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SMD Operations Procedures Manual

8.1.1.23 OPERATION OF CQS SHELL WELDER

Text Pages 1 through 18
Attachment(s) 1, 2

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8.1.1.23 Operation of CQS Shell Welder

1.0 Purpose and Scope

- 1.1 The purpose of this procedure is to provide instruction in the operation of the positioning system of the CQS Shell Welder.
- 1.2 The following instructional information is contained herein:
 - A. Initial state of the Welder, before activating power;
 - B. Activating power to the Welder;
 - C. Description of programmed operating sequence;
 - D. Description of operating controls and indicators for both automatic mode and manual mode;
 - E. Shutting down the Welder;
 - F. Periodically testing the safety interlocks.
- 1.3 The following instructional information is not contained herein:
 - A. Installing the magnet and shells onto the conveyors;
 - B. Transportation, storage, and documentation requirements for completed assembly;
 - C. Operation of welding equipment.

2.0 Responsibilities

- 2.1 The authorized operator will:
 - 2.1.1 Operate the controls of the positioning system;
 - 2.1.2 Test the safety interlocks periodically.

NOTE *A list of authorized operators is maintained by the assembly area supervisor.*

3.0 Prerequisites

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3.1 Training

3.1.1 The operator shall be instructed by the Cognizant Engineer or his designee before operating the Welder positioning system.

3.1.2 The operator shall be trained as an "Affected Employee" as defined by SBMS ESH Standard 1.5.1, "Lockout/Tagout Requirements".

3.2 Equipment

3.2.1 Personal protection equipment for operator:

- A. Hard hat during crane operation
- B. Safety shoes

3.3 The operator should review Attachment 1, "Operator Controls and Indicators", before using this procedure. This attachment describes the function of all of the controls and indicators that the operator may use while operating the Welder Positioning System.

4.0 Precautions

4.1 **Extreme ultraviolet light hazard.** Opaque curtains must be in place completely around the Welder before welding. Failure to do this could result in severe skinburn or severe eye injury for unprotected personnel.

4.2 To protect personnel from the numerous shearing and crushing points, barriers must be in place around the welding frame and conveyors during machine motion. The operator shall ensure that personnel do not stand within the barriers during machine motion.

4.3 There are six red, mushroom-head pushbutton associated with the Welder, but they do not function the same. Be aware that the red, mushroom-head push button labeled "E-STOP" on the control panel is the only one that will stop motion of the feed conveyor, exit conveyor, and roller table during an emergency.

4.4 All lifting and handling operations requiring overhead crane operations shall be performed by holders of valid Safety Awareness Certificates for the lifting device being used.

4.5 Hard hats and safety shoes are required during crane operations.

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5.0 Procedure

NOTE *The location numbers mentioned in this section refer to locations as called out on the diagram of the control panel in Attachment 1.*

5.1 Verify that the safety interlocks have been tested within the past six months.

IF the six month interval has expired,

THEN stop work and perform the steps in section 5.7, "Testing the Safety Interlocks".

NOTE *An "Interlock Test Record" (Attachment 2) is posted on the Control Panel. The record indicates the last test date.*

5.2 Initial Conditions

Before activating power to the Welder Positioning System, check that all of the following initial conditions are present.

5.2.1 No shells or magnets should be in place on the fixture at this time.

Controls and Indicators

5.2.2 Main power disconnect switch for the Motor Control Panel, located on I-beam support "I" near the west wall and labeled "ST. 2 CONTROL PANEL", in the ON position.

Control Panel

5.2.3 Control Panel interlocked power switch/handle assembly, which is located on the front of the CQS Welder Control Panel, in the OFF position.

