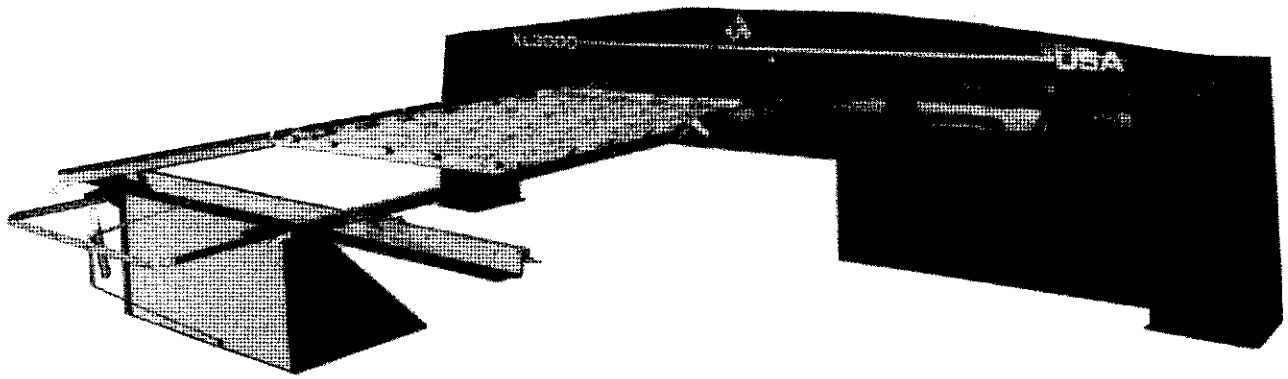
XL-3000 Computer Quilting Machine

For Comforters, Mattresses, Bedspreads, and Sleeping Bags



Overview

One operator produces up to 420 products per day when the XL-3000 is operated in conjunction with the ABM SL-7847 Frame Changing Table and the ABM ACS-318 Air Clamp System. While the machine is quilting the operator unloads and reloads the next frame. When the machine stops, the operator changes frames in 6 seconds and the quilting restarts.

One operator produces up to 840 products per day using two XL-3000s in conjunction with the ABM DL-7847, Dual Frame Changing Table and the ABM ACS-318 Air Clamp System, when both XL-3000s are set for the same product size.

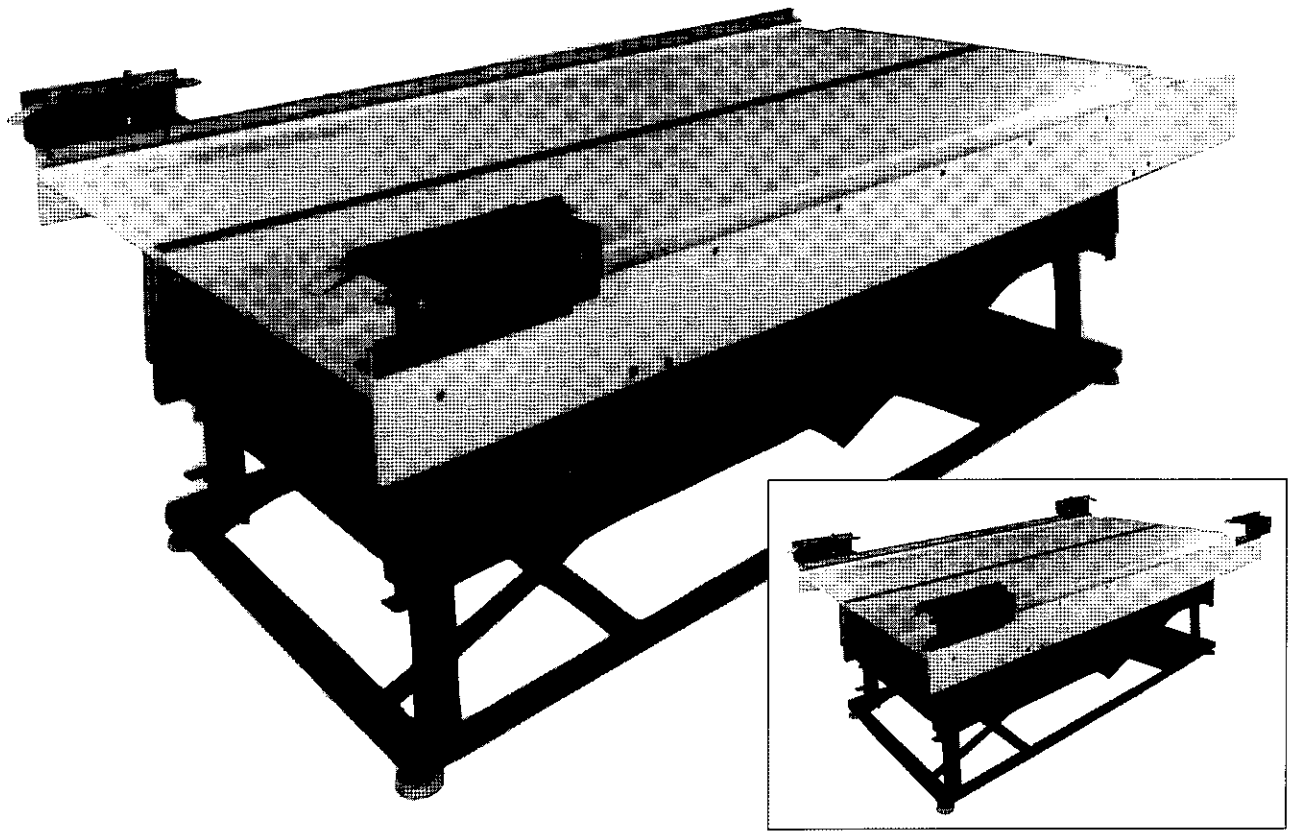
The XL-3000 has many State of the Art features and designs. The movement of the frames is carriageless, which allows higher speeds and less vibration. This means higher quality and more accurate quilting due to the reduction of inertia distortions. The many features enable easy, trouble free operation, and produce the highest quality products faster than ever before.

Features and Benefits

- **Internal Lubrication** means no more having to oil the sewing machine. No more dripping of excess oil onto your products. No more breakdowns due to dry bushings and bearings. Lubrication is automatically delivered in the correct amounts to all parts of the sewing head. The lubrication is delivered inside the bushings, filling micro grooves so the lubrication is not pushed away as moving parts move back and forth through bushings and bearings.
- **Posi-Tron Thread Cutting** assures that both top and bottom threads are trimmed accurately whenever the sewing head stops and the product moves, and at the end of quilting. The thermal feature assures certain trimming for all types of thread.
- **Tacking** occurs at all start and stop points for higher quality sewing, and to prevent thread pull back.
- **Bobbin Counter** alerts when its time to change bobbins so thread doesn't run out in the middle of quilting.
- **Thread Sensors** immediately cause the machine to stop if thread breaks. Touch one button to bring the machine to re-threading position, and touch one button to send the machine back to restart quilting where it left off.
- **High Speed Needle Positioner** assures that the needle is always in the "up" position, when not sewing, to prevent any damage to the material.
- **Needle Cooling System** allows higher speed quilting with a greater choice of threads.

SL-7847
Single Frame Changing Table

DL-7847
Dual Frame Changing Table



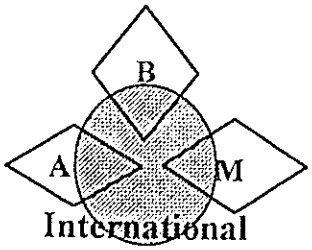
Overview

The SL-7847 or DL-7847 requires only one operator and facilitates changing frames with any make or model quilting machines on the market. These tables allow the operator to remove the finished quilted product and to insert the next product into the quilting machine, all within 6 seconds.

The SL-7847 serves 1 quilting machine. While the machine is quilting the operator works on the table to unload and reload the product into the clamping frame. When the machine finishes quilting the completed frame is removed from the machine while the newly loaded frame is inserted.

The DL-7847 serve 2 quilting machines **when both machines are set to quilt the same size products.** The operation is the same as above except the table allows frame movement from either end. Average quilting is 1-1/2 minutes. Average clamping and unclamping is 35 seconds plus 6 seconds for frame changing and ideal synchronization is accomplished. One quilting machine completes a quilting cycle, change frames, and 45 seconds later the other quilting machine completes its cycle, change frames, and continue.

Faster clamping and unclamping can be accomplished with the ABM ACS-318 Air Clamp System.



"Serving Industry Since 1947"

The two disks labeled A - K and L - Z contain all of the designs currently in our data base. Your manual contains most of the drawings for these patterns but there may be many new additions not covered. To view these as well as all the others available follow the instructions below:

On a IBM compatible computer:

At the c : > MKDIR patterns

c : > cd patterns

Now put the disk labeled A - K into your drive A

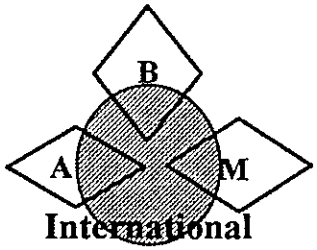
c : > \ patterns \ copy A : * . *

when done put the 2nd disk into drive A :
and hit the F3 key to repeat the above command and then the return key.

You have now transferred all of the patterns to a patterns directory.

When you are in that directory you can type PATVIEW to look at all of the available designs.

We also recommend that you make another directory called: XLBKUP.
All of the designs used on your current XL quilters should be saved into this back-up directory.



MODEL XL 3000

Computer Quilting Machine

OPERATION MANUAL

ABM INTERNATIONAL, INC.

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- Scroll Continuous
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INTRODUCTION

The purpose of this manual is to help the operator become familiar with the proper operation and care of the XL 3000 (Computer Quilting Machine) in order to maximize efficiency with minimum effort.

This manual contains operation and service instructions for Computer Quilting Machine (XL3000) and accessories manufactured by ABM International Inc., Niles, IL., U.S.A

This manual will provide the necessary information required for a proper understanding of the capabilities of the machine.

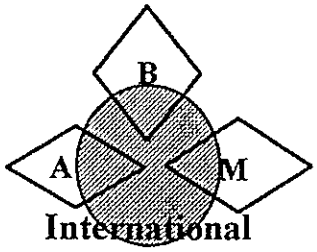
Increased production is a result of the ABM Computer Quilting Machine (XL 3000) used in conjunction with the ABM Frame Changing Table (DL-7847).

SYSTEM OVERVIEW

One person can operate the XL 3000 Computer Quilting Machine. While the machine is quilting, the operator fills the next frame with the new goods to be quilted. When the quilting cycle is completed, the machine stops automatically and the frame lock is released. The completed frame may then be pulled past the needle onto the frame support brackets located on Automatic frame changing table until the actuating button is depressed to engage the frame changing mechanism of the automatic table. Operator removes the finished frame from the machine and then positions the next frame into quilting position. The new frame is pulled past the needle, and with the touch of the "Start" button, the machine commences its operational cycle anew.

Three-axis full servo control automatically adjusts speed of the product movement with the speed of the sewing head to assure exact stitches per inch throughout. The machine always operates at the highest speeds possible consistent with good quality. It automatically runs faster on straightways, and slows down to appropriate levels at curves. The multi-function digital encoder controls needle positioning and thread trimming.

In the event the sewing thread should break, thread sensor immediately causes the machine to stop. A touch of a button brings the machine to the rethreading position, and touching another button sends the machine back to restart quilting where it left off.



RECEIVING AND UNPACKING

Upon receipt, the crates should be inspected for evidence of damage enroute. In the event that there is such evidence of damage, notify the carrier immediately and also notify

ABM International, Inc
7847 Caldwell Ave.
Niles, IL 60714
Phone # (708)-581-0011
Fax # (708)- 581- 0029

Remove bonding straps and make sure to retain all hardware from the crates. Remove all protective wrapping and wadding, ensuring no part of the equipment is discarded. Uncrate the machine, removing all cartons, XL bridge, two X rails with stand, two Y rails, front & rear drive Shafts, front & rear drive shaft covers, and frame stop cylinder.

Optimum Quality and Performance are assured on XL 3000 Quilting Machine and their accessories. Each machine is subjected to rigorous inspection and tested under operating conditions, prior to shipment.

Caution: This machine is precision built, and is accurately adjusted prior to shipment. Uncrate the machine with care. Check the contents of the crates with the packing list. In case of shortage, notify ABM International immediately.

LOCATION OF THE QUILTING MACHINE:

The location of the machine may be chosen to suit the individual requirements of a given production operation. The light weight construction makes it suited to either concrete or wooden flooring . First, the XL3000 bridge is positioned in the desired location on the floor, allowing 12 feet of space at the back of the machine and 12 feet of space in front. The factory electrical supply must be run to the RIGHT endstand of the bridge. All measurements are to be taken from the center line of the bridge. Left/Right reference is made looking at the front of the bridge (side on which XL3000 appears).

ASSEMBLY AND INSTALLATION:

A.) Set the bridge in desired location.
B.) As shown in figure 1, place X rails and stands in position.
C.) Slide shaft into the bridge as shown on figure 1.
D.) Move X-rail slide as far left as you can to time the rail.
E.) Follow the same procedure for Front and Center rails.
F.) Move rear rail at least 16" past the shaft following the same procedure as front and center.
G.) Tighten the rear, front and center rail screws.
H.) As shown in figure 1, set Y rails on top of X rails.
I.) Distance from the inside of unistrut (P5000), located on rear stand, to the back of the XL bridge should be 107 5/8". This distance must be the same at rear left and rear right.
J.) Tighten down Y rails using 1/2" x 13" x 1-1/2" supplied screws.
K.) Move frame pusher (holding Nyltrac) as far back as possible.
L.) The rear of the frame pusher to center of the square shaft which slides inside the "Y" rail should be the same distance on the rear right as it is on rear left.
M.) Tighten screws in Y rail to time the pusher located under cutout on aluminum angle iron cover.
N.) Place right Y rail as far right as the chain within the Aluminum Unistrut on X rail will allow.
O.) Distance from the center of the shaft to the Y rail must be the same for front and back side for correct alignment.
P.) Factory power line must be connected to the box on the Right Rear of the XL3000 Bridge Assembly.(See photo) The machine is normally wired for 220 volt, single phase, 60 cycle AC unless otherwise specified. (All swithes must be in the OFF position.)

Q.) The air hose from the compressor (required air pressure: 90 PSI) must be attached to the air filter located on the Rear of the Right Endstand.

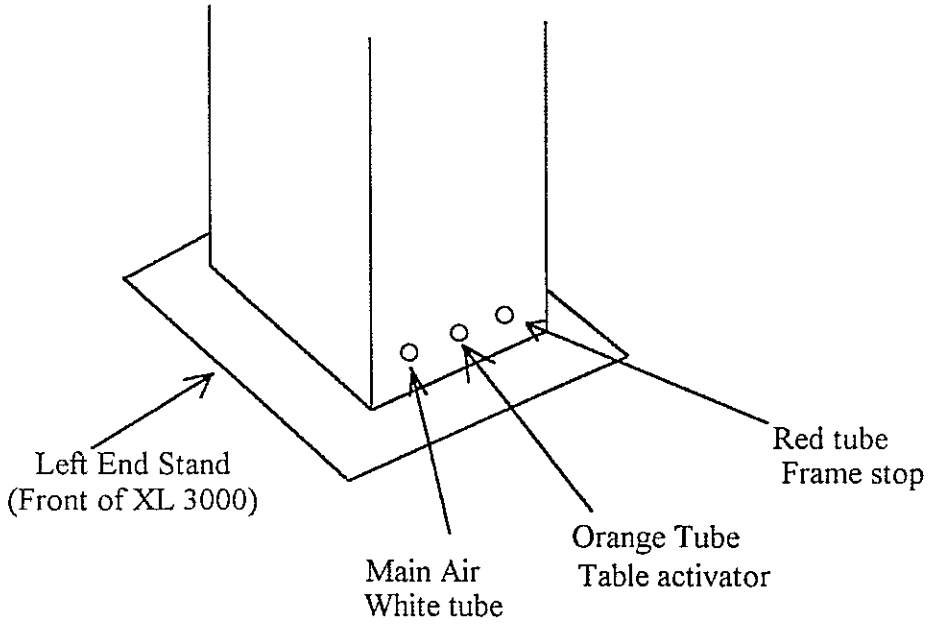
R.) Electronic circuit board must be checked for loose connections.

AUTOMATIC FRAME CHANGING TABLE

Automatic frame changing table is pre-assembled.

A.) As shown in figures 1,2 &3, connect Red, Orange and White tubes to appropriate connectors of the left end stand of XL 3000. Connect Ground cable from Automatic frame changing table to any metal surface of XL3000. Wire and these three hoses are banded in spiral wrap in a group of four.

B.) Now take group of two hoses banded in spiral wrap and connect Orange hose to the top of the frame stop cylinder and connect Red hose to the bottom of this cylinder. See Fig. 1 and 3.



Connection of the Automatic Frame Table Tubes

Fig. 2

BOBBIN USAGE COUNTER: As pre-set, bright LED Flashes when the machine needs to have its bobbin changed. The number of product designs per bobbin, can be programmed into a disk with the XL 3000 computer keyboard. This number is stored with the patterns on its disk and automatically reloaded each time the pattern is chosen to be re-run. See Fig. 1

ELECTRONIC CONTROL CONSOLE :

It is user friendly with a large display screen explaining what's happening and giving necessary instruction. All regular operator functions use "hot" keys which immediately activates the desired function without the need for reading menus and entering data. See Fig. 1

PRELIMINARY SETTING-UP PROCEDURES

This section contains the general operating instructions for (XL3000) Computer Quilting Machine equipped with an SL 7847 Automatic Table. These instructions should be followed explicitly to obtain optimum results from this equipment. Before operating the machine, recheck to ensure that all of the preliminary starting procedures have been satisfactorily completed. The proper use of the XL 3000 Quilter, in conjunction with the Automatic Table, results in increased productivity, better product quality and economy of operation.

The following is the sequence of procedures for pre-production operation.

A.) Place a full spool of ABM ULTRALUX thread on the thread stand on the top of the XL-3000 bridge. (See Fig. 4) Make sure that thread sensor is mounted on larger shaft on thread stand.

B.) Place an ABM ULTRALUX full bobbin in the bobbin case.

C.) Turn the needle down while holding the top thread and pick up the bottom thread.

D.) Thread sensors immediately cause the machine to stop if thread breaks. Touching Home key brings the machine to rethreading position, and touching Re-Start sends the machine back to quilting position where it left off.

E.) Place frame on the Automatic Frame Changing table and clamp the material in place.

F.) Pull the frame onto the carrier of the Quilting Machine.

G.) Leading edge of frame has to be a minimum of 6" away from the needle before starting quilting machine.

OPERATING INSTRUCTIONS

A.) Insert 3 1/2" supplied disk into the floppy drive, located on the right Endstand. (See Fig. 4) Disk contains ABM.BOT and ABM.SYS file. (Explanation of these files is explained later in this manual).

B.) Turn On Main Power switch. (See fig. 4)

C.) Wait until system boots up. Check all parameters for system configuration.(See section listing system parameters shown later in this manual)

D.) After positioning the frame into the frame lock bracket, lock the frame to the Y rail by depressing the Frame Lock key on the keyboard display. (See fig. 1 & 5)

E.) Now, select the pattern mode:

1.) Press Operator Function key on the keyboard. (See Fig. 5 & 6)

2.) To bring up patterns, now press No. 2 button at top of keyboard. (See Fig. 5&6)

F.) To activate X Servo motor (Side to Side motion) and Y Servo motor (Front to back motion) turn on Servo Power switch. This one switch activates both servos simultaneously.

G.) To Power-Up Sewing machine, press Sewing Power key. (See Fig. 4)

H.) Operator sets Home position (0,0) point based on the original design.

I.) For testing, hit the Start button. Run the machine WITHOUT the needle in the sewing head, but with material in frames, for at least ten (10) minutes prior to actually starting production operations. At this point, any minor adjustments of alignment and/or machine function can be made.

J.) While the machine is quilting, the operator should clamp the next product into the second frame on the table. The operator will finish clamping in approximately the same time as the machine quilting cycle.

K.) When the machine completes the quilting cycle it will stop automatically. The needle will be raised to its highest position by a High Speed Needle Positioner system which assures that the needle is always in the "UP" position, when not sewing. This prevents any damage to the material or the needle bar. Posi-Tron thread cutting assures that both top and bottom threads are trimmed accurately whenever the sewing head stops and the product moves and at the end of quilting. The thermal feature assures certain trimming for all types of thread.

L.) In the event that thread breakage should occur during the quilting cycle, an solid state thread sensing device stops the machine automatically.

M.) To Start continuous production, press the START button again on the keyboard, to operate the Automatic Frame Changing Table and the XL3000 (Quilting machine). Tacking occurs at all Start and Stop points for higher quality sewing, and to prevent thread pull back. Operator lifts the completed frame from the carrier and back onto the Table and then pushes the next frame onto the carrier.. When the new frame has stopped moving, the operator will then pull it under the needle of the sewhead. Automatic Pressure Foot lifter raises the pressure foot to its highest position to allow easy access from the frames while protecting the needle, needle bar and pressure cup from inadvertant damage.

N.) To interrupt operation for any reason, press emergency stop button on the keyoard.

Note: Regardless of operating speed determined by types of materials being used, the built in forced-air cooling system assures that the needle will be kept cool at all times. This allows higher speed quilting with a greater choice of threads.

