Before adjusting the disk, first recheck knife sharpness and knife-catch adjustments (par. 8.13). The adjustment may be either to advance or retard the start angle by a small amount, and experiments are normally needed to determine which way to move it and by how much.

The most likely start angle is 270^{o}. The minimum start-of-window setting should never be less than 240^{o}. Since the cut disk shares the same collar as the SYNC disk, adjustment of its angle without affecting the sync disk is done by loosening the three small screws on the right end which hold the cut disk to the right collar.

Be sure to securely tighten the three screws after the proper cut setting is reached.

7. BOBN MON (bobbin monitor)

Pressing DO displays "BOBIN 91". Turn the detector disk by hand which makes the displayed number decrease toward zero, then reset to 91 (the maximum number) at each completion of one revolution.

8. SOLENOID

Pressing DO displays the first solenoid and its "off" status "FOOT 0". To turn it on, press DO and repeat to turn it off again.

The solenoids are displayed in the order shown below, using NEXT to select the next one.

Display	Status (with display shown at left)
FOOT 0	Up
CLAMP 0	Open
UNLOAD 0	Shelf in position to support pallet
LSHELF 0	Up
RSHELF 0	Up
POWER 0	Off
N COOL 0	Off
CUT 0	Catcher in stitching position

When the cut solenoid test is selected, the controls first automatically lower the foot. The display will be "WINDOW" unless the CUT disk is already positioned within its setting. If not, turn the handwheel to satisfy this requirement and when reached, the catcher will extend, and the status and display change to "CUT 1". Then use DO to make the return cut stroke. (May be repeated to check the cut cycle.)

9. SWITCHES

Pressing DO displays "PRESS SW". Actuating (or deactuating if actuated) manually, by turning on or off the air or using the solenoid test, changes the display to show the most recently changed switch and its status. Thereafter, pressing NEXT sequences the display through the switch list shown below (assuming the foot was just changed). (In general, "0" means the displayed name of the switch function is false; "1" means it is true.)

Display	Status (with display shown at left)
FOOTDN 0	Foot is up
FOOTUP 1	Foot is up
SHLFDN 0	Left shelf is up
COVER 1	Closed (normal)
EJECT 0	No pallet in the chute
LIMITS 1	Limits not opened
PAL A 1	Left sensor sees no target
PAL B 1	Middle sensor sees no target
PAL C 1	Right sensor sees no target
S1-4 0	Rightmost DIP switch (B86) down
S1-3 0	Next DIP switch (B86) down
S1-2 0	Next DIP switch (B86) down
S1-1 0	Leftmost DIP switch (B86) down

This switch test and test 8 (solenoids) are structured to provide a rapid interaction between the foot and left shelf solenoid valves and their associated limit switches.

1. Select one of these two solenoids.

2. Change it by pressing DO.

3. Press FAST to display the new FOOTDN status, to be checked.

4. Press NEXT to display the new FOOTUP status and NEXT once more to display the new left shelf status if that solenoid had been the one changed.

5. If desired, press FAST again to return to the selected solenoid, change it again, then repeat steps 3 and 4.

10. SERVO

In order to prevent mechanical interference the X-Y table must first be moved by hand to approximately the middle of the stroke for each axis. The display reminds the tester to do this plus aiding in selecting axis and test. The sequence is as follows:

Switch	Display	Resulting Motion/Speed
DO	POSITION XY AXIS	
DO	X AXIS	
NEXT	Y AXIS	
DO (of either)	SHORT ST	
DO		1.2 mm (.05")/fast
RESET		
NEXT	LONG ST	
DO		2.5 mm (0.1")/fast
RESET		
NEXT	SLEW	
DO		76 mm (3.0")/fast
RESET		
NEXT	ENCODER	
DO		76 mm (3.0")/fast
RESET		
NEXT	DAC	
		Resulting Voltage
DO	TESTING	± 10 V sawtooth

The encoder test checks the encoder performance independently; the short, long and slew tests check all the servo elements working together. The "DAC" (digital analog converter) test is only for circuitry, requiring an oscilloscope connected to the B86 board as follows (see Fig. 11.4):

	X	Y
Probe	U125, Pin 1	U127, Pin 1
Ground	TP2	TP2

11. POS SPD (positioning speed of sewing machine)

This test requires that the speed knob on the control panel be set to minimum, fully CCW. The test sequence is as follows. The buzzer sounds when 180 rpm is measured.

NOTE

Pots C1 and G1 are on the B96 board inside the sewing machine drive enclosure, accessed by removing screws to permit its bottom cover to hinge down. See Figs. 11.2 and 14.29.

Speed Knob	Switch	Display	Required Test Speed
Fully CCW	DO	TURN SPEED KNOB FULLY CCW	
	DO	ADJUST POT C1 FOR 180 SPM	
	START	"NNN" SPM	180
	STOP	ADJUST POT C1 FOR 180 SPM	

If the motor growls, turn pot G1 (normally fully CW) until the noise stops. Then recheck for 180 and readjust C1 if necessary.

12. SPEED

This test requires that the speed knob on the control panel be in its normal maximum, fully CW, position. The test sequence is as follows. The buzzer sounds when the required speed is measured.

NOTE

Pot R1 is on the panel of the sewing machine drive enclosure and R22 on the B93 board inside it (see Figs. 11.2 & 14.29).

Speed Knob	Switch	Display	Required Test Speed
Fully CW	DO	TURN SPEED KNOB FULLY CW	
	DO	ADJUST POT R22 FOR 680 SPM	
	START		680
	STOP	ADJUST POT R1 FOR 2500 SPM	
	START		2500
	STOP	ADJUST POT R22 FOR 680 SPM	

It is best to repeat the low and high adjustments (the second pressing of STOP calls the first, low speed back) because of their interaction; several times if significant adjustments are made.

13. IMPM (Requires full IMPM hardware - see App. F.)

Pressing DO prepares for the first of two subtests.

Joystick	Switch	Display	Switchlamp	Remarks
Idle	DO	KEYS		
	DO	PRESSKEY		
	STCH	STCH	On	
	CPT	CPT	On	
	SLEW	SLEW	On	
	DEL	DEL	On	
	REV	REV	(none)	
	FWD	FWD	(none)	
	RESET	KEYS		
	NEXT	JOYSTICK		
	DO	(SNN)XY(SNN)		S is the sign, NN a number which should be 04 maximum.
Fully left		+(MM)XY(SNN)		MM is a number which should be between 50 and 75.
Fully right		-(MM)XY(SNN)		
Fully rearward		(SNN)XY+(MM)		
Fully forward		(SNN)XY-(MM)		

14. CORNERS

This test is primarily for use in USM factory testing to check for squareness.

Pressing DO causes the table to move to the data interface (0,6400) point. The foot and needle bar can be lowered to insert the cal pin into the cal pallet. Each time FWD is pressed the table moves to successive corners of the area: 0,0; 3600,0 (which is the near right corner of the AJS-1157 "9 inch" cal pallet of the service kit), 3600, 6400; then back to 0,6400. REV can be used to move the table the other way.

15. CYCLE

This test is primarily for use in USM factory repetitive (life) testing.

Pressing DO displays the current status, either "DISABLED" which would always occur on power up or "ENABLED" if it had been previously set. If it is desired to change the status, press NEXT, then DO.

"MANUAL" is the only operating mode which can be used for the cycle test. After that is selected and START is pressed, automatic cycling will continue until STOP is pressed and the cycle test status reset to DISABLED. The transfer status may be either enabled or disabled for the cycle test.

11.2.5 Software I/D - B86 Part Numbers

Fig. 11.1 shows the software I/D card shipped with the MPCS-A machine or with a separate set of EPROMs if a field software update is made. This card should be inserted in the manual next to Fig. 11.1 for service reference. It gives the specific USM part numbers for the B86 board which holds the programmed EPROM. When reordering this board, the complete part number and revision ("REV") letter should be used.

Finally, the card also gives the machine calibration (test 1), established when the machine passed final test.

11.2.6 Termination of Diagnostic Mode

To terminate these diagnostics, press RESET until the idle display is returned. Any solenoids or the power relay, which were set to be opposite to their status prior to entering the diagnostic mode, are automatically reset to what they had been. Also, the FAST status is reset.

11.3 SERVO TROUBLESHOOTING

11.3.1 General

The control computer continually monitors the motion control functions during all machine operations. Two basic checks are performed: excess error (stall) checks, and position loss (drift) checks.

If errors are detected, the displayed errors are:

ERR 30/X STALL	X stall
ERR 31/Y STALL	Y stall
ERR 32	X drift
ERR 32	Y drift

Stall errors result if the actual measured motion distance differs at any time from the commanded motion distance by more than approximately 2 mm (0.08").

Stall errors normally indicate that one or more of the following conditions is present:

1. Excessive friction or a mechanical interference (pallet or workpiece drag, etc.).

2. Excessively low line voltage.

3. Defective servo motor or control (B86 or one of the B52 boards).

Drift errors result if the actual measured position of either axis differs by more than 0.16 mm (0.00625") from the commanded position at the moment when the zero track of the encoder of either axis is read. That act repeats every 8 mm (0.32"), which corresponds to one encoder revolution. This indicates a control failure.

Drift errors would normally indicate a defective servo encoder, encoder cable, or B86 board.

11.3.2 Motion Test

Perform the diagnostics tests for short, long and/or slew (test 10).

11.3.3 Servo Encoder Test

Perform the encoder part of test 10.

11.3.4 Servo DAC Test

Perform the DAC part of test 10.

11.3.5 Power Output Component Failures

Should the table move at high (slew) speed against any limit stop, a power output component may have short circuited. Absence of movement may indicate an open-circuit failure mode.

To test a possible short circuit failure, disconnect the appropriate power cable (see Fig. 13.1) to isolate the heatsink power transistors. However, if by so doing the rapid motion does not then occur, the B86 board is probably at fault.

11.3.6 Power Transistor (Heatsink) Check

Proper condition of the servo heatsink power transistors can be checked by following this procedure. It can be used for either axis.

1. Place CB1 and CB2 in their OFF positions.

2. Unplug one end of the cable that connects the B86 board to the B52 board.

3. Measure between TB1-1 (+30VDC) and TB1-2 (M+) on the B52 board with an ohmmeter. It should read an open circuit. If it doesn't (i.e., if it reads 1 or 2 ohms or a short), then Q1 through Q3 are faulty (XE823B3). See Fig. 14.27.

4. Measure between TB1-3 (-30VDC) and TB1-2 (M+) on the B52 board with an ohmmeter. It should read an open circuit. If it doesn't (i.e., if it reads 1 or 2 ohms or a short), then Q4 through Q6 are faulty (XE823A7). See Fig. 14.27.

5. The mica insulating washers and heat transfer cement (#120 Thermal Joint Compound, Wakefield Engineering, Inc., Wakefield, MA) should be used if a power transistor is replaced. However, replacement of the complete heatsink assembly (MPCS-368) is preferable.

11.4 SYSTEM TROUBLESHOOTING CHART (Error Codes)

Numbered tests shown under "Remedy" refer to the General Purpose Diagnostics, Par. 11.2.

11.4.1 EPROM

Error	Cause	Remedy
01 thru 0F	Checksum wrong, see Par. 6.3.4	a1. Replace B86 board
		a2. Replace failed EPROM(s)
C2	Invalid stitch data EPROM	Use valid EPROM
22	Wrong EPROM size selection on PROM card	Set correct switches, see Sec. 2
24	2732-size (smaller) EPROM not in proper socket holes	Insert as shown on on its PROM card

11.4.2 RAM Memory

Error	Cause	Remedy
10 or 11	See Par. 6.3.4	a. Replace B86 board

11.4.3 IMPM (option)

Error	Cause	Remedy
20 thru 25	See App. F (IMPM)	
22, 24	See Par. 11.4.1	
67, 68	See App. F	
a1 thru da	See App. F	

11.4.4 Servo and XY Table

Error	Cause	Remedy
30/X stall 31/Y stall	(D2017A - EEPROM)	
	a. Stall	a1. Find/eliminate mechanical interference
		a2. Find/fix parts producing excessive drag
	b. Low voltage	b. Check voltage
	c. Control failure	c. Replace B86 board
32 33	X axis Y axis Drift control failure	a1. Run test 10, encoder
		a2. Replace motor/encoder
		a3. Replace B86 board
34	Table limits opened	
	a. Open during cal	a. Adjust switch
	b. Wrong cal position	b. Do machine cal
	c. Wrong data	c. New PROM card
35	Table motions with cover open	Close cover

11.4.5 Sewing Machine Drive

Error	Cause	Remedy
40	Measured speed too high	
70	(Stop) Motor turning too fast	
	a. Pots R1/R22 misadjusted	a. Run test 12
	b. Control failure	b. Replace drive

Error	Cause	Remedy
36	Motor not running, while running tests 11 or 12	a1. Check drive power a2. Check cable connections a3. Replace B86 board a4. Replace drive
37	See App. F	
41	Measured speed too low	
	a. Pot C1 misadjusted	a. Run test 11
	b. Belt loose/broken	b. Tighten/replace belt
	c. Sewing head failure	c. Check that handwheel rotates freely, lubricate, replace head
	d. Drive/control failure	d1. Replace drive d2. Replace B86 board
	If no motion:	
	e. Momentary overload	e. Reset CB3
	f. Short circuit	f. Check/fix wiring, then reset CB3
	g. K5 or K6 failure	g. Replace 5K orK6.
42	A to D converter timeout	a1. Run test 10, DAC a2. Replace B86 board
43	(Stop) Jam detection timeout	
	a. sewing machine jammed	a. Check for jam, correct
50-58	See Par. 11.4.6	
60-66	See Par. 11.4.7	
67,68	See App. F (IMPM)	
70	Listed before 41	
71	(Stop) CUT disk timeout	
	a. Use suggestions for Error 41 above	

Error	Cause	Remedy
	b. Pneumatic failure	b. Lubricate cylinder 65, replace cylinder or valve 11
72	(Stop) STOP disk forward direction timeout	
	a. Use suggestions for Error 41 above	
73	(Stop) STOP disk reverse direction timeout	
	a. Use suggestions for Error 62, Par. 11.4.7	
	b. Drive control failure	b. Replace drive

11.4.6 Data

NOTE

For the following data errors, the general remedies to try are (1) reseat PROM (B83) and B84 boards and all cable connectors, (2) rereading of the PROM card, (3) using a different PROM card since the data on the original card may be improper, and (4) memory failure - power down, then up to run memory tests; replace B86 if needed.

Error	Cause	Remedy
50	Invalid control	See note above.
51	No "start of file" control	
52	Multiple "start of file" controls	
53	No "end of file" control	
54	Premature "end of file" control	
55	X sewing area exceeded in data	
56	Y sewing area exceeded in data	

57	X pattern drift error	
58	Y pattern drift error	
C2	See 11.4.1	

11.4.7 Miscellaneous Hardware

Error	Cause	Remedy
60/AIR?	a. Air not turned on	a. Turn on air
	b. Some device other than presser foot, left shelf or relay K2 has not responded properly	b1. Run tests 8 & 9 for those devices
		b2. Check wiring
		b3. Replace B86 board
61	Presser foot down timeout	
	a. Flow control 43 misadjusted	a. Adjust valve 43
	b. Presser foot down/up switches misadjusted/ defective	b1. Run tests 8 & 9
		b2. Adjust/replace if defective
	c. Wiring problem	c. Check wiring
	d. Air cylinder 26 problem	d. Lubricate/replace cylinder
	e. Control failure	e1. Check/replace valve 1
		e2. Replace B86 board
62	Presser foot up timeout	
	a. Flow control 42 misadjusted; otherwise same as 61	a. Adjust valve 42
63	Servo power failure to turn on	
	a. Momentary overload	a. Reset CB1 or CB2 (whichever is open)

Error	Cause	Remedy
	b. Short circuit	b. Check/fix wiring; then reset CB1 or CB2
	c. K1 or K2 failure	c. Replace K1 or K2
	d. CR2 failure	d. Replace CR2
64	Servo power failure to turn off	
	a. K1 or K2 failure	a. Replace K1 or K2
	b. Control failure	b. Replace B86 board
65 66	Left shelf up timeout Left shelf down timeout	
	a. Needle valve 52 misadjusted	a. Adjust valve 52
	b. Left shelf switch misadjusted/defective	b. Adjust/replace if defective
	c. Wiring problem	c. Check wiring
	d. Air cylinder 34 problem	d. Lubricate/replace cylinder
	e. Control failure	e1. Check/replace valve 7
		e2. Replace B86 board
67,68	See App. F (IMPM)	
70-73	See Par. 11.4.5	

11.4.8 EEPROM Memory

Error	Cause	Remedy
82	Chip's usage exhausted (XE870L21)	Replace chip (Service kit has one)
80,81,83	Control failures	Replace chip; if error repeats, replace B86 board

11.5 SEWING MACHINE DRIVE TROUBLESHOOTING

CAUTION

On power up or down or when troubleshooting the drive system, the sewing head may rotate. Keep fingers away from the needle area.

11.5.1 Speed Test

Perform the diagnostics tests for positioning speed (test 11) and the 680 and 2500 spm speeds (test 12).

11.5.2 Troubleshooting Charts (also see Par. 11.4.5)

Symptom	Cause	Remedy
Motor won't run	a. No power to motor circuit	a. Check circuit breakers CB3, CB6; relays K5, K6; and transformer output voltage
	b. Needle positioner plug disconnected	b. Reconnect
	c. Needle positioner cable damaged	c. Replace cable
	d. Needle positioner defective	d. Replace positioner
	e. Drive unit defective	e. Replace drive
	f. Circuit breaker CB3 tripped	f. Make sure the sewing head & X-Y positioner are free, then reset breaker
	g. No start signal from from main logic system	g. Check wiring
	h. Drive unit defective	h. Replace drive
	i. Control defective	i. Replace B86
Motor always runs at full speed	a. Control defective	a. Replace B86

Symptom	Cause	Remedy
Motor slows but does not stop at end of cycle	a. Needle positioner disk photo cell dirty	a. Clean
	b. Needle positioning speed too fast	b. Set to 180 rpm
	c. Needle positioner	c. Replace positioner
	d. Drive unit defective	d. Replace drive
	e. Control defective	e. Replace B86
Motor runs but trips circuit breaker	a. Too much load on motor	a. Check for bind in sewing head, excessive belt tension
Motor growls	G1 pot on B96 needs adjustment	Run test 11

11.6 SEWING MACHINE TROUBLESHOOTING

Symptom	Cause	Remedy
Erratic thread tension	a. Thread tension	a. Par. 7.4
	b. Wrong size needle	b. Proper needle
	c. Wrong type needle	c. Proper needle
	d. Presser foot too long	d. Par. 7.6 & 8.9
Skip stitch	a. "Flagging"	a. Lower presser foot
	b. Dwell too short	b. Par. 6.11 (increase dwell)
	c. SYNC disk setting wrong	c. Par. 8.14
	d. Presser foot timing	d. Par. 8.9
Loose thread on underside	a. Presser foot too low	a. Par. 7.6 & 8.9
	b. Thread tension	b. Par. 7.4
	c. Dwell too short	c. Par. 6.11
	d. Sync disk wrong	d. Par. 8.14

Symptom	Cause	Remedy
Thread breaks	a. Tension too tight	a. Par. 7.4
	b. Burr on hook, needle plate, etc.	b. Remove burr or replace part
	c. Tangled thread	c. Par. 7.2 & 7.3
	d. Wrong needle	d. Use proper needle
Thread cut failures	a. Wrong type knife, knife maladjusted or dull. Thread catcher misses thread	a. Par. 8.13
	b. Wrong CUT disk setting	b. Par. 8.14; Test 6
	c. Improper speed	c. Par. 11.2, Test 11
	d. Knife does not return	d. Pneumatic circuit mechanism, Par. 8.13
Thread pulled from needle	a. Thread cut too short	a. Knife too sharp. Readjust knife, catcher
	b. Tension not released	b. Par. 8.11
	c. Excessive action of thread check spring	c. Par. 8.11
	d. Excessive tension	d. Par. 7.4
	e. Lift cylinder not restricted.	e. Par. 8.22
Excessive tail at 1st stitch	a. Inadequate action of thread check spring	a. Par. 8.11
	b. Needle too large	b. Use proper needle
	c. Presser foot traps thread	c. Lift presser foot. Par. 7.6
	d. Thread cut too long	d. Readjust knife or catcher

Symptom	Cause	Remedy
Crooked stitches	a. Lock too close to surface	a. Increase bobbin tension
	b. Improper tension	b. Par. 7.4
	c. Wrong needle	c. Change needle
Needle bends	a. Table dwell too short	a. Par. 6.11
	b. Sync disk setting wrong	b. Par. 8.14
	c. Strikes foot, plate or hook	c. Par. 8.3
Material "flags"	a. Presser foot too high	a. Par. 7.6
	b. Presser foot cam out of time	b. Par. 7.6 & 8.9
Material dragged by needle	a. Dwell wrong	a. Par. 6.11
	b. Sync disk setting wrong	b. Par. 8.14
Bobbin overruns	Catcher return speed too high	Adjust flow control valve 46 on right end of cut cylinder, Par. 8.13

USM Microprocessor Controlled Stitcher - Model A
Symbol MPCS-A

Machine Serial Number _____ Date _____

The following information pertains to this particular machine. Insert this card at the end of Section 11 of the machine's Installation and Operating Service Manual.

SOFTWARE (OPERATING SYSTEM) IDENTIFICATION

The complete printed circuit board part number shown below must be used for reordering or service reference. Number should be verified by examination of the board.

