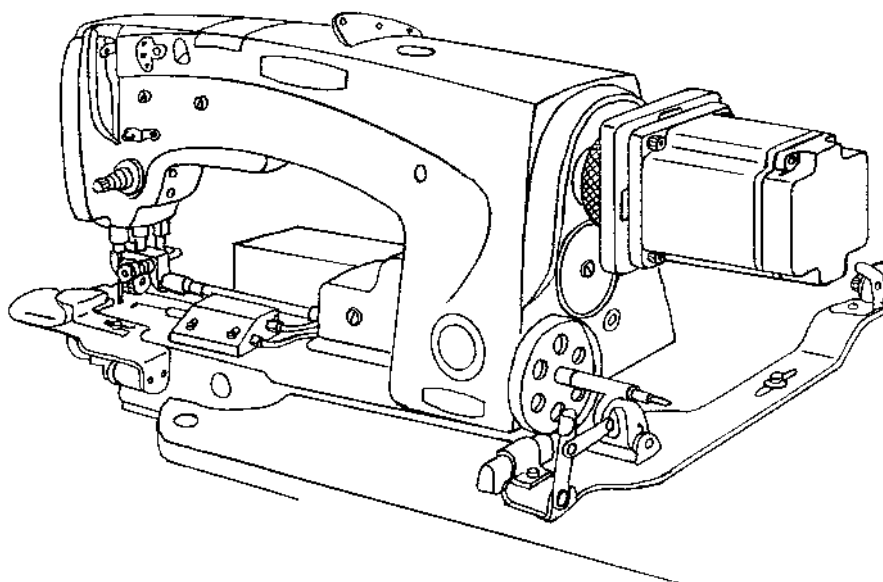


CLINTON MODEL 970

VARIABLE SPEED DC SERVO MOTOR

NEEDLE POSITIONER THREAD TRIMMER



SERVICE MANUAL

40-0258-01



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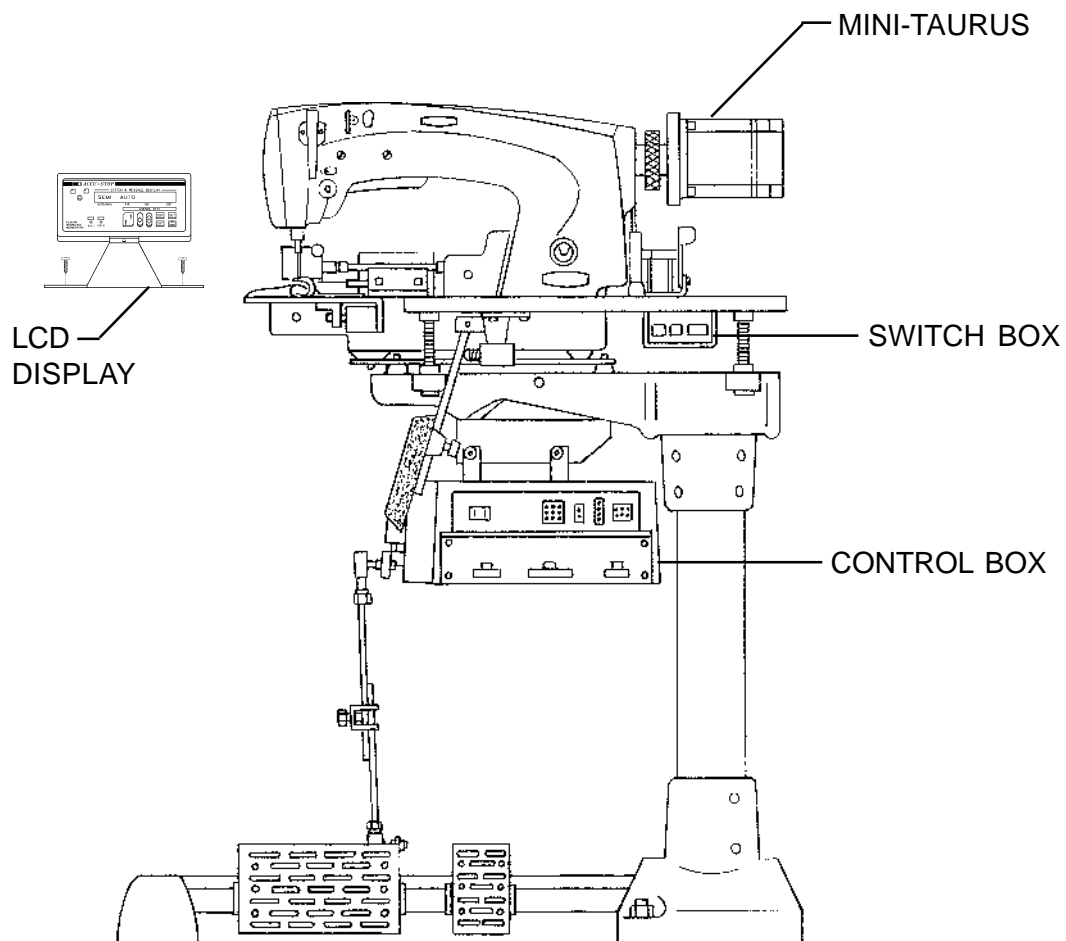
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INTRODUCTION

Clinton's Model 970 is an electronically controlled variable speed drive for industrial sewing machines. The drive consists of a brushless DC Servo Mini-Taurus motor, controller with a microprocessor, speed control and a programmable LCD display as an option. No clutches, brakes or synchronizer are used. All components interact to give a fast accurate and reliable sewing machine drive. The components of the system are shown in figure below.



