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SMD Operations Procedures Manual

8.1.1.36 5M Direct Wiring Machine

Text Pages 1 through 9

Hand Processed Changes

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8.1.1.36 5M Direct Wiring Machine

1. Purpose and Scope

1.1. This procedure provides instruction in the operation of the 5M Direct Magnet Wiring Machine, located in Building 902.

1.2. This procedure establishes the minimum qualification for any person who will operate the Wiring Machine.

2. Responsibilities

2.1. Cognizant Technical Supervisor is in Building 902.

2.2. The operator shall complete the following documentation:

2.2.1. Log Book. Entries shall include notes of any irregularities regarding operation of the Machine.

2.2.2. Interlock Test Form. The form shall be completed when the safety interlocks are tested. A copy of the form shall be posted near the Wiring Machine.

2.2.3. Wiring run sheet. Documents repairs from factory and repairs made by wiring tech.

3. Prerequisites

3.1. Training

3.1.1. Operator shall be hands-on instructed by the cognizant Technical Supervisor before operating the Wiring Machine.

3.1.2. Operator shall be trained as an “affected employee” as defined by SBMS Subject Area: Lockout/Tagout (LOTO)

3.1.3. Compressed Gas Safety

3.2. Physical Requirements

3.2.1. Appropriate signs should be posted while the winding machine is in operation.

3.2.2. Eye protection must be worn while the winding machine is in operation.

3.2.3. Track areas must be marked (striped yellow caution tape, etc.)

3.2.4. All protective guards around belt drives must be on and secured.

3.2.5. The area around the winding machine must be clean of any debris before being put into operation.

3.3. Initial State of Wiring Machine

3.3.1. Operator controls shall be set to their "initial" settings (see paragraph 5.3) before activating power to the Wiring Machine.

4. Precautions

This procedure involves working near moving machinery.

4.1.1. Do not wear loose clothing or hanging jewelry. Keep long hair tied up.

4.1.2. All guards and covers should be in place.

4.1.3. Keep hands away from all pinch points when the machine is in motion. A sudden movement might hit your hand or catch your clothing, causing injury.

4.1.4. A test of the interlocks shall have been performed within the last six months. A dated Interlock Test Form shall be posted near the Wiring Machine.

4.1.5. Verify machine is clear of any foreign objects which could damage equipment or be thrown from machine.

5. Procedure

5.1. Overview

The 5M Direct Wiring Machine provides a means of feeding wire in a tightly controlled pattern into a layer of epoxy pre-impregnated fiberglass cloth. The machine consists of a rotary head for turning the magnet tube, with a movable gantry to position the wiring head along the axis of the tube. On the gantry are two additional linear axis, one to raise and lower the wiring head, and the second to horizontally position the wiring stylus within the slot on the tube. Three rotary axis are on the head, theta is for rotating the head the full 360̊, while two axis are used for positioning the wire feed mechanism and one axis is used for paying out the wire. The machine is computer controlled, with a keyboard for operator input and a monitor for display of menu driven operating instructions and Machine status.

5.2. Operator Controls

5.2.1. System Controls (Attachment 1 – Panel Rack)

5.2.1.1. C - CRASH red mushroom-head push buttons a RED CRASH cord. Deactivates power to the rack; causes all machine motion to stop; requires that the machine be reset before power can be re-activated.

5.2.1.2. A - ON green push button. Activates power to the rack after the RESET button is depressed.

5.2.1.3. B - AC on lamp. Illuminates when AC connected.

5.2.1.4. D – Immobilizer key. When turned to STOP motion on axes is disabled. When turned to RUN motion on axes is enabled.