Operating System O. S. __

Digital Controller board part number MPCS-860B86-1P __ REV __

CALIBRATION VALUES

Display when Test 1, Machine Cal, is run. _____

MPCS-507

Software Identification/Calibration Card

Figure 11.1

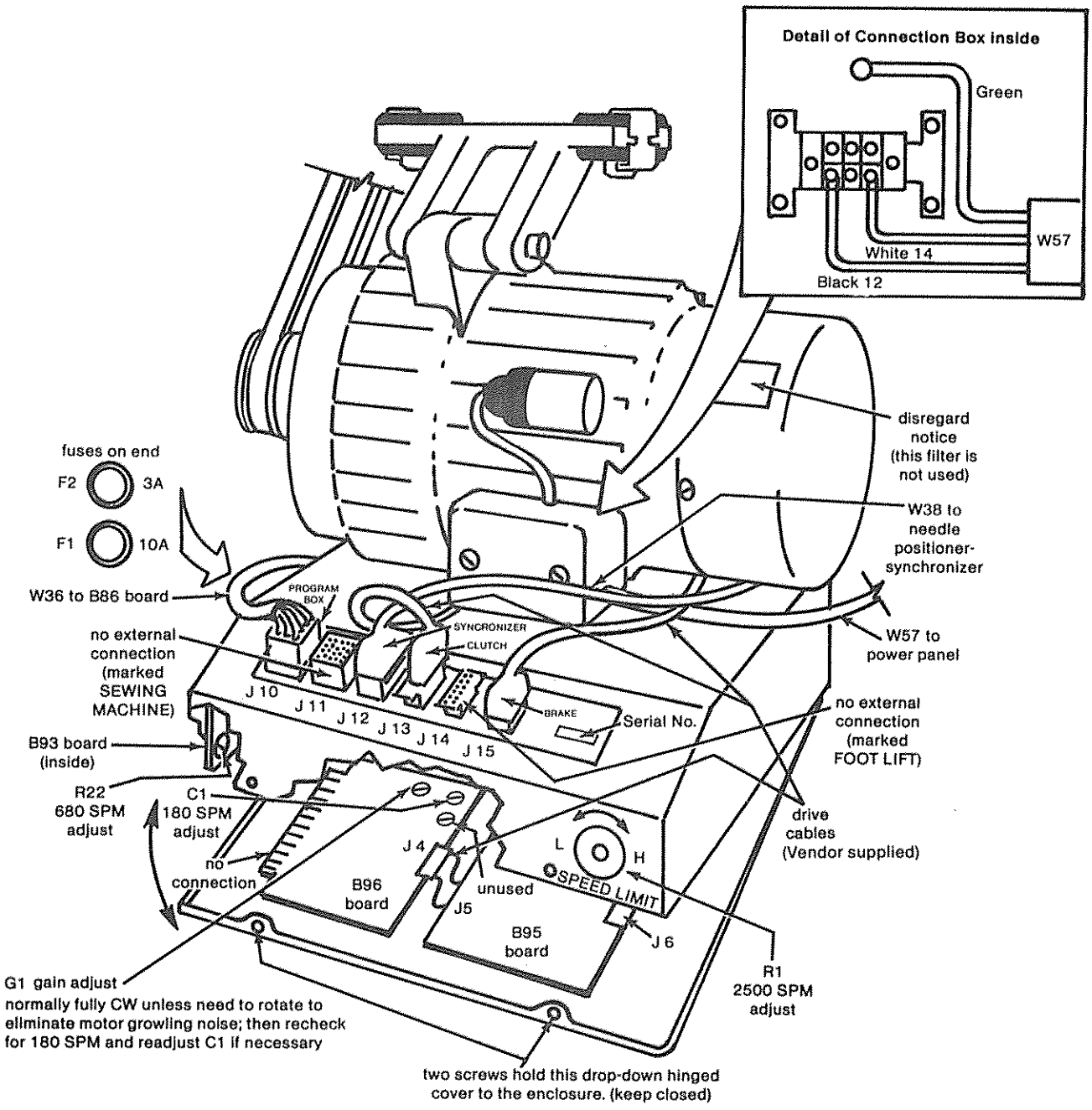


Figure 11.2 Sewing Machine Drive (cover open)

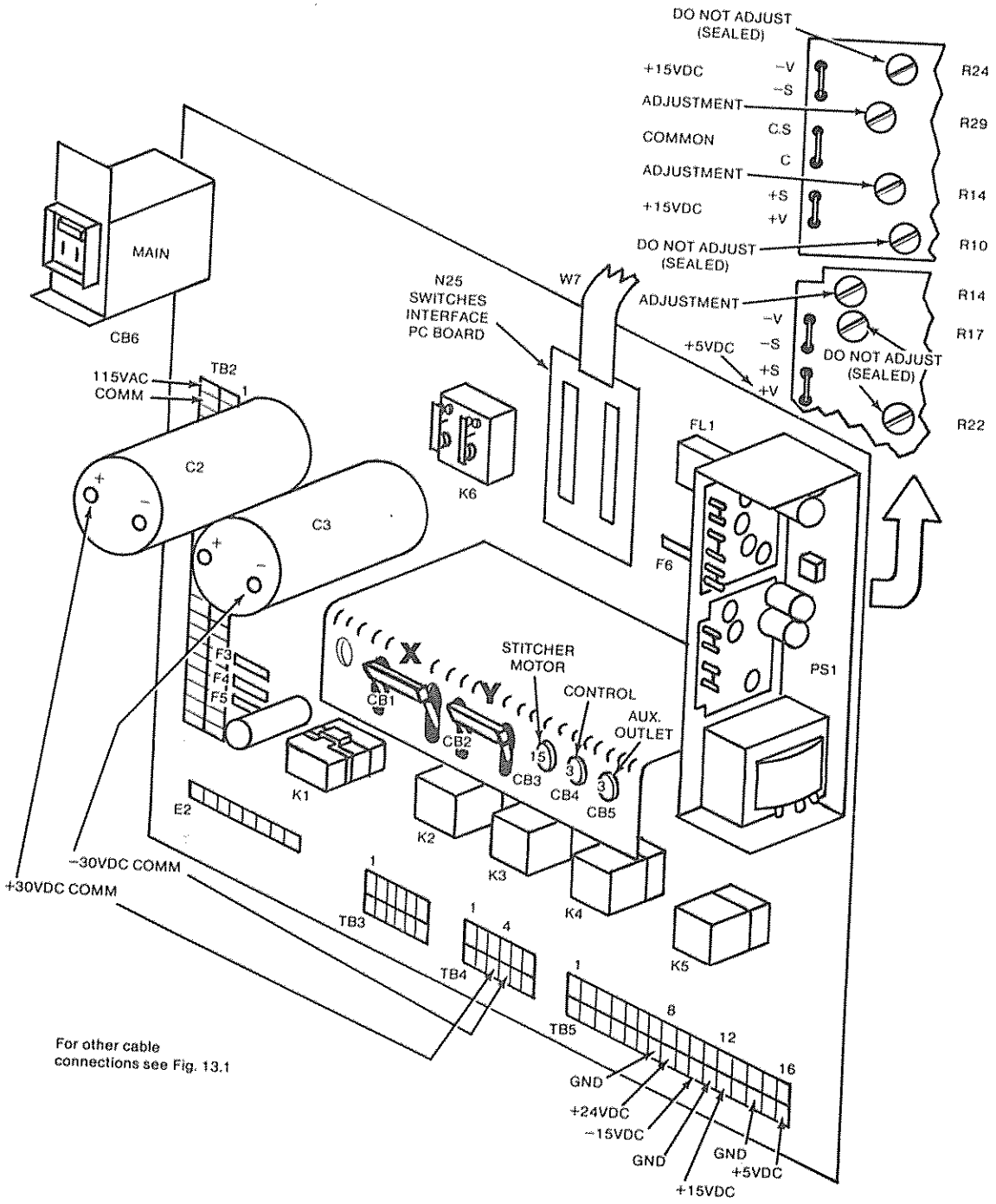


Figure 11.3 Power Supply/Power Panel

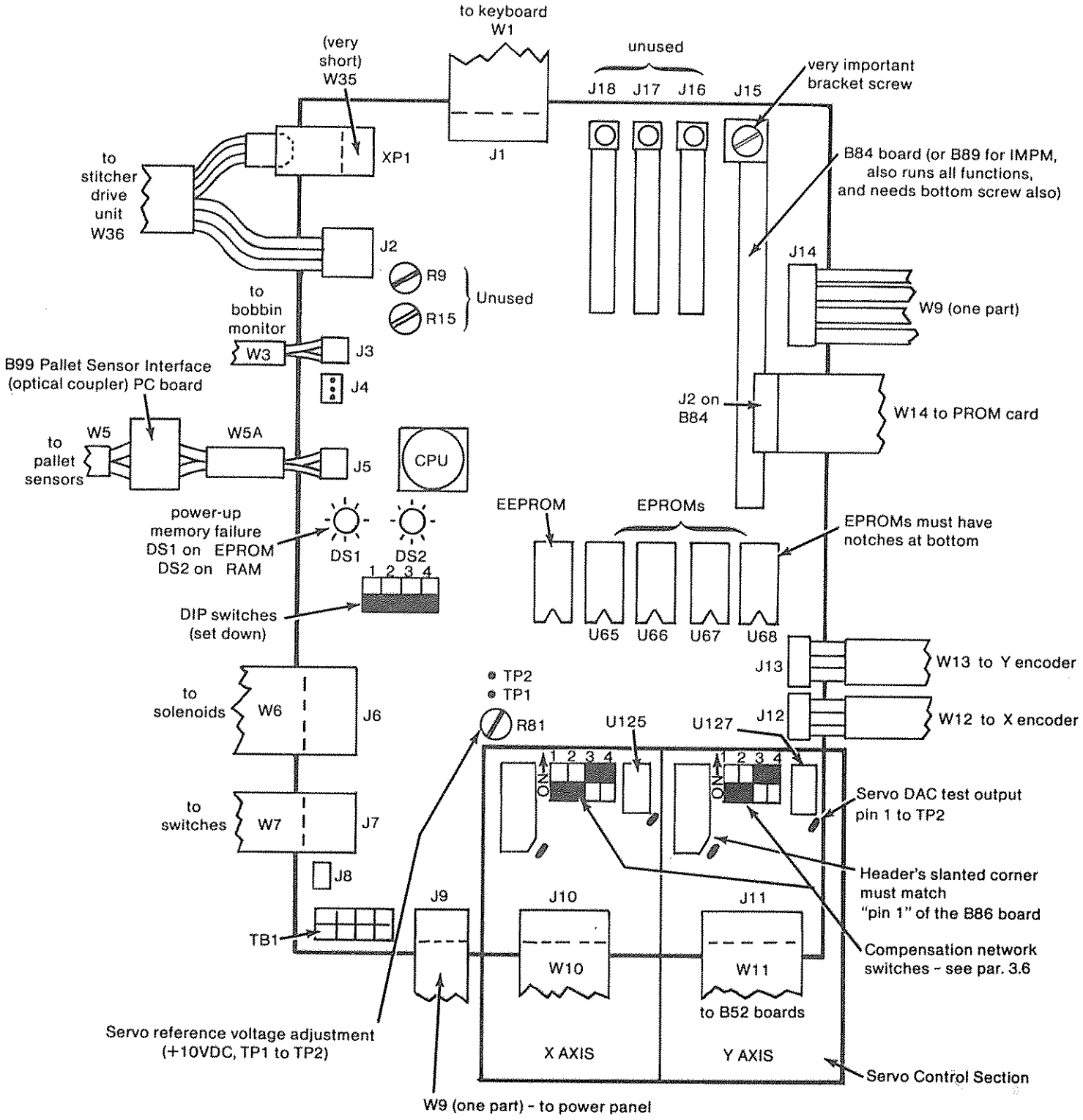


Figure 11.4 Digital Controller Board (B86)

12.0 RECOMMENDED SPARE PARTS

12.1 EXPENDABLE ELECTRICAL PARTS

Qty	Manufacturer Description	USM Part #
1	Servo Motor Brush Replacement Kit (brushes, springs, etc.)	AJS-750
1	Thread Detector Sensor Diode	AJS-355A
1	Limit Switch (long leaf actuator)	XE371E2
1	Limit Switch (short leaf actuator)	XE347A1
1	Limit Switch (roller actuator)	XE347A2
2	Light Bulbs (power/ready)	ED-15341
2	Light Bulbs (control switches)	XE392C6
2	Light Bults (sewing lamp)	ACS-466
1	Fuse (F3), power panel	XE409A9
1	Fuse (F4,F5) power panel, (F2) sewing machine drive	XE401A8
1	Fuse (F6) power panel	ED-15004
1	Fuse (F1) sewing machine drive	XE409C14
1	Bridge Rectifier	XE882H1
1	Switch Cap, small (START)*	MPCS-440
1	Switch Cap, lighted, large (STOP)	MPCS-445

* Exact cap is available from USM. If needed for a function different than START, use tape temporarily.

12.2 PNEUMATIC PARTS

Qty.	Manufacturer Description	Supplier Part #	USM Part #
1	Repair Kit for XE704B4 filter (NOTE: This filter can be cleaned.)	Watts EK504Y	XF406E2
1	Valve, 3-way solenoid air	Mac 111B-502R	XF789A502
1	Valve, 4-way solenoid air	Mac 911A-PM -502C	XF791B502

Qty.	Manufacturer Description	Supplier Part #	USM Part #
1	Valve, 4-way solenoid air (pneumatic cut)	Mac 611B-11 -501A	XF792B501
2	Shock absorbers - join & sew (heavy) pallets or will work with light pallets		XF470F4

12.3 FAN FILTER

Qty.	Manufacturer Description	USM Part #
1	Filter, machine frame (left)	ACS-435

12.4 MECHANICAL PARTS (Select according to work to be done.)

Manufacturer Description	USM Part #
Throat Plate - regular machine	ACS-478
Movable Throat Plate option - regular work	AJS-494
Movable Throat Plate option - close edge work	AJS-493
Movable Throat Plate option - cable stitch work	AJS-492
Other parts for cable stitch work (except presser feet)	MPCS-560
Presser Foot - regular machine	ACS-5034
Presser Foot - cable stitch work	ACS-5036
Join & Sew (extended) presser foot option - regular work	ACS-988

Manufacturer Description	USM Part #
Join & Sew (extended) presser foot option - cable stitch work	ACS-989
Join & Sew (extended) presser foot option - close edge work	ACS-990

(Other options with disks for compressible work are available - ACS-5037 or ACS-5038 - see catalog)

Parts for Pfaff 483 head - Regular & High Lift option.

Needle Bar - regular machine	PF92-171663-92
Needle Bar - high lift option	AJS-785
Presser Foot Bar - regular machine	PF91-168157-01
Presser Foot Bar - high lift option	AJS-786
Hook & Bobbin Case - complete	PF91-171820-91
Presser Foot Bar Guide - high lift option	AJS-784
Rotary Thread Tension Slotted Disk	AJS-1342
Needle Bar Guide Housing	PF91-171032-91
Positioning Lug	PF91-171851-15
Knife	PF91-171853-15
Guide	PF91-171854-15
Block, Knife	PF91-171952-15
Thread Catcher	PF91-171540-05
Thread Tension Spring Check	ACS-371
Control Disk Stud Assembly	ACS-626
Needle Bar Screw	PF11-330085-15
Needle Bar Clamp Screw	PF11-174173-15
Presser Foot Bar Bushing	ACS-963
Presser Foot Bar Clamp	PF91-171848-05
Presser Foot Bar Screw	PF11-108234-15
Presser Foot Screw	PF11-108174-35
Thread Knife Screw	PF11-174086-15
Thread Hook Screw	PF91-000785-15

12.5 NEEDLES - SIZE AND POINT TYPES

Examples: 134D100, 134-35R90

Basic type required for the 483 machine:

134 or 134KK (regular length)
134-35 or 135X16 (long length used with high lift presser foot)

Shape of points:

Triangular point
(first preference for leather)....D (TRI for 135x16 length)
Small rount.....R
Round (for plastic materials).....RS
Narrow wedge, straight.....Ps
Narrow wedge, right twist.....PCr
Narrow wedge, left twist.....PCl
Diamond point.....Dl
Others available

Size (diameter): 90, 100, 110 most commonly used; (50 through 200 available).

12.6 REPLACEMENT PRINTED CIRCUIT BOARDS

WHEN ORDERING PRINTED CIRCUIT BOARDS, THE COMPLETE PART NUMBER, INCLUDING THE DASH NUMBER, MUST BE USED. NUMBERS SHOULD BE VERIFIED BY EXAMINATION OF THE BOARDS IN THE MACHINE. INCLUDE ANY "REV" LETTER.

Qty.	Name	USM PART #
1	Digital Controller Board	MPCS-860B86
1	Servo Power Distribution Board (Heat Sink) Assembly	MPCS-368*

* Includes the XE860B52 board not shipped separately. Use for either axis.

12.7 PALLET SENSING TARGETS MPCS-509

One sheet providing targets of each of the 7 codes, as follows:

Qty.	Code
9	1 or 4 (reversible)
7	2
9	3 or 6 (reversible)
4	5
5	7

13.0 ELECTRICAL SCHEMATICS AND COMPONENTS LIST (See List of Illustrations)

WHEN ORDERING PRINTED CIRCUIT BOARDS, THE COMPLETE PART NUMBER, INCLUDING THE DASH NUMBER, MUST BE USED. NUMBERS SHOULD BE VERIFIED BY EXAMINATION OF THE BOARDS IN THE MACHINE. INCLUDE ANY "REV" LETTER. SEE SECTION 11, FIG. 11.1, SOFTWARE IDENTIFICATION AND CALIBRATION CARD.