The model 970 has outputs for a trimmer, footlift, wiper and needle cooler. It can be used to operate all Clinton trimmers, as well as the Singer, Union Special, Pfaff, Juki and Brother undertrimmers and chain stitch machines.

The programmable LCD display is used to select the trimmer type and other parameters. See section III.



INSTALLATION

A. MOTOR INSTALLATION

1. Remove the handwheel from the machine.
2. Remove the four screws that hold the bearing housing to the machine, see ML970-15. Attach the sewing head mounting plate, 02-4108-01 to the machine with the screws provided 30-1210-01.
3. Attach the sewing head coupling assembly 10-1544-01 to the machine removing all play from the main shaft.
4. Rotate the machine in the standard direction of rotation until the point of the needle is even with the top of the throat plate.
5. With power to the system and the motor detached from the machine press the "arrow right" and "SBT" buttons simultaneously. The display will read "TEST SYSTEM" briefly the "PRESS SET".
6. Press the "SET" button twice, the display will read "TEST INDEX" briefly then show a broken line (-----) rotate the motor slowly by hand until the display reads (---INDEX---).
7. Align the motor coupling with the sewing head coupling, keeping the motor in the INDEX position, and attach the motor to the machine.

Note: The sewing head may have to be rotated slightly in order to align the couplings but the INDEX signal must be between the needle up and the needle down positions.

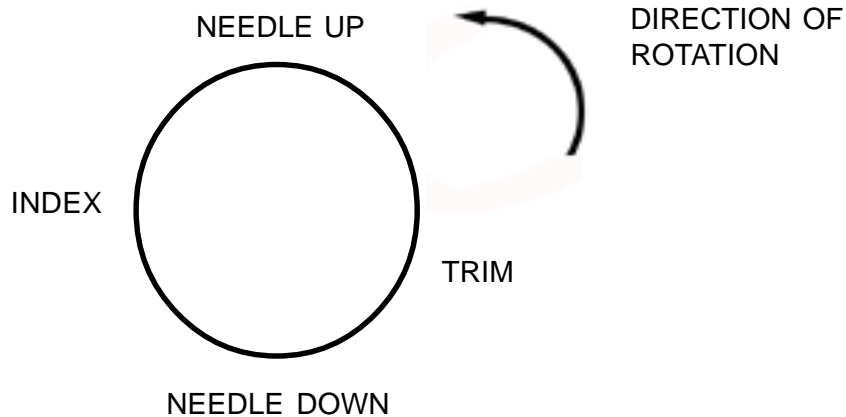


Fig. 2-1

B. LCD DISPLAY

Mount the LCD display console at a convenient location on the table top as shown in figure 2-2.

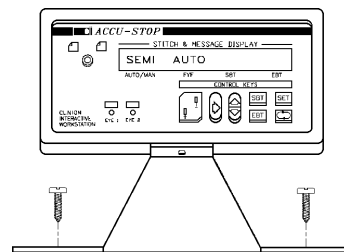


Fig. 2-2



C. SWITCH BOX

Install switch box at a convenient location under the table. See fig. 2-3.

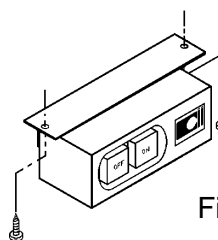


Fig. 2-3

D. POWER AND CABLE CONNECTIONS

Refer to figure 2-4 and connect all cables as shown. The system can be operated from 230V, 3 phase or 230V, single phase power.

CABLE DIAGRAM

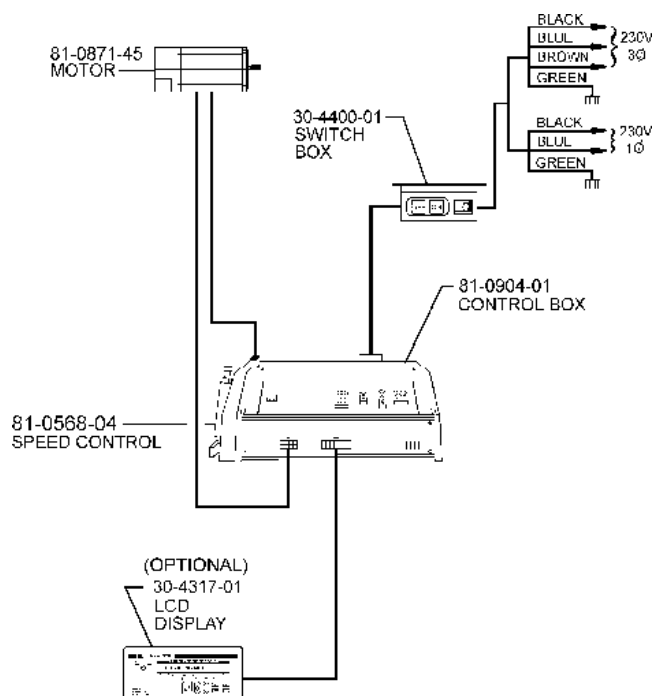


FIG. 2-4

E. MOTOR ROTATION

Before attaching the motor to the sewing head, turn power on, then move the pedal forward and note the direction of motor pulley rotation. If incorrect, do the following:

1. Turn power off.
2. Refer to section III-B, Hidden Parameters, and follow the instructions to change motor rotation. The parameter is in the "**** Toggle Switches" group.
3. Install the motor.



