CLINTON
MODEL AS-870 / 870LCD

VARIABLE SPEED
DC SERVO MOTOR

NEEDLE POSITIONER THREAD TRIMMER
NEEDLE COOLER

SERVICE MANUAL

TABLE OF CONTENTS

INTRODUCTION

Clinton's Model 870LCD is an electronically controlled variable speed drive for industrial sewing machines. The drive consists of a brushless DC Servo Motor, controller with a microcomputer, synchronizer, speed control and programmable LCD display. No clutches or brakes are used. All components interact to give a fast accurate and reliable sewing machine drive. The components of the system are shown are shown in figure below.
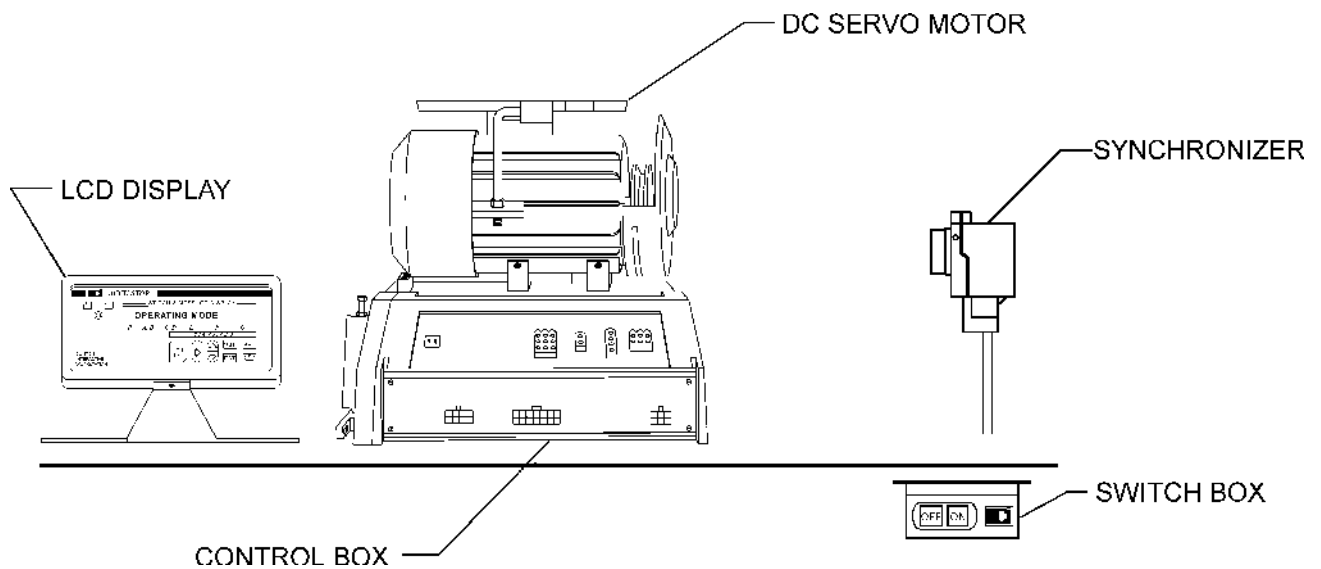
The model 870LCD has outputs for a trimmer, footlift, wiper and needle cooler. It can be used to operate all Clinton trimmers, as well as the Singer, Union Special, Pfaff, Juki, Brother undertrimmers and chain stitch machines.

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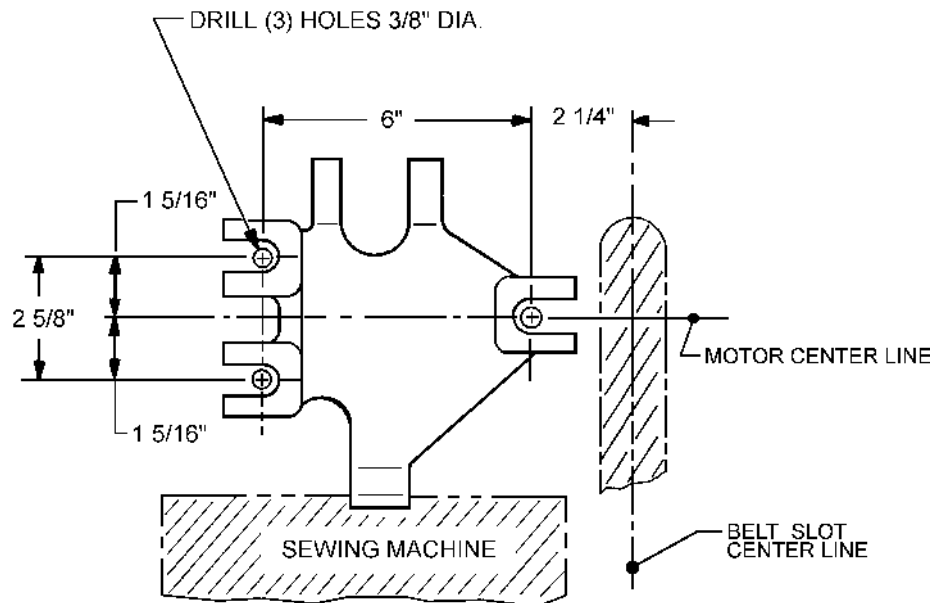
INSTALLATION

A. CONTROL BOX TO MOTOR

Refer to the control box assembly parts drawing in figure 7-3. Attach the mounting brackets to the control box then, mount the control box to the motor with the hardware provided.

