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SMD Operations Procedures Manual

8.1.1.8 OPERATION OF THE SUPERCONDUCTING CABLE INSULATING LINE

Text Pages 1 through 10
Attachment(s) 1

Hand Processed Changes

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8.1.1.8 Operation of the Superconducting Cable Insulating Line

1.0 Purpose and Scope

- 1.1 The purpose of this Procedure is to provide step by step instruction in the start-up, operation, and shut-down of the Superconducting Cable Insulation Line (Line) located in building 924.
- 1.2 This information is provided for any person who will operate the controls on the Line.

2.0 Responsibilities

- 2.1 Authorized operators (Operators) of the cable insulating line will perform the procedure described here. A list of Operators is kept in a controlled location near the Line.
- 2.2 The Operator shall maintain a Wrapping Line log book. Entries shall include notes of any irregularities encountered during start-up, operation, and shut-down of the Line.
- 2.3 The Operator shall complete an inventory traveller for each spool of wrapped cable.

3.0 Prerequisites

3.1 Training

Operators shall be instructed by the Cognizant Engineer or his designee before using this procedure.

3.2 Manpower

Two Operators are required.

3.3 Tools and Equipment

Feeler gage; ohmmeter; micrometer

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3.4 Power

Power is supplied through circuit breakers 8,10,12 from panel P.P. C11 (located on west wall).

4.0 Precautions

4.1 Wear safety glasses.

4.2 Check that work area is clear of unauthorized personnel.

4.3 Check that all guards and interlocks are in place.

4.4 Be aware of the location and function of all Emergency Stop buttons.

4.5.1 Ensure that the Emergency stop Switch Safety Test (Attachment 1) has been completed with the previous three (3) months or perform the test (5.21.6).

5.0 Procedure

5.1 Operator Controls and Displays

5.1.1 Refer to the document entitled "Superconducting Cable Insulating Line Instruction Manual", prepared by Paul Chu and Greg Bagley, (draft copy, revised 6/27/92), for a description of the operator controls and a drawing of the operator control panel.

5.2 Pre-Operational Checks (Before Tape or Cable Spools are Mounted)

5.2.1 Check control panel settings:

- A. HAND/AUTO set to HAND
- B. TAPE TENSION ADJUST set to ON
- C. TAPE TENSION POWER set to OFF
- D. CONTROL POWER set to ON
- E. PAYOUT SPOOLER set to OFF
- F. SHORT CHECKERS set to OFF (observe display for 0 volts)

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G. LUMP CHECKER set to OFF (observe display for 0 volts)

H. TAPE BREAK BYPASS set to ON (deactivates photo eye)

5.2.2 Clean and check all roller guides, lump checker, puller track, and take-up spooler for chips and dirt.

5.3 Set Up Tape Supply on Both Taping Heads

5.3.1 Install tape universal put up or step pack on the tape cob holder, and also on the supply stand of the taping heads with the loose end facing away from the Operator. For tape routing, refer to Appendix 3, "Installation/Operation Instructions, Taping Heads, with Hysteresis Tension Control", by United States Machinery.

5.3.2 Select Taping Head Operating Mode:

A. Set TAPING MODE SELECT switch to MODE A for Kapton over Kapton insulation.

B. Set TAPING MODE SELECT switch to MODE B for fiberglass/Kapton over Kapton insulation.

5.4 Mount Cable Spools

5.4.1 Mount empty spool onto the take-up spooler shaft.

5.4.2 Adjust stops on spooler shaft to center the spool on the centerline of the taping line.

5.4.3 Mount the bare cable spool onto the payout spooler shaft with the thick edge of the keystone toward the Operator.

5.4.4 Adjust stops to center the spool on the taping line centerline.

5.4.5 Install the shaft end support.

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5.5 Splice Cable to Leader

5.5.1 Pull cable end to the work station.

5.5.2 Solder leader and cable end to be spliced.

5.5.3 Clip ends square and crimp the cable to the leader.

5.6 Thread leader through the line. Clamp leader into cable puller. Do not attach leader to take-up spool.

5.7 Run Line Slowly

5.7.1 Make sure CABLE SPEED ADJUST potentiometer is set to zero.

5.7.2 Set RUN/JOG switch to RUN.

5.7.3 Set FWD/REV switch to FWD.

5.7.4 Set PAYOUT SPOOLER switch to PAYOUT.

5.7.5 Press OPERATE button.

5.7.6 Turn CABLE SPEED ADJUST potentiometer until cable begins to move.

5.7.7 Set cable tension to approximately 25 pounds, using the display and potentiometer marked "CABLE TENSION".

5.8 Advance the leader until the good cable reaches the No. 1 taping head. Stop line by turning CABLE SPEED ADJUST potentiometer to zero.