F. TEACH-IN MODE (SETTING THE NEEDLE UP, NEEDLE DOWN AND TRIM POSITIONS)

Note: The index signal from the motor must be set prior to setting the needle up and down positions. (See systems test section for instruction on setting the index signal).

1. NEEDLE DOWN

To set the needle down position access the "****MISC." group of the hidden parameters then select the "NEED.dwn" parameter. Rotate the handwheel of the machine until the needle is in the down position. Press the treadle forward, the machine will make one revolution then save the needle down position.

2. NEEDLE UP

To set the needle up position access the "****MISC." group of the hidden parameters then select the "NEEDLEup" parameter. Rotate the handwheel of the machine until the take-up lever is in dead center position. Press the treadle forward, the machine will make one revolution then save the needle up position.

3. TRIM

To set the trim position access the "****MISC." group of the hidden parameters then select the "TRIMcnt." parameter. Rotate the handwheel of the machine until the needle thread is positioned between the 5 and 6 o'clock position across the hook. The needle is used for the reference point of 12 o'clock position. Press the treadle forward, the machine will make one revolution then save the trim position.

Note: Any of the above positions may be "Fine Tuned" by accessing their respective parameter and using the  or  button to change the displayed value.



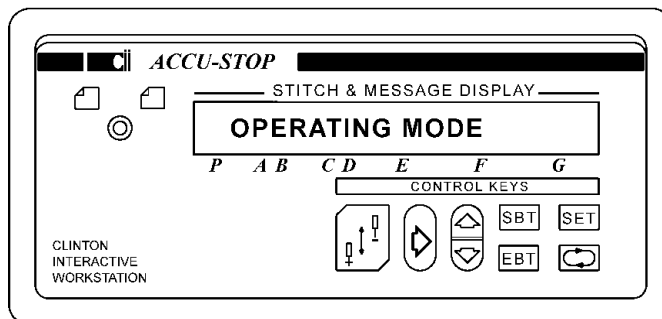
PROGRAMMABLE LCD DISPLAY

The LCD display, shown in fig. below is used to program and set the various parameters of the 970; SPEEDS, TIMERS, COUNTERS, and TOGGLE SWITCHES.

Two (2) different modes of operation are available. They are:

1. Operating Mode
2. Programming Mode

When power is turned on, the display is in the operating mode.







There are two (2) groups of parameters that are accessed in different ways. They are : (1) parameters with direct access and (2) hidden parameters with indirect access. In addition a master reset is available to reset all parameters to their default values.

A. DIRECT ACCESS PARAMETERS

The direct access parameters are divided into four (4) groups. They are (1) SPEEDS, (2) TIMERS, (3) COUNTERS, and (4) TOGGLE SWITCHES. Table 3-1 describes each parameter, shows the default value and range of adjustment for each parameter.

To change a parameter, follow the sequence described below.





1. Press the  key to enter the programming mode. Continue pressing this key until the parameter group that is to be changed is displayed. As an alternative; press the **SET** key to enter the programming mode and display the last changed parameter.
2. Press the **SET** key to step to the next parameter in the selected group.
3. Press the  key to increase or the  key to decrease the contents of the displayed parameter. Both keys are used to toggle parameters between states in the Toggle Switches group. Hold the key down to make the display step automatically.
4. Press the  key to return to the operating mode.

**TABLE 3-1**

PARAMETER	DESCRIPTION	DEFAULT	RANGE
	SPEED GROUP	RPM	RPM
SOFTSTRT	Sets the RPM of the machine while in the soft start option.	500	140-2000
	TIMER GROUP	MS	MS
START DEL	Delays machine start to allow presser foot to drop.	80	10-500
TRIM TIME	Sets the amount of time that the trimmer is on.	90	50-250
WIPER TIME	Sets the amount of time that the wiper is on.	80	10-250
	COUNTER GROUP	STITCHES	STITCHES
SOFTSTRT	Number of stitches sewn at soft start speed.	3	1-50
	TOGGLE SWITCHES		
PF/SEAM	Presser foot UP or DOWN in the seam, treadle neutral.	DOWN	UP/DOWN
PF/EOC	Presser foot UP or DOWN at the end of cycle, pedal neutral.	DOWN	UP/DOWN
SOFT STRT	Turns the soft start function On or OFF.	OFF	ON/OFF
HEEL 2	Turns the trim function On or OFF.	ENABLED	ENABLED/ DISABLED

B. HIDDEN PARAMETERS

The parameters in this section are separated from the Direct Access parameters because they are infrequently changed and should not be changed by the operator. The parameters are listed in table 3-2.