B. MOTOR

1. Drill three holes in the sewing machine table as shown in figure 2-1.

MOTOR INSTALLATION
FIG. 2-1

2. Mount the motor to the table using the spacers, carriage bolts, nuts, washers, and flanged spacers supplied (See Figure 7-2). Install pulley and belt then check the following:

    a. The motor is mounted so that the motor drive pulley and sewing machine drive pulley are properly aligned.

    b. The V-belt connecting the motor to the sewing machine should be tensioned properly. It should be possible to pull a correctly tensioned belt together between two fingers within approximately 2 cm (3/4"). Excessive tension may not only shorten the life of the bearings, but could also affect the operation of the sewing machine. A loose belt will affect positioning accuracy.

    c. Install the belt guard.

C. SYNCHRONIZER

Two methods are used to attach the synchronizer to the handwheel. They are (1) handwheel turned down to accept synchronizer and (2) an adapter that is mounted to a machined handwheel.

Refer to figure 2-2 and install the synchronizer as follows:
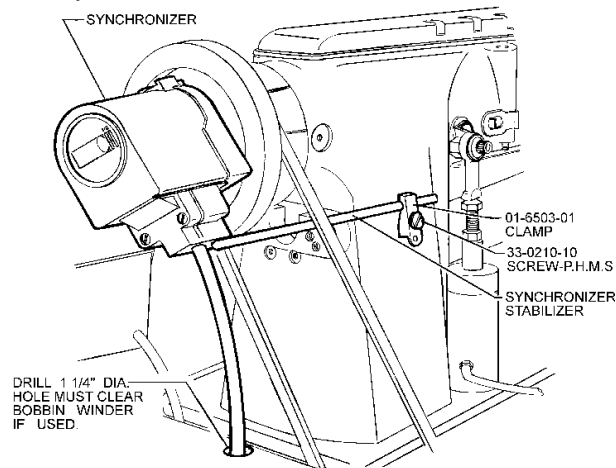
SYNCHRONIZER INSTALLATION
UNIVERSAL MOUNT
FIG. 2-2

1.   Install adapter if used.
2.   Mount and secure synchronizer to handwheel or adapter.
3.   Position the synchronizer retaining rod and clamp as shown in figure 2-2. Make sure that the rod clears the sewing machine belt.
4.   Using the mounting clamp hole as a guide, drill and tap a 10-32 hole in the machine casting. Secure clamp and rod with a 10-32 X 1/2 B.H.M.S.
5.   Drill a 1-1/4" Dia. hole in table to route synchronizer cable to logic box. Check that cable has adequate slack when tilting machine for service.

D. LCD DISPLAY

Mount the LCD display console at a convenient location on the table top as shown in figure 2-3. Route cable through same hole that synchronizer cable passes through.

FIG. 2-3

E. SWITCH BOX

Install switch box at a convenient location under the table. See figure 2-4.

FIG. 2-4
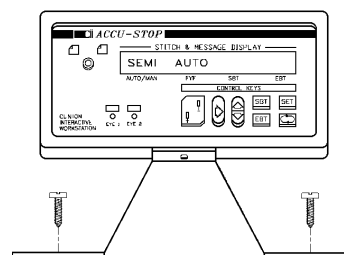
F. POWER AND CABLE CONNECTIONS

Refer to figure 2-5 and connect all cables as shown. The system can be operated from 230V, 3 phase or 230V, single phase power. See figure 2-5.

Caution: It is important that the ground wire be connected between the motor and sewing machine to prevent a static charge buildup at the sewhead.

FIG. 2-5

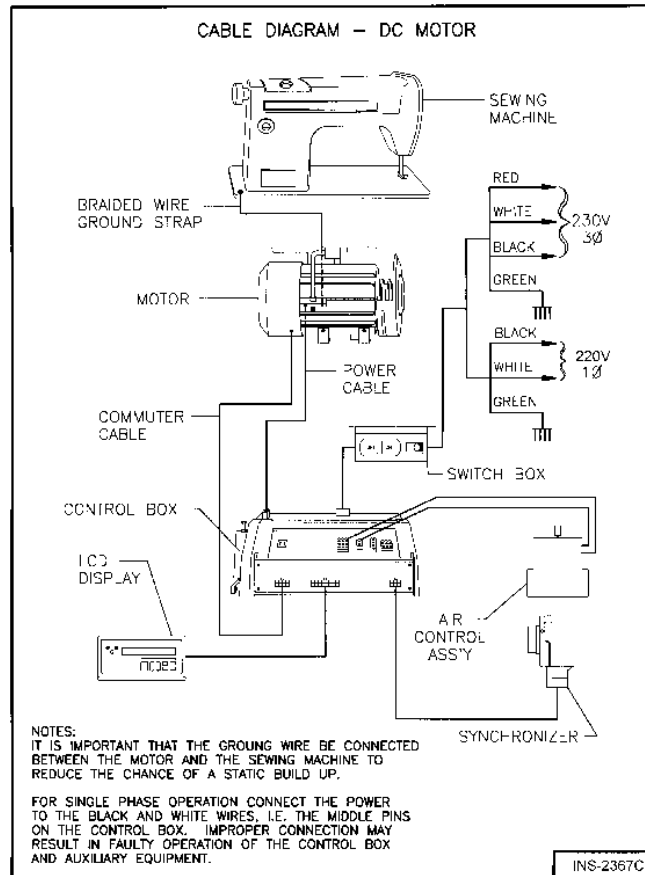## G. MOTOR ROTATION

Temporarily remove the "V" belt. 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 V-B, Hidden Parameters, and follow the instructions to change motor rotation. The parameter is in the "**** Toggle Switches" group.