SYSTEM PARAMETERS

1000	IPM(INCHES PER MINUTE)	RAPID TRAVEL
600	IPM	DEFAULT SPEED
480	IPM	CONSTANT SPEED
200	IPM	THREAD BREAK SPEED
1000 (100%)		SCALE
15	IPSS(INCHES/SECOND/SEC)	CORNER ACCEL
15	IPSS	CORNER DECEL
15	IPSS	CONTOUR ACCEL
15	IPSS	CONTOUR DECEL
15	RPSS	SEW RAMP
30	DEGREES	CURVE ANGLE APPROACH
150	RADIAN/SECOND	QUALITY
5		STITCHES PER INCH
35	DEGREES	NEEDLE UP POSITION
0	REV./MIN	IDLE SPEED
80	REV./MIN	NEEDLE POSITION SPEED
500	MILLISECOND	SEW ON DELAY
300	MILLISECOND	SEW OFF DELAY
1500	MILLISECOND	THREAD TRIM DELAY
500	(.001 INCHES)	BACKTACK
3000	(.001 INCHES)	FRAME LOCK DIST
1500	REV./PULSE	INJECTOR RATE
3	PATTERNS	BOBBIN
1	ENABLED	BACK TACK
1	ENABLED	THREAD TRIM

TO CHANGE SYSTEM PARAMETERS:

-SELECT TECHNICIAN
-SELECT 3 FOR PARAM
-SELECT 1 FOR SYSTEM

ESC - ACCEPTS PARAMETERS

Operator and Technician functions

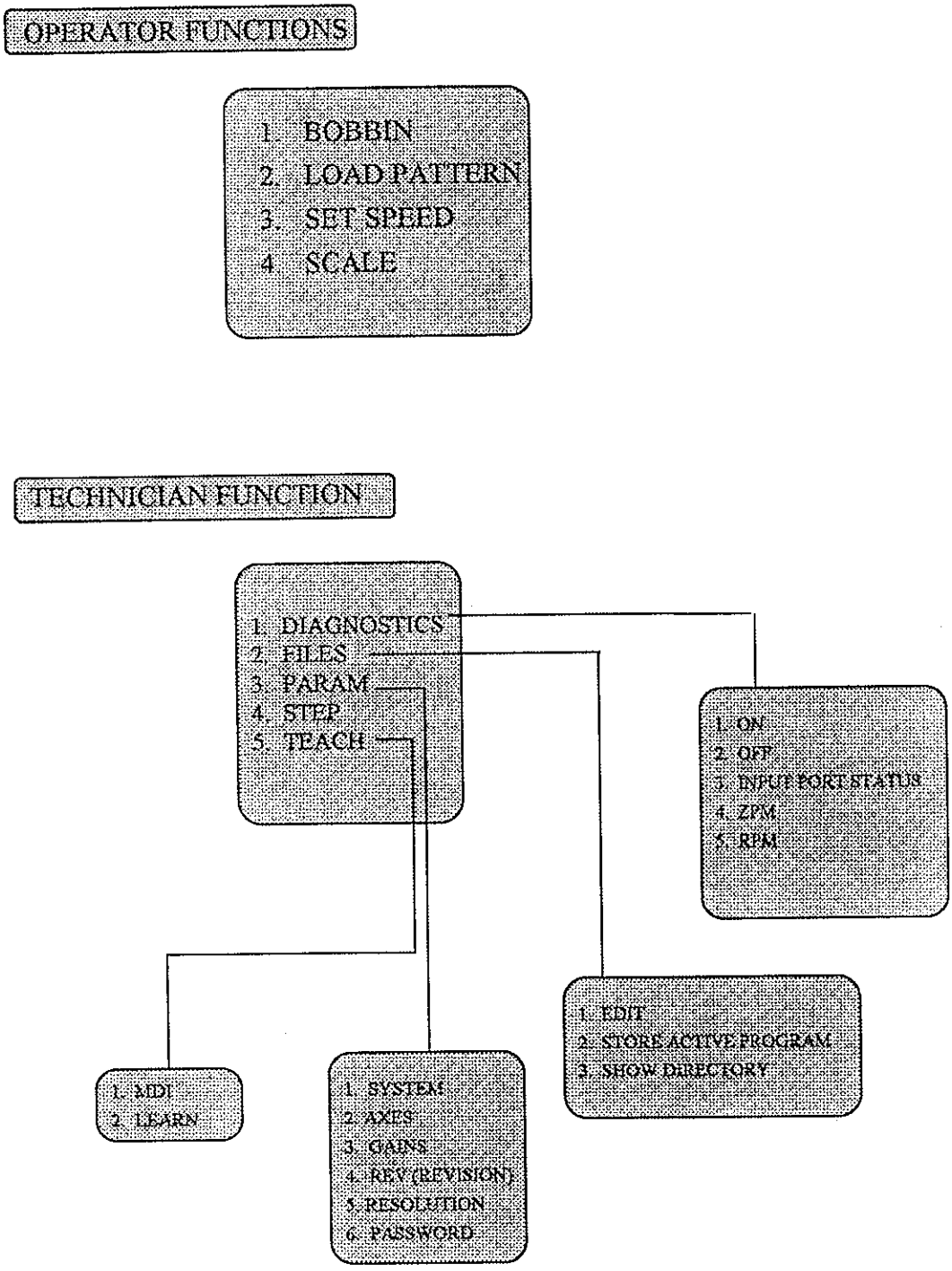


Fig. 6

1.0 PROGRAMMING INFORMATION

The ABM system supports the standard EIA machine tool programming language. Programs may be generated by a variety of methods: manual keyboard entry, digitization via manual jog, or download from a host computer via a serial link. Programs generated on the host computer via a compatible CAD system with G code compiler will be accepted by the controller.

2.0 SOFTWARE DETAILS

2.1 Power Up of the Controller

All parameter values and the current active program will be lost whenever the controller is powered down. This problem is solved by executing a boot up sequence on power up. This boot sequence restores the state of the CNC controller when last powered down by reading a specific configuration file from disk. All disks must contain a bootup file ABM.BOT and should also contain a configuration file ABM.SYS. The boot file contains additional code required by the CNC controller; the CNC controller will not operate if this file is not found on disk. The configuration file contains the current values of all parameters including the general system parameters, axes parameters, gain factors and axes resolutions and also contains the name of the current active pattern program. The boot sequence consists of the following steps.

1. The controller attempts to establish a link with the disk drive by searching for the boot file ABM.BOT. If the disk is not operational or if the boot file is not found, the controller will hang with an error message.

2. Once the boot file is read from disk, the controller searches for the configuration file ABM.SYS. If the configuration file is not found, the boot sequence is terminated with all parameters set to the default values and no active program in controller memory.

3. The controller reads the configuration file from disk and sets the controller parameters to the values contained in the configuration file.

4. If the configuration file contains an active program name, the specified program is read from disk to controller memory and is made the active program. (Note: Only single programs can be read and activated during the boot sequence; appended programs must be generated each time the controller is powered up.)

Once the boot sequence is completed, the controller enters the Manual Mode of operation.

2.2 Manual Mode Operations

The following information will be displayed while in the manual mode.

LINE 1	COMMAND FAST ON
LINE 2	X+ 0.0000 Y+ 0.0000
LINE 3	Pattern Prod Spd
LINE 4	BOX 0 5

LINE 1

The first line displays the working status of the controller and will display COMMAND when in the manual mode. The Jog status (FAST/SLOW) and the Sew Enable status (ON/OFF) will follow the COMMAND descriptor.

LINE 2

This line displays the current X and Y axes coordinates relative to the home position. The axes positions will be updated about 8 times a second when the axes are in motion.

LINE 4

The fourth line will display the current active program name, the current Production count and the current FeedRate Override factor (5 = 100%) for the active program. If there is no active program in memory, line 4 will display NO ACTIVE PROGRAM.

The following dedicated keys will be active when in the Manual Mode.

UP

Jogs the X axis in the positive direction. Also used to scroll up during program edit, directory search and parameter configuration.

RIGHT

Jogs the Y axis in the negative direction. Also used to scroll right during program edit.

DOWN

Jogs the X axis in the negative direction. Also used to scroll down during program edit, directory search and parameter configuration.

LEFT

Jogs the Y axis in the positive direction. Also used to scroll left during program edit.

JOG SPEED

2.2.1 Operator Menu

The Operator Menu provides simplified options available to the operator. The Operator Menu is shown below:

OPERATOR MENU
1. BOBBIN 4. SCALE
2. LOAD PATTERN
3. SET SPEED

The ***BOBBIN*** option allows the operator to change the Bobbin program parameter. The current value will be displayed; the operator has the option of entering a new value or pressing ENTER without typing a new value to retain the value displayed.

The ***LOAD PATTERN*** option allows the operator to scan thru the disk directory to select a new active program. Once a program is selected, it is read from the disk, replacing the current active program. Refer to Section 2.2.2 for more details on selecting active programs from the disk directory.

The ***SET SPEED*** option allows the operator to change the FeedRate Override for the active program. The FeedRate Override can be any value from 1 to 5; 1 corresponds to 20% the programmed speed and 5 corresponds to 100% the programmed speed.

The ***SCALE*** option allows the operator to change the Scale for the active program. The Scale can be any value from 1 to 30000 (1000 = 100%); a value of 300 corresponds to 30% the programmed scale and a scale of 10000 corresponds to 10 times the programmed scale.

The changes made via the Operator Menu will NOT be written back to disk. This can only be done via the Technician Menu.

The controller will automatically return to the command level once a selection from the Operator Menu is completed.

2.2.2 Technician Menu

The Technician Menu provides more advanced options and is available only to the technicians or floor managers. This menu is password protected; The user must log in by entering a 4 character password consisting of alphabetical (A-Z) characters only. (All lower case a-z characters are automatically converted to upper case A-Z characters.) The characters will be echoed as * when entered. The Technician Menu will be displayed ONLY if the password matches. All selections from the Technicians Menu will exit back to theTechnician Menu on completion, requiring the technician to only log in initially when

Toggles between the Fast/Slow jog mode. The axes will jog at about 8% the Fast jog speed when in the Slow jog mode.

SET HOME

Sets the Pattern Stop or Home position. The axes will display 0.0000,0,0000 at this position.

HOME

Initiates a home sequence which first lifts the needle if sewing is enabled, then sends the axes to the Home position via straight line motion at the Rapid Travel Speed.

SEWING

Toggles between the Sew Enable and Sew Disable mode. When sewing is disabled, all programmed sew enable and disabled commands are ignored and the program will execute at Rapid Travel Speed.

LOCK FRAME

Toggles the Frame Lock output (O5) to lock and unlock the frame.

OPERATOR

Displays the Operator Menu for selecting active programs and to change feedrates and scale factors for the active program.

TECHNICIAN

Displays the password protected Technicians menu for configurating system and program parameters, modifying and selecting the active program and for performing other miscellaneous functions.

INSERT

Used to insert a line during program edit or to append a program when selecting active programs.

DELETE

Used to delete lines during program edit.

ESC

Exits the current operation and backs up to the previous menu displayed.

START

Starts execution of the active program. The controller enters the Automatic Mode once program execution begins.

performing multiple selections from the Technician Menu. The ESCAPE key must be pressed to exit the Technician Menu and return back to the command level.

The Technician Menu is shown below:

TECHNICIAN MENU
1. DIAGNOSTICS
2. FILES 3. PARAM
4. STEP 5. TEACH

The *DIAGNOSTICS* option allows the operator to manually activate and deactivate output ports, to check the status of input ports during initial installation of the system, to manually search for the sew motor Zero Reference Marker (ZRM) and to calibrate the sew head output. When this option is selected, the following submenu will be displayed:

DIAGNOSTICS
1. ON 4. ZRM
2. OFF 5. RPM
3. INPUT PORT STATUS

Selections 1 and 2 are used to turn on and off specified output ports and will first prompt for an output port number and then will activate or deactivate the specified output port.

Selection 3 will display the input port status display.

Selection 4 will initiate execution of the Sew Motor Zero Reference Marker (ZRM) Test. This test will only be executed if the Sew Enable output (O2) is ON and controls the bobbin output(O8) according to the status of the sew motor ZRM; if on, the Bobbin output will be activated for 250 milliseconds; if off, the Bobbin output will be deactivated. This test is exited by pressing any key on the HHT.

Selection 5 will initiate execution of the Sew Motor RPM calibration. This test is only performed if the Sew Enable output (O2) is ON. The operator will be prompted for entry of a Sew Head speed in RPM. Once this value is entered, the controller will ramp the sew head from its current speed to the specified speed at a specified ramp and will then maintain the specified speed to the sew head motor before exiting back to the DIAGNOSTICS submenu. Once options 1-4 are selected and the command executed, the system will return back to the DIAGNOSTICS submenu. Pressing the ESC key when the DIAGNOSTICS submenu is displayed will ramp the sew motor to the specified Idle Speed and will then return the system back to the command level.

Check with ABM before :

There is a fifth option, the *NULL ADJUST* option which is not displayed in the diagnostics submenu but which is selected via the 5 key. The null adjust selection puts the controller in an open loop mode until a hardware reset is issued. In the open loop mode, the servos are not compensated for axes position errors. The null adjust mode of operation is useful when adjusting the software gains.

The ***FILES*** option is used to edit the current active program, write the active program and parameters back to disk and to activate a single pattern or an appended pattern via the disk directory display. When this option is selected, the controller will display the **FILES** submenu.

MANAGE FILES
1. EDIT
2. STORE ACTIVE PROGRAM
3. SHOW DIRECTORY

The operator then selects options 1-3 by pressing the appropriate number key. If the *EDIT* option is selected, the controller will initiate editing of the current active pattern. The *EDIT* option is not available if an appended pattern is currently active. The *STORE ACTIVE PROGRAM* option allows the current active program to be rewritten to disk and is done once any changes to the pattern program via EDIT or the program scale and FeedRate Override have been proven. If the *SHOW DIRECTORY* option is selected, the disk directory read form disk will be displayed. All single or appended programs are activated via the disk directory display. The names of all pattern program files containing the .PAT extension will be displayed in alphabetical order. The operator may scroll through the directory one pattern at a time via the UP and DOWN keys or may press any alphabetical hot key (A-Z) to display the first pattern name beginning with the hot key. The operator may activate a single file by first scrolling to the desired file via the UP and DOWN keys or the alphabetic hot keys and then pressing ENTER to select the program for activation. Once a single program is activated, the name of the active program is written to the configuration file and the configuration file rewritten to disk as the ABM.SYS file. Multiple files may be appended by scanning to the desired files and pressing INSERT to append the selected program. (Note: All pattern program files stored on disk must have the .PAT extension. The disk will contain other files used for configuration; only those files with names ending with the .PAT extension will be displayed when showing the directory.)

The *PARAM* option is used to configure controller parameters such as software gains, axes resolutions and system and axes parameters. All these options are displayed in the *CHANGE PARAMETER* submenu shown below:

CHANGE PARAMETERS
1. SYSTEM 2. AXES
3. GAINS 4. REV
5. RESOL 6. PSWD

If the *SYSTEM* parameter option is selected, the controller will scroll through the list of the system parameters which include default feedrates, ramps and parameters associated with the sew enable and sew disable cycles. If the *AXES* parameter option is selected, the controller will first prompt for an axis identifier (X or Y) and then scroll through the list of axes parameters which include jog and homing feedrates and ramps. (The rotary Z axis cannot be manually jogged and has no configurable axes parameters). Selection of the *GAINS* option will scroll through the axes software gains. Selection of the *REV* option will display the current software revision before returning to the command level. Selection of the RES option will scroll through the X, Y and Z axes resolutions. Selection of the PSWD option will allow the technician to specify the secondary password by typing 4 alphabetical characters A-Z. (The characters will not be echoed to the display when typed; the technician will be prompted to verify the entry before it is accepted.) Whenever parameters are modified, the values for all the parameters are written to the configuration file and the configuration file is then rewritten to disk as the ABM.SYS file.

The ***STEP*** option is a method of verifying programs by executing programs in the single step mode. In the single step mode, programs are executed step by step with the controller executing cycle stops at the end of each step. Also, in this mode, the line number of the current step is displayed with the current axes position. The STEP AND EXECUTE option is useful when testing programs under no sew conditions to check the validity of programs and to identify program steps for editing. Once this option is selected, the controller prompts for the scale factor. Once this information is entered, the controller prompts the operator for the START key. Once pressed, the program is executed step by step with the START key used to step through the program. At the end of program execution, single stepping is disabled, and the controller returns to the command level. The current program step number is displayed at line 3 during program execution. This provides the operator an indication of which program step is currently being executed.

The *TEACH* option is used for entry of programs into controller memory and onto disk. There are three methods of program entry, *Manual Data Input* via the keyboard(MDI), teaching via jogging to critical points (*LEARN*) and digitization via the digitizer tablet (*DIGITIZE*). All three options are displayed on the TEACH submenu shown below:

TEACH
1. MDI
2. LEARN

Once options 1 or 2 are selected, the controller will prompt for the pattern name of the new program before beginning the selected process. Once program generation is completed, the pattern program is made the current active program and is then written to the disk.

2.3 Automatic Mode

The automatic mode is the mode entered when program execution is initiated from the manual mode. EIA compatible pattern programs consist of a series of program blocks, or program steps. Program blocks consist of a series of EIA commands, terminated by an end of block character.

EIA commands include

- commands to set programming modes
- execute linear or circular motion in the XY axes
- perform various I/O (process control) functions
- modify program flow via subroutine calls and program jumps.

A motion block consist of one or more program blocks which contain an interpolation motion command.

Program execution may be suspended by triggering of the STOP key. Once program execution is suspended in this manner, the controller enters the cycle stop mode.

All keys with the exception of the STOP key are ignored in the automatic mode.

2.4 Cycle Stop Mode

Once program execution is suspended and the controller enters the cycle stop mode, the operator may restart the program or initiate a thread break recovery cycle. All options available eventually result in restart of program execution.

The following keys are active when in the Cycle Stop mode.

HOME Initiates a home sequence which first lifts the needle if sewing is enabled, then sends the axes to the Home position via straight line motion at the Rapid Travel Speed.

SEWING Toggles between the Sew Enable and Sew Disable mode. When sewing is disabled, all programmed sew enable and disabled commands are ignored and the program will execute at Rapid Travel Speed.

RESTART Initiates a thread break recovery cycle. Refer to Section 2.10.1 for a description of the thread break recovery cycle.

START Continues execution of the active program at the current programmed position.

2.5 Fault Mode

The fault mode is entered when irrecoverable faults are detected by the controller. There are three general sources of irrecoverable faults.

- ***Servo faults***
- ***Frame lock faults***
- ***Pattern program format faults***

Servo faults may occur at any time and are generated when the controller detects excess following error when closing the servo loop.

Frame lock faults are generated during pattern program execution during the automatic frame lock cycle or when the frame lock input is deactivated.

Program format faults are detected during the automatic mode when executing pattern programs.

Program format errors include illegal G and M functions, illegal code words and illegal subroutine call and program jump commands. The most common source of program errors is when programming circular moves which must specify the start, end and center points of the arc. The controller will generate an error if the points specified do not define an arc.

The fault mode can only be exited back to the manual mode by pressing the ESC key on the keyboard.

2.6 Z Axis Control

There are two modes of operation of the sew (Z axis) motor. In the ***normal open loop mode***, a 0V command is applied to the sew motor without any attempt to maintain positioning of the sew motor. When in the ***closed loop mode***, a 0 to 10V closed loop command is applied to the sew motor to maintain both accurate velocity and position control of the sew motor. The mode of the sew motor is determined by the state of the Sew Motor Enable output (O2); if this output is on, the sew motor will be in the closed loop mode; if off, the sew motor will be in the open loop mode. The Sew Enable output (O2) must be ON to enable sewing during program execution; this output will be automatically controlled via the Sew On (M20) and Sew Off (M21) program commands.

During program execution, when sewing is enabled, the speed of the sew head must be proportional to the current vector Cartesian (X,Y) speed at all times. This is necessary to maintain a constant stitch length along the programmed path. The rotary sew head speed is based on the vector Cartesian speed according to the following formula:

$$Frpm = Fipm * Ks$$

Frpm is the rotary sew head speed resulting in the desired number of stitches per minute, ***Fipm*** is the current Cartesian speed in units of inches per minute and ***Ks*** is the

desired number of stitches per inch. The number of stitches per inch is configurable as the system parameter Stitches Per Inch.

The current axes Cartesian speed, Fipm is based on the programmed speed. Generally, the programmed speed is based on the Default Speed and the FeedRate Override according to the formula below:

$$Fp = (Fd * FRO)$$

Fd is the Default Speed, ***FRO*** is the Feedrate Override (1 = 100%). The programmed speed, ***Fp*** may be overridden by specifying a programmed speed in the pattern program via the F EIA command.

Once sewing is enabled under normal default programmed conditions, the sew head speed is scaled to the XY Cartesian speed during steady state conditions where the XY vector speed is constant and during acceleration and deceleration of the XY axes. The sew speed is clamped to the Idle Speed during sewing and cannot fall below this value.

An alternative Constant Velocity mode of sew speed control may be enabled via programmed Miscellaneous functions. In the Constant Velocity mode of operation, the programmed speed of the XY axes is set to the configurable system parameter Constant Speed. The sew head speed is then determined based on the Constant Speed instead of the programmed speed. The Constant Velocity mode is useful when sewing complicated patterns which cause frequent variations in the speed of the XY axes due to radius clamping and block update limitations. The Constant Speed is a configurable system parameter and is set to 50 to 75% of the Default Speed used as the programmed speed during normal operations.

The Constant Velocity mode of operation is enabled via the programmed Miscellaneous Function M22 and disabled via the sew disable Miscellaneous function M21. The M22 function may occur in the same program line as a linear or circular motion command, however it cannot occur in the same line with another M function (either M20 or M21).

During manual operations or program execution when The Sew Enable status is ON, the sew head speed is set to the configurable system parameter, Idle Speed. The Idle Speed will always be set to zero for three axis systems. If the Sew Enable status is OFF, the CNC controller will output an open loop 0V command to the drives regardless of the Idle Speed; therefore a nonzero Idle Speed will still result in no movement of the sew motor.

The CNC controller supplies the 0-10V tachometer signal to the sew axis servo motor via the fourth channel of analog output. This signal is proportional to the current

sew axis speed based on the encoder feedback and is scaled so that a speed of 5000 RPM will produce a tach signal of 10V.

2.7 Sew Enable and Disable

Sewing is enabled and disabled under program control via specialized EIA commands. When these commands are encountered during program execution, the controller will perform a preprogrammed series of events, refereed as canned cycles necessary to enable and disable the sewing process before continuing with program execution. The sew enable and disable processes are described below:

2.7.1 Sew Enable Cycle

The following is the sequence of events that take place when sewing is enabled under program control.

1. All programmed motion in the XY axes is disabled.
2. The sew motor enable output is energized.
3. The controller delays for a specified duration (Sew On Delay) to allow the sew head motor to engage.
4. If backtacking is enabled, a backtack operation is performed while maintaining control of the sew head speed.
5. Program execution is resumed at the next program block.

Sewing is enabled from the pattern program via the M20 Miscellaneous function.

2.7.2 Sew Disable Cycle

The following is the sequence of events that take place when sewing is disabled under program control.

1. All motion in the XY axes is disabled.
2. If backtacking is enabled, a backtack operation is performed while maintaining the control of the sew head speed.
3. The speed of the sew head is reduced to a specified Needle Position Speed.
4. The controller delays for a specified duration (Sew Off Delay). During this delay, the sew head is ramped from its current speed to the Needle Position Speed.
5. If thread trimming is disabled, the cycle immediately jumps to step 13. Otherwise, the controller waits for activation of the sew motor Zero Reference Marker (ZRM).
6. The sew enable output is turned off.
7. The thread trim solenoid is activated.
8. The controller delays for a specified duration (Thread Trim Delay).
9. The thread trim solenoid is deactivated.
10. The thread lock solenoid is activated.

11. The controller delays for 250 milliseconds to allow the thread lock output to settle.
12. The sew enable output is reactivated. The cycle then jumps to step 14.
13. The controller waits for activation of the sew motor ZRM.
14. The sew motor is allowed to rotate from the zero position to the specified Needle Up Position.
15. The thread lock solenoid is deactivated.
16. The Sew Enable solenoid is deactivated.
17. The speed of the sew head is immediately set to the specified Idle Speed.
18. Program execution is resumed at the next program step.

The sew head is ramped from the Idle Speed to the Needle Position Speed during the Sew Off Delay. The sew head ramp is calculated so that ramping is completed during the first 1/4 of the delay which will allow the sew head to stabilize during the remaining 3/4 of the delay. The Idle Speed is immediately reapplied without ramping to complete the cycle. A 100 millisecond delay is executed before the cycle is completed to insure that the sew head speed has settled to the Idle Speed.

Sewing is disabled from the pattern program via the M21 Miscellaneous function. In addition, M21 also disables the Constant Velocity mode of sew speed control.

Output port 2 is used as a sew motor enable. When in the off state, the sew motor enable to the drive is disengaged, preventing any motion in the sew head regardless of the voltage supplied by the CNC controller. This output will be activated only after execution of the M20 Sew Enable command and will remain active until execution of the M21 Sew Disable command. Once activated, the sew motor enable output is automatically deactivated under the following conditions.

1. The controller enters an irrecoverable fault condition via a servo overload, program format error or frame lock fault.
2. A cycle stop is generated during program execution via the STOP key or the threadbreak sensor.
3. Pattern program execution is completed. The sew motor enable is deactivated a quarter second after execution of the pattern program is completed to allow the sew head speed to settle to the Idle Speed.

2.7.3 Backtack Operations

Backtacking is an operation involving repetitive back and forth movement of the XY axes a specified Backtrack Distance while matching the sew head speed to the Cartesian speed and is performed when initiating or terminating a stitch. Backtacking occurs during sew enable and disable cycles.