1. Turn power off, if it is on, then wait until the display goes blank.
2. Press the  key and the  key simultaneously. Keep pressed then,
3. Turn power on. A series of "****" will appear on the display. They will slowly disappear.
4. Release the keys then press the  key before all the stars disappear.
5. Press the  key repeatedly, until the first hidden parameter group (****SPEEDS) is displayed. Note that 4 stars (*) as described in section "A" above.



C. MASTER RESET

In some cases it may be necessary to reset all parameters to their default values. This is done as follows:






1. Turn power off, if it is on, then wait until the display goes blank.
2. Press the  key,  key and  key simultaneously. Keep pressed then,
3. Turn power on. The display alternates between "Push Set" and "For Reset".
4. Push the **SET** key within 10 cycles.
5. The word "Programming" is displayed. The parameters will be reset to their default values after a few seconds.

TABLE 3-2

PARAMETER	DESCRIPTION	DEFAULT	RANGE
	****SPEED GROUP	RPM	RPM
TRIM/POS MAXIMUM	Sets the positioning speed of the machine Sets the maximum speed of the machine	220 4200	100-250 500-9900
	****MISCELLANEOUS		
POS. DOWN	Sets the Needle Down position.*	130	0-255
POS. UP	Sets the Needle Up position.*	210	0-255
TRIM COUNT	Sets when the trimmer activates.*	140	0-255
PF DUTY	Average voltage applied to the presser foot solenoid.	5	1-10
REVERSE COUNT	Sets the amount the machine will turn back if the reverse mode is activated.	3	0-255
	****TOGGLE SWITCHES		
DIRECTION	Sets the motor direction. ++CW = Clockwise --CCW = Counterclockwise.	--CCW	++CW / --CCW
TRIM	2 Position = The machine will not stop when the trimmer is activated. 3 Position = The machine stops when the trimmer is activated.	2 POS.	2 POS. / 3 POS.
REVERSE MODE	Turns the reverse function On or Off.	DISABLED	ENABLED / DISABLED

* See Section II, Teach-in mode.

**TEST MODE****A. BUILT-IN TEST PROGRAM**

A test program is available to test the major functions for a proper operation. To access the program press the  and  buttons simultaneously.

The display will read "SYSTEM TEST" briefly then press "SET", after which the following may be tested: TREADLE, INDEX SIGNAL, ENCODER, MOTOR BALANCE


1. Treadle Test

Press the  button until "TEST TREADLE" will be displayed briefly then "NEUTRAL".

- a. Move the pedal from neutral to heel 1 then to heel 2. The display should show each position.
- b. Move the pedal forward slowly. As the pedal is moved, a number (0 to 255) will be displayed.


Note: This number is proportional to how far the pedal is moved. The lowest number should be no more than "8" and the highest number greater than "250".


2. Index Signal

Press the  button. The display will read "TEST INDEX" briefly then show a broken line "-----". Rotate the motor by hand until the display shows "----INDEX----" signal. If this signal is not displayed within one revolution of the handwheel, the encoder has failed.


3. Encoder Test


CAUTION: Separate the coupling. The coupling must be separated because the motor may not develop sufficient torque to turn the machine.

Press the  button. The display will read "TEST ENCODER" briefly then "PUSH START (enc)".

Press the  button, the motor will begin to rotate slowly and the display will read "PLEASE WAIT". After 2 or 3 seconds the motor will stop and the display shows the number of counts. The number should be between 240 and 260 pls.

4. Motor Balance Test

Press the  button. The display will read "CHECK BALANCE" briefly then "PUSH START(bal)".

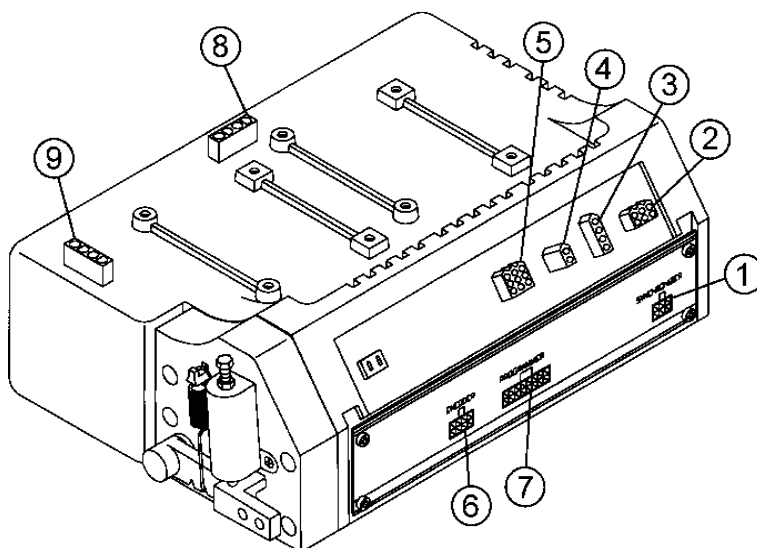
Press the  button. The motor will begin to rotate slowly in one direction and then the other, the display will read "PLEASE WAIT". When the motor stops the display will show a balance number (0-255). The balance number should be below 10.