3. Install the "V" belt.

SYNCHRONIZER TIMING

Turn the power off before making synchronizer adjustments. Refer to figure below for all adjustments and perform the steps below to time the synchronizer.

1. Remove cover from synchronizer, then loosen the disc locking screw.

2. Rotate the handwheel so that the take up during the rising portion of its cycle is approxiamately 1/16" below its highest position.

3. Rotate the UP sensor disc until the notch is centered in the photo interrupter module.

4. Turn the handwheel until the needle is positioned down.

5. Rotate the down sensor disc until the notch is centered in the photo interrupter module.

6. Rotate the handwheel until the needle thread is positioned between 6 and 7 o'clock around the bobbin case. Rotate the trim disc until the notch is centered in the photo interrupter module.

7. Tighten the disc locking screw and replace the cover.

NOTE: After power is turned on a fine adjustment may be necessary and can be made by positioning the needle under power and noting the actual needle UP and needle DOWN and 6 o'clock stopping positions. If any of the positions are not correct, readjust the appropriate disc.
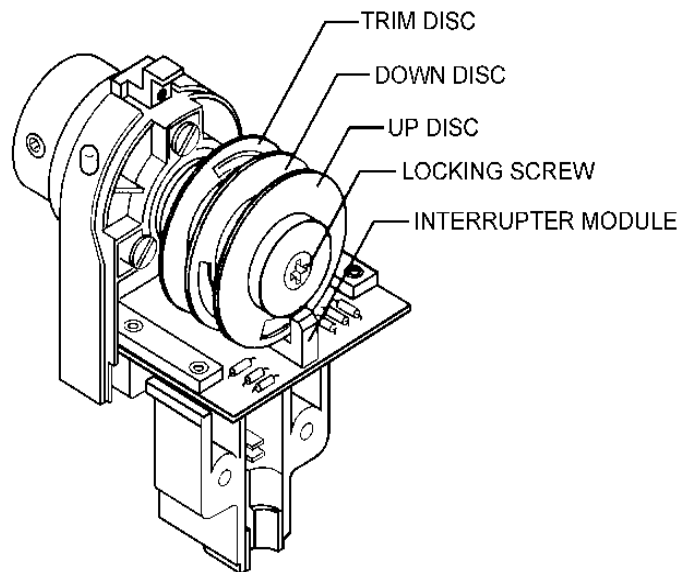
CONTROL BOX ADJUSTMENTS

A. MAXIMUM SEWING SPEED

Maximum sewing speed can be adjusted by changing the "MAXIMUM SPEED" parameter in the "LCD" display (see section V).
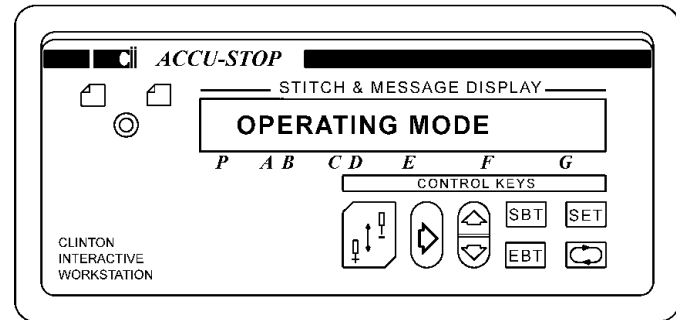
PROGRAMMABLE LCD DISPLAY

The LCD display, shown in fig. below is used to program and set the various parameters of the 870LCD; 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 5-1 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 closed to make the display step automatically.

4. Press the ▷ key to return to the operating mode.

TABLE 5-1

PARAMETER	DESCRIPTION	DEFAULT	RANGE
	SPEED GROUP	RPM	RPM
MINIMUM	First speed when pedal is moved forward. Initial speed at start of cycle (after trim).	180	80-400
SLOW STRT	This speed is maintained for No. of stitches set by soft start count parameter.	500	150-1000
	TIMER GROUP	MS	MS
STRT DEL	Delays machine start to allow presser foot to drop.	120	10-500
TRM TIME	Clinton Lockstitch- Time machine stops at 6 o'clock position to pick up threads.	80	10-1000
WIPER TIME	Wiper Pulse time.	80	0-1000
	COUNTER GROUP	STITCHES	STITCHES
SOFT ST	Number of stitches sewn at soft start speed after trim (EOC).	3	1-25
	TOGGLE SWITCHES		
PF/SEAM	Pr. Ft. UP or DOWN in seam, treadle neutral.	DOWN	UP/DOWN
PF/EOC	Pr. Ft. UP or DOWN after trim, treadle neutral.	DOWN	UP/DOWN
SOFT STRT	Used to turn soft "ON" or "OFF".	OFF	ON/OFF
HEEL 2	If "ENABLED", trims with heel 2. If "DISABLED" no trim with heel 2.	ENABLED	ENABLE/ DISABLE
TURNBAK	If "ON", machine rotates in reverse direction after trim, to move needle to its highest position.	OFF	ON/OFF
POSITION	Selects the needle position in the seam to "UP" or "DOWN".	DOWN	UP/DOWN