5.2.4 On the CQS Welder Control Panel, amber "115V AC" and red "12V DC" indicator lights illuminated (location 17).

5.2.5 Selector switch labeled SEQUENCE SELECTION set to HOME (location 16).

5.2.6 Selector switch labeled MOTOR CONTROL set to MANUAL (location 4).

5.2.7 Selector switch labeled WELD ENABLE set to POSITION (location 5).

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- 5.2.8 Three potentiometers labeled SPEED set to "5" (locations 7, 9, and 18).
- 5.2.9 Feed conveyor and exit conveyor selector switches labeled DIRECTION set to OUT (locations 7 and 18).
- 5.2.10 Roller table selector switch labeled DIRECTION set to DOWN (location 9).
- 5.2.11 Keyed selector switch labeled PLC STOP/RUN , located on the right side of the control panel cabinet, in the RUN position.
- 5.2.12 The other selector switches on the Control Panel do not have to be set to a particular position before activating power to the Panel.

Other Settings

- 5.2.13 Four toggle switches on the hand-held air cylinder control box positioned to the left (A1-RET, A2-UP, A3-LOCK, A4-DOWN).
- 5.2.14 Set hydraulic air pressure to 80 psi, using the pressure regulator located at the west end of the Welder.

NOTE *The main shut-off valve for the air is located on the I-beam building support labeled "H".*

5.3 Activating Power to the Control Panel and Homing the Welder

- 5.3.1 Place the power switch/handle assembly on the front of the Control Panel in the ON position. The red indicator light labeled "12V AC" should illuminate.
- 5.3.2 Depress the push button labeled MOTOR POWER ON. The amber indicator light labeled MOTOR POWER, and the red indicator light labeled 15VDC, should illuminate.
- 5.3.3 Verify that the three speed potentiometers (one for each motor) are set to "5".

NOTE *During the homing operation, the components move very slowly so that home will be reached without overshoot. The next step moves the components slightly off their home positions. This is done to save time.*

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- 5.3.4 Manually position the components of the Welder as follows:
 - A. Confirm that the MOTOR CONTROL selector switch is set to MANUAL.
 - B. Using the DIRECTION and JOG controls associated with the feed conveyor, move the feed conveyor so that it is 2 inches in from its outer limit. Make sure that it clears the roller table.
 - C. Using the DIRECTION and JOG controls associated with the exit conveyor, move the exit conveyor so that it is 1 inch in from its outer limit. Make sure that it clears the roller table.
 - D. Using the DIRECTION and JOG controls associated with the roller table, move the roller table so that it is 1/2 inch up from its zero position.
- 5.3.5 Set the Welder positioning system to automated mode by placing the MOTOR CONTROL selector switch in the AUTO position.
- 5.3.6 Depress the PLC RESET push button.
- 5.3.7 Confirm that the SEQUENCE SELECTION selector switch is set to the HOME position.

WARNING

Automated machine motion will begin when the SEQUENCE START push button is depressed. To avoid causing an injury, make sure that no personnel are standing inside of the barriers before depressing SEQUENCE START.

- 5.3.8 Depress the SEQUENCE START push button. The following homing sequence will take place:
 - A. The roller table will lower to the "Home" position and the red "0.0" level indicator light will illuminate.
 - B. The feed conveyor will move to its outer limit and the red HOME/LIMIT indicator light will illuminate.
 - C. The exit conveyor will move to its outer limit and the red HOME/LIMIT indicator light will illuminate.

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The homing sequence is now complete.

5.4 Manual Mode Operation

NOTE 1 *Manual mode is normally used when it is necessary to perform a non-standard task, such as correct a misaligned component.*

NOTE 2 *The operator should attempt to let a sequence finish. In a non-emergency situation, the operator should use the PAUSE push button to pause the sequence, rather than the Emergency Stop push button, which will abort the sequence.*

NOTE 3 *Refer to Attachment 1, "Operator Controls and Indicators" for a description of all of the operator controls and indicators associated with the Welder positioning system.*

5.4.1 IF you have aborted automated operation before the sequence in progress has finished by, for instance, depressing the Emergency Stop push button,

THEN complete the remaining sequences by operating the Welder positioning system manually. Perform the following steps:

- A. Contact the Cognizant Engineer (CE) or the CE's designee immediately.
- B. In a log book, record a detailed description of the reason for aborting automated mode.
- C. Depress the push button labeled PLC RESET.
- D. Set the four toggle switches on the hand-held air cylinder control box as appropriate considering the current position of the associated components.