Note: If the motor is too far out of balance the display may read "DIRECTION FAILED". This error message will also occur if the motor is unplugged from the control box when the balance is being tested.



CONNECTOR DIAGRAMS

Listed below are the pinouts for the Model 970 control box connectors.



NO.	TOTAL PINS	CONNECTOR	PIN NO.	FUNCTION
1	-----	NOT USED	-----	NOT USED
2	6	AUX INPUTS	1 2 3 4 5 6	+5 GND CHASSIS GND I 1 I 2 I 3
3	4	AUX OUTPUTS	1 2 3 4	+48 V R1 +48 V R2
4	2	FOOTLIFT	1 2	FOOTLIFT SOL. +48V
5	9	TRIM, WIPER, BACKTACK SOLENOIDS, AND MANUAL BACKTACK SW.	1 4 2 5 3 6 7 8 9	WIPER SOL. - WIPER SOL. +(48V) TRIMMER SOL. - TRIMMER SOL. +(48V) BACKTACK SOL. - BACKTACK SOL. +(48V) + MANUAL BACK - TACK SWITCH NOT USED



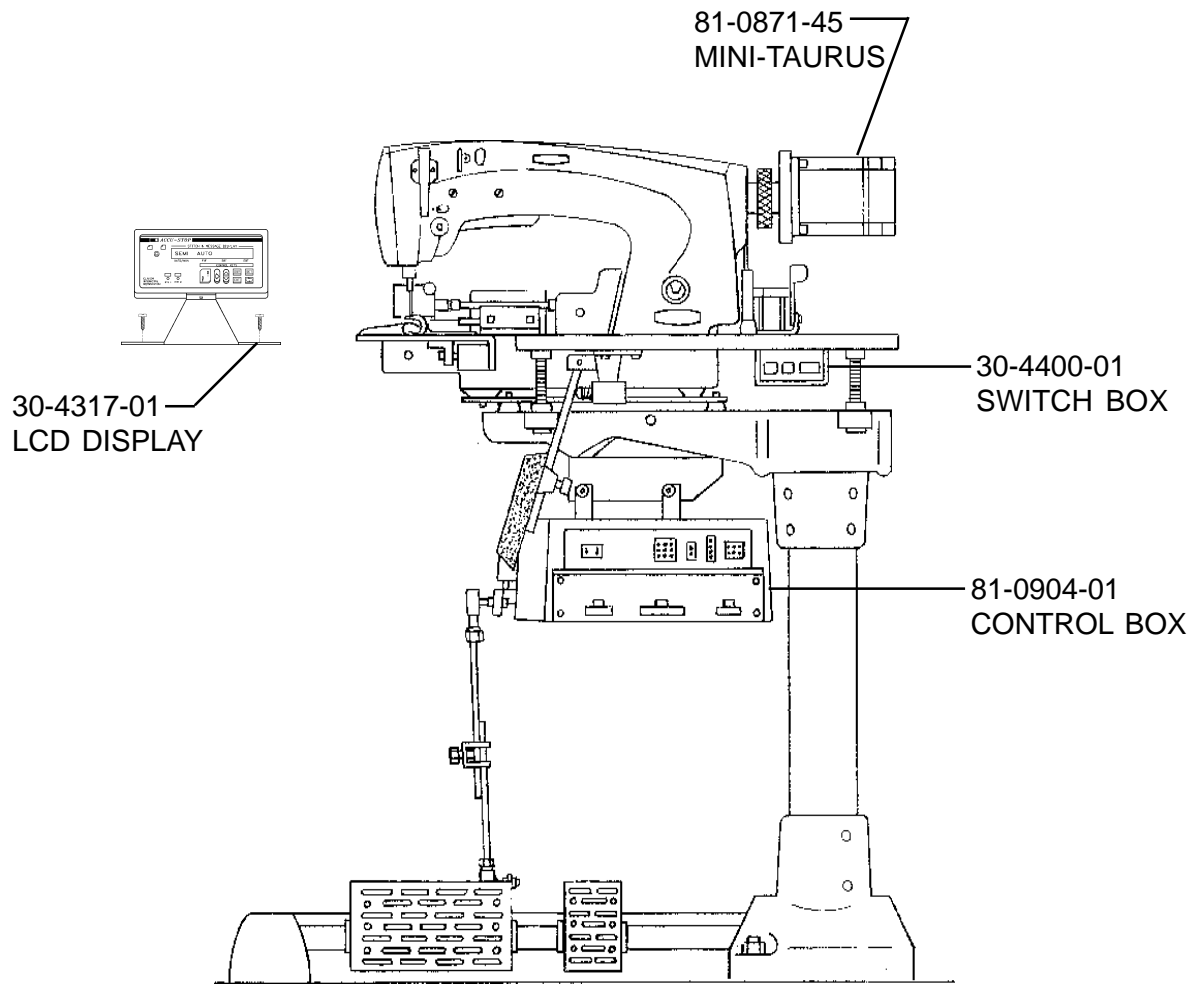
NO.	TOTAL PINS	CONNECTOR	PIN NO.	FUNCTION
6	8	ENCODER	1 2 3 4 5 6 7 8	+5V ENCODER (S1) ENCODER (S2) SIG. GND PHASE C PHASE B PHASE A INDEX
7	16	LCD DISPLAY	1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16	EXT1 CHASSIS GND +5V GND D0 D1 D2 D3 D4 D5 D6 D7 CA1 E ERD CA0
8	4	AC POWER 220V 3	1 2 3 4	PHASE A PHASE B PHASE C CHASSIS GND
9	4	MOTOR VOLTAGE	1 2 3 4	PHASE A PHASE B PHASE C CHASSIS GND