Backtacking is always performed in the XY axes along the programmed path a distance specified by the Backtack Distance parameter. When backtacking occurs during a

sew enable operation, the backtack operation involves movement along the programmed path at the start of the next move after the sew enable operation, followed by reverse movement back to the starting point, followed by another forward movement along the programmed path of the next move, terminated by a second reverse movement back to the starting point. If backtacking occurs during a sew disable operation, the initial motion will be movement in the reverse direction along the programmed path at the end of the last motion block before sewing is disabled, followed by movement back to the start point along the programmed path.

Sew Disable

Backtacking will be performed at the programmed feedrate. However, due to the short backtack distances and the repetitive back and forth motion, it is unlikely that the programmed speeds will be attained. After a backtack operation during sew enable and disable cycles, the axes will be positioned at the start point of the next move at the end of the backtack, therefore there is no need to compensate the next programmed move after a sew enable or disable cycle.

The speed of the sew head will be synchronized to the current XY vector speed during execution of all backtack moves during sew enable and disable operations. Once backtacking is completed during a sew enable cycle, the sew head speed will remain synchronized to the current XY vector speed until the sew disable cycle is completed.

The backtack operation may be disabled via the system parameter Backtack Enable.

2.8 Frame Locking

The ABM system is equipped with a solenoid which releases the frame and activates the autotable to unload a pattern on completion of program execution.

This solenoid, interfaced to output port 5 must be activated whenever the axes are currently at the pattern stop position and must be deactivated whenever the axes move from the pattern stop position under program control. On power up, this output port is activated and will be activated when any one of the following operations are performed.

1. The pattern stop position is set via the SET HOME key.
2. Execution of the current active pattern program has successfully completed. This assumes that all programs position the axes to the pattern stop position as the last program command.

The autotable output is deactivated at the start of program execution in order to lock the frame prior to axes movement. The frame must be in the proper position in order to lock the frame. A frame lock proximity switch interfaced to input port 10 is used to sense whether the frame is in the proper position to be locked. This input is also used to generate a fault condition if the frame becomes unlocked during program execution.

The following cycle is performed to lock the frame when the START command is issued to begin program execution or to continue program execution after a thread break recovery cycle.

1. The controller checks if the axes are currently at the pattern stop position by examining the status of the autotable output. If this output is off indicating that the axes are not at the pattern stop position, the cycle is completed and program execution begins. Otherwise, the cycle proceeds to step 2.

2. The controller then check the frame lock input. If this input is off, the cycle proceeds to step 3. Otherwise, the autotable output is deactivated to lock the frame, followed by a 500 millisecond delay to allow the process to complete. Program execution begins once the delay is complete.

3. If the frame lock input is off, the Y axis is moved the specified FrameLock Distance at one quarter the current Rapid Travel speed while scanning the frame lock input. The autotable output is deactivated to lock the frame without stopping the XY axes as soon as the frame lock input is seen. If the specified distance is covered without the frame lock input being activated. A FRAME LOCK FAULT message is generated and program execution is aborted.

4. The controller delays for one second once the move is completed with the frame lock input being sensed.

5. The Y axis is returned to the pattern stop position at Rapid Travel Speed. Program execution begins once the Y axis has reached the pattern stop position. If the autotable output is currently active, indicating that the axes are at the pattern stop position, it will not be deactivated if the axes are jogged from the pattern stop position. If this occurs, the autotable output must be manually deactivated via the FRAME LOCK key. Otherwise, if this output is on and the axes are not at the pattern stop position when the START command is issued to begin program execution, the controller will attempt to execute the frame lock cycle even though the axes are not in the proper position to lock the frame.

The moves in the Y axis during the frame lock cycle may be suspended by pressing the HOME pushbutton.

The frame lock input is continually scanned during program execution and will generate a FRAME LOCK FAULT condition if the frame lock input is deactivated. Once a FRAME LOCK FAULT is generated, all axes motion immediately stops and the controller waits for the ESC key or a hardware reset to exit the fault.

2.9 Oil Injection

The ABM system is equipped with an oil injection pump used to lubricate the sew head. The pump operates by sending a square wave signal to the oil injector solenoid at a frequency proportional to the current rotary speed of the sew head. The controller generates the square wave signal to the oil injection system by pulsing the oil injection solenoid (Output Port 7). The frequency of the square wave generated is proportional to the current sew head speed as shown below:

$$Pf = Vs / K$$

Vs is the current sew head speed in RPM
K is a configurable constant specifying the number of revolutions of the sew head per pulse of the oil injector
Pf is the resulting frequency of the pulse output in pulses per minute

The constant K is accessible as the configurable system parameter Injection Rate. The default value of 100 revolutions per pulse will result in an output frequency of 36 pulses per minute or 0.6Hz at 3600 RPM sew speed.

As the speed of the sew head increases, the frequency of the pulses to the injection system will also increase. A new pulse rate will be determined based on the current sew speed each time output port 7 is toggled to produce the square wave signal. For example, if the current motor speed is fluctuating at 1000 RPM producing a square

wave with a frequency of 10 pulses per minute, a new pulse frequency will be determined every 6 seconds.

When sewing is enabled in the automatic mode, the pulse frequency will be clamped to a minimum value of 0.2 Hz (one pulse per 5 seconds). This is necessary to properly update the pulse frequency as the axes accelerate from a stop.

The oil injector solenoid is pulsed continuously based on the current sew speed only if the sew motor enable output (Output Port 2) is enabled. (Output 2 is automatically enabled while in the automatic mode via execution of the M20 Sew Enable function.) During automatic operations, the pulse frequency will be based on the current sew speed which in turn is based on the current axes speed if sewing is enabled. The square wave signal will be generated when in the DIAGNOSTICS menu during execution of the Sew Voltage and RPM tests only if Output Port 2 is manually activated from the DIAGNOSTICS menu.

2.10 Suspension of Program Execution

During program execution, motion may be suspended via a cycle stop command. When a stop is issued during program execution, the controller immediately decelerates the XY axes to a stop, disables the sew motor enable, thread lock and thread trim output ports and enters the cycle stop mode of operation.

There are two physical devices that will generate a cycle stop during program execution, the STOP key and the thread brake sensor. If either of these devices are activated, the controller will execute the following sequence of events.

1. The XY axes decelerate to a stop. Program execution is suspended at this point.
2. The sew motor enable, thread lock and thread trim outputs are deactivated.

The STOP key is recognized at all times during program execution and will generate a cycle stop when activated. The thread break input will generate a cycle stop when activated only if all of the following criteria are met.

1. Sewing is currently enabled.
2. A backtack operation is not being performed.
3. A sew enable or sew disable cycle is not being performed.

The thread break input will continuously change states as long as the thread is being properly fed to the sew head. The frequency at which the threadbreak input changes state is determined by the speed of the sew head which in turn is determined by the current XY vector speed. A thread break is sensed if the thread break input is in the same state for a period exceeding a delay which is determined by the current XY vector speed and the specified Thread Break Delay. The Thread Break Delay is a configurable system parameter and specifies the delay corresponding to the current Rapid Travel Speed. The actual delay is determined by continuously adding the Thread Break Delay and multiplying the specified XY vector speed by 2 until the specified Rapid Travel Speed is exceeded. For example, the Rapid Travel Speed is 1000 IPM and the Thread Break Delay is 2.5 seconds. The adjusted delay will be 5 seconds for all vector speeds from 500 to 999 IPM; 7.5 seconds for all vector speeds between 250 and 500 IPM; 10 seconds for all vector speeds from 125 and 249 IPM and so forth. The thread break input is ignored if the Thread Break Delay is set to zero or if any of the three conditions listed above are not met.

On completion of the cycle stop sequence, the operator has the option of restarting program execution at the point of suspension via the START key or initiating a thread break recovery cycle via activation of the HOME key. If the START key is pressed to continue program execution, a Sew Enable cycle is performed to enable the sew head

motor, provided that sewing was active when the STOP was issued and the SEW DISABLE OVERRIDE switch is off when the restart is issued.

2.10.1 Thread Break Recovery

Thread break recovery is initiated during a cycle stop via the HOME key. Once the HOME command is issued, a sew disable cycle without backtacking is performed provided that sewing is enabled at the time the cycle stop is issued prior to any motion, Once the sew disable cycle is completed, the XY axes are sent to the grid zero or pattern stopper position (X0Y0) via linear interpolation at the Rapid Travel Speed and the autotable solenoid is activated. Once this position is reached, the controller waits for activation of the START or RESTART keys. If the START key is pressed, the automatic frame lock cycle is executed and program execution will be restarted at the first line of the program at the specified feedrate. (If sewing is enabled at this point of the program and the Sew Enable status is ON, the speed of the sew head is ramped to correspond to the top XY vector speed of the initial move during execution of the Sew On Delay. The sew motor enable is then activated once the delay is complete.) If the RESTART key is pressed, frame lock cycle is executed and the XY axes will immediately position to the start point of the motion block in which the cycle stop was generated. The operator has the option of then pressing the START key to restart program execution at the block start point, or to backup one motion block in the program by pressing the RESTART key a second time. (The program is backed up via the RESTART key until the start point of the move that contained the thread break is reached.) If the START key was pressed, a sew enable cycle is performed to enable the sew head motor (provided that sewing is enabled at this point in the program and the Sew Enable status is ON) and program execution will resume at the programmed feedrate. If the Sew Enable status is OFF when the START command is issued, program execution will resume at the reduced Threadbreak Speed with the sew head motor disengaged and running at the Idle Speed. The threadbreak sensor will be ignored once the START command is issued until the operator issues a cycle stop at the position at which the thread broke. The operator will then set the Sew Enable status to ON via the SEW key to reenable sewing before the START command is issued to resume program execution. When the Sew Enable status is OFF to disable sewing, all programmed moves will be executed at the specified Threadbreak Speed with the threadbreak sensor disabled until a cycle stop is issued so that the system may be stopped accurately at the point of thread break. Once a cycle stop is issued and the Sew Enable status is set to ON via the SEW key, the feedrate is reset to the programmed feedrate and the threadbreak sensor reenabled. If the RESTART key is pressed again, the XY axes will position to the start point of the previous motion block. The operator may back up as many motion blocks as desired via the RESTART key all the way to the start of the program. Pressing the START key will reenable sewing by ramping the sew head speed and engaging the sew motor enable (if sewing is enabled at that point in the program and the Sew Enable status is ON) and will start program execution at the current position.

The RESTART key is active only during the thread brake recovery cycle.

2.11 Bobbin Control

Bobbin control is a process where an indicator light is illuminated when a specified amount of thread has been used to warn the operator that the sew head is almost out of thread. The CNC controller estimates the linear amount of thread used by counting the number of patterns produced or the number of sew disable cycles since the bobbin was last changed. The Bobbin control defaults to counting the number of patterns produced but the software may be changed to count the number of sew disable cycles. This is NOT a configurable parameter and can only be changed by Kurt.

The configurable system parameter Bobbin specifies the number of patterns produced or sew disable cycles executed before activation of the Bobbin indicator light. Whenever execution of the active pattern program has successfully completed, the number of patterns produced or number of sew disable cycles executed since the last bobbin change is incremented and compared to the specified Bobbin. If equal, the Bobbin output port is activated, warning the operator than the bobbin is almost out of thread. This output will remain energized until program execution is initiated via the START key at which time the number of patterns produced is cleared to zero and the Bobbin output is deactivated. The Bobbin output port is also deactivated and the number of patterns produced since the last bobbin change is cleared to zero when the RESTART key is pressed during a Cycle Stop to initiate a thread break recovery cycle. If the software is configured to count sew disable cycles, a cycle stop will be generated and the Bobbin output is activated when the specified Bobbin target is reached. The Bobbin output will remain active until program execution is restarted.

The Bobbin may be changed from both the Operator Menu and the Technician Menu. The Bobbin output is interfaced to output port 8.

2.12 Parameter Modification

The ABM system contains several parameters which may be configured via the Technician Menu. These configurable parameters include the General or System parameters which are accessed via the SYSTEM (1) selection of the PARAM sub menu, the Axes parameters accessible via the AXES (2) selection of the PARAM sub menu, the software gains accessible via the GAINS (3) selection of the PARAMS sub menu, the axes resolutions accessible via the RES (4) selection of the PARAMS sub menu and the FeedRate Override accessible via the Operator Menu.

The ABM operating system supports both **global** and **local parameters**. **Global parameters** are parameters which retain their values regardless of the operational mode of the controller until modified by the operator via the ABM operating system. The global parameters are always active when executing command level operations when the main menu is being displayed. **Local parameters** are parameters local to the current pattern program being executed. Local parameters are active only during execution of the

current active pattern programs. Local parameters are stored in pattern program memory along with the EIA pattern program code; when a pattern program is executed, the local parameters contained in pattern program memory are made the current active parameters during execution of the pattern program. Once pattern program execution is completed, the values of these parameters are set to the current global values.

The general system parameters and FeedRate Override are defined as local parameters. The axes parameters, software gains and axes resolutions are defined as global parameters. The global parameters may only be modified via the PARAMS menu selection. All global parameters are stored on disk in the configuration file ABM.SYS. This file will be rewritten to disk each time any the global parameters are modified.

Local parameters may be modified only via the EDIT menu selection of the FILES sub menu (or the Operator Menu menu selection in the case of the FeedRate Override). When a new pattern program is created via the TEACH sub menu, the current global values for the system parameters and FeedRate Override are written into pattern program memory preceding the actual pattern program code. Once a new pattern program is generated, the local parameters may be modified without affecting the values for the global parameters via the EDIT menu selection of the FILES sub menu. Once the active program is selected for editing via the EDIT option, the operator will be given the option of editing the local system parameters contained in the pattern program being edited. The method of modifying the local system parameters is identical to the method used to modify the global parameters via the PARAMS sub menu. The initial system parameter and its value will be displayed. The operator has the option of modifying the parameter value, scrolling to the next parameter or terminating local parameter modification via the ESC key. Once local parameter modification is terminated via the ESC key, the actual pattern program code will be available for editing. This process modifies only the system parameters local to the pattern program being edited and has no affect on the global system parameters accessible via the PARAMS sub menu.

The local FeedRate Override is accessible via the Operator Menu. The Operator Menu selection sets the active FeedRate Override to the local FeedRate Override and prompts for a new FeedRate Override. Modification of the FeedRate Override will change both the global FeedRate Override and the local FeedRate Override for the active program. The local FeedRate Override for all other pattern programs are unaffected.

2.12.1 Local Parameter Header

When a pattern program is uploaded from controller memory to disk after program generation or after a program is edited, both the local parameters are uploaded as the local parameter header along with the pattern program code. This will allow storage of the local parameters on disk so they may by downloaded along with the pattern program code once the program is activated from the disk directory display.

For all software revisions preceding 2.612I, the local parameter header was downloaded in a binary format. The first byte of a parameter header is the header ID and is always 0 for binary headers; the second byte of a binary header always specifies the length of the parameter header in bytes (minus the ID and length bytes). These bytes represent the parameter values directly in binary. Each parameter is represented as a 2 byte (lsb then msb) binary value.

For all software revisions proceeding and including 2.612I, the parameter header is downloaded in ASCII format. The parameter header ID byte is always 1 for ASCII headers. The remaining parameter header is represented in Hex-ASCII format. Four Hex-Ascii characters are required to represent a two byte value; since all local parameters are two bytes in length, each parameter including the header length must be represented as a four character Hex-ASCII string. Each 4 character Hex-ASCII string is terminated by a Carriage Return. The Hex-ASCII string represents the parameter value in Hexadecimal; for example 64 represents the decimal value 100, 2F represents the value 47. The first string of the ASCII header proceeding the header ID represent the number of parameters contained in the header (as opposed to the actual length of the header). All strings proceeding this string represent the Hexadecimal value of the next local parameter.

The exact number of parameters contained in the parameter header depends on how many local parameters were supported when the pattern program was generated and uploaded to the host. There are a total of 28 local parameters for the current three axis software revision (27 general parameters plus FeedRate Override). The parameter header is valid only as long as the number of local parameters does not change; if future software revisions add or delete local parameters, the parameter header must be ignored when downloading the pattern program back to the controller.

The local parameter header need not be present when a program is downloaded from host to the controller. In fact, a program generated at the host CAD system will not contain a parameter header when initially downloaded to the controller. The presence of a parameter header is determined by the first byte of the program file. If this byte is an ASCII value, the file contains no parameter header and the local parameters will be set to the global parameter values. If the initial byte of the file is zero, the file contains a binary header. The next byte of a binary parameter header contains the header length. If this value is different than the header length supported by the current software revision or if the current software revision supports ASCII parameter headers (All revisions proceeding and including 2.612I support ASCII headers), the binary header will be ignored and the local parameters will be set to the global parameter values.

If the initial byte of the program file is one, the file contains an ASCII header. The next string represents the number of local parameters contained in the parameter header. If this value is different than the number of local parameters supported in the current software revision, the ASCII header will be ignored and the local parameters will be set to

Curve Angle Approach

The Curve Angle Approach determines when the axes decelerate to execute a sharp corner during program execution with Constant Velocity mode disabled and specifies the maximum discontinuity between motion blocks allowed before the axes will decelerate to the specified Corner Speed to execute a sharp corner. The units of the Curve Angle Approach is degrees and the default value is **30 degrees.**

Quality

The Quality parameter determines whether a circular move is radius clamped and specifies the maximum allowed rotation speed of the arc which in turn depends on the radius of the arc and the programmed feedrate. The Maximum Radial Speed is only active during program execution when the Constant Velocity mode of sew speed control is disabled. The units of the Maximum Radial Speed is in radians per minute and the default value is **150 radians per minute.**

Sttches per Inch

The Stitches per Inch is used when determining the sew head speed during sew enable conditions and specifies the desired number of stitches per inch of XY travel. This parameter is used to determine the sew head speed, in RPM from the current XY vector speed in IPM. This parameter is also used to determine the minimum distance of a program block. If the distance of a program block is less than the distance of one stich, the program block will be ignored and will be added to the next program block. The default value is **5 stitches per inch.**

Needle Up Position

The Needle Up Position is used during the sew disable cycle after the thread trim cycle for locating the sew motor position prior to disabling the sew enable output at the end of the cycle. Once the thread trim cycle is complete and the sew enable output reactivated, the ZRM of the sew motor is searched. Once found, the sew motor is allowed to rotate the specified Needle Up Position before deactivating the sew enable output. The default value is **35 degrees.**

Idle Speed

The Idle Speed is the speed of the sewhead in RPM during manual operations or during automatic operations when sewing is disabled and is also the minimum sew head speed allowed during automatic operations with sewing enabled. The default value **0 RPM.**

The Sew Ramp is the acceleration and deceleration ramp used during the DIAGNOSTICS Sew RPM Test to ramp the sew motor from the current speed to the specified sew speed and to ramp back to the idle speed once the DIAGNOSTICS mode is exited. The default value is **15 RPSS.**

The Scale is used to scale all programmed moves by a specified amount, either expanding or shrinking the pattern. The units of the Scale is .1% (1000 = 100% scale). The default value is 1000.

Threadbreak Speed

The Threadbreak Speed is the speed at which all programmed moves are executed when the sew Disable Override toggle switch is in the on position. This speed will remain in affect until suspended by a cycle stop. The move will be executed at the programmed speed once the restart command is issued only if the Sew Disable Override switch is turned off. The units of Threadbreak Speed is inches per minute. The default value is **200 IPM.**

Corner Accel

The Corner Accel is the acceleration ramp used when accelerating the XY axes during program execution with Constant Velocity mode disabled between moves that are not radius clamped. The units of Corner Accel is inches per second per second (IPSS). The default value is **15 IPSS.**

Corner Decel

The Corner Decel is the deceleration ramp used when decelerating the XY axes during program execution with Constant Velocity mode disabled between moves that are not radius clamped. The units of Corner Decel is inches per second per second (IPSS). The default value is **15 IPSS.**

Contour Accel

The Contour Accel is the acceleration ramp used when accelerating the XY axes during program execution with Constant Velocity mode disabled between moves that are radius clamped. The units of Contour Accel is inches per second per second (IPSS). The default value is **10 IPSS.**

Contour Decel

The Contour Decel is the deceleration ramp used when decelerating the XY axes during program execution with Constant Velocity mode disabled between moves that are radius clamped. The units of Contour Decel is inches per second per second (IPSS). The default value is **15 IPSS.**

Sew Ramp

Needle Position Speed

The Needle Position Speed is the speed of the sew head in RPM applied to the sew head motor during a sew disable cycle. The default value is **50 RPM.**

Sew On Delay

The Sew On Delay is the delay in units of milliseconds that is preformed from the time the Sew Enable output (O2) is activated to the end of the dew enable cycle. This delay is necessary to allow the sew head motor to come to the proper speed before XY motion is allowed. The default value is **500 (.5 second).**

Sew Off Delay

The Sew Off Delay is the delay in units of milliseconds that is preformed from the time the Nominal Sew Head Speed is applied and the time the thread lock solenoid is activated during a sew disable cycle. The default value is **300 (.3 second).**

Thread Trim Delay

The Thread Trim Delay is the delay in units of milliseconds that is performed between the time the thread trim solenoid is enabled and disabled during a sew disable cycle. The default value is **1500 (1.5 second).**

Voltage Spike Suppressor

The Voltage Spike Suppressor is the adjustable software filter used to filter noise when reading all input ports (with the exception of the thread break sensor) and is the length, in milliseconds that the input must be continuously activated before the controller will recognize the active input. The default value is **40 (.040 seconds).**

Thread Break Delay

The Thread Break Delay is the length, in milliseconds that the thread break input must be continuously activated or deactivated before the controller will recognize a thread break when the axes are running at the specified Rapid Travel Speed. The default value is **1500 (1.5 seconds).**

Backtack Distance

The Backtack Distance is the distance in units of .001 inches that the XY axes move along the programmed path when executing a backtack operation during sew enable and sew disable cycles. The default value is **500 (0.500 inch).**

FrameLock Distance

The FrameLock Distance is the distance in units of .001 inches that the Y axis moves when executing a frame lock cycle during initiation of program execution. The default value is **3000 (3 inches).**

Injector Rate

The Injector Rate is used in conjunction with the current sew head speed to determine the pulse frequency of the oil injector solenoid and specifies the number of revolutions of the sew head per pulse of the oil injector solenoid. The default value is **1500 revolutions per pulse.**

Bobbin

The Bobbin is the number of patterns that must be produced before the Bobbin output port (O8) is activated. The default value is **3 patterns.**

Backtack Enable

The Backtack Enable is used to enable or disable the backtack cycle during sew enable and disable cycles. If set to 0, backtacking is disabled during these cycles; if set to a nonzero value, backtacking is enabled. The default value is **1 (Backtack enabled).**

Thread Trim Enable

The Thread Trim Enable is used to enable or disable the thread trim cycle during sew disable cycles. If set to 0, thread trimming is disabled during the sew disable cycle; if set to a nonzero value, thread trimming is enabled. The default value is 0 (Backtack disabled).

All of the above system parameters are configurable from the manual mode via the PARAMS sub menu selection of the Operator Menu. The Scale and Bobbin are also configurable from the Operator Menu, although changes made from the Operator Menu will not be saved to disk..

The axes parameters are also configurable via the PARAMS sub menu selection. Axes parameters affect the speeds and ramp.

2.12.3 Separate Axes Resolutions

The ABM system supports separate axes resolutions for the X, Y and Z axes. The axes resolutions are configured via the PARAMS sub menu selection, Upon selection of the RES entry of the sub menu, the operator will be prompted to enter the resolution of the X, Y and Z axes respectively. The X and Y axes resolution are entered in units of encoder pulses per inch; the SEW (Z) axis resolution is entered in units of encoder pulses per revolution.

The default axes resolutions

X AXIS: 18200 pulses per inch
Y AXIS: 7630 pulses per inch
Z AXIS: 10000 pulses per revolution .