WARNING

Performing the next step could result in machine motion. One or more air cylinders may pressurize or release. To avoid causing an injury, make sure no personnel are standing inside of the barriers.

- E. Place the MOTOR CONTROL selector switch in the MANUAL position.

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- F. To move the feed conveyor in manual mode, perform the following steps:

Set the DIRECTION selector switch (location 18) to the desired direction, either IN or OUT.

Set the SPEED potentiometer (location 18) to a setting representing the desired speed: "5" is a moderate speed.

Depress the JOG push button (location 18) to activate the conveyor motor. The motor will be activated as long as the push button is depressed.

- G. To move the exit conveyor in manual mode, perform the following steps:

Set the DIRECTION selector switch (location 7) to the desired direction, either IN or OUT.

Set the SPEED potentiometer (location 7) to a setting representing the desired speed: "5" is a moderate speed.

Depress the JOG push button (location 7) to activate the conveyor motor. The motor will be activated as long as the push button is depressed.

- H. To move the roller table in manual mode, perform the following steps:

NOTE *The "0.0" and "0.5" indicator lights (location 8) do not function in manual mode.*

Set the DIRECTION selector switch (location 9) to the desired direction, either UP or DOWN.

Set the SPEED potentiometer (location 9) to a setting representing the desired speed: "5" is a moderate speed.

Depress the JOG push button (location 9) to activate the table motor. The motor will be activated as long as the push button is depressed.

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- 5.4.2 IF the current automated sequence is finished, as indicated by the illumination of the SEQUENCE COMPLETE indicator light (location 10), and you wish to enter manual mode,

THEN perform the following steps:

- A. Set the four toggle switches on the hand-held air cylinder control box as appropriate considering the current position of the associated components.

WARNING

Performing the next step could result in machine motion. One or more air cylinders may pressurize or release. To avoid causing an injury, make sure no personnel are standing inside of the barriers.

- B. Place the MOTOR CONTROL selector switch in the MANUAL position.
- C. To move the feed conveyor in manual mode, perform the following steps:

Set the DIRECTION selector switch (location 18) to the desired direction, either IN or OUT.

Set the SPEED potentiometer (location 18) to a setting representing the desired speed: "5" is a moderate speed.

Depress the JOG push button (location 18) to activate the conveyor motor. The motor will be activated as long as the push button is depressed.

- D. To move the exit conveyor in manual mode, perform the following steps:

Set the DIRECTION selector switch (location 7) to the desired direction, either IN or OUT.

Set the SPEED potentiometer (location 7) to a setting representing the desired speed: "5" is a moderate speed.

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Depress the JOG push button (location 7) to activate the conveyor motor. The motor will be activated as long as the push button is depressed.

- E. To move the roller table in manual mode, perform the following steps:

Set the DIRECTION selector switch (location 9) to the desired direction, either UP or DOWN.

Set the SPEED potentiometer (location 9) to a setting representing the desired speed: "5" is a moderate speed.

Depress the JOG push button (location 9) to activate the table motor. The motor will be activated as long as the push button is depressed.

- F. When you are ready to return to automated mode, position the conveyors, roller table, and lifting frame to the positions they were at when you exited automated mode. If you are not sure about the positions, then refer to the description of the sequence in Section 5.5. For example, if you exited automated mode upon completion of sequence 4, refer to the description of Sequence 4 as a guide to the positions of the components at that time.
- G. Place the MOTOR CONTROL selector switch in the AUTO position.
- H. Position the four toggle switches on the air cylinder control box as follows: A1 set to RET, A2 set to UP, A3 set to LOCK, A4 set to DOWN.
- I. Set the SEQUENCE SELECTION selector switch to the next sequence.
- J. Depress the SEQUENCE START push button.