DRAWINGS AND PARTS LIST

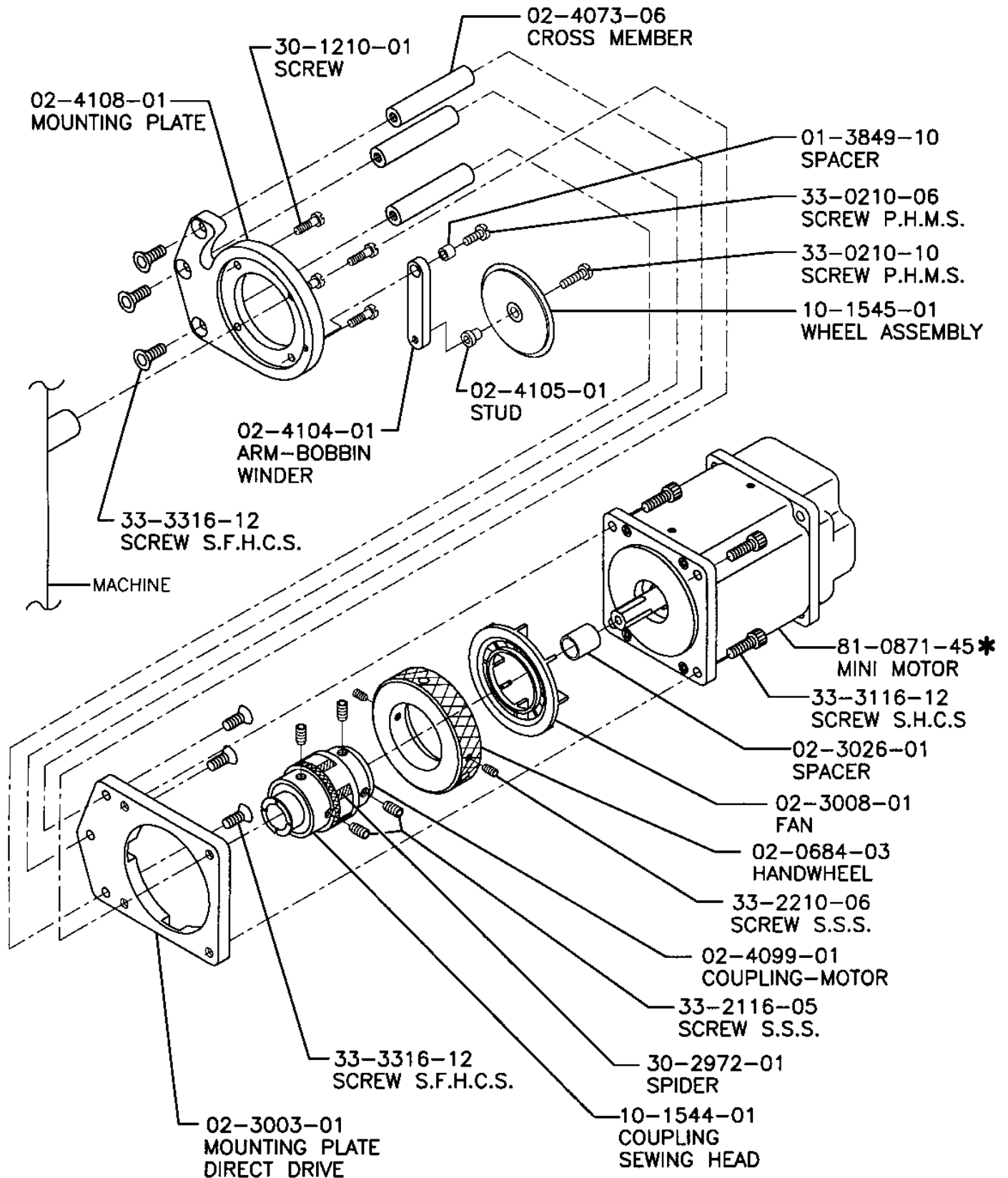
MODEL 970

A. MAJOR ASSEMBLIES