2.13 Program Execution

Program execution is initiated from the manual mode via the following sequence:

1. The axes are sent to the pattern stop position via the HOME key.
2. The desired pattern program is activated or an appended file created via the LOAD DESIGN option and the proper FeedRate Override set via the SPEED option of the Operator Menu.
3. The START key is pressed to begin program execution.
4. The local parameters contained in the pattern program parameter header are transferred as the active parameters.

2.13.1 Selection of pattern Program for Execution

Prior to executing a pattern program, the desired program or programs must be selected as the active file for program execution. The ABM system has the capability of executing two types of files.

1. A file which consists of a single pattern program residing on disk.
2. An appended file which consists of a series of pattern programs residing on disk.

Single programs must be activated for program execution via the directory display command by scrolling to the desired program name and activating the program by pressing the ENTER key. The ABM.SYS configuration file residing on disk also contains the current active program name; whenever a single program is activated, the configuration file will be updated and rewritten to disk.

An append file consisting of a series of pattern programs also must be created via the directory display command. The operator selects the programs to append by scrolling through the directory display and selecting the programs to append by pressing the INSERT key. Once multiple programs are appended by this method, the programs will be executed in the order in which they were selected when program execution is initiated.

Once a program append file is created via the directory display command, execution of the RUN command will display the appended file name as the file name APPENDED.

A maximum of ten pattern programs may be appended. If the operator attempts to append additional programs, the controller will exit the directory display command with the first ten programs selected contained in the append file.

The append file consists of a list of pattern program names which are executed in order once the START key is pressed. The append file is not available for program editing, however the individual pattern programs specified by the append file may be edited via the EDIT option.

Once a program is activated or an appended file is created, it remains active until a new program is activated even if power to the controller is removed.

2.13.2 Execution of the Active Program File

The active program file consisting of a single pattern program or an appended series of pattern programs may be executed at any time by pressing the START key. The operator may wish to disable the sew on and off cycles via the SEW key prior to issuing the START command. This is desirable when executing a program for the first time to check the validity of the program.

All programs will be executed starting at the pattern stop position as determined by manually jogging the axes and setting the pattern stop position via the SET HOME key. The ABM system is not equipped with home switches and does not support commands to home the axes to a machine home position.

On execution of a program, the controller automatically activates the sew inhibit relay as required by the program.

Programs will be executed at the specified feedrate under all conditions with the excel. A sharp corner is detected by the controller via its lookahead scheme. The X and Y axes will decelerate to a stop at the corner and accelerate back to the specified programmed speed. The criteria for sharp corner detection is an adjustable system parameter. During acceleration of the XY axes, the sew head will also decelerate to maintain the linear relationship between head speed and XY speed.

2. The Constant Velocity mode of sew speed control is enabled via the Miscellaneous function M22. In this mode, the programmed speed of the XY axes is set to the parametric Constant Speed regardless of the current feedrate specified via the F code or the current default speed specified by the parametric Default Speed. The specified Curve Angle Approach is overridden to a value of 45 degrees while in the Constant Velocity mode.

3. The speed of a circular move is limited by the Quality parameter while in the normal mode of sew speed control. This is necessary for cases such as a 90 degree corner replaced by a 90 degree arc of small radius. Since there are no sharp corners detected by the controller, the controller will try to execute the 90 degree arc at the specified feed. as the radius of the 90 degree arc becomes smaller, it becomes more difficult to maintain the pattern at high speed. The Quality allows the operator to clamp the speed of all arcs based on the rotary and not the Cartesian speed of the arc. Since this is a configurable system parameter, it can if affect be disabled by entering an extremely large value. The controller utilizes the Contour Accel and Contour Decel ramps if the speed of a circular move is limited by the Quality. The feedrate of circular moves is limited by the Quality only when the normal mode of sew speed control is enabled. If the Constant Velocity mode of sew speed control is enabled via M22, the speed of circular moves are no longer limited by the Quality.

4. The speed of all moves is limited by the block update rate of the controller. This generally affects small moves at high speeds. The block update rate for the controller is approximately 800 milliseconds, which means that all moves will be executed in a minimum of 800 milliseconds. This corresponds to 1 inch of travel at 12 inches/second. All motion blocks less than 1 inch is vector distance will be executed at reduced speed. This should not be a problem with the ABM system, since the patterns do not show the complexity requiring motion blocks every 1 inch. This is especially true if the programs are developed on a scaled down pattern and then scaled up on program execution. The controller will not execute motion blocks which specify a linear distance of less than one stitch in length but will tag these small moves to the beginning of the next move. This is necessary in order to prevent slowdowns due to execution of very small moves which are inserted by the host CAD system between motion blocks to guarantee that the motion blocks are continuous. In general, these moves inserted by CAD systems are less than .01 inch so the visual affect of ignoring these small moves will be very minimal. These small blocks are ignored by maintaining the programmed endpoints of the last record executed; if a block is ignored, the endpoint coordinates are not updated. This does not present a problem if blocks are ignored before linear moves; however if a block is ignored before a circular move, the programmed end and center points and the start point of the arc may no longer define an arc. The controller will compensate by slightly adjusting the center point coordinates so that the three points defile an arc. Since the start and end points of the arc are not adjusted and the adjustment to the arc center point is small, the visual affects will again be minimal. The minimum distance of a motion record is determined by the length of a single stitch which in turn is determined by the Stitches per Inch parameter.

2.13.3 Maintaining the Current Production Count

The controller maintains a current production count which is incremented each time a pattern program is successfully completed. This production count is displayed when in the Manual Mode and specifies the total number of patterns completed since the

current pattern program was activated for program execution. The current production count is cleared to zero when a single pattern program is activated or when an appended program file is generated from either the Operator or Technician Menus.

If an appended pattern program file is currently active for program execution, the production count is not incremented until the last pattern program in the program append list has been executed.

2.14 Program Generation

All new pattern programs are generated via the **TEACH menu** as either **Manual Data Input (MDI)** or **digitized programs**. The operator will be initially prompted for entry of the pattern program name; program names are limited to 15 characters and cannot contain any DOS extensions or wildcard character. All pattern program files stored on disk will have file names ending in the .PAT extension; the controller will automatically extend the file names to include the .PAT extension when storing to disk. Because of limitations in the Christie disk drive interface, it is highly recommended that all file names have the same number of characters. For example, if two files with names TWIN.PAT and TW.PAT are on disk, it is probable that the disk will find the TWIN.PAT file when it was asked to find the TW.PAT file. This is a limitation in the disk operating system and cannot be remidied by CNC controller software.

The controller must accept programs generated by one of the following methods:

1. Manual program entry from the keyboard.
2. Program digitization, where the axes are manually moved around the pattern by jogging and critical points of the pattern are entered. This mode of program generation is also called Teach and Learn
3. Programs developed on a PC via a compatible CAD system and stored on disk.

Manual program entry is useful only for very short programs. Teach and Learn will create EIA compatible patterns. Teach and Learn will generate programs in the absolute programming format to reduce errors due to backlash of the gear box. This is easily complished by referencing all axes coordinates to the pattern stop (grid zero) position during the teaching process. There must be some means of generating sew enable and disable program commands during Teach and Learn. This is easily accomplished by dedicating alphabetical keys to generate the appropriate sew enable and disable commands. The S key is dedicated to generating the sew enable command (M20); the N key is dedicated to generating the sew disable command (M21). The M functions to enable and disable the Constant Velocity mode do not have dedicated keys and must be entered manually.

When Teach and Learn is initiated, the controller defaults to the sew disable condition. When sewing is disabled, all motion commands digitized will be written as linear rapid travel (G00) commands. This means that commands to specify the mid point

of an arc will be ignored in the sew disable condition. Once sewing is enabled via the S key command, all digitized moves will be written as linear (G01) commands if an endpoint command is issued or as circular (G02, G03) commands if a mid point command, followed by another mid point or endpoint command is issued.

Whenever a G00 rapid travel command is taught, the endpoint of the rapid travel command is saved as a close point. This close point may be selected as an end point of a linear or circular move via dedicated commands. This allows the operator to 'close' a pattern back to its initial starting point exactly without having to reteach the initial start point. It is virtually impossible to reteach this start point at the exact coordinates at which it was first taught.

During Teach and Learn, all points are entered via single dedicated alphabetical keys of the HHT. The E key is used to enter end points for linear and circular blocks; the I key is used to enter mid points of circular blocks and the C key is used to define the end point of linear and circular block as the current close point coordinate.

Teach and Learn is terminated by pressing the ESC (End of Job) key at the terminal. The controller will automatically insert a M21 (Sew Disable) command followed by a G00X0Y0 command to return to the pattern stop position before generating the M02 end of program command. All taught programs must terminate is a sew enable condition.

During Teach and Learn, the current step number will be displayed at line 3 and the step number of the previous program block will be displayed at line 4.

For more details on program digitization, refer to the ABM Instructions on Program Generation.

Once program generation is completed, the pattern program is stored to disk under the specified file name (with the .PAT extension added) and is also made the current active program. If the program already exists, the operator will be prompted with the following message:

FILE EXISTS
REWRITE? (Y/N)

If the operator responds with Y, the new file will replace the existing file; if the response is N, the operator will be reprompted for entry of the file name before the pattern program is stored on disk.

Programs generated on a host PC and stored on disk must be generated in the EIA format. The Quick Cam system with G code compiler is an acceptable CAD package. Any CAD package can be used as long as it generates EIA compatible programs. The following are the specifications of the controller when setting up the CAD system:

End of Block Character	Carriage return
End of Text Character	ASCII 03H
End of Program Function	M2
End Point Coordinates	absolute
Center Point Coordinates	absolute

In addition, there may be other parameters that need to be properly set up. This will become clearer as more information on the CAD systems becomes available.

All programs generated by a host PC must include step numbers (N) for all program steps. The controller will ignore all characters in a pattern program file until the program step command (N) is received.

All programs generated on a host PC and stored on disk must have file names ending with the .PAT extension. The CNC controller recognized only those files containing the .PAT extension as EIA pattern program files.

2.15 Download of pattern Programs from Disk

When programs are downloaded to the controller from disk during the initial boot up or after program activation, the controller will automatically insert the M20 and M21 sew enable and disable commands based on the presence of G0 rapid travel moves which are always executed with sewing disabled, provided that the M20 and M21 commands are not present in the pattern program. The following are the rules that the controller follows when inserting an M20 or an M21 command to insure that all rapid travel moves are executed with sewing disabled.

1. If the current line being downloaded contains a G00 rapid travel command, an M21 sew disable command is inserted as a separate line before the line containing the G00 move, provided that an M21 command does not already precede the G00 command. The exception is the first G00 move of the pattern program.
2. If the previous line downloaded contains a G00 rapid travel move, an M20 sew enable command is inserted as a separate line between the line containing the G00 command and the current line being downloaded provided that an M20 command does not already proceed the G00 command.
3. The controller will insert an M21 command followed by a G0X0Y0 command to return to the pattern stop position whenever an M02 end of program command is encountered provided that these commands do not already directly precede the M02 command. All programs generated at the host PC should always terminate in a sew enable condition.

Since the M20 and M21 commands are inserted as separate lines, the step number used for these commands is the step number of the line proceeding the inserted command minus 1. This requires that the CAD system generates step numbers with an auto

increment of more than one so that the decremented step number of the inserted line still represents a unique step number.

The CNC controller automatically inserts the ETX (End Of Text) character after the M02 (End Of Program) function. All pattern programs downloaded to the CNC controller must be terminated by the M02 command.

3.0 COMMUNICATIONS DETAILS

The ABM systems will be provided with three RS-232 ports, one for communication with the rack mount display and keyboard, one for communication with an optional Hitachi or compatible digitizer tablet, and one port, referred as the DNC port interfaced to the Christie disk drive.

3.1 RS-232-C Specification

The rack mount display/keyboard serial port configuration is shown below:

Baud Rate	9600
Stop Bits	2
Start Bits	1
Data Bits	7
Parity	none

The rack mount display/keyboard must be interfaced to J9 of the CNC controller board.

The disk serial port configuration is shown below:

Baud Rate	2400
Stop Bits	1
Start Bits	1
Data Bits	8
Parity	none

Tx, Rx and ground lines will be supported. XON and XOFF will be supported only by the DNC serial port. No communications protocol other than a straight ASCII dump to the DNC port will be supported.

The disk port must be interfaced to J12 of the CNC controller board.

4.0 INPUT/OUTPUT PORT DETAILS

The standard 16 input/8 output I/O daughter board will be used in the ABM system. The 16 input ports are numbered 1-16 and the 8 output ports are numbered 1-8.

The following is a list of the input ports and their functions.

Input Port	Function
1	Thread break sensor
2	Spare
3	Spare
4	Spare
5	Spare
6	Spare
7	Spare
8	Spare
9	Spare
10	Frame Lock proximity sensor
11	Spare
12	Spare
13	Spare
14	Spare
15	Spare
16	Spare

All inputs must be at a low (on) state normally and in the high (off) state when activated.

The following is a list of the output ports and their function.

Otput Port	Function
1	Spare
2	Sew Motor Enable
3	Thread Trim solenoid
4	Fault Indicator
5	Autotable solenoid
6	Thread Lock solenoid
7	Oil Injection solenoid
8	Bobbin indicator

The solenoid outputs will be normally high (off) and will be low (on) to activate the solenoids. All outputs are optically isolated.

4. Typ - Type 6432 — Detaljlista - Bestandteilliste - Parts List

Komplement till ritning nr 17560 - Komplement zum Zeichnung Nr 17560 - Complement to drawing No 17560

Pos.	Svenska	Deutch	English
1	Rörprofil	Rohrprofil	Profile
2	Inre löpare	Lastträger	Load carrier
3	Stödring	Stützringe	Support ring
4	Glidskena	Gleitschiene	Bearing strip
5	Magnethus	Magnetgehäuse	Magnet housing
6	Magnet	Magnet	Magnet
7	Gavel, driv	Deckel, Antriebsseite	End cap, drive
8	Kuggrem	Zahnriemen	Timing belt
9	Klämplatta	Untere Klemmplatte	Clamping plate
10	Överfall	Obere Klemmplatte	Clamp
11	Axel, driv	Achse, Antriebsseite	Shaft, drive
12	Axel, löp	Achse, Umlenkseite	Shaft, run
13	Kullager	Kugellager	Ball bearing
14	Remhjul	Zahnscheibe	Beltwheel
15	Spännstift	Spannstift	Tension pin
16	Lagerenhet	Lagereinheit	Bearing housing
17	Gavel, löp	Deckel, Umlenkseite	End cap, run
18	Cylindrisk pinne	Führungsstift	Parallell pin
19	X-ring	X-Ring	X-ring
20	O-ring	O-Ring	O-ring
21	Bandlås, yttre	Klemmstück, aussen	Bandlock, outer
22	Standardfäste	Lastbefestigung	Carrier mounting
23	O-ring	O-Ring	O-ring
24	Avstrykare	Abstreifer	Scraper
	Skruv	Schraube	Screw
26	Stoppskruv	Stoppschraube	Stopscrew
27	Gavelskruv	Deckelschraube	End cap screw
28	Skruv	Schraube	Screw
29	Yttre band	Äusseres Band	Outer band
30	Radialtätning	Radialdichtung	Radial seal
31	Täckplatta	Deckplatte	Cover plate
35	Skruv	Schraube	Screw

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Ändringar förbehålles
Änderungen vorbehalten

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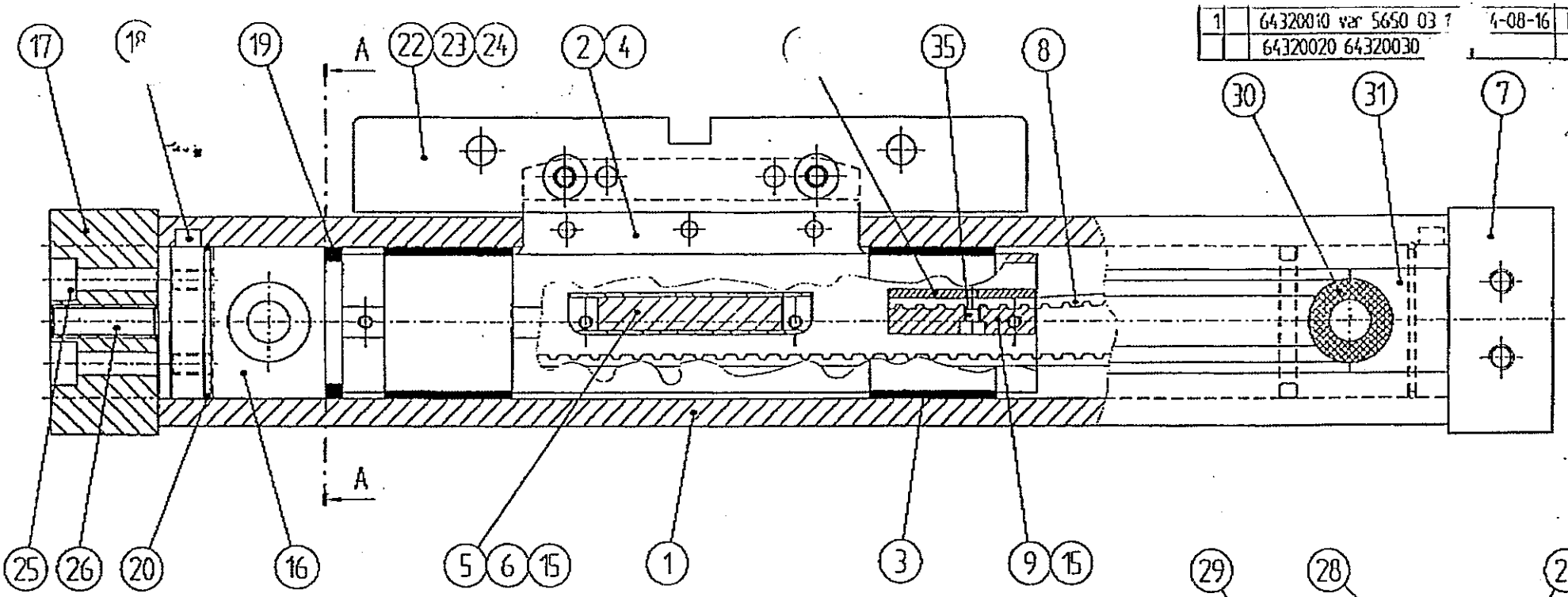
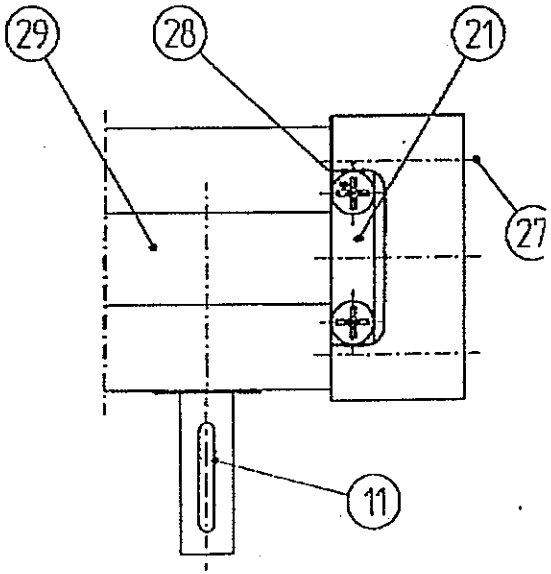
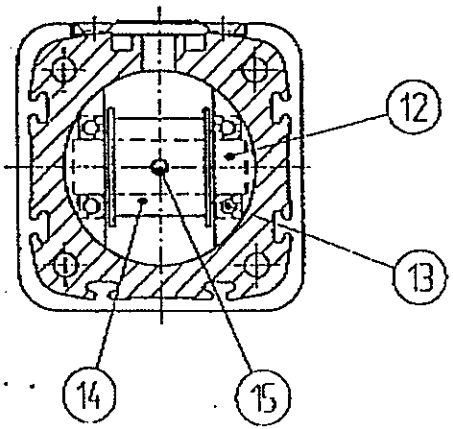
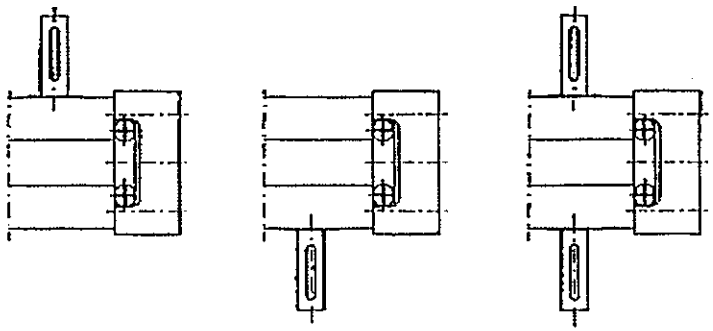
	64320020 64320030			







SNITT A-A



64320010 64320020 64320030

1

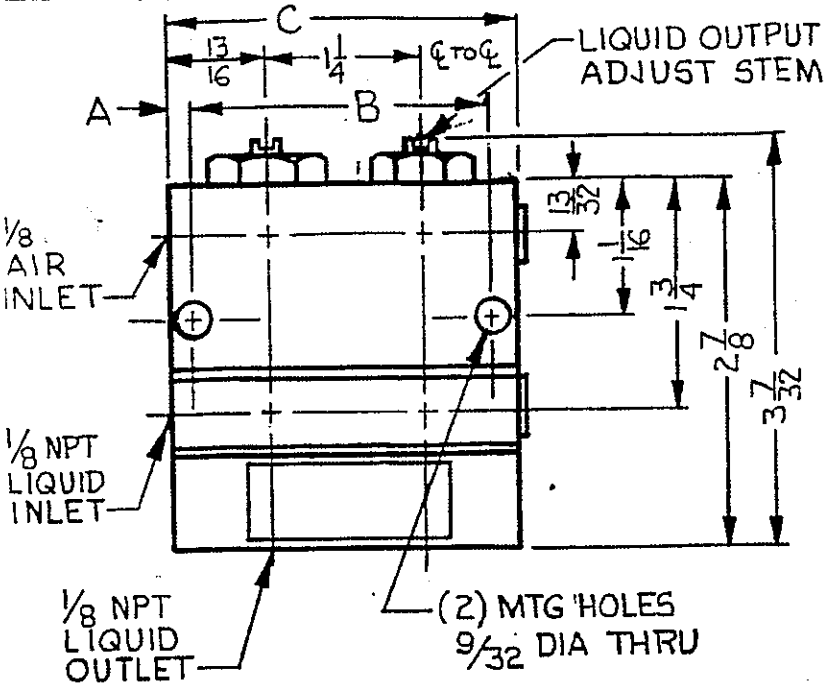
Delar	Ant.	Beräkning		Material	Modul Antal Dimension	Anm.		
Konstr. SOS	Ritad LK	Kop	Kontr.	Stand.	Ändr.	Skala 1:1	Ersatter	Ersatt av
E-Line Origa AB			LINEAR ACTUATOR 6432 LINJÄRENHET 6432			Filnamn 17560	Dat. 93-11-2	
						Ritnr 17560		

5. Typ - Type 6450 — Detaljlista - Bestandteilliste - Parts List

Komplement till ritning nr 17712 - Komplement zum Zeichnung Nr 17712 - Complement to drawing No 17712

	Svenska	Deutch	English
1	Rörprofil	Rohrprofil	Profile
2	Inre löpare	Lastträger	Load carrier
3	Stödring	Stützringe	Support ring
4	Glidskena	Gleitschiene	Bearing strip
5	Magnethus	Magnetgehäuse	Magnet housing
6	Magnet	Magnet	Magnet
7	Gavel, driv	Deckel, Antriebsseite	End cap, drive
8	Gavel, löp	Deckel, Umlenkseite	End cap, run
9	Kuggrem	Zahnriemen	Timing belt
10	Klämplatta	Untere Klemmplatte	Clamping plate
11	Överfall	Obere Klemmplatte	Clamp
12	Axel, driv	Achse, Antriebsseite	Shaft, drive
13	Axel, löp	Achse, Umlenkseite	Shaft, run
14	Remhjul	Zahnscheibe	Beltwheel
15	Lagerenhet	Lagereinheit	Bearing housing
16	Cylindrisk pinne	Führungsstift	Parallell pin
17	Kullager	Kugellager	Ball bearing
18	Spännstift	Spannstift	Tension pin
19	Spännstift	Spannstift	Tension pin
20	X-ring	X-Ring	X-ring
21	O-ring	O-Ring	O-ring
22	O-ring	O-Ring	O-ring
23	Standardfäste	Lastbefestigung	Carrier mounting
24	Avstrykare	Abstreifer	Scraper
25	Bandlås, yttre	Klemmstück, aussen	Bandlock, outer
	Yttre band	Äusseres Band	Outer band
27	Radialtätning	Radialdichtung	Radial seal
28	Täckplatta	Deckplatte	Cover plate
29	Gavelskruv	Deckelschraube	End cap screw
30	Stoppskruv	Stoppschraube	Stopscrew
31	Skruv	Schraube	Screw
32	Skruv	Schraube	Screw
33	Skruv	Schraube	Screw
34	Skruv	Schraube	Screw
35	Fjäderbricka	Federscheibe	Elastic washer

© 1995 E-Line Örlga AB
Ändringar förbehålles
Änderungen vorbehalten
Subject to alteration



ASSY NO. B-2800	-1	-2	-3	-4	-5	-6
NO. FEEDS	1	2	3	4	5	6
A ±.007	3/16	← 1 7/16 →				
B ±.007	1 1/4	2 1/2	1 1/4	2 1/2	3 3/4	5
C ± .015 .007	1 5/8	2 7/8	4 1/8	5 3/8	6 5/8	7 7/8

ASSY NO. B-2800	-7	-8	-9	-10	-11	-12
NO. FEEDS	7	8	9	10	11	12
A ±.007	1 7/16	2 11/16		3 15/16		5 3/16
B ±.007	← 5 →					
C ± .015 .000	9 1/8	10 3/8	11 5/8	12 7/8	14 1/8	15 3/8

I) INSTALLATION:

A. Mounting:

Two 9/32 dia mounting holes thru body. Secure to flat surface. Pump may be mounted in any position (such as upside down).