5.5 Sequence Description

NOTE 1 *In the following section, steps lettered "A", "B", "C", etc., are actions that the Welding Fixture will perform under program control. They are included for the operator's information.*

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- NOTE 2** *The short label in parenthesis following an action, such as (A2) or (M2), refers to the device that actuates or energizes to cause the action.*
- A1 through A4 refers to solenoid-activated air cylinders. M1 through M3 refers to electric motors. The location of these devices is indicated on the CQS Welder Control Panel.*
- NOTE 3** *When a sequence is finished, the sequence number light in the SEQUENCE COMPLETE section of the control panel will illuminate.*
- NOTE 4** *If a sequence is not selected in the correct numerical order, then the light labeled "FAULT" will illuminate.*
- NOTE 5** *If the E-STOP push button on the CQS Welder Control Panel is depressed during a sequence, motor power will de-activate. However, if the MOTOR POWER ON push button is then depressed, motor power will re-activate and the sequence will continue.*
- NOTE 6** *Do not turn the SEQUENCE SELECTION selector switch backward (counter-clockwise) once in automated mode. Doing so could result in an undefined PLC state that could cause a loss of automated control.*

WARNING

At times during the automated sequence described in this section, it may be necessary to exit the automated mode and operate the Welder Positioning System in manual mode. Before doing so, read section 5.4, "Manual Mode Operation". Failure to follow the steps in section 5.4 could result in unexpected machine motion, possibly causing injury.

- 5.5.1 Install a magnet/upper shell assembly onto the feed conveyor, and install a lower shell onto the exit conveyor, by following the steps in the applicable Magnet Assembly Procedure.

Sequence 1

- 5.5.2 Place the SEQUENCE SELECTION selector switch in the SEQ1 position and depress the SEQUENCE START push button.

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- A. The roller table rises to the 0.50 inch level (M3). The red indicator light labeled "0.5" illuminates.
- B. The feed conveyor moves the upper shell and magnets in place on the center roller table (M1).

5.5.3 Confirm that the magnet/upper shell feed conveyor is at the proper position by aligning the holes and inserting a pin at the feed end of the welding fixture. Remove the pin before continuing.

IF the holes are not aligned,

THEN perform the following steps:

- A. Place the MOTOR CONTROL selector switch in the MANUAL position.
- B. Set the roller table SPEED potentiometer and DIRECTION selector switch for an appropriate speed and direction.
- C. Depress the roller table JOG push button to jog the table.
- D. Visually check the alignment arrows drawn on the cradle and the table as a guide. Verify alignment with the pin.
- E. When alignment is achieved, remove the pin.
- F. Place the MOTOR CONTROL selector switch in the AUTO position.

Sequence 2

5.5.5 Place the SEQUENCE SELECTION selector switch in the SEQ2 position and depress the SEQUENCE START push button.

- A. The roller table lowers to the 0.0 inch position (M3).
- B. The uplock detent is withdrawn (A3).
- C. The lifting frame lowers and exerts force on the upper shell (A2). The red indicator light labeled DOWN illuminates.

5.5.6 IF alignment of the shell is required,

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THEN perform the following steps:

- A. Verify that the four toggle switches on the hand-held air cylinder control box are set as follows: A1 set to RET, A2 set to UP, A3 set to LOCK, A4 set to DOWN.
- B. Place the MOTOR CONTROL selector switch in the MANUAL position. The lifting frame will move up.
- C. After the uplock detents engage the lifting frame, align the shell.
- D. Set the A1 toggle switch to DOWN. The lifting frame will lower until it contacts the upper shell.
- E. Place the MOTOR CONTROL selector switch in the AUTO position.
- F. Set the A1 toggle switch to UP.

5.5.7 Set the POSITION/WELD selector switch to WELD.

NOTE *At this point, the welder will tack weld the back-up strip and top shell. All precautions associated with welding shall be followed.*

5.5.8 After the welding is finished, set the POSITION/WELD selector switch to POSITION.

Sequence 3

5.5.9 Place the SEQUENCE SELECTION selector switch in the SEQ3 position and depress the SEQUENCE START push button.

- A. The lifting frame rises and locks (A2).
- B. The roller table rises to the 5.5 inch level (M3).

5.5.10 Install straps and suspend the magnet/upper shell assembly.

Sequence 4

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5.5.11 Place the SEQUENCE SELECTION selector switch in the SEQ4 position and depress the SEQUENCE START push button.