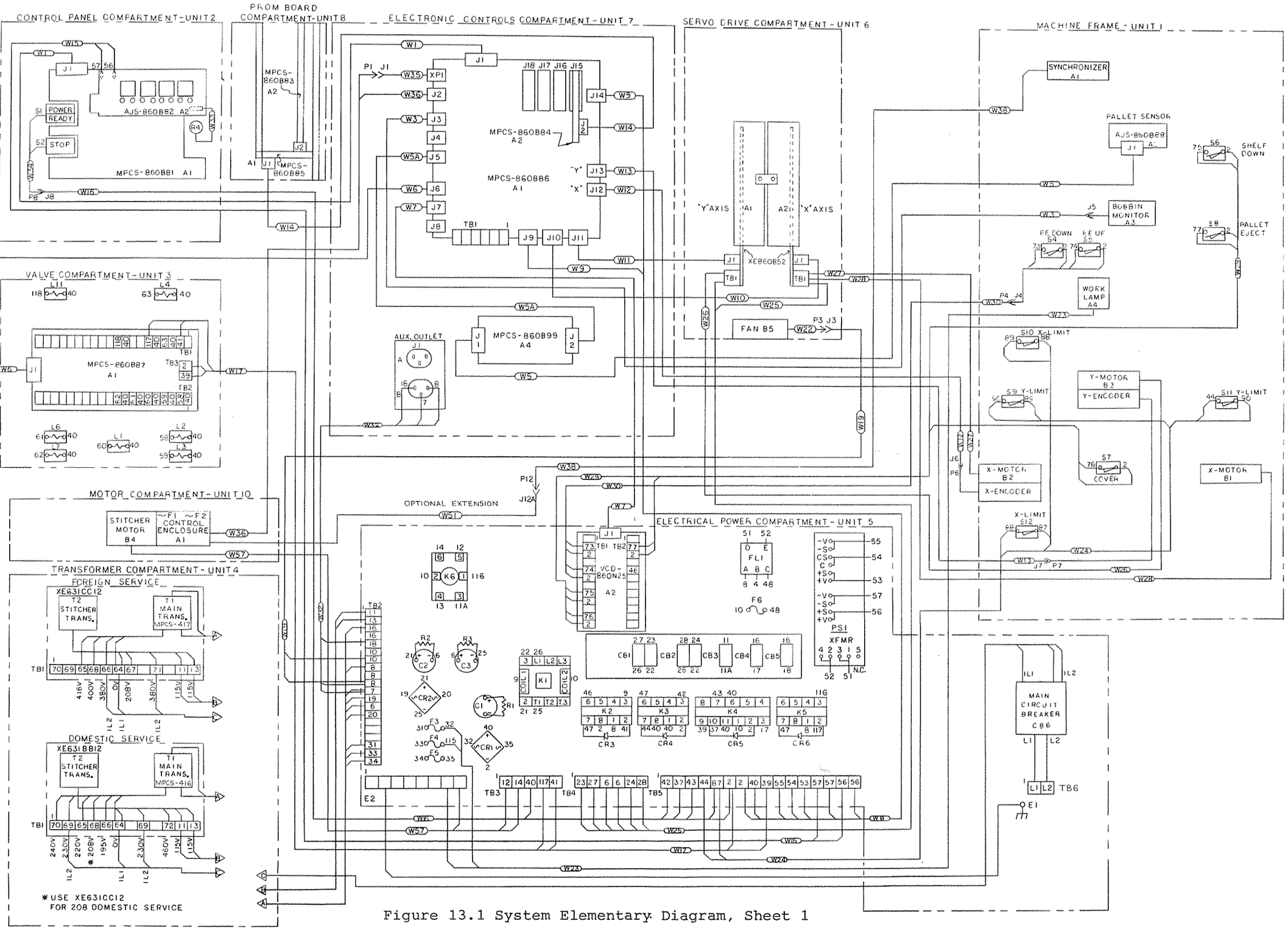


Figure 13.1 System Elementary Diagram, Sheet 1

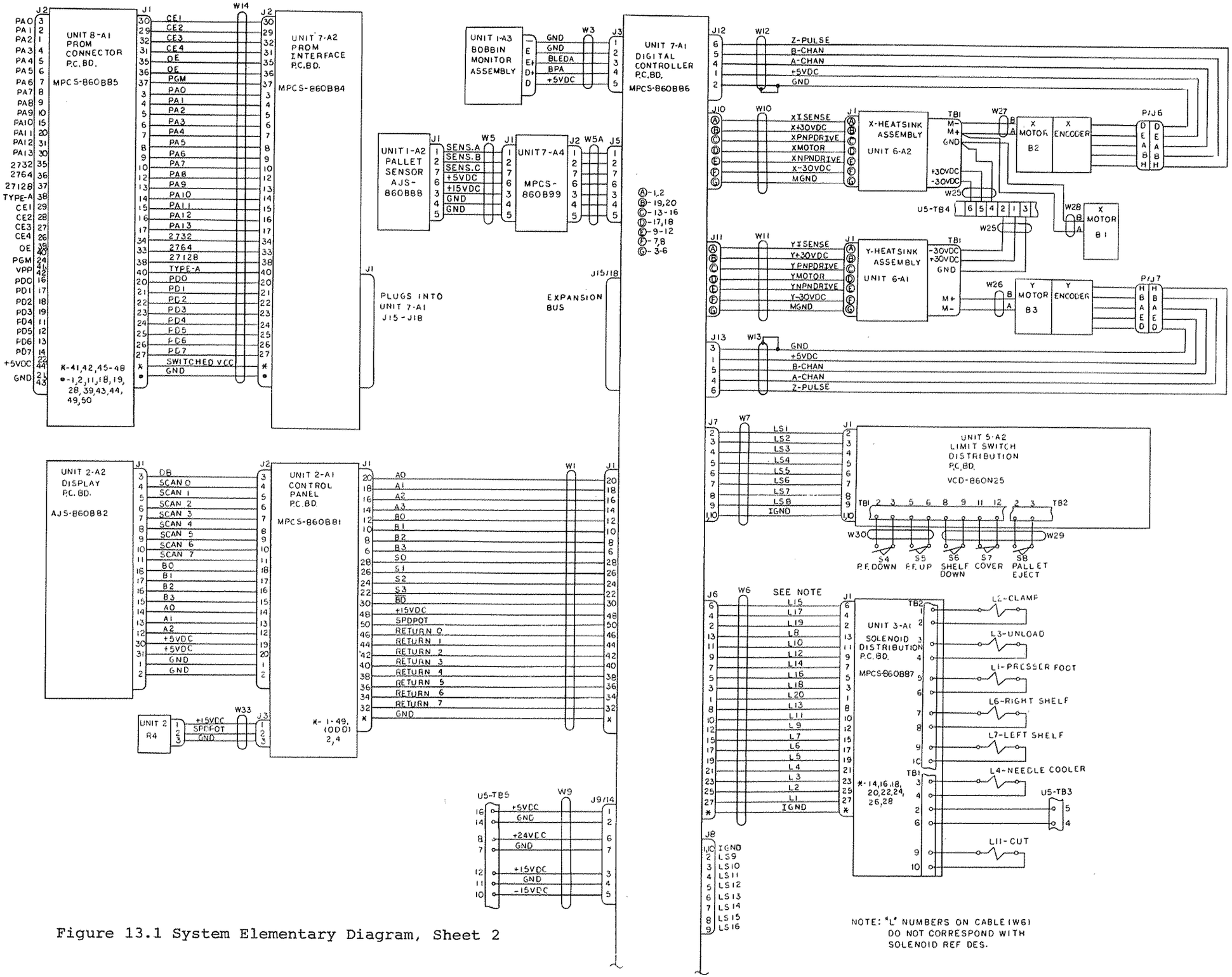


Figure 13.1 System Elementary Diagram, Sheet 2

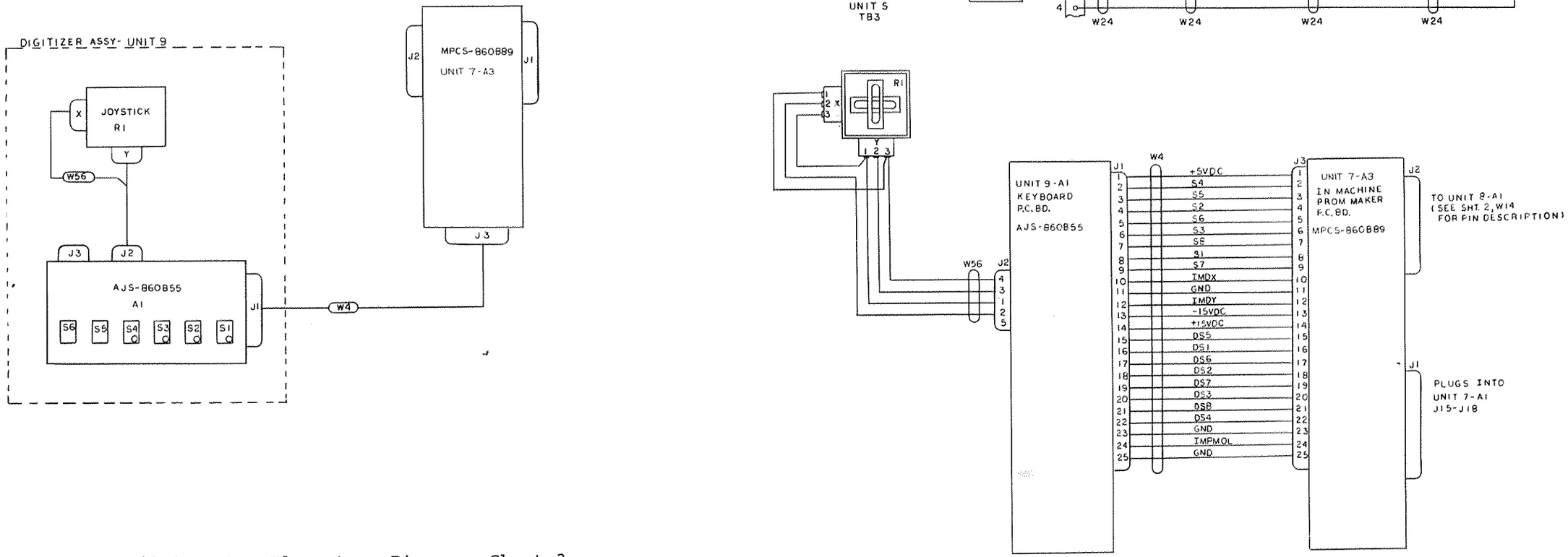


Figure 13.1 System Elementary Diagram, Sheet 3

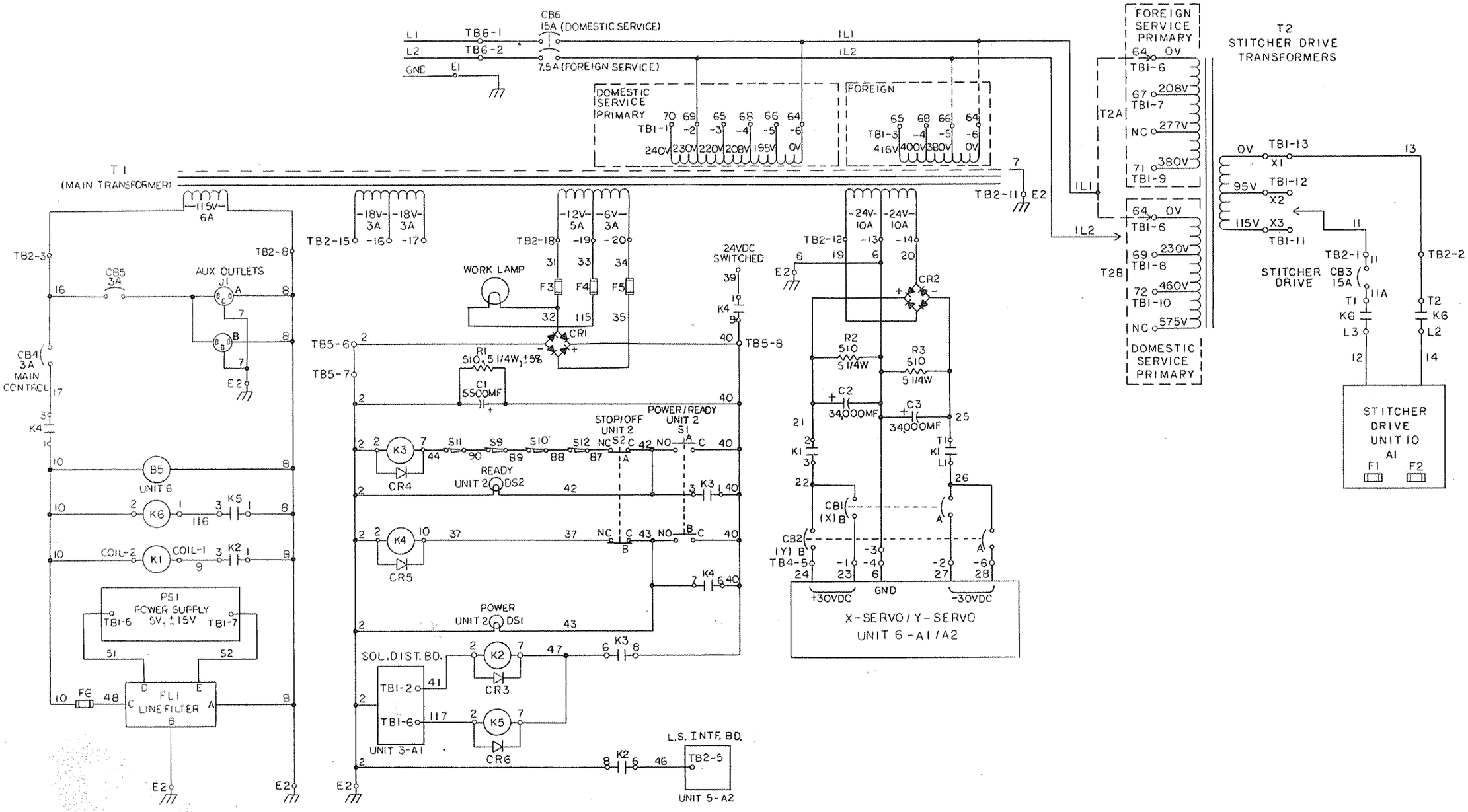


Figure 13.2 Electrical Power Distribution Diagram

*Denotes Spare Part
$Denotes Replacement Part

MPCS-A ELECTRICAL COMPONENT LIST
Document No. 8618A 9-25-86

When ordering PC boards, the suffix must be added to the part No. shown below. Examine the board in the machine.

REF. DES.	NAME	DESCRIPTION	FUNCTION	LOCATION	MANUFACTURER NAME	MANUFACTURER NUMBER	USM PART NO.
	UNIT 1						
1B1	MOTOR	SERVO MOTOR	DRIVES FRONT OF X AXIS MECHANISM	X-Y TABLE			AJS-125
1B2	MOTOR-ENCODER	SERVO MOTOR WITH INTEGRAL ENCODER	DRIVES REAR OF X AXIS MECHANISM	X-Y TABLE			AJS-747
1B3	MOTOR-ENCODER	SERVO MOTOR WITH INTEGRAL ENCODER	DRIVES Y AXIS MECHANISM	X-Y TABLE			AJS-747
*1S4	SWITCH	LIMIT, SUBMINIATURE, 3 AMP IND., 28VDC, SPDT, ROLLER ACTUATOR	PRESSER FOOT DOWN	SEWING HEAD	MICROSWITCH	111SM2	XE347A2
*1S5	SWITCH	LIMIT, SUBMINIATURE, 3 AMP IND., 28VDC, SPDT, ROLLER ACTUATOR	PRESSER FOOT UP	SEWING HEAD	MICROSWITCH	111SM2	XE347A2
*1S6	SWITCH	LIMIT, SUBMINIATURE, 3 AMP IND., 28VDC, SPDT, ROLLER ACTUATOR	LEFT SHELF DOWN	MACHINE FRAME	MICROSWITCH	111SM2	XE347A2
*1S7	SWITCH	LIMIT MINIATURE, 3 AMP IND., 28VDC, SPDT, LONG LEAF ACT.	COVER IN PLACE	MACHINE FRAME	MICROSWITCH	V3L-3005-D8	XE371B2
*1S8	SWITCH	LIMIT MINIATURE, 3 AMP IND., 28VDC, SPDT, LONG LEAF ACT.	PALLET IN CHUTE	MACHINE FRAME	MICROSWITCH	V3L-3005-D8	XE371B2
*1S9,11	SWITCH	LIMIT, SUBMINIATURE, 3 AMP IND., 28VDC, SPDT, LEAF ACTUATOR	Y AXIS LIMITS	MACHINE FRAME	MICROSWITCH	111SM1	XE347A1
*1S10,12	SWITCH	LIMIT, SUBMINIATURE, 3 AMP IND., 28VDC, SPDT, LEAF ACTUATOR	X AXIS LIMITS	MACHINE FRAME	MICROSWITCH	111SM1	XE347A1
$1A1	SYNCHRONIZER	NEEDLE POSITIONER - ENCODER ASSEMBLY (PART OF MPCS-407)	SENSE NEEDLE POSITION & SPEED	SEWING HEAD		ASSEMBLY	MPCS-418
1A2	OPTICAL SENSOR	PALLET SENSOR	SENSE PALLET CODE	MACHINE FRAME	USM	ASSEMBLY	AJS-860B88
*1A3	OPTICAL SENSOR	PHOTON MODULE ("BOBBIN MONITOR")	SENSE TOP THREAD MOTION	SEWING HEAD	USM	ASSEMBLY	AJS-355A
*1A4	BULB	INCANDESCENT, 12 VOLT	WORK LAMP	SEWING HEAD	USM	ASSEMBLY	ACS-466

	UNIT 2						
2A1	PC BOARD	CONTROL PANEL	OPERATOR CONTROLS	OPERATOR CONTROL ENCLOSURE	USM	ASSEMBLY	MPCS-860B81
*	BULB	INCANDESCENT, BI-PIN, SIZE T-1 3/4, 5 VOLT, 60MA	(FOR SWITCH LAMPS ON MPCS-860B81)	OPERATOR CONTROL ENCLOSURE	CHICAGO MINIATURE LAMP	CM7-7361	XE392C6
2A2	PC BOARD	DISPLAY	DISPLAY CHARACTERS AND LIGHTS	OPERATOR CONTROL ENCLOSURE	USM	ASSEMBLY	AJS-860B82
2R4	POTENTIOMETER	1K ± 10%, 1/2W, CARBON COMP.	SEWING SPEED	OPERATOR CONTROL ENCLOSURE	ALLEN-BRADLEY	WA2-G056S102UA	XE804C19
	KNOB	NUMERALS 0-9	ROTATES R4	OPERATOR CONTROL ENCLOSURE	ALCO-SWITCH	KBS-500A-10 -1/4	XM932A2
	SHAFT REDUCER	1/4" TO 1/8"	ATTACHES KNOB	OPERATOR CONTROL ENCLOSURE	ALCO-SWITCH	KR1	XM933A1
2S1	SWITCH	PUSHBUTTON, ILLUMINATED MOMENTARY, DPDT	POWER ON & READY & STATUSES	OPERATOR CONTROL ENCLOSURE	DIALIGHT	554-5221-411	XE386B2
	CAP	GREEN - SPLIT LENS, ENGRAVED		OPERATOR CONTROL ENCLOSURE			AFS-2167
2S2	SWITCH	PUSHBUTTON, ILLUMINATED, MOMENTARY, DPDT	POWER OFF	OPERATOR CONTROL ENCLOSURE	DIALIGHT	554-1221-511	XE386B5
	CAP	RED		OPERATOR CONTROL ENCLOSURE	DIALIGHT	328-0071	XE384C4
	BARRIER	END, FOR 2S1, 2S2		OPERATOR CONTROL ENCLOSURE	DIALIGHT	565-0721	XE386C2
	BULB	INCANDESCENT, MINI, SINGLE CONT., MIDGIT FL. BASE, 28VDC	(FOR XE386B2 OR XE386B5)	OPERATOR CONTROL ENCLOSURE	G.E.	327	ED-15341
	UNIT 3						
3A1	PC BOARD	SOLENOID DISTRIBUTION	SUPPLY SOLENOIDS	MACHINE FRAME	USM	ASSEMBLY	MPCS-860B87
	COILS	COILS FOR SOLENOID VALVES (SEE FIG. 10.1)		MACHINE FRAME			

	UNIT 4						
4T1	TRANSFORMER	1.5KVA, 195/208/220/230/240V PRIMARY, 115V, 48CT, 18V (12VT) SECONDARY, 50/60 Hz	MAIN CONTROL TRANSFORMER DOMESTIC SERVICE	MACHINE FRAME			MPCS-416
4T1	TRANSFORMER	1.5KVA, 380/400/416V PRIMARY, 115V, 48VCT, 18V (12VT) SECONDARY, 50/60 Hz	MAIN CONTROL TRANSFORMER FOREIGN SERVICE	MACHINE FRAME MACHINE FRAME			MPCS-417
4T2	TRANSFORMER	1.5KVA, 230/460/575V PRIMARY, 115/95V SECONDARY, 50/60 Hz	STITCHER DRIVE TRANSFORMER 230 & SPECIAL HIGH VOLTS SERVICE	MACHINE FRAME	G.E.	9T58B73	XE631BB12
4T2	TRANSFORMER	1.5KVA, 208/277/380V PRIMARY, 115/95V SECONDARY, 50/60 Hz	STITCHER DRIVE TRANSFORMER 208,277,380V SERVICE	MACHINE FRAME	G.E.	9T58B93	XE631CC12
4TB1	TERMINAL BLOCK	16 SCREW-TERMINAL SECTIONS 20A, 1100V	TRANSFORMER CONNECTIONS	MACHINE FRAME	CINCH MFG.	16-141	ED-2694
	UNIT 5						
5PS1	POWER SUPPLY	+5VDC/8 AMP, +15VDC & -15VDC/1.5 AMP, LINEAR	SUPPLY REGULATED DC VOLTAGES	POWER PANEL	STANDARD POWER POWER ONE	SPW131WT CP13I-A	XE641F6
5FL1	FILTER	RFI POWER, 115VAC, 5A, 50-400 Hz	FILTER REGULATED VOLTAGES	POWER PANEL	CORCOM	SK1-5A	XE840B1
5A2	PC BOARD	SIGNAL (SWITCH) DISTRIBUTION	RECEIVE SIGNALS	POWER PANEL	USM	ASSEMBLY	VCD-860N25
5K1	CONTACTOR	MAGNETIC, 3 POLE & AUXILIARY CONTACTS	SERVO POWER CONTROL	POWER PANEL	G.E.	CR305C002	ED-11011
	COIL	50 Hz, SUBSTITUTE FOR ED-10500A/60 Hz					ED-3259
5K2,3, 5	RELAY	CONTROL, PLUG IN, DPDT, 24VDC, 10A	POWER CONTROL CIRCUIT	POWER PANEL	POTTER & BRUMFIELD	KRP11DG-24V	ED-14834
	SOCKET	8 PIN, OCTAL		POWER PANEL	AMPHENOL	146-103	ED-6235
5K4	RELAY	CONTROL, PLUG IN, 3PDT, 24VDC, 10A	POWER CONTROL CIRCUIT	POWER PANEL	POTTER & BRUMFIELD	KRP14DG-24V	XE602B11
	SOCKET	11 PIN, OCTAL		POWER PANEL	MAGNECRAFT	70-170	XE628A1
5K6	RELAY	POWER (HEAVY DUTY), DPST, 120VAC	STITCHER DRIVE POWER CONTROL	POWER PANEL	POTTER & BRUMFIELD	PRD7AY0-120V	XE599A4

5CB1	CIRCUIT BREAKER	MAGNETIC, DP, TOGGLE ACT., 20A	X AXIS POWER PROTECTION	POWER PANEL	POTTER & BRUMFIELD	W68X1Q1-0-20	XE753E6
5CB2	CIRCUIT BREAKER	MAGNETIC, DP, TOGGLE ACT., 10A	Y AXIS POWER PROTECTION	POWER PANEL	POTTER & BRUMFIELD	W68X1Q1-0-10	XE753E5
5CB3	CIRCUIT BREAKER	THERMAL, PUSHBUTTON RESET, 15A	STITCHER DRIVE POWER PROTECTION	POWER PANEL	POTTER & BRUMFIELD	W58XB1A4A-15	XE753F6
5CB4	CIRCUIT BREAKER	THERMAL, PUSHBUTTON RESET, 3A	MAIN CONTROL POWER PROTECTION	POWER PANEL	POTTER & BRUMFIELD	W58XB1A4A-3	XE753F5
5CB5	CIRCUIT BREAKER	THERMAL, PUSHBUTTON RESET, 3A	AUXILIARY OUTLET POWER PROTECTION	POWER PANEL	POTTER & BRUMFIELD	W58XB1A4A-3	XE753F5
5CB6	CIRCUIT BREAKER	MAGNETIC 15A 2 POLE COMMON TRIP, 480VAC	MAIN POWER DISCONNECT, DOMESTIC	ABOVE POWER PANEL	AIRPAX ELECTRONICS	205-11-1-62-5A-153	XE753G106
5CB6	CIRCUIT BREAKER	MAGNETIC 7.5A 2 POLE COMMON TRIP, 480VAC	MAIN POWER DISCONNECT FOREIGN	ABOVE POWER PANEL	AIRPAX ELECTRONICS	205-11-1-62-5A-752	XE753G103
*5CR1,2	RECTIFIER	BRIDGE, 100V, 400A		POWER PANEL	MOTOROLA	MDA3501	XE882H1
5CR3,4, 5,6	DIODE	DIODE ASSEMBLY	RELAY COIL KICK-BACK SUPPRESSION	POWER PANEL	USM	ASSEMBLY	ACS-703
5C1	CAPACITOR	ELECTROLYTIC, 550 MFD, 40WVDC		POWER PANEL	SPRAGUE	36D552G040-AC2A	XE833D552
5C2,3	CAPACITOR	ELECTROLYTIC, 34,000 MFD, 50WVDC	± 30VDC SUPPLY FILTERING	POWER PANEL	SPRAGUE	36D343G050-DF2A	XE833J343
5R1,2, 3	RESISTOR	WIREWOUND, 510 OHM, 5 1/4W, ASSEMBLY	± 30VDC SUPPLY FILTERING	POWER PANEL	OHMITE	2887	ED-14480-1
*5F3	FUSE	3AB, CERAMIC TUBE, MEDIUM TIME LAG, 4A	24VDC & WORKLAMP PROTECTION	POWER PANEL	LITTLEFUSE	314004	XE409A9
*5F4,5	FUSE	MDX, GLASS TUBE, TIME LAG, 3A	24VDC & WORKLAMP PROTECTION	POWER PANEL	BUSSMAN	MDX-3	XE401A8
*5F6	FUSE	MDL, GLASS TUBE, TIME LAG, 2A	PS1 POWER SUPPLY PROTECTION	POWER PANEL	BUSSMAN	MDL-2	ED-15004
5TB2	TERMINAL BLOCK	20 SCREW-TERMINAL SECTIONS, 20A, 1100V	TRANSFORMERS, FAN, AUX. OUTLET POWER	POWER PANEL	CINCH MFG.	20-141	XE200A45
5TB3	TERMINAL BLOCK	5 SCREW-TERMINAL SECTIONS, 15A, 1100V	SMD, SOL., CONT. PANEL POWER	POWER PANEL	CINCH MFG.	5-140	ED-2695
5TB4	TERMINAL BLOCK	6 SCREW-TERMINAL SECTIONS, 20A, 1100V	SERVO POWER	POWER PANEL	CINCH MFG.	6-141	ED-2714
5TB5	TERMINAL BLOCK	16 SCREW-TERMINAL SECTIONS, 15A, 1100V	LIMIT SW, DISP., B86, SOL, CONT. PANEL POWER	POWER PANEL	CINCH MFG.	16-140	XE200A16
5E2	CONNECTOR	CABLE, NEUTRAL BAR, 8 CIRCUITS	MACHINE GROUNDS	POWER PANEL	ILSCO	D167-8	XE163B8

	UNIT 6						
6B5	FAN	225CFM, 6 INCH, 115VAC, 0.5A	COOLING	MACHINE FRAME	ETRI	148KV-282	XE981B3
6A1,2	PC BOARD	SERVO POWER	Y/X AXIS POWER	MACHINE FRAME	USM	ASSEMBLY	XE860B52 DO NOT ORDER
*	HEAT SINK ASSY.	ASSEMBLY OF B52 AND AJS-426 HEAT SINK	Y/X AXIS POWER	MACHINE FRAME	USM	ASSEMBLY	MPCS-368
	UNIT 7						
*7A1	PC BOARD	DIGITAL CONTROLLER	OVERALL MACHINE LOGIC & I/O	MACHINE FRAME	USM	ASSEMBLY	MPCS-860B86
7A2	PC BOARD	PROM CARD INTERFACE	READ EPROMS ON B83	INSERTS INTO B86	USM	ASSEMBLY	MPCS-860B84
7A3	PC BOARD	IN-MACHINE PROM MAKER (OPTION)	PROGRAM & READ EPROMS ON B83	INSERTS INTO B86 IN PLACE OF B84	USM	ASSEMBLY	MPCS-860B89
7A4	PC BOARD	INPUT ISOLATOR	PROCESS B88 SIGNALS	MACHINE FRAME	USM	ASSEMBLY	MPCS-860B99
7J1	RECEPTACLE	OUTLET, DUAL	IMPM OPTICS & SERVICE POWER	MACHINE FRAME	HUBBEL	5262	XE240B2
	UNIT 8						
8A1	PC BOARD	PROM INTERFACE	CONNECTION FOR PROM CARD	MACHINE FRAME	USM	ASSEMBLY	MPCS-860B85
8A2	PC BOARD	EPROM (NOT SUPPLIED UNLESS ORDERED)	HOLDS 1 TO 4 PATTERN EPROMS	MACHINE FRAME	USM	ASSEMBLY	MPCS-860B83
	UNIT 9						
9A1	PC BOARD	IN-MACHINE PROM MAKER KEYBOARD	OPERATOR SWITCHES	IMPM ENCLOSURE	USM	ASSEMBLY	AJS-860B55 AJS-860B94
9R1	POTENTIOMETER	JOYSTICK, 5K OHMS, 2 AXIS, (PART OF AJS-839 CABLE)	OPERATOR X-Y INPUTS	IMPM ENCLOSURE	KRAFT SYSTEMS	990-032	XE228A1
*	BULB	INCANDESCENT, 28VDC (SPECIAL LEAD LENGTH FOR AJS-860B55)		IMPM ENCLOSURE			AJS-838

UNIT 10

10B4 10A1	DRIVE UNIT	INTEGRATED ELECTROMAGNETIC CLUTCH-BRAKE-CONTROL	SEWING MACHINE DRIVE	MACHINE FRAME			MPCS-407
10TB6	TERMINAL BLOCK	2 SCREW TERMINAL SECTIONS, 30A, 1600V	INCOMING POWER	MACHINE FRAME	CINCH MFG.	2-142	ED-2679
10E1	CONNECTOR	CABLE, SCREW (LUG) CLAMPING, SIZE 14-6	GROUNDING OF INCOMING POWER	MACHINE FRAME	THOMAS & BETTS	35301	ED-4256
	PC BOARD	STITCHER DRIVE INTERFACE (PART OF MPCS-407)	CONTROL TO/FROM B26 BOARD	INSIDE MPCS-407	USM	ASSEMBLY	MPCS-860B93
	PC BOARD	STITCHER DRIVE SPEED CONTROL (PART OF MPCS-407)	SPEED	INSIDE MPCS-407	USM	ASSEMBLY	MPCS-865B96
	PC BOARD	STITCHER DRIVE LOGIC CONTROL (PART OF MPCS-407)	OTHERS BESIDE SPEED	INSIDE MPCS-407	USM	ASSEMBLY	MPCS-865B95
*10F1	FUSE	MDA, CERAMIC TUBE, SLOW BLOW, 10A	STITCHER DRIVE PROTECTION	MPCS-407	BUSSMAN	MDA-10	XE409C14
*10F2	FUSE	MDX, GLASS TUBE, TIME LAG, 3A	STITCHER DRIVE PROTECTION	MPCS-407	BUSSMAN	MDX-3	XE401A8

CABLES

W1	CABLE	J1 of 7A1 (B86) TO J1 of 241 (B81)	KEYBOARD	B86 BOARD TO OP. CONT. ENCLOSURE	USM	ASSEMBLY	MPCS-515
W3	CABLE	J3 of 7A1 (B86) TO J5 of 1A3	BOBBIN MINITOR	B86 BOARD TO SEWING HEAD	USM	ASSEMBLY	MPCS-516
W4	CABLE	J3 of 7A3 (B89) TO J1 of 9A1 (B55)	DIGITIZING (OPTION)	B89 (ON B86 BOARD) TO IMPM ENCLOSURE	USM	ASSEMBLY	MPCS-546
W5	CABLE	J1 OF 7A4 (B99) TO J1 of 1A2 (B88)	PALLET SENSORS	B99 (NEXT TO B86 BD.) TO PALLET SENSOR	USM	ASSEMBLY	MPCS-517
W5A	CABLE	J5 of 7A1 (B86) TO J2 of 7A4 (B99)	PALLET SENSORS	B86 BOARD TO B99 BOARD	USM	ASSEMBLY	MPCS-556
W6	CABLE	J6 OF 7A1 (B86) TO J1 OF 3A1 (B87)	SOLENOID VALVES LOGIC	B86 BOARD TO VALVE ENCLOSURE	USM	ASSEMBLY	MPCS-518
W7	CABLE	J7 OF 7A1 (B86) TO J1 OF 5A2 (N25)	SWITCH/SIGNALS LOGIC	B86 BOARD TO POWER PANEL	USM	ASSEMBLY	MPCS-519
W9	CABLE	J9 AND J14 OF 7A1 (B86) TO 5TB5	B86 POWER	B86 BOARD TO POWER PANEL	USM	ASSEMBLY	MPCS-520
W10	CABLE	J10 OF 7A1 (B86) TO J1 OF 6A2 (B52, X)	X AXIS LOGIC	B86 BOARD TO HEAT SINK ASSY.	USM	ASSEMBLY	MPCS-521
W11	CABLE	J11 of 7A1 (B86) TO J1 OF 6A2 (B52, Y)	Y AXIS LOGIC	B86 BOARD TO HEAT SINK ASSY.	USM	ASSEMBLY	MPCS-522
W12	CABLE	J12 of 7A1 (B86) TO 1P6 (X ENCODER)	X AXIS ENCODER	B86 BOARD TO REAR X MOTOR	USM	ASSEMBLY	MPCS-523
W13	CABLE	J13 OF K7A1 (B86) TO 1P7 (Y ENCODER)	Y AXIS ENCODER	B86 BOARD TO Y AXIS MOTOR	USM	ASSEMBLY	MPCS-524
W14	CABLE	J2 OF 7A2 (B84) TO J1 OF 8A1 (B85)	PROM CARD DATA	B84 (ON B86 BD.) TO PROM CARD	USM	ASSEMBLY	MPCS-525
W15	CABLE	5TB5 to 2A2	DISPLAY POWER	POWER PANEL TO OP. CONT. ENCLOSURE	USM	ASSEMBLY	MPCS-526
W16	CABLE	5TB3 AND 5TB5 TO 2P8	POWER/READY AND STOP FEEDER	POWER PANEL TO OP. CONT. ENCLOSURE	USM	ASSEMBLY	MPCS-527