B. Air and Liquid Connections:

1. Attach suction line to 1/8 NPT liquid inlet.
2. Attach discharge line(s) to 1/8 NPT liquid outlet(s).
3. Attach air line to 1/8 NPT air inlet.

II) OPERATION:

A. Start up procedure:

1. Fill reservoir with solution to be pumped.
2. Set the air cycle rate and air pressure.
3. Set liquid output using adjust stem.
4. Pump is ready to operate.
5. For faster start-up, prefill lines.

NOTE: START UP PROCEDURE MUST BE DONE IN A CLEAN ENVIRONMENT.

A-5136 O-RING INSTALLATION TOOL
5150 SEAL KIT
A 244 ASSY TOOL

B. Liquid output adjustment:

1. Use the adjust stem atop each feed in conjunction with the air cycle rate. Individual conditions may vary.
2. Each clockwise turn of the adjust stem reduces output per cycle by:

.002 in^3/.03cc/.001 oz/1.78 (1/8 dia) drops.

3. Max output, per cycle, per feed, with adjust stem backed all the way out:

.012 in^3/.20 cc/.007 oz/12 (1/8 dia) drops.

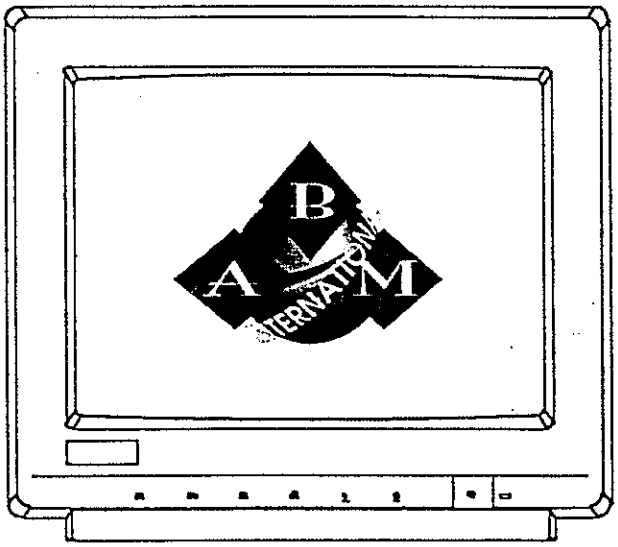
SPECIFICATIONS:

AIR PRESSURE REQUIRED: 40 PSI MIN.
OPERATING TEMP: −15 TO 180°F.
SEALS: BUNA/VITON STANDARD.
OTHER MAT'LS: ALUM., BRASS, MUSIC WIRE, STAINLESS STEEL, PLATED STEEL.

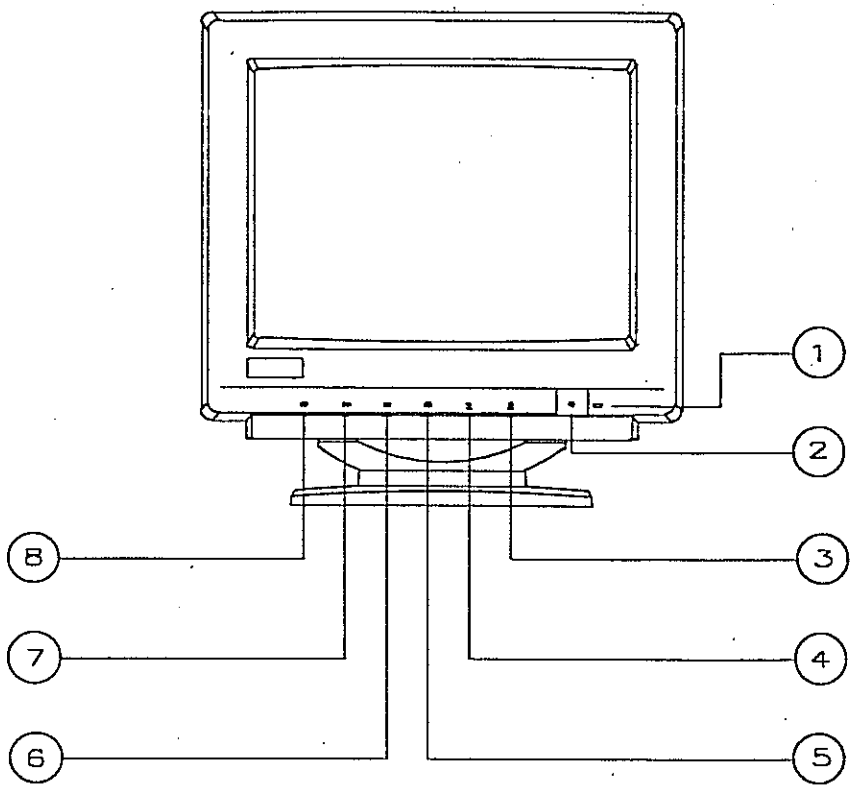
REV	CO NO	CHANGE	BY DATE APVD
C	10958	ADDED "CLEAN" NOTE	JR 4-28-95 SW
B	10259	CHANGED DIMENSIONS	JR 6/16/93 SW
A	10134	REDRAWN	JR 1/21/93 SW

SCALE :	DATE	Installation & Operation Instructions Air Injector Pump Assy B-2800 Style DG	A-5275	REV. C 4-28 95
DRAWN : JR	1/21/93			
CHK'D :			CLASS	
APP'D : SW	1-22-93			

Color Touchscreen Operating Information



USER'S CONTROLS



'1) POWER INDICATOR
Dual color LED for indication of different power draw status. Green LED is lit in normal operation, while amber LED color indicates power-saving mode.

(2) POWER SWITCH

(3) BRIGHTNESS CONTROL

(4) CONTRAST CONTROL

(5) VERTICAL PHASE CONTROL

(6) VERTICAL SIZE CONTROL

(7) HORIZONTAL PHASE CONTROL

(8) HORIZONTAL WIDTH CONTROL

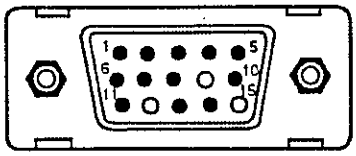
POWER SAVE NOTE
This monitor is equipped with automatic power-saving circuitry design which will work with any computer unit following the VESA DPMS detection format, and it meets ENERGY STAR^{SM} low power state definition. When first power on and input signal into the monitor, the power save function remains in active, the function will then be triggered when the input signal is cut off by the computer itself, or loss of signal input afterwards.

PRESET MODES

Display Format Abbildungsformat Format d'affichage	VGA			1)VESA	2)VESA	3)VESA	4)VESA	8514A	NI
Horizontal Dots Horizontal Pixel Point d'images horizontaux	640			640	800	800	800	1024	1024
Vertical Lines Vertikal Pixel Lignes verticales	350	400	480	480	600	600	600	768	768
Horizontal Frequency Horizontalfrequenz Fréquence de ligne	31.5KHz			37.8KHz	35.2KHz	37.9KHz	48KHz	35.5KHz	48.89KHz
Vertical Frequency Vertikalfrequenz Fréquence verticale	70H	70H	60H	72Hz	56Hz	60Hz	72Hz	87Hz	60Hz

PIN ASSIGNMENTS

D-SUB TYPE 15P



PIN (Broche)	COLOR (Couleur)	PIN (Broche)	COLOR (Couleur)
1	Red Rot Rouge	9	No-Connection Nicht belegt Aucune connexion
2	Green Grün Vert	10	Ground Erde Masse
3	Blue Blau Bleu	11	Ground Erde Masse
4	Ground Erde Masse	12	No-connection Nicht belegt Aucune connexion
5	No-connection Nicht belegt Aucune connexion	13	H. Sync H-Sync Synchr. horiz.
6	Red Rtn Rot Zurück Rouge(retour)	14	V.Sync V-Sync Synchr. vertic.
7	Green Rtn Grün Zurück Vret (retour)	15	No-Connection Nicht belegt Aucune connexion
8	Blue Blau Bleu		

USER'S SPECIFICATIONS

Picture Tube:	35.5cm/14 inches, 0.28mm Dot Pitch, (Low Radiation/ Anti-Static/Anti-Magnetic for LR model only)				
Scan Freq.:	30 ~ 50KHz, Horizontal				
	50 ~ 90Hz, Vertical				
Resolution:	1024*768(60Hz), maximum				
Power Supply:	AC 100V to 250V, 50/60Hz (Automatic)				
Power Consumption:	80W max. (<30W in power-saving mode)				
Dimension:	352 (W) x 366 (H) x 372 (D)mm				
	13.8(W) x 14.4(H) x 14.6(D) inches				
Weight:	11Kgs / 24.2lbs				
Environmental:	Operating	Temperature	0°C	to	40°C
		Humidity	20%	to	80%
	Storage	Temperature	-20°c	to	60°C
		Humidity	10%	to	90%

Bildröhre	35,5 cm, 0,28 mm Pixelgröße, (strahlungsarm, Anti-Statik, Anti-Magnetisch für , LR Model)				
Abtastfrequenz	30 ~ 50 KHz horizonal				
	50 ~ 90 Hz vertikal				
Auflösung	1024 x 768 (60 Hz) maximal				
Stromversorgung	AC 100 V bis 250 V, 50/60 Hz (automatisch)				
Stromverbrauch	80 W < 30 W in Stromsparmodus				
bmessungen	352 (B) x 366 (H) x 372 (T) mm				
Gewicht	11 kgs				
Umgebungsbedingungen	Betriebstemperatur		0°C	bis	40°C
	Feuchtigkeit		20%	bis	80%
	Lagerungstemperatur		-20°C	bis	60°C
	Feuchtigkeit		10%	bis	90%

Tube de l'image:	35,5 cm/14 pouces; distance interligne de points 0,28.(Radiation basse/anti-statique/anti-magnétique seulement pour ,LR)				
Fréquence d'analyse:	30 à 50 Hz, horizontale				
	50 à 90 Hz, verticale				
Résolution:	1024x768 (60 Hz), au maximum				
Alimentation électrique:	100 V à 250 V, courant alternatif; 50/60 Hz (automatique)				
Consommation d'énergie:	80 W; í+ 30 W en mode de power-saving				
Dimensions: mm:	352 (largeur) x 366 (hauteur) x 372 (longueur);				
pouces:	13.8 (largeur) x 14,4 (hauteur) x 14.6 (longueur)				
Poids:	11 kgs / 24.2 livres				
Milieu:	Température de service opérationnelle:		0°C	à	40°C
	Humidité		20%	à	80%
	Température pour entreposage:		-20°C	à	60°C
	Humidité:		10%	à	90%

USER'S HANDY TROUBLE-SHOOTING GUIDE

What you see	What to do
No picture	Check signal cable Is the PC on? Is the video card working ? Check monitor power switch, power cable Maximize brightness, contrast
Wavy Picture	Remove nearby hi-frequency electronic devices, TV/radio, transmitter, etc.

Call service personnel when:

A. The power cord or plug is damaged or frayed.
B. Liquid has been spilled into the monitor.
C. The monitor does not operate normally when operating instructions are observed.
D. The monitor has been dropped or the cabinet has been damaged.

Fehler	Lösung
Kein Bild	Signalkabel überprüfen Ist Computer angeschaltet? Arbeitet die Videokarte? Monitornetzschalter, Netzanschlußkabel überprüfen. Helligkeit erhöhen.
Schlechtes Bild	Elektrische Geräte in der Nähe des Monitors entfernen, wie z. B. Fernsehen, Radio, Sender etc.

Kundendienst anrufen, wenn

A. Netzkabel beschädigt oder abgenutzt ist;
B. Flüssigkeit in das Innere des Monitors eingedrungen ist;
C. Der Monitor nicht normal arbeitet, obwohl alle Bedienungshinweise beachtet wurden.
D. Der Monitor heruntergefallen ist oder das Gehäuse beschädigt wurde.

Ce que vous voyez:	Ce qu'il faut faire:
Aucune image	Vérifiez le câble de signal. Le PC, est-il mis en circuit? La carte vidéo, marche-t-elle? Vérifiez le commutateur pour éteindre ou mettre en circuit du moniteur, le câble électrique, la luminosité maximale, et le contraste.
L'image n'est pas clair	Éloignez des appareils électroniques de haute fréquence près du moniteur (télévision, radio, transmetteur, etc.)

Consultez les experts pour entretien si:

A: Le câble électrique est endommagé ou effilé.
B: Des liquides sont renversées sur et dans le moniteur.
C: Le moniteur ne marche pas normalement malgré avoir suivi les instructions.
D: Le moniteur est tombé ou le revêtement a été endommagé.

Specifications

A.)	**Electric:**	220 VAC, 50/60 Cycle, Single Phase, 15AMP
B.)	**Pneumatic:**	100 PSI, .75CFM
C.)	**Product movement speed**	70 Ft./Min. Can exceed 90 Ft./Min.
D.)	**Sewing Speed**	5,000 RPM Rated. Average speed 4300RPM
E.)	**Floor space:**	King size machine + Frame table 21' x 30'
F.)	**Crating:**	Machines without frame changing table utilize two crates for shipping: (1)--21' X 6' X 4' - - 4000 lbs (2)--21' X 4' X 4' - - - 240 lbs Machines with frame changing table must include the following crate size and weight in addition to the above: 11' X 4' X 7' ---------1000 lbs

G.) **Disk Drive Specification**

D.C. Input	9-15 Volts, 900 milliamps (peak)
Media	3.5 inch micro floppy diskette, double sided, double or high density
Media Capacity	1.44 Mbytes
Data Transfer	Maximum Baud rate 38,400

DRIVE MECHANISM SPECIFICATION :

Temperature:	
Operational	+5 to 45 deg C.
Non-operational	-20 to 50 deg C.
Temperature cycling	No condensation should result
Humidity	
Operational	20 to 80% relative humidity, noncondensing.
Non-operational	1 to 95% relative humidity, noncondensing.
Altitude:	

Operational:	Sea level to 15000ft (4500 meter)
Non-Operational	Sea level to 40,000 ft (12000 meter)
Vibration:	
Operational :	The unit shall withstand a peak acceleration of 2g for the frequency range of 20-100 HZ.
Non-operational	The unit shall withstand a peak acceleration of 4.5g for the frequency range 20-100HZ
Shock:	The equipment in a non-operational status shall not suffer damage or fail to operate according to specifications, when subjected to a 60g shock for 10mS.
MTBF:	Approx. 10,000 hours.

F.) Sewing Head choices:

ABM, Pfaff, Singer, Durkopf-Adler, Consew, Juki and more

ELECTRICAL WIRING SCHEMATICS

AND

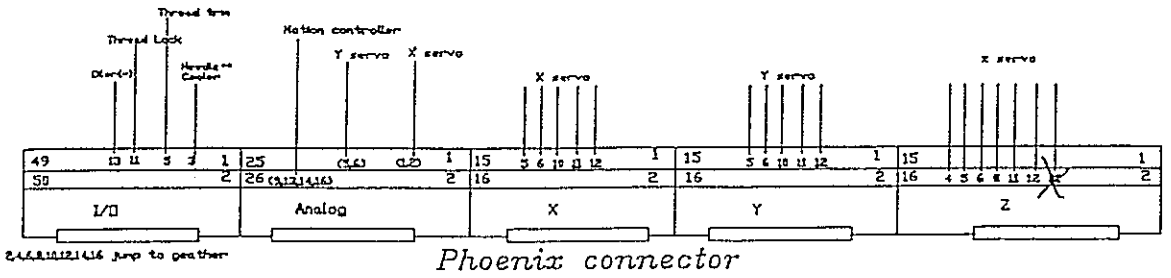
ERROR CODE CHART

FOR

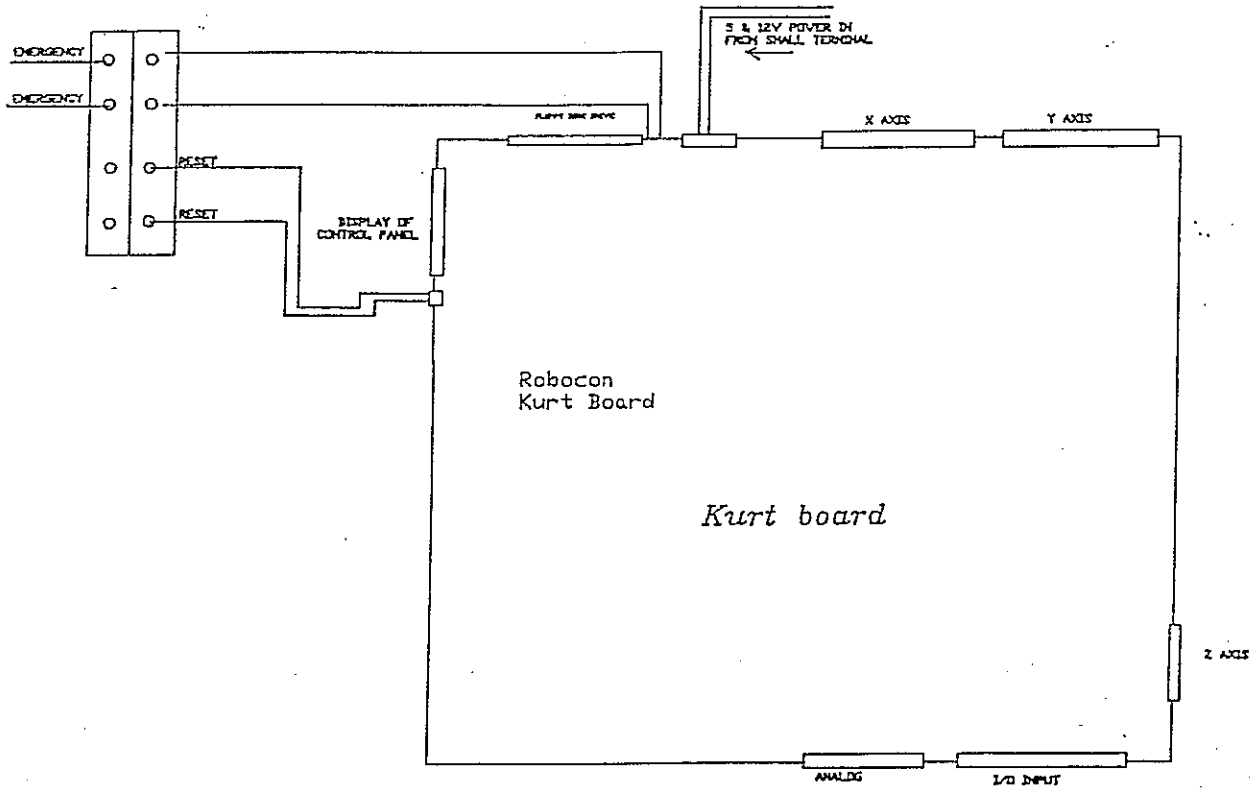
ABM INTERNATIONAL, INC

XL 3000 COMPUTER QUILTING MACHINE

Phoenix Connector, Kurt Board

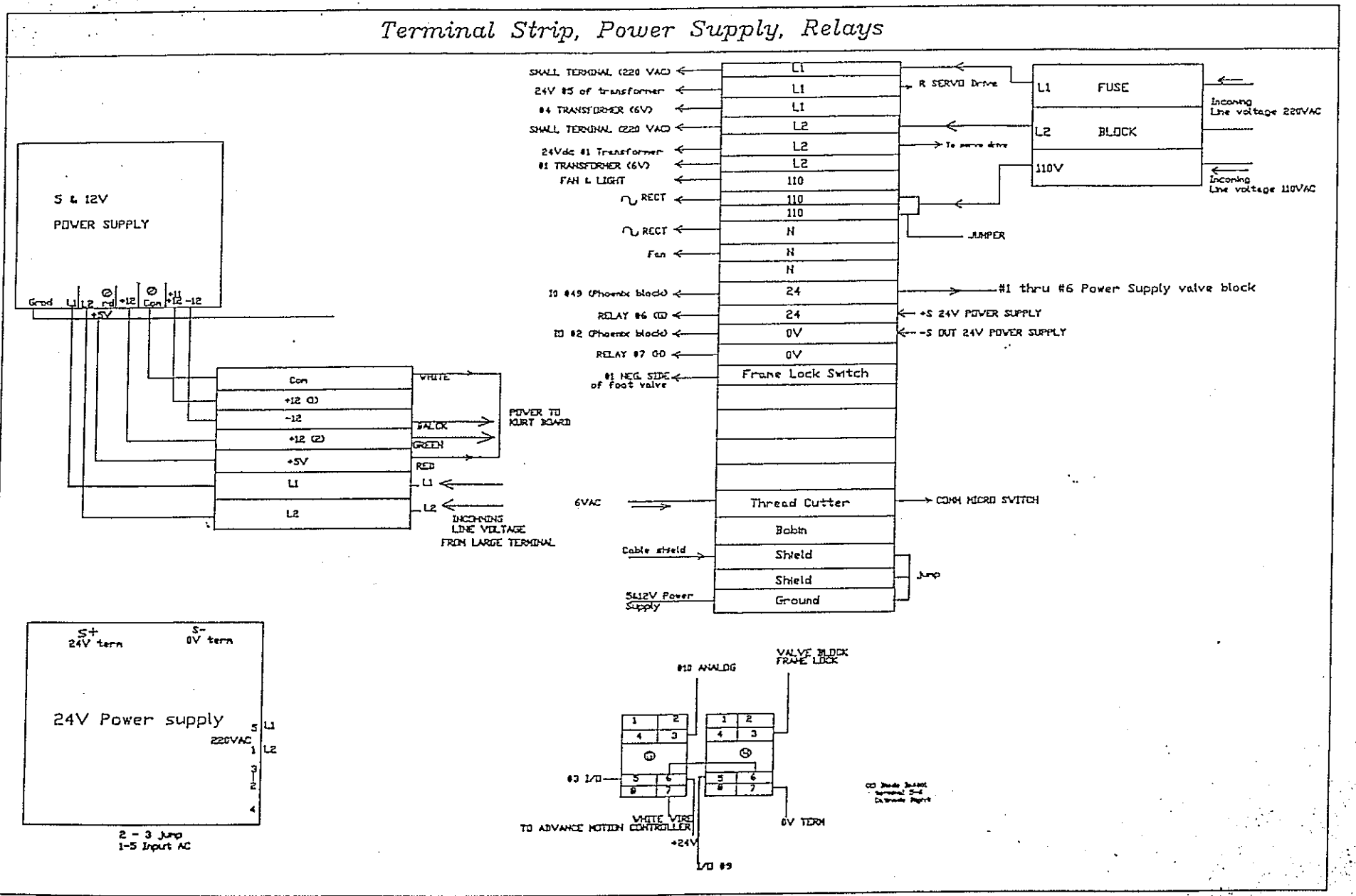


Phoenix connector

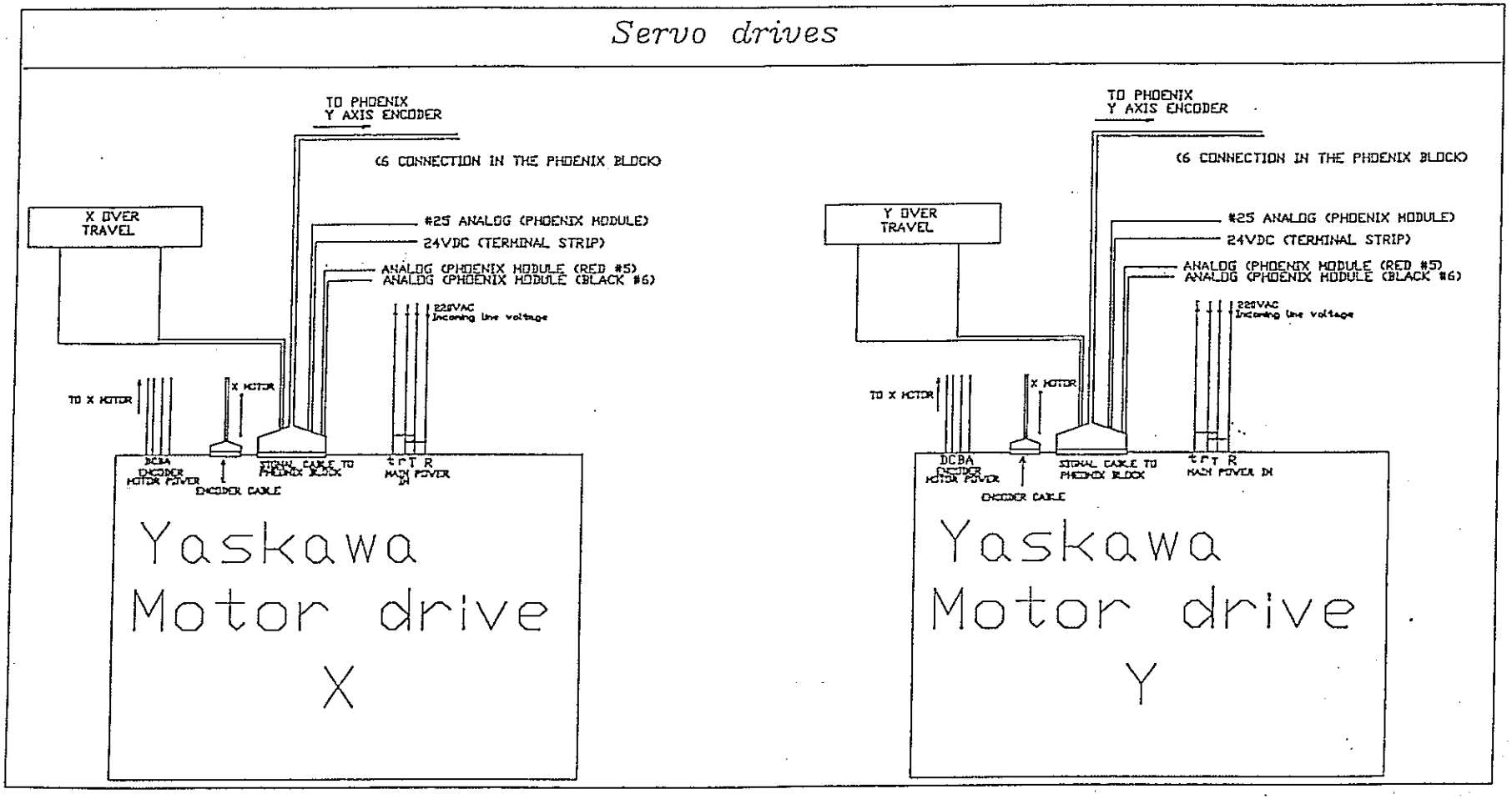


Kurt board

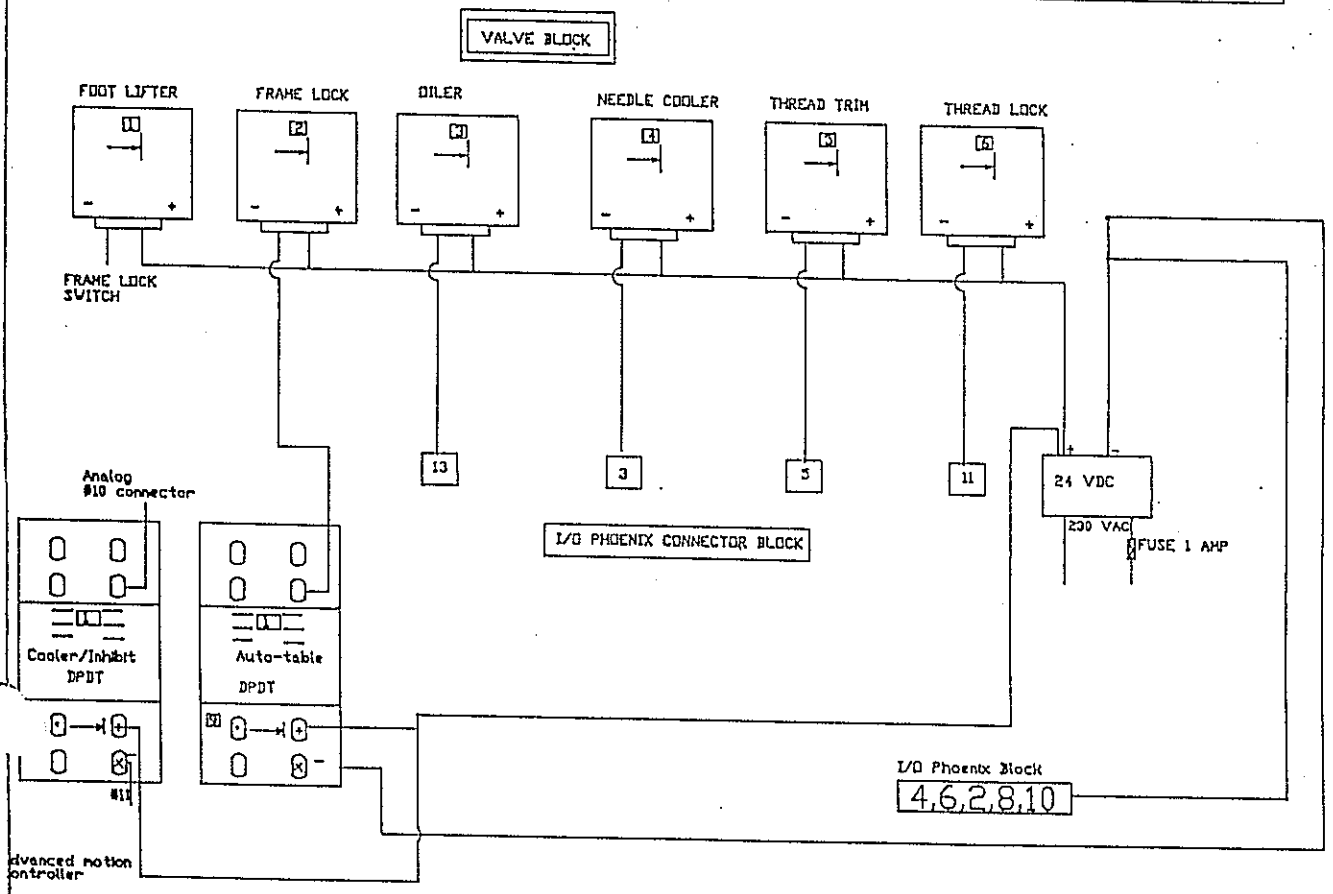
Terminal Strip, Power Supply, Relays



Servo drives



RELAY CONNECTIONS FOR CARRIERLESS CNC QUILTER

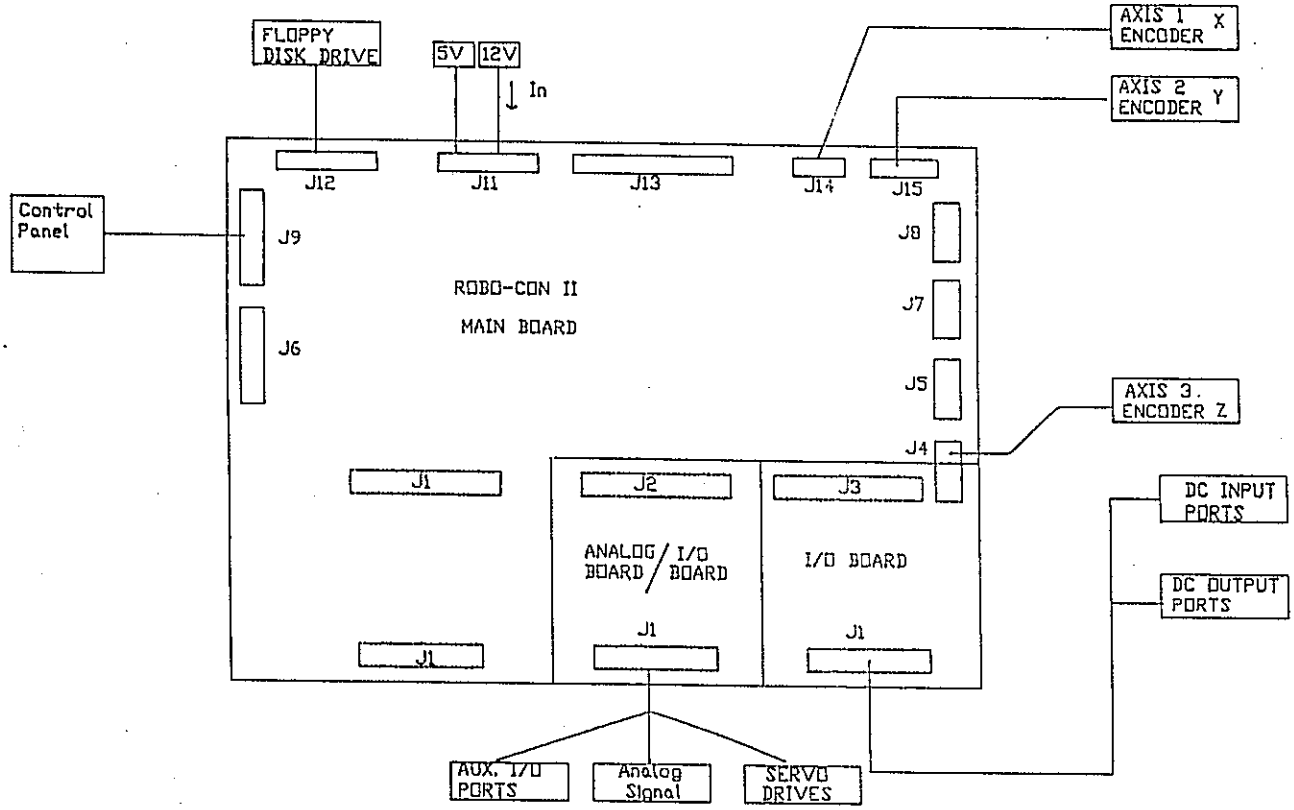


REPLACEABLE CHIPS I/O BOARD	
INPUTS	
U1	HOME, RESTART, START, STOP
U2	THREAD BREAKER, NEEDLE UP, THREAD TRIM
U4	NOT USED AS OF 2/1/92
U6	SEW DISABLE OVERRIDE, FRAME LOCK SWITCH
OUTPUTS	
U7	PORTS #5-8
U8	PORTS #1-4

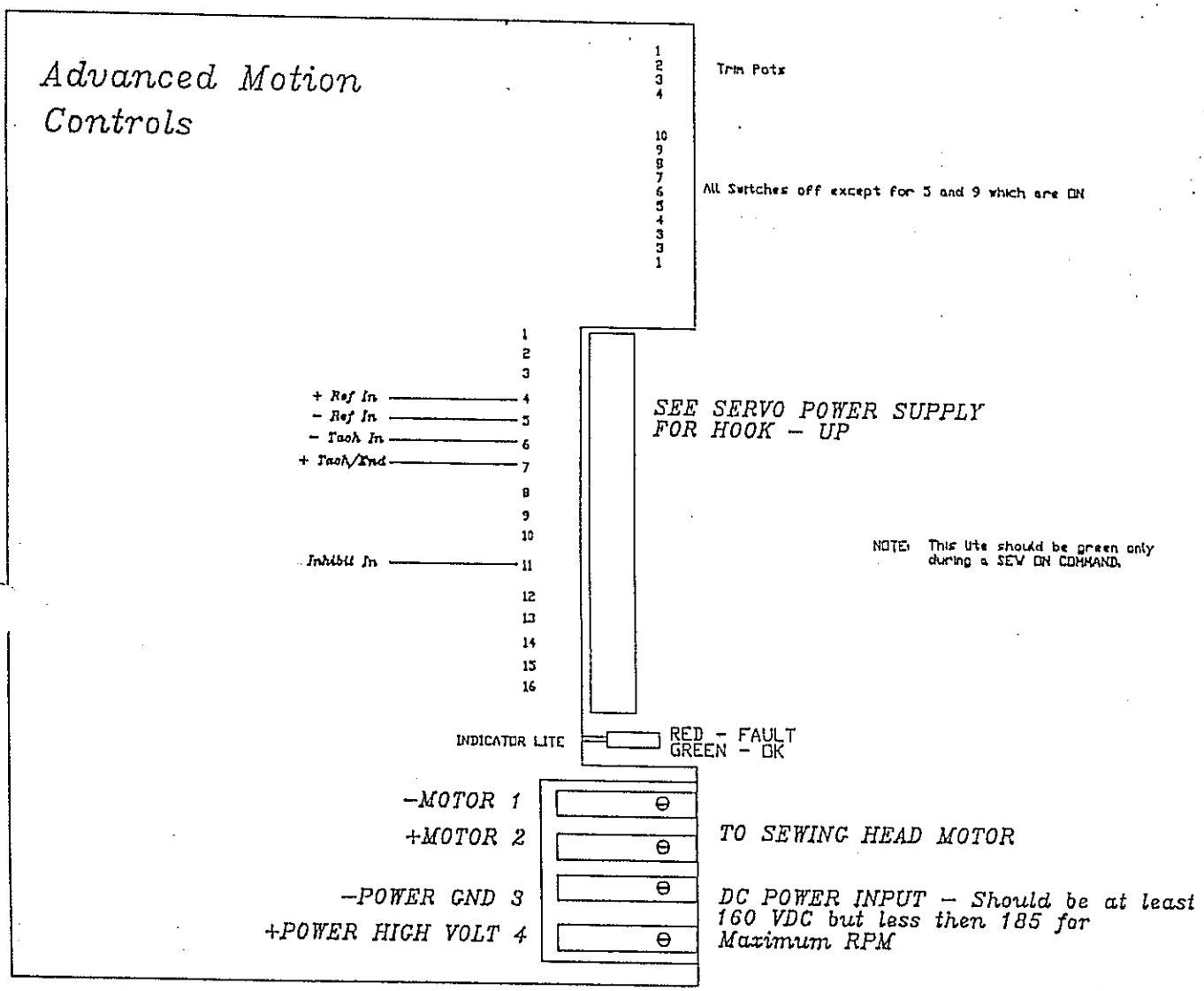
2ND ROW

INPUT PORT #	FUNCTION	OUTPUT PORT #	FUNCTION
1	THREAD BREAK SENSOR	1	PATTERN ACTIVE LIGHT
2	NOT USED	2	SEW MOTOR ENABLE
3	NOT USED	3	THREAD TRIM ACTUATOR
4	NOT USED	4	SYSTEM DEFAULT LED
5	NOT USED	5	AUTOMATIC TABLE RELAY
6	NOT USED	6	THREAD LOCK CYLINDER
7	NOT USED	7	OILER PUMP
8	NOT USED	8	BOBBIN LOW WARNING
9	NOT USED		
10	FRAME LOCK POSITION SENSORS		

Cable Hook-Up to Main CNC Controller Board



SEWING HEAD SERVO CONTROLLER



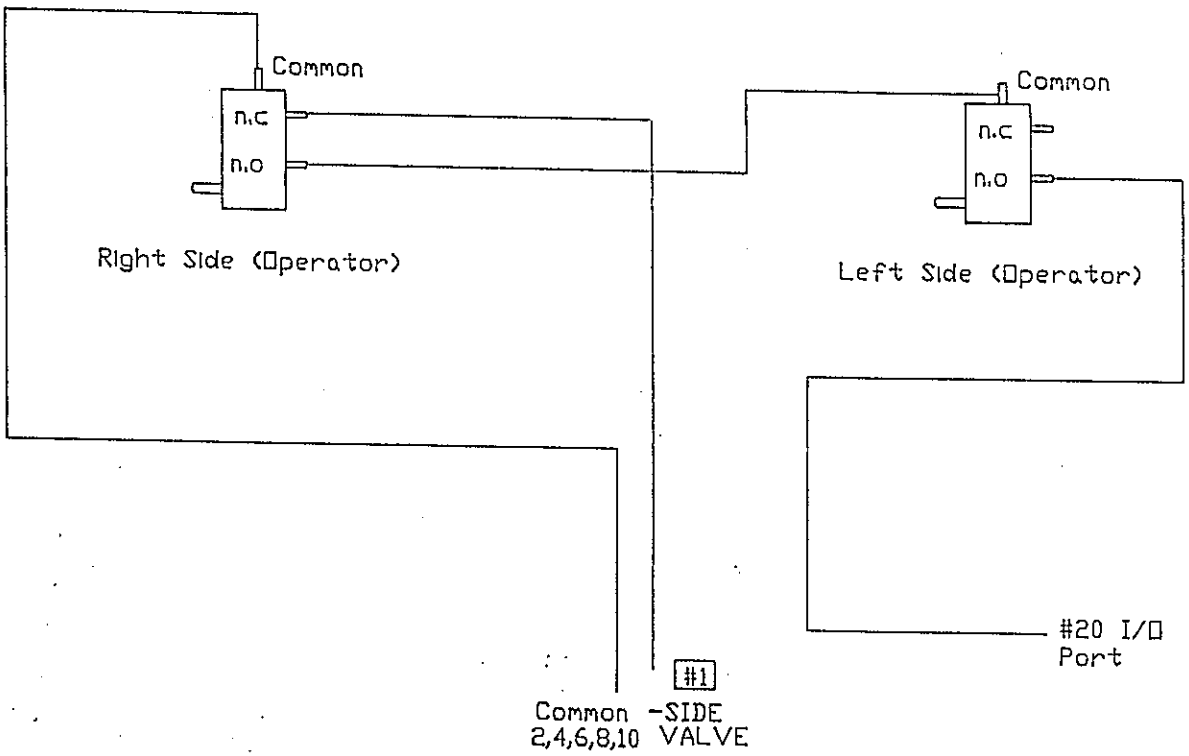
Loop Gain - This controls how responsive the control will be to commands from the CNC controller. Turn slowly clockwise untill sewing head motor hums then counterclockwise 3-4 turns. Adjust clockwise as needed for fast sewing head response.

Curr Limit: Factory set

Ref In Gain: This adjusts the RPM of the sewing head to the correct specified speed. In diagnostics specify 1000 RPM, using an external techometer adjust this trim pot for that specified speed.

Trim/Offset: Factory set, but may be adusted in the field. This sets the null point of the sewing head so that it does not drift forward or reverse when indicator green.

CNC Quilter Frame Lock connections



TROUBLE SHOOTING THE RS-232 PORT

WHEN USING THE RS-232 PORT YOUR ADAPTER IS EQUIPPED WITH L.E.D INDICATORS.

Checking the RS-232 port

Quilting Machine side

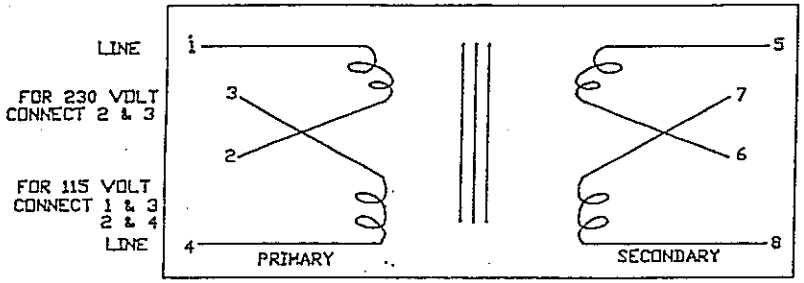
TD red, RTS green, CD green, DTR red

Computer side

RD red

When the computer is sending the RD light will flash red/green.
When the quilter is sending the TD light will flash red/green

SECONDARY WIRING

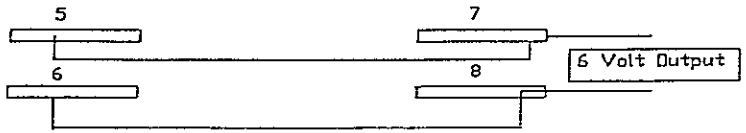


6 VOLT OUTPUT
5 & 7, 6 & 8

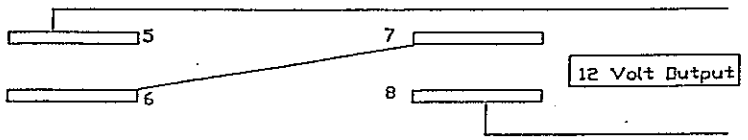
12 VOLT OUTPUT
6 & 7

The above diagram shows the general wiring for use of Transformer part # 090092. When used in XL-3000 quilters for Thread cutting wired 6 Volt. Most regular quilters regardless of age are wired for 6 volt output. PLC equipped quilters are generally wired for 12 Volt output.

6 Volt operation connect 5 & 7 and 6 & 8

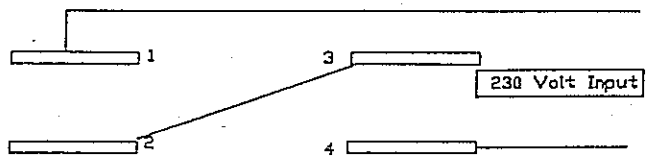


12 Volt operation connect 6 & 7

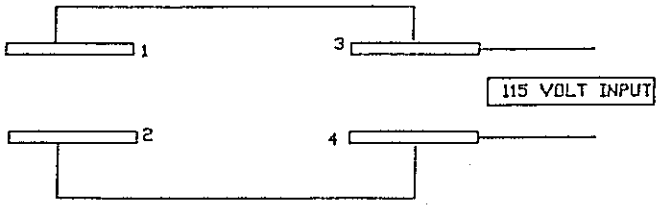


PRIMARY WIRING

Most quilting machines regardless of age are wired for 230 volt operation.