5.9 Adjust Taping Head Rollers and Attach Tape to Cable

5.9.1 Adjust the set of side guide rollers on the No. 1 taping head snug against the bare cable. Adjust the set of horizontal guide rollers two mils larger than the thickness of the cable.

5.9.2 Adjust the set of guide rollers on the No. 2 taping head with a 0.003 to 0.005 inch clearance all around the leader/cable.

5.9.3 Pass the loose end of the Kapton or fiberglass tape over the taping head rollers and secure the tape to the cable by applying adhesive (Kingco 15-106-37 or approved equivalent).

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5.10 Check Tape Tension and Adjust as Necessary

5.10.1 Run line very slowly.

5.10.2 Check that tape is at correct running tension; adjust the potentiometer marked RUN TENSION as necessary and note the voltmeter reading.

5.10.3 Press STOP button to stop the machine.

5.10.4 Set STOP TENSION potentiometer to a voltmeter reading approximately the same voltage as the RUN TENSION setting.

5.11 Set Up Photoelectric Automatic Tension Control

5.11.1 Make sure that the tape spool is full so that it is at its maximum o.d.

5.11.2 Check that the TAPE TENSION ADJUST switch is ON.

5.11.3 Set the HAND/AUTO switch to AUTO.

5.11.4 Press and hold the PHOTOEYE RETURN button; a small red light above the button will glow. When the light goes out, release the button.

5.11.5 Check that the RUN tension, as indicated on the 100V meter, is the desired tension as found during step 5.10

5.12 Check for proper tape overlap. The wrap is 50% overlap for Kapton; the wrap is 0% overlap for fiberglass wrap with a gap of 0.020 in. +/- 0.015 in. Adjust as necessary.

5.13 Run line again until wrapped cable passes through the first short checker.

5.14 Set Up and Test Short Checker No. 1

5.14.1 Check and clean Hi-Pot rollers.

CAUTION

Cable shall be grounded to avoid shock hazard.

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5.14.2 Check that bare cable is grounded (use ohmmeter).

5.14.3 Check Operation of Hi-Pot:

- A. Open clear plastic guard of Short Checker No. 1 and attach alligator clip side of high-voltage probe to roller assembly.
- B. Turn on Short Checker No. 1 by pressing the ON/OFF button.
- C. Set for 1000 V RMS by turning dial and observing display.
- D. Touch probe to ground briefly (a sustained short will damage the Hi-Pot); indicator light and buzzer should turn on.
- E. Reset by pressing RESET button.
- F. Turn Short Checker No. 1 off by again pressing the ON/OFF button.
- G. Replace guard.

5.15 Advance cable by running the line until the good cable reaches No. 2 Taping Head. Repeat steps 5.9 to 5.12 for No. 2 Taping Head.

5.16 Advance the wrapped cable past Short Checker No. 2. Repeat step 5.14 to set up and test Short Checker No. 2.

5.17 Advance wrapped cable past the lump detector.

5.18 Set Up and Test Lump Detector

5.18.1 Check and clean lump detector rollers.

5.18.2 Switch the lump detector on by pressing the ON/OFF button.

5.18.3 Deflect proximity switch roller; indicator light and buzzer should turn on.

5.18.4 Reset lump detector by pressing RESET button.

5.18.5 Adjust voltage level so that the detector will trip when the roller is displaced more than 0.005 inches:

- A. Thread insulated cable through the rollers.