- A. The roller table lowers to the 0.5 inch level (M3).
- B. The feed conveyor moves out until it reaches its "Home" position (M1). The "HOME/LIMIT" red indicator light will illuminate.

Sequence 5

5.5.12 Place the SEQUENCE SELECTION selector switch in the SEQ5 position and depress the SEQUENCE START push button.

- A. The exit conveyor moves in until the lower shell is in place on the center roller table.

5.5.13 Confirm that the lower shell is in the proper position. If necessary, adjust the position using a soft mallet.

Sequence 6

5.5.14 Place the SEQUENCE SELECTION selector switch in the SEQ6 position and depress the SEQUENCE START push button.

- A. The roller table rises to the 4.0 inch level (M3).

5.5.15 Remove straps.

Sequence 7

5.5.16 Place the SEQUENCE SELECTION selector switch in the SEQ7 position and depress the SEQUENCE START push button.

- A. The roller table lowers to the 0.0 inch level (M3).
- B. The uplock detent is withdrawn (A3).
- C. The lifting frame lowers and exerts downward force on the magnet assembly (A2).

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Sequence 8

5.5.17 Place the SEQUENCE SELECTION selector switch in the SEQ8 position and depress the SEQUENCE START push button.

- A. The A4 air cylinders exert upward force on the lower shell, pressing the shell up against the magnet assembly.
- B. The WELD ENABLE red indicator light illuminates.

5.5.18 Place the POSITION/WELD selector switch in the WELD position.

NOTE *At this point, the welder will weld the shell.*

5.5.19 When welding is completed, set the POSITION/WELD selector switch to POSITION.

Sequence 9

5.5.20 Place the SEQUENCE SELECTION selector switch in the SEQ9 position and depress the SEQUENCE START push button.

- A. The A4 air cylinders release, removing upward force from the lower shell.
- B. The lifting frame rises and locks in the "Up" position (A2).
- C. The magnet assembly rises to the 0.5 inch level.
- D. The exit conveyor moves the welded magnet assembly out of the fixture. The HOME/LIMIT red indicator light illuminates.

5.5.21 Remove the magnet assembly.

5.6 **Shutting Down the Welder**

5.6.1 Confirm that the conveyors, roller table, and lifting frame are at their initial, or "Home", positions. If they are not, then enter manual mode and move them to their "Home" positions.

5.6.2 Set CQS Welder Control Panel switches and controls to their initial settings as described in section 5.2.

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5.6.3 Place the power switch/handle assembly on the front of the CQS Welder Control Panel in the OFF position.

5.6.4 Place the input disconnect switch for control panel power, labeled ST. 2 CONTROL POWER, in the OFF position.

5.7 Testing the safety interlocks

NOTE 1 *This test should be performed every six months.*

NOTE 2 *Refer to the "Interlock Test Record" (Attachment 2) when performing the test. As each device is successfully tested, check it off.*

NOTE 3 *This test should be performed by two operators. One operator should stand at the Control Panel while the other operator trips the interlocks.*

Emergency Stop Push Buttons

NOTE *There are six Emergency Stop push buttons. They are not on a single string so they do not function the same.*

5.7.1 Perform all of the steps in section 5.2, "Initial Conditions".

5.7.2 Activate power to the CQS Welder Control Panel by performing steps 5.3.1 and 5.3.2.

5.7.3 Depress the Emergency Stop push button on the CQS Welder Control Panel. Observe that the amber indicator light labeled MOTOR POWER extinguishes. Depress one of the JOG push buttons to verify that motor power is deactivated.