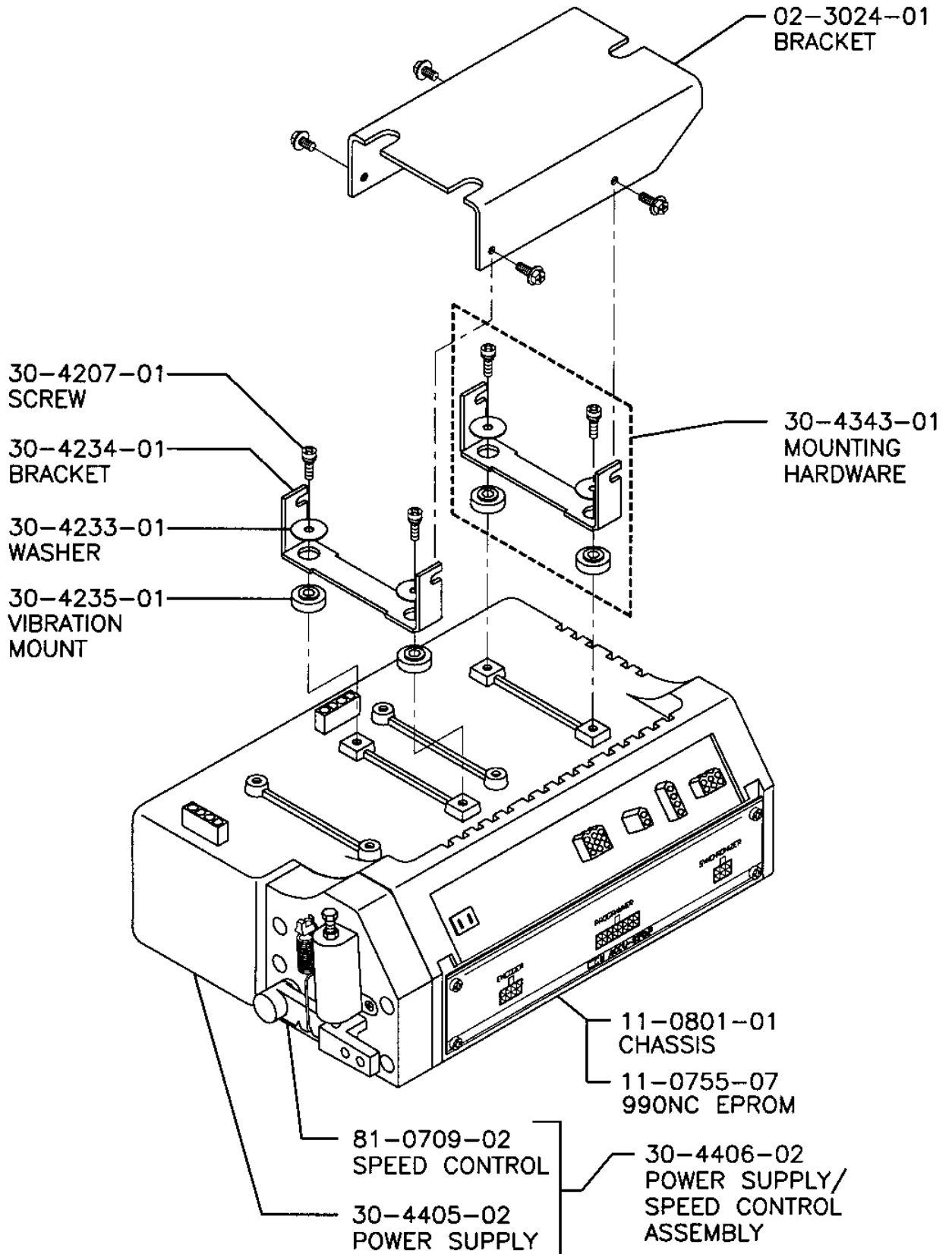
B. MOTOR MOUNT ASSEMBLY - 970DD, US 63900 80-0543-09