TABLE 5-2

PARAMETER	DESCRIPTION	DEFAULT	RANGE
	****SPEEDS	RPM	RPM
TRIM	Machine speed during the position trim cycle. If *** Tgl switch "position" is set to w/ramp the "trm/pos" speed affects the slope of the ramp. If "no ramp" is selected, position speed is constant and can be changed by the "trim/pos" parameter	220	100-400
MAXIMUM	Maximum sewing machine speed. The speed cannot go higher than 3500 times the pulley ratio	4200	8000
	****MISCELLANEOUS		
HYSTERESIS	The amount the pedal has to be moved when going from one direction to the other before the speed changes.	3	1-10
PF DUTY	Average voltage applied to Pr. Ft. solenoid. The voltage should be high enough to keep the solenoid energized without overheating.	3	2-10
T.BK.DEL	Delays reversing of motor until the trim cycle is finished. See "TURNBAK" parameter.	10	3-15
SELECT TRIM SYSTEM			
Press ⟳ then SET keys first, then use △ or ▽ keys to select one of the following trimmers, NO TRIM SYS, CLINTON LOCKST, JUKI/DURKOPP, PFAFF MECH, BROTH/PFAFF PN, SINGER/UNION, CLINTON T & B TRIM or CHAIN ST.		CLINTON LOCKSTITCH	
	****TOGGLE SWITCHES		
DIRECTION	Direction of motor rotation viewed from pulley.	OFF	ON/OFF
POSITION	Select position with ramp or position at constant position speed.		
AFTER TR	Not used in this system.	CONTINUE	CONTINUE/ PED. NEUT.
SAFETY SW	Set to enable only on machine with trimmer safety sw. If enabled, machine will not run unless safety switch is properly connected.	DISABLE	ENABLE/ DISABLE
SAFETY SW SEW	Set to CLS if safety switch is closed while sewing or OPN if switch is open while sewing.	CLS	CLS/OPN

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 5-2.

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 dissapear.

4. Release the keys then press the [SBT] key before all the stars dissapear.

5. Press the [↻] key repeatedly, until the first hidden parameter group (****SPEEDS) is diplayed.   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.

D. PULLEY RATIO (RATIO BETWEEN MOTOR AND MACHINE PULLEYS)

During the initial setup and after power is first turned on. The pulley ratio must be calculated. The pedal must be moved to the maximum forward position to do this. While the ratio is being taken, the machine speed is limited for several stitches. After the ratio is taken, the machine will then accelerate to maximum speed.
Each time power is turned off then back on, the ratio is checked when the pedal is moved forward the first time. If the ratio has changed, because of a pulley change, then the ratio will be recalculated. The ratio can be displayed by pressing the [▷] and [EBT] keys simultaneously. If the ratio is correct, a star (*) will be displayed after the ratio number.

E. TEST PROGRAM

A test program is available to test the treadle, synchronizer, encoder, and divider for proper operation. To select the program, press the ⬡ and SBT keys simultaneously. The display will show "SYSTEM TEST". Press the ⟳ key to toggle between each test, i.e. Treadle, Synchronizer, Encoder, or Divider. Press the SET key to activate whichever test is selected.

1. Treadle Test

    Press the ⟳ button until "TEST TREADLE" is displayed. Press the SET button once. The display should show "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, see NOTE#4) will be displayed.
        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".
        (NOTE: the maximum speed pot should be in the full cw position.)
    c. Press the pedal full forward. Turn the maximum speed pot ccw. The displayed count should decrease as the pot is turned. Return the pot to its maximum cw position.

2. Synchronizer Test

    Press the ⟳ button. The display will read "TEST SYNCHRONIZER". Press the SET button. Rotate the machine pulley by hand. The display will show the position. The positions are as follows: "UP", "DOWN", and "TRIM".

3. Encoder Test

    CAUTION: Remove sewing machine belt. The belt has to be removed because the motor may not develop sufficient torque to turn the machine.

    Press the ⟳ button. The display will read "TEST ENCODER". Press the SET button. The display will read "PUSH TREADLE". Press the pedal fully forward for approximately three seconds then release the treadle. Do not heel. The result will be displayed, either "OK" or "NOT OK".
    Heel the pedal. The display shows the number of counts. The number should be between 795 and 800 pls.

4. Divider Test

    NOTE: This test will not function properly if the encoder test fails. Also remove sewing ma chine belt.

    Press the ⟳ button, the display will read "TEST DIVIDER". Press the SET button. The display reads "PUSH TREADLE". Press the treadle fully forward for 3 seconds, then release the treadle. If the test works the display will read "DIVIDER OK". If the test fails the display will show the test which failed, ie. "PASS 1", "PASS 2", "PASS 3", "PASS 4", "PASS 5", or "PASS 6" .