5.2.1.5. E – Drive Power Switch. Kills power to the servo motor drive.

5.2.2. Air Tank Controls

5.2.2.1. K - Main air feed shutoff valve. This valve is mounted on the N2 tank.

5.2.2.2. L - Air regulator and gauge. Regulates cooling air to the machine. Mounted on tank.

5.2.3. Ultrasonic Controls

5.2.3.1. I - ON/OFF toggle switch. Activates power to the U/S generator.

5.2.3.2. F - RUN/STOP toggle switch. Allows U/S to run when amplitude is commanded.

5.2.3.3. H – Overload reset. Can be used to reset the unit in the event of an overload.

5.2.3.4. G – Amplitude potentiometer. When in manual mode this can be used to set the amplitude of the U/S generator.

5.2.3.5. J – Fuse. Protection fuse that should be replaced if light is lit.

5.3. Initial Control Settings (Assumes norm operation stylus in calibration)

5.3.1. U/S Gen. ON/OFF toggle switch set to off.

5.3.2. U/S Gen. RUN/STOP toggle switch set to STOP.

5.4. Starting the Machine

5.4.1. Refer to the applicable Magnet Assembly Procedure for instructions on setting up the substrate on the magnet tube.

5.4.2. Verify that the controls are set to their initial settings (5.3).

5.4.3. Turn on the air supply by turning the valve on the air line next to the machine. Verify that the regulator settings are as per the log book for the machine.

5.4.4. Mount the wire spool and thread the wire through the wiring head.

5.4.5. The computer located in the back of the rack should turn on automatically. When the login prompt appears, log into the system.

5.4.6. Toggle the Drive Power Switch to ON.

5.4.7. Turn the Immobilizer key to RUN.

5.4.8. Toggle ON the U/S power switch.

5.4.9. Set the U/S Gen. RUN/STOP to RUN.

5.4.10. Once logged in, launch the Direct Wind WPF application.

5.4.11. Choose an action from the menu of action choices on the computer monitor (Refer to the next section for a description of the operator choices available from the software menu).

5.5. Compute Software Operations

NOTE:

THE CORRECT VERSION OF COMPUTER SOFTWARE MUST BE LOADED PER THE MAGNET TRAVELER.

5.5.1. User must first select Connect and Start to initiate communication with the motor controller.

5.5.2. Active choices are: Settings, Joystick, “INI Settings”, Exit. Files are used for selection or retrieving a wiring file from the network.

5.5.2.1. Once a file has been selected, the program will retrieve it. Each file has four associated files:

5.5.2.1.1. “filename”.hom provides the home position information.

5.5.2.1.2. “filename”.pin provides the pin location on the tube relative to zero.

5.5.2.1.3. “filename”.cor provides the tube position correction information.

5.5.2.1.4. “filename”.add provides the information for correction harmonics.

5.5.2.2. The program will notify the operator should the associated files do not exist, as for example, when a wiring file is run for the first time. The system will prompt the operator for a file that will be copied under the new filename for use by the current filename.

5.5.2.2.1. .hom, .pin All the files for a specific layer must be the same, and should be the same for all layers of a specific tube.

5.5.2.2.2. .cor, .add All the files for a layer must be the same.

Once the four files are set, the program will load the wiring file, and indicate when it is finished successfully.

5.5.2.3. Once a wiring file is loaded, the program will enable the home selection. Click to begin the home process.

5.5.2.4. Once the homing is complete, select pin check to verify the correct location of the pin, This verifies the placement of the tube, as well as the accuracy of homing procedure. The machine will go to a point over the pin, and at a Z height of 2 inches. Use the joystick to bring the stylus down to the pin. If all is correct, the stylus should drop into the slot of the pin. If not, use the joystick to move the offending axis to the correct location. (Note: use caution when the stylus is in the vicinity of the pin, as the wrong move can break the stylus.) Use the microscope for checking the pin into the slot travel, as sub one mil accuracy is required.

5.5.2.5. When the location of the pin and stylus is correct, exit out of the pin check procedure by closing the joystick window. Once done, the operator will be prompted to either save the information or ignore it. If a new stylus home position was determined, select yes. The program will than ask for the Z height. Read the height from the program screen Z position readout. (Note: It is not possible to zero the z axis as Z zero is the center of the magnet tube.

NOTE: In the event of incorrect machine travel, use the crash buttons or wire to halt machine travel.