* NOT PART OF ASSEMBLY 80-0543-09

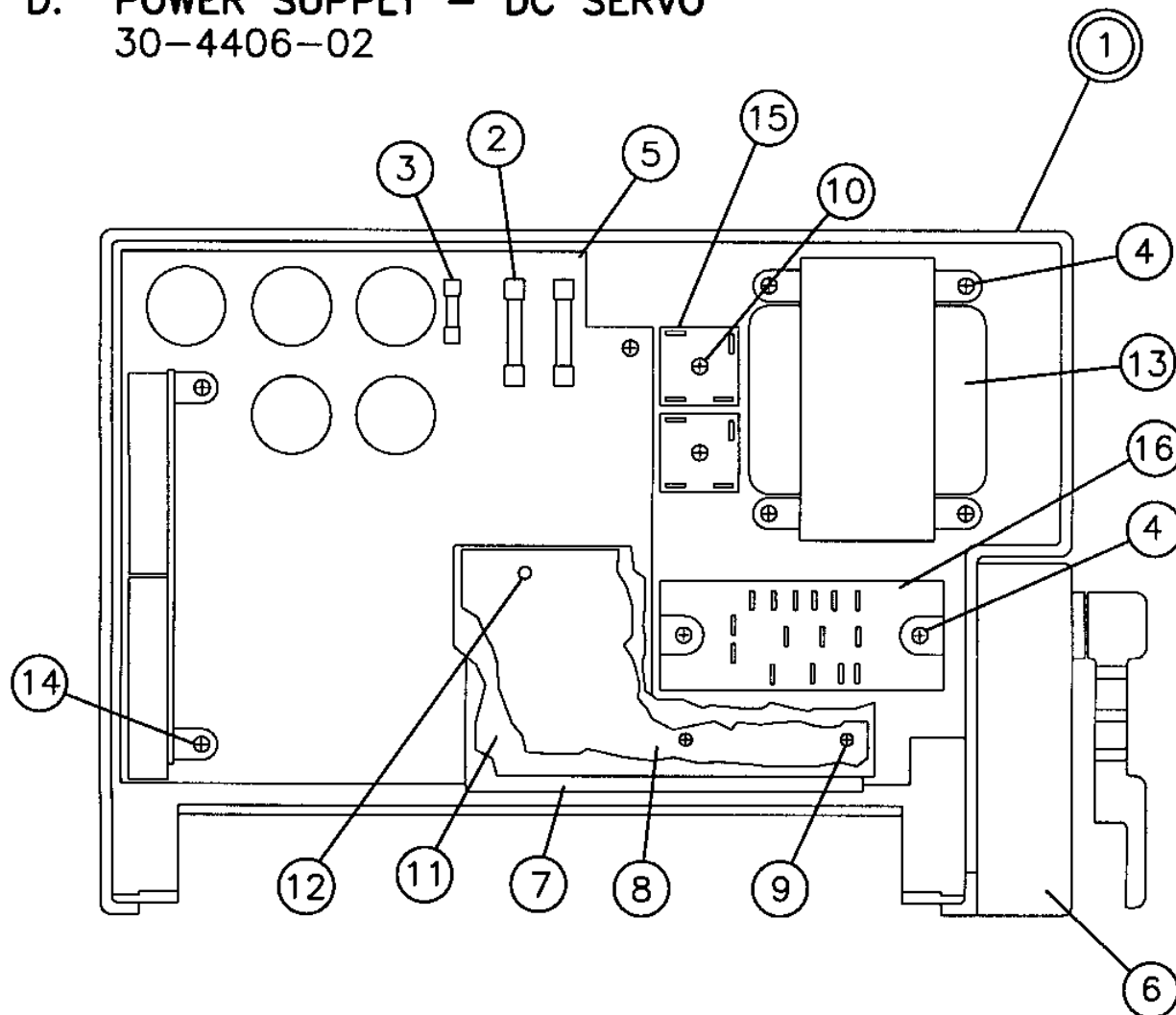


C. CONTROL BOX ASS'Y-DC SERVO MODEL 970DD - 81-0904-01





D. POWER SUPPLY - DC SERVO
30-4406-02

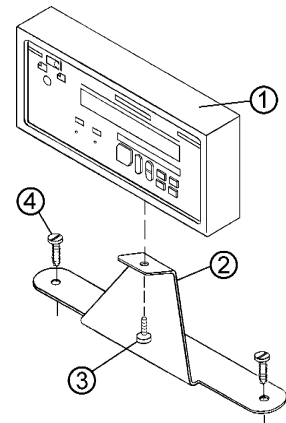


ITEM	DESCRIPTION	PART NO.	QUANTITY
1	POWER SUPPLY-DC SERVO	30-4405-02	1
2	FUSE 15A 250V	30-2748-01	2
3	FUSE 4A 250V	30-2749-01	1
4	SCREW M5 X 10	30-4208-01	6
5	POWER BOARD	30-4408-01	1
6	SPEED CONTROL	81-0709-02	1
7	INSULATOR, LOWER	30-4421-01	1
8	INSULATOR, UPPER	30-4422-01	1
9	SCREW M3 X 7	30-4423-01	2
10	SCREW M5 X 20	30-4424-01	2
11	SERVO MODULE BOARD	30-4425-02	1
12	STANDOFF	30-4426-01	1
13	TRANSFORMER	30-4431-01	1
14	SCREW M4 X 10	30-4432-01	4
15	RECTIFIER BRIDGE	37-0241-01	2
16	POWER MODULE	37-0242-01	1

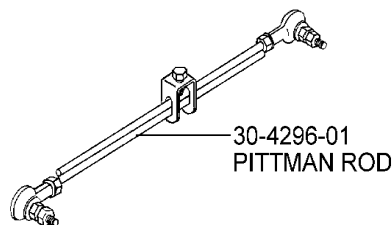


E. PROGRAMMABLE DISPLAY

ITEM	DESCRIPTION	PART NO.	QUANTITY
1	PROGRAMMABLE DISPLAY	30-4317-01	1
2	BRACKET, MOUNTING	30-4286-01	1
3	SCREW M4 X 12	30-4287-01	1
4	SCREW	30-4288-01	2



F. MISCELLANEOUS PART



G. E-PROM

Most of the E-proms used in Clinton's Mini-Taurus are Cmos devices, thus subject to being damaged by electrostatic discharges. Proper grounding practices should be followed when handling and replacing them. Refer to figure below when replacing the E-prom.

- Notes: 1. The notch on the E-prom chip and the other chips on the board all face towards the back of the board (towards back of chassis).
- 2. Check to make sure that all of the E-prom chip's legs/pins are properly seated.