CONNECTOR DIAGRAMS

Listed below are the pinouts for the model AS 870LCD control box connectors.
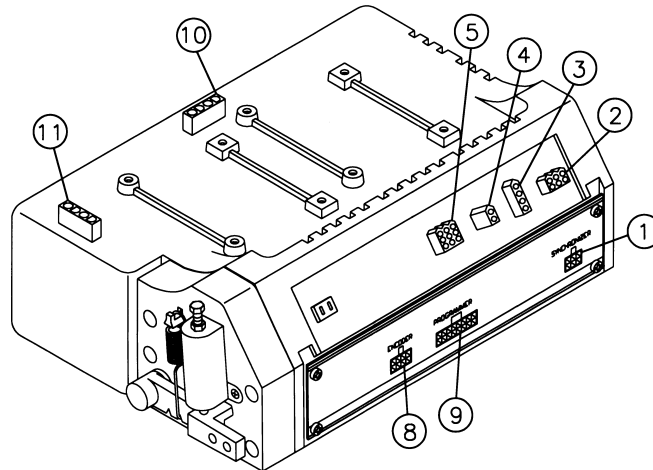
NO.	TOTAL PINS	CONNECTOR	PIN NO.	FUNCTION
1	6	SYNCHRONIZER	1 2 3 4 5 6	+5 DOWN SENSOR UP SENSOR TRIM SENSOR GND LED
2	6	AUX INPUTS	1 2 3 4 5 6	+5 GND CHASSIS GND I 1 I 2 I 3
3	4	AUX OUTPUTS	1 2 3 4	+48 V R1 +48 V R2
4	2	FOOTLIFT	1 2	FOOTLIFT SOL. +48V
5	9	TRIM, WIPER, NEEDLE COOLER, AND SAFETY SWITCH	1 4 2 5 3 6 7 8 9	WIPER SOL. - WIPER SOL. +(48V) TRIMMER SOL. - TRIMMER SOL. +(48V) NEEDLE COOLER + NEEDLE COOLER - +5V OR +10V SAFETY SWITCH (GND) SAFETY SWITCH (NO)

NO.	TOTAL PINS	CONNECTOR	PIN NO.	FUNCTION
8	8	COMMUTATOR	1 2 3 4 5 6 7 8	+5V ENCODER (S1) ENCODER (S2) SIG. GND PHASE C PHASE B PHASE A -5V
9	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
10	4	AC POWER 220V 3	1 2 3 4	PHASE A PHASE B PHASE C CHASSIS GND
1 1	4	MOTOR VOLTAGE	1 2 3 4	PHASE A PHASE B PHASE C CHASSIS GND