W17	CABLE	5TB3 AND 5TB5 TO 7B1 AND TB3 OF 3A1	SOLENOID VALVE POWER	POWER PANEL TO VALVE ENCLOSURE	USM	ASSEMBLY	MPCS-528
W19	CABLE	5TB2 TO 6P3 (FAN)	FAN FEEDER	POWER PANEL TO MACHINE FRAME	USM	ASSEMBLY	MPCS-530
W22	CABLE	6P3 TO FAN	FAN	MACHINE FRAME	USM	ASSEMBLY	MPCS-533
W23	CABLE	5F3, 5F4 AND 5E2 TO 1A4 (WORKLAMP)	WORKLAMP	POWER PANEL TO SEWING HEAD	USM	ASSEMBLY	MPCS-534
W24	CABLE	5TB5 TO SWITCHES, S9, S10, S11, S12	LIMIT SWITCHES	POWER PANEL TO X-Y TABLE	USM	ASSEMBLY	MPCS-535
W25	CABLE	5TB4 TO TB1 OF 6A1 (B52, Y) AND 6A2 (B52, X)	SERVOS POWER	POWER PANEL TO HEAT SINK ASSY.	USM	ASSEMBLY	MPCS-536
W26	CABLE	TB1 OF 6A1 (B52, Y) TO 1B3 (Y MOTOR)	Y AXIS MOTOR POWER	HEAT SINK ASSY. TO X-Y TABLE	USM	ASSEMBLY	MPCS-537
W27	CABLE	TB1 OF 6A2 (B52, X) TO 1B2 (REAR X MOTOR)	REAR X AXIS MOTOR POWER	HEAT SINK ASSY. TO X-Y TABLE	USM	ASSEMBLY	MPCS-538
W28	CABLE	TB1 OF 6A2 (B52, X) TO 1B1 (FRONT X MOTOR)	FRONT X AXIS MOTOR POWER	HEAT SINK ASSY. TO X-Y TABLE	USM	ASSEMBLY	MPCS-539
W29	CABLE	TB1 AND TB2 of 5A2 (N25) TO SWITCHES, S7, S8, S9	PALLET AND COVER SWITCHES	POWER PANEL TO MACHINE FRAME	USM	ASSEMBLY	MPCS-540
W30	CABLE	TB1 OF 5A2 (N25) TO SWITCHES, S4, S5	PRESSER FOOT SWITCHES	POWER PANEL TO SEWING HEAD	USM	ASSEMBLY	MPCS-541
W32	CABLE	5TB2 to 7J1	AUX. OUTLET	POWER PANEL TO MAIN FRAME	USM	ASSEMBLY	MPCS-543
W33	CABLE	2A2 TO 2R4	SPEED POT	OP. CONT. ENCLOSURE	USM	ASSEMBLY	MPCS-545
W34	CABLE	2P8 TO S1 AND S2 OF 2A1	POWER/READY AND STOP	OP. CONT. ENCLOSURE	USM	ASSEMBLY	MPCS-544
W35	CABLE	XP1 OF 7A1 (B86) TO 7P1 (W36)	STITCHER DRIVE LOGIC FEEDER	B86 BOARD	USM	ASSEMBLY	MPCS-550
W36	CABLE	J2 OF 7A1 AND W35 TO 10J1 (PROGRAM)	STITCHER DRIVE LOGIC	B86 BOARD TO STITCHER DR. ENCLOSURE	USM	ASSEMBLY	MPCS-551
$W38	CABLE	PART OF SYNCHRONIZER 1A1					
W51	CABLE	EXTENSION FOR W38 (ONLY USED IF W38 COMES TOO SHORT)			USM	ASSEMBLY	MPCS-549
W56	CABLE	J2 OF 9A1 (B55) TO 9R1 (JOYSTICK)	JOYSTICK SIGNALS	IMPM ENCLOSURE	USM	ASSEMBLY	AJS-839
W57	CABLE	5TB3 AND 5E2 to 10B4 (STITCHER DRIVE MOTOR)	STITCHER DRIVE MOTOR POWER	POWER PANEL TO STITCHER DR. MOTOR	USM	ASSEMBLY	MPCS-557

14.0 ILLUSTRATIONS

NOTES

SOME FIGURE NUMBERS ARE PURPOSELY OMITTED.

COVERS ARE REMOVED IN SOME ILLUSTRATIONS FOR PHOTOGRAPHIC PURPOSES.

THE MPCS-A SHOULD NEVER BE OPERATED (OR LEFT UNATTENDED) WITHOUT ALL COVERS IN PLACE.

SEE SAFETY INSTRUCTIONS, PAR. 6.1 IN THIS MANUAL.

WHEN ORDERING PRINTED CIRCUIT BOARD, THE COMPLETE PART NUMBER, INCLUDING THE DASH NUMBER, MUST BE USED. NUMBERS SHOULD BE VERIFIED BY EXAMINATION OF THE BOARDS IN THE MACHINE. INCLUDE ANY "REV" LETTER. SEE SECTION 11, FIG. 11.1, SOFTWARE IDENTIFICATION AND CALIBRATION CARD.

LEGEND FOR FIGURE 14.2

KEY NO.	DESCRIPTION	PART NO.
1	Complete Needle Positioner Synchronizer Unit	MPCS-418
2	Left ("Stop") Disk - Set at 350^{o} to 30^{o}..... (Stops forward & reversal motions)	
3	Middle ("Sync") Disk - Set at 157^{o} to 197^{o} *.....	
4	Right ("Cut") Disk - See Par. 11.2.4, Test 6 ..... (NEEDL PS") for setting information	
5	Encoder.....	
6	Anti-Rotation Bracket.....	MPCS-387

* See App. G for Extended Head option.

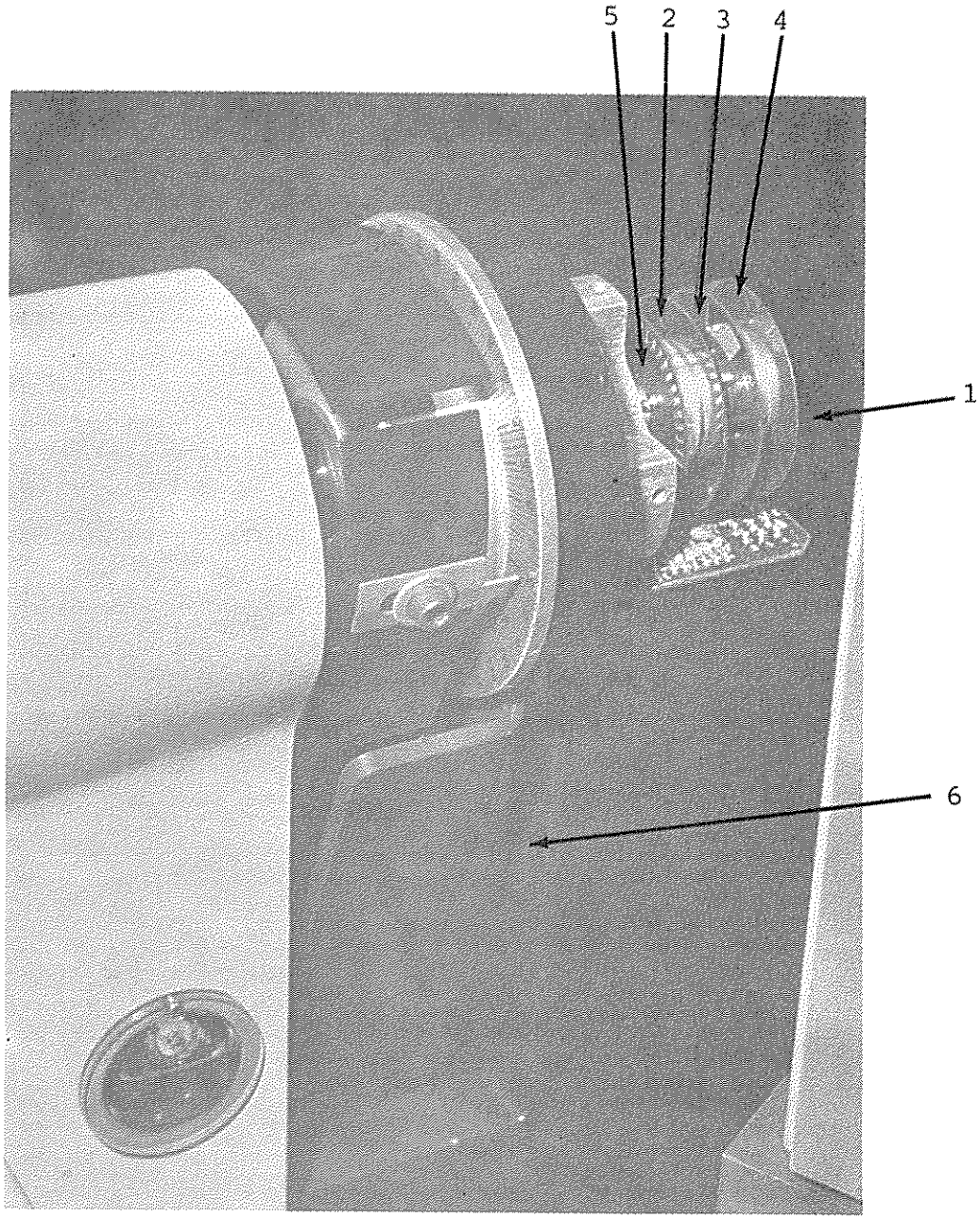


Figure 14.2 Needle Positioner - Cover Removed

LEGEND FOR FIGURE 14.3

REF. NO.	DESCRIPTION	PART NO.
1	High Pressure Adjusting Knob (Adj. 1).....	ACS-226
2	Thread Tension Spring Check.....	ACS-371
3	Control Disk Assembly.....	AJS-1342
4	Photon Module.....	AJS-355A

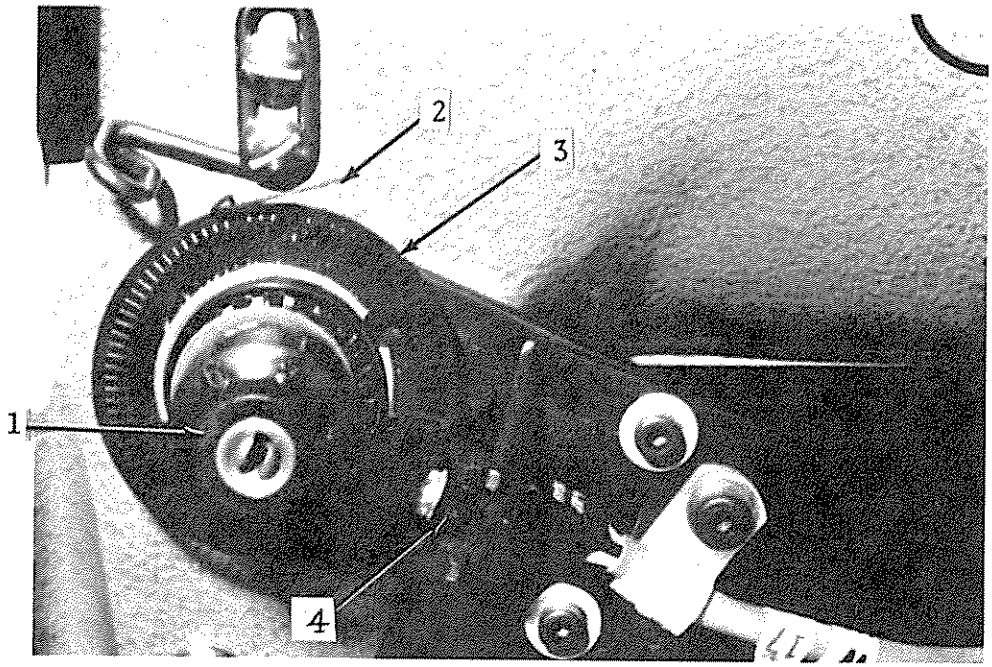


Figure 14.3 Thread Tensioning Device

LEGEND FOR FIGURE 14.4

REF. NO.	DESCRIPTION	PART NO.
1	Hole Number 1.....	
2	Hole Number 2.....	
3	Hole Number 3.....	
4	Hole Number 4 (Access through Cover also).....	
5	Hole Number 5.....	
6	*Movable Throat Plate Option	

* See Figure 14.6 for Part Numbers

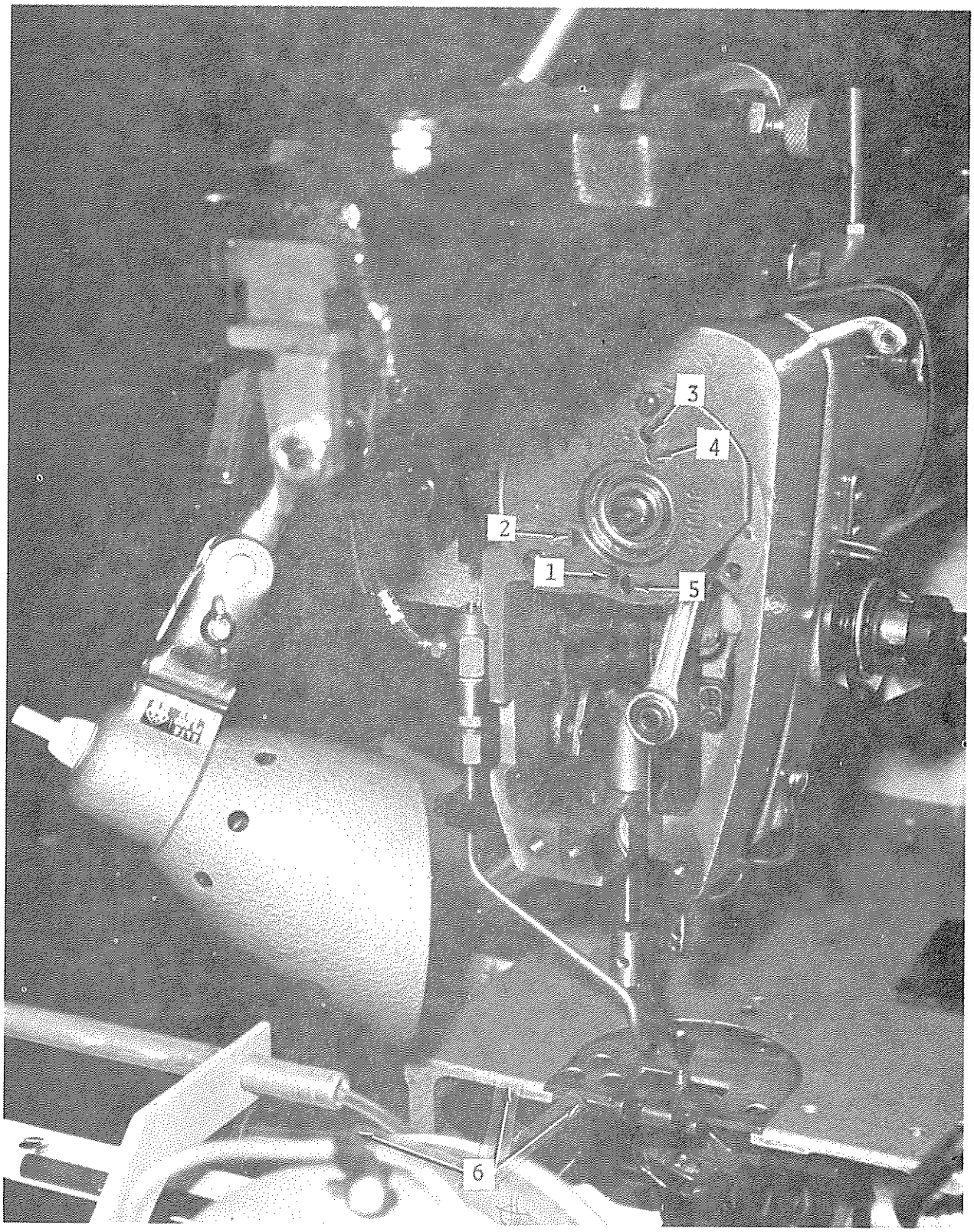


Figure 14.4 Sewing Head Timing - Cover Lifted

LEGEND FOR FIGURE 14.5

REF. NO.	DESCRIPTION	PART NO.
	High Lift Parts Shown	
1	Presser Bar Clamp	ACS-5077+
2	Clamp Screw	PF11-108234-15
3	Needle Bar Height Adjusting Screws	PF11-174172-15
4	Needle Bar - High Lift	AJS-785
5	Presser Foot (NOTE: Different presser foot used for different work. See Parts Catalog.)	
6	Presser Foot Bar - High Lift	AJS-786
7	Presser Foot Bar Guide Bushing - High Lift	AJS-784
8	Presser Foot Screw	PF11-108174-15
9	Throat Plate - High Lift - Regular Work (NOTE: Different throat plate used for different work. See Parts Catalog.)	AJS-494
10	Needle Bar Frame	PF91-171032-91
	Regular Lift Parts - Not Shown	
4	Needle Bar	PF91-171663-92
	Screw	PF11-220085-15
6	Presser Foot Bar	PF91-168157-01
7	Presser Foot Bar Guide Bushing	ACS-963
9	Throat Plate - Regular	ACS-478

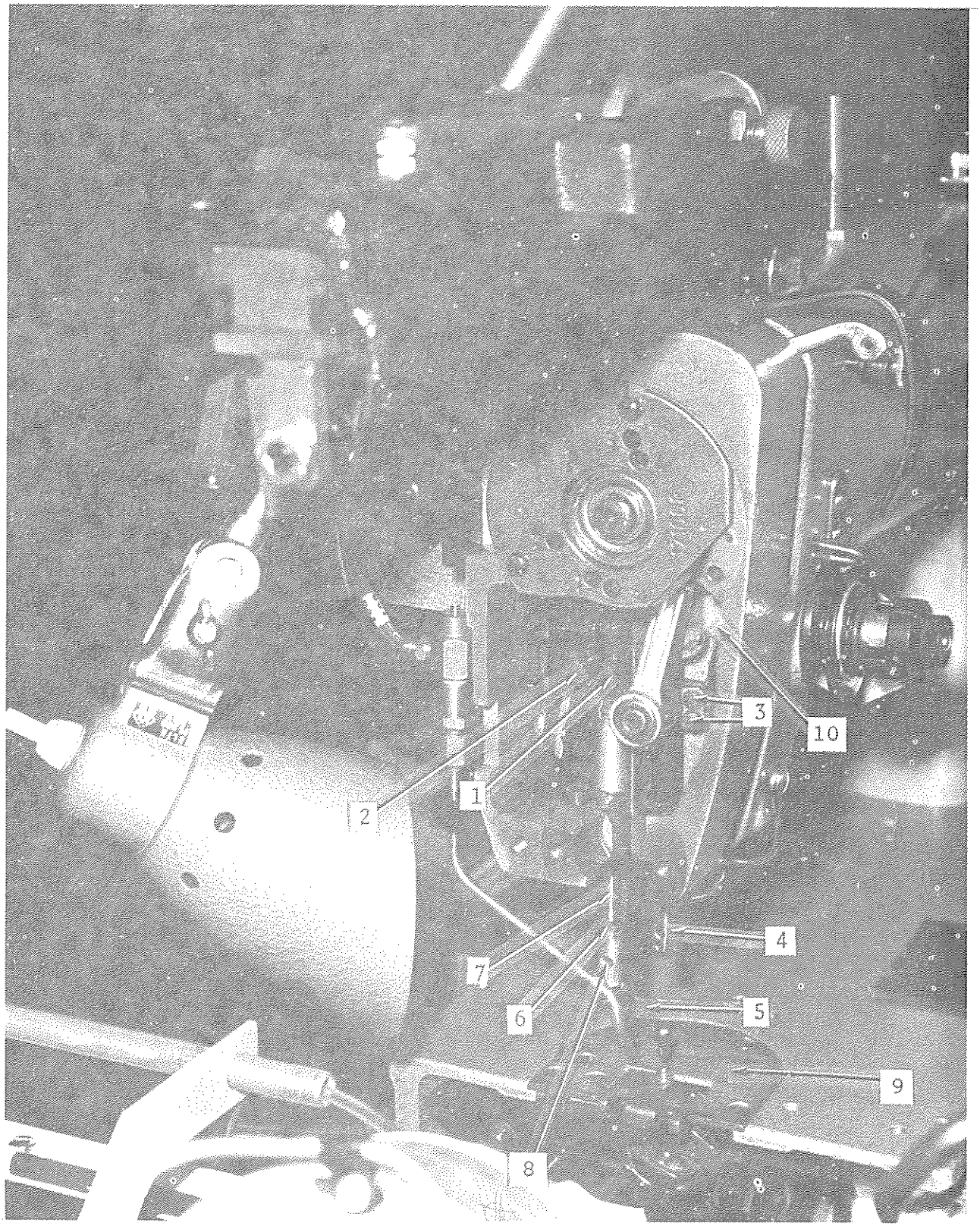
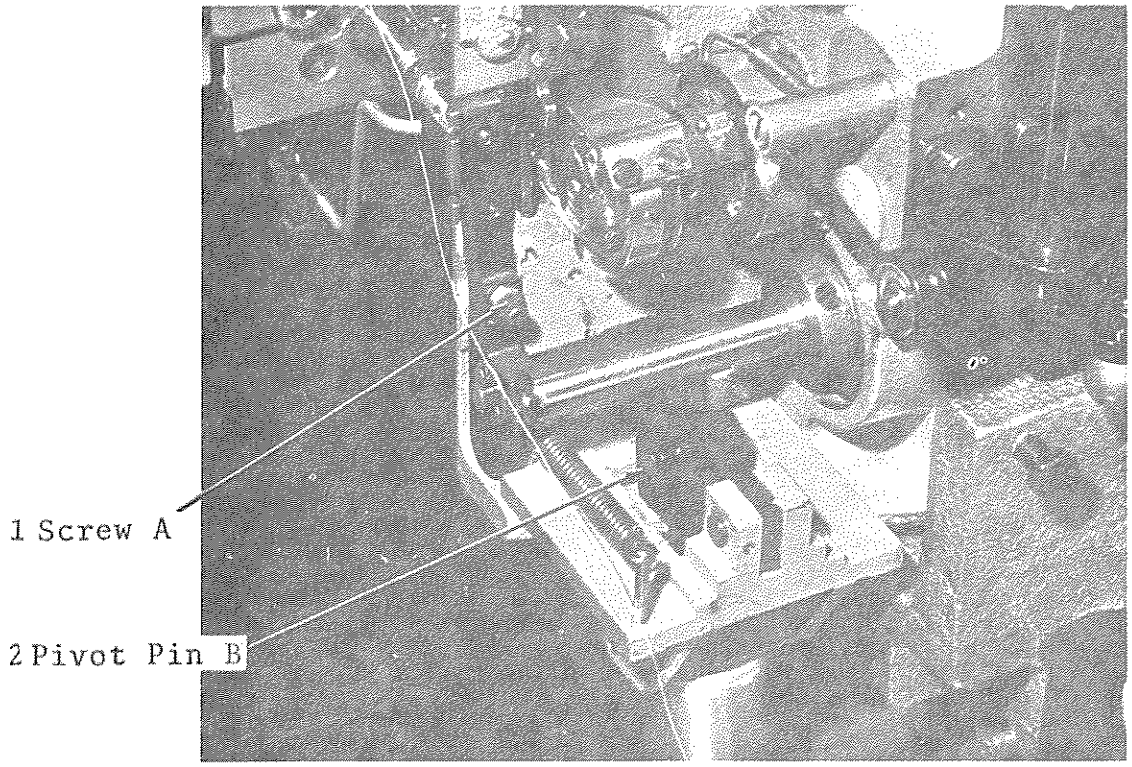


Figure 14.5 Left End of Sewing Head - Cover Lifted

LEGEND FOR FIGURE 14.6

REF. NO.	DESCRIPTION	PART NO.
1	Adjusting Screw	
2	Pivot Pin B	PL-6647P
3	Positioning Lug	PF91-171851-15
4	Catcher	PF91-175540-05
5	Complete Hook Assembly	PF91-171820-91
6	Toggle Cylinder	XF412A41
7	Extension Spring	XM110E25
8	Throat Link	AJS-408+
9	Throat Link E Ring	TCF-496
10	Lower Toggle Link	AJS-216
11	Upper Toggle Link	AJS-214+