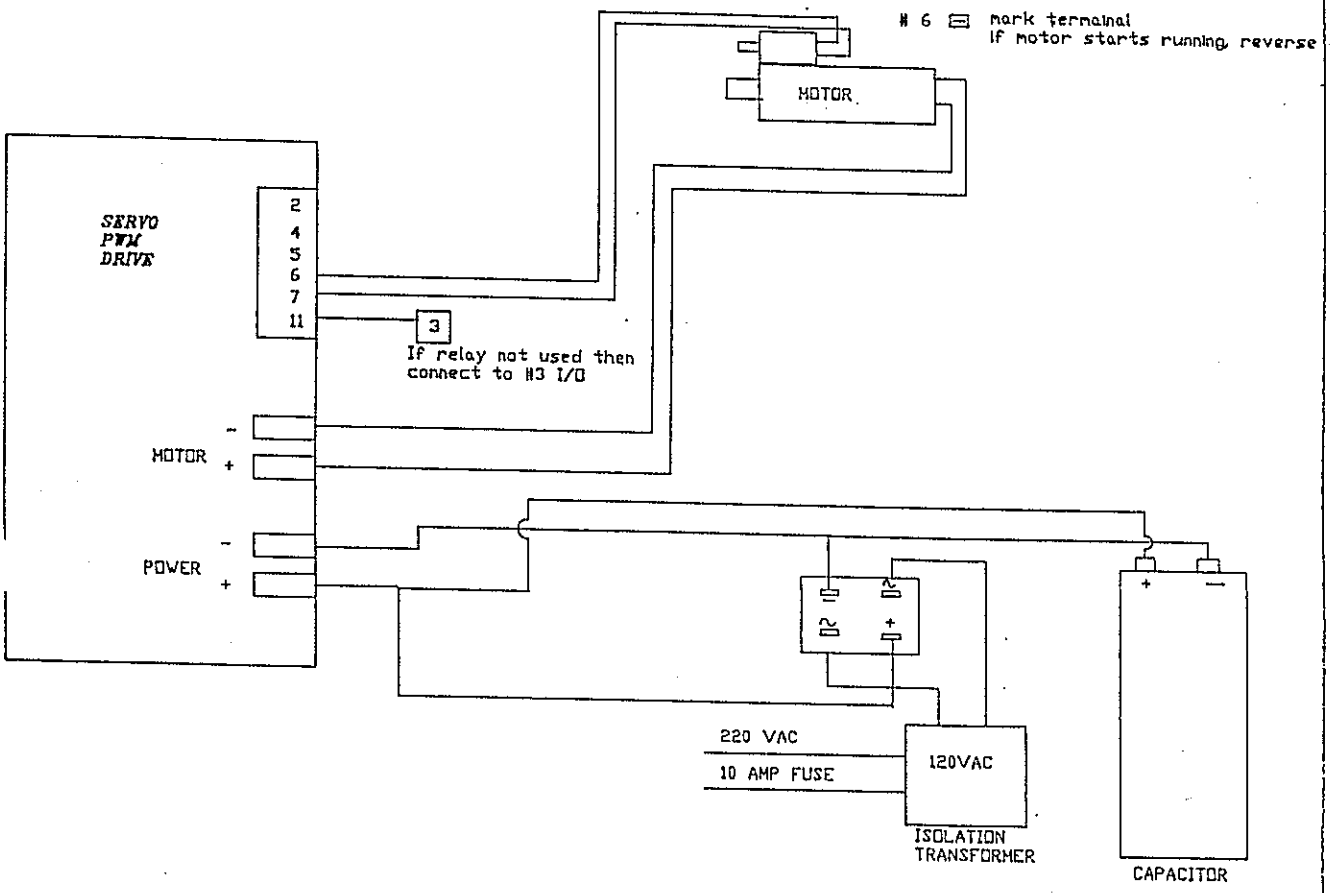


230 VOLT OPERATION CONNECT 2 & 3

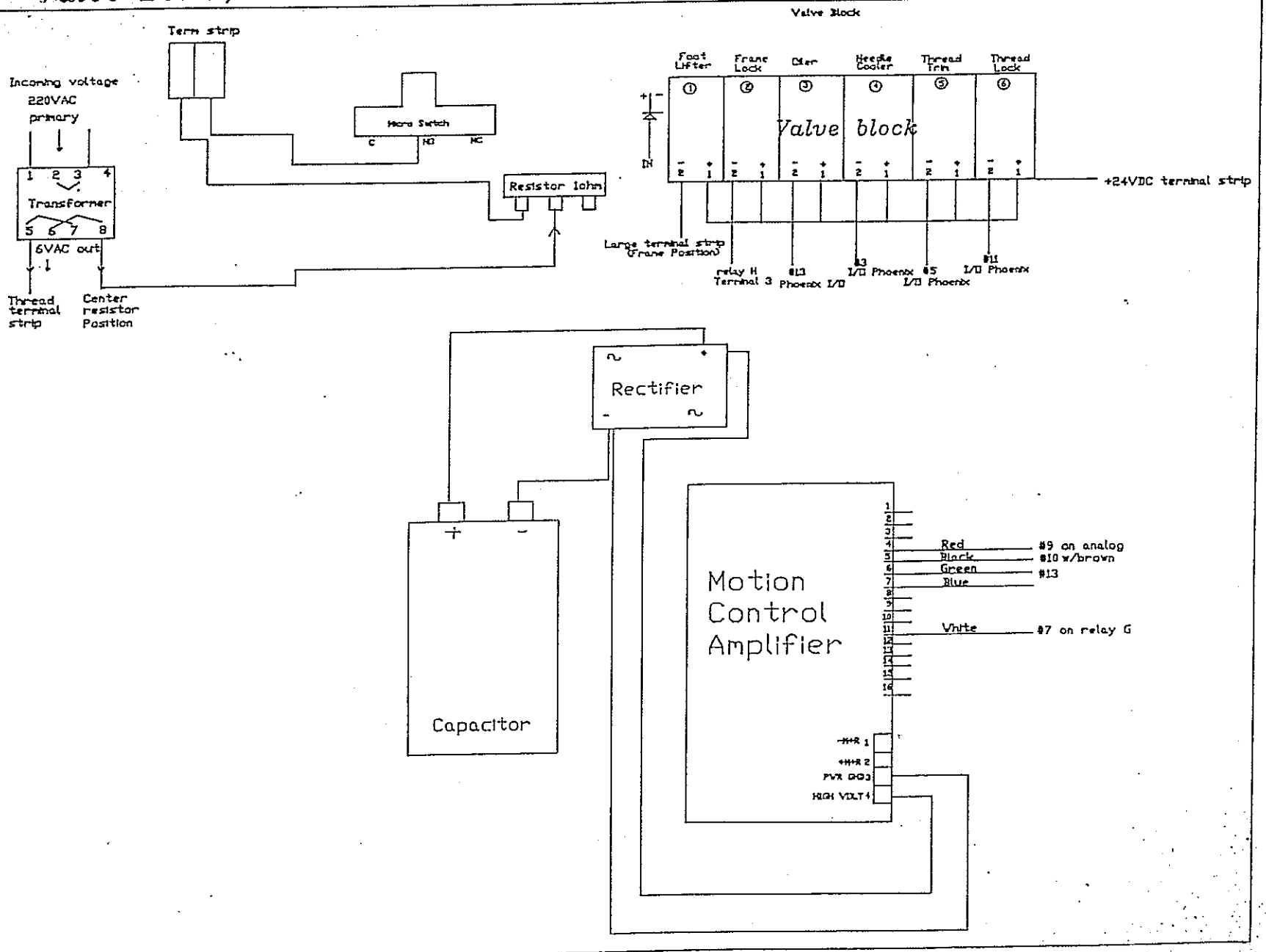


115 VOLT OPERATION CONNECT 1 & 3 AND 2 & 4

CNC SERVO DRIVE FOR SEWING HEAD

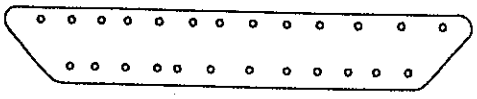


Valve Block, Motion Controller, Transformer, Rectifier, Capacitor

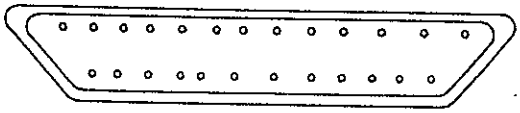


SERIAL PORT CONNECTIONS

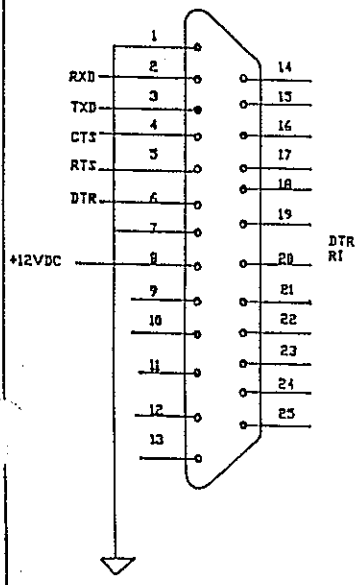
25 PIN 'D' SUB CONNECTOR ON
RC II ENCLOSURE
(SOCKET)



25 PIN 'D' SUB CONNECTOR ON
CABLE INTERFACE
(PLUG)

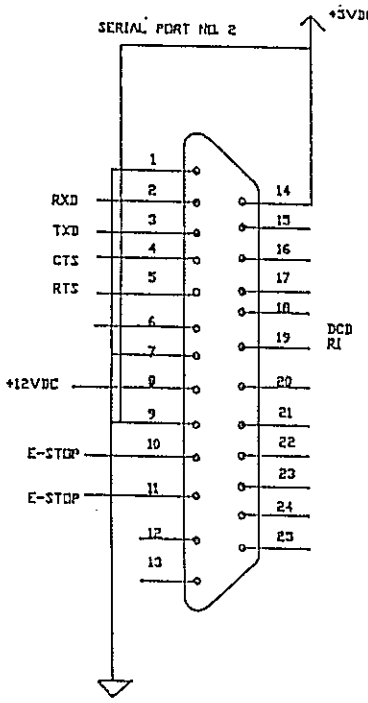


SERIAL PORT NO. 1



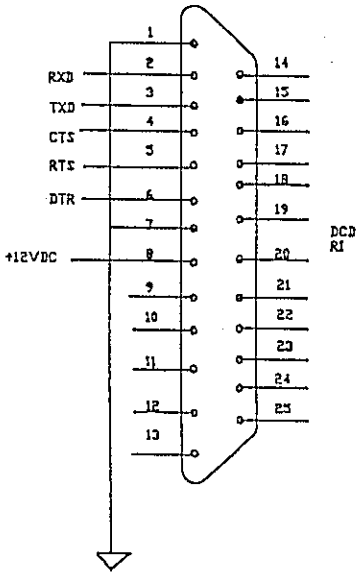
OPTIONAL RS-232-C
(HOST COMPUTER)

SERIAL PORT NO. 2



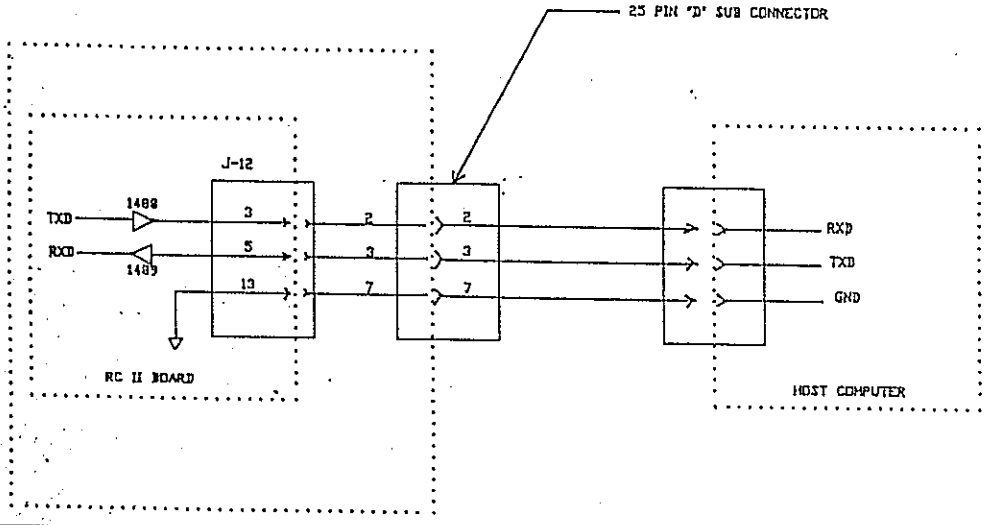
HAND HELD TERMINAL

SERIAL PORT NO. 3

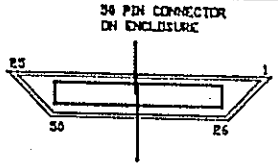


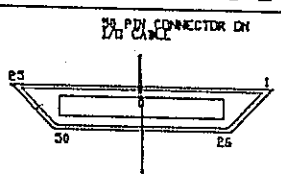
OPTIONAL RS-232-C
(DIGITIZER)

HOST COMPUTER INTERFACE



INPUT/OUTPUT CONNECTIONS





DIODE/TRANSISTOR IS A NEC PS2502-4 MULTICHANNEL PHOTO COUPLER ABSOLUTE MAXIMUM RATINGS

DIODE
FORWARD CURRENT 80mA

TRANSISTOR
COLLECTOR TO EMITTER VOLTAGE 40V
COLLECTOR CURRENT 150mA

INPUT PORTS

NO. 1	P23 (P49) P17 (P33) P42 (P34)	THREAD BREAKER
NO. 2	P23 (P49) P18 (P35) P43 (P36)	
NO. 3	P23 (P49) P19 (P37) P44 (P38)	NEEDLE UP PHOTO CELL
NO. 4	P23 (P49) P17 (P33) P42 (P34)	THREAD TRIM PHOTO CELL
NO. 5	P23 (P49) P21 (P41) P46 (P42)	HOME BUTTON
NO. 6	P23 (P49) P22 (P43) P47 (P44)	RESTART BUTTON
NO. 7	P23 (P49) P23 (P45) P48 (P46)	START BUTTON
NO. 8	P23 (P49) P24 (P47) P49 (P48)	

INPUT PORTS

NO. 9	P23 (P49) P9 (P17) P34 (P18)	SEW DISABLE OVERRIDE
NO. 10	P23 (P49) P10 (P19) P35 (P20)	FRAME LOCK/ IN SWITCH
NO. 11	P23 (P49) P11 (P21) P36 (P22)	
NO. 12	P23 (P49) P12 (P23) P37 (P24)	
NO. 13	P23 (P49) P13 (P25) P38 (P26)	
NO. 14	P23 (P49) P14 (P27) P39 (P28)	
NO. 15	P23 (P49) P15 (P29) P40 (P30)	
NO. 16	P23 (P49) P16 (P31) P41 (P32)	

OUTPUT PORTS

NO. 1	P1 (P1)	PATTERN ACTIVE LED
	P26 (P2)	
NO. 2	P2 (P3)	SEW MOTOR INHIBIT
	P27 (P4)	
NO. 3	P3 (P5)	THREAD TRIM AIR VALVE
	P28 (P6)	
NO. 4	P4 (P7)	INHIBIT FAULT LED
	P29 (P8)	
NO. 5	P5 (P9)	AUTO-TABLE/FRAME LOCK RELAY
	P30 (P10)	
NO. 6	P6 (P11)	
	P31 (P12)	
NO. 7	P7 (P13)	OIL INJECTION AIR VALVE
	P32 (P14)	
NO. 8	P8 (P15)	BOBBIN OUT WARNING LED
	P33 (P16)	

THE NUMBER IN PARENTHESIS REFERS TO THE I/O GREEN TERMINAL STRIP CONNECTOR NUMBER.

LED Indication for Troubleshooting (Cont'd)

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
b.	A/D error	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
-	CPU error	Goes on during operation.	• Faulty internal elements.	• Resume after reset operation.
			• Defective internal elements.	• Replace the Servopack.
C. 1.	Overrun prevention	The motor does not rotate, and C. and 1. blink alternately when the servo power is turned on.	• Encoder cables are bloken. • Contact fault of connector or defective encoder.	• Replace the cable. • Check the signal in phases U, V, and W.
C. 2.		Blink alternately after the motor rotates momentarily at starting or during operation.	• Wrong combination of motor and Servopack. • Disconnection, contact fault, connection error, defective encoder.	• Check and correct the combination. • Check and correct pulses in phases A, B, U, V, and W. • Correct the connection.
C. 4.		• Blink alternately after the motor rotates momentarily at starting. • Blink alternately during operation.	• Wiring error. —	• Correct the wiring. • Contact your Yaskawa representative

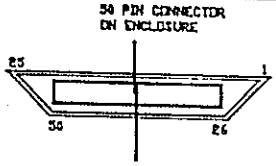
* The LED C. displays one of three type indications according to the trouble conditions.
These displays will blink alternately between C. and 1., 2. or 4.

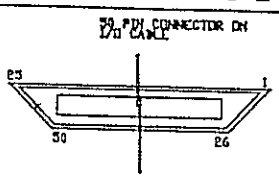
LED Indication for Troubleshooting (Cont'd)

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
b.	A/D error	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
—	CPU error	Goes on during operation.	• Faulty internal elements.	• Resume after reset operation.
			• Defective internal elements.	• Replace the Servopack.
C. 1.	Overrun prevention	The motor does not rotate, and C. and 1. blink alternately when the servo power is turned on.	• Encoder cables are broken. • Contact fault of connector or defective encoder.	• Replace the cable. • Check the signal in phases U, V, and W.
C. 2.		Blink alternately after the motor rotates momentarily at starting or during operation.	• Wrong combination of motor and Servopack. • Disconnection, contact fault, connection error, defective encoder.	• Check and correct the combination. • Check and correct pulses in phases A, B, U, V, and W. • Correct the connection.
C. 4.		• Blink alternately after the motor rotates momentarily at starting. • Blink alternately during operation.	• Wiring error. —	• Correct the wiring. • Contact your Yaskawa representative

* The LED C. displays one of three type indications according to the trouble conditions.
These displays will blink alternately between C. and 1., 2. or 4.

INPUT/OUTPUT CONNECTIONS





DIODE/TRANSISTOR IS A NEC PS2502-4 MULTICHANNEL PHOTO COUPLER ABSOLUTE MAXIMUM RATINGS

DIODE
FORWARD CURRENT 80mA

TRANSISTOR
COLLECTOR TO EMITTER VOLTAGE 40V
COLLECTOR CURRENT 150mA

INPUT PORTS

NO. 1	P25 (P49) P17 (P33) P42 (P34)	THREAD BREAKER
NO. 2	P25 (P49) P18 (P35) P43 (P36)	
NO. 3	P25 (P49) P19 (P37) P44 (P38)	NEEDLE UP PHOTO CELL
NO. 4	P25 (P49) P17 (P33) P42 (P34)	THREAD TRIM PHOTO CELL
NO. 5	P25 (P49) P21 (P41) P46 (P42)	HOME BUTTON
NO. 6	P25 (P49) P22 (P43) P47 (P44)	RESTART BUTTON
NO. 7	P25 (P49) P23 (P45) P48 (P46)	START BUTTON
NO. 8	P25 (P49) P24 (P47) P49 (P48)	

INPUT PORTS

NO. 9	P25 (P49) P9 (P17) P34 (P18)	SEW DISABLE OVERRIDE
NO. 10	P25 (P49) P10 (P19) P35 (P20)	FRAME LOCK/ IN SWITCH
NO. 11	P25 (P49) P11 (P21) P36 (P22)	
NO. 12	P25 (P49) P12 (P23) P37 (P24)	
NO. 13	P25 (P49) P13 (P25) P38 (P26)	
NO. 14	P25 (P49) P14 (P27) P39 (P28)	
NO. 15	P25 (P49) P15 (P29) P40 (P30)	
NO. 16	P25 (P49) P16 (P31) P41 (P32)	

OUTPUT PORTS

NO. 1	P1 (P1)	PATTERN ACTIVE LED
	P26 (P2)	
NO. 2	P2 (P3)	SEW MOTOR INHIBIT
	P27 (P4)	
NO. 3	P3 (P5)	THREAD TRIM AIR VALVE
	P28 (P6)	
NO. 4	P4 (P7)	INHIBIT FAULT LED
	P29 (P8)	
NO. 5	P5 (P9)	AUTO-TACK/FRAME LOCK RELAY
	P30 (P10)	
NO. 6	P6 (P11)	
	P31 (P12)	
NO. 7	P7 (P13)	OIL INJECTION AIR VALVE
	P32 (P14)	
NO. 8	P8 (P15)	BOBBIN OUT WARNING LED
	P33 (P16)	

THE NUMBER IN PARENTHESIS REFERS TO THE I/O GREEN TERMINAL STRIP CONNECTOR NUMBER.

LED Indication (7-segment) for Troubleshooting

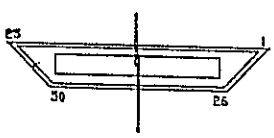
LED Indication for Troubleshooting

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
1.	Over-current	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
		Goes on when power is supplied to the main circuit and servo power is turned on. • MCCB does not trip.	• Defective current feedback circuit. • Defective main circuit transistor module.	• Insert the 3CN connector firmly. • Replace the Servopack.
		Goes on when power is supplied to the main circuit and servo power is turned on. • MCCB trips.	• Defective motor grounding • Defective main circuit transistor module.	• Replace the motor. • Replace the Servopack.
		Goes on when power is supplied to the main circuit.	• Defective main circuit transistor module.	• Replace the Servopack.
		Goes on when the motor is running.	• Faulty internal elements. • Defective internal elements.	• Replace the Servopack.
2.	Circuit protector tripped	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
		Goes on when power is supplied to the main circuit.	• Defective main circuit thyristor–diode module.	• Replace the Servopack.
			• MCCB trips.	• Check if there is disconnection in the wiring leads in Servopack. • Check the conduction state on connecting parts.
J	Regener-ative trouble	Goes on when power is supplied to the control circuit.	• Defective control circuit board. (1 PWB).	• Replace the Servopack.
		Goes on approximate 0.5 to 1 second after power is supplied to the main circuit.	• Defective regenerative transistor.	• Replace the Servopack.
			• Regenerative resistor disconnection.	• Check and replace the regenerative resistor. (Replace the Servopack.)
4.	Over-voltage	Goes on when the motor starts or slows down.	• Load inertia (GD^2) too large.	• Check the inertia of the machine with the value converted to the motor shaft.
			• Defective regenerative circuit.	• Replace the Servopack.
5.	Over-speed	When the reference is input, the motor runs fast and 5. goes on.	• Motor connection error. • Optical encoder connection error.	• Correct the motor connection. • Check and correct pulses in phases A, B, C, U, V and W with 2CN.
			• The reference input voltage too large.	• Decrease the reference input voltage.
6.	Voltage drop	Goes on when power is supplied to the main circuit.	• Defective main circuit thyristor–diode. module.	• Replace the Servopack.
7.	Overload	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
		Goes on during operation. • When power to the control circuit is turned off and then turned on again, the operation starts.	• Operation with 105% to 130% or more of the rated load.	• Check and correct the load (may be overload).
		The motor rotates, but the torque is unavailable. When power to the control circuit is turned off and then turned on again, the operation starts, but the torque is still unavailable.	• Motor circuit error connection, such as U–V, V–W, W–U or single-phase connection.	• Correct the connection.