DRAWINGS AND PARTS LIST

MODEL 870LCD
81-0752-02

A. MAJOR ASSEMBLIES
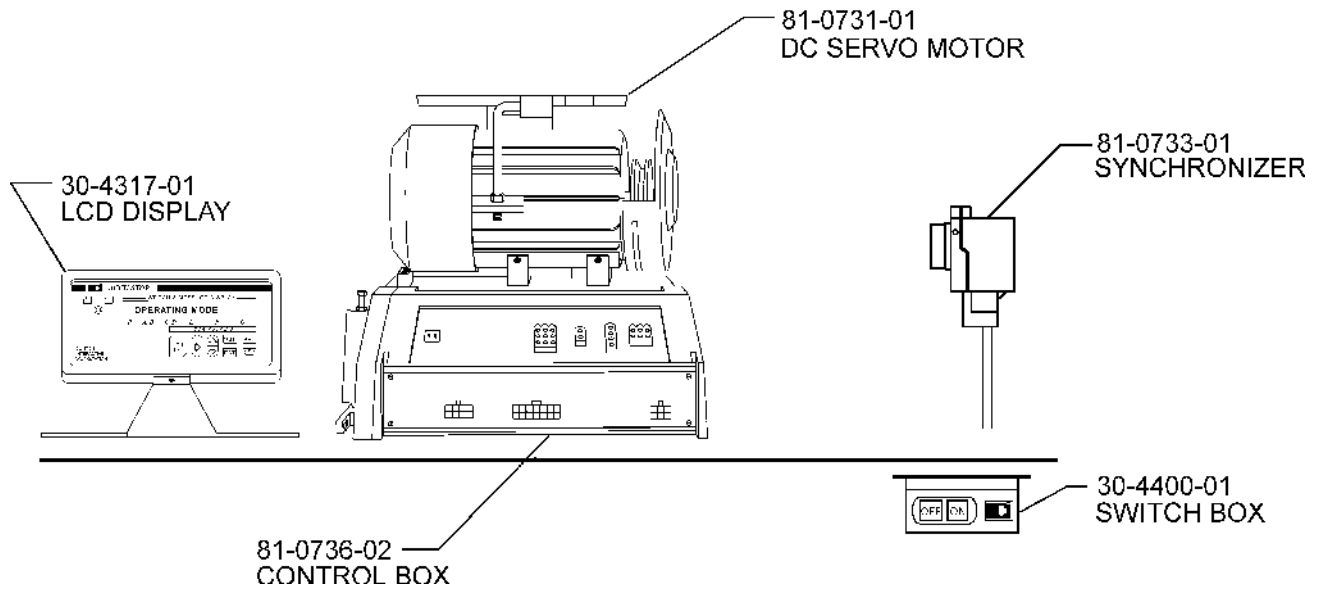
B. MOTOR ASSEMBLY DC SERVO
81-0731-01

MOTOR ASSEMBLY PARTS LIST, DC SERVO
81-0731-01

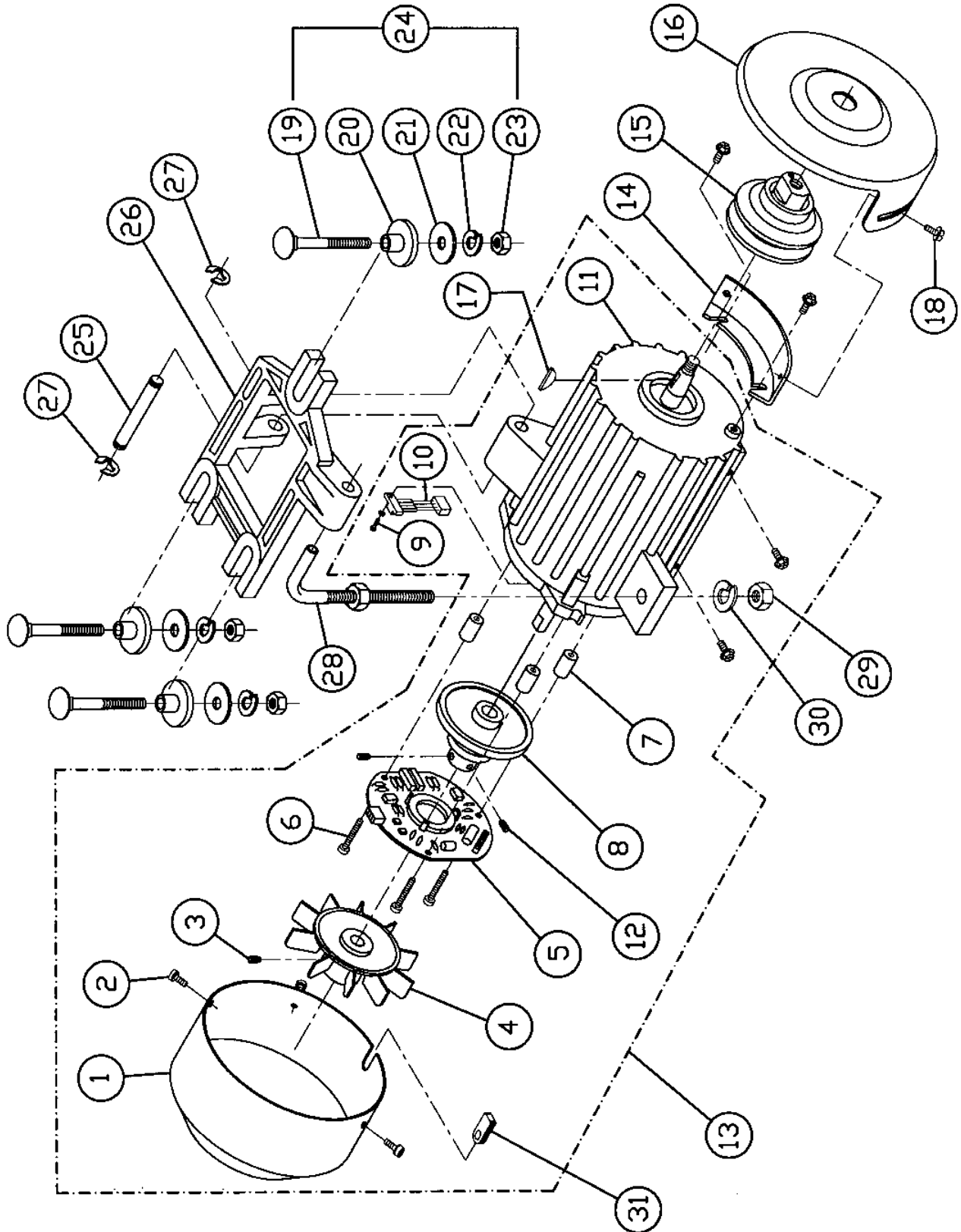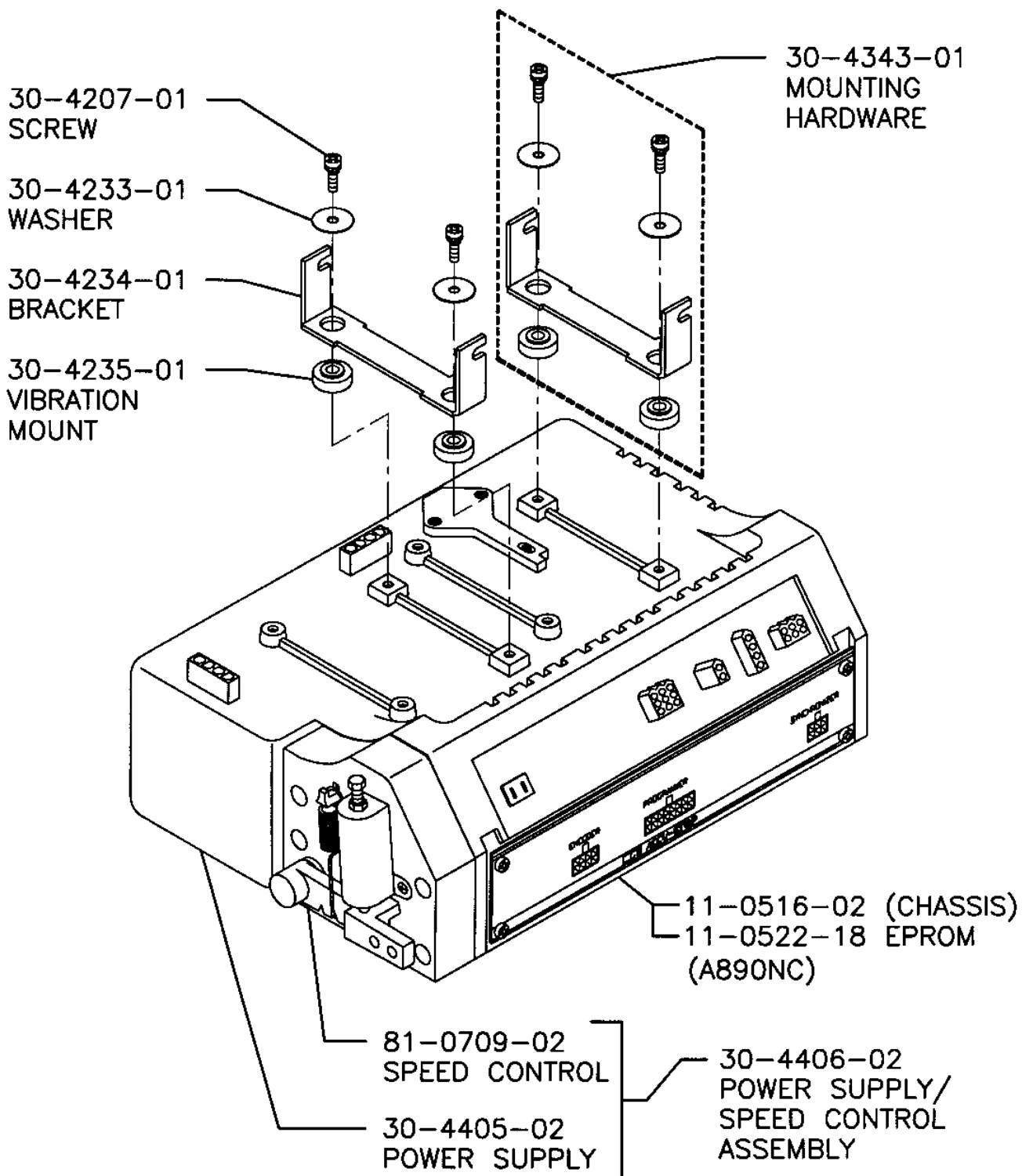| ITEM	DESCRIPTION	PART NO.	QUANTITY
1	COVER	30-4433-01	1
2	SCREW	30-4434-01	3
3	SCREW, S.S.S.	30-4435-01	2
4	FAN	30-4436-01	1
5	PC BOARD, ENCODER	30-4437-01	1
6	SCREW	30-4438-01	3
7	SPACER	30-4439-01	3
8	ENCODER DISC	30-4440-02	1
9	SCREW	30-4441-01	1
10	ENCODER SENSOR	30-4442-01	1
11	MOTOR, DC	30-4443-01	1
12	SCREW, S.S.S.	30-4444-01	2
13	MOTOR/ENCODER ASSEMBLY	81-0732-01	1
14	BELT GUARD, FIXED	30-4445-01	1
15	PULLEY - 50MM	30-4204-50	1
	PULLEY - 60MM	30-4204-60	1
	PULLEY - 65MM	30-4204-65	1
	PULLEY - 70MM	30-4204-70	1
	PULLEY - 75MM	30-4204-75	1
	PULLEY - 80MM	30-4204-80	1