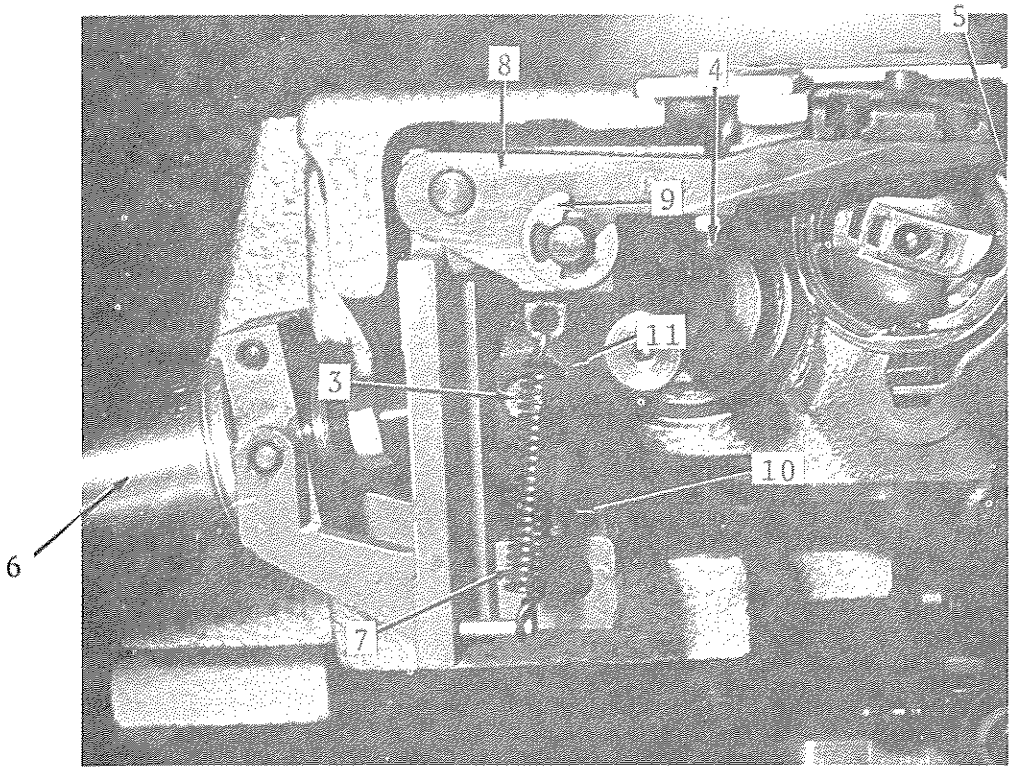
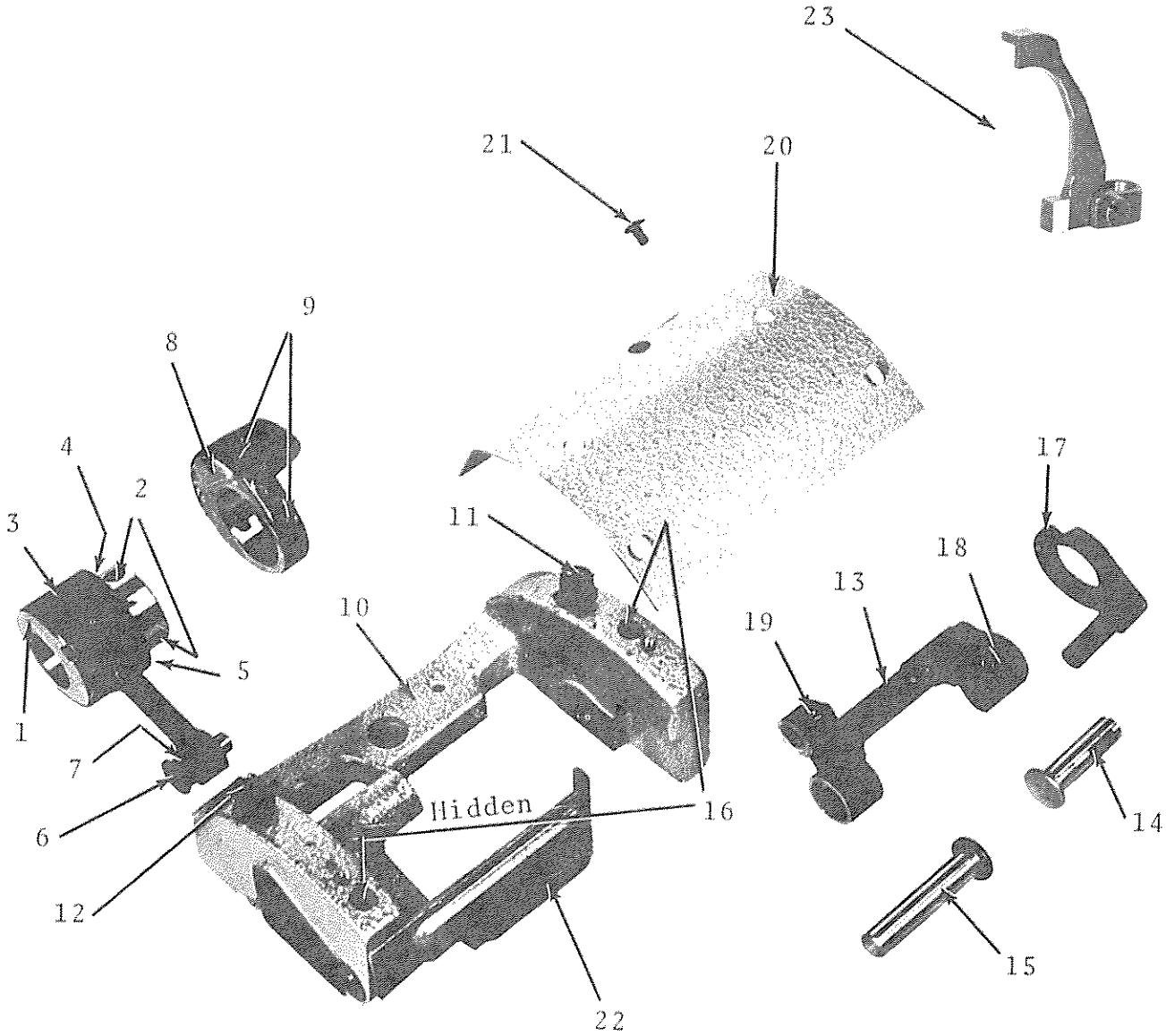


Figure 14.6 Movable Throat Plate - Underneath

LEGEND FOR FIGURE 14.8

REF. NO.	DESCRIPTION	PART NO.
1	*Eccentric Cam	PF91-069444-92
2	Eccentric Cam Screw	PF91-700785-15
3	*Crank	PF91-069475-15
4	*Crank Bearing (Inside)	PF14-215304-03
5	*Crank Bearing Seal Ring (Inside)	PF91-069476-05
6	*Stud	PF91-069468-15
7	*Stud Bearing	PF14-215013-03
8	Collar	PF91-169301-12
9	Collar Screw	PF11-330220-15
	Complete Set of Above Parts	PF91-069473-91
	*These parts not furnished separately.	
10	Bearing Bracket	PF91-169468-92
11	Bearing Bracket Screw (Right)	PF11-108231-15
12	Bearing Bracket Screw (Left)	PF11-108237-15
13	Driving Lever	PF91-069577-91
14	Driving Lever Stud (Right)	PF91-069483-04
15	Driving Lever Stud (Left)	PF91-069484-04
16	Bearing Stud Binding Screw (2) (Inside)	PF11-314220-15
17	Stop Cam	PF91-171841-11
18	Stop Cam Binding Screw	PF11-108177-15
19	Bearing Stud Binding Screw	PF11-108174-15
20	Bracket Arm Cover	PF91-069518-45
21	Bracket Arm Cover Screw (4)	PF91-700335-35
22	Oil Catch Pan	PF91-171631-91
23	Presser Bar Clamp	PF91-171848-05
24	Clamp Screw	PF11-108234-15

High Lift Parts Are Shown in Figure 14.9



14.8 Reciprocrating Presser Foot - Regular Lift

LEGEND FOR FIGURE 14.9

High Lift Parts Shown

REF. NO.	DESCRIPTION	PART NO.
1	Bearing Bracket	PF91-169468-92
2	Eccentric Arm Link	AJS-293
3	Eccentric Arm Bearing	PF14-215013-13
4	Spacer	AJS-290
5	Spacer Link Pin	AJS-294
6	Spacer Link	AJS-295
7	Presser Foot Lift Lever	AJS-291
8	Bearing Stud Binding Screw	PF11-108174-15
9	Eccentric Arm Pin	AJS-296
10	Driving Lever	PF91-069577-91
11	Spacer Mtg. Screw (2) Hidden	ACS-278

Regular Lift Parts Are Shown in Figure 14.8.

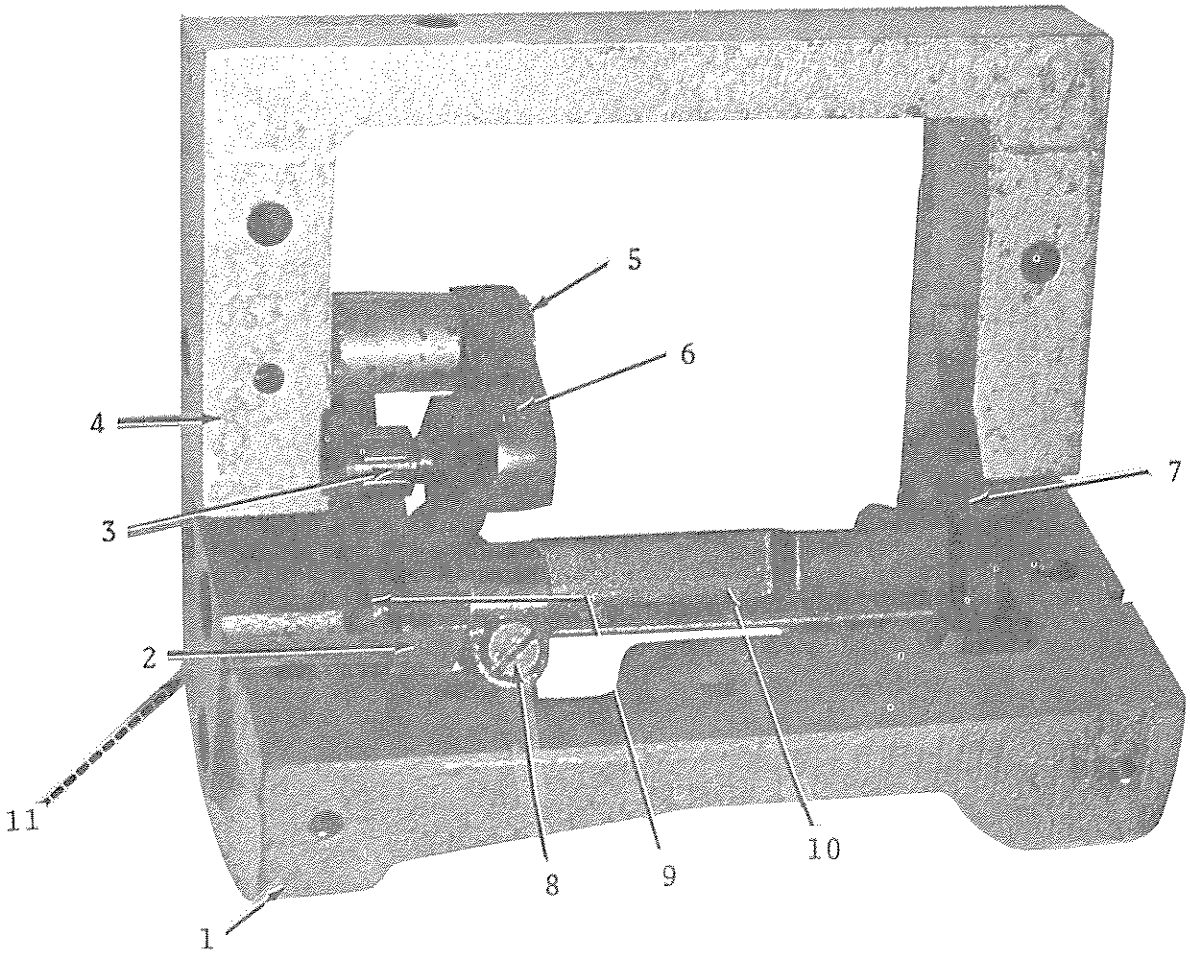


Figure 14.9 Reciprocating Presser Foot - High Lift

LEGEND FOR FIGURE 14.10

REF. NO.	DESCRIPTION	PART NO.
1	Thread Tension Release Wire.....	PF91-174059-05
2	Thread Tension Release Screw & Clevis.....	PF91-174066-12
3	Shaft (L.H. & R.H. Ends) - for adjustment of thread catcher.....	PF91-174067-15
4	Thread Cut Pneumatic Cylinder (65).....	AJS-1274
5	See note below.	
6	Catcher Return Speed Flow Control Valve (46)....	XF995B2

Also see Fig. 14.43.

Note for Ref. No. 5: The flow control valve has been eliminated.

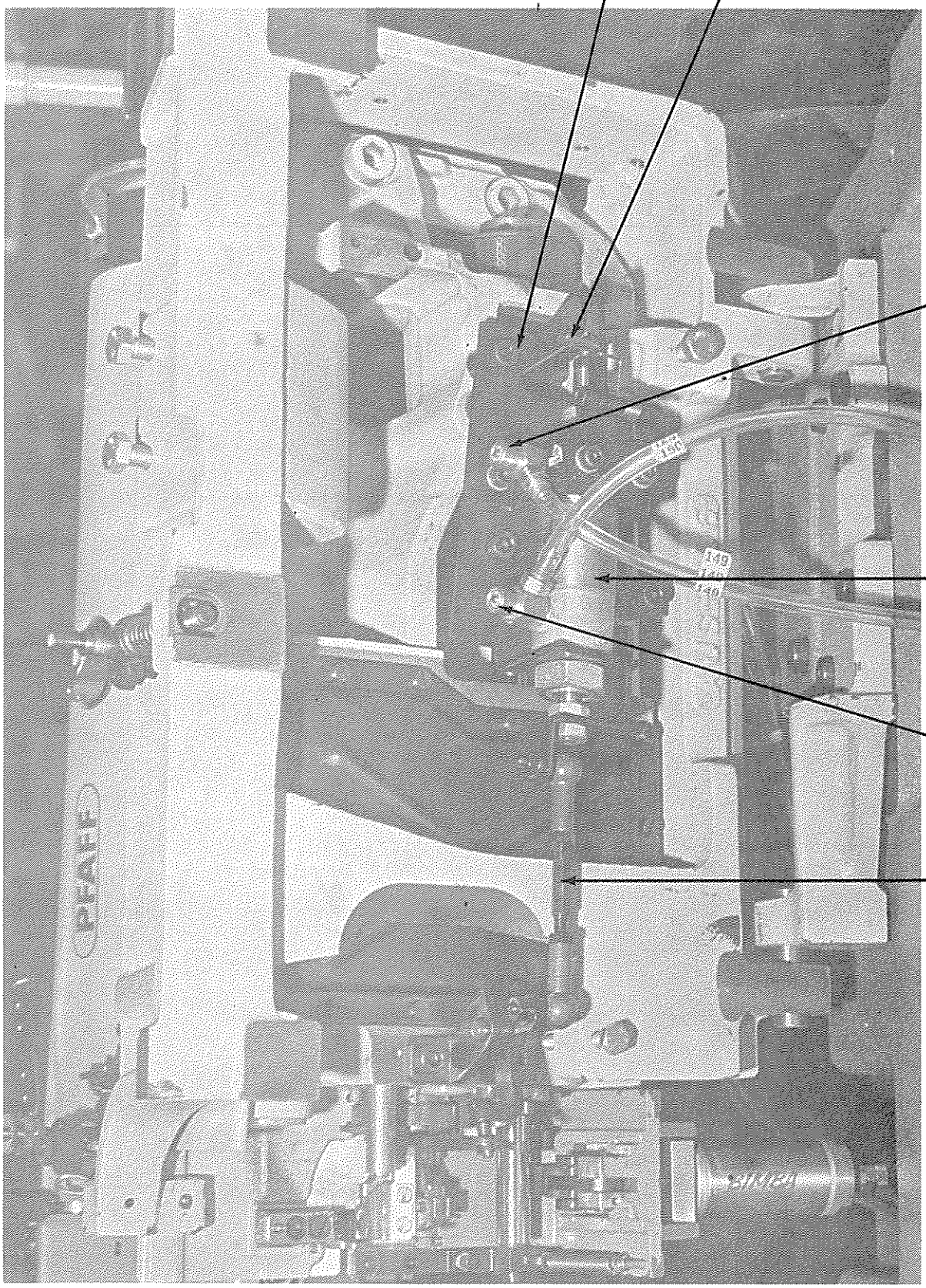


Figure 14.10 Sewing Machine - Bottom View

LEGEND FOR FIGURE 14.12

REF. NO.	DESCRIPTION	PART NO.
1	Solenoid No. 1 Presser Foot	XF791B502
2	Solenoid No. 2 Pallet Clamp	XF789A502
3	Solenoid No. 3 Unloading Shelf	XF789A502
4	Solenoid No. 4 Needle Cooling	XF789A502
5	Solenoids P.C. Board	MPCS-860B87
6	Solenoid No. 6 R.H. Loading Shelf	XF789A502
7	Solenoid No. 7 L.H. Loading Shelf	XF789A502
8	Solenoid No. 11 Thread Cut	XF792B501
9	Muffler (1/8" NPT) in all Exhaust Ports *	XF719A1
10	Flow Control Valve (48)	XF995B2
11	Needle Valve (53)	XF995A2
12	W17 Valve Power Cable	MPCS-528
13	W6 Valve Logic Cable	MPCS-518

WHEN ORDERING PRINTED CIRCUIT BOARDS, USE THE COMPLETE PART NUMBER, INCLUDING THE DASH PART. SEE THE BOARD ON THE MACHINE.

* Except Needle Cooling valve (4).

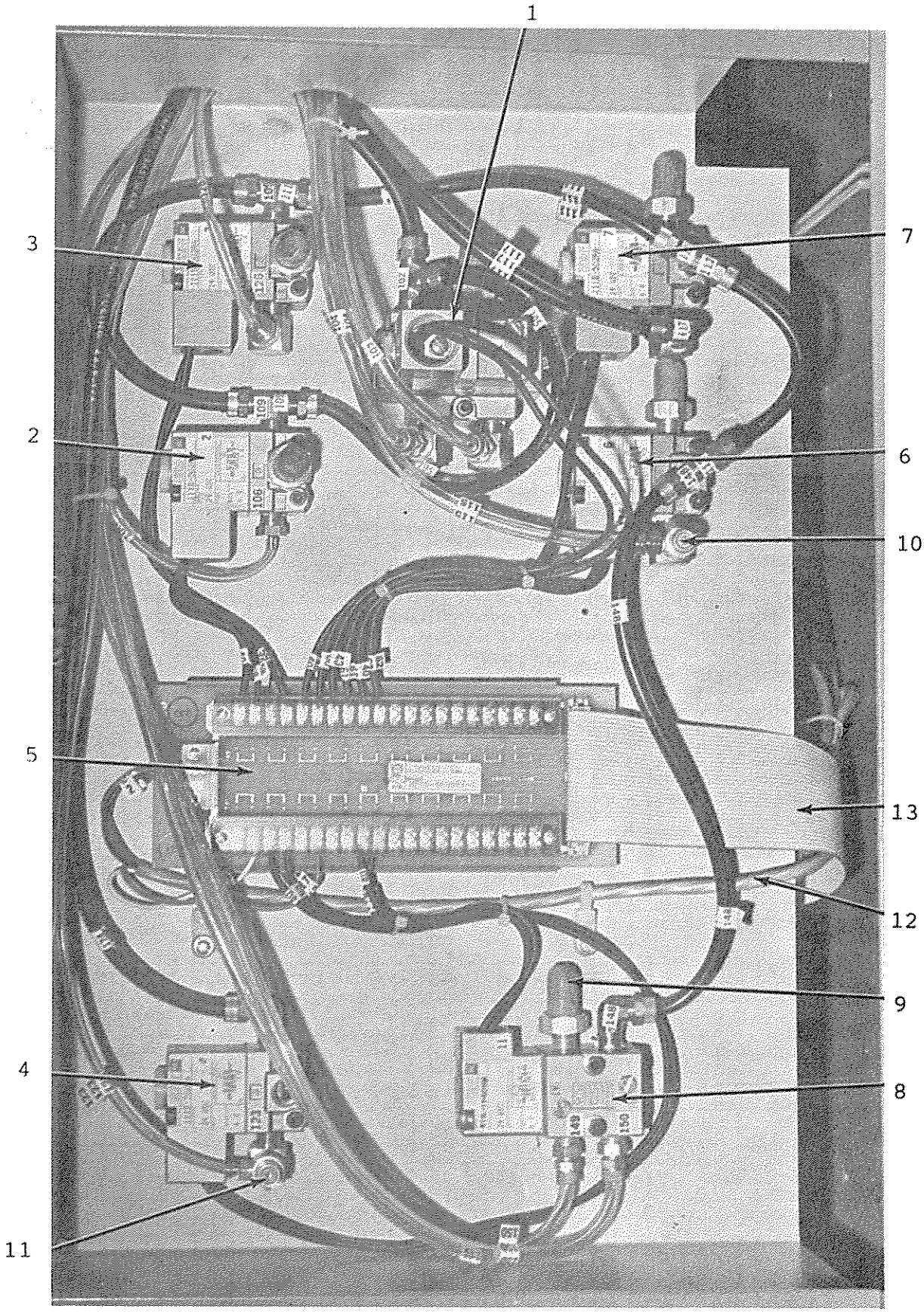


Figure 14.12 Air Solenoid Valves - Cover Removed

LEGEND FOR FIGURE 14.21

REF. NO.	DESCRIPTION	PART NO.
1	Capacitor, 5500MF (C1)	XE833D552
	Clamp	XE838A2
	Bleeder Resistor, 510 ohms (R1)	ED-14480-1
2	Capacitor, 34000MF (C2, C3)	XE833J343
	Clamp	XE838A7
	Bleeder Resistor, 510 ohms (R2, R3)	ED-14480-1
3	Bridge Rectifier (CR1, CR2)	XE882H1
4	Contactor, Main (K1)	ED-11011
5	Relay, 8 pin plug-in (K2, K3, K5)	ED-14834
6	Relay, 11 pin plug-in(K4)	XE602B11
7	Contactor, Stitcher Drive (K6)	XE599A4
8	Power Supply, DC Regulated	XE641F6
9	Line Filter	XE840B1
10	Switches Distribution PC Board	VCD-860N25
11	Fuse, 4A (F3)	XE409A9
12	Fuse, 3A (F4, F5)	XE401A8
13	Fuse, 2A (F6)	ED-15004
14	Circuit Breaker Panel	MPCS-453
15	Circuit Breaker, X Axis, 20A (CB1)	XE753E6
16	Circuit Breaker, Y Axis, 10A (CB2)	XE753E5
17	Circuit Breaker, Stitcher Drive, 15A (CB3)	XE753F6
18	Circuit Breaker, Main Control, 3A (CB4)	XE753F5
19	Circuit Breaker, Aux. Outlet, 3A (CB5)	XE753F5
20	Ground Connector (E2)	XE163B8
21	Terminal Block (TB1)	ED-2679
22	Circuit Breaker, Main Power, (CB6)	
	15A - Domestic Service	XE753G106
	7.5A - Foreign Service	XE753G103

Also see Figs. 11.3 & 13.1, Sheet 1.

When ordering PC boards, use the complete part number, including the dash part. See the board on the machine.