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- B. Set the trip voltage to about 10 volts using the LEVEL SET dial.
 - C. Place a 0.005 inch feeler gage between the insulated cable and the roller.
 - D. Adjust the voltage level downward until the detector trips.
 - E. Remove feeler gage. Reset detector. Voltage level is set.
- 5.19 Advance leader through cable puller and cut off leader after it exits the puller. Set footage counter to zero.
- 5.20 Advance cable to empty take-up spool and secure with the appropriate clamp block.
- 5.21 Commence Run
- 5.21.1 Prepare the cable wrapping log book for data entry.
 - 5.21.2 Double check all settings and alignments of the line.
 - 5.21.3 Operator #1 is to monitor the control panel and all the operations of the line.
 - 5.21.4 Operator #2 is to to be posted at the take-up spooler and maintain the proper lay of the cable on the spool. Special attention is to be given to the placement of cotton rope along the flanges of the spool to assure a level lay of the cable.
 - 5.21.5 Start Line:
 - A. MAIN MOTOR CONTROL RUN/JOG switch to RUN.
 - B. FWD/REV switch to FWD.
 - C. Press OPERATE.
 - D. Adjust CABLE SPEED ADJUST-RUN potentiometer to a satisfactory speed.
 - E. Tape Break Bypass switch to OFF (this activates photoy eye).

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5.21.6 Check the "Emergency Stop Switch Safety Test" check-off sheet (see Attachment B) posted near the Line for the last date that the stop switches were tested. They should be tested every three months. If a test is due, perform the following safety test for all three switches:

- A. While the line is running, press the Emergency Stop button on the control console.
- B. All machine motion should cease. Control power should remain on.
- C. Repeat for the emergency stop switches on the payout spooler and the take-up spooler.
- D. Check off, date, and initial the "Emergency Stop Switch Safety Test" sheet.

5.21.7 Mount new tape spools and splice as necessary. Splices are to be made in accordance with the appropriate specification (see BNL Spec No. RHIC-MAG-R-7152).

5.21.8 Press STOP to stop run.

5.22 At Completion of Run

5.22.1 Splice next leader/cable to the end of the cable being insulated.

5.22.2 Pull next leader/cable through the wrapping line.

5.22.3 Cut cable being insulated at lead end (tail) splice and secure loose end to take-up spool.

5.22.4 Place protective cover over spool.

5.22.5 Complete log book and inventory traveller.

5.22.6 Tape traveller to side of loaded spool.

5.22.7 Remove loaded spool from line and store in refrigerator.

5.23 Shut Down Line

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Photoelectric eye shall be shut off when not in use.

5.23.1 Set HAND/AUTO switch to HAND.

5.23.2 Set console controls to pre-operational settings.

5.23.3 Turn off CONTROL POWER.

6.0 Documentation

6.1 Wrapping line log book.

6.2 Inventory traveller.

6.3 Emergency stop switch safety test check-off sheet.

7.0 References

7.1 Superconducting Cable Insulating Line Instruction Manual, prepared by Paul Chu and Greg Bagley, draft copy, revised 6/27/92.

7.2 Instruction Manual; Digital Tension Readout and Control for Clutches, Brakes, DC or AC drives; Magnetic Power Systems, Inc.

7.3 Instruction Manual; Taping Heads, with Hysteresis Tension Control; United States Machinery.

7.4 Instruction Manual; High Frequency Sine Wave Spark Tester, Model HF-20-H; Clinton Instrument Co.

7.5 BNL Specification No. RHIC-MAG-R-7152, for splicing of electrical insulation film (Kapton or equivalent).

7.6 BNL Specification No. RHIC-MAG-R-7155 cable insulating magnet assembly procedure

8.0 Attachments

1. Emergency Stop Switch Safety Test Check-Off Sheet

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Attachment 1

EMERGENCY STOP SWITCH SAFETY TEST

DATE----->	1/15/93	4/15/93				
CONSOLE	X	X				
PAYOUT SPOOLER	X	X				
TAKE-UP SPOOLER	X	X				
INITIALS->	GHJ	GHJ				

Notes:

1. Keep posted near the Line.
2. Test switches once every three months.
3. Test Procedure:
 - 3.1 While Line is running, press Emergency Stop button on console.
 - 3.2 All machine motion should cease.
 - 3.3 Repeat for Emergency Stop buttons on payout spooler and take-up spooler.
 - 3.4 Check off, date, and initial chart.