	PULLEY - 85MM	30-4204-85	1
	PULLEY - 90MM	30-4204-90	1
	PULLEY - 95MM	30-4204-95	1
	PULLEY - 100MM	30-4204-100	1
	PULLEY - 105MM	30-4204-105	1
	PULLEY - 110MM	30-4204-110	1
	PULLEY - 115MM	30-4204-115	1
	PULLEY - 120MM	30-4204-120	1
	PULLEY - 125MM	30-4204-125	1
	PULLEY - 130MM	30-4204-130	1
	PULLEY - 140MM	30-4204-140	1
	PULLEY - 150MM	30-4204-150	1
16	BELT GUARD, ADJUSTABLE	30-4203-01	1
17	KEY, PULLEY	30-4227-01	1
18	SCREW M5 X 10 HEX HD.	30-4206-01	2
19	BOLT, CARRAIGE	30-4298-01	3
20	SPACER	30-4332-01	3
21	WASHER, FLAT	30-4300-01	3
22	WASHER, SPLIT LOCK	30-4301-01	3
23	NUT, HEX	30-4229-01	3
24	HARDWARE KIT, MOTOR MOUNT	30-4337-01	1
25	PIN	30-4219-01	1
26	BRACKET, MOTOR MOUNT	30-4446-01	1
27	SNAP RING	30-4220-01	1
28	BOLT, ADJUSTING	30-4205-01	1
29	NUT, HEX	30-4210-01	1
30	WASHER, SPLIT LOCK	30-4218-01	1
31	GROMMET	30-4472-01	1