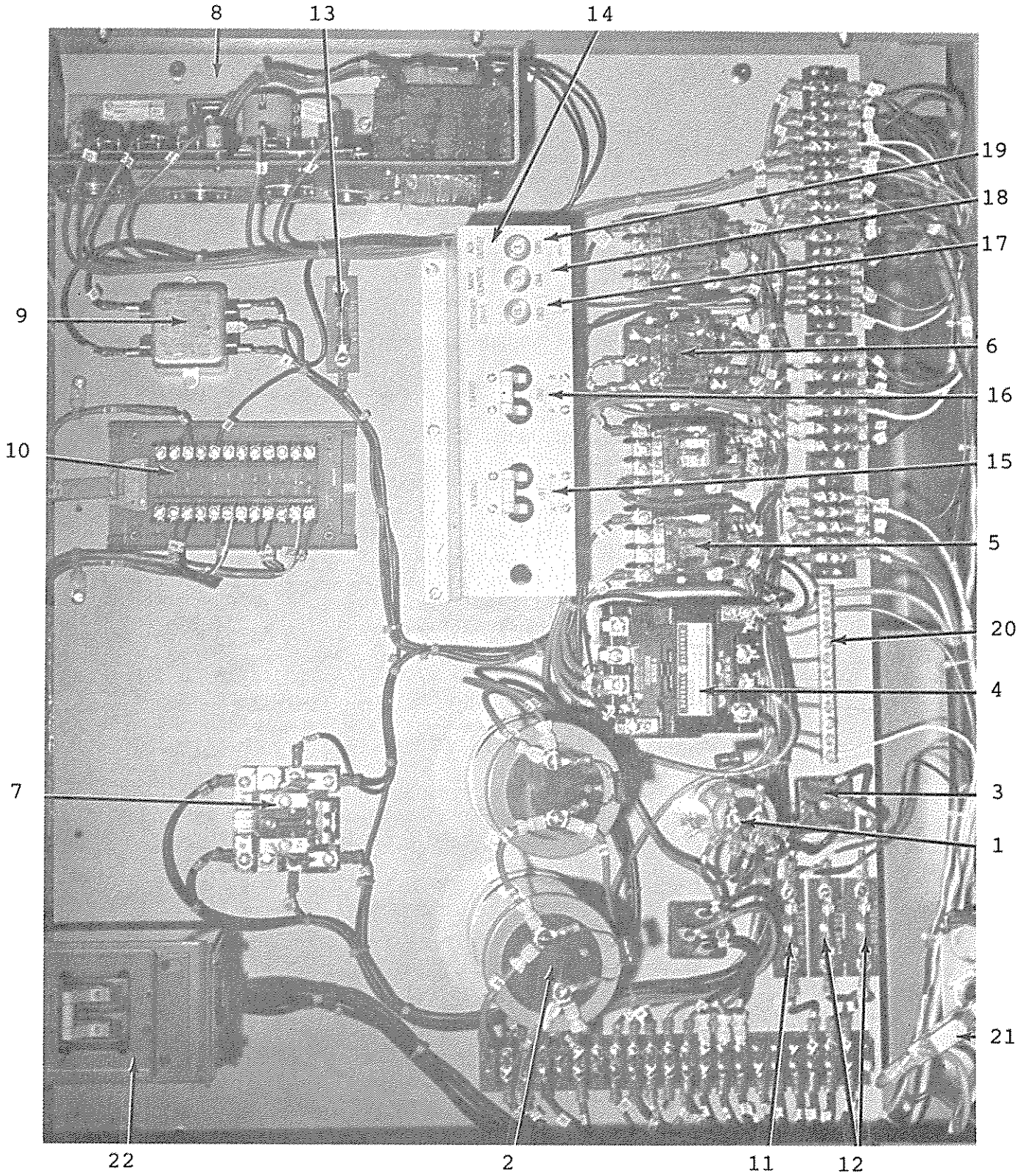


Figure 14.21 Power Panel - Rear Door Open

LEGEND FOR FIGURE 14.23

REF. NO.	DESCRIPTION	PART NO.
1	Digital Controller P.C. Board	MPCS-860B86
2	PROM Card Interface P.C. Board	MPCS-860B84
3	B84 Bracket Screw (#6-32x¼")	SL-9A7
4	W1 - Keyboard Cable	MPCS-515
5	W35 - B86 to W36 Cable	MPCS-550
6	W36 - Sewing Machine Drive Cable	MPCS-551
7	W3 - Bobbin Monitor Cable	MPCS-516
8	W5 - Pallet Sensors Cable**	MPCS-517
9	Optical Couplers (Pallet Sensor Interface) P.C. Board**	MPCS-860B99
10	W5A Pallet Sensor Interface Cable	MPCS-556
11	W6 - Valve Logic Cable	MPCS-518
12	W7 - Switch Distribution Board Cable	MPCS-519
13	W9 - B86 Power Cable	MPCS-520
14	(other B86 connection for W9) - hidden	
15	W10 - X Axis Power Cable	MPCS-521
16	W11 - Y Axis Power Cable	MPCS-522
17	W12 - X Axis Encoder Cable	MPCS-523
18	W13 - Y Axis Encoder Cable	MPCS-524
19	W14 - PROM Card Interface Cable	MPCS-525
20	X Axis Network Compensation Header	AJS-743
21	Y Axis Network Compensation Header	AJS-742
22	EEPROM	XE870L21
23	EPROM Set (Operating System) 4 EPROMs	MPCS-185 *
24	Digital Controller Board Panel	MPCS-344
25	PROM Card Interface P.C. Board - hidden	MPCS-860B85

When ordering P.C. boards, the complete part number, including the dash number, must be used. Number should be verified by examination of the boards in the machine. Include any "REV" letter.

The dash number for the B86 board and the suffix number for the MPCS-185 EPROM set are the same.

Also see Fig. 11.4.

* Add the specific software version number suffix.

** Adjacent at the left.

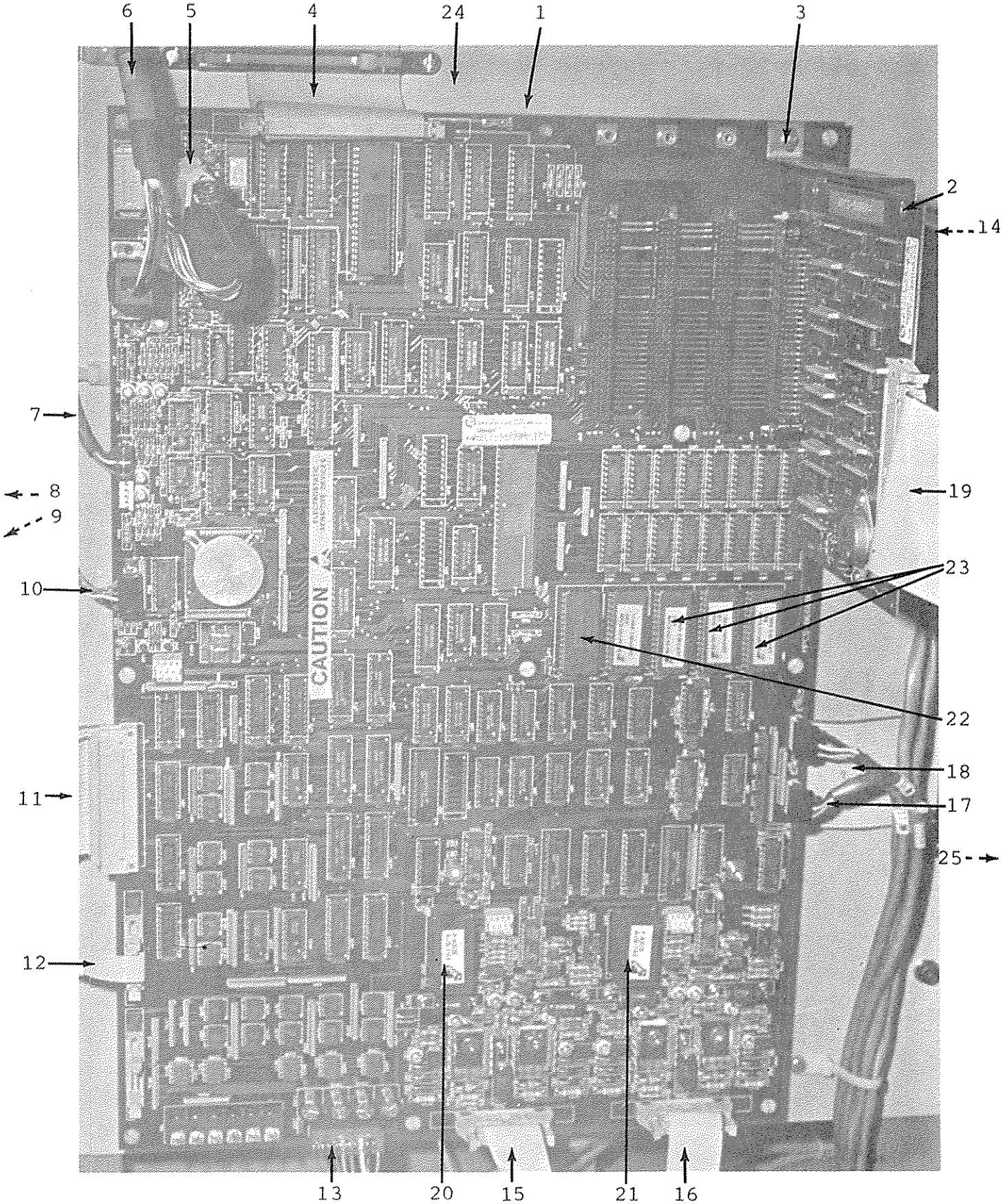


Figure 14.23 Electronic Panel - Front Door Open

LEGEND FOR FIGURE 14.27

REF. NO.	DESCRIPTION	PART NO.
1	Servo Driver Heat Sink - Complete	MPCS-368
2	Heat Sink	AJS-426
3	Servo Power P.C. Board (This is not shipped separately. Order MPCS-368.)	XE860B52
4	Q1, Q2, Q3 Transistor (ref.)	
5	Q4, Q5, Q6 Transistor (ref.)	
6	*Heat Sink Air Baffle	MPCS-423
7	W26 - Y Axis Motor Cable	MPCS-537
8	W27 - Rear X Axis Motor Cable	MPCS-538
9	W28 - Front X Axis Motor Cable	MPCS-539
10	W10 - X Axis Cable to B86	MPCS-521
11	Fan	XE981B3
12	Fan Guard	XE981M10
13	Fan Filter (on outside)	ACS-435

* Attaches to four standoffs.

Also see Fig. 13.1.

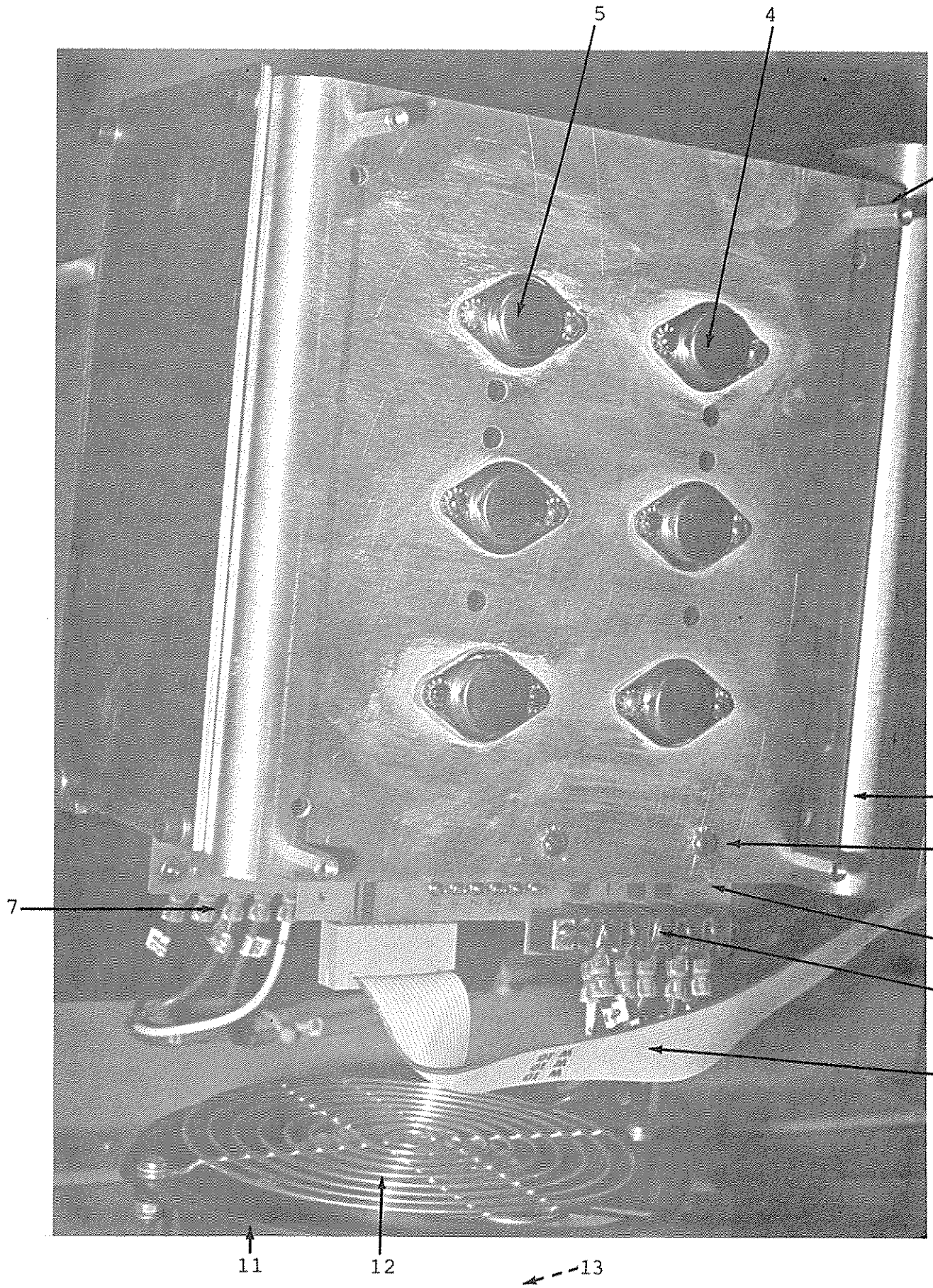


Figure 14.27 Servo Heat Sink, Power Transistors, Fan – Cover & Front Baffle Removed

LEGEND FOR FIGURE 14.29

REF. NO.	DESCRIPTION	PART NO.
1	Motor/Clutch/Brake Control Drive	MPCS-407
2	Pulley, 60 Hz	MPCS-408
	Pulley, 50 Hz	MPCS-409
3	Stitcher Motor Bracket	MPCS-386
4	Bracket Screw	MH200C275
5	R1 Potentiometer (2500 spm adjustment)	
6	R22 Potentiometer (680 spm adjustment hidden*	
7	C1 Potentiometer (180 spm adjustment) hidden**	
8	F1 Fuse (10A) (at left end)	XE409C14
9	F2 Fuse (3A) (at left end)	XE401A8
10	W36 Cable (Program Box Jack to B86 Board)	MPCS-551
11	W38 Cable (Synchronizer Jack to Needle Positioner)	Part of MPCS-407***
12	Drive Belt	MPCS-427
13	W57 Cable (Power panel to sewing machine drive motor)	MPCS-557
14	Pneumatic Enclosure	AJS-1565

* Part of B93 board (hidden)
** Part of B96 board (hidden) in Fig. 11.2
*** In some cases, this vendor-supply cable may require a W51 cable extension MPCS-549.

Also see Fig. 11.2.

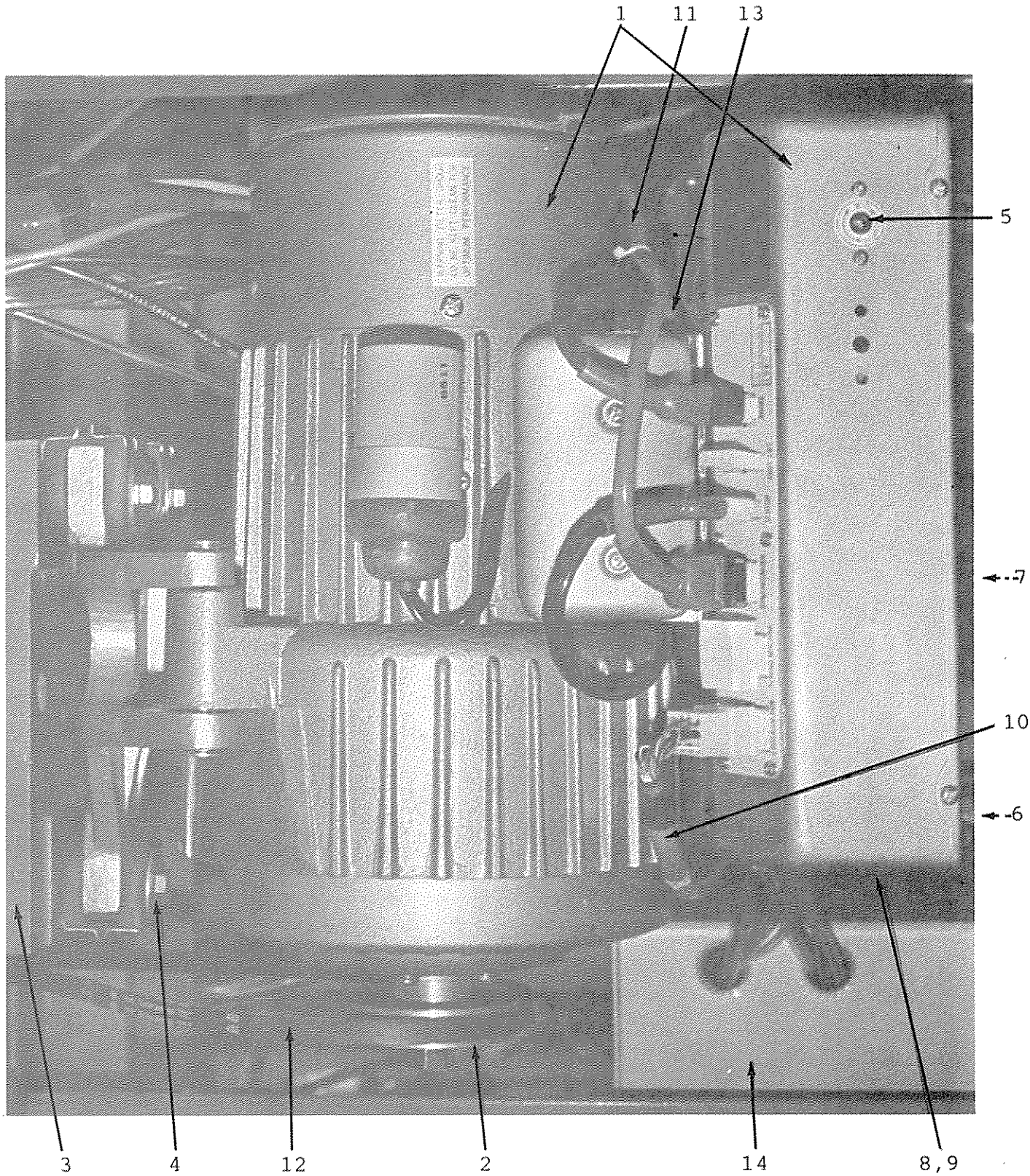


Figure 14.29 Sewing Machine Drive - Cover Removed

LEGEND FOR FIGURE 14.37

REF. NO.	DESCRIPTION	PART NO.
	Later machines substitute the parts listed at the bottom.	
1	Pallet Sensor Support Bracket (hidden)	AJS-1217
2	Pallet Sensor Support	AJS-1218
3	Pallet Sensor Mounting Plate	AJS-1236
4	Pallet Sensor P.C. Board (3 sensors) (hidden behind it)	AJS-860B88-2
5	P.C. Board Cover	MPCS-352
6	Plate Adjusting Screw	MH201A67
7	Righthand Loading Shelf	AJS-1220
8	Righthand Loading Support (assembled)	AJS-1216+
9	Righthand Loading Support Bracket	MPCS-341
10	Righthand Loading Shelf Cover (removed)	AJS-1573
11	Righthand Pallet Ejection Chute	AJS-1221
12	Shock Absorber Bracket	AJS-1233
13	Shock Absorber	XF470F4
14	Holddown Screw (2)	AJS-1268
15	Chute-Support Bracket - RH	MPCS-342
16	Snapslide Fastener (part of 15)	XM402A4
17	Pallet Slide - RH	AJS-1225
18	Right Shelf Down Flow Control Valve (49)	XF995B2

When ordering P.C. boards, the complete part number, including the dash number, must be used. Numbers should be verified by examination of the boards in the machine. Include any "REV" number.

Later machines (redesign) - substitutes for 1, 2, 3, 5, 8, 9 and 14

	Pallet Sensor Support Bracket	MPCS-470
	Pallet Stop	MPCS-472
*	Pallet Sensor Backup Plate	MPCS-471
**	Pallet Sensor Mounting Plate	MPCS-481
	P.C. Board Cover	MPCS-482
	Righthand Loading Support (assembled)	MPCS-484+
	Righthand Loading Support Bracket	MPCS-483

(The special holddown screws are eliminated, since the righthand loading shelf parts no longer need to be rotated outward for access to the head.)

* For left/right sensors adjustment.
** For up/down sensors adjustment.

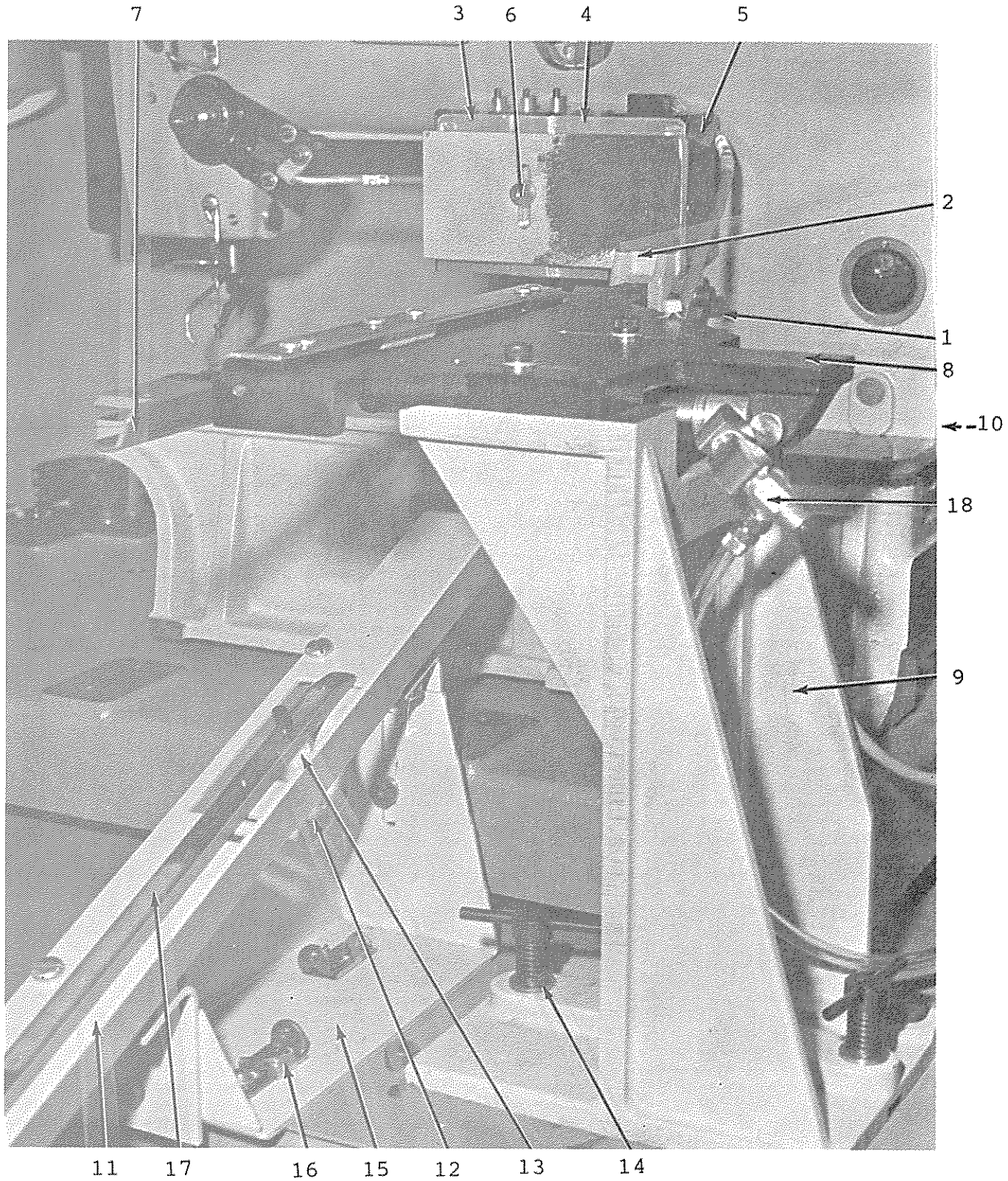


Figure 14.37 Pallet Sensor/Stop/Right Pallet Shelf/jection Parts

LEGEND FOR FIGURE 14.41

REF NO.	DESCRIPTION	PART NO.
1	Lefthand Loading Shelf	AJS-1231
2	Lefthand Loading Support (assembled)	AJS-1229+
3	Shelf Switch Bracket	MPCS-377
4	Switch Bracket Support	MPCS-378
5	Shelf Signal Switch (S6)	XE347A2
6	Front Pallet Support	AJS-128A+
7	Link, Unloading Lever	AJS-1197
8	E-ring, Link Retaining	STA-83
9	Pallet Clamp Lever	AJS-123+
10	Unloading Cylinder (30)	XF409D1
11	Lefthand Pallet Ejection Chute	AJS-1244
12	Ejection Switch (S8)	XE371E2
13	Chute-Support Bracket - LH	MPCS-353
14	Chute Extension (with rubber bumper)	AJS-1248