INPUT/OUTPUT CONNECTIONS

50 PIN CONNECTOR ON ENCLOSURE

50 PIN CONNECTOR ON I/O CABLE



DIODE/TRANSISTOR IS A NEC PS2502-4 MULTICHANNEL PHOTO COUPLER ABSOLUTE MAXIMUM RATINGS

DIODE
FORWARD CURRENT 80mA

TRANSISTOR
COLLECTOR TO EMITTER VOLTAGE 40V
COLLECTOR CURRENT 150mA

INPUT PORTS

NO. 1	P25 (P49)	
	P17 (P33)	THREAD BREAKER
	P42 (P34)	
NO. 2	P25 (P49)	
	P18 (P35)	
	P43 (P36)	
NO. 3	P25 (P49)	
	P19 (P37)	NEEDLE UP PHOTO CELL
	P44 (P38)	
NO. 4	P25 (P49)	
	P17 (P33)	
	P42 (P34)	THREAD TRIM PHOTO CELL
NO. 5	P25 (P49)	
	P21 (P41)	
	P46 (P42)	HOME BUTTON
NO. 6	P25 (P49)	
	P22 (P43)	
	P47 (P44)	RESTART BUTTON
NO. 7	P25 (P49)	
	P23 (P45)	
	P48 (P46)	START BUTTON
NO. 8	P25 (P49)	
	P24 (P47)	
	P49 (P48)	

INPUT PORTS

NO. 9	P25 (P49)	
	P9 (P17)	
	P34 (P18)	SEW DISABLE OVERRIDE
NO. 10	P25 (P49)	
	P10 (P19)	
	P35 (P20)	FRAME LOCK/ IN SWITCH
NO. 11	P25 (P49)	
	P11 (P21)	
	P36 (P22)	
NO. 12	P25 (P49)	
	P12 (P23)	
	P37 (P24)	
NO. 13	P25 (P49)	
	P13 (P25)	
	P38 (P26)	
NO. 14	P25 (P49)	
	P14 (P27)	
	P39 (P28)	
NO. 15	P25 (P49)	
	P15 (P29)	
	P40 (P30)	
NO. 16	P25 (P49)	
	P16 (P31)	
	P41 (P32)	

OUTPUT PORTS

NO. 1	P1 (P1)	PATTERN ACTIVE LED
	P26 (P2)	
NO. 2	P2 (P3)	SEW MOTOR INHIBIT
	P27 (P4)	
NO. 3	P3 (P5)	THREAD TRIM AIR VALVE
	P28 (P6)	
NO. 4	P4 (P7)	INHIBIT FAULT LED
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NO. 5	P5 (P9)	AUTO-TABLE/FRAME LOCK RELAY
	P30 (P10)	
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	P32 (P14)	
NO. 8	P8 (P15)	BOBBIN OUT WARNING LED
	P33 (P16)	

THE NUMBER IN PARENTHESIS REFERS TO THE I/O GREEN TERMINAL STRIP CONNECTOR NUMBER.

LED Indication (7-segment) for Troubleshooting

LED Indication for Troubleshooting

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
1.	Over-current	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
		Goes on when power is supplied to the main circuit and servo power is turned on. • MCCB does not trip.	• Defective current feedback circuit. • Defective main circuit transistor module.	• Insert the 3CN connector firmly. • Replace the Servopack.
		Goes on when power is supplied to the main circuit and servo power is turned on. • MCCB trips.	• Defective motor grounding • Defective main circuit transistor module.	• Replace the motor. • Replace the Servopack.
		Goes on when power is supplied to the main circuit.	• Defective main circuit transistor module.	• Replace the Servopack.
		Goes on when the motor is running.	• Faulty internal elements. • Defective internal elements.	• Replace the Servopack.
2.	Circuit protector tripped	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
		Goes on when power is supplied to the main circuit.	• Defective main circuit thyristor–diode module.	• Replace the Servopack.
			• MCCB trips.	• Check if there is disconnection in the wiring leads in Servopack. • Check the conduction state on connecting parts.
	Regener-ative trouble	Goes on when power is supplied to the control circuit.	• Defective control circuit board. (1 PWB).	• Replace the Servopack.
		Goes on approximate 0.5 to 1 second after power is supplied to the main circuit.	• Defective regenerative transistor.	• Replace the Servopack.
			• Regenerative resistor disconnection.	• Check and replace the regenerative resistor. (Replace the Servopack.)
4.	Over-voltage	Goes on when the motor starts or slows down.	• Load inertia (GD^2) too large.	• Check the inertia of the machine with the value converted to the motor shaft.
			• Defective regenerative circuit.	• Replace the Servopack.
5.	Over-speed	When the reference is input, the motor runs fast and 5. goes on.	• Motor connection error. • Optical encoder connection error.	• Correct the motor connection. • Check and correct pulses in phases A, B, C, U, V and W with 2CN.
			• The reference input voltage too large.	• Decrease the reference input voltage.
6.	Voltage drop	Goes on when power is supplied to the main circuit.	• Defective main circuit thyristor–diode. module.	• Replace the Servopack.
7.	Overload	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
		Goes on during operation. • When power to the control circuit is turned off and then turned on again, the operation starts.	• Operation with 105% to 130% or more of the rated load.	• Check and correct the load (may be overload).
		The motor rotates, but the torque is unavailable. When power to the control circuit is turned off and then turned on again, the operation starts, but the torque is still unavailable.	• Motor circuit error connection, such as U–V, V–W, W–U or single-phase connection.	• Correct the connection.

LED Indication (7-segment) for Troubleshooting

LED Indication for Troubleshooting

LED	Detection	Lighting Condition	Probable Cause	Corrective Action
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		Goes on when power is supplied to the main circuit and servo power is turned on. • MCCB does not trip.	• Defective current feedback circuit. • Defective main circuit transistor module.	• Insert the 3CN connector firmly. • Replace the Servopack.
		Goes on when power is supplied to the main circuit and servo power is turned on. • MCCB trips.	• Defective motor grounding • Defective main circuit transistor module.	• Replace the motor. • Replace the Servopack.
		Goes on when power is supplied to the main circuit.	• Defective main circuit transistor module.	• Replace the Servopack.
		Goes on when the motor is running.	• Faulty internal elements. • Defective internal elements.	• Replace the Servopack.
2.	Circuit protector tripped	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
		Goes on when power is supplied to the main circuit.	• Defective main circuit thyristor–diode module.	• Replace the Servopack.
			• MCCB trips.	• Check if there is disconnection in the wiring leads in Servopack. • Check the conduction state on connecting parts.
3.	Regener-ative trouble	Goes on when power is supplied to the control circuit.	• Defective control circuit board. (1 PWB).	• Replace the Servopack.
		Goes on approximate 0.5 to 1 second after power is supplied to the main circuit.	• Defective regenerative transistor.	• Replace the Servopack.
			• Regenerative resistor disconnection.	• Check and replace the regenerative resistor. (Replace the Servopack.)
4.	Over-voltage	Goes on when the motor starts or slows down.	• Load inertia (GD^2) too large.	• Check the inertia of the machine with the value converted to the motor shaft.
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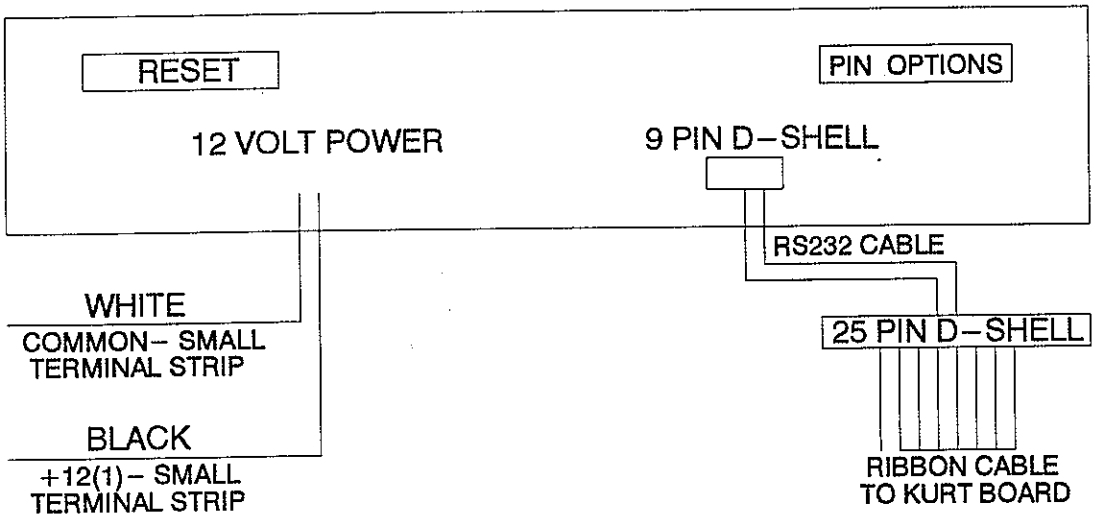
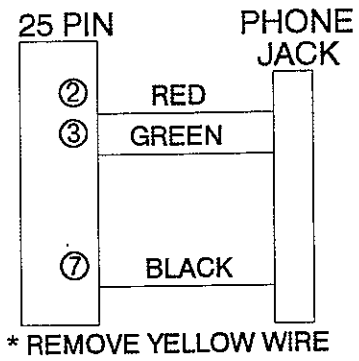
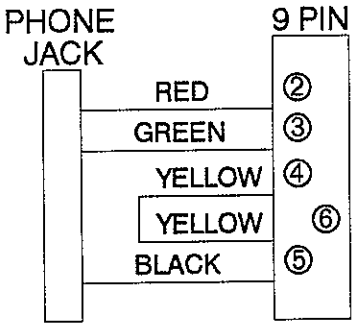
5.	Over-speed	When the reference is input, the motor runs fast and 5. goes on.	• Motor connection error. • Optical encoder connection error.	• Correct the motor connection. • Check and correct pulses in phases A, B, C, U, V and W with 2CN.
			• The reference input voltage too large.	• Decrease the reference input voltage.
6.	Voltage drop	Goes on when power is supplied to the main circuit.	• Defective main circuit thyristor–diode. module.	• Replace the Servopack.
7.	Overload	Goes on when power is supplied to the control circuit.	• Defective control circuit board (1 PWB).	• Replace the Servopack.
		Goes on during operation. • When power to the control circuit is turned off and then turned on again, the operation starts.	• Operation with 105% to 130% or more of the rated load.	• Check and correct the load (may be overload).
		The motor rotates, but the torque is unavailable. When power to the control circuit is turned off and then turned on again, the operation starts, but the torque is still unavailable.	• Motor circuit error connection, such as U–V, V–W, W–U or single-phase connection.	• Correct the connection.

DISC DRIVE

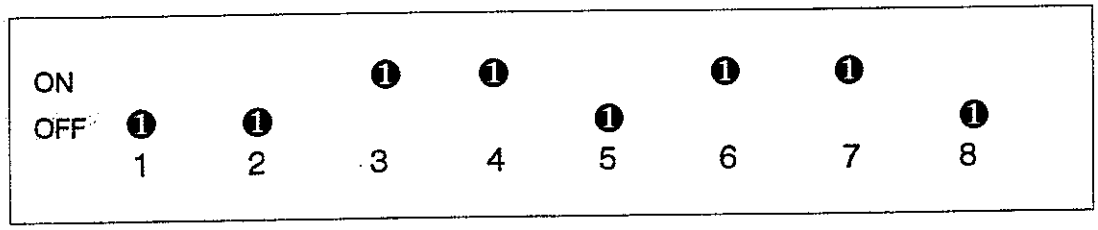


D–SHELL CONNECTIONS

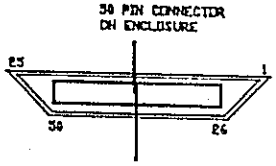


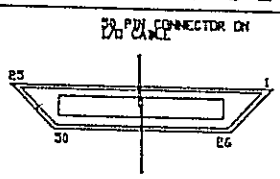


OPTION SETTINGS



INPUT/OUTPUT CONNECTIONS





DIODE/TRANSISTOR IS A NEC PS8502-4 MULTICHANNEL PHOTO COUPLER ABSOLUTE MAXIMUM RATINGS

DIODE	TRANSISTOR
FORWARD CURRENT 80mA	COLLECTOR TO EMITTER VOLTAGE 40V
	COLLECTOR CURRENT 130mA

INPUT PORTS

NO. 1	P25 (P49) P17 (P33) P42 (P34)	THREAD BREAKER
NO. 2	P25 (P49) P18 (P35) P43 (P36)	
NO. 3	P25 (P49) P19 (P37) P44 (P38)	NEEDLE UP PHOTO CELL
NO. 4	P25 (P49) P17 (P33) P42 (P34)	THREAD TRIM PHOTO CELL
NO. 5	P25 (P49) P21 (P41) P46 (P42)	HOME BUTTON
NO. 6	P25 (P49) P22 (P43) P47 (P44)	RESTART BUTTON
NO. 7	P25 (P49) P23 (P45) P48 (P46)	START BUTTON
NO. 8	P25 (P49) P24 (P47) P49 (P48)	

INPUT PORTS

NO. 9	P25 (P49) P9 (P17) P34 (P18)	SEW DISABLE OVERRIDE
NO. 10	P25 (P49) P10 (P19) P33 (P20)	FRAME LOCK/ IN SWITCH
NO. 11	P25 (P49) P11 (P21) P36 (P22)	
NO. 12	P25 (P49) P12 (P23) P37 (P24)	
NO. 13	P25 (P49) P13 (P25) P38 (P26)	
NO. 14	P25 (P49) P14 (P27) P39 (P28)	
NO. 15	P25 (P49) P15 (P29) P40 (P30)	
NO. 16	P25 (P49) P16 (P31) P41 (P32)	

OUTPUT PORTS

NO. 1	P1 (P1)	PATTERN ACTIVE LED
	P26 (P2)	
NO. 2	P2 (P3)	SEW MOTOR INHIBIT
	P27 (P4)	
NO. 3	P3 (P5)	THREAD TRIM AIR VALVE
	P28 (P6)	
NO. 4	P4 (P7)	INHIBIT FAULT LED
	P29 (P8)	
NO. 5	P5 (P9)	AUTO-TABLE/FRAME LOCK RELAY
	P30 (P10)	
NO. 6	P6 (P11)	
	P31 (P12)	
NO. 7	P7 (P13)	OIL INJECTION AIR VALVE
	P32 (P14)	
NO. 8	P8 (P15)	BOBBIN OUT WARNING LED
	P33 (P16)	

THE NUMBER IN PARENTHESIS REFERS TO THE I/O GREEN TERMINAL STRIP CONNECTOR NUMBER.

SECTION A

(1) 5140906 Upper face plate cover screw (long)
(2) 5106309 Face plate cover complete with guard
(3) 5106353 Face plate cover thread take-up lever guard
(4) 5106354 Face plate cover screw spacer
(7) 5131 Face plate cover lower screw (short)
(21) 5227 Thread take-up lever guard attachment screws

SECTION B

(6) 5106302 Rear arm cover
(5) 5127 Arm cover screws

SECTION C

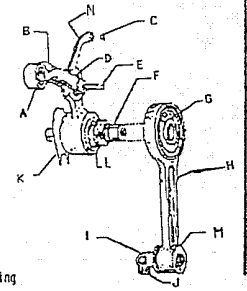
(4) 51350435 Pressure bar -pressure regulating screw with extended knob for bridge.
(11) 5106336 Pressure bar spring- long black
(12) 5106394 Pressure bar spring locating pin.
(13) 5276025 Pressure bar tracking ball
(14) 5190 Slack thread regulator attachment screw
(15) 5106342 Slack thread regulator
(16) 5106335 Pressure bar position guide with screw (5158)
(17) 5158 Pressure bar position guide screw
(18) 5276028 Pressure bar lifting lever bracket (optional only on manual quilters)
(23) 51350442 Pressure bar lifter hinge screw (optional only on manual quilters)
(24) 5276117 pressure bar lifter finger (optional only on manual quilters)
(25) 5276536 Pressure bar bushing
(26) 5276241 Pressure bar with screw and ball
(27) 5176 Pressure bar screw
(28) 200039 Small pressure cup
200070 Large pressure cup (option not shown)

SECTION D

(1) 5435 Thread take-up lever link hinge stud set screw
(5) 5106357 Thread take-up lever link hinge stud (with oil wick)
(6) 5106368A Thread take-up lever assembly complete
Individual parts:

Part # 5106368A

(A) Hinge stud bronze bushing #5106368A-1
(B) Side Link #5106368A-2
(C) Thread eylet #5106368A-3
(D) Take-up finger ball bearing #5106368A-4
(E) side link support pin #5106368A-5
(F) Counter weight main stud #5106368A-6
(G) Main link ball bearing #5106368A-7
(H) Main link #5106368A-8
(I) Needle bar stud #5106368A-9
(J) Needle bar stud screw #5140706
(L) Main stud needle bearing #5106368A-10
(M) Needle bar stud Needle bearing #5106368A-11
(N) Take-up Finger #5106368-12
(k) kit containing plastic thrust washers, oil plug, snap ring #5106368A-0



(7) 5106397 Upper oil felt
(8) 5106325 Upper needle bar bushing (older quilters only) **NO oil groove**
5106325-1 Upper needle bar bushing
(All XL quilters and newer manual quilters) **Oil groove**
(9) 200030 Lower oil felt
(10) 5106424-1 Lower needle bar bushing (all quilting machines) with retaining ring
5106424-2 Retaining ring can be used for both upper and lower bushings
(11) 598923 Lower needle bar bushing wire thread guide
(12) 200032 Needle bar with screw
(13) 200032-1 Needle bar set screw
(17) 200033-? Needles
(please check with the factory for application recommendation)
(18) 5106346 Thread eylet and guide
(19) 5106346-1 Thread eylet attachment screw

SECTION E

(1) 5140609 Thread take-up clamping screw (hex head)
(2) 51036 Thread take-up flat alignment set screw (slotted)
(3) 5106304 Main arm shaft front bearing
010002 Rear bearing (not shown)
260001 Adapter bushing for above bearing (not shown)
080001 Flexible coupling for main arm shaft with 260001 and 010002 installed
(4) 5106303 Main counter-weight shaft with 5106303-1 and 5106304
5106303-1 Black counter-weight only

SECTION F

(2) 51654 3-hole thread guide lock nut
(3) 516377 3-hole thread guide
(30) 5448 Tension assembly locking set screw
(31) 5140610 Acess hole plug
(29) 5106374 Tension assembly Rotary disc style
5106374-1 Tension assembly squeeze discs style
5106374-2 Rotary disc for 5106374
5106374-3 Check spring for either tension assembly
5106374-5 Tension assembly- Air Operated for XL quilters with thread cutter

SECTION G

(5) 5106306 Timing pulley upper shaft 5/8"
(6) 5106303-3 Set screws for timing pulleys (upper or lower)
(7) 5106305 Rubber timing belt
(13) 5106307 Timing belt separator

Sewing Head Lower Assembly

(1) 200053 Bobbin case L style
200053-1 Bobbin case - large capacity M style
(3) 200050-1 Screw for bobbin case holder finger
(4) 200050 Bobbin case holder finger
(5) 200043 Hook- plain chrome L style
200043-1 Hook- black teflon coated basket L style
200043-2 Hook- large capacity- M style
(7) 5272229 Hook pump- complete
(8) 5200346 Hook pump holding set screw
(9) 200046 Bed slide
(10) 200041 Ring gear - inside oil resovoir drives hook pump
(12) 200048 Gasket for oil resovoir
(13) 5276246 Oil resovoir cover
(14) 5200346 Set screw to hold ring gear drive shaft bushing in oil reso
(15) 5276244 Resovoir oil drain plug
(16) 200040 Ring gear drive shaft
(17) 010001 Ring gear drive shaft rear bearing
(18) 5114063 Lower timing pulley set screws

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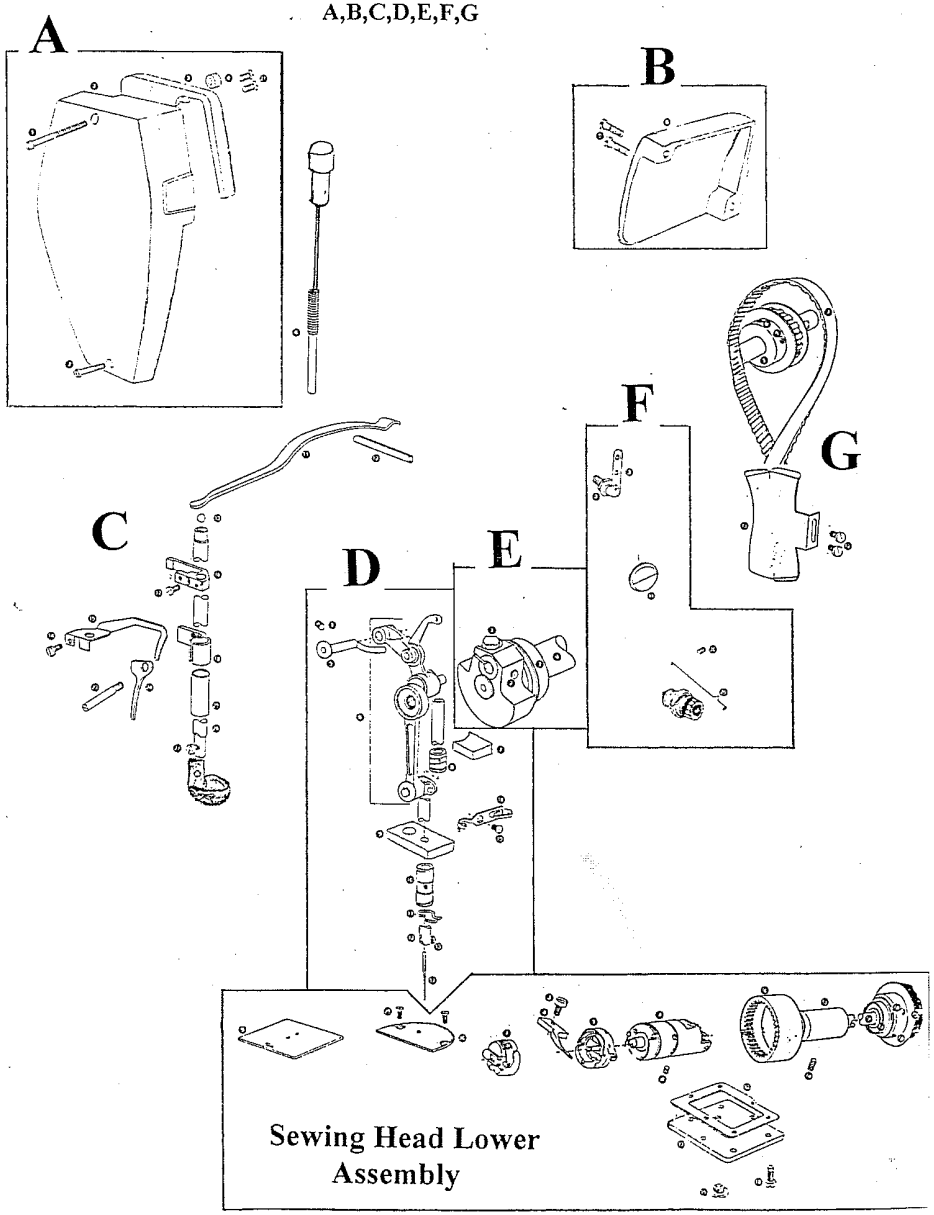
Sewing Head Upper Assembly
A,B,C,D,E,F,G