C. CONTROL BOX ASS'Y-DC SERVO
MODEL 870LCD - 81-0736-02

30-4207-01
SCREW

30-4233-01
WASHER

30-4234-01
BRACKET

30-4235-01
VIBRATION
MOUNT

30-4343-01
MOUNTING
HARDWARE

11-0516-02 (CHASSIS)
11-0522-18 EPROM
(A890NC)

81-0709-02
SPEED CONTROL

30-4405-02
POWER SUPPLY

30-4406-02
POWER SUPPLY/
SPEED CONTROL
ASSEMBLY
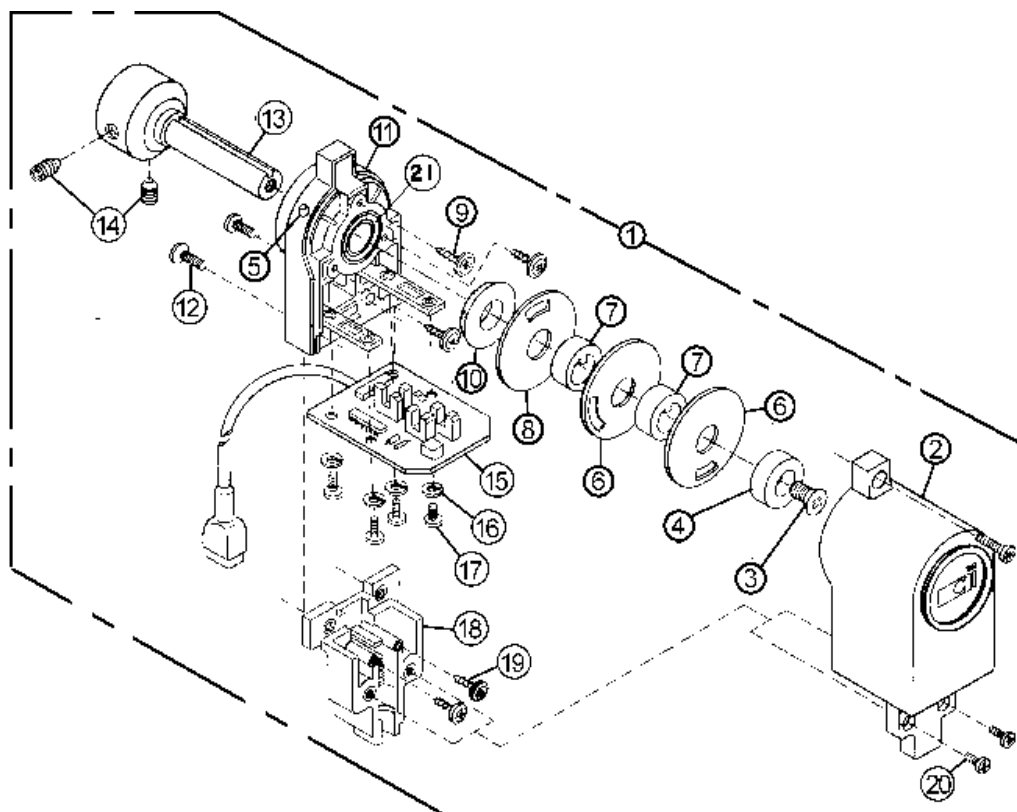
E. SYNCHRONIZER

ITEM	DESCRIPTION	PART NO.	QUANTITY
1	SYNCHRONIZER	81-0733-01	1
2	COVER, SYNCHRONIZER	30-4262-02	1
3	SCREW M5 X 12 F.H.M.S.	30-4263-01	1
4	SPACER DISC RETAINING	30-4264-01	1
5	LED	30-4428-01	1
6	DISC POSITIONER	30-4266-01	2
7	SPACER, DISC	30-4267-01	3
8	DISC, TRIM	30-4268-01	1
9	SCREW M3.5 X SELF TAP	30-4270-01	3
10	SPACER	30-4271-01	1
11	HOUSING	30-4272-02	1
12	SCREW M4 X 10	30-4273-01	2
13	SHAFT, SYNCHRONIZER	30-4429-01	1
14	SCREW M6 X 8 S.S.S.	30-4275-01	2
15	PC BOARD, SYNCHRONIZER	30-4430-01	1
16	SCREW, PC BOARD MOUNT	30-4209-01	4
17	WASHER, SPLIT LOCK	30-4277-01	4
18	BASE	30-4278-02	1
19	SCREW M3 X SELF TAP	30-4279-01	2
20	SCREW M3 X 10	30-4280-01	2
21	BEARING	30-4281-01	1

F. PROGRAMMABLE DISPLAY
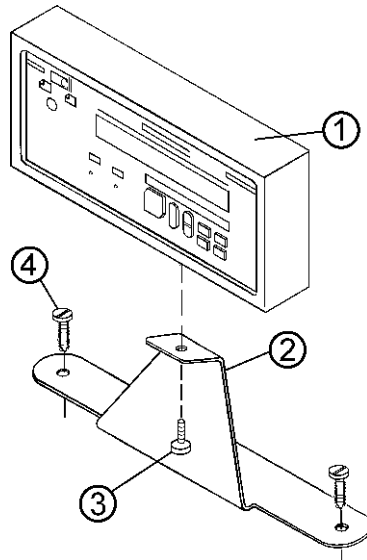
ITEM	DESCRIPTION	PART NO.	QUANTITY
1	PROGRAMMABLE DISPLAY	30-4321-01 (890)	1
	PROGRAMMABLE DISPLAY	30-4317-01 (870LCD)	1
2	BRACKET, MOUNTING	30-4286-01	1
3	SCREW M4 X 12	30-4287-01	1
4	SCREW	30-4288-01	2

G. MISCELLANEOUS PARTS

30-4296-01
PITTMAN ROD

30-4297-01
SYNCHRONIZER
STABILIZING
BRACKET