Also see Fig. 8.13

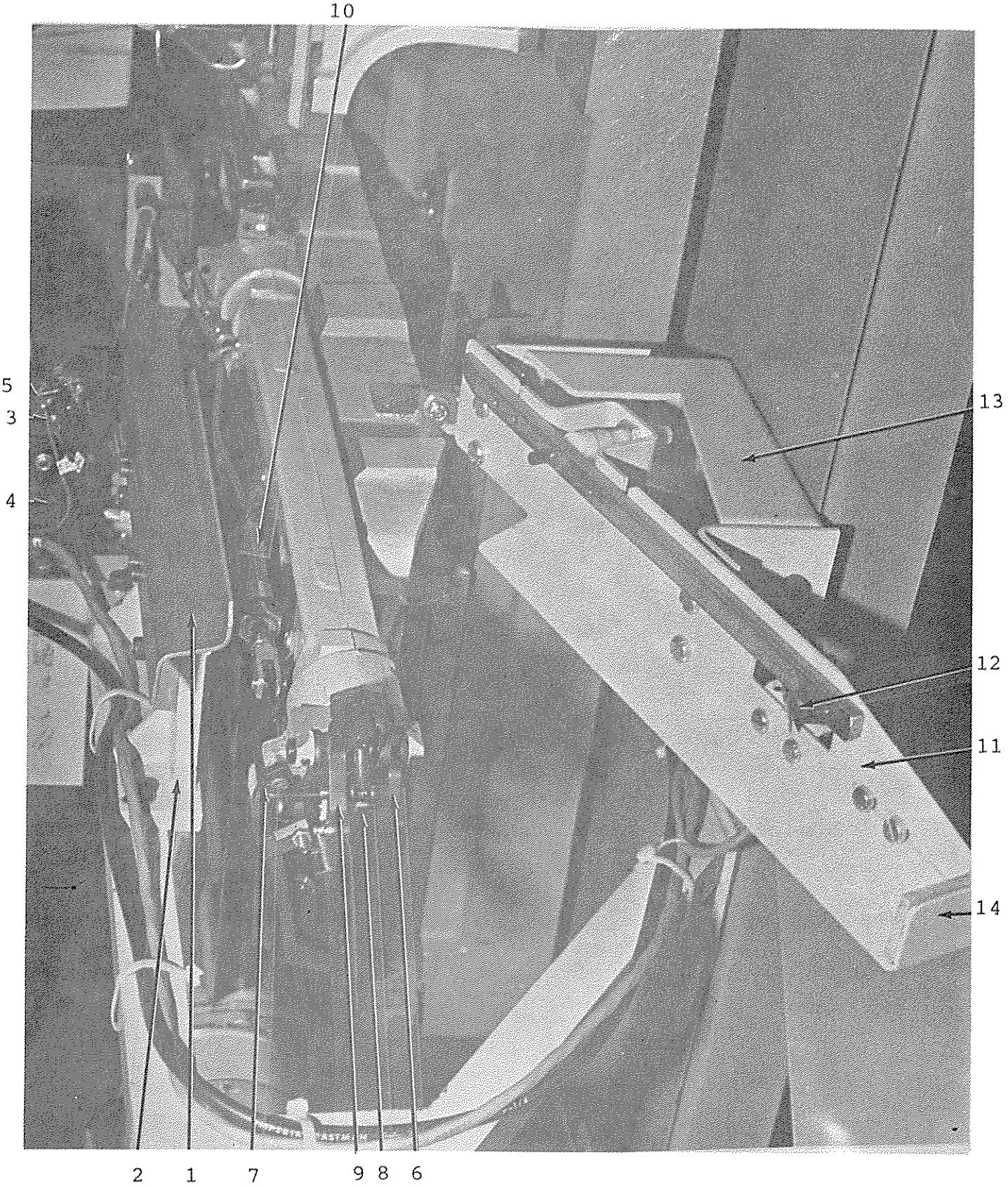


Figure 14.41 Left Pallet Shelf/Unloading/Ejection Parts

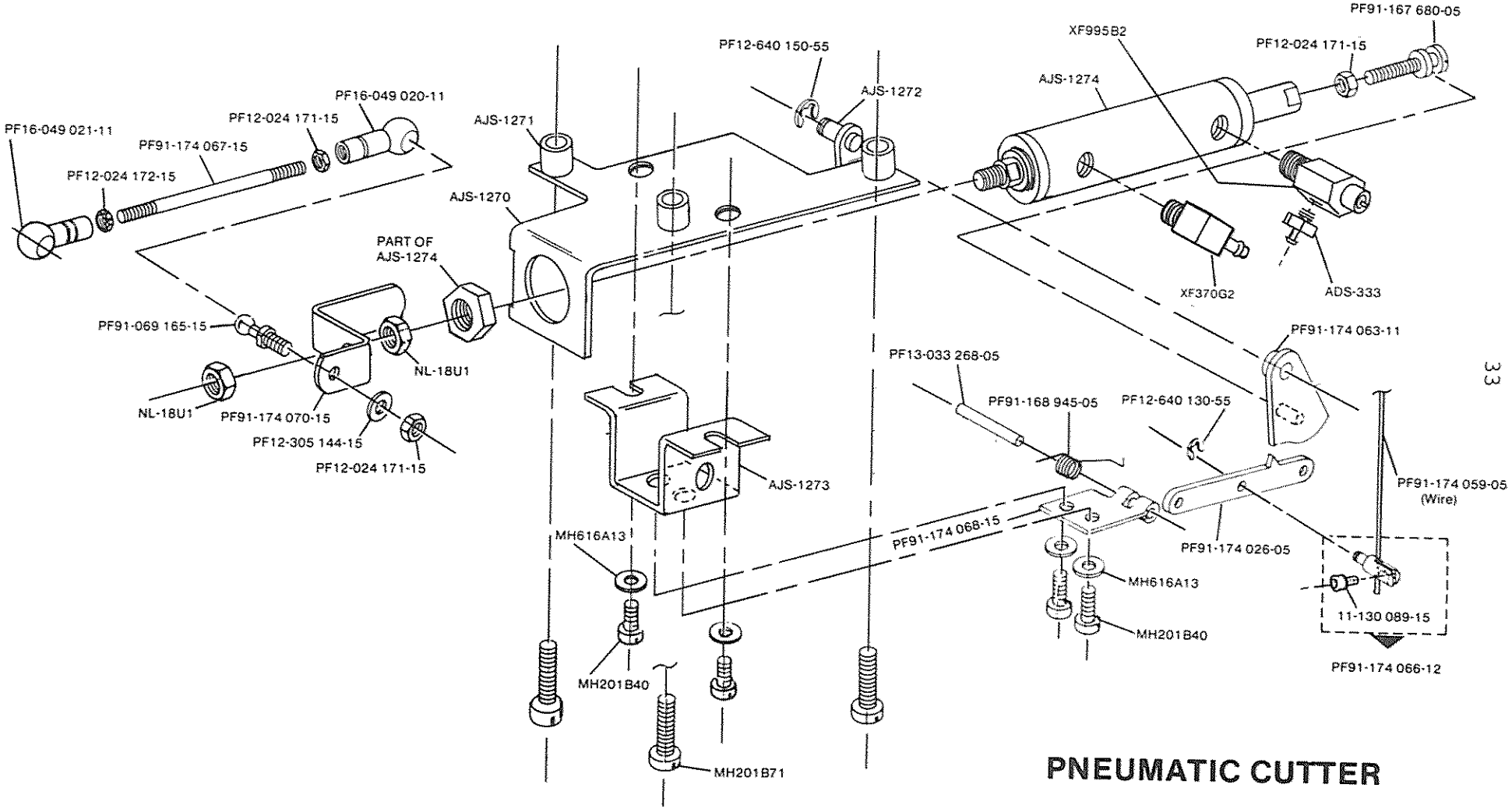

PF16-049 021-11
PF91-174 067-15
PF12-024 172-15
PF12-024 171-15
PF16-049 020-11
AJS-1271
PF12-640 150-55
AJS-1272
AJS-1270
PART OF AJS-1274
PF91-069 165-15
NL-18U1
NL-18U1
PF91-174 070-15
PF12-305 144-15
PF12-024 171-15
AJS-1273
MH616A13
MH201B40
MH201B71
PF91-174 068-15
PF13-033 268-05
PF91-168 945-05
PF12-640 130-55
PF91-174 063-11
PF91-174 026-05
MH616A13
MH201B40
PF91-174 059-05 (Wire)
11-130 089-15
PF91-174 066-12
AJS-1274
XF995B2
PF12-024 171-15
PF91-167 680-05
XF370G2
ADS-333
PNEUMATIC CUTTER

Figure 14.43

Appendix A

USM SPECIFICATION NUMBERS AND COMMERCIAL EQUIVALENTS – OILS

If your regular source is unable to furnish lubricants to the above specifications, they may be currently obtained from the following oil companies under the trademarks indicated.

OIL

ISO Viscosity Grade	USM No.	Chevron Oil Co.	Cities Service Oil Co.	Exxon Co.	Getty Oil Co.	Gulf Oil Co.	Lubriplate (Fiske)	Master Lubricants Company	Mobil Oil Co.	Shell Oil Co.	Sun Oil Co.	Texaco Inc.
32	150B	OC Turbine Oil #32	Pacemaker 32	Teresstic 33	Aturbrio 50	Harmony 32			D.T.E. Light	Turbo 25	Sunvis 916	Rando 32
32	150BCW	EP Hydraulic Oil #32	AW Hydraulic Oil 32	Nuto H32	Aturbrio AW51	Harmony 32AW	HO-0		D.T.E. 24	Tellus 32	Sunvis 706	Rando HD32
46	225BCW	EP Hydraulic Oil #46	AW Hydraulic Oil 46	Nuto H46	Aturbrio AW59	Harmony 46AW	HO-1		D.T.E. 25	Tellus 46	Sunvis 747	Rando HD46
68	300B	OC Turbine Oil #68	Pacemaker 68	Teresstic 68	Aturbrio 60	Harmony 68	3-V		D.T.E. Heavy Medium	Turbo 33	Sunvis 931	Rando 68
68	300BCW	EP Hydraulic Oil #68	AW Hydraulic Oil 68	Nuto H68	Aturbrio AW61	Harmony 68AW	HO-2		D.T.E. 26	Tellus 68	Sunvis 754	Rando HD68
100	465MR			Enmist EP Grade 100		EP-HD100			Mobil Mist Lube 27	Omala 100		Texamist 100
	X100CP	Universal Gear Lubricant 80W-90	Premium Gear Oil 80W-90	Gear Oil GX85W-90	Multi-Gear B, 80/90	Multi-purpose Gear Lube 80W-90	APG90	SAE90EP	Mobilube HD 80W-90	Spirax HD 85W-90	Gear Oil GL-5 90	EP85W-90
460 (AGMA 7 COMP.)	X150C		Cylinder Oil 460-5	Cylesstic TK460	Atwater 83	Senate 460			Cylinder Oil 600W		Occident Cylinder Oil	Vanguard Cylinder Oil

GREASE

NLGI No.												
2	300SL36	Polyurea EP2	Cifgo HEP-2	Lidok EP2	Alithex 20	Gulf Crown EP2	630-2	L-206EP	Mobilux EP2	Alvania EP2	Prestige 742EP	Multifak EP2
1	650M32	Polyurea EP1	Cifgo HEP-1	Lidok EP1	Alithex 10	Gulf Crown EP1		L-203EP	Mobilux EP1	Alvania EP1	Prestige 741EP	Multifak EP1
1	750L32			Estan 1	Alastac 10						Sun C-891-T	Novatex 1

NOTE: Page II For Special Purpose Lubricants.

SPECIAL-PURPOSE OILS

USM SPEC. NO.	APPROVED COMMERCIAL EQUIVALENT	SOURCE
*66BR	Velocite Oil #6	Mobil Oil Corporation
100BR	Tellus 22	Shell Oil Company
100CKR	Air Lube 10H/NR	Non-Fluid Oil Corporation
850CPR	Roberts Gear Oil 223-SAE 90	Andrew Roberts, Inc.
950CPR	Vactra #4	Mobil Oil Corporation
1500AAR	A-79/EPV	Non-Fluid Oil Corporation
X120CPR	Mobilgear 632 (AGMA 6 EP)	Mobil Oil Corporation

*XF850A1 (USM Part No.) 40cc Tube of USM 66BR Oil

SPECIAL-PURPOSE GREASES

USM SPEC. NO.	APPROVED COMMERCIAL EQUIVALENT	SOURCE
1NT8R	Mobiltemp No. 1	Mobil Oil Corporation
2GPT8R	Molykote G-n Paste	Dow Corning Corporation
2NT6R	Aeroshell No. 5	Shell Oil Company
20MR	Rheolube 728H	William F. Nye, Inc.

APPENDIX E

MPCS-A

Carriage (X-Y Positioner) Alignment

Instructions

It is expected that these instructions will be used infrequently in the field. However, there are instances when either customer or USM personnel will need to use one or more of the listed sections to check alignment or replace a critical component.

1. "X" and "Y" Axes Servo Gear Motor & Housing (AJS-318 & AJS-319)

NOTE

If these assemblies, or portions thereof, or if the "X" racks are replaced, the "X-Y" axis alignment procedures of Par. 16 must be repeated. Also, the factory calibration must be repeated prior to operating.

1.1 Lubrication

Cover the flanks of the servo pinion and mating gear teeth with a generous portion of USM300SL36 grease.

1.2 Backlash

The backlash is minimized by biasing the servo motor and pinion towards the mating gear while tightening the adapter screws. Do not apply a high biasing load which could bend the motor shaft. Just apply enough load to remove the backlash.

2. "Y" Housing (AJS-117+)

2.1 Attach rack (AJS-132) to the "Y" housing (AJS-117+).

2.2 Ball Bushing Fit

2.2.1 Assemble ball bushing (XM651B3) inside oil-soaked felts (ACS-132), sleeves (AFS-385), and anti-rotation pins (PL-5959P) into the "Y" housing. Outside oil-soaked felts and end caps (AJS0-119+, AJS-643+) are to be added after the bushings have been preloaded.

2.2.2 Attach the guide rod (AJS-110) to the "X-Y" carrier (AJS-109).

2.2.3 Carefully mount the "Y" housing onto the guide rod.

2.2.4 Apply Loctite 222 to one of the sleeve adjusting screws (MH400C57) and thread into housing until the screw touches the sleeve. Move the "Y" housing to disengage the other bushing from the guide rod. Keep the housing in line with the rod as much as possible when only one bushing is engaged. Rotate the housing, which should be quite free without any preload, by hand while threading the above screw. Stop threading the screw when resistance from rotation is felt through the housing. The resistance indicates bearing preload. Carefully withdraw the screw until the harsh resistance disappears. A small amount of drag should still be felt.

2.2.5 Repeat 2.2.2 through 2.2.4 for the other bushing.

2.2.6 Engage both bearings to the guide rod. Insert the outside oil-soaked felts and attach the end caps. Move the housing back and forth several times to ensure that there are no interferences and to seat the felts.

2.3 Attach the servo motor (AJS-747) and gear housing (AJS-319) assembly to the carrier.

2.4 Attach and adjust the position of the backup roll such that a slight drag can be felt when the roll is rotated by hand while holding the rack stationary.

Check the backlash at several positions of the rack. There should be little to no backlash along the entire working length of the rack.

3. "X-Y" Carrier

The "X-Y" carrier has eight horizontal and two vertical cam followers that roll on two "X" axis rails (MPCS-217).

3.1 Horizontal cam followers. Three of the top rolls are the fixed type (XM542M1) and the fourth is an adjustable type containing an eccentric sleeve (XM542L1). The latter follower is located at the operator end of the carrier. (See Fig. E.1.) All of the bottom rolls are adjustable.

Tighten the fixed cam followers, but keep the adjustable ones loose. Note the access holes through the rail supports for the bottom rolls.

3.2 Vertical cam followers. There are two vertical can followers at the operator end of the carrier. (See Fig. E.1.) The roll on the inside edge of the rail is fixed, whereas the one on the outside edge (closest to operator) is adjustable.

Attach and tighten the fixed roll only. The adjustable roll will be attached when the "Y" carrier is positioned on the rails.

4. Attach the "X" axis rails (MPCS-217) to the machine base (AJS-1212).

5. Mount the "X-Y" carrier assembly onto the "X" axis guide rails. The rails should be between the top and bottom horizontal cam followers. Make sure the top adjustable follower is loose and not forcing the carrier upwards.

6. Attach the two servo motor and gear housing assemblies to the motor brackets (AJS-102A). Only one of the "X" axis servos has an encoder. See Fig. E.3 for the location of that unit. Connect the output shafts (AJS-130) of the two gear housings with the cross shaft assembly as shown in Figs. E.2 and E.3. Leave the middle collar (XM601A7) loose. (See Note under 1.)

7. Attach the adjustable vertical follower, but do not tighten fully.

8. Bring the horizontal cam followers in contact with the "X" axis rails that are under the top fixed followers. These six rolls establish the horizontal plane (three points) of the "X-Y" carrier. Carefully bring the fourth top roll into contact with the guide rail without twisting the carrier. The last bottom roll can now be brought into contact with the rail.

9. Engage the "X" axis racks with the output gear housing pinions and attach the ends of the racks to the carrier. The connections at the carrier should be loose enough to allow the racks to pivot a small amount. (See Fig. E.2.) Loosely connect the spacer (AJS-134+) to the other ends of the racks. (See Note under 1.)

10. Attach and adjust the position of the backup roll at both "X" axis gear housings. A slight drag should be felt when the roll is rotated by hand while holding the rack stationary.

11. Attach loosely the outside vertical follower to the "X-Y" carrier.

12. Position the "Y" axis of the carrier perpendicular to the "X" axis guide rails and lock the middle collar at the spacer bar. This is not the final positioning or alignment of the carrier and should be done with a minimum of effort.

13. Adjust the eccentric vertical roll such that a slight drag can be felt when the roll is rotated by hand while holding the carrier stationary.

14. Lateral alignment of sewing head to "Y" axis.

14.1 Clamp the pallet adapter (AJS-1152+). Air source required and pallet clamp mechanism must be operable.

14.2 Attach a small dial indicator to the pallet adapter with the sensor positioned onto the needle plate. The sensor should be positioned to obtain 38.1 mm (1.5") of uninterrupted "Y" motion. (See Fig. E.4.)

14.3 Adjust the tilt of the sewing head via the level screws until the slope of the needle plate is (±0.0015") over a distance of 38.1 mm (1.5").

CAUTION

Dial indicator sensor must be removed from the needle plate before tilting the sewing head for access to the level screws.

15. Height and Alignment of Pallet Supports

15.1 Position a dial indicator base to a convenient pad on the "X-Y" machine base. The pad should be in close proximity to the needle plate and the front end cap (AJS-119+).

15.2 Position the dial indicator sensor onto the needle plate and zero the dial.

15.3 Carefully shift the sensor onto the front pallet support (AJS-131). This support should be no higher than 0.1270 mm (0.005") above and not below the needle plate. The level of the support can be changed by pivoting the end cap assembly about a dowel after loosening the end cap screws.

15.4 Upon satisfying the above specifications, zero the dial with the sensor onto the front support.

15.5 Carefully shift the sensor onto the rear pallet support (AJS-643+) and adjust to within 0.0508 mm (±.002").

16. "X-Y" Axes Alignment Procedure

16.1 Parallel alignment of pallet clamps with "Y" axis guide rod.

16.1.1 Loan the calibration pallet (AJS-1157) and attach the calibration pin (ACS-483) to the needle bar.

16.1.2 Turn on machine power and air. In the menu call diagnostics test 14, "Corners".

16.1.3 Press DO which should position the pallet to be able to accept the pin into hole A (Fig. E5). When this is done, retract the pin out of hole A.

16.1.4 Press FWD to position the pallet in the "Y" direction to hole B.

16.1.5 Lower the needle bar and pin towards hole B. Alignment is acceptable when the calibration pin enters hole B without touching the edge of the hole. Unacceptable parallelism between the pallet clamps and the "Y" axis guide rod will cause the pin to hit the edges of the hole or, worse, not enter the hole at all. However, both the front and rear pallet clamps (AJS-1159) are mounted in recesses and can be moved horizontally a small smount to correct the parallelism error. If the pin enters hole B properly, go to Instruction 17. Otherwise, continue to the next step.

16.1.6 Unclamp the calibration pallet.

16.1.7 Loosen front pallet clamp screw and reposition clamp to move B position of pallet in direction opposite to interference. Tighten clamp screw.

16.1.8 Repeat Instruction 16.1 until the pin enters hole B when calibrated to hole A. Further adjustment may be obtained by repositioning the rear pallet clamp.

16.2 Final perpendicular alignment of "Y" axis guide rod to "X" axis rails.

16.2.1 Following the procedure of Par. 16.1.2 and 16.1.3, position the pallet to accept the pin into hole A. Retract pin out of hole A.

16.2.2 Press REV to position the pallet in the "X" direction to hole C.

16.2.3 Lower the needle bar and pin towards hole C. Alignment is acceptable when the calibration pin enters hole C without touching the edge of the hole. Unacceptable perpendicular alignment will cause the pin to touch the edge of the hole or, worse, not go into the hole at all. Such a condition may be corrected by adjusting the middle collar at the spacer bar. If the calibration pin enters the hole properly, go to Instruction 16.2.4. Otherwise, go to the next step.

16.2.3.1 Loosen the middle collar at the spacer bar and carefully rotate the locking collar XM601A6 in a direction to correct the dial indicator error. Retighten the middle collar and repeat Instruction 16.2.

16.2.4 Tighten the rack spacer bar and the rack screws of the "X-Y" carrier. Make sure that the racks are properly positioned on the pinions and do not touch the face of the gear housing.

16.2.5 Repeat Instruction 16.2 as a final check on alignment.

17. Position of Limit Switches

17.1 Load and clamp the calibration plate (AJS-1157) and attach the calibration pin (ACS-483) to the needle bar. Air source required and pallet clamp mechanism must be operable.

17.2 Position the pallet to accept the pin into hole A. (See Fig. E.5.)

17.3 Position the "X" limit stop bracket (AJS-107) onto the base with the stop spring (AJS-106) just touching a 4.826 mm (0.19") spacer between it and the carrier. Attach assembly to the base.

17.4 Position pallet with the pin into hole C. Attach other "X" limit stop assembly as above.

17.5 The "Y" axis limit stops have no adjustments and are attached without the use of the calibration pallet.

17.6 The "X" and "Y" limit switches are positioned in the actuated mode. Push each switch against its limit stop spring until a click is heard, then go 0.254 mm (.01") further. Fasten at this setting.