5.5.2.6. Select Run to begin the wiring. The machine will move the head to the start location, at a Z of 2 inches, then ask “is the stylus in the correct location?” A “no” exits the run. A “yes” causes the machine to lower the Z axis until the stylus is at the surface of the tube. The computer then asks “ok to run?.” A “no” will exit the run, a “yes” will start the run. Note: In the center of the screen is a text box with the heading “next position.” By entering a number in this box prior to starting the run, it is possible to begin at a point other than the first point of the file. This makes it practical to restart a file in the middle of the pattern.

NOTE: A pause will halt all controlled motion, but does NOT de-

energize the motor circuits. If access within the motion envelope is required, disable the machine using the crash string.

5.5.2.7. Once the run is started, it is possible to pause the operation of the machine at any time by depressing any key on the keyboard or clicking the pause menu selection at the top left menu bar. To continue, click the continue menu selection.

5.5.3. Joystick

5.5.3.1. Once selected, a screen comes up allowing the selection of the axis to be moved using the joystick. The top bar allows the operator to select the speed for use in moving the axis.

5.5.3.2. When finished, select finished, and exit. The joystick box will disappear, returning to the main program.

5.5.4. INI Settings

5.5.4.1. By clicking on any parameter in the setup field, the parameter can be changed. When clicked, a screen pops up allowing the parameter to be changed. This can be done during the running of the wiring file, after a pause has been enabled.

Exit: Select this to exit the program.

End: This choice is for ending the program.

5.6. Shutting Down the Machine

5.6.1. Return the wiring head to the load position.

5.6.2. Turn the Immobilizer key to STANDBY

5.6.3. Exit from the control software.

5.6.4. Turn off the air.

5.7. Testing the Safety Interlocks

5.7.1. Set all the controls to their initial settings.

5.7.2. Depress a CRASH mushroom push button. The POWER red indicator light.

5.7.3. Check the appropriate box on the Interlock Test Form (Attachment 5).

5.7.4. Test all CRASH push buttons and both crash cords (Rack, X1, X2, Y1, Y2, Z1, Z2). To re-energize the Machine after each crash, depress the ON green push button.

5.7.5. After the last CRASH push button has been tested, re-start the Machine.

5.7.6. Initial and date the Form and post it near the Wiring Machine.

5.7.7. If an interlock fails, stop work, write "fail" on the form, and immediately notify the Cognizant Engineer and the ES & H Coordinator.

5.8. Aligning the Stylus

5.8.1. Home Machine

5.8.1.1. Bring stylus down to tube using joystick.

5.8.1.2. Place pin gauge under stylus

5.8.1.3. Use Joystick to adjust theta until rod is parallel with tube

5.8.1.4. If Adjustment is needed copy the angle shown in joystick mode UI

5.8.1.5. Add this value to the home offset value in Automation1 Studio

Then:

5.8.1.6. Joystick up off of tube

5.8.1.7. Install magnetic base dial indicator

5.8.1.8. Align indicator against flat on stylus

5.8.1.9. Zero indicator

5.8.1.10. In joystick mode rotate theta 180 degrees

5.8.1.11. Adjust four set screws for zero runout for side to side play

5.8.1.12. Repeat 180 rotation and adjust screws until zero runout

5.8.1.13. Rotate theta 90 degrees

5.8.1.14. Repeat same 180 rotation and adjust screws until zero forward and backward runout is achieved.

5.8.1.15. Verify all 4 sides for zero runout and repeat steps as needed

5.8.1.16. If zero runout cannot be achieved, consult with cognizant coil engineer prior to proceeding.

6. Documentation

6.1. Log Book
6.2. Interlock Test Form

7. References

7.1. SBMS Subject Area: Lockout/Tagout (LOTO)
7.2. SBMS Subject Area: Compressed Gas Cylinders and Related Systems

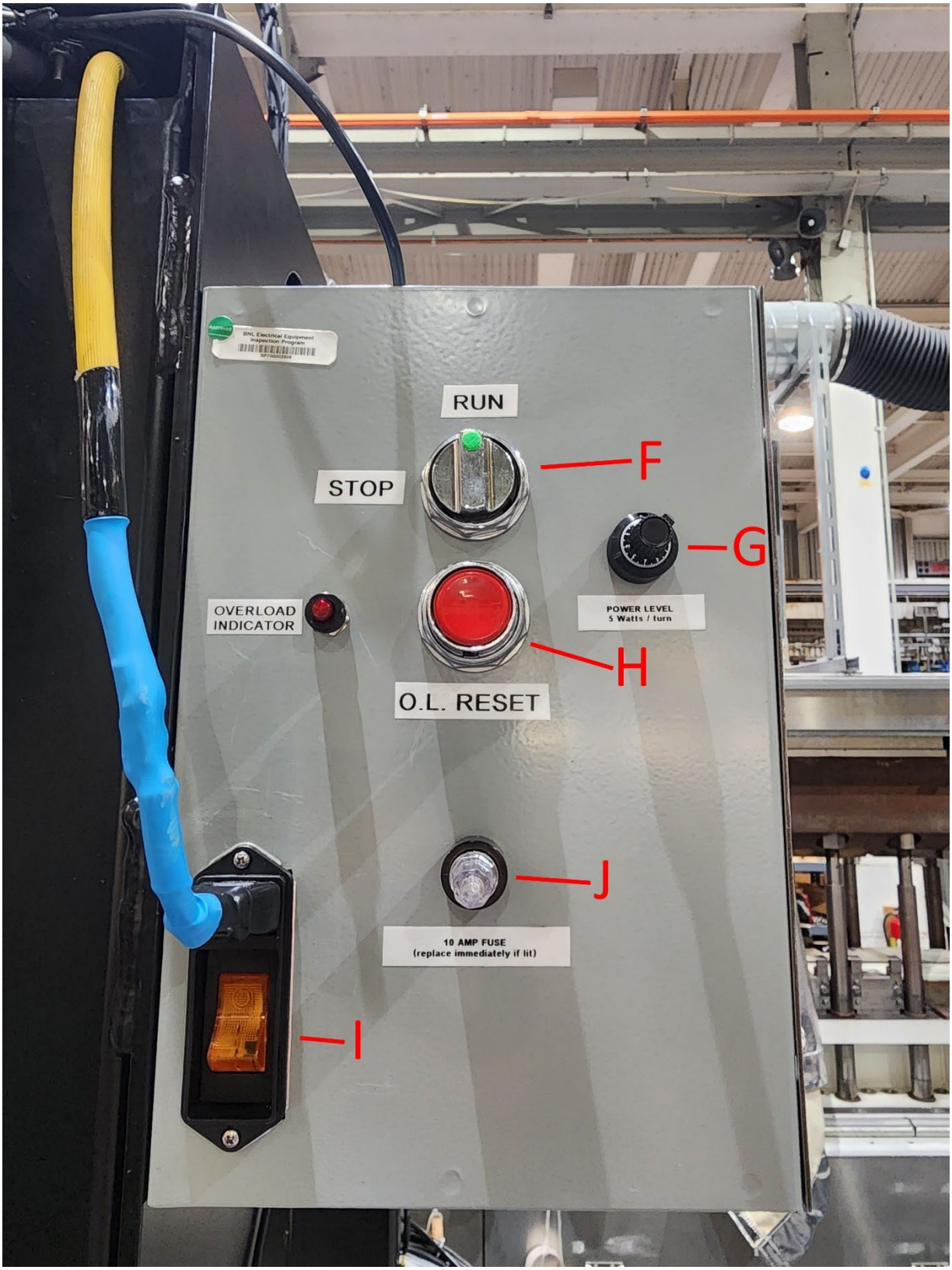
8. Attachment

Attachment 1 – Panel Rack
Attachment 2 – Air Tank
Attachment 3 – Ultrasonic Generator & Power Supply
Attachment 4 – Interlock Test Form

Attachment 1 – Panel Rack

Attachment 2 – Air Tank

Attachment 3 – Ultrasonic Generator & Power Supply



Attachment 4 – Interlock Test Form

Check if passed

Rack Crash Button	2 Table Crash Buttons	2 X Axis Range of Motion End Crash Switches	2 Y Axis Range of Motion End Crash Switches	2 Z Axis Range of Motion End Crash Switches	Table Crash Cords	Operator	Date