5.7.4 Activate power to the welding equipment as follows:

A. Set the POSITION/WELD switch on the Control Panel to WELD.

B. Place the POWER ON/OFF switches on the front of the two orange welder power supply cabinets in the ON position.

C. Place the POWER ON/OFF switches on the front of the two blue welder remote control cabinets in the ON position.

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- D. Depress the green push button labeled "WELDING POWER", located on the box attached to I-beam "H" and labeled "POWER CABINET FOR WELDING EQUIPMENT". Observe that the red indicator light labeled "WELDING POWER ON" illuminates.
- 5.7.5 Depress the red Emergency Stop push button on the front of the left blue welding cabinet. Verify that power to both orange cabinets deactivates.
- 5.7.6 Activate power to the orange cabinets by resetting the ON/OFF circuit breakers on the front of each orange cabinet and depressing the green WELDING POWER push button on the box labeled "POWER CABINET FOR WELDING EQUIPMENT".
- 5.7.7 Depress the red Emergency Stop push button on the front of the right blue welding cabinet. Verify that power to both orange cabinets deactivates.
- 5.7.8 Repeat step 5.7.6.
- 5.7.9 Depress the red Emergency Stop push button on the left remote control box. Verify that power to the associated orange welding cabinet deactivates. Repeat for the right remote control box.
- 5.7.10 Repeat step 5.7.6.
- 5.7.11 Depress the red Emergency Stop push button on the box labeled "POWER CABINET FOR WELDING EQUIPMENT". Verify that power to both orange welding cabinets deactivates.
- 5.7.12 Place the ON/OFF power switches on the front of both orange cabinets and both blue cabinets in the OFF position.

Limit switches

- 5.7.13 Confirm that the feed conveyor, the exit conveyor, and the lifting frame are at their "Home" positions.
- 5.7.14 Using the crane, place cradles on the feed conveyor and the exit conveyor.
- 5.7.15 Activate motor power by performing steps 5.3.1 and 5.3.2.

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- 5.7.16 After noting the setting of the SPEED potentiometer for the feed conveyor, set it to "3" so that the conveyor will move slowly when activated.
- 5.7.17 Set the DIRECTION selector switch for the feed conveyor to IN.
- 5.7.18 Depress the JOG push button. The feed conveyor will begin moving in.
- 5.7.19 When the "In" limit switch is tripped, verify that the conveyor stops.
- 5.7.20 Set the DIRECTION selector switch for the feed conveyor to OUT.
- 5.7.21 Depress the JOG push button. The feed conveyor will begin moving out.
- 5.7.22 When the "Out" limit switch is tripped, verify that the conveyor stops.
- 5.7.23 Repeat steps 5.7.15 to 5.7.22 for the exit conveyor.
- 5.7.24 Confirm that the conveyors are at their "Home" positions.
- 5.7.25 Repeat steps 5.7.15 to 5.7.22 for the roller table. In this case, the DIRECTION selector switch is set to UP or DOWN and the limit switches are tripped at the "Up" or "Down" limit.
- 5.7.26 Confirm that the roller table is at its "Home" position.
- 5.7.27 Restore the potentiometer settings.
- 5.7.28 When all devices have been checked off, date and initial the Interlock Test Record and post a copy on the Control Panel.

6.0 Documentation

- 6.1 Interlock Test Record

7.0 References

- 7.1 SBMS ESH Standard 1.5.1, "Lockout/Tagout Requirements".