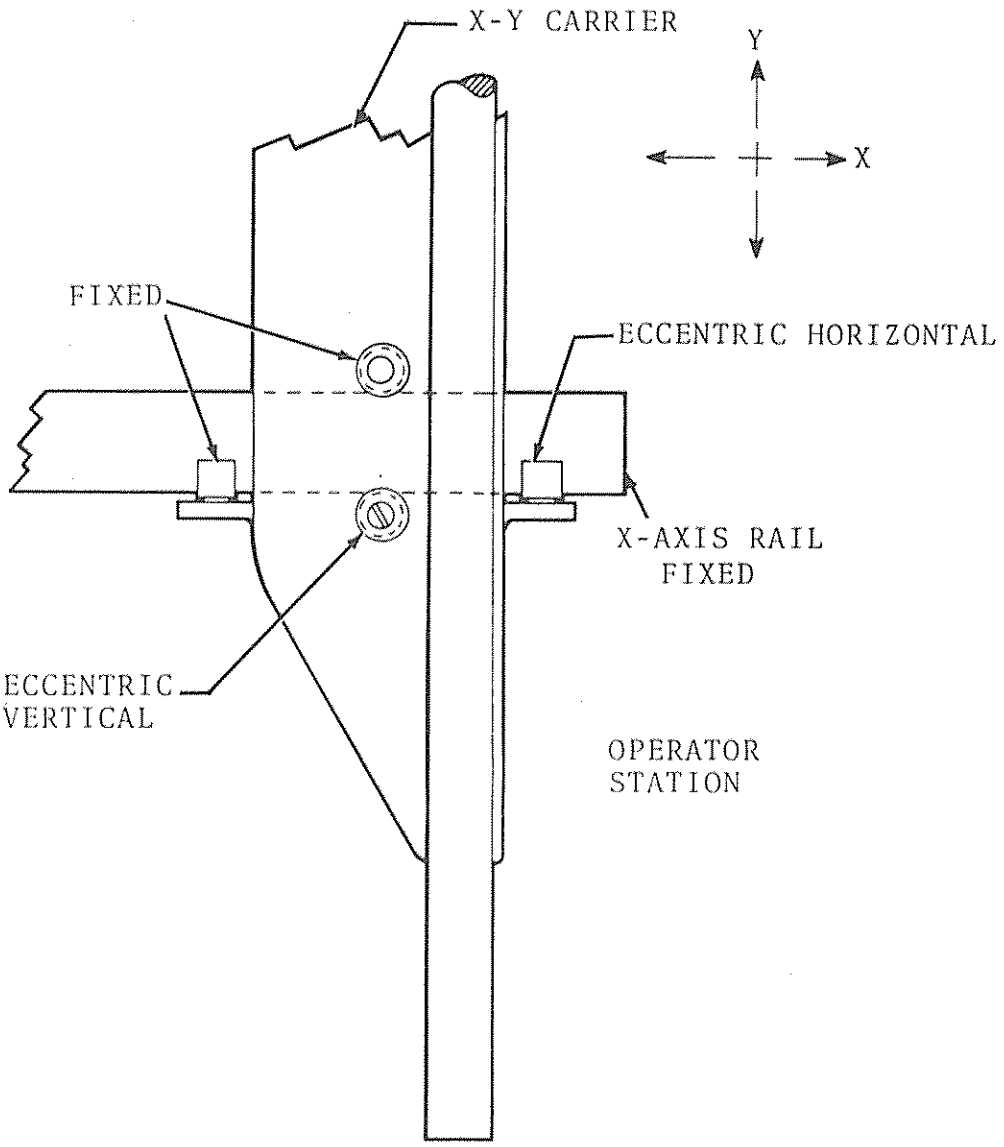

X-Y CARRIER
Y
X
FIXED
ECCENTRIC HORIZONTAL
X-AXIS RAIL
FIXED
ECCENTRIC
VERTICAL
OPERATOR
STATION

Figure E.1

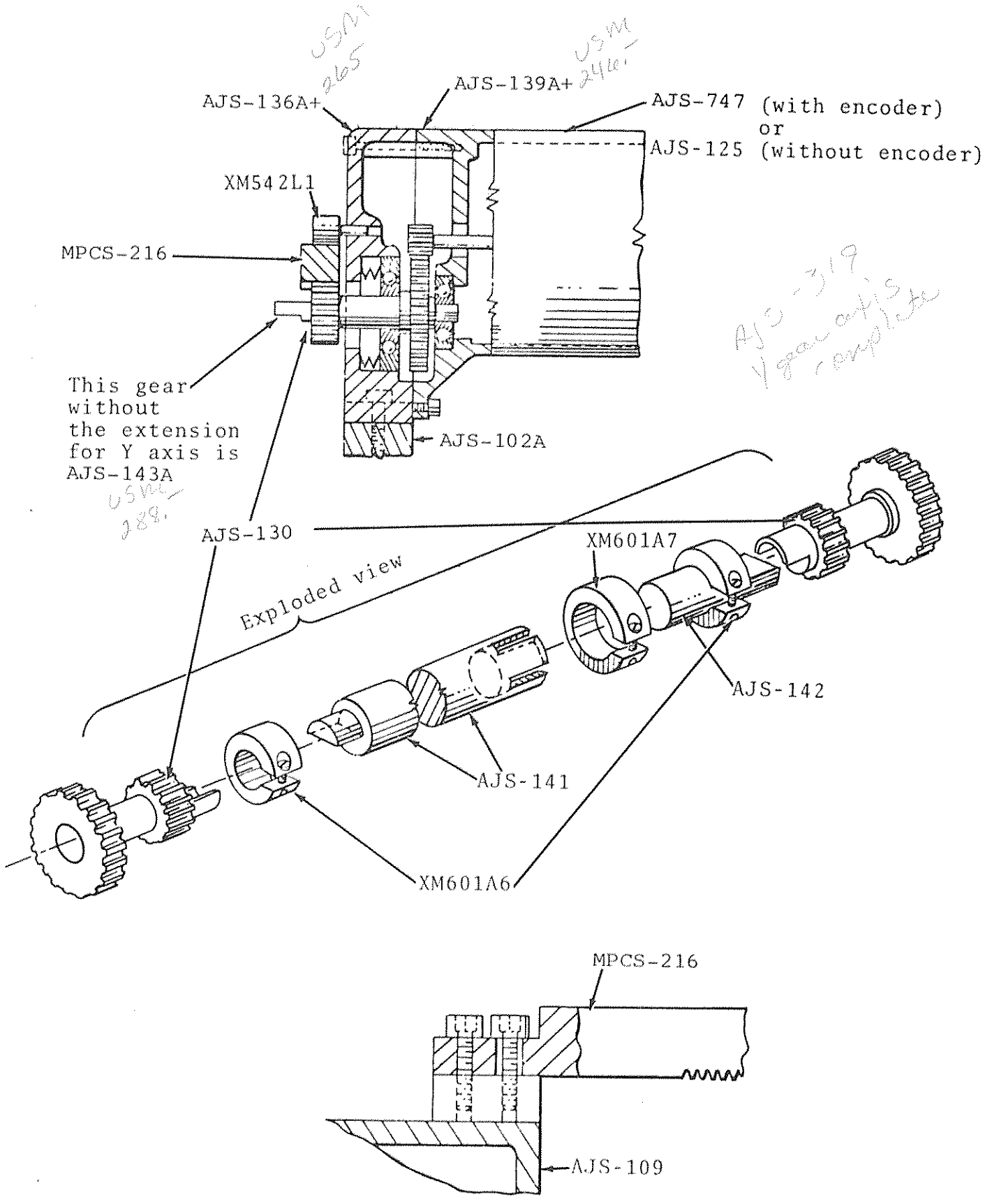

AJS-136A+
AJS-139A+
AJS-747 (with encoder)
or
AJS-125 (without encoder)
XM542L1
MPCS-216
This gear without the extension for Y axis is AJS-143A
AJS-102A
AJS-130
Exploded view
XM601A7
AJS-142
AJS-141
XM601A6
MPCS-216
AJS-109

Figure E.2

LEGEND FOR FIGURE E.3

REF. NO.	DESCRIPTION	PART NO.
1	Servo Motor/Encoder - Rear Axis	AJS-747
2	X Axis Rail	MPCS-217
3	Adjustable Arm Follower	XM542L1
	Fixed Arm Follower	XM542M1
4	Bushing Sleeve	AFS-385
	Bearing Seal	ACS-132
	Bearing	XM651B3
	Anti-Rotation Pin	PL-5959P
	Sleeve Adjusting Screw	MH400C57
5	Y Axis Rack	AJS-132
6	X-Y Carrier	AJS-109
7	Drive Gear & Pinion - Y Axis	AJS-143A
8	Servo Motor/Encoder - Y Axis	AJS-747
9	Y Housing	AJS-117+
10	Y Axis Guide Rod	AJS-110
11	X Axis Rack	MPCS-216
12	Short Cross Shaft	AJS-142
13	Collar	XM601A7
14	Long Cross Shaft	AJS-141
15	X Axis Front Servo Motor (No Encoder)	AJS-125
16	Drive Gear & Pinion - X Axis	AJS-130
17	Servo Motor Bracket	AJS-102A
18	Rack Spacer	AJS-134+
19	Collar	XM601A6
20	"C" Clamp	
21	Right Angle Square	
22	Dial Indicator	
23	Servo Motor Adapter	AJS-139A+
24	Servo Gear Housing	AJS-136A+

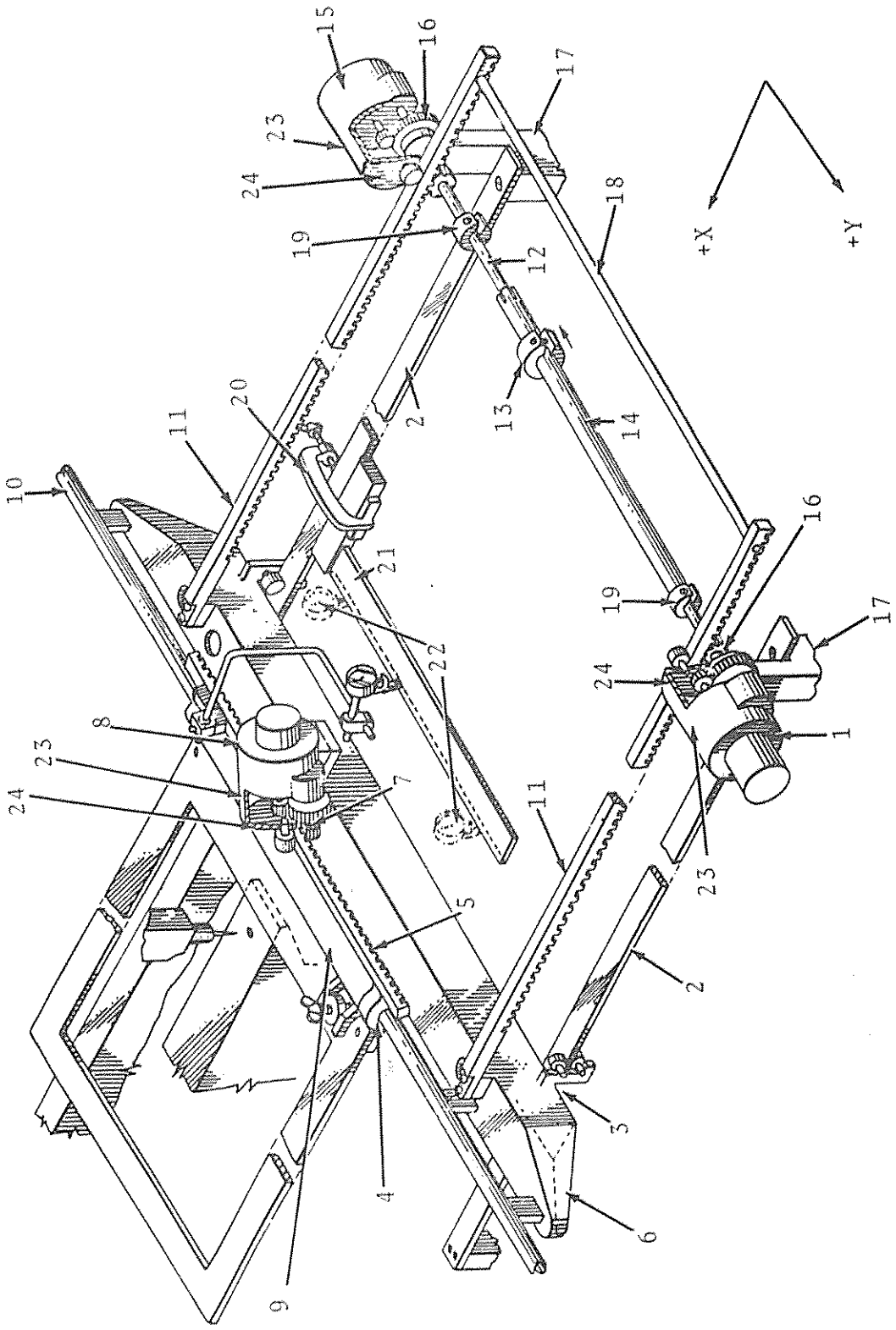


Figure E.3

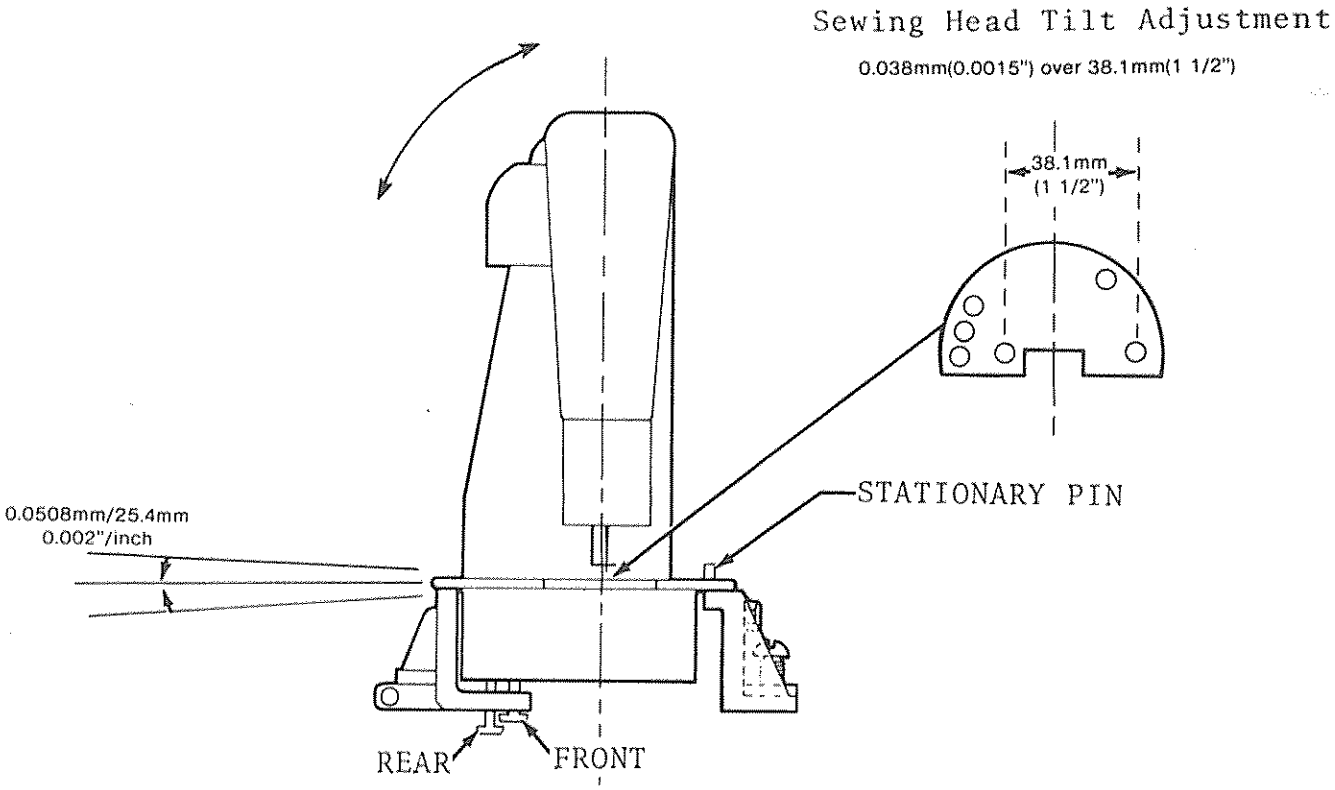


Figure E.4 Sewing Head Tilt Adjustment

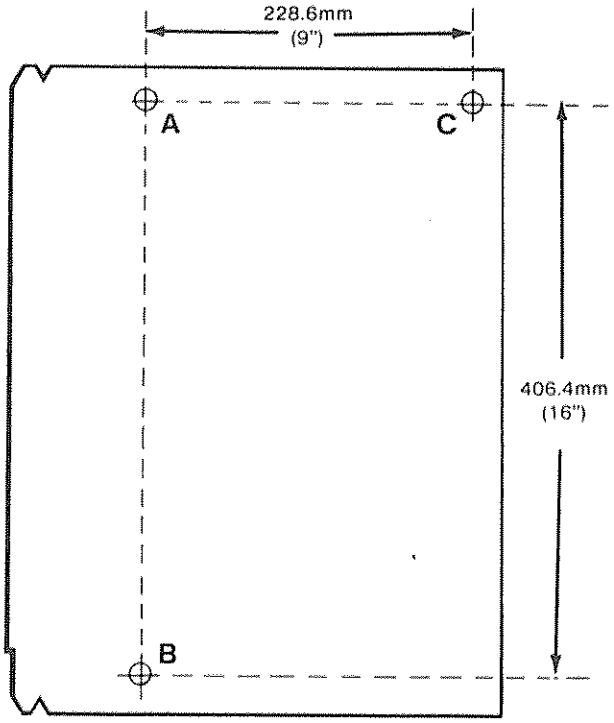


Figure E.5 Calibration Pallet

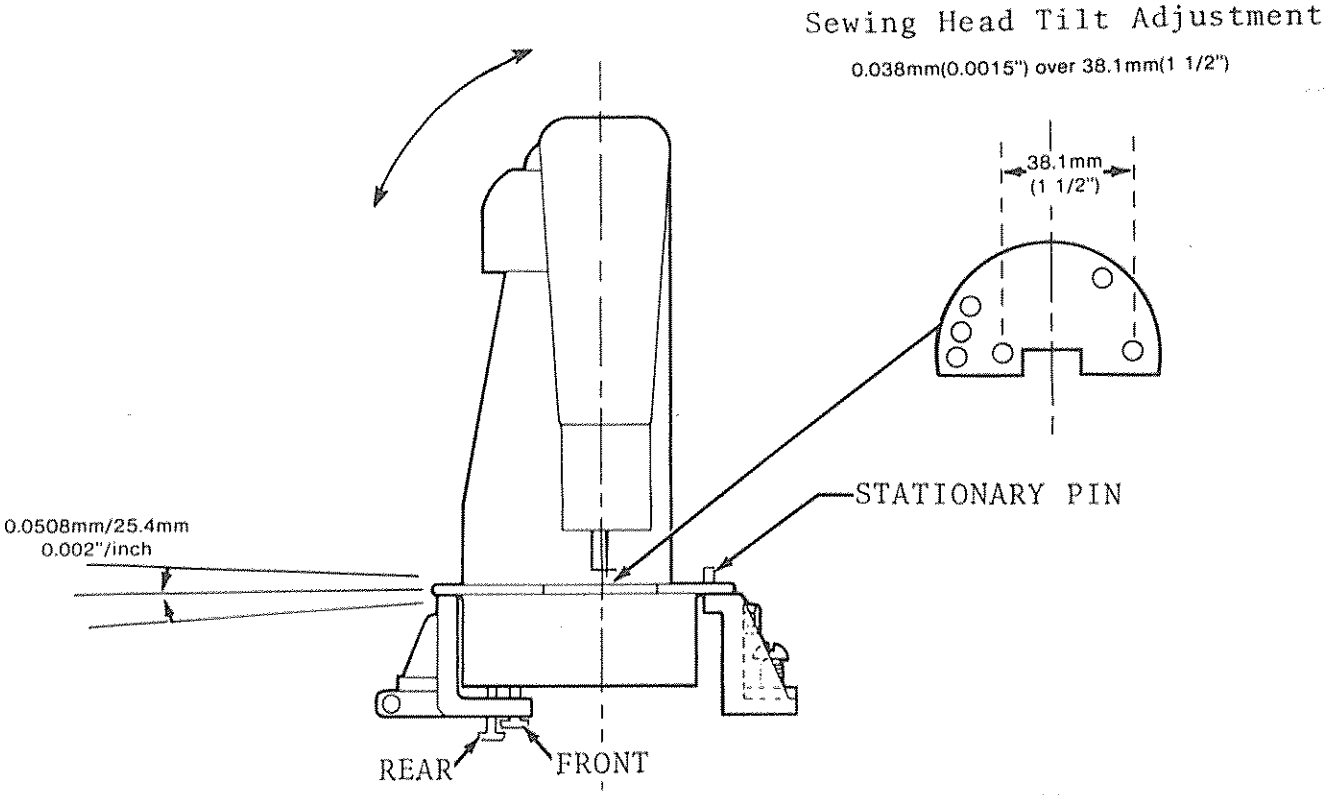


Figure E.4 Sewing Head Tilt Adjustment

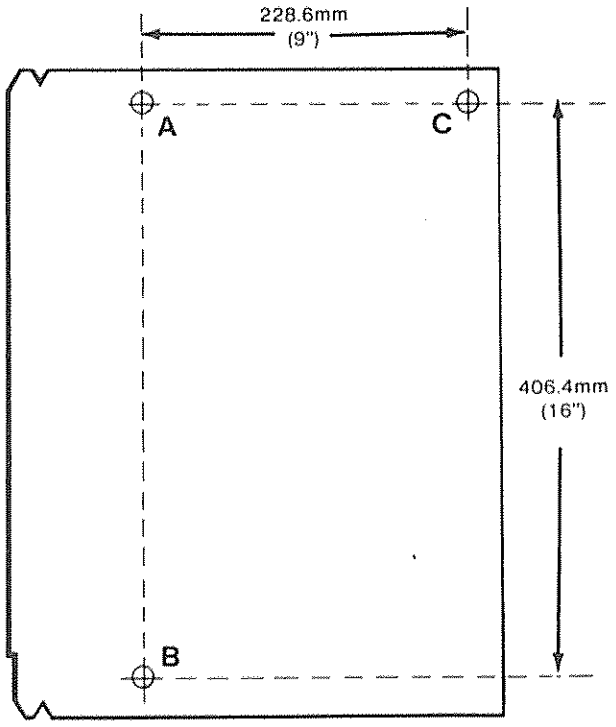


Figure E.5 Calibration Pallet

MPCS-A ERROR LIST INCLUDING IMPM

ERROR NO.

CHECKSUM ERRORS (PROMS SHOWN)

01	U66			
02		U67		
03	U66	U67		
04	U65			
05	U65	U66		
06	U65		U67	
07	U65	U66	U67	
08				U68
09	U66			U68
0A		U67		U68
0B	U66	U67		U68
0C	U65			U68
0D	U65	U66		U68
0E	U65		U67	U68
0F	U65	U66	U67	U68

MEMORY ERRORS

10	Memory test pattern error
11	Memory test address error

EPROM ERRORS (also many in the "IMPM ERRORS" list)

20	EPROM programming verification error
21	EPROM address out of range
22	EPROM type selection wrong
23	EPROM file checksum error
24	EPROM directory format error
25	IMPM interface not installed

TABLE-MOTION ERRORS

30	X axis servo stall
31	Y axis servo stall
32	X axis servo drift
33	Y axis servo drift
34	Table limit switch opened
35	Table motion with cover open

SEWING HEAD ERRORS

36	Stitcher not-running error
37	(See "other devices" list)
40	Measured head speed exceeds maximum
41	Measured head speed is below minimum
42	RPM A-D converter timed out
43	Head jam timer expired
44	Head run-away error (clutch failed to open)

PATTERN DATA ERRORS

50	Invalid control
51	No "start-of-file" control
52	Multiple "start-of-file" controls
53	No "end-of-file" control
54	Premature "end-of-file" control
55	X axis sewing area exceeded
56	Y axis sewing area exceeded
57	X axis pattern drift error
58	Y axis pattern drift error

OTHER DEVICES ERRORS

(37)	Joystick pot out of range
60	Device failure during initialization
61	Presser foot down time-out
62	Presser foot up time-out
63	Servo power failed to turn on
64	Servo power failed to turn off
65	Shelf up time-out
66	Shelf down time-out
67	Joystick enclosure not installed
68	Joystick out of calibration
70	Stop error - head speed excessive
71	Stop error - cut disk time-out
72	Stop error - stop disk forward time-out
73	Stop error - stop disk reverse time-out
80	EEPROM format mismatch (any previous values are lost)
81	EEPROM block size exceeded
82	EEPROM usage exhausted (must replace it)
83	EEPROM failed to accept a write

OVER

IMPM ERRORS (INCLUDING WRITING ONLY WITHOUT JOYSTICK ENCLOSURE)

A1	INVALID ACTION CODE
A2	VALUE TOO HIGH
A3	VALUE TOO LOW
B1	DIGITIZED DATA BUFFER FULL
B2	NOTHING TO DELETE
B3	CAN'T DUPLICATE PAST FILE END
B4	CAN'T DUPLICATE INTO TAGGED PORTION OF FILE
B5	CAN'T DIGITIZE IN THIS MODE
B6	TAG NOT FOUND
B7	CAN'T DELETE IN THIS MODE
B8	NO AVAILABLE FILES
B9	ACTION CODE ILLEGAL IN THIS MODE
BA	DIGITIZED DATA FILE EMPTY
BB	RECORD NOT FOUND
BC	CAN'T MOVE TO RECORD IN THIS MODE
BD	STITCH FILE EMPTY
BE	CAN'T DELETE DATA INTERFACE POINT
BF	CAN'T MOVE DATA INTERFACE POINT
C1	EPROM NOT ERASED
C2	INVALID STITCH FILE EPROM
C3	NO DIGITIZED DATA TO WRITE
C4	NO STITCH DATA TO WRITE
C5	INVALID DIGITIZED DATA EPROM
C6	EPROM ERASED
C7	NO FILE TO READ
C8	TOO MANY FILES FOR APPENDING
C9	EPROM CAPACITY EXCEEDED
CA	BUFFER FULL
CB	DIGITIZED DATA CAPACITY EXCEEDED
CC	STITCH DATA CAPACITY EXCEEDED
D1	STITCH DATA BUFFER FULL
D2	SEWING AREA BOUNDARY VIOLATION
D3	STITCH ASSIGNMENT CHECKSUM ERROR
D4	STITCH LENGTH TOO LONG
D5	OVERFLOW, CONVERTING REAL TO INTEGER
D6	DIVISION BY ZERO (ILLEGAL)
D7	OVERFLOW, REAL MULTIPLICATION
D8	OVERFLOW, REAL ADDITION
D9	OVERFLOW, REAL SUBTRACTION
DA	OVERFLOW, CONVERTING TO TRIPLE PRECISION

See SEC. 11.4 of the MPCS-A Manual for more details including possible causes and remedies.