8.0 Attachments

- 1. Operator Controls and Indicators

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2. Interlock Test Record

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Attachment 1

Operator Controls and Indicators

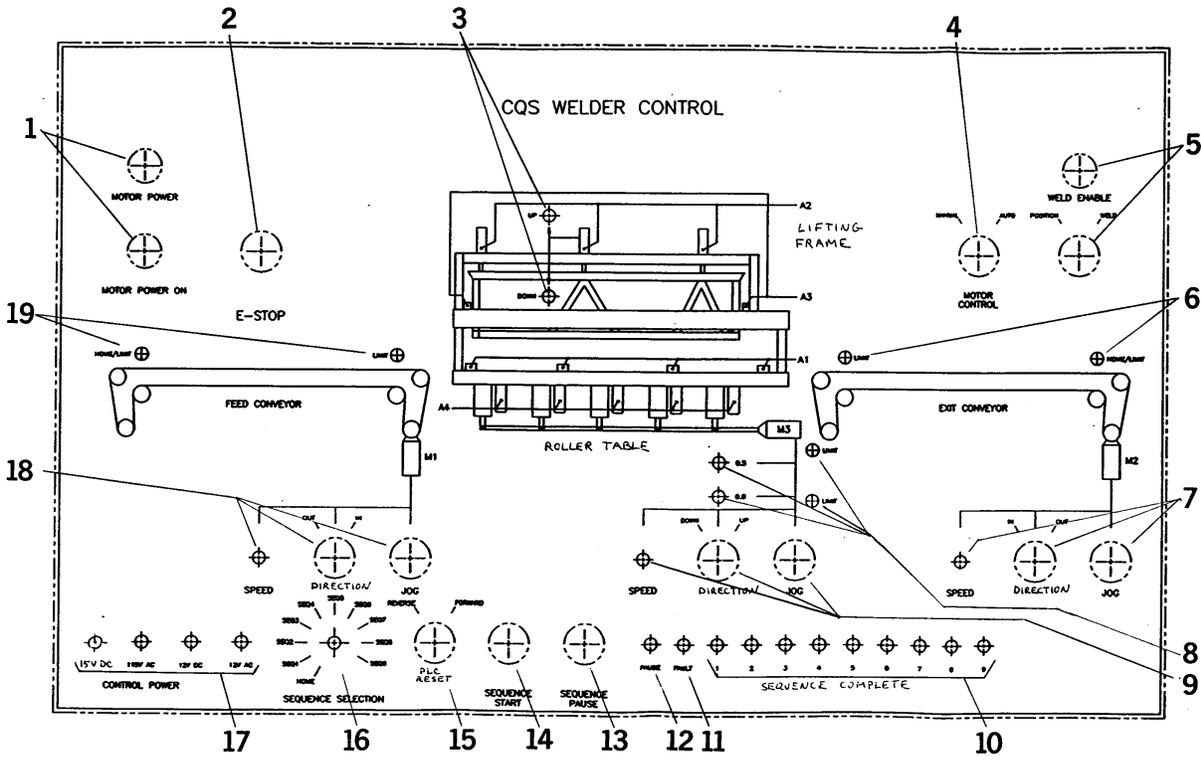


Figure 1. Control Panel Diagram

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Table 1. Control Panel Controls and Indicators

(Attachment 1 cont'd)

NOTE *Refer to Figure 1, "Control Panel Diagram," for location numbers.*

Location#	Designation	Device Type	Function
1	MOTOR POWER ON	push button	Activates power to the motors. Enabled only if the POSITION/WELD selector switch (location 5) is set to POSITION.
1	MOTOR POWER	indicator light	On when power to the motors is activated.
2	E-STOP	mushroom-head push button	Deactivates motor power.
3	UP and DOWN	indicator lights	On when the lifting frame is fully raised or fully lowered.
4	MOTOR CONTROL MANUAL/AUTO	two-position selector switch	Selects mode of operation. "Manual" mode enables manual control of the motors. "Auto" mode places the motors under control of the PLC.
5	POSITION/WELD	two-position selector switch.	When set to POSITION, motor control is enabled and the welding equipment cannot be activated. When set to WELD, motor control is disabled and power to the welding equipment may be activated.
5	WELD ENABLE	indicator light	Illuminates under PLC control to indicate to the operator that welding is about to be performed and the POSITION/WELD switch should be set to WELD.
6	EXIT CONVEYOR LIMIT and HOME/LIMIT	indicator lights	On when the exit conveyor is at its inner limit, outer limit, or "Home" position.
7	EXIT CONVEYOR SPEED	potentiometer	Controls conveyor speed when under manual control.
7	EXIT CONVEYOR DIRECTION	two-position selector switch	Controls conveyor direction when under manual control.
7	EXIT CONVEYOR JOG	push button	Causes the conveyor to move while depressed, as long as the inner or outer limit has not been reached.
8	LIMIT	indicator lights	On when the table reaches its upper limit or lower limit.
8	0.5 and 0.0	indicator lights	On when the table, under PLC control, moves to its zero position or its 0.5" position

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Location#	Designation	Device Type	Function
9	ROLLER TABLE SPEED	potentiometer	Controls table speed when under manual control.
9	ROLLER TABLE DIRECTION	two-position selector switch	Controls table direction when under manual control.
9	ROLLER TABLE JOG	push button	Causes the table to move while depressed, as long as the upper or lower limit has not been reached.
10	SEQUENCE COMPLETE (1 thru 9)	indicator lights	On when the associated sequence is finished executing.
11	FAULT	indicator light	On when a sequence is selected out of correct numerical order.
12	PAUSE	indicator light	On when the PLC is paused by depressing the SEQUENCE PAUSE push button.
13	SEQUENCE PAUSE	push button	Causes the PLC to pause.
14	SEQUENCE START	push button	Causes the PLC to begin, or to continue from a paused state.
15	PLC RESET	push button	Resets the PLC to its initial power-on state.
16	SEQUENCE SELECTION	multi-position selector switch	Selects sequence to run under PLC control.
17	115V AC 12V DC 12V AC 15V DC	indicator lights	Control power status
18	FEED CONVEYOR SPEED	potentiometer	Controls conveyor speed when under manual control.
18	FEED CONVEYOR DIRECTION	two-position selector switch	Controls conveyor direction when under manual control.
18	FEED CONVEYOR JOG	push button	Causes the conveyor to move while depressed, as long as the inner or outer limit has not been reached.
19	FEED CONVEYOR LIMIT and HOME/LIMIT	indicator lights	On when the feed conveyor is at its inner limit, outer limit, or "Home" position.

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(Attachment 1 cont'd)

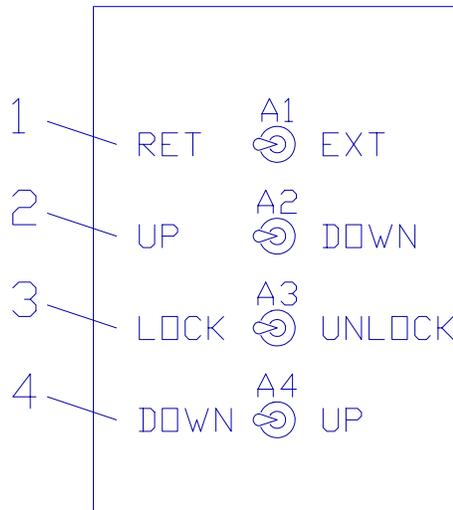


Figure 2. Air Cylinder Manual Control Diagram

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Table 2. Air Cylinder Manual Control Description

(Attachment 1 cont'd)

NOTE Refer to Figure 2, "Air Cylinder Manual Control Diagram."

Location#	Label	Device Type	Function
1	A1-RET/EXT	toggle switch	Manual pressurizing and release of A1 air cylinders. Cylinders designated "A1" retract or extend the roller table support chocks. <i>Note: The support chocks are no longer used and remain retracted at all times. However, the control is still functional.</i>
2	A2-UP/DOWN	toggle switch	Manual pressurizing and release of A2 air cylinders. Cylinders designated "A2" raise or lower the lifting frame
3	A3-LOCK/UNLOCK	toggle switch	Manual pressurizing and release of A3 air cylinders. Cylinders designated "A3" insert and withdraw the uplock detents, which lock the lifting frame in the "Up" position. Pressurizing the cylinder causes the lock to retract. Releasing pressure causes the lock, which is spring-loaded, to extend.
4	A4-DOWN/UP	toggle switch	Manual pressurizing and release of A4 air cylinders. Cylinders designated "A4" raise and lower the table.

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Table 3. Other Controls and Indicators

(Attachment 1 cont'd)

Location	Label	Device Type	Function
Right side of control panel cabinet	PLC STOP/RUN	keyed two-position selector switch	Starts or stops the PLC. Diagnostic use.
Electrical cabinet mounted to I-Beam building support labeled "H"	E-STOP	mushroom-head push button	Deactivates power to <u>both</u> orange welding power supply cabinets.
Two blue welding control cabinets	E-STOP	mushroom-head push button	Deactivates power to <u>both</u> orange welding power supply cabinets.
Two orange remote control welding boxes	E-STOP	mushroom-head push button	Deactivates power to the <u>single</u> orange power supply cabinet to which the remote box is attached.

